**Příloha č. 1 smlouvy č. 2022/065 NAKIT – Technická specifikace Předmětu plnění**

**TECHNICKÁ SPECIFIKACE GIS SOFTWAROVÉHO**

1. **Úvod**

**SYSTÉMU PRO DATA INSPIRE**

Poptávaný GIS softwarový systém pro data INSPIRE (dále jen GIS Systém) bude nedílnou součástí projektu Informační systém pro veřejné služby a služby veřejné správy INSPIRE (dále jen ISSI). Účelem projektu ISSI je zpracování a zpřístupnění dat uvedených ve Směrnici Evropského parlamentu a Rady 2007/2/ES o zřízení Infrastruktury pro prostorové informace v Evropském společenství (dále jen INSPIRE) v příloze III tématu 6 (dále jen INSPIRE III/6) viz příloha 1. ISSI má již definovanou softwarovou viz kapitola 5 a infrastrukturní viz kapitola 4 architektonickou koncepci, které dodávané řešení GIS Systému musí reflektovat. Ve výsledku musí dojít k plné integraci dodaného řešení GIS Systému s dalšími částmi projektu ISSI dodávaného zadavatelem. Zadavatel na této integraci bude plně spolupracovat

1. **Popis**

GIS Systém bude nástroj pro komplexní řešení požadavků na zpracování dat v rámci požadavků INSPIRE včetně uživatelských nástrojů pro řízení zpracování dat, vytváření procesů pro zpracování dat, sběr informací pro zpracování dat (mapovací schémata) a kontrolu kvality dat a datového obsahu.

Typickým požadavkem na GIS Systém je přijetí dat, jejich validace, mapování schématu, zapsání do datového úložiště a publikace prostřednictvím předepsaných formátů síťových služeb INSPIRE (vyhledávací, prohlížecí, stahovací, transformační) viz příloha 2. Důležitou součástí požadavků na GIS Systém jako celku jsou i další nástroje pro jeho správu a řízení.

GIS Systému musí mít široké možnosti tvorby transformačních datový procesů, aby bylo možné reagovat na změny nejen v rámci INSPIRE, ale i na změny formy poskytování a struktury vstupních dat, a s tím spojené úpravy harmonizačních schémat a validací dat.

Hlavní funkční požadavky na GIS Systém tedy jsou:

* 1. Zpracování vstupních dat a správa zdrojů
  2. Validace vstupních dat a správa validačních pravidel a mapovacích schémat včetně nástrojů na jejich sběr od poskytovatelů dat
  3. Komplexní mapování schématu validovaných vstupních dat a manipulace s prostorovou složkou (harmonizace dat)
  4. Validace harmonizovaných dat
  5. Uložení harmonizovaných dat včetně historizace
  6. Publikace harmonizovaných dat
  7. Prohlížení harmonizovaných dat
  8. Řízení procesů paralelního zpracování dat včetně automatizace (automatické spuštění, vytváření chybových reportů a zasílání notifikací)
  9. **Zpracování vstupních dat a správa zdrojů**

GIS Systém bude zpracovávat data jak z veřejných, tak neveřejných zdrojů. GIS Systém umožňuje přijímat i stahovat data v různých datových formátech. GIS Systém obsahuje nástroje pro správu zdrojů, jako je editace cesty ke zdroji, správa autentifikačních údajů (jméno, heslo, certifikáty).

* 1. **Validace vstupních dat a správa validačních pravidel a mapovacích schémat včetně nástrojů na jejich sběr od poskytovatelů dat**

GIS Systém bude validovat vstupní data dle zadaných validačních pravidel a schémat a bude obsahovat nástroje pro jejich editaci a sběr. Na základě výsledků validace bude možné automaticky spustit definované akce (procesy), jako je zaslání automatických zpráv, vytvoření reportu a oprava vstupních dat. Nedílnou součástí budou i nástroje pro sběr validačních pravidel a mapovacích schémat od poskytovatelů dat

* 1. **Komplexní mapování schématu validovaných vstupních dat a manipulace s prostorovou složkou (harmonizace dat)**

GIS Systém bude harmonizovat validní vstupní data do datového modelu INSPIRE III/6. Jedná se o komplexní mapování schématu vstupních dat do schématu INSPIRE III/6 odpovídajících datových sad jak na úrovni názvů atributů, tak na úrovni hodnot atributů. Důležitým požadavkem na GIS Systém v rámci harmonizace dat je přítomnost nástrojů pro manipulaci s daty jak v atributové, tak prostorové složce. Na základě výsledků harmonizace bude možné automaticky spustit definované akce (procesy), jako je zaslání automatických zpráv a vytvoření reportu.

GIS Systém obsahuje grafické uživatelské nástroje pro editaci a řízení mapování atributů a hodnot atributů včetně nastavení podmínek na základě definovaných schémat vstupních dat a schémat INSPIRE III/6.

* 1. **Validace harmonizovaných dat**

GIS Systém bude validovat transformovaná data ve formátu INSPIRE III/6, čímž dojde k ověření správnosti harmonizace. Validace bude jak vnitřní, na základě schématu dat INSPIRE III/6, tak bude možné provést validaci dat přes evropský a národní validátor dat INSPIRE III/6. Na základě výsledků validace bude možné automaticky spustit definované akce (procesy) jako je generování reportu a odeslání zprávy.

* 1. **Uložení harmonizovaných dat včetně historizace**

GIS Systém bude umožňovat ukládání harmonizovaných dat jak do databázových, tak souborových struktur. Součástí požadavku je i zobrazení přehledu jednotlivých verzí harmonizovaných dat na základě času a data harmonizace.

* 1. **Publikace harmonizovaných dat**

GIS Systém bude umožnovat publikaci harmonizovaných dat přes služby definované v rámci síťových služeb INSPIRE (vyhledávací, prohlížecí, stahovací, transformační). Poskytované služby musí projít přes evropský a národní validátor služeb INSPIRE.

* 1. **Prohlížení harmonizovaných dat**

V rámci GIS Systému bude možné prohlížení harmonizovaných datových sad INSPIRE III/6 ve formátech definovaných v rámci prohlížecích síťových služeb INSPIRE. Pro prohlížení dat bude v rámci GIS Systému vytvořena aplikace v designu dodaném zadavatelem. Aplikace bude spustitelná ve standartních internetových prohlížečích a očekáváná je responzibilita pro mobilní zařízení.

V rámci aplikace bude mít možnost uživatel zobrazit harmonizovaná data, dotazovat se na jednotlivé prvky, volit si detail přiblížení, bude mít k dispozici také nástroje pro měření ploch a délek a možnost měnit mapový podklad.

* 1. **Řízení procesů paralelního zpracování dat včetně automatizace (automatické spuštění, vytváření chybových reportů a zasílání notifikací)**

Na GIS Systém jsou vzhledem k předpokládanému vysokému počtu datových vstupů o velkých datových objemech kladeny vysoké výkonové nároky na zpracování dat a s tím související požadavky s jejich paralelním zpracováním. Paralelním zpracováním dat se v rámci poptávky rozumí nezávislé zpracování dvou a více datových sad v jednom čase viz kapitola 5. Samotné paralelní zpracování jedné datové sady není požadováno.

Součástí dodávky budou nástroje na řízení paralelního zpracování dat a možnost definice automatického spuštění procesů harmonizace a validace dat.

1. **Účel a obsah dodávky**

Účelem dodávky je zajištění komplexního zpracování definovaných dat v rámci INSPIRE včetně dodávky uživatelských a podpůrných nástrojů a zajištění provozu a rozvoje GIS Systému v rámci ISSI.

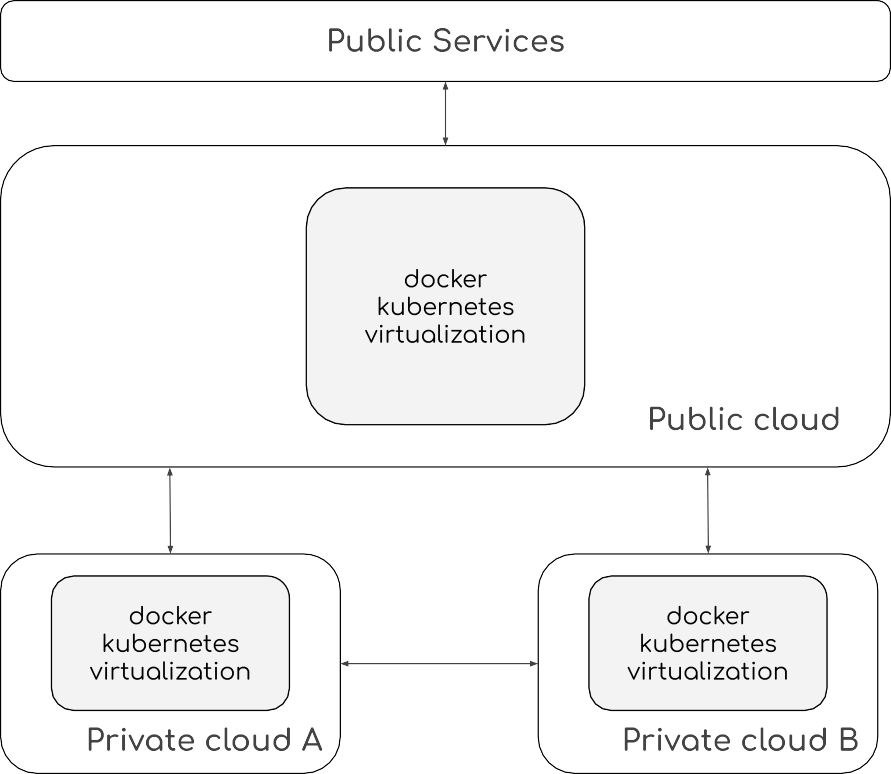
Obsahem dodávky tedy je:

* 1. GIS Systém odpovídající požadavkům na softwarovou architekturu a technickou specifikaci komponent včetně instalace, integrace do prostředí ISSI (implementace), základního nastavení, ověření funkčnosti, dokumentace a školení. Součástí bude i případné pořízení licencí použitých softwarových řešení
  2. Role dle specifikace v definovaném časovém rozsahu
  3. Podpora na dodávané řešení včetně rozvoje, podpora na použité licence softwarových řešení (aktualizace verzí, oprava chyb) v definovaném časovém rozsahu
  4. **Architektura infrastruktury a běhové prostředí**

Infrastruktura ISSI je postavena na cloudových technologiích firmy Microsoft. Konktrétně se jedná o dva geograficky oddělené privátní cloudy na technologii Microsoft Azure Stack a jeden veřejný cloud na technologii Microsoft Azure. Společně tak tvoří koncept tzv. hybridního cloudu. Cloudy budou vzájemně propojené a budou disponovat veškerými výpočetními zdroji (výpočetní výkon, síťová konektivita) s ohledem na požadavky provozu GIS Systému.

V rámci hybridního cloudového prostředí bude formou DevOps implementováno kromě produkčního prostředí rovněž vývojové, testovací a stage (předprodukční) prostředí s potřebnými nástroji pro nasazování CI/CD a účely testování nových nasazení a změn. Dále se počítá s využitím funkcí pro automatizaci úloh a plnou funkcionalitou „infrastruktura jako kód“ a s maximálním využitím platformních služeb (PaaS), kterými cloudová technologie bude disponovat.

V rámci cloudového prostředí je pro běh aplikací GIS Systému připravena technologie Docker a Kubernetes. V případě nutných desktopových grafických aplikací je možné použít i cloudové virtualizační technologie s operačním systémem Windows či Linux. Běhové prostředí GIS Systému včetně jeho správy a operačních systémů je kompletně zajištěno zadavatelem.



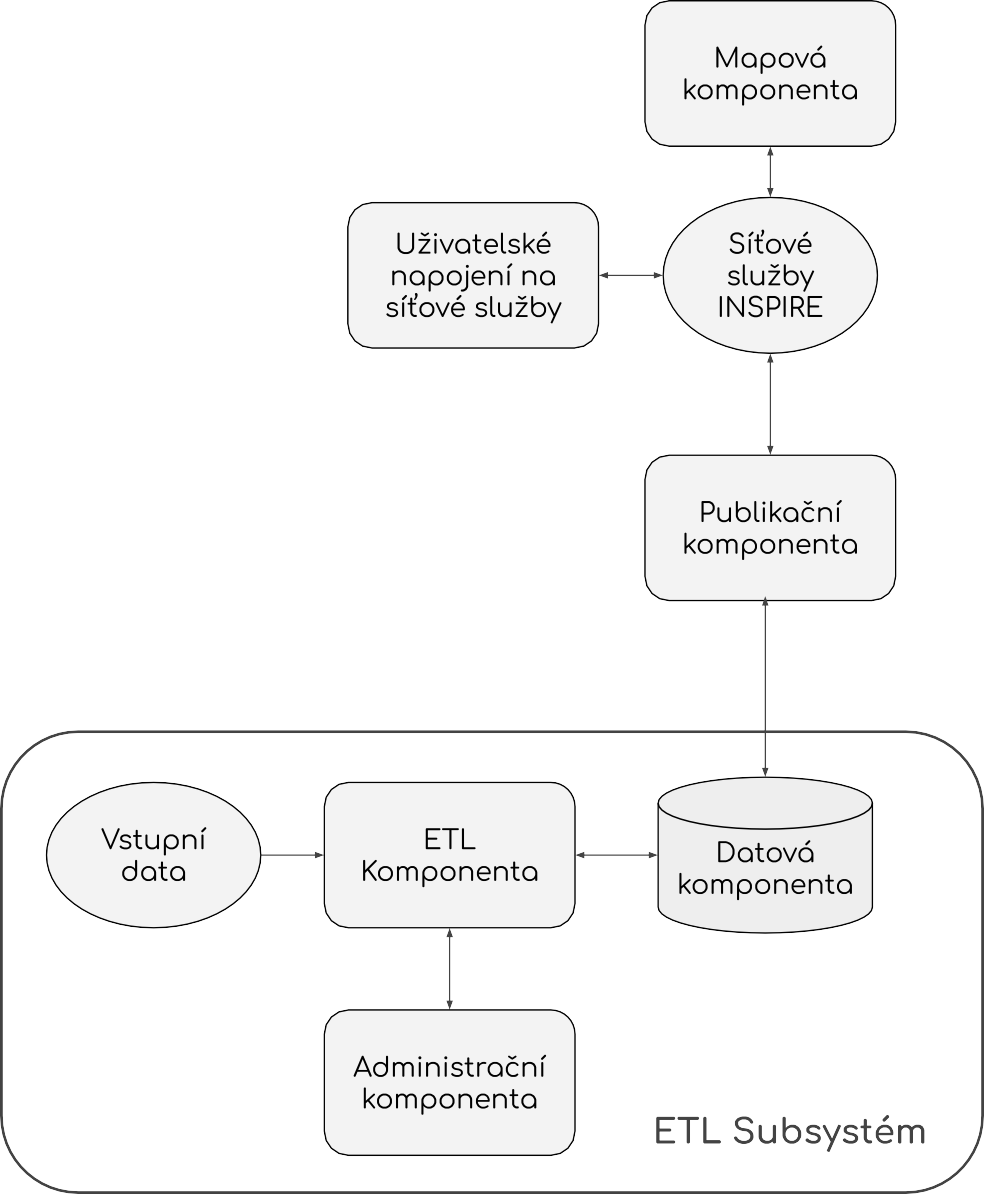
Obrázek 1- Architektura infrastruktury ISSI

* 1. **Softwarová architektura GIS Systému**
     1. **Popis definované softwarové architektury**

V rámci návrhu ISSI je definována softwarová architektura GIS Systému, viz Obrázek 2, která je postavena na komplexních dílčích prvcích s definovanými požadavky, tzv. komponentami. Základní softwarová architektura je pro dodavatele závazná. Vnitřní struktura (architektura) komponent však není definována, tedy záleží na dodavateli, jakými technickými prostředky dosáhne požadované funkcionality. Nicméně dodávka jednotlivých komponent, resp. celého GIS Systému musí být v souladu s definovanou softwarovou architekturou, běhovým prostředím a architekturou infrastruktury ISSI.

Na realizaci GIS Systému nejsou kladeny požadavky na použité softwarové prostředky (programovací jazyky, frameworky, databázové systémy, softwarové prostředky třetích stran apod.). Dodavatel však bude plně odpovídat za dodaný GIS Systém (funkce, oprava chyb), s výjimkou využití nabídnutých softwarových prostředků zadavatelem.

Aktualizace GIS Systému bude probíhat s využitím nástrojů CI/CD dodaných zadavatelem. Všechny vlastní zdrojové kódy, konfigurační soubory a případné vlastní nadstavbové moduly i jejich zdrojové kódy softwarových prostředků třetích stran, budou ve výhradní licenci zadavatele. Úložiště zdrojových kódů určí zadavatel a bude odpovídat za jeho dostupnost pro dodavatele.



Obrázek 2 – Softwarová architektura GIS Systému

Komponenty jsou dle funkcionality seskupeny do dvou tzv. Subsystémů. První Subsystém tzv. ETL Subsystém je určen pro přijetí dat, jejich validaci, mapování schématu a zapsání do datového úložiště (body 1-5 hlavních funkčních požadavků, viz kapitola Popis). Součástí ETL Subsystému budou i nástroje pro řízení paralelních procesů zpracování vstupních dat (bod 8 hlavních funkčních požadavků, viz kapitola Popis)

Druhý Subsystém tzv. PUB Subsystém je určen pro publikaci a prohlížení dat (body 6-7 základních funkčních požadavků, viz kapitola Popis).

* + 1. **Paralelní zpracování a publikace dat**

Na základě požadavků na výkon a dostupnost funkcí GIS Systému a potřeb rozvoje a testování byl definován požadovaný počet GIS Systémů s rozpadem na jednotlivé Subsystémy. Zároveň byl definován počet paralelních procesů pro zpracování dat ETL Subsystémem a počet paralelně odbavovaných uživatelů PUB Subsystémem.

Jak je již uvedeno v kapitole 2.8, je paralelním procesem zpracování vstupních dat v rámci technické specifikace myšleno zpracování dvou a více, resp. do počtu požadovaných paralelních procesů zpracování dat v rámci typu využití, datových sad v jednom čase. Tedy v jeden čas bude ETL Subsystém moci zpracovávat dle uvedených požadavků v Tabulce 1 až

5 nezávislých datových sad v jednom čase v rámci jednoho produkčního prostředí ETL Subsystému a 2 datové sady v rámci testovacího a vývojového prostředí ETL Subsystému. Samotné paralelní zpracování jedné datové sady není požadováno.

Počtem paralelních uživatelů PUB Subsystému se rozumí, že v jeden čas budou odbavovány požadavky na čtení dat až 20-ti uživatelů bez nutnosti frontování.

Tabulka 1 - Přehled počtu požadovaných GIS Systémů dle Subsystémů a typu licence

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GIS**  **Systém** | **ETL**  **Subsystém** | **Počet paralelních procesů zpracování dat ETL Subsystému** | **PUB**  **Subsystém** | **Počet paralelních uživatelů**  **PUB Subsystému** | **Typ licence** |
| 1 | NE | - | ANO | 20 | Produkční |
| 2 | ANO | 5 | ANO | 20 | Produkční |
| 3 | ANO | 5 | ANO | 20 | Produkční |
| 4 | ANO | 2 | ANO | 20 | Neprodukční |
| 5 | ANO | 2 | ANO | 20 | Neprodukční |

* + 1. **Autentizace uživatelů**

Požadavkem realizace projektu ISSI je implementace jednotné autentizační služby pro všechny jeho části, tedy i v rámci GIS Systému. Pro projekt ISSI byl vybrán produkt Keycloak (https:[//w](http://www.keycloak.org/))ww[.keycloak.org/),](http://www.keycloak.org/)) který je dodáván a spravován zadavatelem. Všechny komponent resp., použité softwarové prostředky použité v rámci plnění dodávky GIS Systému, musí být v případě požadavku na autentizaci uživatelů (viz Příloha 3) připraveny a nakonfigurovány pro napojení na produkt Keycloak.

* + 1. **Logování**

Požadavkem realizace projektu ISSI je jednotný přístup ke sběru a analýze logů pro všechny jeho části, tedy i v rámci GIS Systému. Pro projekt ISSI byl vybrán produkt Microsoft Azure Monitor resp., Application Insights a Log Analytics ([https://docs.microsoft.com/en-](https://docs.microsoft.com/en-us/azure/azure-monitor/overview) [us/azure/azure-monitor/overview](https://docs.microsoft.com/en-us/azure/azure-monitor/overview)), který je dodáván a spravován zadavatelem. Všechny komponent resp., použité softwarové prostředky použité v rámci plnění dodávky GIS Systému musí umožňovat vytváření logů a připraveny a nakonfigurovány pro napojení na Azure Monitor.

* 1. **Technická specifikace a požadavky na komponenty**
     1. **ETL komponenta**

ETL komponenta je hlavním výpočetním prvkem GIS Systému v oblasti ETL procesů. Umožňuje operace s daty v podporovaných formátech dle procesů definovaných prostřednictvím Administrační komponenty ETL.

ETL Komponenta bude podporovat paralelní zpracování dat dle definice a popisu v kapitole 5 a 2.8. Součástí ETL Komponenty budou i nástroje na řízení paralelního zpracování, které budou obsahovat funkce k zobrazení aktuálně zpracovávaných datových sad, čekajících datových sad ke zpracování s možností úpravy jejich priority zpracování. Součástí ETL Komponenty budou dále nástroje pro nastavení podmínek pro automatického spuštění ETL procesů (harmonizace, validace apod.) na základě časového plánovače, výsledku ETL procesu, změny zdrojových souborových dat a změny stavu služby poskytující zdrojová data

Požadavky na funkcionalitu ETL Komponenty jsou uvedeny v Příloze 3 v Tabulce 1.

* + 1. **Administrační komponenta ETL**

Administrační komponenta ETL je hlavním řídícím prvkem systému. Komponenta je úzce provázána s ETL komponentou. Komponenta umožňuje přívětivé grafické prostředí pro nastavení celého ETL procesu nad jednotlivými soubory dat. V rámci komponenty je možné sledovat průběh jednotlivých ETL procesů včetně zobrazení logů.

Komponenta je určena administrátorům GIS Systému a umožňuje plnou správu ETL procesů tedy jak jejich editaci, tak vytváření. Obsahuje funkce (nástroje) pro definici nových ETL procesů včetně podpůrných funkcí jako je detailní logování, procházení logů a prohlížení výstupů. Rozsah poskytovaných funkcí (nástrojů) bude možné rozšiřovat dle požadavků na práci se vstupními a výstupními daty.

Požadavky na funkcionalitu Administrační komponenty ETL jsou uvedeny v Příloze 3 v Tabulce 2.

* + 1. **Publikační komponenta**

Publikační komponenta zprostředkovává data dle požadavků síťových služeb INSPIRE směrem ke konzumentům služeb nebo Mapové komponentě. Umožňuje výkonovou škálovatelnost dle počtu požadavků.

Požadavky na funkcionalitu Publikační komponenty jsou uvedeny v Příloze 3 v Tabulce 3.

* + 1. **Mapová komponenta**

Mapová komponenta představuje webovou mapovou aplikaci (mapové okno a ovládací prvky a nástroje). Podporuje připojení definovaných formátů dat, síťových služeb a vytváření témat nad daty (mapová kompozice).

Jedná se o základní prohlížecí prvek GIS Systému se základní funkcionalitou. V rámci GIS Systému se od koncových uživatelů počítá s vyšším využitím přímého napojení na sítové služby INSPIRE.

Požadavky na funkcionalitu Mapové komponenty jsou uvedeny v Příloze 3 v Tabulce 4.

* + 1. **Datová komponenta**

Datová komponenta představuje hlavní datové úložiště GIS Systému. Jedná se jak o databázové, tak souborové struktury. Úložiště podporuje ukládání jak atributové, tak prostorové složky dat. Data se pomocí nástrojů komponenty mohou zálohovat a v případě více datových komponent i replikovat. Nástroje komponenty budou obsahovat i funkce pro práci s atributovou a prostorovou složkou dat.

Komponenta bude umožňovat výkonovou škálovatelnost v závislosti na množství požadavků a objemu dat.

Zadavatel může dodavateli poskytnout databázi PostgreSQL/PostGIS v rámci Azure Database for PostgreSQL. Nabízené řešení má však omezení verzí PostgreSQL kde je maximální dostupná verze 11 a PostGIS, kde je dostupná maximální verze 2.5. V nabízeném řešení jsou také další omezení na dostupnost rozšíření PostgreSQL. Možná rozšíření jsou uvedena v dokumentaci Azure Database for PostgreSQL ([https://docs.microsoft.com/en-](https://docs.microsoft.com/en-us/azure/postgresql/concepts-extensions) [us/azure/postgresql/concepts-extensions](https://docs.microsoft.com/en-us/azure/postgresql/concepts-extensions)). Zadavatel rovněž nabízí dodavateli výkonný systém souborového ukládání dat postavený také na technologie Microsoft Azure. Obě nabízená řešení plně odpovídají požadavkům na provoz GIS Systému. Za licence a provoz těchto nabídnutých úložišť odpovídá zadavatel. Je samozřejmě možné zvolit jiná datová úložiště vyhovující požadavkům na dodávaný GIS Systém s plnou odpovědností dodavatele.

Požadavky na funkcionalitu Datové komponenty jsou uvedeny v Příloze 3 v Tabulce 5. Pokud uchazeč využije nabídku zadavatele, Tabulku 5 v příloze 3 nevyplňuje.

* 1. **Dokumentace a školení**

V rámci GIS Systému bude dodána následující dokumentace v editovatelné elektronické podobě:

|  |  |
| --- | --- |
| **Dokumentace** | **Popis** |
| Vývojová dokumentace | Komentáře ve zdrojovém kódu, celkový popis propojenosti jednotlivých SW částí (architektura), popis komunikačních rozhraní a jejich definice |
| Administrátorská dokumentace | Popis správy a implementace dodaných SW částí, popis logů a jejich struktura. Metodika odstraňování provozních chyb a problémů |
| Uživatelská dokumentace | Popis ovládání GIS Systému (srozumitelný návod na obsluhu systému a podrobný popis provádění jednotlivých úkonů), zejména grafických uživatelských rozhraní. Popis procesů v GIS Systému |
| Systémová dokumentace | Popis funkcí, včetně bezpečnostních, které používá správce systému pro provádění určených činností. Podrobný popis GIS Systému nebo odkaz na dokument, ve kterém je popis uveden a který je  Objednateli dostupný |
| Dokumentace k řešení GIS Systému | Popis identifikovaných datových toků, protokolů, architektonického nákresu komponent a jejich  spolupráce, diagram logického a fyzického zapojení |

Veškerá dokumentace bude zpracovaná v souladu s požadavky zákona č. 365/2000 Sb., o informačních systémech veřejné správy, ve znění pozdějších předpisů a v souladu s vyhláškou č. 529/2006 Sb., o požadavcích na strukturu a obsah informační koncepce a provozní dokumentace a o požadavcích na řízení bezpečnosti a kvality informačních systémů veřejné správy (vyhláška o dlouhodobém řízení informačních systémů veřejné správy), ve znění pozdějších předpisů.

V rámci GIS Systému bude dodáno následující školení:

|  |  |
| --- | --- |
| **Školení** | **Popis** |
| Administrátorské školení | Školení na základě administrátorské dokumentace i s názornými ukázkami odstraňování provozních chyb a problémů. Čtení logů a jejich vyhodnocování |
| Školení uživatelů | Školení na základě uživatelské dokumentace. Praktické ukázky práce s GIS Systémem a implementovanými procesy |

* 1. **Implementace GIS Systému**

Dodavatel se bude podílet na implementaci GIS Systému jak v testovacím, vývojovém, produkčním prostředí v nutném rozsahu (instalace, integrace do prostředí ISSI, základního nastavení, ověření funkčnosti).

* 1. **Specifikace rolí a definice časového rozsahu**

Obsahem dodávky GIS Systému jsou i požadované role s danou specifikací. V rámci dodaných rolí dojde k nastavení a optimalizaci (výkonové a funkční) dodané platformy GIS Systému a jeho plné integraci do prostředí ISSI. Rozsah znalostí jednotlivých rolí v určených oblastech musí korespondovat s dodanou technologií komponent GIS Systému.

Role a definice časového rozsahu v člověkodnech (MD):

|  |  |
| --- | --- |
| **Role** | **MD** |
| Projektový manažer | 10 |
| DB analytik | 40 |
| DB specialista | 65 |
| DB vývojář | 65 |
| Metadatový specialista | 30 |
| GIS Specialista ETL | 145 |
| GIS Vývojář | 105 |
| GIS Analytik | 55 |

**Projektový manažer**

Vede projekt na straně Dodavatele. Plánuje dílčí úkoly, kontroluje a dohlíží na jejich plnění. Spolupracuje s Projektovým manažerem na straně Zadavatele.

**DB analytik**

Umí vybrat vhodné databázové softwarové prostředky na základě požadavků. Vytváří logické i fyzické databázové modely. Navrhuje logiku databázových funkcí a umí připravit zadání pro jejich vývoj. Má odpovědnost za implementaci databázových modelů a schémat na dané technologii.

**DB specialista**

Konfiguruje dané databázové softwarové prostředky a optimalizuje jejich výkon. Umí analyzovat výkoností problémy a navrhovat jejich řešení. Podílí se na implementaci, provozu a dohledu databázových softwarových prostředků. Má znalosti a zkušenosti se zálohováním, obnovou a replikací databázových dat.

**DB vývojář**

Vyvíjí databázové funkce na základě požadavků a určuje jejich strukturu. Má zodpovědnost za kvalitu programového zdrojového kódu a jeho verzování. Připravuje automatické testy funkcí a implementaci programových změn. Pro naplnění požadavků dokáže zvolit vhodné programovací prostředky na základě určené databázové technologie.

**Metadatový specialista**

Orientuje se v oblasti metadatových softwarových prostředků a formátů. Analyzuje požadavky na metadata a na jejich základě dokáže zvolit vhodné softwarové technologie a připravit zadání pro vývoj. Umí ověřit správnou funkci metadatových softwarových prostředků a validovat použité metadatové formáty.

**GIS Specialista ETL**

Dle požadavků navrhuje a vytváří transformační procesy nad prostorovými daty. Orientuje se v oblasti GIS ETL softwarových prostředků a umí je využít. Má zodpovědnost za funkci, kvalitu a verzování vytvořených ETL procesů a dokáže připravit jejich automatické funkční testy. Podílí se na implementaci, provozu, dohledu a rozvoji ETL procesů.

**GIS Vývojář**

Dokáže zvolit vhodné prostorové programovací prostředky dle požadavků. Zná problematiku souřadnicových systémů. Umí programově pracovat se souřadnicemi (manipulace, výpočty) a vizualizovat výsledky. Ovládá programové webové GIS technologie. Má zodpovědnost za kvalitu programového zdrojového kódu, jeho verzování a automatické testování. Podílí se na implementaci vyvinutých softwarových prostředků.

**GIS Analytik**

Disponuje znalostmi v oblasti GIS technologií. Na základě požadavků navrhuje vhodná řešení a připravuje zadání pro vývoj softwarových prostředků. Podílí se na funkčním testování, kontrole zdrojového kódu, analýze chyb, implementaci a provozu. Má zodpovědnost za funkčnost navrženého řešení.

* 1. **Záruka a podpora GIS Systému**

V rámci dodávky GIS Systému bude dodána záruka a podpora (včetně veškerých systémových, aplikačních a bezpečnostních aktualizací a povyšování verzí) v délce trvání dle smlouvy o Poskytnutí podpory GIS systému. V rámci záruky budou řešeny veškeré provozní chyby a problémy a podpora případných licencí softwarových produktů třetích stran.

V rámci podpory budou dodány i člověkodny (MD) pro správu ETL procesů v rozsahu:

|  |  |
| --- | --- |
| **Oblast podpory** | **MD za kalendářní rok** |
| Úprava procesů ETL | 15 |
| Přidání nového procesu ETL | 30 |

* 1. **Akceptace**

Akceptační podmínky a řízení je definováno ve Smlouvě na dodávku GIS SW systému pro data INSPIRE, licencí SW a souvisejících služeb.

**Seznam příloh**

Příloha 1 – Definice dat uvedených ve směrnici INSPIRE III/6

|  |  |
| --- | --- |
| **Typ** | **Název** |
| soubor | P6\_ZD\_Příloha 1 Technické specifikace\_definice\_dat\_inspire\_III\_6 |

Příloha 2 – Definice síťových služeb INSPIRE

|  |  |
| --- | --- |
| **Typ** | **Název** |
| soubor | P6\_ZD\_Příloha 2 Technické specifikace\_definice\_vyhledavacich\_sluzeb\_inspire |
| soubor | P6\_ZD\_Příloha 2 Technické specifikace\_definice\_stahovacich\_sluzeb\_inspire |
| soubor | P6\_ZD\_Příloha 2 Technické specifikace\_definice\_stahovacich\_sluzeb\_inspire-wcs |
| soubor | P6\_ZD\_Příloha 2 Technické specifikace\_definice\_prohlizecich\_sluzeb\_inspire |
| soubor | P6\_ZD\_Příloha 2 Technické specifikace\_definice\_transformacnich\_sluzeb\_inspire |

Příloha 3 – Požadavky na funkcionalitu jednotlivých komponent

|  |  |
| --- | --- |
| **Typ** | **Název** |
| soubor | P6\_ZD\_Příloha 3 Technické specifikace\_pozadavky\_na\_funkcionalitu\_komponent |

**Seznam zkratek**

|  |  |
| --- | --- |
| AD | Active directory |
| CI/CD | Continuous integration and continuous delivery |
| DB | Databáze |
| ETL | Extract, transform, load (extrakce, transformace a nahrání dat do datového skladu, nebo do datového tržiště) |
| GIS | Geografický informační systém |
| INSPIRE | Infrastruktura pro prostorové informace v Evropě |
| ISSI | Informační systém pro veřejné služby a služby veřejné správy INSPIRE |
| LDAP | Lightweight directory access protocol |
| OGC | Open Geospatial Consortium |
| RÚIAN | Registr územní identifikace, adres a nemovitostí |



INSPIRE

Infrastructure for Spatial Information in Europe

D2.8.III.6 Data Specification on *Utility and Government Services*

– Technical Guidelines

|  |  |
| --- | --- |
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| **Coverage** | Project duration |

**Foreword**

**How to read the document?**

|  |
| --- |
| This document describes the *“INSPIRE data specification on Utility and Government Services – Technical Guidelines”* version 3.0 as developed by the Thematic Working Group (TWG) *Utility and Government Services* using both natural and a conceptual schema language.  The data specification is based on a common template1 used for all data specifications, which has been harmonised using the experience from the development of the Annex I, II and III data specifications.  This document provides guidelines for the implementation of the provisions laid down in the Implementing Rule for spatial data sets and services of the INSPIRE Directive. It also includes additional requirements and recommendations that, although not included in the Implementing Rule, are relevant to guarantee or to increase data interoperability.  Two executive summaries provide a quick overview of the INSPIRE data specification process in general, and the content of the data specification on *Utility and Government Services* in particular. We highly recommend that managers, decision makers, and all those new to the INSPIRE process and/or information modelling should read these executive summaries first.  The UML diagrams (in Chapter 5) offer a rapid way to see the main elements of the specifications and their relationships. The definition of the spatial object types, attributes, and relationships are included in the Feature Catalogue (also in Chapter 5). People having thematic expertise but not familiar with UML can fully understand the content of the data model focusing on the Feature Catalogue. Users might also find the Feature Catalogue especially useful to check if it contains the data necessary for the applications that they run. The technical details are expected to be of prime interest to those organisations that are responsible for implementing INSPIRE within the field of *Utility and Government Services*, but also to other stakeholders and users of the spatial data infrastructure.  The technical provisions and the underlying concepts are often illustrated by examples. Smaller examples are within the text of the specification, while longer explanatory examples and descriptions of selected use cases are attached in the annexes.  In order to distinguish the INSPIRE spatial data themes from the spatial object types, the INSPIRE spatial data themes are written in *italics.* |
| The document will be publicly available as a ‗non-paper‘. It does not represent an official position of the European Commission, and as such cannot be invoked in the context of legal procedures. |
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1 The common document template is available in the ―Framework documents‖ section of the data specifications web page at [*http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2*](http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2)

**Interoperability of Spatial Data Sets and Services – General Executive Summary**

The challenges regarding the lack of availability, quality, organisation, accessibility, and sharing of spatial information are common to a large number of policies and activities and are experienced across the various levels of public authority in Europe. In order to solve these problems it is necessary to take measures of coordination between the users and providers of spatial information. The Directive 2007/2/EC of the European Parliament and of the Council adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment.

INSPIRE is based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure have been specified: metadata, interoperability of spatial data sets (as described in Annexes I, II, III of the Directive) and spatial data services, network services, data and service sharing, and monitoring and reporting procedures.

INSPIRE does not require collection of new data. However, after the period specified in the Directive2

Member States have to make their data available according to the Implementing Rules.

Interoperability in INSPIRE means the possibility to combine spatial data and services from different sources across the European Community in a consistent way without involving specific efforts of humans or machines. It is important to note that ―interoperability‖ is understood as providing access to spatial data sets through network services, typically via Internet. Interoperability may be achieved by either changing (harmonising) and storing existing data sets or transforming them via services for publication in the INSPIRE infrastructure. It is expected that users will spend less time and efforts on understanding and integrating data when they build their applications based on data delivered in accordance with INSPIRE.

In order to benefit from the endeavours of international standardisation bodies and organisations established under international law their standards and technical means have been utilised and referenced, whenever possible.

To facilitate the implementation of INSPIRE, it is important that all stakeholders have the opportunity to participate in specification and development. For this reason, the Commission has put in place a consensus building process involving data users, and providers together with representatives of industry, research and government. These stakeholders, organised through Spatial Data Interest Communities (SDIC) and Legally Mandated Organisations (LMO)3, have provided reference materials, participated in the user requirement and technical4 surveys, proposed experts for the Data Specification Drafting Team5, the Thematic Working Groups6 and other ad-hoc cross-thematic technical groups and participated in the public stakeholder consultations on draft versions of the data

2 For all 34 Annex I,II and III data themes: within two years of the adoption of the corresponding Implementing Rules for newly collected and extensively restructured data and within 5 years for other data in electronic format still in use

3 The current status of registered SDICs/LMOs is available via INSPIRE website:

[*http://inspire.jrc.ec.europa.eu/index.cfm/pageid/42*](http://inspire.jrc.ec.europa.eu/index.cfm/pageid/42)

4 Surveys on unique identifiers and usage of the elements of the spatial and temporal schema,

5 The Data Specification Drafting Team has been composed of experts from Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Switzerland, UK, and the European Environment Agency

6 The Thematic Working Groups have been composed of experts from Austria, Australia, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Romania, Slovakia, Spain, Slovenia, Sweden, Switzerland, Turkey, UK, the European Environment Agency and the European Commission.

specifications. These consultations covered expert reviews as well as feasibility and fitness-for- purpose testing of the data specifications7.

This open and participatory approach was successfully used during the development of the data specifications on Annex I, II and III data themes as well as during the preparation of the Implementing Rule on Interoperability of Spatial Data Sets and Services8 for Annex I spatial data themes and of its amendment regarding the themes of Annex II and III.

The development framework elaborated by the Data Specification Drafting Team aims at keeping the data specifications of the different themes coherent. It summarises the methodology to be used for the development of the data specifications, providing a coherent set of requirements and recommendations to achieve interoperability. The pillars of the framework are the following technical documents9:

* The *Definition of Annex Themes and Scope* describes in greater detail the spatial data themes defined in the Directive, and thus provides a sound starting point for the thematic aspects of the data specification development.
* The *Generic Conceptual Model* defines the elements necessary for interoperability and data harmonisation including cross-theme issues. It specifies requirements and recommendations with regard to data specification elements of common use, like the spatial and temporal schema, unique identifier management, object referencing, some common code lists, etc. Those requirements of the Generic Conceptual Model that are directly implementable are included in the Implementing Rule on Interoperability of Spatial Data Sets and Services.
* The *Methodology for the Development of Data Specifications* defines a repeatable methodology. It describes how to arrive from user requirements to a data specification through a number of steps including use-case development, initial specification development and analysis of analogies and gaps for further specification refinement.
* The *Guidelines for the Encoding of Spatial Data* defines how geographic information can be encoded to enable transfer processes between the systems of the data providers in the Member States. Even though it does not specify a mandatory encoding rule it sets GML (ISO 19136) as the default encoding for INSPIRE.
* The *Guidelines for the use of Observations & Measurements and Sensor Web Enablement-related standards in INSPIRE Annex II and III data specification development* provides guidelines on how the ―Observations and Measurements‖ standard (ISO 19156) is to be used within INSPIRE.
* The *Common data models* are a set of documents that specify data models that are referenced by a number of different data specifications. These documents include generic data models for networks, coverages and activity complexes.

The structure of the data specifications is based on the ―ISO 19131 Geographic information - Data product specifications‖ standard. They include the technical documentation of the application schema, the spatial object types with their properties, and other specifics of the spatial data themes using natural language as well as a formal conceptual schema language10.

7 For Annex II+III, the consultation and testing phase lasted from 20 June to 21 October 2011.

8 Commission Regulation (EU) No 1089/2010 [implementing Directive 2007/2/EC of the European](http://eur-lex.europa.eu/JOHtml.do?uri=OJ%3AL%3A2010%3A323%3ASOM%3AEN%3AHTML) [Parliament and of the Council as regards interoperability of spatial data sets and services,](http://eur-lex.europa.eu/JOHtml.do?uri=OJ%3AL%3A2010%3A323%3ASOM%3AEN%3AHTML) published in the Official Journal of the European Union on 8th of December 2010.

9 The framework documents are available in the ―Framework documents‖ section of the data specifications web page at [*http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2*](http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2)

10 UML – Unified Modelling Language

A consolidated model repository, feature concept dictionary, and glossary are being maintained to support the consistent specification development and potential further reuse of specification elements. The consolidated model consists of the harmonised models of the relevant standards from the ISO 19100 series, the INSPIRE Generic Conceptual Model, and the application schemas11 developed for each spatial data theme. The multilingual INSPIRE Feature Concept Dictionary contains the definition and description of the INSPIRE themes together with the definition of the spatial object types present in the specification. The INSPIRE Glossary defines all the terms (beyond the spatial object types) necessary for understanding the INSPIRE documentation including the terminology of other components (metadata, network services, data sharing, and monitoring).

By listing a number of requirements and making the necessary recommendations, the data specifications enable full system interoperability across the Member States, within the scope of the application areas targeted by the Directive. The data specifications (in their version 3.0) are published as technical guidelines and provide the basis for the content of the Implementing Rule on Interoperability of Spatial Data Sets and Services12. The content of the Implementing Rule is extracted from the data specifications, considering short- and medium-term feasibility as well as cost-benefit considerations. The requirements included in the Implementing Rule are legally binding for the Member States according to the timeline specified in the INSPIRE Directive.

In addition to providing a basis for the interoperability of spatial data in INSPIRE, the data specification development framework and the thematic data specifications can be reused in other environments at local, regional, national and global level contributing to improvements in the coherence and interoperability of data in spatial data infrastructures.

11 Conceptual models related to specific areas (e.g. INSPIRE themes)

12 In the case of the Annex II+III data specifications, the extracted requirements are used to form ulate an amendment to the existing Implementing Rule.

***Utility and Government Services* – Executive Summary**

The theme *“Utility and Government Services”* covers different feature types under its scope (i.e. miscellaneous energy networks, plentiful public services of different types and several environmental management facilities).

In order to develop data specifications, the list of geographical entities has been restricted to those features potentially linked with environmental issues (according to the INSPIRE directive fundamentals) and moreover dispatched in three main subthemes described below.

Nevertheless, the *“Utility and Government Services”* thematic approach consists in providing quite simple information describing such services, among which:

* Feature location;
* Party involved in the service (Administration or organization on behalf of an administrative mandate);
* Basic technical characteristics, such as capacity or details on the type of service provided.

The use cases studied and taken into account in the data specifications development process are based on few European regulation processes (such as the Waste Framework Directive– cf. Annexes B & C of the current document), but other non-legally referenced basic uses - as locating features and simply describing information - were also to be considered.

This statement is principally due to (i) various national and local uses – impossible to be exhaustively considered – and also (ii) the aim of simplicity underlying the data specifications development process.

Considering width of the scope, it has been decided to split the thematic into 3 different sub-domains:

1. Utility networks;
2. Administrative and social governmental services;
3. Environmental management facilities.

Each of them has its own modelization, independent from one to another (though some elements may be linked between sub-domains).

The purpose of such an approach is permitting to any data provider and user to exchange its own data with as much flexibility as possible.

1. The ***“Utility networks”*** sub-model is structured into 2 profiles:
   * **Utility Networks Profile:** derived from the Generic Network model13, this modelization is based on a node-arc-node structure and network concept. Especially designed for utility networks managers willing to describe their data into a structured modelization that allows its business use (estimation of propagation, calculation of capacities, etc.); the technical description of several network elements is limited to very simple information (type of material transported and basic characteristics). The use of this profile is also adapted for non-topological data, since the relation between nodes and arcs is optional;
   * **Extended Utility Networks Profile:** annexed proposals for richer models, detailing the Utility Networks Profile, i.e. same structure based on the Generic Network model and many other attributes and lists of values proposed to better describe the utility networks characteristics for a richer use.

In each profile, the information is detailed in several application schemas:

* + Electricity network
  + Oil, Gas & Chemicals network
  + Sewer network
  + Telecommunications network (only proposed in the technical guidance, out of legislation)

*13 developed and used by Annex I “Transport networks” and “Hydrography” themes*

* + Thermal network
  + Water network

In addition to generic network information (utility link elements, connection with nodes and belonging to a network), each element (UtilityLinkSet, UtilityNode and UtilityNetwork) is detailed within its specific application schema through various attributes, developed through several codelists values or Measure types for most of them.

1. The model of the ***“Administrative and social governmental services”*** sub-theme is based on one single central feature type, ―GovernmentalService‖, that is basic in a core-defined profile (mainly location, contact and type of service information) and detailed in an extended one (including occupancy, resources and other description).

Its geometric reference can be an existing object (such as INSPIRE Annex I ―Address‖, Annex III

―Building‖ or abstract type ―ActivityComplex‖ described below) or a created object (GM\_Object, mostly GM\_Point to be consistent with the well-used notion of POI = Point of Interest).

The GovernmentalService type value is selected from a codelist of more than 50 items, organized in a hierarchical structure, based on the ―Classification of the functions of government‖ - abbreviated as COFOG, currently used by EUROSTAT, and developed within the respect of INSPIRE criteria (focused on public & environmental aspects).

1. The ***“Environmental Management Facilites”*** application schema defines a single feature type called ―EnvironmentalManagementFacility‖, with a generic geometric reference (GM\_Object).

―EnvironmentalManagementFacility‖ is a specialisation of the Generic Conceptual Model

―ActivityComplex‖ feature type. This ensures close alignment (harmonisation) with other feature types derived from ―ActivityComplex‖, especially those from the *Production and Industrial Facilities* (PF) and *Agricultural and Aquaculture Facilities* (AF) themes.

The ―EnvironmentalManagementFacility‖ feature type is suitable for the representation of sites and installations. The ―parentFacility‖-association from ―EnvironmentalManagementFacility‖ to

―EnvironmentalManagementFacility‖ supports the representation of hierarchies among installations and sites.

Several aspects of environmental management facilities are represented in the model, most notably facility functions, permissions, capacities, related parties (owners, operators, authorities) and status information. Several established codelists are used for the representation of such aspects, including Eurostat‘s NACE list of economic activities, the Decision 2000/532 List of Wastes and the Waste Framework Directive (2008/98) list of disposal and recovery operations.

**Acknowledgements**

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The Thematic Working Group *Utility and governmental services* (TWG-US) included:

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Other contributors to the INSPIRE data specifications are the Drafting Team Data Specifications, the JRC Data Specifications Team and the INSPIRE stakeholders - Spatial Data Interested Communities (SDICs) and Legally Mandated Organisations (LMOs).

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Unit H06: Digital Earth and Reference Data

[*http://inspire.ec.europa.eu/index.cfm/pageid/2*](http://inspire.ec.europa.eu/index.cfm/pageid/2)

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# Scope

This document specifies a harmonised data specification for the spatial data theme *Utility and Government Services* as defined in Annex III of the INSPIRE Directive.

This data specification provides the basis for the drafting of Implementing Rules according to Article 7

(1) of the INSPIRE Directive [Directive 2007/2/EC]. The entire data specification is published as implementation guidelines accompanying these Implementing Rules.

## Overview

**2.1 Name**

INSPIRE data specification for the theme *Utility and Government Services*.

### Informal description

**Definition:**

―Includes utility facilities such as sewage, waste management, energy supply and water supply, administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals.‖ [Directive 2007/2/EC]

#### Utility networks

**Comprehension of the scope**

Utility services and networks include the physical constructions for transport of defined utility products (namely pipelines for transport of oil, gas, chemicals, water, sewage and thermal products), transmission lines and cables (included those for transmission of electricity, phone and cable-TV signals) and other network elements for encasing pipes and cases (e.g. ducts, poles and towers).

All kinds of transmission utility systems have nodes (e.g. pump stations), and they are linked to facilities for production and treatment of different kinds of utility products. These major production and treatment sites are described in the theme production and industrial facilities (Annex.III – PF).

Six important types of utility networks are distinguished, namely Electricity Network, Oil, Gas & Chemicals Network, Sewer Network, Telecommunications Network, Thermal Network and Water Network.

All these networks use the node-arc-node model, as defined in the Generic Network Model. Especially designed for a structured modelization of utility networks that allows its business use (estimation of propagation, calculation of capacities, etc.), the use of this node-arc-node model is also adapted for non-topological data, since the relation between nodes and arcs is optional.

Different organizations have different responsibilities and this will influence the kind of data they collect, manage and use. Some organizations will use simple models while other will have more complex data models. This data specification is a basic framework that user can adopt and, if necessary, adapt and extend for themselves. The specification is focused on the core spatial objects required by networks, i.e. network centerlines etc.

In the utility services and networks there are ―ducts‖, which are utility links used to protect and guide cable and pipes via an encasing construction. A duct may contain other duct(s), pipes and cables.

―Duct‖ contains information about the position and characteristics of ducts as seen from a manhole, vault, or a cross section of a trench and duct.

The nodes of the networks include poles. Poles represent node objects that support utility devices and cables. ―Pole‖ is a container to other utility objects. Other important nodes are manholes, towers and cabinets. A ―Manhole‖ is the top openings to an underground public utility or service. A ―Tower‖ is a vertical tower object that carries utility cables or pipes. A ―Cabinet‖ is container for utility node objects (e.g. appurtenances). Poles, manholes, towers and cabinets represent containers for other network elements belonging to one or more utility networks.

**Overlaps / links with other themes**

This sub-theme might overlap with themes:

* Hydrography (A-I.8)
* Buildings (A-III.2)
* Land use (A-III.4)
* Environmental monitoring facilities (like treatment plants/pumping stations) (A-III.7)
* Production and industrial facilities (A-III.8)
* Energy resources (A-III.20)

Current sub-theme holds potential dependencies with the following themes:

* Annex I
  + Coordinate reference systems (geo-referencing of the point)
  + Geographical grid systems (geo-referencing of the point)
  + Geographical names (Identification of the point and of the place where it is located)
  + Administrative units (that contain the point)
  + Addresses (referencing of the point)
  + Cadastral parcels (that contain the given service and from which the service is provided)
  + Transport networks (that provide access to/from the services)
  + Protected sites (that may contain services or being potential receptors of these)
* Annex II
  + Elevation (referencing of the point)
* Annex III
  + Statistical units (that contain the point)
  + Buildings (that contain the given service and from which the service is provided)
  + Population distribution – demography (potential service ―clients‖)
  + Utilities (that the service make use/depend on)

#### Administrative and social governmental services

**Comprehension of the scope**

According to the INSPIRE Directive, the scope of the sub-theme comprises ―… administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals. [Annex III].‖

On another hand, INSPIRE document ―Definition of Annex Themes and Scope v3.0 (D 2.3)‖ details governmental services as those fitting the following description:

*“Administrative and social governmental services such as public administrations, civil protection sites, schools, hospitals. The kind of sites that are commonly presented in governmental and municipal portals and map systems as “points of interest”-data (POI), and may be point-based location of a variety of categories of municipal and governmental services and social infrastructure”.*

Given this description and, very specially, the concrete mention to the use of this type of data as POI, a wide interpretation of what ―administrative and social governmental services‖ should be done.

In this same sense, the following words from the manual of the Spanish EIEL (Spanish acronym for Enquiry on Local Infrastructures and Services) database, which does also contain information on public services, may be considered as highly relevant: ―(...)The variety of ways how public services are provided and the correspondent variety in facilities management, as well as the concurrent activity of different Public Administration bodies, do recommend having in mind a broad scope on what are the utilities and services that are collectively facing the same needs‖.

***Eligibility criteria***

To identify the relevant service types, legal requirements (mainly the wording of the INSPIRE directive itself) as well as requirements based on use cases have to be considered. In detail a list of relevant criteria has been defined. Thus service types are within the scope, when they are

* explicitly mentioned in the INSPIRE directive Annex III (―such as public administrations, civil protection sites, schools and hospitals‖) or
* in a common understanding covered by the general scope of the annex theme (―administrative and social governmental services‖) and which are similar to the explicitly mentioned ones (e.g. kindergarten) or
* covered by the general scope of the annex theme (partly in a broader sense of ―public‖ service) and which obviously address environmental issues (e.g. environmental education center) or
* generally considered as ―social governmental services‖ (e.g. specialized service for the disabled) or
* in a common understanding covered by the general scope of the annex theme and whose main purpose is to provide services for environmental risk/disaster assessment/management (e.g. civil protection sites) or
* in a common understanding covered by the general scope of the annex theme and which are the most important means of governments to manage (environmental) disaster events (e.g. police services).

Aside, there are a lot of public services (in a broader sense), whose main purpose is not to provide services in environmental disaster events but can be used in these situations, like sports halls or fair venues. For example, thousands of people took shelter in the New Orleans‘ Superdome during the hurricane Katrina. Despite this, these sites are neither seen first and foremost as ―administrative and social governmental services‖ nor do they have an environmental context. Therefore, they are not considered to be within the scope of this data specification.

Furthermore, some ―administrative and social governmental services‖ can be regarded as especially

―vulnerable‖ to environmental disasters. This aspect is covered by the ―Natural risk zones‖ theme and therefore out of scope of this data specification.

In opposite to the criteria listed above, the fact whether the service is provided by a Public Administration Body (PAB) or by private institutions is not a relevant criterion. Very often, administrative and social governmental services are not provided by the PAB itself but by a private institution as a matter of public interest. In many cases, this varies from Member State to Member State, from region to region and from municipality to municipality.

**Overlaps / links with other themes**

Overlaps: This sub-theme overlaps the following ones:

* Buildings (A-III.2), e.g. use of buildings
* Human health and safety (A-III.5), e.g. hospitals
* Natural risk zones (A-III.12), e.g. a number of governmental services can be considered as vulnerable elements too (e.g. schools)

Links and dependencies: The sub-theme holds potential dependencies with the following themes, primarily in order to provide the spatial reference of the services respectively the (spatial) area of responsibility of the service

* Annex I

Coordinate reference systems Geographical names Administrative units Addresses

* Annex III

Buildings

#### Environmental management facilities

**Comprehension of the scope**

The INSPIRE Directive ―Definition of Annex Themes and Scope v3.0 (D 2.3)‖ states that this sub- theme comprises several categories in order to identify the environmental protection facilities. Categories such as waste treatment sites, waste treatment facilities, regulated and illegal areas for dumping, mining waste and sewage sludge are mentioned as categories to be included. The use cases also indicate the need for providing information on waste treatment, storage and disposal.

The sub-theme scope therefore includes all the facilities involved or/and requested by law to be registered on the management of all kind of wastes of the ―European Waste Catalogue and Hazardous Waste List‖. Locations of the facilities are given by point or polygon. The waste management facilities are referred to either as installations or sites, where an installation is understood as a stationary unit where one or more waste management activities are carried out, or any other directly associated activities. The site is understood as a single location, in which certain infrastructure and facilities are shared, and where waste management activities take place.

All of the following is considered relevant for the scope: The function of the environmental facility, expressed as economic activity (typically as waste management activity), permissions, inputs and outputs. In addition, information on service hours and capacities are also linked to facility, as well as operators, owners, contacts, and competent authorities.

Waste management activities are distinguished by categories such as storage, recovery, and/or disposal of waste. Economic activities can be categorized by entries of the NACE catalogue (Classification of Economic Activities in the European Community), particularly those under the `E´- Group ―Water supply; sewerage; waste management and remediation activities‖. The Eurostat CPA list of products (Annex to Regulation (EC) n. 451/2008) is used for the classification of output products.

The Environmental Management Facilities Model is based on the Generic Activity Complex Model and in the Data Types described on it as potential extensions.

**Organization of information**

The following types of data are within the scope of the TWG-US sub-theme. They are provided with links to reference documents that illustrate which user requirements the type of data originate from.

* Discharge [9] (of waste water)
* Disposal [1] (of waste)
* Dumping [1] (of waste at sea)
* Facility [3] (of waste production, treatment, storage)
* Hazardous waste [1]
* Incineration [8] (of waste)
* Installation [3]
* Landfill [13] (of waste)
* Non-hazardous waste [1]
* Plant [8] (of waste production, treatment, storage)
* Radioactive waste [14]
* Recovery [1] (of waste)
* Site [3] (of waste production, treatment, storage)
* Storage [8] (of waste)
* Treatment [1] (of waste or waste water)
* Transfer [3],[4] (of waste)
* Waste [1]
* Waste water [9]

Data out of scope:

* Emissions [2]
* Exhaust gas [8]
* Flooding
* Pollutants [3]

**Dependencies and Overlaps**

The following overlaps with other Feature Types have been identified:

* Buildings: Certain environmental management facilities may be regarded as buildings (and vice versa).
* Production and Industrial Facilities: A production facility may be an environmental management facility, for instance in cases where waste is used as fuel.
  + - * Land use: Dumping of waste onto land and landfills may be seen as overlapping with land use

***Reference documents***

1. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste
2. Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control
3. Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register
4. Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste
5. Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators
6. Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC -

Statement by the European Parliament, the Council and the Commission

1. Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics
2. Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)
3. 2000/532/EC: Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (notified under document number C(2000) 1147) (Text with EEA relevance)
4. Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste
5. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy
6. Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles
7. Council Regulation (EEC) No 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community
8. European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste
9. Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
10. Council Directive 92/3/Euratom of 3 February 1992 on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community
11. Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

**Definition:**

―Includes utility facilities such as sewage, waste management, energy supply and water supply, administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals.‖ [Directive 2007/2/EC]

**Description:**

The theme *Utility and Government Services* provides basic information (e.g. the location, basic technical characteristics or involved parties) on a wide range of administrative and social services of public interest.

The theme is split in the following subthemes:

* Utility Networks: Node-link-node structured networks for collection, transmission and distribution, including electricity, oil/gas and chemicals, sewer, thermal, water or (not mandatory) telecommunications networks;
* Administrative and social governmental services: Local and governmental services and social infrastructures, selected with respect to the INSPIRE scope (focused on public & environmental aspects), represented as "points of interest‖;
* Environmental management facilities: Generic facility descriptions for waste management sites, water treatment plants and regulated or illegal areas for dumping.

Entry in the INSPIRE registry: [*http://inspire.ec.europa.eu/theme/us/*](http://inspire.ec.europa.eu/theme/us/)

### Normative References

[Directive 2007/2/EC] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

[Directive 2008/98/EC] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

[ISO 19107] EN ISO 19107:2005, Geographic Information – Spatial Schema

[ISO 19108] EN ISO 19108:2005, Geographic Information – Temporal Schema

[ISO 19108-c] ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19113] EN ISO 19113:2005, Geographic Information – Quality principles

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19123] EN ISO 19123:2007, Geographic Information – Schema for coverage geometry and functions

[ISO 19125-1] EN ISO 19125-1:2004, Geographic Information – Simple feature access – Part 1: Common architecture

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19138] ISO/TS 19138:2006, Geographic Information – Data quality measures

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[ISO 19157] ISO/DIS 19157, Geographic information – Data quality

[OGC 06-103r4] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.1

NOTE This is an updated version of "EN ISO 19125-1:2004, Geographic information – Simple feature access – Part 1: Common architecture".

[Regulation 1205/2008/EC] Regulation 1205/2008/EC implementing Directive 2007/2/EC of the

European Parliament and of the Council as regards metadata

[Regulation 976/2009/EC] Commission Regulation (EC) No 976/2009 of 19 October 2009

implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services

[Regulation 1089/2010/EC] Commission Regulation (EU) No 1089/2010 of 23 November 2010

implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services

[Regulation 166/2006/EC] Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC

### Terms and definitions

General terms and definitions helpful for understanding the INSPIRE data specification documents are defined in the INSPIRE Glossary14.

* 1. **Symbols and abbreviations**

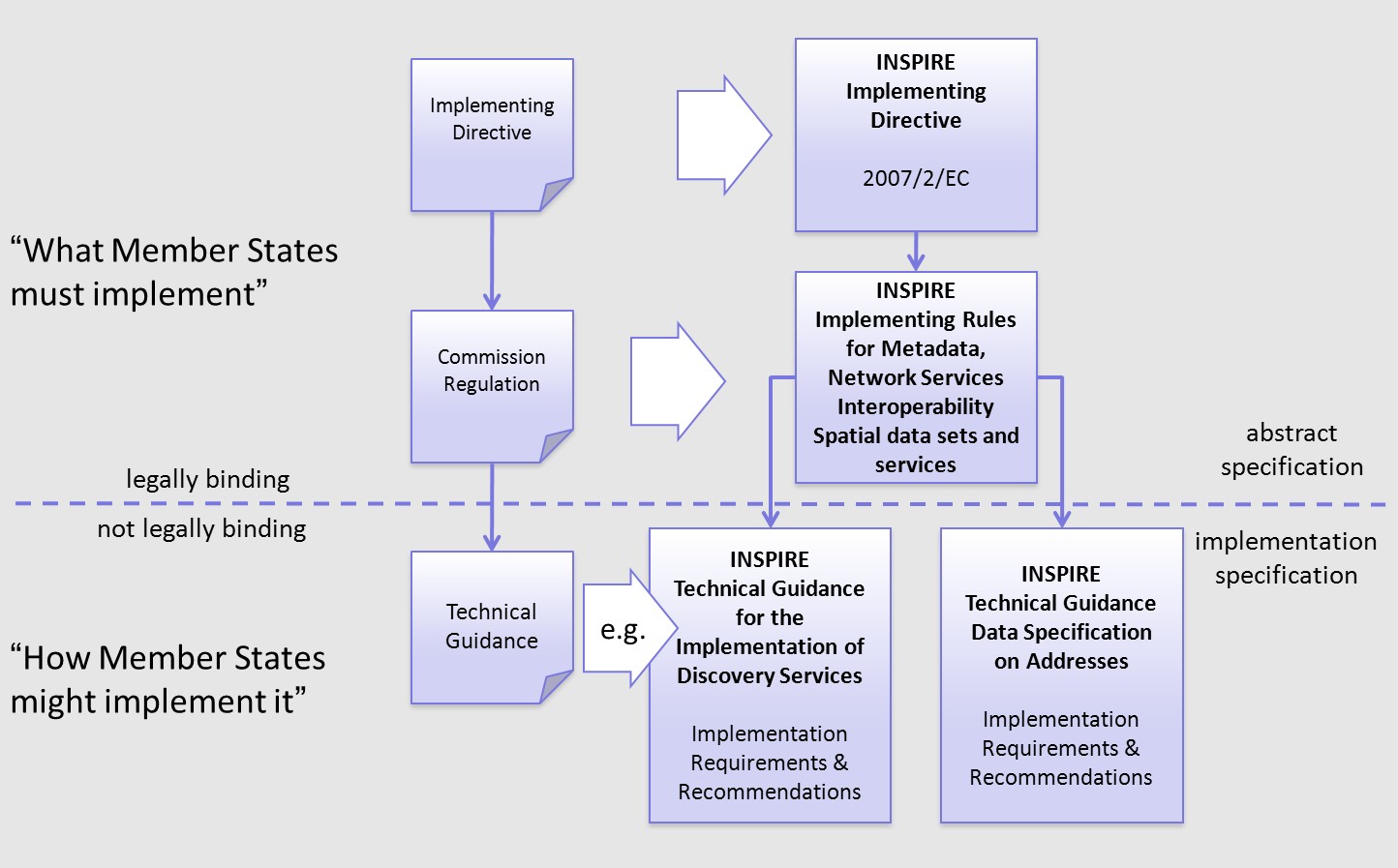
**2.6 How the Technical Guidelines map to the Implementing Rules**

The schematic diagram in [Figure 1](#_bookmark11) gives an overview of the relationships between the INSPIRE legal acts (the INSPIRE Directive and Implementing Rules) and the INSPIRE Technical Guidelines. The INSPIRE Directive and Implementing Rules include legally binding requirements that describe, usually on an abstract level, *what* Member States must implement.

In contrast, the Technical Guidelines define *how* Member States might implement the requirements included in the INSPIRE Implementing Rules. As such, they may include non-binding technical requirements that must be satisfied if a Member State data provider chooses to conform to the

14 The INSPIRE Glossary is available from [http://inspire-](http://inspire-/) registry.jrc.ec.europa.eu/registers/GLOSSARY

Technical Guidelines. Implementing these Technical Guidelines will maximise the interoperability of INSPIRE spatial data sets.



**Figure 1 - Relationship between INSPIRE Implementing Rules and Technical Guidelines**

**2.6.1 Requirements**

The purpose of these Technical Guidelines (Data specifications on *Utility and Government Services*) is to provide practical guidance for implementation that is guided by, and satisfies, the (legally binding) requirements included for the spatial data theme *Utility and Government Services* in the Regulation (Implementing Rules) on interoperability of spatial data sets and services. These requirements are highlighted in this document as follows:

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| **IR Requirement**  *Article / Annex / Section no.*  **Title / Heading**  This style is used for requirements contained in the Implementing Rules on interoperability of spatial data sets and services (Commission Regulation (EU) No 1089/2010). |
| For each of these IR requirements, these Technical Guidelines contain additional explanations and examples.  NOTE The Abstract Test Suite (ATS) in Annex A contains conformance tests that directly check conformance with these IR requirements.  Furthermore, these Technical Guidelines may propose a specific technical implementation for satisfying an IR requirement. In such cases, these Technical Guidelines may contain additional technical requirements that need to be met in order to be conformant with the corresponding IR requirement *when using this proposed implementation*. These technical requirements are highlighted as follows: |

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| **TG Requirement X** This style is used for requirements for a specific technical solution proposed in these Technical Guidelines for an IR requirement. |
| NOTE 1 Conformance of a data set with the TG requirement(s) included in the ATS implies conformance with the corresponding IR requirement(s).  NOTE 2 In addition to the requirements included in the Implementing Rules on interoperability of spatial data sets and services, the INSPIRE Directive includes further legally binding obligations that put additional requirements on data providers. For example, Art. 10(2) requires that Member States shall, where appropriate, decide by mutual consent on the depiction and position of geographical features whose location spans the frontier between two or more Member States. General guidance for how to meet these obligations is provided in the INSPIRE framework documents.  **2.6.2 Recommendations**  In addition to IR and TG requirements, these Technical Guidelines may also include a number of recommendations for facilitating implementation or for further and coherent development of an interoperable infrastructure. |
| **Recommendation X** Recommendations are shown using this style. |
| NOTE The implementation of recommendations is not mandatory. Compliance with these Technical Guidelines or the legal obligation does not depend on the fulfilment of the recommendations.  **2.6.3 Conformance**  Annex A includes the abstract test suite for checking conformance with the requirements included in these Technical Guidelines and the corresponding parts of the Implementing Rules (Commission Regulation (EU) No 1089/2010). |

## Specification scopes

This data specification does not distinguish different specification scopes, but just considers one general scope.

NOTE For more information on specification scopes, see [ISO 19131:2007], clause 8 and Annex D.

# Identification information

These Technical Guidelines are identified by the following URI: <http://inspire.ec.europa.eu/tg/us/3.0>

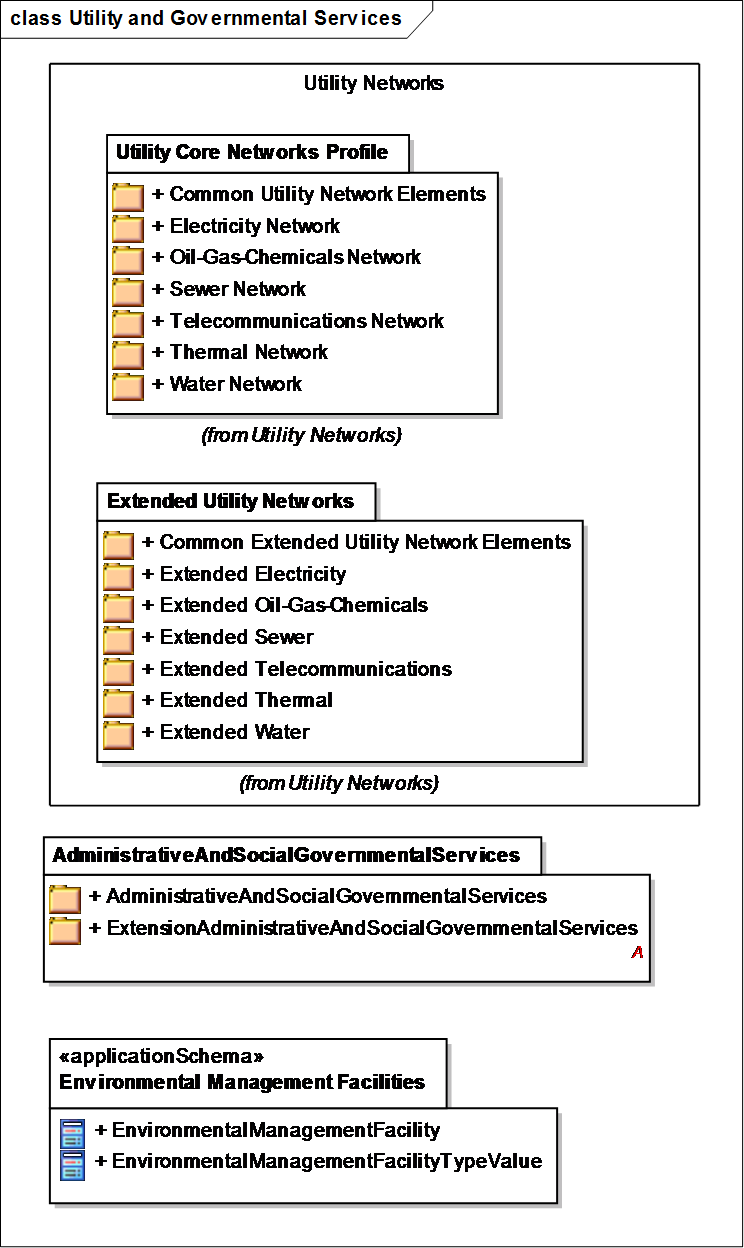
NOTE ISO 19131 suggests further identification information to be included in this section, e.g. the title, abstract or spatial representation type. The proposed items are already described in the document metadata, executive summary, overview description (section 2) and descriptions of the application schemas (section 5). In order to avoid redundancy, they are not repeated here.

## Data content and structure

The INSPIRE theme *Utility and governmental services* has been split in 3 separate main packages, that are developed hereafter.

Though main features of the 3 sub-themes have common concepts related to the theme (such as localization, technical description and responsible party), they were treated separately with different modelization approaches within 3 nearly independent packages each containing specific applications schemas. This is principally due to the observation that data providers and data users for each sub- theme are almost different.

It has also been decided to not apply a coverage / grid modelization at this stage of the development of the data specification, due to the fact that such coverage, if existing, are more resulting of spatial analysis outputs (e.g. access to telecommunication networks – GSM, 3G, etc.) than real spatial information (e.g. position of antennas).



**Figure 2 – UML class diagram: Overview of the “Utility and governmental services” theme.**

This data specification defines the following application schemas:

**For *Administrative and social governmental services*:**

* The ***“Administrative and Social Governmental Services” application schema*** that provides information concerning the location and the type of administrative and social governmental services;
* The ***“Extended Administrative and Social Governmental Services” application schema*** that provides more detailed information concerning administrative and social governmental services such as occupancy, resources and other specific descriptions;

**For *Environmental Management Facilities*:**

* The ***“Environmental Management Facilities” application schema*** that supports information about waste treatment and storage practices, plus other environmental activities.

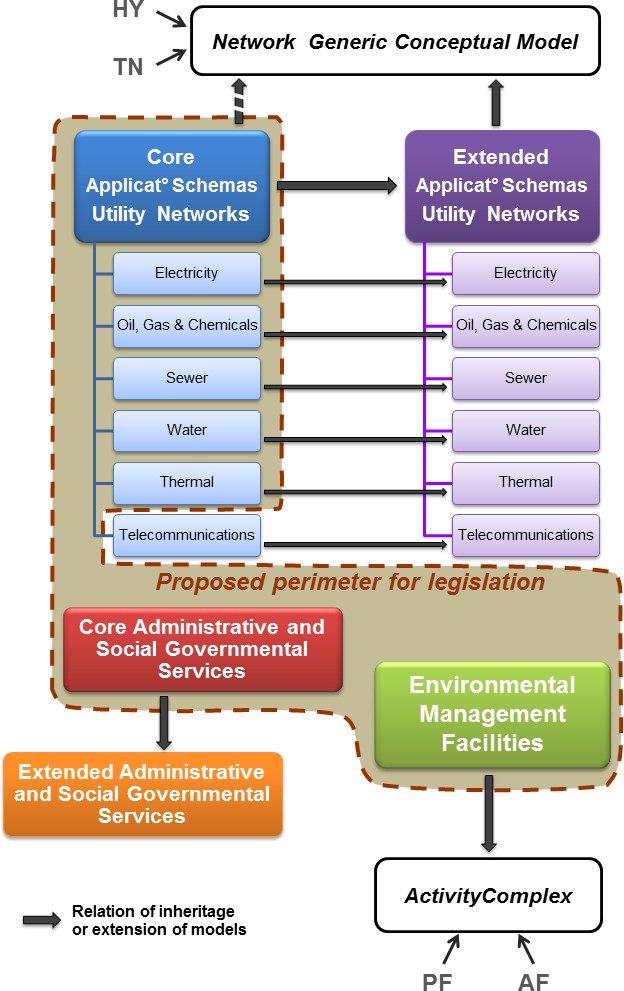
**For *Utility networks*:**

The *“Utility Networks Profile” application schemas* are based on a node-arc-node structure and network concept (derived from the Generic Network model). Especially designed to describe data into a structured model with only the most basic characteristics, but adhering to the node-arc-node concept (taken from the “Network” concept in the GCM), respectively for the six types of utility networks (electricity, oil-gas-chemicals, water, sewer, thermal and telecommunications). Topology is not required being possible to represent networks as single features not topologically interconnected (“spaghetti” representation). ***Utility Networks Profile contains the following application schemas:***

* The **“Common Utility Network Elements” Application Schema** that contains the common elements to all thematic networks.
* The **“Electricity Network” Application Schema** that extends the common elements for the electricity domain.
* The **“Oil-Gas-Chemical Network” Application Schema** that extends the common elements for the Oil, Gas and Chemical domain.
* *The* ***“Telecommunications Network” Application Schema*** that extends the common elements for the Telecommunications domain*.*
* *The* ***“Thermal Network” Application Schema*** that extends the common elements for the Thermal domain*.*
* *The* ***“Water network” Application Schema*** that extends the common elements for the Water domain.

The *“Extended Utility Networks” application schemas* cannot be considered as real application schemas, since their development is at its first step and they are proposed in the present document in Annex G only as leads for defining more-detailed standards later;

* The **“Common Extended Utility Network Elements” Application Schema** that contains the common elements to all thematic networks.
* The **“Extended Electricity” Application Schema** that extends the common elements for the electricity domain.
* The **“Extended Oil-Gas-Chemical” Application Schema** that extends the common elements for the Oil, Gas and Chemical domain.
* *The* ***“Extended Telecommunications” Application Schema*** that extends the common elements for the Telecommunications domain*.*
* *The* ***“Extended Thermal” Application Schema*** that extends the common elements for the Thermal domain*.*
* *The* ***“Extended Water” Application Schema*** that extends the common elements for the Water domain.



**Figure 3 – Overview of the “Utility and governmental services” criteria for Application Schemas.**

### Application schemas – Overview

#### Application schemas included in the IRs

Articles 3, 4 and 5 of the Implementing Rules lay down the requirements for the content and structure of the data sets related to the INSPIRE Annex themes.

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| **IR Requirement**  Article 4  **Types for the Exchange and Classification of Spatial Objects**   1. For the exchange and classification of spatial objects from data sets meeting the conditions laid down in Article 4 of Directive 2007/2/EC, Member States shall use the spatial object types and associated data types, enumerations and code lists that are defined in Annexes II, III and IV for the themes the data sets relate to. 2. Spatial object types and data types shall comply with the definitions and constraints and include the attributes and association roles set out in the Annexes. 3. The enumerations and code lists used in attributes or association roles of spatial object types or data types shall comply with the definitions and include the values set out in Annex II. The enumeration and code list values are uniquely identified by language-neutral mnemonic codes for computers. The values may also include a language-specific name to be used for human interaction. |

The types to be used for the exchange and classification of spatial objects from data sets related to the spatial data theme *Utility and Government Services* are defined in the following application schemas (see sections 5.3 – 5.5 – 5.6.2 – 5.6.3 – 5.6.4 – 5.6.5 – 5.6.6 – 5.6.7):

* + - * Common Utility Network Elements
      * Electricity Network
      * Oil-Gas-Chemical Network
      * Sewer Network
      * Thermal Network
      * Water Network
      * Administrative and Social Governmental Services
      * Environmental Management Facilities

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| The application schemas specify requirements on the properties of each spatial object including its multiplicity, domain of valid values, constraints, etc.  NOTE The application schemas presented in this section contain some additional information that is not included in the Implementing Rules, in particular multiplicities of attributes and association roles. |
| **TG Requirement 1** Spatial object types and data types shall comply with the multiplicities defined for the attributes and association roles in this section. |
| An application schema may include references (e.g. in attributes or inheritance relationships) to common types or types defined in other spatial data themes. These types can be found in a sub- section called ―Imported Types‖ at the end of each application schema section. The common types referred to from application schemas included in the IRs are addressed in Article 3. |

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| **IR Requirement** *Article 3* **Common Types**  Types that are common to several of the themes listed in Annexes I, II and III to Directive 2007/2/EC shall conform to the definitions and constraints and include the attributes and  association roles set out in Annex I. |
| NOTE Since the IRs contain the types for all INSPIRE spatial data themes in one document, Article 3 does not explicitly refer to types defined in other spatial data themes, but only to types defined in external data models.  Common types are described in detail in the Generic Conceptual Model [DS-D2.7], in the relevant international standards (e.g. of the ISO 19100 series) or in the documents on the common INSPIRE models [DS-D2.10.x]. For detailed descriptions of types defined in other spatial data themes, see the corresponding Data Specification TG document [DS-D2.8.x]. |

#### Additional recommended application schemas

In addition to the application schemas listed above, the following additional application schemas have been defined for the theme *Utility and Government Services* (see sections Annex.G):

* + - * Common Extended Utility Network Elements
      * Extended Electricity
      * Extended Oil-Gas-Chemical
      * Extended Sewer
      * Extended Thermal
      * Extended Water
      * Extended Administrative and Social Governmental Services

These additional application schemas are not included in the IRs. They typically address requirements from specific (groups of) use cases and/or may be used to provide additional information. They are included in this specification in order to improve interoperability also for these additional aspects and to illustrate the extensibility of the application schemas included in the IRs.

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| **Recommendation 1** Additional and/or use case-specific information related to the theme *Utility and Government Services* should be made available using the spatial object types and data types specified in the following application schemas: Common Extended Utility Network Elements; Extended Electricity; Extended Oil-Gas-Chemical; Extended Sewer; Extended Thermal; Extended Water; Extended Administrative and Social Governmental Services.  These spatial object types and data types should comply with the definitions and constraints and include the attributes and association roles defined in this section.  The enumerations and code lists used in attributes or association roles of spatial object types or data types should comply with the definitions and  include the values defined in this section. |

* 1. **Basic notions**

This section explains some of the basic notions used in the INSPIRE application schemas. These explanations are based on the GCM [DS-D2.5].

* + 1. **Notation**
       1. Unified Modeling Language (UML)

The application schemas included in this section are specified in UML, version 2.1. The spatial object types, their properties and associated types are shown in UML class diagrams.

NOTE For an overview of the UML notation, see Annex D in [ISO 19103].

The use of a common conceptual schema language (i.e. UML) allows for an automated processing of application schemas and the encoding, querying and updating of data based on the application schema – across different themes and different levels of detail.

The following important rules related to class inheritance and abstract classes are included in the IRs.

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| **IR Requirement** Article 5 **Types**  (…)   1. Types that are a sub-type of another type shall also include all this type‘s attributes and association roles. 2. Abstract types shall not be instantiated. |
| The use of UML conforms to ISO 19109 8.3 and ISO/TS 19103 with the exception that UML 2.1 instead of ISO/IEC 19501 is being used. The use of UML also conforms to ISO 19136 E.2.1.1.1- E.2.1.1.4.  NOTE ISO/TS 19103 and ISO 19109 specify a profile of UML to be used in conjunction with the ISO 19100 series. This includes in particular a list of stereotypes and basic types to be used in application schemas. ISO 19136 specifies a more restricted UML profile that allows for a direct encoding in XML Schema for data transfer purposes.  To model constraints on the spatial object types and their properties, in particular to express data/data set consistency rules, OCL (Object Constraint Language) is used as described in ISO/TS 19103, whenever possible. In addition, all constraints are described in the feature catalogue in English, too.  NOTE Since ―void‖ is not a concept supported by OCL, OCL constraints cannot include expressions to test whether a value is a *void* value. Such constraints may only be expressed in natural language.  5.2.1.2. Stereotypes  In the application schemas in this section several stereotypes are used that have been defined as part of a UML profile for use in INSPIRE [DS-D2.5]. These are explained in Table 1 below.  **Table 1 – Stereotypes (adapted from [DS-D2.5])** |

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| **Stereotype** | **Model**  **element** | **Description** |

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| --- | --- | --- |
| applicationSchema | Package | An INSPIRE application schema according to ISO 19109 and the Generic Conceptual Model. |
| leaf | Package | A package that is not an application schema and contains no packages. |
| featureType | Class | A spatial object type. |
| type | Class | A type that is not directly instantiable, but is used as an abstract collection of operation, attribute and relation signatures. This stereotype should usually not be used in INSPIRE application  schemas as these are on a different conceptual level than classifiers with this stereotype. |
| dataType | Class | A structured data type without identity. |
| union | Class | A structured data type without identity where exactly one of the  properties of the type is present in any instance. |
| enumeration | Class | An enumeration. |
| codeList | Class | A code list. |
| import | Dependency | The model elements of the supplier package are imported. |
| voidable | Attribute, association role | A voidable attribute or association role (see section [5.2.2](#_bookmark23)). |
| lifeCycleInfo | Attribute, association  role | If in an application schema a property is considered to be part of the life-cycle information of a spatial object type, the property  shall receive this stereotype. |
| version | Association role | If in an application schema an association role ends at a spatial object type, this stereotype denotes that the value of the property is meant to be a specific version of the spatial object, not the spatial object in general. |
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| **5.2.2 Voidable characteristics**  The «voidable» stereotype is used to characterise those properties of a spatial object that may not be present in some spatial data sets, even though they may be present or applicable in the real world. This does *not* mean that it is optional to provide a value for those properties.  For all properties defined for a spatial object, a value has to be provided – either the corresponding value (if available in the data set maintained by the data provider) or the value of *void.* A *void* value shall imply that no corresponding value is contained in the source spatial data set maintained by the data provider or no corresponding value can be derived from existing values at reasonable costs. |
| **Recommendation 2** The reason for a *void* value should be provided where possible using a  listed value from the VoidReasonValue code list to indicate the reason for the missing value. |
| The VoidReasonValue type is a code list, which includes the following pre-defined values:   * *Unpopulated*: The property is not part of the dataset maintained by the data provider. However, the characteristic may exist in the real world. For example when the ―elevation of the water body above the sea level‖ has not been included in a dataset containing lake spatial objects, then the reason for a void value of this property would be ‗Unpopulated‘. The property receives this value for all spatial objects in the spatial data set. * *Unknown*: The correct value for the specific spatial object is not known to, and not computable by the data provider. However, a correct value may exist. For example when the ―elevation of the water body above the sea level‖ *of a certain lake* has not been measured, then the reason for a void value of this property would be ‗Unknown‘. This value is applied only to those spatial objects where the property in question is not known. * *Withheld*: The characteristic may exist, but is confidential and not divulged by the data provider. |

NOTE It is possible that additional reasons will be identified in the future, in particular to support reasons / special values in coverage ranges.

The «voidable» stereotype does not give any information on whether or not a characteristic exists in the real world. This is expressed using the multiplicity:

* If a characteristic may or may not exist in the real world, its minimum cardinality shall be defined as 0. For example, if an Address may or may not have a house number, the multiplicity of the corresponding property shall be 0..1.
* If at least one value for a certain characteristic exists in the real world, the minimum cardinality shall be defined as 1. For example, if an Administrative Unit always has at least one name, the multiplicity of the corresponding property shall be 1..\*.

In both cases, the «voidable» stereotype can be applied. In cases where the minimum multiplicity is 0, the absence of a value indicates that it is known that no value exists, whereas a value of void indicates that it is not known whether a value exists or not.

EXAMPLE If an address does not have a house number, the corresponding Address object should not have any value for the «voidable» attribute house number. If the house number is simply not known or not populated in the data set, the Address object should receive a value of *void* (with the corresponding void reason) for the house number attribute.

* + 1. **Enumerations**

Enumerations are modelled as classes in the application schemas. Their values are modelled as attributes of the enumeration class using the following modelling style:

* + - * No initial value, but only the attribute name part, is used.
      * The attribute name conforms to the rules for attributes names, i.e. is a lowerCamelCase name. Exceptions are words that consist of all uppercase letters (acronyms).

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| **IR Requirement**  Article 6  **Code Lists and Enumerations**  (…)  5) Attributes or association roles of spatial object types or data types that have an enumeration type may only take values from the lists specified for the enumeration type.‖ |
| * + 1. **Code lists**   Code lists are modelled as classes in the application schemas. Their values, however, are managed outside of the application schema.   * + - 1. Code list types   The IRs distinguish the following types of code lists. |

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| **IR Requirement**  Article 6  **Code Lists and Enumerations**   1. Code lists shall be of one of the following types, as specified in the Annexes:    1. code lists whose allowed values comprise only the values specified in this Regulation;    2. code lists whose allowed values comprise the values specified in this Regulation and narrower values defined by data providers;    3. code lists whose allowed values comprise the values specified in this Regulation and additional values at any level defined by data providers;    4. code lists, whose allowed values comprise any values defined by data providers.   For the purposes of points (b), (c) and (d), in addition to the allowed values, data providers may use the values specified in the relevant INSPIRE Technical Guidance document available on the  INSPIRE web site of the Joint Research Centre. |
| The type of code list is represented in the UML model through the tagged value *extensibility*, which can take the following values:   * *none*, representing code lists whose allowed values comprise only the values specified in the IRs (type a); * *narrower*, representing code lists whose allowed values comprise the values specified in the IRs and narrower values defined by data providers (type b); * *open*, representing code lists whose allowed values comprise the values specified in the IRs and additional values at any level defined by data providers (type c); and * *any*, representing code lists, for which the IRs do not specify any allowed values, i.e. whose allowed values comprise any values defined by data providers (type d). |
| **Recommendation 3** Additional values defined by data providers should not replace or redefine any value already specified in the IRs. |
| NOTEThis data specification may specify recommended values for some of the code lists of type (b),  (c) and (d) (see section [5.2.4.3](#_bookmark27)). These recommended values are specified in a dedicated Annex.  In addition, code lists can be hierarchical, as explained in Article 6(2) of the IRs. |

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| **IR Requirement**  Article 6  **Code Lists and Enumerations**  (…)  2) Code lists may be hierarchical. Values of hierarchical code lists may have a more generic parent value. Where the valid values of a hierarchical code list are specified in a table in this  Regulation, the parent values are listed in the last column. |
| The type of code list and whether it is hierarchical or not is also indicated in the feature catalogues. |

5.2.4.2. Obligations on data providers

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| **IR Requirement**  Article 6  **Code Lists and Enumerations**  (….)   1. Where, for an attribute whose type is a code list as referred to in points (b), (c) or (d) of paragraph 1, a data provider provides a value that is not specified in this Regulation, that value and its definition shall be made available in a register. 2. Attributes or association roles of spatial object types or data types whose type is a code list may only take values that are allowed according to the specification of the code list. |
| Article 6(4) obliges data providers to use only values that are allowed according to the specification of the code list. The ―allowed values according to the specification of the code list‖ are the values explicitly defined in the IRs plus (in the case of code lists of type (b), (c) and (d)) additional values defined by data providers.  For attributes whose type is a code list of type (b), (c) or (d) data providers may use additional values that are not defined in the IRs. Article 6(3) requires that such additional values and their definition be made available in a register. This enables users of the data to look up the meaning of the additional values used in a data set, and also facilitates the re-use of additional values by other data providers (potentially across Member States).  NOTEGuidelines for setting up registers for additional values and how to register additional values in these registers is still an open discussion point between Member States and the Commission.  5.2.4.3. Recommended code list values  For code lists of type (b), (c) and (d), this data specification may propose additional values as a recommendation (in a dedicated Annex). These values will be included in the INSPIRE code list register. This will facilitate and encourage the usage of the recommended values by data providers since the obligation to make additional values defined by data providers available in a register (see section [5.2.4.2](#_bookmark26)) is already met. |
| **Recommendation 4** Where these Technical Guidelines recommend values for a code list in addition to those specified in the IRs, these values should be used. |
| NOTE For some code lists of type (d), no values may be specified in these Technical Guidelines. In these cases, any additional value defined by data providers may be used.   * + - 1. Governance   The following two types of code lists are distinguished in INSPIRE:   * + - * + *Code lists that are governed by INSPIRE (INSPIRE-governed code lists).* These code lists will be managed centrally in the INSPIRE code list register. Change requests to these code lists (e.g. to add, deprecate or supersede values) are processed and decided upon using the INSPIRE code list register‘s maintenance workflows.   INSPIRE-governed code lists will be made available in the INSPIRE code list register at [*http://inspire.ec.europa.eu/codelist/<CodeListName*](http://inspire.ec.europa.eu/codelist/%3cCodeListName)>. They will be available in SKOS/RDF, XML and HTML. The maintenance will follow the procedures defined in ISO 19135. This means that the only allowed changes to a code list are the addition, deprecation or supersession of values,  i.e. no value will ever be deleted, but only receive different statuses (valid, deprecated, |

superseded). Identifiers for values of INSPIRE-governed code lists are constructed using the pattern [*http://inspire.ec.europa.eu/codelist/<*](http://inspire.ec.europa.eu/codelist/)*CodeListName*>/<value>.

* *Code lists that are governed by an organisation outside of INSPIRE (externally governed code lists).* These code lists are managed by an organisation outside of INSPIRE, e.g. the World Meteorological Organization (WMO) or the World Health Organization (WHO). Change requests to these code lists follow the maintenance workflows defined by the maintaining organisations. Note that in some cases, no such workflows may be formally defined.

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| **Recommendation 5** The http URIs and labels used for encoding code list values should be taken from the INSPIRE code list registry for INSPIRE-governed code lists and generated according to the relevant rules specified for externally governed code lists. |
| NOTE Where practicable, the INSPIRE code list register could also provide http URIs and labels for externally governed code lists.  5.2.4.5. Vocabulary  For each code list, a tagged value called ―vocabulary‖ is specified to define a URI identifying the values of the code list. For INSPIRE-governed code lists and externally governed code lists that do not have a persistent identifier, the URI is constructed following the pattern [*http://inspire.ec.europa.eu/codelist/<UpperCamelCaseName*](http://inspire.ec.europa.eu/codeList/%3cUpperCamelCaseName)*>*.  If the value is missing or empty, this indicates an empty code list. If no sub-classes are defined for this empty code list, this means that any code list may be used that meets the given definition.  An empty code list may also be used as a super-class for a number of specific code lists whose values may be used to specify the attribute value. If the sub-classes specified in the model represent all valid extensions to the empty code list, the subtyping relationship is qualified with the standard UML constraint "{complete,disjoint}". |

* The *Governance* column describes the external organisation that is responsible for maintaining the code list.
* The *Source* column specifies a citation for the authoritative source for the values of the code list. For code lists, whose values are mandated in the IRs, this citation should include the version of the code list used in INSPIRE. The version can be specified using a version number or the publication date. For code list values recommended in these Technical Guidelines, the citation may refer to the ―latest available version‖.
* In some cases, for INSPIRE only a subset of an externally governed code list is relevant. The subset is specified using the *Subset* column.
* The *Availability* column specifies from where (e.g. URL) the values of the externally governed code list are available, and in which formats. Formats can include machine- readable (e.g. SKOS/RDF, XML) or human-readable (e.g. HTML, PDF) ones.

Since the updates of externally governed code lists is outside the control of INSPIRE, the IRs and these Technical Guidelines reference a specific version for such code lists.

The tables describing externally governed code lists in this section contain the following columns:

Code list values are encoded using http URIs and labels. Rules for generating these URIs and labels are specified in a separate table.

**5.2.5 Identifier management**

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| **IR Requirement**  *Article 9*  **Identifier Management**   1. The data type Identifier defined in Section 2.1 of Annex I shall be used as a type for the external object identifier of a spatial object. 2. The external object identifier for the unique identification of spatial objects shall not be changed   during the life-cycle of a spatial object. |
| NOTE 1 An external object identifier is a unique object identifier which is published by the responsible body, which may be used by external applications to reference the spatial object. [DS-D2.5]  NOTE 2 Article 9(1) is implemented in each application schema by including the attribute *inspireId* of type Identifier.  NOTE 3 Article 9(2) is ensured if the *namespace* and *localId* attributes of the Identifier remains the same for different versions of a spatial object; the *version* attribute can of course change.  **5.2.6 Geometry representation** |

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| **IR Requirement**  *Article 12*  **Other Requirements & Rules**  1. The value domain of spatial properties defined in this Regulation shall be restricted to the Simple Feature spatial schema as defined in Herring, John R. (ed.), OpenGIS® Implementation Standard for Geographic information – Simple feature access – Part 1: Common architecture, version 1.2.1, Open Geospatial Consortium, 2011, unless specified otherwise for a specific  spatial data theme or type. |
| NOTE 1 The specification restricts the spatial schema to 0-, 1-, 2-, and 2.5-dimensional geometries where all curve interpolations are linear and surface interpolations are performed by triangles.  NOTE 2 The topological relations of two spatial objects based on their specific geometry and topology  properties can in principle be investigated by invoking the operations of the types defined in ISO 19107 (or the methods specified in EN ISO 19125-1). |

The location of some *Utility and governmental services* features may be originally defined in the real world relative to administrative, cadastral or natural boundaries (roads, rivers, walls, etc.). These locations are initially similar to the position of a facility or a service (exact location of the networks elements, or of a zone where some public service is provided), which may be known to exist up to a natural or administrative feature. However, the INSPIRE *Utility and governmental services* data specification represents such facilities or services as absolute, not relative geometries. That is, they have their own, absolute geometries (as INSPIRE defined GM\_Object or GM\_MultiSurface) and their geographical location is not dependent on other features (other than during their original delineation). This is because many Member States do not update *Utility and governmental services* geometries if there are changes to administrative or natural boundaries, and in any case, the official definition of a *Utility and governmental services* remains fixed even if there are underlying changes to the administrative boundary or the location of natural features.

*For example, one can see that some underground networks can remain at the same position, even after some road works.*

On another hand, some other *Utility and governmental services* features do really share their existence with other datasets (buildings, facilities described in other themes, like *Production and industrial facilities*). For those elements, the location refers directly to the objects of those related themes, so that if an instantiation of these supportive objects are deleted from a database, the service object has to be deleted in cascade. That reflects the dependence in real world: if a governmental service is provided in a building that is destroyed, then no more service is provided, or if a service is provided for a certain aggregation of administrative units (such as intercommunality, or region), the perimeter of responsibility will evolve with the new geometry of such administrative area, if modified.

In such case, the model refers directly to the objects (among the proposed location or area in the union type, for example).

Since the data concerned by the INSPIRE theme *Utility and governmental services* can be also produced and used at a local level (according to many decentralization processes), the level of detail should be important. In fact, description of a utility network or of services provided by or for a specific Public Administrative Body will be rich in their geometries and attributes (large scale data, accurate distinction between several services provided at local level).

This seems opposite to one goal of the INSPIRE directive, which is to gather similar data from different producers and users, at a greater level (regional, national or European). Then, the level of details described in the former paragraph is less important than collecting exhaustively the same type of data for the whole territory analysed.

This *data collection* work is somehow developed by aggregating agencies (regional, national or pan- European) and therefore may include some generalization processes, whether geometric or semantic. Thus data can be simplified, as soon as they‘re used at a greater level, and the use of large scale data at such greater levels can prove to be counterproductive. Then, if certain datasets are inappropriate to be used at certain scales, it should be specified within its restrictions metadata.

On another hand, the different use cases (localization, management of services, spatial and semantic analysis or reporting) imply different approaches and treatments of the data related to *Utility and governmental services*.

Thus, the models proposed for the theme *Utility and governmental services* tend to be as simple as possible and should fit to the use of such data at any scale (whether local or global). Nevertheless, the level of detail (according to the scale and accuracy of the dataset) should be provided within the metadata and data quality information.

#### 5.2.7 Temporality representation

The application schema(s) use(s) the derived attributes "beginLifespanVersion" and "endLifespanVersion" to record the lifespan of a spatial object.

The attributes "beginLifespanVersion" specifies the date and time at which this version of the spatial object was inserted or changed in the spatial data set. The attribute "endLifespanVersion" specifies the date and time at which this version of the spatial object was superseded or retired in the spatial data set.

NOTE 1 The attributes specify the beginning of the lifespan of the version in the spatial data set itself, which is different from the temporal characteristics of the real-world phenomenon described by the spatial object. This lifespan information, if available, supports mainly two requirements: First, knowledge about the spatial data set content at a specific time; second, knowledge about changes to a data set in a specific time frame. The lifespan information should be as detailed as in the data set (i.e., if the lifespan information in the data set includes seconds, the seconds should be represented in data published in INSPIRE) and include time zone information.

NOTE 2 Changes to the attribute "endLifespanVersion" does not trigger a change in the attribute "beginLifespanVersion".

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| **IR Requirement**  *Article 10*  **Life-cycle of Spatial Objects**  (…)  3. Where the attributes beginLifespanVersion and endLifespanVersion are used, the value of endLifespanVersion shall not be before the value of beginLifespanVersion. |
| NOTE The requirement expressed in the IR Requirement above will be included as constraints in the UML data models of all themes. |
| **Recommendation 6** If life-cycle information is not maintained as part of the spatial data set, all spatial objects belonging to this data set should provide a void value with a  reason of "unpopulated". |
|  |

5.2.7.1. Validity of the real-world phenomena

The application schema(s) use(s) the attributes "validFrom" and "validTo" to record the validity of the real-world phenomenon represented by a spatial object.

The attributes "validFrom" specifies the date and time at which the real-world phenomenon became valid in the real world. The attribute "validTo" specifies the date and time at which the real-world phenomenon is no longer valid in the real world.

Specific application schemas may give examples what ―being valid‖ means for a specific real-world phenomenon represented by a spatial object.

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| --- |
| IR Requirement  *Article 12*  Other Requirements & Rules  (…)  3. Where the attributes validFrom and validTo are used, the value of validTo shall not be before the value of validFrom. |
| NOTE The requirement expressed in the IR Requirement above will be included as constraints in the UML data models of all themes. |

The beginLifespanVersion stores the date on which the data instance representing the features of the *Utility and Governmental Services* theme was first created, and the endLifespanVersion is populated when some attribute or geometry of that instance changes. At this point, an entirely new instance is created repeating all of the attributes of the instance that have not changed, and providing new values for the attributes or geometries that have changed. The new instance uses the same value for objectIdentifier.localId and objectIdentifier.nameSpace, but has a new value for objectIdentifier.version. Using this method for representing temporality, all of the versions of features of the *Utility and Governmental Services* theme can be established by looking for all the *Utility and Governmental Services* instances with the same value for objectIdentifier.localID and objectIdentifier.namespace.

The system dates can also be used for incremental updates. Instances that have been added since the last update can be determined by finding instances whose beginLifespanVersion is after the date

of the last update. Instances that have been changed since the last update can be determined by finding instances whose endLifespanVersion is after the date of the last update.

* 1. **Application schema Administrative and Social Governmental Services**

###### Description

* + - 1. Narrative description

The *Administrative and social governmental services* application schema consists of the class

*GovernmentalService*, the related data types, union classes plus a code list.

Non-voidable attributes of the class *GovernmentalService* are *InspireID*, the location where the service is provided (*serviceLocation*) and the type of the service (*serviceType*).

The location of the service (attribute serviceLocation) can be modelled variously, so data providers can choose the most appropriate alternative. Since the data type of these alternatives can vary, a union-class15 is used for that attribute16.

If services are located inside buildings or activity complexes, the service geometry should be provided as a reference to these features. Some service sites are located outside buildings or activity complexes, but they have an address (e.g. rescue helicopter landing site). Then the spatial reference should be allocated by the address.

In single cases the service location coincides with a network element which can also be used as spatial reference. The approach to use existing geometries avoids redundancy between the application schemas of different INSPIRE themes. Beyond that the service location can be provided by a geometry.

The type of the service is specified by a code list (*ServiceTypeValue*). Foundation is the COFOG classification by EUROSTAT [COFOG 1999]17. The acronym COFOG means ―Classification of the Functions of Government‖. This classification covers a broad range of administrative and social governmental services but provides primarily a template for statistics regarding government expenditures. Therefore COFOG can‘t be used unmodified.

The list has been tailored and refined by types, which are based on requirements derived from legislation, use cases and interviews. The code list is organized hierarchically18. In order to map the hierarchy inside the code list, parent value is mentioned in the codelist table (cf. § 5.4.3.1).

To be complete, the sub-part of the code list regarding the education domain, it has involved the recent evolution of the ISCED (International Standard Classification of Education) that occurred in 201119.

In this context, it‘s important to note that the meaning of any item has to be taken not only from its name, definition or description, but also from its position within the hierarchy. The type

―GovernmentalService‖ is the (fictive – because not part of the list) root element of the tree. Both nodes (e.g. fire-protection service) and leafs (e.g. fire station) are useable as service types. The tree is intentionally unbalanced.

15 See [ISO 19103]

*16 Attention: The “union” type is not yet taken into account in the process “Extraction of feature catalogue”. It is therefore not included in the § “5.4.2 Feature catalogue”, but visible in the following figure “*UML class diagram: Overview of the US ―*Administrative and social governmental services*‖

application schema‖

17

<http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=CL>

\_COFOG99 &StrLanguageCode=EN&IntPcKey=&StrLayoutCode=HIERARCHIC)

*18 For a better overview, the code list is provided within Annex D.*

19 <http://www.uis.unesco.org/Education/Documents/UNESCO_GC_36C-19_ISCED_EN.pdf>

The further attributes of *GovernmentalService* are of stereotype <<voidable>>. Beside *begin/endLifespanVersion*, which refer to the lifecycle of a version of the (digital) spatial object, the feature type in its core version contains the attribute *pointOfContact* and *areaOfResponsibility*.

*PointOfContact* (data type *Contact* from GCM) provides contact information in order to get access to a service and/or initial information regarding a service.

The attribute *areaOfResponsibility* contains the spatial responsibility of a service instance, e.g. of an administration or a police station.

This information simplifies the identification of the appropriate service location for users. The spatial reference can be provided either by an *AdministrativeUnit*, a *NamedPlace*, an *ActivityComplex* or geometry (union-class).

In its extended version *GovernmentalService* includes a number of voidable attributes (see the feature catalog for further information):

* *additionalLocationDescription* can be used to give an additional textual description of the service location. This is useful to find the service (e.g. an office) inside a large building complex.
* *hoursOfService* refers to the time, when the service itself is available. The temporal availability of a service itself will often coincide with the availability of the dedicated point of contact, which is specified inside the *pointOfContact* attribute (e.g. in case of a medical practice). In other cases, there is a clear distinction. For example a rescue station is engaged only a limited time (shall be expressed by *hoursOfService)* but there is a central hotline which is available twenty- four-seven (shall be expressed by hoursOfService inside the contact data type of the core attribute *pointOfContact*).
* *name* can be used to provide a common denotation for the service (e.g. ―hôtel de ville‖)
* *note* can be used to provide further information regarding the service. The inclusion of *note* considers the fact, that the scope of feature type inside the application schema is very broad and therefore not all information data providers want to publish can be covered by the given attributes.
* *occupancy* states the type (as PTFreeText) and number of persons a service can handle in terms of a capacity (e.g. the capacity of a school).
* *relatedParty* (see GCM for definition) contains the owner(s), the operator(s) or the authorit(y|ies) of the service inclusive their contact information.The point of contact of a service (which is provided as *pointOfContact* inside the core) will coincide often with the contact information of one of the three mentioned party types, but not in always
* *resources* is comparable to *occupancy* but describes the type and amount of technical resources a service provides (e.g. type and capacity of a hydrant).
* *serviceLevel* allows data providers to classify services regarding the administrative level where the service is provided from (based on NUTS classification).
* *validFrom* and *validTo* refer to the lifecycle of the real world object.

|  |
| --- |
| «union»  **AreaOfResponsibilityType** |
| + areaOfResponsibilityByAdministrativeUnit :AdministrativeUnit [1..\*]  + areaOfResponsibilityByNamedPlace :NamedPlace [1..\*]  + areaOfResponsibilityByNetwork :NetworkReference [1..\*]  + areaOfResponsibilityByPolygon :GM\_MultiSurface |

* + - 1. UML Overview

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| --- |
| «union»  **Serv iceLocationType** |
| + serviceLocationByAddress :Address  + serviceLocationByBuilding :Building [1..\*]  + serviceLocationByActivityComplex :ActivityComplex  + serviceLocationByGeometry :GM\_Object  + serviceLocationByUtilityNode :UtilityNode |

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| --- |
| unions & structured dataTypes |

|  |
| --- |
| «codeList»  **Serv iceTypeValue** |
|  |
| **tags**  UML Profile for INSPIRE data specifications::codeList::asDictionary = true  UML Profile for INSPIRE data specifications::codeList::extensibility = narrower  UML Profile for INSPIRE data specifications::codeList::vocabulary = <http://inspire.ec.europa.eu/codeList/ServiceTypeValue> UML Profile for INSPIRE data specifications::codeList::xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 4 – Class diagram: Overview of the “Administrative and Social Governmental Services” application schema**



**class Core Administrativ e and Social Gov ernmental Serv ices**

enumeration & codeList

+ inspireId :Identifier

+ serviceLocation :ServiceLocationType

+ serviceType :ServiceTypeValue

+ areaOfResponsibility :AreaOfResponsibilityType [0..1]

+ pointOfContact :Contact [1..\*]

+ beginLifespanVersion :DateTime

+ endLifespanVersion :DateTime [0..1]

«featureType»

**Gov ernmentalServ ice**

endLifespanVersion

/\* If set, the date endLifespanVersion shall be later than beginLifespanVersion. \*/

inv: self.endLifespanVersion .isAfter (self.beginLifespanVersion)

«lifeCycleInfo, voidable»

«voidable»

* + - 1. Consistency between spatial data sets Nothing more than what‘s previously referred
      2. Identifier management

Nothing more than what‘s previously referred

* + - 1. Modelling of object references Internal references:

The application schema describes single services. Several services can be offered at the same location or by the same authority. Such internal references aren‘t explicitly modelled but can be analysed by spatial or logical intersections.

**External references:**

This application schema provides a special view at real world objects. Very often the same real world object, which is modelled as a service in the application schema, can be seen as a building, an Activity Complex or a vulnerable element as well. Such external references are partly explicitly modelled in the application schema by using references to buildings or to activity complexes as data types for the

spatial attribute serviceLocation. Beyond that external references can be analysed by spatial intersections.

* + - 1. Geometry representation

As depicted and explained in the UML model above, instances of feature type *GovernmentalService,* may be modelled by using several types of spatial references or any kind of geometry (geometry type: *GM\_Geometry*) in order not to force any MS or data producer to introduce changes in the way how they model and store their original data sets.

Since this application schema is focussed on services (and not on the spatial objects where services are located), it is strongly recommended to provide no other geometries as points. The intention to use the data type *GM\_Object* in the application schema is to ease the effort for data provides if the geometry is originally stored with other data types. Anyway, the usage of other geometry types than point should be an exception.

|  |
| --- |
| **Recommendation 7** When the spatial reference of an administrative and social governmental service is provided by an autonomous geometry, then the data should be  modelled as point objects (geometry type: GM\_Point). |

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema AdministrativeAndSocialGovernmentalServices |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*AreaOfResponsibilityType*](#_bookmark35) | AdministrativeAndSocialGovernmentalServices | «union» |
| [*GovernmentalService*](#_bookmark34) | AdministrativeAndSocialGovernmentalServices | «featureType» |
| [*ServiceLocationType*](#_bookmark36) | AdministrativeAndSocialGovernmentalServices | «union» |
| [*ServiceTypeValue*](#_bookmark37) | AdministrativeAndSocialGovernmentalServices | «codeList» |

* + - 1. Spatial object types
         1. *GovernmentalService*

|  |  |
| --- | --- |
| **GovernmentalService** | |
| Name: | governmental service |
| Definition: | Administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals provided by Public Administrative Bodies or by private institutions as far as they are covered by the scope of the INSPIRE directive. This scope is mapped to the values of the corresponding  code list serviceType Value. |
| Description: | The accordant sites are commonly presented in governmental and municipal portals and map systems as "point of interest"-data, and may be point-based locations of a variety of categories of municipal and governmental services and social infrastructure. The spatial object type itself is generic in terms of the  modelling approach, that the concrete type of a GovernmentalService is determined by the value of the attribute serviceType. |
| Stereotypes: | «featureType» |
| **Attribute: areaOfResponsibility**  Name: area of responsibility Value type: AreaOfResponsibilityType | |

|  |  |
| --- | --- |
| **GovernmentalService** | |
| Definition: | The spatial responsibility of a service instance. |
| Description: | EXAMPLE 1: An administration is responsible for a municipality; EXEMPLE 2: A specialized hospital is responsible for a region. |
| Multiplicity: | 0..1 |
| Stereotypes: | «voidable» |
| **Attribute: beginLifespanVersion**  Name: begin lifespan version  Value type: DateTime  Definition: Date and time at which this version of the spatial object was inserted or changed in the spatial data set.  Description: Related to the life-cycle of the spatial object in the data set. Multiplicity: 1  Stereotypes: «lifeCycleInfo,voidable» | |
| **Attribute: endLifespanVersion**  Name: end lifespan version  Value type: DateTime  Definition: Date and time at which this version of the spatial object was superseded or retired in the spatial data set.  Description: Related to the life-cycle of the spatial object in the data set. Multiplicity: 0..1  Stereotypes: «lifeCycleInfo,voidable» | |
| **Attribute: inspireId**  Name: INSPIRE identifier  Value type: Identifier  Definition: External object identifier of the governmental service.  Description: NOTE: An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object.  The identifier is an identifier of the spatial object, not an identifier of the real- world phenomenon.  Multiplicity: 1 | |
| **Attribute: pointOfContact**  Name: point of contact  Value type: Contact  Definition: Contains necessary information to get access to a service and/or initial information regarding a service.  Description: In some cases this information will coincide with the contact information of the service authority, owner or operator (i.e. specific position or role of the responsible party, described in the relatedParty attribute of the GovernmentalServiceExtended in the extended profile).  Multiplicity: 1..\* Stereotypes: «voidable» | |
| **Attribute: serviceLocation**  Name: service location Value type: ServiceLocationType  Definition: Location where the service is offered.  Multiplicity: 1 | |
| **Attribute: serviceType** | |

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| --- | --- |
| **GovernmentalService** | |
| Name: | service type value |
| Value type: | ServiceTypeValue |
| Definition: | Type of an administrative and governmental service. |
| Multiplicity: | 1 |
| **Constraint: endLifespanVersion**  Natural If set, the date endLifespanVersion shall be later than beginLifespanVersion. language:  OCL: inv: self.endLifespanVersion .isAfter(self.beginLifespanVersion) | |

* + - 1. Data types
         1. *AreaOfResponsibilityType*

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| --- | --- |
| **AreaOfResponsibilityType** | |
| Name: | area of responsibility type |
| Definition: | Set of types for the description of spatial responsibility. |
| Stereotypes: | «union» |
| **Attribute: areaOfResponsibilityByAdministrativeUnit**  Name: area of responsibility by administrative unit Value type: AdministrativeUnit  Definition: Administrative unit describing the geographic extent of the responsibility of a service.  Multiplicity: 1..\* | |
| **Attribute: areaOfResponsibilityByNamedPlace**  Name: area of responsibility by named place Value type: NamedPlace  Definition: Geographical object describing the geographic extent of the responsibility of a service.  Multiplicity: 1..\* | |
| **Attribute: areaOfResponsibilityByNetwork**  Name: area of responsibility by network Value type: NetworkReference  Definition: Part of a network describing the geographic extent of the competence of a service.  Multiplicity: 1..\* | |
| **Attribute: areaOfResponsibilityByPolygon**  Name: area of responsibility by polygon Value type: GM\_MultiSurface  Definition: Polygon describing the geographic extent of the responsibility of a service.  Multiplicity: 1 | |

* + - * 1. *ServiceLocationType*

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| --- | --- |
| **ServiceLocationType** | |
| Name: | service location type |
| Definition: | Set of types of references to locate a service. |
| Stereotypes: | «union» |
| **Attribute: serviceLocationByAddress**  Name: service location by address  Value type: Address | |

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| --- | --- |
| **ServiceLocationType** | |
| Definition: | Location of the service by referring to an address. |
| Multiplicity: | 1 |
| **Attribute: serviceLocationByBuilding**  Name: service location by building  Value type: Building  Definition: Location of the service by referring to a building. Multiplicity: 1..\* | |
| **Attribute: serviceLocationByActivityComplex**  Name: service location by activity complex Value type: ActivityComplex  Definition: Location of the service by referring to an activity complex.  Multiplicity: 1 | |
| **Attribute: serviceLocationByGeometry**  Name: service location by geometry  Value type: GM\_Object  Definition: Location of the service by referring to a geometry. Multiplicity: 1 | |
| **Attribute: serviceLocationByUtilityNode**  Name: location service by utility node  Value type: UtilityNode  Definition: Location of the service by referring to a node related to a utility network (water, telecommunication, etc.), e.g. hydrant or emergency call point.  Multiplicity: 1 | |

* + - 1. Code lists
         1. *ServiceTypeValue*

|  |  |
| --- | --- |
| **ServiceTypeValue** | |
| Name: | service type value |
| Definition: | Codelist containing a classification of governmental services. |
| Extensibility: | narrower |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ServiceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark37)  and narrower values defined by data providers. |

* + - 1. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *ActivityComplex*

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| --- | --- |
| **ActivityComplex** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 [DS-D2.10.3] |
| Definition: | A "single unit", both technically and economically, under the management control of the same legal entity (operator), covering activities as those listed in the Eurostat NACE classification, products and services. Activity Complex includes all infrastructure, equipment and materials. It must represent the whole area, at the same or different geographical location, managed by a "single unit". |

|  |  |
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| **AdministrativeUnit** | |
| Package: | AdministrativeUnits |
| Reference: | INSPIRE Data specification on Administrative Units [DS-D2.8.I.4] |
| Definition: | Unit of administration where a Member State has and/or exercises jurisdictional |

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| --- |
| **ActivityComplex** |
| Description: NOTE 1 This class describes the minimal set of elements necessary to describe and identify geographically a legal entity and the activities taken place on it under the context of a Environmental purposes.  NOTE 2 "Activity Complex" could be assimilated to terms described on the legislation as Facility, Establishment, Plant, Holding, Organization ,Farm, Extractive Industries or Aquaculture Production Business among others  EXAMPLE i.e. an Agro-business that is legally registered under the Emissions Directive. |

* + - * 1. *Address*

|  |  |
| --- | --- |
| **Address** | |
| Package: | Addresses |
| Reference: | INSPIRE Data specification on Addresses [DS-D2.8.I.5] |
| Definition: | An identification of the fixed location of property by means of a structured composition of geographic names and identifiers. |
| Description: | NOTE 1 The spatial object, referenced by the address, is defined as the "addressable object". The addressable object is not within the application schema, but it is possible to represent the address' reference to a cadastral parcel or a building through associations. It should, however, be noted that in different countries and regions, different traditions and/or regulations determine which object types should be regarded as addressable objects.  NOTE 2 In most situations the addressable objects are current, real world objects. However, addresses may also reference objects which are planned, under construction or even historical.  NOTE 3 Apart from the identification of the addressable objects (like e.g. buildings), addresses are very often used by a large number of other applications to identify object types e.g. statistics of the citizens living in the building, for taxation of the business entities that occupy the building, and the utility installations.  NOTE 4 For different purposes, the identification of an address can be represented in different ways (see example 3).  EXAMPLE 1 A property can e.g., be a plot of land, building, part of building, way of access or other construction,  EXAMPLE 2 In the Netherlands the primary addressable objects are buildings and dwellings which may include parts of buildings, mooring places or places for the permanent placement of trailers (mobile homes), in the UK it is the lowest level of unit for the delivery of services, in the Czech Republic it is buildings and entrance doors.  EXAMPLE 3 Addresses can be represented differently. In a human readable form an address in Spain and an address in Denmark could be represented like this: "Calle Mayor, 13, Cortijo del Marqués, 41037 Écija, Sevilla, España" or "Wildersgade 60A, st. th, 1408 Copenhagen K., Denmark". |

|  |  |
| --- | --- |
| **NamedPlace** | |
| Package: | Geographical Names |
| Reference: | INSPIRE Data specification on Geographical Names [DS-D2.8.I.3] |
| Definition: | Any real world entity referred to by one or several proper nouns. |

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| --- |
| **AdministrativeUnit** |
| rights, for local, regional and national governance. |

* + - * 1. *Building*

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| --- | --- |
| **Building** | |
| Package: | BuildingsBase |
| Reference: | INSPIRE Data specification on Buildings [DS-D2.8.III.2] |
| Definition: | A Building is an enclosed construction above and/or underground, used or intended for the shelter of humans, animals or things or for the production of economic goods. A building refers to any structure permanently constructed or erected on its site. |

* + - * 1. *Contact*

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| --- | --- |
| **Contact** | |
| Package: | Base Types 2 |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | Communication channels by which it is possible to gain access to someone or something. |

* + - * 1. *DateTime*

|  |  |
| --- | --- |
| **DateTime** | |
| Package: | Date and Time |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *GM\_MultiSurface*

|  |  |
| --- | --- |
| **GM\_MultiSurface** | |
| Package: | Geometric aggregates |
| Reference: | Geographic information -- Spatial schema [ISO 19107:2003] |

* + - * 1. *GM\_Object*

|  |  |
| --- | --- |
| **GM\_Object (abstract)** | |
| Package: | Geometry root |
| Reference: | Geographic information -- Spatial schema [ISO 19107:2003] |

* + - * 1. *Identifier*

|  |  |
| --- | --- |
| **Identifier** | |
| Package: | Base Types |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | External unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. |
| Description: | NOTE1 External object identifiers are distinct from thematic object identifiers.  NOTE 2 The voidable version identifier attribute is not part of the unique identifier of a spatial object and may be used to distinguish two versions of the same spatial object.  NOTE 3 The unique identifier will not change during the life-time of a spatial object. |

* + - * 1. *NetworkReference*

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| --- | --- |
| **NetworkReference** | |
| Package: | Network |
| Reference: | INSPIRE Data Specifications – Base Models – Generic Network Model, version 1.0 [DS-D2.10.1] |
| Definition: | A reference to a network element. |

* + - * 1. *UtilityNode*

|  |  |
| --- | --- |
| **UtilityNode (abstract)** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A point spatial object which is used for connectivity. |
| Description: | Nodes are found at both ends of the UtilityLink. |

#### Externally governed code lists

There are not externally governed code list in this application schema.

|  |  |  |
| --- | --- | --- |
| **G** | **ove** | **rnmentalServiceExtension** |
|  |  |  |
| «voidable» |  |  |
| + addition  + hoursOf  + name:  + note: P  + occupan  + relatedP  + resourc  + serviceL  + validFro  + validTo: | alLo Serv Geo T\_F cy: arty es: evel m:  Da | cationDescription: PT\_FreeText [0..1] ice: PT\_FreeText  graphicalName [0..\*] reeText [0..\*] OccupancyType [0..\*]  : RelatedParty [0..\*] ResourceType [0..\*]  : ServiceLevelValue [0..\*]  DateTime eTime [0..1] |

|  |  |  |
| --- | --- | --- |
|  |  | «dataType»  **OccupancyType** |
| + typeOfO | ccu | pant: PT\_FreeText |
| «voidable» |  |  |
| + number | OfOc | cupants: Integer |

|  |  |  |
| --- | --- | --- |
|  |  | «dataType»  **ResourceType** |
| + typeOfT | echn | icalMeans: PT\_FreeText |
| «voidable» |  |  |
| + amount: | Me | asure |

### Application schema Extended Administrative and Social Governmental Services

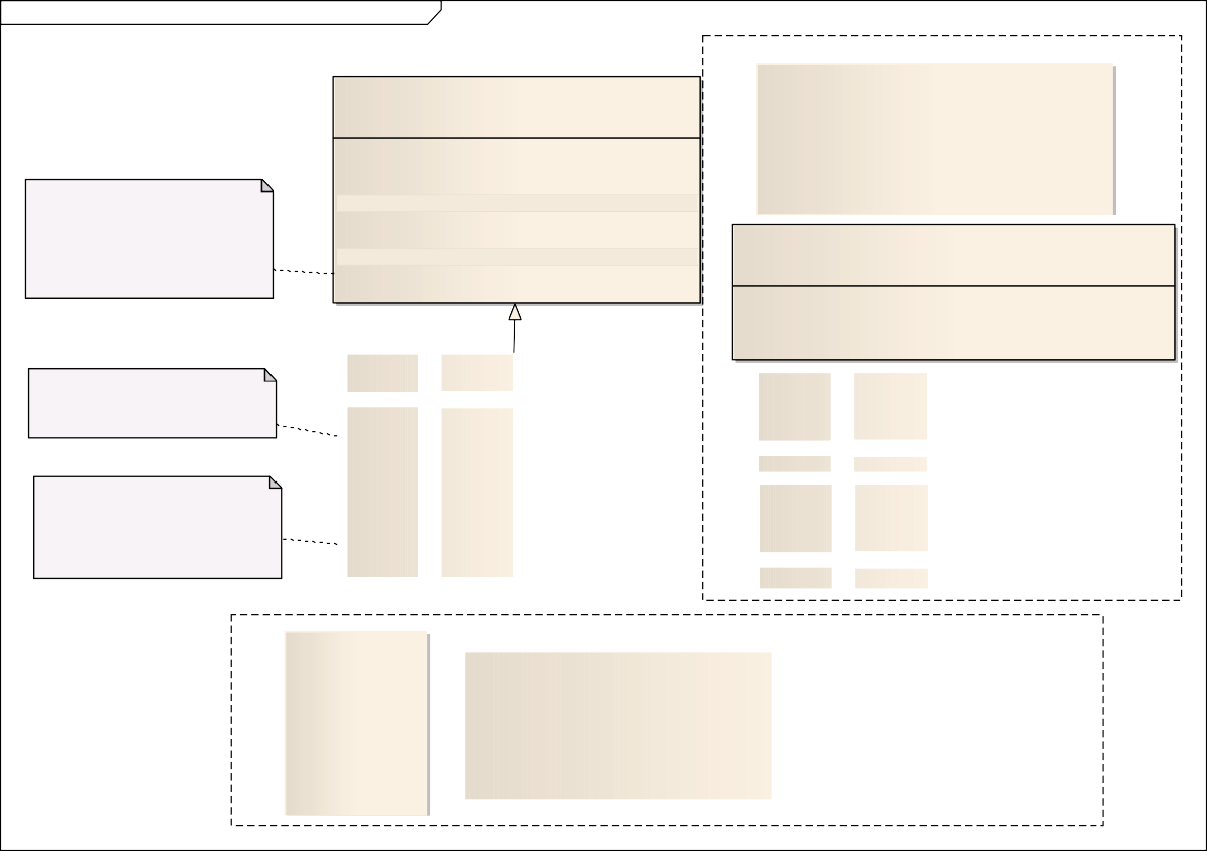
* + - 1. Narrative description

Extended definition of the Governmental Services feature type.

* + - 1. UML Overview

|  |
| --- |
| «codeList»  **CoreAdministrativeAndSocialGovernmentalServices::ServiceTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = narrower  vocabulary = <http://inspire.ec.europa.eu/codeList/ServiceTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 5 – UML class diagram: Overview of the Extended Administrative and Social Government Services application schema**



**class Extended Administrative and Social Governmental Servi...**

unions & structured dataTypes

«featureType» **CoreAdministrativeAndSocialGovernmentalServices:: GovernmentalService**

+ inspireId: Identifier

+ serviceLocation: serviceLocationType

+ serviceType: ServiceTypeValue

«voidable»

+ areaOfResponsibility: AreaOfResponsibilityType [0..1]

+ pointOfContact: Contact [1..\*]

«lifeCycleInfo, voidable»

+ beginLifespanVersion: DateTime

+ endLifespanVersion: DateTime [0..1]

*A*

«union» **CoreAdministrativeAndSocialGovernmentalServices:: AreaOfResponsibilityType**

+ areaOfResponsibilityByAdministrativeUnit: AdministrativeUnit [1..\*]

+ areaOfResponsibilityByNamedPlace: NamedPlace [1..\*]

+ areaOfResponsibilityByNetwork: NetworkReference [1..\*]

+ areaOfResponsibilityByPolygon: GM\_MultiSurface

t

enumeration & codeList

GLB EUR STA NUTS1 NUTS2 NUTS3 LAU1 LAU2

«enumeration»

**ServiceLevelValue**

+ serviceLocationByAddress: Address

+ serviceLocationByBuilding: Building [1..\*]

+ serviceLocationByActivityComplex: ActivityComplex

+ serviceLocationByGeometry: GM\_Object

+ serviceLocationByUtilityNode: UtilityNode

«union» **CoreAdministrativeAndSocialGovernmentalServices:: ServiceLocationType**

validTo

/\* If set, the date validTo shall be equal or later than validFrom. \*/

inv: self.validTo .isEqual(self.validFrom)

or self.validTo .isAfter(self.validFrom)

*A*

NOTE : The attribute hoursOfService is consistent to the ISO data type

CI\_Citation's attribute hoursOfService

*A*

endLifespanVersion

/\* If set, the date endLifespanVersion shall be later than beginLifespanVersion.

\*/

inv: self.endLifespanVersion .isAfter (self.beginLifespanVersion)

* + - 1. Consistency between spatial data sets

Nothing more than what‘s previously defined for the *Administrative and Social Government Services*

application schema.

* + - 1. Identifier management

Nothing more than what‘s previously defined for the *Administrative and Social Government Services*

application schema.

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema ExtensionAdministrativeAndSocialGovernmentalServices |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*OccupancyType*](#_bookmark41) | ExtensionAdministrativeAndSocialGovernmentalServices | «dataType» |
| [*ResourceType*](#_bookmark42) | ExtensionAdministrativeAndSocialGovernmentalServices | «dataType» |

* + - 1. Data types
         1. *OccupancyType*

|  |  |
| --- | --- |
| **OccupancyType** | |
| Name: | occupancy type |
| Definition: | Description of a group of occupants. |
| Stereotypes: | «dataType» |
| **Attribute: numberOfOccupants**  Name: number of occupants  Value type: Integer  Definition: Number of occupants. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: typeOfOccupant**  Name: type of occupant Value type: PT\_FreeText  Definition: Qualitative description of a group of occupants. Description: EXAMPLE: Elderly people, partly immobile.  Multiplicity: 1 | |

* + - * 1. *ResourceType*

|  |  |
| --- | --- |
| **ResourceType** | |
| Name: | resource type |
| Definition: | Description of a single technical resource. |
| Description: | EXAMPLE: Capacity of a fire water reservoir. |
| Stereotypes: | «dataType» |
| **Attribute: amount**  Name: amount  Value type: Measure  Definition: Quantitative description of a technical resource. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: typeOfTechnicalMeans**  Name: type of technical means Value type: PT\_FreeText  Definition: Qualitative description of a technical resource.  Multiplicity: 1 | |

* + - 1. Enumerations
         1. *ServiceLevelValue*

|  |  |
| --- | --- |
| **ServiceLevelValue** | |
| Name: | service level value |
| Definition: | Classification of European territorial units, based on EUROSTAT values (extension to sub-national levels). |
| URI: |  |
| Value: | **GLB** |
| Definition: | Global, supra-European level. |
| Value: | **EUR** |
| Definition: | Pan-European level. |
| Value: | **STA** |
| Definition: | Member State or national level. |
| Value: | **NUTS1** |
| Definition: | Major socio-economic region level. |
| Value: | **NUTS2** |
| Definition: | Basic region level (for the aplication of regional policies). |
| Value: | **NUTS3** |
| Definition: | Small region level (for specific diagnoses). |
| Value: | **LAU1** |
| Definition: | Local administrative units at the supramunicipal level. |
| Value: | **LAU2** |
| Definition: | Local administrative units at the municipal level. |

* + - 1. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Integer*

|  |  |
| --- | --- |
| **Integer** | |
| Package: | Numerics |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *Measure*

|  |  |
| --- | --- |
| **Measure** | |
| Package: | ProductionAndIndustrialFacilitiesExtension |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *PT\_FreeText*

|  |  |
| --- | --- |
| **PT\_FreeText** | |
| Package: | Cultural and linguistic adapdability |
| Reference: | Geographic information -- Metadata -- XML schema implementation [ISO/TS 19139:2007] |

#### Externally governed code lists

There are not externally governed code list in this application schema.

### Application schema Environmental Management Facilities

###### Description

* + - 1. Narrative description

The Environmental Management Facilities application schema introduces a single Feature Type named *EnvironmentalManagementFacility,* which is defined as follows:

*A physical structure designed, built or installed to serve specific functions in relation to environmental material flows, such as waste or waste water flows, or a delimited area of land or water used to serve such functions.*

*EnvironmentalManagementFacility* is modelled as specialisation of the INSPIRE Generic Conceptual Model Feature Type *ActivityComplex* and the extended *DataTypes* described on it.

The environmental management facility data as defined by the Environmental Management Facilities application schema can be categorised as follows:

* + - * + Identification
        + Spatiality (extent or position, any type of geometry)
        + Temporality (start and potentially end of existence in the ―real world‖)
        + Classification and basic information, consisting of the following details:

Facility functions, i.e., activities and types of input/output the facility is designed or built for.

*Example*: *incineration of residual waste*;

Facility capacities in relation to activities and types of input/output.

*Example*: *physical capacity to incinerate 250000 tons of residual waste per year*;

Permissions granted in relation to the facility, especially permitted functions and/or capacities.

*Example*: *permission to incinerate at most 100000 tons of residual waste per year*;

Classification of the type of facility.

*Example: installation or site*;

Parties related to the facility, such as operators, owners or competent authorities;

Parties related to facility permissions, such as the authority granting a permission;

Facility service hours;

The link to parent facilities, i.e., other environmental management facilities of which the facility is a part.

*Note: The link to parent facilities makes it possible to represent facility hierarchies, such as a number of installations on one site, or multiple installations that are parts of another installation.*

The objectives for the development of the Environmental Management Facilities application schema were as follows:

* + - * + To cover the most essential use case requirements from environmental management, foremost waste management;
        + To harmonise with respect to identical or similar requirements from other themes, especially Production and Industrial Facilities (PF) and Agricultural Facilities (AF);
        + To support avoidance of redundancy in data instances;
        + To avoid redundancy in the application schema and the data specification.

In the field of waste management the concepts of *site* and *installation* are very common. These terms are used in legislation such as the EU directive on waste (2008/98) and the EU regulation on a Pollutant Release and Transfer Register (PRTR) (2006/166). In the Environmental Management Facilities application schema these concepts are covered with the single Feature Type *EnvironmentalManagementFacility* for the following reasons:

1. While in the majority of cases there is clarity about whether something qualifies as a site or as an installation, there are also other cases where such a clear distinction may not be possible. For example, a landfill could qualify as both site and installation;
2. The information relevant to sites, such as spatial extents or positions, permissions, operators, etc. is similar or corresponding to the information relevant to installations. Thus redundancy in the application schema is avoided by using a single Feature Type.

The vast majority of *EnvironmentalManagementFacility* content is derived from the Generic Conceptual Model *ActivityComplex* Feature Type and its recommended Data Types. This ensures close alignment with various related Annex III Feature Types, especially ones from Production and Industrial Facilities (PF) and Agricultural Facilities (AF). The *ActivityComplex* Feature Type includes a classification of activities according to the *Statistical Classification of Economic Activities in the European Community (NACE).* A description of the NACE codelist and of the other codelists in use in the application schema is given in the last paragraphs of this section. The functions considered for the *Environmental Management Facilities* Theme fall mainly under the NACE rev. 2 category E "*Water supply; Sewerage; Waste management and remediation activities*".

The *EnvironmentalManagementFacility* Feature Type includes the same basic temporality information that is common with all INSPIRE Feature Types, especially the date from which and optionally the date up to which the object exists or existed in the ―real world‖. Additional temporality information can be provided in relation to permissions. For permissions, both the validity period as well as the date when the permission was granted is taken into account in the application schema.

There are associations with three of the Annex I Feature Types from

*EnvironmentalManagementFacility.* These are:

1. *Address* (facility address);
2. *CadastralParcel* (cadastral parcels covered by the facility);
3. *AbstractBuilding* (buildings wherein the facility is located or considered part of the facility);

The application schema makes use of several standardised codelists most of them inherited from the Activity Complex Model:

* + - * + Statistical Classification of Economic Activities in the European Community (NACE) [*http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST\_CLS\_DLD&StrN*](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_CLS_DLD&StrN) *om=NACE\_REV2&StrLanguageCode=EN&StrLayoutCode=HIERARCHIC*

Sample entries (out of a total number of 615 entries):

* 01.11 - Growing of cereals (except rice), leguminous crops and oil seeds

...

* 38.11 - Collection of non-hazardous waste
* 38.12 - Collection of hazardous waste
* 38.21 - Treatment and disposal of non-hazardous waste
* 38.22 - Treatment and disposal of hazardous waste
* 38.31 - Dismantling of wrecks
* 38.32 - Recovery of sorted materials
* 39.00 - Remediation activities and other waste management services

...

* 99.00 - Activities of extraterritorial organisations and bodies
  + - * + List of economic activities according to Annex I Section 8 of Regulation (EC) No 2150/2002 on waste statistics

[*http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002R2150:EN:NOT*](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32002R2150%3AEN%3ANOT)

Sample entries (out of a total number of 20 entries):

* 1 – Agriculture, hunting and forestry

...

* 17 – Recycling
* 18 – Wholesale of waste and scrap
* 19 – Sewage and refuse disposal, sanitation and similar activities
* 20 – Waste generated by households
  + - * + List of recovery and disposal operations according to Annex I and Annex II of Directive 2008/98/EC on waste

[*http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT*](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32008L0098%3AEN%3ANOT)

Sample entries (out of a total number of 28 entries):

* R1 - Use principally as a fuel or other means to generate energy
* R2 - Solvent reclamation/regeneration

...

* R10 - Land treatment resulting in benefit to agriculture or ecological improvement
* R11 - Use of waste obtained from any of the operations numbered R 1 to R 10
* R12 - Exchange of waste for submission to any of the operations numbered R 1 to R 11
* R13 - Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where the waste is produced)
* D1 - Deposit into or on to land (e.g. landfill, etc.)
* D2 - Land treatment (e.g. biodegradation of liquid or sludgy discards in soils, etc.)
* D3 - Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)

...

* D11 - Incineration at sea
* D12 - Permanent storage (e.g. emplacement of containers in a mine, etc.)
* D13 - Blending or mixing prior to submission to any of the operations numbered D 1 to D 12
* D14 - Repackaging prior to submission to any of the operations numbered D 1 to D 13
* D15 - Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage, pending collection, on the site where the waste is produced)
  + - * + EU Decision 2000/532 List of Wastes

[*http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000D0532:EN:NOT*](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32000D0532%3AEN%3ANOT)[*http://www5.umweltbundesamt.at/dataharmonisation/codelist/ev7jv8yw2ndj9awiygm7z5kee7q*](http://www5.umweltbundesamt.at/dataharmonisation/codelist/ev7jv8yw2ndj9awiygm7z5kee7q) *y.html*

Sample entries (out of a total number of 839 entries):

* 01 01 01 - Wastes from mineral metalliferous excavation
* 01 01 02 - Wastes from mineral non-metalliferous excavation

...

* 20 03 06 - Waste from sewage cleaning
* 20 03 07 - Bulky waste
* 20 03 99 - Municipal wastes not otherwise specified
  + - * + Eurostat Statistical Classification of Products by Activity in the European Economic Community [*http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST\_CLS\_DLD&StrN*](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_CLS_DLD&StrN) *om=CPA\_2008&StrLanguageCode=EN&StrLayoutCode=HIERARCHIC*

Sample entries (out of a total number of 3520 entries):

* 01.11.11 - Durum wheat
* 01.11.12 - Wheat, except durum wheat

...

* 38.11.11 - Collection services of non-hazardous recyclable waste, municipal
* 38.11.19 - Collection services of non-hazardous recyclable waste, other

...

* 38.11.51 - Glass waste
* 38.11.52 - Paper and paperboard waste

...

* 38.11.55 - Plastic waste

...

* 99.00.10 - Services provided by extraterritorial organisations and bodies
  + - 1. UML Overview



**class Env ironmental Management Facilities**

+ inspireId :Identifier

+ thematicId :ThematicIdentifier [0..\*]

+ geometry :GM\_Object

+ function :Function [1..\*]

+ name :CharacterString [0..1]

+ validFrom :DateTime

+ validTo :DateTime [0..1]

+ beginLifespanVersion :DateTime

+ endLifespanVersion :DateTime [0..1]

+parentFacility

«voidable» 0..\*

+ type :EnvironmentalManagementFacilityTypeValue [0..\*]

+ serviceHours :PT\_FreeText [0..1]

+ facilityDescription :ActivityComplexDescription [0..1]

+ physicalCapacity :Capacity [0..\*]

+ permission :Permission [0..\*]

+ status :ConditionOfFacilityValue

+ description :PT\_FreeText [0..1]

+ address :AddressRepresentation [0..1]

+ contact :Contact [0..1]

+ relatedParty :RelatedParty [0..\*]

«dataType»

**Activ ity Complex:: Activ ityComplexDescription**

«featureType»

**Env ironmentalManagementFacility**

«featureType»

**Activ ity Complex::Activ ityComplex**

«voidable»

«voidable»

«voidable, lifeCycleInfo»

«voidable»

**Figure 6 – UML class diagram: Overview of the Environmental Management Facilities application schema**

|  |
| --- |
| «dataType»  **Activ ity Complex::Function** |
| + activity :EconomicActivityValue [1..\*] |
| «voidable» |
| + input :InputOutputValue [0..\*]  + output :InputOutputValue [0..\*]  + description :PT\_FreeText [0..1] |

|  |
| --- |
| «dataType»  **Addresses::AddressRepresentation** |
| + adminUnit :GeographicalName [1..\*] {ordered}  + locatorDesignator :CharacterString [0..\*] {ordered}  + locatorName :GeographicalName [0..\*] {ordered} |
| «voidable» |
| + addressArea :GeographicalName [0..\*] {ordered}  + postName :GeographicalName [0..\*] {ordered}  + postCode :CharacterString [0..1]  + thoroughfare :GeographicalName [0..\*] {ordered} |

**Figure 7 – UML class diagram: US “Environmental Management Facilities” application schema, Data Types**

**class Env ironmental Management Facilities Datatypes**

Data Types from Activity Complex

Data Types from Annex I, II and III

Data Types from Related Party

«dataType»

**Base Types 2::RelatedParty**

+ individualName :PT\_FreeText [0..1]

+ organisationName :PT\_FreeText [0..1]

+ positionName :PT\_FreeText [0..1]

+ contact :Contact [0..1]

+ role :PartyRoleValue [0..\*]

«dataType»

**Base Types 2::Contact**

+ address :AddressRepresentation [0..1]

+ contactInstructions :PT\_FreeText [0..1]

+ electronicMailAddress :CharacterString [0..1]

+ hoursOfService :PT\_FreeText [0..1]

+ telephoneFacsimile :CharacterString [0..\*]

+ telephoneVoice :CharacterString [0..\*]

+ website :URL [0..1]

«voidable»

«voidable»

**class Env ironmental Management Facilities Codelists**



Environmental Management Facilities INSPIRE Internal Codelists

|  |
| --- |
| «codeList»  **Env ironmentalManagementFacilityTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = narrower  vocabulary = <http://inspire.ec.europa.eu/codeList/EnvironmentalManagementFacilityTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

INSPIRE External Codelists from Activity Complex

|  |
| --- |
| «codeList»  **Activ ity Complex::EconomicActiv ityValue** |
|  |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codelist/EconomicActivityValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

«codeList»

**Activ ity Complex::EconomicActiv ityNACEValue**

**tags**

asDictionary = true extensibility = narrower

vocabulary = <http://inspire.ec.europa.eu/codeList/EconomicActivityNACEValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

{incomplete,

overlapping}Activity

«codeList»

**Activ ity Complex::WasteRecov eryDisposalValue**

**tags**

asDictionary = true extensibility = narrower

vocabulary = <http://inspire.ec.europa.eu/codeList/WasteRecoveryDisposalValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

«codeList»

**Activ ity Complex::EconomicActiv ityWasteStatisticsValue**

**tags**

asDictionary = true extensibility = narrower

vocabulary = <http://inspire.ec.europa.eu/codeList/EconomicActivityWasteStatisticsValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

«codeList»

**Activ ity Complex::InputOutputValue**

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codelist/InputOutputValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

{incomplete,

overlapping}InputOutput

«codeList»

**Activ ity Complex::ProductCPAValue**

«codeList»

**Activ ity Complex::WasteValue**

**tags**

asDictionary = true extensibility = narrower

vocabulary = <http://inspire.ec.europa.eu/codeList/ProductCPAValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

**tags**

asDictionary = true extensibility = narrower

vocabulary = <http://inspire.ec.europa.eu/codeList/WasteValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

**Figure 8 – UML class diagram: US “Environmental Management Facilities” application schema, Code Lists**

* + - 1. Consistency between spatial data sets

Nothing more than what‘s written in the general introduction.

* + - 1. Identifier management

The *Environmental Management Facilities* application schema uses the Identifier dataType from the INSPIRE General Conceptual Model [DS-D2.5]. These identifiers include version number, so can be used to track changes to an object.

Identifiers may have been assigned to Environmental Facilities in multiple contexts and datasets (legal registration, registry based on legislation, etc.). In the thematicId attribute, which is of unbounded multiplicity, any such identifiers can be represented in application schema data instances.

|  |
| --- |
| **Recommendation 8** The identifier provided must be unique and representative for the Facility from the point of view of the geographical representation. Generic Identifiers not directly linked with geographical entities should be avoided  (e.g. Company Name Identifier). |

* + - 1. *Modelling of object references*

References to data types are represented using attributes of the relevant data type.

* + - 1. Geometry representation

Datasets relating to Environmental Facilities may be provided by different organizations, especially private and public administration related with waste and waste water management. Independently of the level of detail the geographical position of the facility should be represented at least as a ―point‖.

According to the most generic legislation (waste, IPPC, E-PRTR) the geographical information is required in the form of geographical coordinates (X,Y). In certain cases the geographical position can be estimated by automatic processing of addresses provided at the facility‘s registration. Care has to be taken though to avoid that automatic processing yields incorrect geospatial positions, such as in cases where a legal address is provided instead of a facility address.

If a single facility is considered to be composed of separate geographical extents not connected to each other, then it is valid to provide just the one continuous extent which can be regarded as the main one. It is however not valid to provide the centroid of the separate extents as the facility‘s position.

References to addresses, cadastral parcels or buildings shall be provided in addition to geographical position or extent information, but not as the only spatiality information of environmental facilities.

In some cases related with activities which cover a representative extension of land, ―Sites‖, this could be provided as the geographical representation of the facility, described as polygons (2D) in Local – Regional Datasets. Based on this option, the model includes an extension for this particular case. In some cases ―Sites‖ or Polygons in which the facility is placed could be linked with cadastral parcels but this relation seems to be quite complex from the ontological point of view.

Other kind of potential geo-referenced information is required under the legislation embedded on documents and descriptions requested without references to specific formats. This option only could be resolved with external elements (like URL‘s) or the inclusion of raster layers (out of scope).

The model is open to other kind of detailed elements included on the Facility (e.g. Installations, Technical Units). These elements should be represented by points topologically related with the ―Site‖ or the Facility. In some cases, the geographical representation could be coincident and inherited from the higher hierarchical level to which they belong.

|  |
| --- |
| **Recommendation 9** Only tested geographical information should be provided in order to guarantee a minimum error respecting the real perimeter (real emplacement) of the Facility. Information is valid if the coordinates are inside the perimeter (It‘s not required to be the centroïd) or in a margin of 100 meters around it for State or European scale. |

* + - 1. Temporality representation

Nothing more than what‘s written in the general introduction.

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Environmental Management Facilities |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*EnvironmentalManagementFacility*](#_bookmark47) | Environmental Management Facilities | «featureType» |
| *EnvironmentalManagementFacilityTypeValue* | Environmental Management Facilities | «codeList» |

* + - 1. Spatial object types

*5.5.2.1.1. EnvironmentalManagementFacility*

|  |  |
| --- | --- |
| **EnvironmentalManagementFacility** | |
| Name: | environmental management facility |
| Subtype of: | ActivityComplex |
| Definition: | A physical structure designed, built or installed to serve specific functions in relation to environmental material flows, such as waste or waste water flows, or a delimitable area of land or water used to serve such functions. |
| Description: | EXAMPLE In the context of waste management the "specific function" may be a waste recovery or disposal operation. Typically, waste management sites and waste management installations (such as incineration plants, landfills or storages) get distinguished. Multiple waste management installations may be found at the same site. Waste management installations can be a part of other waste management installations.  The functions considered for the Environmental Facilities Theme fall mainly under the NACE rev. 2 category E "Water supply; Sewerage; Waste management and remediation activities". |
| Stereotypes: | «featureType» |
| **Attribute: type**  Name: type  Value type: EnvironmentalManagementFacilityTypeValue Definition: The type of facility, such as installation or site. Multiplicity: 0..\*  Stereotypes: «voidable» | |
| **Attribute: serviceHours**  Name: service hours Value type: PT\_FreeText  Definition: Service hours of the facility.  Multiplicity: 0..1 | |

|  |  |
| --- | --- |
| **EnvironmentalManagementFacility** | |
| Stereotypes: | «voidable» |
| **Attribute: facilityDescription**  Name: facility description  Value type: ActivityComplexDescription  Definition: Additional information on an Environmental Management Facilities, including its address, a contact details, related parties and a free text description.  Multiplicity: 0..1 Stereotypes: «voidable» | |
| **Attribute: physicalCapacity**  Name: physical capacity  Value type: Capacity  Definition: A quantification of an actual or potential ability to perform an activity, that typically does not change, does not change often, or does not change to a significant degree.  Description: NOTE Capacity could refer depending of the thematic scope to different concepts included on the legislation as ―emission limits‖, ―capacity incineration‖,  ―nominal capacity‖, ―objective estimation data‖, ―rate of desulphurization‖ or  ―recycling rate‖.  Multiplicity: 0..\* Stereotypes: «voidable» | |
| **Attribute: permission**  Name: permission  Value type: Permission  Definition: Official Decision (formal consent) granting authorization to operate all or part of an Environmental Management Facility , subject to certain conditions which guarantee that the installation or parts of installations on the same site operated by the same operator complies with the requirements fixed by the law or standards. A permit may cover one or more functions and fix parameters of capacity; The term may be extended to other kind of certificates or documents of special relevance depending of the scope (e.g. ISO, EMAS, National Quality Standards, etc).  Description: NOTE This terms is referred in several legislative acts as ―permit‖ ,  ―authorization‖, ―development consent‖ or ―exploration permit‖ among others.  EXAMPLE 1 ―…a [written] decision by which the competent authority grants permission to operate all or part of an installation‖ ; EXAMPLE 2 ―.. the decision of the competent authority or authorities which entitles the developer  Multiplicity: 0..\* Stereotypes: «voidable» | |
| **Attribute: status**  Name: status  Value type: ConditionOfFacilityValue  Definition: The status of the Environmental Management Facility, such as operational or decommissioned.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Association role: parentFacility**  Name: parent facility  Value type: EnvironmentalManagementFacility | |

|  |  |
| --- | --- |
| **EnvironmentalManagementFacility** | |
| Definition: | A parent facility, i.e., a facility to which this facility belongs. |
| Description: | A facility may belong to multiple other facilities. |
| Multiplicity: | 0..\* |
| Stereotypes: | «voidable» |

* + - 1. Code lists

*5.5.2.2.1. EnvironmentalManagementFacilityTypeValue*

|  |  |
| --- | --- |
| **EnvironmentalManagementFacilityTypeValue** | |
| Name: | environmental facility classification |
| Definition: | Classification of environmental facilities, such as into sites and installations. |
| Extensibility: | narrower |
| Identifier: | <http://inspire.ec.europa.eu/codelist/EnvironmentalManagementFacilityTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in *Annex C*  and narrower values defined by data providers. |

* + - 1. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *ActivityComplex*

|  |  |
| --- | --- |
| **ActivityComplex** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 [DS-D2.10.3] |
| Definition: | A "single unit", both technically and economically, under the management control of the same legal entity (operator), covering activities as those listed in the Eurostat NACE classification, products and services. Activity Complex includes  all infrastructure, equipment and materials. It must represent the whole area, at the same or different geographical location, managed by a "single unit". |
| Description: | NOTE 1 This class describes the minimal set of elements necessary to describe and identify geographically a legal entity and the activities taken place on it under the context of a Environmental purposes.  NOTE 2 "Activity Complex" could be assimilated to terms described on the legislation as Facility, Establishment, Plant, Holding, Organization ,Farm, Extractive Industries or Aquaculture Production Business among others  EXAMPLE i.e. an Agro-business that is legally registered under the Emissions Directive. |

* + - * 1. *ActivityComplexDescription*

|  |  |
| --- | --- |
| **ActivityComplexDescription** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 [DS-D2.10.3] |
| Definition: | Additional information about an activity complex, including its description, address, contact and related parties. |

* + - * 1. *Capacity*

|  |  |
| --- | --- |
| **Capacity** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 |

|  |  |
| --- | --- |
| **Capacity** | |
|  | [DS-D2.10.3] |
| Definition: | A quantification of an actual or potential ability to perform an activity, that typically does not change, does not change often, or does not change to a significant degree. |
| Description: | NOTE Capacity could refer depending of the thematic scope to different concepts included on the legislation as ―emission limits‖, ―capacity incineration‖,  ―livestock units‖, ―nominal capacity‖, ―objective estimation data‖, ―rate of desulphurization‖ or ―recycling rate‖. |

* + - * 1. *ConditionOfFacilityValue*

|  |  |
| --- | --- |
| **ConditionOfFacilityValue** | |
| Package: | Base Types |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | The status of a facility with regards to its completion and use. |

* + - * 1. *PT\_FreeText*

|  |  |
| --- | --- |
| **PT\_FreeText** | |
| Package: | Cultural and linguistic adapdability |
| Reference: | Geographic information -- Metadata -- XML schema implementation [ISO/TS 19139:2007] |

* + - * 1. *Permission*

|  |  |
| --- | --- |
| **Permission** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 [DS-D2.10.3] |
| Definition: | Official Decision (formal consent) granting authorization to operate all or part of an Activity Complex, subject to certain conditions which guarantee that the installations or parts of installations on the same site operated by the same operator comply with the requirements fixed by a competent authority. A permit may cover one or more functions and fix parameters of capacity. The term could be extended to other kind of certificates or documents of special relevance depending of the scope (e.g. ISO, EMAS, National Quality Standards, etc). The term may be extended to other kind of certificates or documents of special relevance depending of the scope (e.g. ISO, EMAS, National Quality Standards,  etc). |
| Description: | NOTE This terms is referred in several legislative acts as ―permit‖ ,  ―authorization‖, ―development consent‖ or ―exploration permit‖ among others.  EXAMPLE 1 ―…a [written] decision by which the competent authority grants permission to operate all or part of an installation‖ ; EXAMPLE 2 ―.. the decision of the competent authority or authorities which entitles the developer to proceed with the project..‖. |

#### 5.5.3 Externally governed code lists

No externally governed code lists is included in the ―Environmental Management Activities‖ application schema apart for those described to Activity Complex.

### Application Schemas “Utility Networks”

***Definition***

Utility services and networks include the physical constructions for transport of utility products - namely pipelines for transport of oil, gas, chemicals, water, sewage and thermal products – and cables for transmission of electricity, phone and cable-TV signals, etc.

All kinds of utility systems have nodes like e.g. pump stations, and they are linked to facilities for production and treatment of different kinds of utility products. These major production and treatment sites are treated in the theme production and industrial facilities.

***Description***

It is acknowledged that each organization has different responsibilities and this will influence the kind of data they collect, manage and use. Some organizations will use simple models while other will have more complex data models.

This data specification is a basic framework that user can adopt and, if necessary, adapt and extend for themselves. The specification is focused on the core spatial objects required by networks, i.e. network centrelines etc.

Not all the application-specific spatial objects (e.g. flow measurement sensors) are incorporated. Non- geographic data (e.g. information on flow in m3/s) is also out of scope of this specification.

***Abstract***

To support a consistent approach to all themes the European Commission, through the Data Specifications Drafting Team, developed the ―Generic Conceptual Model‖ [GCM] which was reviewed and published prior to the commencement of work on the Annex II and III themes. This is the foundation model for every utility network – with the intention that any additional network may be combined in future and used in a way that is predicable.

The scope of the INSPIRE Utility Networks Data Product Specification incorporates six distinct utility themes:

* Water Network
* Sewer Network
* Electricity Network
* Oil, Gas & Chemicals Network
* Thermal Network
* Telecommunications (Excluded from the IRs)

Understanding of the Generic Conceptual Model is essential and the GCM/GNM should be read in conjunction with this document. The GCM describes the basic form of real world abstraction. The GNM adapts this and describes the basic concepts that underpin and define the common Utility Networks Application Schema upon which all six themes are based. The GCM relies on ISO standards and the 19xxx series in particular.

***Purpose***

The purpose of this document is to specify a harmonized data specification for the spatial data theme Utility Networks, being a sub-scope of the Utility and Governmental Services, as defined in Annex III of the INSPIRE Directive.

This data specification is provided as basic framework that users can adopt and - if required – extend for themselves. The model is structured to maximize reuse and the sharing of organizational data about a network. The specification is concerned only with the core spatial objects required by Utility Networks. This specification is mainly focused on the ―widely reused – widely referenced― segment of

spatial objects (e.g. utility pipes‟ centerlines, or utility node objects).

***Associated “non-Geographic” data***

Any ―non geographic data‖ (the majority of the data holdings in any organization) – is also out of scope of this specification – such records maybe ―an asset condition report‖, ―flow report‖, ―images of assets‖,

―statistics‖ and so on. Therefore much of the data used in the utility industry is classified as application-specific. While associated with the network, all these examples are closer to the application end of the spectrum than generic use by a wide community whether they represent a geographic entity or non- geographic data.

To maximize reuse, the linkage of such organizational data with the spatial objects should be ―loose‖ in the sense that these are ideally defined as different data objects in a database. Configured correctly such data may then be reused in several different applications and any associated information shared and exchanged as desired.

***Applications and use cases***

The following use cases are highlighted to demonstrate the width and breadth of applications (the list is not exhaustive):

* **Asset Management**
* Capacity Planning
* Construction
* **Design & Planning**
* Disaster management
* Emergency response
* Environmental Impact Assessments
* Estate management
* Flow modelling
* Maintenance

The applications in bold above were used as use cases in the preparation of this specification. These represent applications at the European, national, local public sector levels and in the private sector. It is evident that the scope of the specification does not attempt to support all these applications. User extensibility is supported and encouraged. Future model extensions may incorporate further object types if it is felt that further standardization is necessary.

***Characteristics of the specification***

The key characteristics of the Utility Networks datasets are:

* They contain information of specific interest for the public sector in its role to support economic growth through efficient utility networks (electricity, telecommunications, water, sewer, etc.)
* The information is applicable from local to European levels of operation.
* The data represents a structure or methods of operation that is stable over time (even if parts of the data content frequently changes, e.g. telecommunications).
* Supports cross border (pan-European) applications.
* Being a part of the European Spatial Data Infrastructure the data may be more easily used with other kinds of data themes, such as geographical names, administrative units, and addresses etc.

***Spatial resolution and Topology***

In the real world, objects are connected to each other: an optical cable is connected to a multiplexer that in turn is connected to copper cables connecting into our homes to provide cable TV, telephony and internet access. Using GIS to support network utility management typically involves many types of features that may have connectivity to each other.

Topology in GIS is generally defined as the spatial relationship between connecting or adjacent features, and is an essential prerequisite for many spatial operations such as network analysis. Utility networks can be described as NaN (Node-Arc-Node) network using two basic geometric types: points (aka nodes) and polylines (aka arcs). NaN topologies can be directed or un-directed, depending on specific type of network (i.e. water networks are directed, while telecommunications networks are not). Such topology structure provides an automated way to handle digitizing and editing errors, and enable advanced spatial analyses such as adjacency, connectivity and containment. Infrastructure networks rely on the Generic network model.

That being said, Utility Networks support single spatial resolution. Containment (e.g. equipment being installed in manholes or on poles) is not taken in account as a different Level of Detail (LOD).

The topology or spatial relationships between utility network features can be defined explicitly by referring nodes within links and vice versa. But this is an option and so is not mandatory.

According to the Generic Network Model, the relations between starting/ending nodes and links are voidable, therefore these relationships can be provided if the source data already contains this information, but if the source data doesn't contain this relationship information a data provider should not be forced to provide them. In the latter case, such topology could be implicit if the source data is sufficiently clean in which a users' application could construct such topology automatically.

Furthermore, the cardinality of the links is mentioned to be [0..1] or [0..\*], so a dataset can be INSPIRE compliant, even if containing no relation between links and nodes.

***Color-coding used on model classes***

In order to facilitate easier reading of the Utility Networks UML model, color-coding on the UML model classes is used. This helps to visually recognize immediately the different kind of model classes.

With the color-coding we differentiate the abstract featureTypes, main and common featureTypes from the Utility Networks Profile, featureTypes from Extended Utility Networks, codelists from Core and from Extended Utility Networks. These are the assigned codes:

* **default white (EA)** for abstract featureTypes
* **green** for the common featureTypes
* **red** for the main featureTypes from a particular utility network
* **yellow** for the featureTypes of Extended
* **grey** for the codelists of the Utility Networks Profile
* **dark** grey for the codelist of Extended Utility Networks

***Organisation of the diagrams***

For the Utility Networks Profile there is on Common Application Schema that contains all the common elements shared among thematic packages and ―applicationSchema‖ packages for each utility network type (Electricity, Oil-Gas-Chemicals, Sewer, Thermal and Water) with one diagram for each

―applicationSchema‖

The Abstract Types in the Utility Networks Profile inherit much from the generic Network model from the GCM. The Utility Networks Profile can be used if a data provider has data available based on a node-arc-node topological concept. The node-arc-node logic is represented in the GCM using Node and Link featureTypes which contain associations in both directions.

The Utility Networks Profile extends the Network LinkSet, Node and Network featureTypes with respectively *UtilityLinkSet*, *UtilityNode* and *UtilityNetwork* featureTypes.

The *UtilityNodeContainer* featureType has no counterpart in the generic Network model. This UtilityNodeContainer featureType has a part-relationship with UtilityNode, indicating a utility container object can contain many utility node objects.

The *UtilityNetworkElement* contains the properties that are common to all these abstract utility featureTypes.

UtilityNetworkElement has two special properties for referencing features of other themes that are related to the Utility Network (sub) theme. One is ―utilityFacilityReference‖ which references an ActivityComplex featureType (from INSPIRE Base Models), which can be used to describe more complex objects that are utility facilities having a more complex geometry. The other one is

―governmentalServiceReference‖ referencing a GovernmentalService feature (from Administrative and social governmental services (sub) theme of INSPIRE US), which can be used to refer to governmental service features that are conceptually related to utility network features.

The Utility Network Profile - Abstract Types further contain two codelists that are used by the two properties of the UtilityLinkSet featureType and two codelists from the INSPIRE Base Types.

* 1. **“Common Utility Networks Elements” application schema**

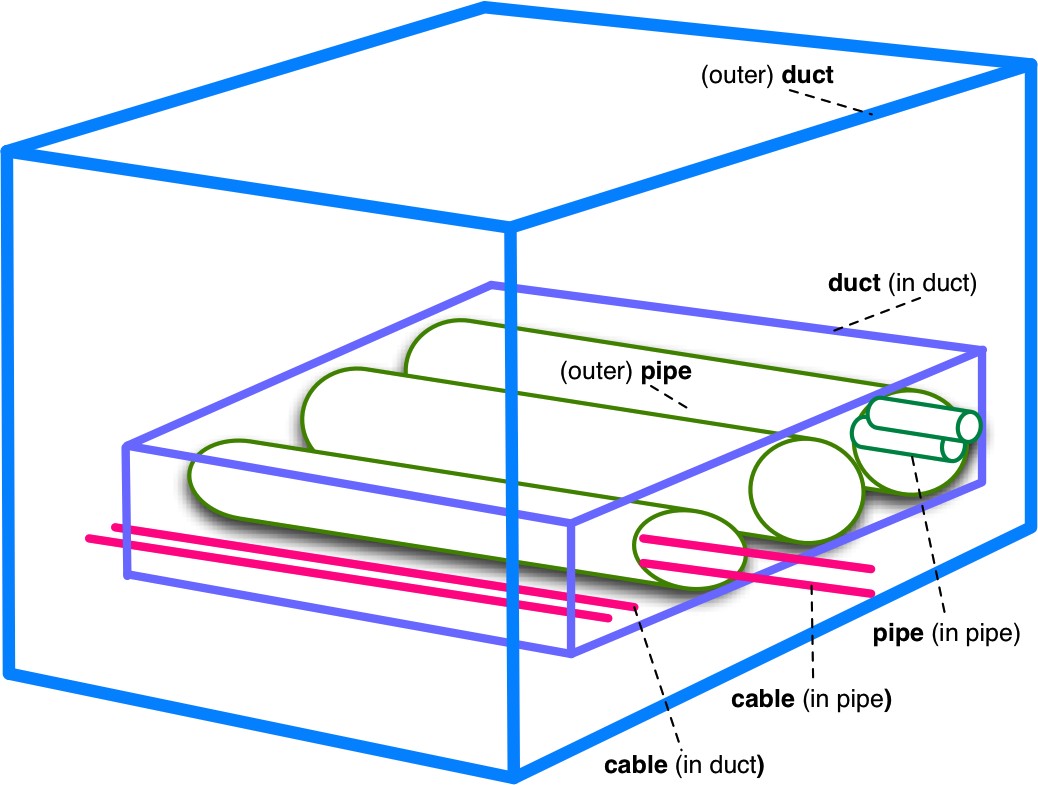
#### Description

* + - 1. **Narrative description**

The Common Types of the Utility Networks Profile contain the *Cable*, *Pipe* and *Duct* featureTypes. These are link objects which can extend the UtilityLinkSet.

These three featureTypes have various associations that can be used to model their real-life relationships:

* A Duct can contain multiple other Ducts, e.g. in case the outer duct is a larger construction containing multiple smaller ducts;
* A Duct can contain multiple Pipes, e.g. in case the duct acts as a protecting layer or as a construction to keep the pipes together;
* A Duct can contain multiple Cables, idem as with the Duct-Pipe relationship;
* A Pipe can contain multiple other Pipes, e.g. in case the other pipe is used to keep a number of inner pipes together;
* A Pipe can contain multiple Cables, idem as with the Pipe-Pipe relationship.



**Figure 9 – Physical relations between cables, pipes and ducts**

Cable is an abstract featureType and can be used in the various utility themes by concrete featureTypes (e.g. ElectricityCable).

Duct and Pipe on the other hand are not abstract, so this means that all utility themes can use the Duct and Pipe featureTypes as concrete featureTypes as part of their concrete utility network (e.g. ElectricityNetwork can have ElectricityCables and Ducts). Hence Duct and Pipe are here color-coded in green. Furthermore, Duct and Pipe can be used in utility networks that we call ―crossTheme‖. This means that we can have a cross-theme utility networks with ducts and pipes that are used to encase cables and pipes from other utility network themes.

Cable, Pipe and Duct inherit from the abstract UtilityLinkSet featureType, but a constraint has been put on the Duct featureType indicating that the utilityDeliveryType property cannot be used in a Duct. This utilityDeliveryType property indicates that a link object is used in e.g. transport or distribution type of utility networks. But a Duct can contain link objects from more than one specific utility network them, it should not use this property, which is expressed by the constraint.

The UtilityNetwork featureType has a property ―utilityNetworkType‖ with a codelist

―UtilityNetworkTypeValue‖ that describe the kind of utility network. Note that there‘s also a

―crossTheme‖ utility network type that can be used for ducts and pipes for encasing of cables and pipes from other utility networks.

The UtilityNetwork featureType has a reflexive association, meaning a utility network can contain other networks. A UtilityNetwork has a number of authorities with different roles, but these roles can be different for certain parts of a utility network. This reflexive association allows to model this case by having a main utility network with several sub networks, each having different organisations - modelled using the RelatedParty data type (from INSPIRE Basic Types 2) - fulfilling the authority roles.

The UtilityNetwork featureType also uses the ―utilityFacilityReference‖ property to allow to conceptually include a utility facility in a utility network.

There are four utility node container objects, indicated as green color-coded featureTypes, meaning they are concrete and can be used in all utility networks: *Manhole*, *Tower*, *Pole* and *Cabinet*.

Finally there is the Appurtenance featureType which has the ―appurtenanceType‖ property and a hierarchy of codelists that can be used for values. The lowest level of codelists are codelists with the

base values we provide in this data specification, but these can be extended for application specific purposes.

* + - 1. **UML Overview**



|  |
| --- |
| **class Utility Networks Profile - Abstract Types**  Generic Network Model (from GCM)  «featureType»  ***Network::NetworkElement*** +inNetwork «featureType»  «voidable» **Network::Network**  + inspireId :Identifier [0..1]  «lifeCycleInfo, voidable» 0..\* 1..\* «voidable»  + beginLifespanVersion :DateTime +elements + geographicalName :GeographicalName [0..\*]  + endLifespanVersion :DateTime [0..1]  «dataType»  «featureType» +link «featureType» **Network::DirectedLink**  ***Network::LinkSet Network::***  1..\* ***GeneralisedLink*** + direction :Sign 0..\*  +link 1 +spokeStart  +startNode  «featureType» «voidable»  «featureType» ***Network::Link*** 0..\* 0..1 «featureType»  ***Network::LinkSequence Network::Node***  + centrelineGeometry :GM\_Curve  + link :DirectedLink [1..\*] {ordered} + fictitious :Boolean = false 0..\* 0..1 + geometry :GM\_Point  +spokeEnd +endNode  «voidable»  «featureType» «featureType» «featureType» +nodes «featureType»  **UtilityLinkSequence UtilityLink *UtilityNode*** «voidable» ***UtilityNodeContainer***  **constraints** 0..\* + geometry :GM\_Point  {All utility node objects have inspireId} + inspireId :Identifier [0..1]  «featureType» «featureType»  ***UtilityLinkSet UtilityNetworkElement***  «voidable» «voidable»  + utilityDeliveryType :UtilityDeliveryTypeValue [0..1] + currentStatus :ConditionOfFacilityValue  + warningType :WarningTypeValue + validFrom :DateTime  + validTo :DateTime [0..1]  **constraints** + verticalPosition :VerticalPositionValue  {All utility link objects have inspireId} + utilityFacilityReference :ActivityComplex [0..1]  + governmentalServiceReference :GovernmentalService [0..1]  «codeList» «enumeration»  **Base Types:: Base Types:: ConditionOfFacilityValue VerticalPositionValue**  + disused onGroundSurface  + functional suspendedOrElevated  + projected underground  + underConstruction  + decommissioned |

**Figure 10 – UML class diagram: Overview of the “Utility Networks Profile - Abstract Types”**

**Figure 11 – UML class diagram: Overview of the “Utility Networks Profile - Common Types”**



**class Utility Networks Profile - Common Types**

+cables

«voidable»

+pipes

0..\*

0..\*

+pipes

+cables

«voidable»

0..\*

**constraints**

+ducts {"Duct" shall not have a "utilityDeliveryType"}

«voidable» 0..\*

+nodes

«voidable»

+networks

«voidable» 0..\*

0..\*

«voidable» «voidable»

+ towerHeight :Length + poleHeight :Length

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

«voidable»

«featureType»

**Appurtenance**

«featureType»

**Cabinet**

«featureType»

**Pole**

«featureType»

**Tower**

«featureType»

**Manhole**

+ geometry :GM\_Point

+ inspireId :Identifier [0..1]

*UtilityNetwork Element*

«featureType»

***UtilityNodeContainer***

*Node UtilityNetwork Element*

«featureType»

***UtilityNode***

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

«voidable»

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

«featureType»

**UtilityNetwork**

+ geographicalName :GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

«voidable» 0..\*

+ pipeDiameter :Measure

+ pressure :Measure [0..1]

+ ductWidth :Length

«voidable»

«voidable»

«featureType»

***Cable***

«featureType»

**Pipe**

«featureType»

**Duct**

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

«voidable»

*Link Set UtilityNetwork Element*

«featureType»

***UtilityLinkSet***

|  |
| --- |
| «codeList»  **AppurtenanceTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/AppurtenanceTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **UtilityDeliveryTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **UtilityNetworkTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityNetworkTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

* + - 1. **Consistency between spatial data sets**

Nothing more than what‘s written in the general paragraph.

* + - 1. **Identifier management**

Nothing more than what‘s written in the general paragraph.

* + - 1. **Modelling of object references**

Nothing more than what‘s written in the general paragraph.

* + - 1. **Geometry representation**

There are two types of geometry in the specification:

1. Centreline objects in Utility Networks
2. Point objects in Utility Networks

Type (b) are network nodes, but can also be used to associate appurtenances with the network (e.g. antenna, pump, treatment plant etc).

Levels of detail: The specification addresses the highest resolution of data capture in Utility Networks and is also applicable to any derived lower resolution levels of detail where the number of coordinates is reduced and the geometry simplified to support viewing and reporting at regional, national and European levels.

This specification cannot advise on the form of representation at the highest resolution nor the accuracy since this will be driven by member state needs. Ideally, derived lower resolution datasets will use the approach outlined in D2.6 A.19 where all the objects are related from lowest to highest resolution and any user information collected about the network can be simply aggregated at the lower lever or disaggregated as the user increases the resolution.

*Local, Regional, National and European relevance of the specification*

The datasets in scope are used extensively at the ―local level‖ and extend to regional, national and European levels. Usage can change with levels of operation or within an organisation. The specification is mainly focused on establishing a more coherent approach to those datasets that are universally used, probably held at regional and local level and at the highest resolution within this context.

*Seamless resolution representations at the local and regional level*

Lower resolution datasets would be derived from the local/high resolution data - outlined in the previous paragraph – and referenced (no geographic) data could then be aggregated and disaggregated as desired.

*Multiple representations at regional, national and European levels.*

Ideally the same data would be scalable dynamically from local to European level seamlessly. Since the current datasets and methods are insufficiently mature to support this - several ―levels of detail‖ will usually be stored to represent the network at different operational levels.

Unfortunately today there is very little correspondence between each level. Ideally it would be easy to seamlessly move from the highest to the lowest resolution with corresponding scaling and aggregation and disaggregation of the associated organisational information (as we do on statistical datasets) e.g. for reporting purposes or trans-European analysis, real-time management (SCADA), planning and policy making.

In the meantime this specification applies to all levels of detail, although data providers are encouraged to introduce this specification at the local level as a priority.

|  |
| --- |
| **Recommendation 10** All Utility Networks spatial objects should be provided at the source resolution and accuracy where possible. |

|  |
| --- |
| **Recommendation 11** Lower order resolutions should be derived from the highest order representation of the utility network, and any user information should be captured once and referenced to each geometrical representation. |

* + - 1. **Temporality representation**

Nothing more than what‘s written in the general paragraph.

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Common Utility Network Elements |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*Appurtenance*](#_bookmark53) | Common Utility Network Elements | «featureType» |
| [*AppurtenanceTypeValue*](#_bookmark68) | Common Utility Network Elements | «codeList» |
| [*Cabinet*](#_bookmark54) | Common Utility Network Elements | «featureType» |
| [*Cable*](#_bookmark55) | Common Utility Network Elements | «featureType» |
| [*Duct*](#_bookmark56) | Common Utility Network Elements | «featureType» |
| [*Manhole*](#_bookmark57) | Common Utility Network Elements | «featureType» |
| [*Pipe*](#_bookmark58) | Common Utility Network Elements | «featureType» |
| [*Pole*](#_bookmark59) | Common Utility Network Elements | «featureType» |
| [*SpecificAppurtenanceTypeValue*](#_bookmark69) | Common Utility Network Elements | «codeList» |
| [*Tower*](#_bookmark60) | Common Utility Network Elements | «featureType» |
| [*UtilityDeliveryTypeValue*](#_bookmark70) | Common Utility Network Elements | «codeList» |
| [*UtilityLink*](#_bookmark61) | Common Utility Network Elements | «featureType» |
| [*UtilityLinkSequence*](#_bookmark62) | Common Utility Network Elements | «featureType» |
| [*UtilityLinkSet*](#_bookmark63) | Common Utility Network Elements | «featureType» |
| [*UtilityNetwork*](#_bookmark64) | Common Utility Network Elements | «featureType» |
| [*UtilityNetworkElement*](#_bookmark65) | Common Utility Network Elements | «featureType» |
| [*UtilityNetworkTypeValue*](#_bookmark71) | Common Utility Network Elements | «codeList» |
| [*UtilityNode*](#_bookmark66) | Common Utility Network Elements | «featureType» |
| [*UtilityNodeContainer*](#_bookmark67) | Common Utility Network Elements | «featureType» |
| [*WarningTypeValue*](#_bookmark72) | Common Utility Network Elements | «codeList» |

* + - 1. **Spatial object types**
         1. *Appurtenance*

|  |  |
| --- | --- |
| **Appurtenance** | |
| Name: | appurtenance |
| Subtype of: | UtilityNode |
| Definition: | An appurtenance is a node object that is described by its type (via the attribute "appurtenanceType"). |
| Description: | The "appurtenanceType" attribute uses the "AppurtenanceTypeValue" codelist for its values. But this is an empty codelist that needs to be extended by a concrete codelist of appurtenance types for each utility network type. So e.g. for the electricity network, the "ElectricityAppurtenanceTypeValue"  codelist should be used. |
| Stereotypes: | «featureType» |
| **Attribute: appurtenanceType**  Name: appurtenance type value Value type: AppurtenanceTypeValue Definition: Type of appurtenance  Description: The "AppurtenanceTypeValue" codelist is an abstract codelist that can be replaced by the various appurtenance type value codelists for each utility network.  Multiplicity: 1 | |

|  |  |
| --- | --- |
| **Appurtenance** | |
| Stereotypes: | «voidable» |
| **Attribute: specificAppurtenanceType**  Name: specific appurtenance type Value type: SpecificAppurtenanceTypeValue  Definition: Type of appurtenance according to a domain-specific classification. Multiplicity: 0..1  Stereotypes: «voidable» | |
| **Constraint: "TelecommunicationsAppurtenanceTypeValue" is not in IR**  Natural language:  OCL: | |

* + - * 1. *Cabinet*

|  |  |
| --- | --- |
| **Cabinet** | |
| Name: | cabinet |
| Subtype of: | UtilityNodeContainer |
| Definition: | Simple cabinet object which may carry utility objects belonging to either single or multiple utility networks. |
| Description: | Cabinets represent mountable node objects that can contain smaller utility devices and cables. |
| Stereotypes: | «featureType» |

* + - * 1. *Cable*

|  |  |
| --- | --- |
| **Cable (abstract)** | |
| Name: | cable |
| Subtype of: | UtilityLinkSet |
| Definition: | A utility link or link sequence used to convey electricity or data from one location to another. |
| Stereotypes: | «featureType» |

* + - * 1. *Duct*

|  |  |
| --- | --- |
| **Duct** | |
| Name: | duct |
| Subtype of: | UtilityLinkSet |
| Definition: | A utility link or link sequence used to protect and guide cable and pipes via an encasing construction. |
| Description: | A Duct (or Conduit, or Duct-bank, or Wireway) is a linear object which belongs to the structural network. It is the outermost casing. A Duct may contain Pipe(s), Cable(s) or other Duct(s). Duct is a concrete feature class that contains information about the position and characteristics of ducts as seen from a manhole, vault, or a cross section of a trench and duct. |
| Stereotypes: | «featureType» |
| **Attribute: ductWidth**  Name: duct width  Value type: Length  Definition: The width of the duct.  Description: The measurement of the object - in this case, the duct - from side to side. Multiplicity: 1  Stereotypes: «voidable» | |

|  |  |
| --- | --- |
| **Duct** | |
| **Association role: d**  Name: | **ucts**  ducts |
| Value type: | Duct |
| Definition: | A single duct or set of ducts that constitute the inner-duct. |
| Multiplicity: | 0..\* |
| Stereotypes: | «voidable» |
| **Association role: cables**  Name: cables  Value type: Cable  Definition: A duct may contain one or more cables. Multiplicity: 0..\*  Stereotypes: «voidable» | |
| **Association role: pipes**  Name: pipes  Value type: Pipe  Definition: The set of pipes that constitute the duct bank. Multiplicity: 0..\*  Stereotypes: «voidable» | |
| **Constraint: "Duct" shall not have a "utilityDeliveryType"**  Natural The multiplicity of "utilityDeliveryType" shall be 0 language:  OCL: inv: utilityDeliveryType->size()=0 | |

* + - * 1. *Manhole*

|  |  |
| --- | --- |
| **Manhole** | |
| Name: | manhole |
| Subtype of: | UtilityNodeContainer |
| Definition: | Simple container object which may contain either single or multiple utility networks objects. |
| Description: | Manholes perform following functions:   * Provide drainage for the conduit system so that freezing water does not damage the conduit or wires. * Provide a location for bending the conduit run without damaging the wires. * Provide a junction for conduits coming from different directions. * Provide access to the system for maintenance. |
| Stereotypes: | «featureType» |

* + - * 1. *Pipe*

|  |
| --- |
| **Pipe** |
| Name: pipe |

|  |  |
| --- | --- |
| **Pipe** | |
| Subtype of: | UtilityLinkSet |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |
| Stereotypes: | «featureType» |
| **Attribute: pipeDiameter**  Name: pipe diameter  Value type: Measure  Definition: Pipe outer diameter.  Description: For convex shaped objects (e.g. a circle) the diameter is defined to be the largest distance that can be formed between two opposite parallel lines tangent to its boundery.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: pressure**  Name: pressure  Value type: Measure  Definition: The maximum allowable operating pressure at which a product is conveyed through a pipe.  Description: The unit of measure for pressure is commonly expressed in "bar". Multiplicity: 0..1  Stereotypes: «voidable» | |
| **Association role: cables**  Name: cables  Value type: Cable  Definition: A pipe may contain one or more cables. Multiplicity: 0..\*  Stereotypes: «voidable» | |
| **Association role: pipes**  Name: pipes  Value type: Pipe  Definition: A pipe may contain one or more pipes. Multiplicity: 0..\*  Stereotypes: «voidable» | |

* + - * 1. *Pole*

|  |  |
| --- | --- |
| **Pole** | |
| Name: | pole |
| Subtype of: | UtilityNodeContainer |
| Definition: | Simple pole (mast) object which may carry utility objects belonging to either single or multiple utility networks. |
| Description: | Poles represent node objects that can support utility devices and cables. |
| Stereotypes: | «featureType» |
| **Attribute: poleHeight**  Name: pole height  Value type: Length  Definition: The height of the pole.  Description: The height is the vertical extend measuring accross the object - in this case, the | |

|  |  |
| --- | --- |
| **Pole** | |
|  | pole - at right angles to the lenght. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |

* + - * 1. *Tower*

|  |  |
| --- | --- |
| **Tower** | |
| Name: | tower |
| Subtype of: | UtilityNodeContainer |
| Definition: | Simple tower object which may carry utility objects belonging to either single or multiple utility networks. |
| Description: | Towers represent node objects that support reservoirs, cables or antennas. |
| Stereotypes: | «featureType» |
| **Attribute: towerHeight**  Name: tower height  Value type: Length  Definition: The height of the tower.  Description: The height is the vertical extend measuring accross the object - in this case, the tower - at right angles to the lenght.  Multiplicity: 1  Stereotypes: «voidable» | |

* + - * 1. *UtilityLink*

|  |  |
| --- | --- |
| **UtilityLink** | |
| Name: | name -- utility Link -- definition -- A linear spatial object that describes the geometry and connectivity of a utility network between two points in the network. |
| Subtype of: | LinkUtilityNetworkElement |
| Stereotypes: | «featureType» |

* + - * 1. *UtilityLinkSequence*

|  |  |
| --- | --- |
| **UtilityLinkSequence** | |
| Name: | name -- utility Link Sequence -- description -- A linear spatial object, composed of an ordered collection of utility links, which represents a continuous path in the utility network without any branches. The element has a defined beginning and end and every position on the utility link sequence is identifiable with one single parameter. |
| Subtype of: | UtilityNetworkElementLinkSequence |
| Stereotypes: | «featureType» |

* + - * 1. *UtilityLinkSet*

|  |  |
| --- | --- |
| **UtilityLinkSet (abstract)** | |
| Name: | utility linkset |
| Subtype of: | LinkSetUtilityNetworkElement |
| Definition: | <font color="#1a1a1a">An abstract utility network class which groups common properties of Cable, Pipe and Duct featureTypes. |
| Description: | <font color="#1a1a1a">This class also extends the LinkSet featureType, which allows Cable, Pipe and Duct classes to use either the (more complex)  LinkSequence or (more simple) Link class. |
| Stereotypes: | «featureType» |
| **Attribute: utilityDeliveryType**  Name: utility delivery type Value type: UtilityDeliveryTypeValue | |

|  |  |
| --- | --- |
| **UtilityLinkSet (abstract)** | |
| Definition: | Kind of utility delivery network e.g. transport, distribution, collection ... |
| Multiplicity: | 0..1 |
| Stereotypes: | «voidable» |
| **Attribute: warningType**  Name: warning type  Value type: WarningTypeValue  Definition: Kind of overground visible warning mechanism used to indicate an underground utility network element.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Constraint: All utility link objects have inspireId**  Natural All utility link objects have an external object identifier. language:  OCL: inv:inspireId->notEmpty() | |

* + - * 1. *UtilityNetwork*

|  |  |
| --- | --- |
| **UtilityNetwork** | |
| Name: | utility network |
| Subtype of: | Network |
| Definition: | Collection of network elements that belong to a single type of utility network. |
| Description: | In the real world, objects are connected to each other: an optical cable is connected to a multiplexer that in turn is connected to copper cables connecting into our homes to provide cable TV, telephony and internet access. Using GIS to support network utility management typically involves many types of features that may have connectivity to each other. Topology in GIS is generally defined as the spatial relationship between connecting or adjacent features, and is an essential prerequisite for many spatial operations such as network analysis. Utility networks can be described as NaN (Node-Arc-Node) network using two basic geometric types: points (aka *nodes*) and polylines (aka *arcs*). NaN topologies can be directed or un-directed, depending on specific type of network (i.e. water networks are directed, while telecommunications networks are not). Such topology structure provides an automated way to handle digitising and editing errors, and enable advanced spatial analyses such as adjacency, connectivity and containment. Infrastructure networks rely on Generic network model developed during Annex I.  Note:  Via the attribute "utilityNetworkType", that uses the "UtilityNetworkTypeValue" codelist, the type of utility network can be defined. E.g. by selecting the "sewer" value, the utility network becomes a "sewer utility network". Using the "crossTheme" value, a utility network can be created that contains e.g. ducts, which can contain pipes and cables from various utility network types. |
| Stereotypes: | «featureType» |
| **Attribute: utilityNetworkType**  Name: utility network type Value type: UtilityNetworkTypeValue  Definition: The type of utility network or the utilily network theme.  Description: Uses the codelist "UtilityNetworkTypeValue" to describe the possible utility networks. This also contains the "crossTheme" value to be used for utility networks that can contain cables or pipes from various themes, typically used by utility network providers that provide ducts.  Multiplicity: 1 | |

|  |  |
| --- | --- |
| **UtilityNetwork** | |
| **Attribute: authorit**  Name: | **yRole**  authority role |
| Value type: | RelatedParty |
| Definition: | Parties authorized to manage a utility network, such as maintainers, operators or owners. |
| Multiplicity: | 1..\* |
| **Attribute: utilityFacilityReference**  Name: utility facility reference Value type: ActivityComplex  Definition: Reference to a facility activity complex that is linked to (e.g. part of) this utility network.  Description: This reference can be used to link utility facilities - having a more complex geometry - to a utility network.  Multiplicity: 0..\* Stereotypes: «voidable» | |
| **Attribute: disclaimer**  Name: disclaimer Value type: PT\_FreeText  Definition: Legal text describing confidentiality clauses applying to the utility network information.  Multiplicity: 0..\* Stereotypes: «voidable» | |
| **Association role: networks**  Name: networks Value type: UtilityNetwork  Definition: A single sub-network that can be considered as part of a higher-order utility network.  Multiplicity: 0..\* Stereotypes: «voidable» | |
| **Constraint: "telecommunications" value of "utilityNetworkType" is not in IR**  Natural The multiplicity of "telecommunications" shall be 0 language:  OCL: inv: telecommunications->size()=0 | |
| **Constraint: All utility network objects have inspireId**  Natural All utility network objects have an external object identifier. language:  OCL: inv:inspireId->notEmpty() | |

* + - * 1. *UtilityNetworkElement*

|  |  |
| --- | --- |
| **UtilityNetworkElement (abstract)** | |
| Name: | utility network element |
| Definition: | Abstract base type representing an utility network element in an utility network.  Every element in an utility network provides some function that is of interest in the utility network. |
| Description: | NOTE Derived 'views' of real-world utility objects are represented through  specialisations in other application schemas; all representations of the same real-world object share a common geographic name. |
| Stereotypes: | «featureType» |

|  |  |
| --- | --- |
| **UtilityNetworkElement (abstract)** | |
| **Attribute: currentS**  Name: | **tatus**  current status |
| Value type: | ConditionOfFacilityValue |
| Definition: | The status of an utility object with regards to its completion and use. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |
| **Attribute: validFrom**  Name: valid from  Value type: DateTime  Definition: The time when the utility network element started to exist in the real world. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: validTo**  Name: valid to  Value type: DateTime  Definition: The time from which the utility network element no longer exists in the real world. Multiplicity: 0..1  Stereotypes: «voidable» | |
| **Attribute: verticalPosition**  Name: vertical position Value type: VerticalPositionValue  Definition: Vertical position of the utility object relative to ground. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: utilityFacilityReference**  Name: utility facility reference Value type: ActivityComplex  Definition: Reference to a facility activity complex that is linked (related) to this utility network element.  Description: This reference can be used to link a utility facility - having a more complex geometry - to a utility network element.  Multiplicity: 0..1 Stereotypes: «voidable» | |
| **Attribute: governmentalServiceReference**  Name: governmental service reference Value type: GovernmentalService  Definition: Reference to a governmental service object that is linked (related) to this utility network element.  Description: This reference can be used to link a governmental service object to a utility network element.  Multiplicity: 0..1 Stereotypes: «voidable» | |

* + - * 1. *UtilityNode*

|  |  |
| --- | --- |
| **UtilityNode (abstract)** | |
| Name: | utility node |
| Subtype of: | NodeUtilityNetworkElement |

|  |  |
| --- | --- |
| **UtilityNode (abstract)** | |
| Definition: | A point spatial object which is used for connectivity. |
| Description: | Nodes are found at both ends of the UtilityLink. |
| Stereotypes: | «featureType» |
| **Constraint: All utility node objects have inspireId**  Natural All utility node objects have an external object identifier. language:  OCL: inv:inspireId->notEmpty() | |

* + - * 1. *UtilityNodeContainer*

|  |  |
| --- | --- |
| **UtilityNodeContainer (abstract)** | |
| Name: | utility node container |
| Subtype of: | UtilityNetworkElement |
| Definition: | A point spatial object which is used for connectivity, and also may contain other spatial objects (not neccessarily belonging to the same utility network). |
| Description: | Nodes are found at either end of the UtilityLink. |
| Stereotypes: | «featureType» |
| **Attribute: geometry**  Name: geometry  Value type: GM\_Point  Definition: Location of the utility node container. Multiplicity: 1 | |
| **Attribute: inspireId**  Value type: Identifier  Definition: External object identifier of the spatial object. Multiplicity: 0..1 | |
| **Association role: nodes**  Name: nodes  Value type: UtilityNode  Definition: Contained utility nodes. Multiplicity: 0..\*  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *AppurtenanceTypeValue*

|  |  |
| --- | --- |
| **AppurtenanceTypeValue** | |
| Name: | appurtenance type |
| Definition: | Classification of appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/AppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values of the following code lists and additional values at any level defined by data providers:   * ElectricityAppurtenanceTypeValue (INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6]) * OilGasChemicalsAppurtenanceTypeValue (INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6]) * SewerAppurtenanceTypeValue (INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6]) |

|  |
| --- |
| **AppurtenanceTypeValue** |
| * ThermalAppurtenanceTypeValue (INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6]) * WaterAppurtenanceTypeValue (INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6]) |

* + - * 1. *SpecificAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **SpecificAppurtenanceTypeValue** | |
| Name: | specific appurtenance type |
| Definition: | Domain-specific classification of appurtenances. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SpecificAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. |

* + - * 1. *UtilityDeliveryTypeValue*

|  |  |
| --- | --- |
| **UtilityDeliveryTypeValue** | |
| Name: | utility delivery type |
| Definition: | Classification of utility delivery types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/UtilityDeliveryTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark70)  and additional values at any level defined by data providers. |

* + - * 1. *UtilityNetworkTypeValue*

|  |  |
| --- | --- |
| **UtilityNetworkTypeValue** | |
| Name: | utility network type |
| Definition: | Classification of utility network types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/UtilityNetworkTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark71)  and additional values at any level defined by data providers. |

* + - * 1. *WarningTypeValue*

|  |  |
| --- | --- |
| **WarningTypeValue** | |
| Name: | warning type |
| Definition: | Classification of warning types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WarningTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark72)  and additional values at any level defined by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *ActivityComplex*

|  |  |
| --- | --- |
| **ActivityComplex** | |
| Package: | Activity Complex |
| Reference: | INSPIRE Data Specifications – Base Models – Activity Complex, version 1.0 [DS-D2.10.3] |

|  |  |
| --- | --- |
| **ActivityComplex** | |
| Definition: | A "single unit", both technically and economically, under the management control of the same legal entity (operator), covering activities as those listed in the Eurostat NACE classification, products and services. Activity Complex includes all infrastructure, equipment and materials. It must represent the whole area, at  the same or different geographical location, managed by a "single unit". |
| Description: | NOTE 1 This class describes the minimal set of elements necessary to describe and identify geographically a legal entity and the activities taken place on it under the context of a Environmental purposes.  NOTE 2 "Activity Complex" could be assimilated to terms described on the legislation as Facility, Establishment, Plant, Holding, Organization ,Farm, Extractive Industries or Aquaculture Production Business among others  EXAMPLE i.e. an Agro-business that is legally registered under the Emissions Directive. |

* + - * 1. *ConditionOfFacilityValue*

|  |  |
| --- | --- |
| **ConditionOfFacilityValue** | |
| Package: | Base Types |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | The status of a facility with regards to its completion and use. |

* + - * 1. *DateTime*

|  |  |
| --- | --- |
| **DateTime** | |
| Package: | Date and Time |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *ElectricityAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **ElectricityAppurtenanceTypeValue** | |
| Package: | Electricity Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Classification of electricity appurtenances. |

* + - * 1. *GM\_Point*

|  |  |
| --- | --- |
| **GM\_Point** | |
| Package: | Geometric primitive |
| Reference: | Geographic information -- Spatial schema [ISO 19107:2003] |

* + - * 1. *GovernmentalService*

|  |  |
| --- | --- |
| **GovernmentalService** | |
| Package: | ExtensionAdministrativeAndSocialGovernmentalServices |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Administrative and social governmental services such as public administrations, civil protection sites, schools and hospitals provided by Public Administrative Bodies or by private institutions as far as they are covered by the scope of the  INSPIRE directive. This scope is mapped to the values of the corresponding code list serviceType Value. |
| Description: | The accordant sites are commonly presented in governmental and municipal portals and map systems as "point of interest"-data, and may be point-based locations of a variety of categories of municipal and governmental services and social infrastructure. The spatial object type itself is generic in terms of the modelling approach, that the concrete type of a GovernmentalService is determined by the value of the attribute serviceType. |

|  |
| --- |
| **Measure** |
| Package: ProductionAndIndustrialFacilitiesExtension |

* + - * 1. *Identifier*

|  |  |
| --- | --- |
| **Identifier** | |
| Package: | Base Types |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | External unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. |
| Description: | NOTE1 External object identifiers are distinct from thematic object identifiers.  NOTE 2 The voidable version identifier attribute is not part of the unique identifier of a spatial object and may be used to distinguish two versions of the same spatial object.  NOTE 3 The unique identifier will not change during the life-time of a spatial object. |

* + - * 1. *Length*

|  |  |
| --- | --- |
| **Length** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *Link*

|  |  |
| --- | --- |
| **Link (abstract)** | |
| Package: | Network |
| Reference: | INSPIRE Data Specifications – Base Models – Generic Network Model, version 1.0 [DS-D2.10.1] |
| Definition: | Curvilinear network element that connects two positions and represents a homogeneous path in the network. The connected positions may be represented as nodes. |

* + - * 1. *LinkSequence*

|  |  |
| --- | --- |
| **LinkSequence (abstract)** | |
| Package: | Network |
| Reference: | INSPIRE Data Specifications – Base Models – Generic Network Model, version 1.0 [DS-D2.10.1] |
| Definition: | A network element which represents a continuous path in the network without any branches. The element has a defined beginning and end and every position on the link sequence is identifiable with one single parameter such as length. |
| Description: | EXAMPLE A link sequence may represent a route. |

* + - * 1. *LinkSet*

|  |  |
| --- | --- |
| **LinkSet (abstract)** | |
| Package: | Network |
| Reference: | INSPIRE Data Specifications – Base Models – Generic Network Model, version 1.0 [DS-D2.10.1] |
| Definition: | A collection of link sequences and/or individual links that has a specific function or significance in a network. |
| Description: | NOTE This spatial object type supports the aggregation of links to form objects with branches, loops, parallel sequences of links, gaps, etc.  EXAMPLE A dual carriageway road, as a collection of the two link sequences that represent each carriageway. |

|  |  |
| --- | --- |
| **ThermalAppurtenanceTypeValue** | |
| Package: | Thermal Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Classification of thermal appurtenances. |

|  |  |
| --- | --- |
| **Measure** | |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *Network*

|  |  |
| --- | --- |
| **Network** | |
| Package: | Assessment Methods |
| Reference: | INSPIRE Data specification on Area Management Restriction Regulation Zones and Reporting units [DS-D2.8.III.11] |

* + - * 1. *Node*

|  |  |
| --- | --- |
| **Node (abstract)** | |
| Package: | Network |
| Reference: | INSPIRE Data Specifications – Base Models – Generic Network Model, version 1.0 [DS-D2.10.1] |
| Definition: | Represents a significant position in the network that always occurs at the beginning or the end of a link. |
| Description: | NOTE if a topological representation of the network is used the road node is either a topological connection between two or more links or the termination of a ink. If a geometric representation of the network is used road nodes are represented by points or alternatively another geometric shape. [EuroRoadS] |

* + - * 1. *OilGasChemicalsAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **OilGasChemicalsAppurtenanceTypeValue** | |
| Package: | Oil-Gas-Chemicals Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Classification of oil, gas, chemicals appurtenances. |

* + - * 1. *PT\_FreeText*

|  |  |
| --- | --- |
| **PT\_FreeText** | |
| Package: | Cultural and linguistic adapdability |
| Reference: | Geographic information -- Metadata -- XML schema implementation [ISO/TS 19139:2007] |

* + - * 1. *RelatedParty*

|  |  |
| --- | --- |
| **RelatedParty** | |
| Package: | Base Types 2 |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | An organisation or a person with a role related to a resource. |
| Description: | NOTE 1 A party, typically an individual person, acting as a general point of contact for a resource can be specified without providing any particular role. |

* + - * 1. *SewerAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **SewerAppurtenanceTypeValue** | |
| Package: | Sewer Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Classification of sewer appurtenances. |

* + - * 1. *VerticalPositionValue*

|  |  |
| --- | --- |
| **VerticalPositionValue** | |
| Package: | Base Types |
| Reference: | INSPIRE Generic Conceptual Model, version 3.4 [DS-D2.5] |
| Definition: | The relative vertical position of a spatial object. |

* + - * 1. *WaterAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **WaterAppurtenanceTypeValue** | |
| Package: | Water Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Classification of water appurtenances. |

#### 5.7.3 Externally governed code lists

There are not externally governed code list in this application schema.

* 1. **“Electricity Network” application schema**

#### Description

* + - 1. **Narrative Description**

Electricity Network application schema is structured containing:

* One concrete link object extending from an abstract Cable or Pipe featureType (shown in red color);
* One Appurtenance node object (green color) ;
* One UtilityNetwork object (green color);
* All codelists used by the featureType properties of this diagram (grey color):
  + Those used by the abstract UtilityLinkSet featureType properties;
  + Those used by the concrete cable or pipe and appurtenance featureType properties of the specific utility network;
  + Those used by the ―appurtenanceType‖ property of the Appurtenance object;
  + The ―UtilityNetworkTypeValue‖ used by the ―utilityNetworkType‖ property of the UtilityNetwork object..
    - 1. **UML Overview**

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements:: UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::WarningTypeValue** |
| + net  + tape  + concretePaving |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/WarningTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 12 – UML class diagram: Overview of the “Electricity Networks”**

**class Electricity Network**

+ geographicalName :GeographicalName [0..\*]

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

+networks

«voidable» 0..\*

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

+ operatingVoltage :Measure

+ nominalVoltage :Measure

**tags**

asDictionary = true extensibility = any vocabulary =

<http://inspire.ec.europa.eu/codeList/ElectricityAppurtenanceTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ capacitorControl

+ connectionBox

+ correctingEquipment

+ deliveryPoint

+ dynamicProtectiveDevice

+ fuse

+ generator

+ loadTapChanger

+ mainStation

+ netStation

+ networkProtector

+ openPoint

+ primaryMeter

+ recloserElectronicControl

+ recloserHydraulicControl

+ regulatorControl

+ relayControl

+ sectionalizerElectronicControl

+ sectionalizerHydraulicControl

+ streetLight

+ subStation

+ switch

+ transformer

+ voltageRegulator

+ detectionEquipment

+ pointSettingMachine

+ monitoringAndControlEquipment

+ anode

«codeList»

**ElectricityAppurtenanceTypeValue**

«codeList»

**Common Utility Network Elements:: AppurtenanceTypeValue**

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

«featureType»

**Common Utility Network Elements::UtilityNetwork**

«featureType»

**Network::Network**

«featureType»

**ElectricityCable**

«featureType»

***Common Utility Network Elements::Cable***

*Link Set UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityLinkSet***

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

«featureType»

**Common Utility Network Elements::Appurtenance**

*Node UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityNode***

«voidable»

«voidable»

«voidable»

«voidable»

«voidable»

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Electricity Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*ElectricityAppurtenanceTypeValue*](#_bookmark78) | Electricity Network | «codeList» |
| [*ElectricityCable*](#_bookmark77) | Electricity Network | «featureType» |

* + - 1. **Spatial object types**

*5.8.2.1.1. ElectricityCable*

|  |  |
| --- | --- |
| **ElectricityCable** | |
| Name: | electricity cable |
| Subtype of: | Cable |
| Definition: | A utility link or link sequence used to convey electricity from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: operatingVoltage**  Name: operating voltage  Value type: Measure  Definition: The utilization or operating voltage by the equipment using the electricity. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: nominalVoltage**  Name: nominal voltage  Value type: Measure  Definition: The nominal system voltage at the point of supply. Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**

*5.8.2.2.1. ElectricityAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **ElectricityAppurtenanceTypeValue** | |
| Name: | electricity appurtenance type |
| Definition: | Classification of electricity appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ElectricityAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark78)  and additional values at any level defined by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Cable*

|  |  |
| --- | --- |
| **Cable (abstract)** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence used to convey electricity or data from one location to another. |

* + - * 1. *Measure*

|  |  |
| --- | --- |
| **Measure** | |
| Package: | ProductionAndIndustrialFacilitiesExtension |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

#### 5.8.3 Externally governed code lists

There are not externally governed code list in this application schema.

* 1. **“Oil-Gas-Chemicals Network” application schema**

#### Description

* + - 1. **Narrative Description**

Oil-Gas-Chemicals Network application schema is structured containing:

* One concrete link object extending from an abstract Cable or Pipe featureType (shown in red color);
* One Appurtenance node object (green color) ;
* One UtilityNetwork object (green color);
* All codelists used by the featureType properties of this diagram (grey color):
  + Those used by the abstract UtilityLinkSet featureType properties;
  + Those used by the concrete cable or pipe and appurtenance featureType properties of the specific utility network;
  + Those used by the ―appurtenanceType‖ property of the Appurtenance object;
  + The ―UtilityNetworkTypeValue‖ used by the ―utilityNetworkType‖ property of the UtilityNetwork object..
    - 1. **UML Overview**

|  |  |
| --- | --- |
| «codeList»  **OilGasChemicalsProductTypeValue** | |
| + | liquefiedNaturalGas |
| + | methane |
| + | naturalGas |
| + | naturalGasAndTetrahydrothiophene |
| + | nitrogenGas |
| + | residualGas |
| + | accetone |
| + | air |
| + | argon |
| + | butadiene |
| + | butadiene1,3 |
| + | butane |
| + | c3 |
| + | carbonMonoxide |
| + | chlorine |
| + | compressedAir |
| + | crude |
| + | dichloroethane |
| + | diesel |
| + | ethylene |
| + | gasFabricationOfCocs |
| + | gasHFx |
| + | gasoil |
| + | hydrogen |
| + | isobutane |
| + | JET-A1 |
| + | kerosene |
| + | liquidAmmonia |
| + | liquidHydrocarbon |
| + | multiProduct |
| + | MVC |
| + | nitrogen |
| + | oxygen |
| + | phenol |
| + | propane |
| + | propyleen |
| + | propylene |
| + | raffinate |
| + | refineryProducts |
| + | saltWater |
| + | saumur |
| + | tetrachloroethane |
| + | unknown |
| + | empty |
| **tags** | |
| asDictionary = true | |
| extensibility = any | |
| vocabulary = | |
| <http://inspire.ec.europa.eu/codeList/OilGasChemicalsProductTypeValue> | |
| xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions | |

|  |
| --- |
| «codeList»  **OilGasChemicalsAppurtenanceTypeValue** |
| + pump  + gasStation  + node  + compression  + terminal  + deliveryPoint  + frontier  + marker  + beacon |
| **tags**  asDictionary = true extensibility = any vocabulary =  <http://inspire.ec.europa.eu/codeList/OilGasChemicalsAppurtenanceTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements:: UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |

**Figure 13 – UML class diagram: Overview of the “Oil-Gas-Chemicals Networks**



**class Oil-Gas-Chemicals Network**

*Link Set UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityLinkSet***

«voidable»

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

*Node UtilityNetwork Element*

«featureType»

***Common Utility Network Elements:: UtilityNode***

«featureType»

**Common Utility Network Elements::Pipe**

«voidable» +pipes

«featureType»

**Common Utility Network Elements::Appurtenance**

+ pipeDiameter :Measure

+ pressure :Measure [0..1]

«voidable» 0..\*

«voidable»

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

+networks

«voidable» 0..\*

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

«featureType»

**OilGasChemicalsPipe**

«voidable»

+ oilGasChemicalsProductType :OilGasChemicalsProductTypeValue [1..\*]

«codeList»

**Common Utility Network Elements:: AppurtenanceTypeValue**

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

«voidable»

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

«featureType»

**Common Utility Network Elements::UtilityNetwork**

+ geographicalName :GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any vocabulary =  <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::WarningTypeValue** |
| + net  + tape  + concretePaving |
| **tags**  asDictionary = true extensibility = any vocabulary =  <http://inspire.ec.europa.eu/codeList/WarningTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

* + 1. **Feature catalogue**

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Oil-Gas-Chemicals Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*OilGasChemicalsAppurtenanceTypeValue*](#_bookmark83) | Oil-Gas-Chemicals Network | «codelist» |
| [*OilGasChemicalsPipe*](#_bookmark82) | Oil-Gas-Chemicals Network | «featureType» |
| [*OilGasChemicalsProductTypeValue*](#_bookmark84) | Oil-Gas-Chemicals Network | «codelist» |

* + - 1. **Spatial object types**

*5.9.2.1.1. OilGasChemicalsPipe*

|  |  |
| --- | --- |
| **OilGasChemicalsPipe** | |
| Name: | oil, gas and chemicals pipe |
| Subtype of: | Pipe |
| Definition: | A pipe used to convey oil, gas or chemicals from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: oilGasChemicalsProductType**  Name: oil, gas and chemicals product type Value type: OilGasChemicalsProductTypeValue  Definition: The type of oil, gas or chemicals product that is conveyed through the oil, gas, chemicals pipe.  Multiplicity: 1..\* Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *OilGasChemicalsAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **OilGasChemicalsAppurtenanceTypeValue** | |
| Name: | oil, gas and chemicals appurtenance type |
| Definition: | Classification of oil, gas, chemicals appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/OilGasChemicalsAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark83) and additional values at any level defined by data providers. |

* + - * 1. *OilGasChemicalsProductTypeValue*

|  |  |
| --- | --- |
| **OilGasChemicalsProductTypeValue** | |
| Name: | oil, gas and chemicals product type |
| Definition: | Classification of oil, gas and chemicals products. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/OilGasChemicalsProductTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark84) and additional values at any level defined by data providers. [*Annex C*](#_bookmark84)includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

*5.9.2.3.1. Pipe*

|  |  |
| --- | --- |
| **Pipe** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |

* + 1. **Externally governed code lists**

There are not externally governed code list in this application schema.

* 1. **“Sewer Network” application schema**

#### Description

* + - 1. **Narrative Description**

Sewer Network application schema is structured containing:

* One concrete link object extending from an abstract Cable or Pipe featureType (shown in red color);
* One Appurtenance node object (green color) ;
* One UtilityNetwork object (green color);
* All codelists used by the featureType properties of this diagram (grey color):
  + Those used by the abstract UtilityLinkSet featureType properties;
  + Those used by the concrete cable or pipe and appurtenance featureType properties of the specific utility network;
  + Those used by the ―appurtenanceType‖ property of the Appurtenance object;
  + The ―UtilityNetworkTypeValue‖ used by the ―utilityNetworkType‖ property of the UtilityNetwork object..
    - 1. **UML Overview**

|  |
| --- |
| «codeList»  **SewerWaterTypeValue** |
| + combined  + reclaimed  + sanitary  + storm |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/SewerWaterTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements::**  **UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::WarningTypeValue** |
| + net  + tape  + concretePaving |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/WarningTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 14 – UML class diagram: Overview of the “Sewer Networks”**

**class Sewer Network**

*Link Set UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityLinkSet***

«voidable»

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

«featureType»

**Common Utility Network Elements::Pipe** +pipes

«voidable»

«voidable» 0..\*

+ pipeDiameter :Measure

+ pressure :Measure [0..1]

+networks

«voidable» 0..\*

«featureType»

**SewerPipe**

«voidable»

+ sewerWaterType :SewerWaterTypeValue

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/SewerAppurtenanceTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ anode

+ barrel

+ barScreen

+ catchBasin

+ cleanOut

+ dischargeStructure

+ meter

+ pump

+ regulator

+ scadaSensor

+ thrustProtection

+ tideGate

+ other

+ node

+ connection

+ specificStructure

+ mechanicAndElectromechanicEquipment

+ rainwaterCollector

+ watertankOrChamber

«codeList»

**SewerAppurtenanceTypeValue**

«codeList»

**Common Utility Network Elements:: AppurtenanceTypeValue**

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

«voidable»

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

«featureType»

**Common Utility Network Elements::UtilityNetwork**

+ geographicalName :GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

«voidable»

«featureType»

**Common Utility Network Elements::Appurtenance**

*Node UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityNode***

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Sewer Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*SewerAppurtenanceTypeValue*](#_bookmark90) | Sewer Network | «codeList» |
| [*SewerPipe*](#_bookmark89) | Sewer Network | «featureType» |
| [*SewerWaterTypeValue*](#_bookmark91) | Sewer Network | «codeList» |

* + - 1. **Spatial object types**

*5.10.2.1.1. SewerPipe*

**SewerPipe**

|  |  |
| --- | --- |
| **SewerPipe** | |
| Name: | sewer pipe |
| Subtype of: | Pipe |
| Definition: | A sewer pipe used to convey wastewater (sewer) from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: sewerWaterType**  Name: sewer water type Value type: SewerWaterTypeValue Definition: Type of sewer water.  Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *SewerAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **SewerAppurtenanceTypeValue** | |
| Name: | sewer appurtenance type |
| Definition: | Classification of sewer appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SewerAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark90)  and additional values at any level defined by data providers. |

* + - * 1. *SewerWaterTypeValue*

|  |  |
| --- | --- |
| **SewerWaterTypeValue** | |
| Name: | sewer water type |
| Definition: | Classification of sewer water types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SewerWaterTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark91)  and additional values at any level defined by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

*5.10.2.3.1. Pipe*

|  |  |
| --- | --- |
| **Pipe** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |

#### Externally governed code lists

There are not externally governed code list in this application schema.

.

* 1. **“Thermal Network” application schema**

#### Description

* + - 1. **Narrative Description**

Thermal Network application schema is structured containing:

* One concrete link object extending from an abstract Cable or Pipe featureType (shown in red color);
* One Appurtenance node object (green color) ;
* One UtilityNetwork object (green color);
* All codelists used by the featureType properties of this diagram (grey color):
  + Those used by the abstract UtilityLinkSet featureType properties;
  + Those used by the concrete cable or pipe and appurtenance featureType properties of the specific utility network;
  + Those used by the ―appurtenanceType‖ property of the Appurtenance object;
  + The ―UtilityNetworkTypeValue‖ used by the ―utilityNetworkType‖ property of the UtilityNetwork object..
    - 1. **UML Overview**

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |  |  |
| --- | --- | --- | --- |
|  | «codeList»  **Common Utility Network Elements:: AppurtenanceTypeValue** | |  |
|  | |
|  | |  | |
| «codeList»  **ThermalAppurtenanceTypeValue** | | | |
|  | | | |
| **tags**  asDictionary = true extensibility = any vocabulary =  <http://inspire.ec.europa.eu/codeList/ThermalAppurtenanceTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions | | | |

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements::**  **UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::WarningTypeValue** |
| + net  + tape  + concretePaving |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/WarningTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 15 – UML class diagram: Overview of the “Thermal Networks”**



**class Thermal Network**

+networks

«voidable» 0..\*

+pipes

«voidable» 0..\*

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

«voidable»

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

«featureType»

**Common Utility Network Elements::UtilityNetwork**

+ geographicalName :GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

«voidable»

«featureType»

**Common Utility Network Elements::Appurtenance**

*Node UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityNode***

+ thermalProductType :ThermalProductTypeValue

«voidable»

«featureType»

**ThermalPipe**

+ pipeDiameter :Measure

+ pressure :Measure [0..1]

«voidable»

«featureType»

**Common Utility Network Elements::Pipe**

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

«voidable»

*Link Set UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityLinkSet***

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Thermal Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*ThermalAppurtenanceTypeValue*](#_bookmark97) | Thermal Network | «codeList» |
| [*ThermalPipe*](#_bookmark96) | Thermal Network | «featureType» |

* + - 1. **Spatial object types**

*5.11.2.1.1. ThermalPipe*

|  |  |
| --- | --- |
| **ThermalPipe** | |
| Name: | thermal pipe |
| Subtype of: | Pipe |
| Definition: | A pipe used to disseminate heating or cooling from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: thermalProductType** | |

|  |  |
| --- | --- |
| **ThermalPipe** | |
| Name: | thermal product type |
| Value type: | ThermalProductTypeValue |
| Definition: | The type of thermal product that is conveyed through the thermal pipe. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |

* + - 1. **Code lists**

*5.11.2.2.1. ThermalAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **ThermalAppurtenanceTypeValue** | |
| Name: | thermal appurtenance type |
| Definition: | Classification of thermal appurtenances. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codeList/ThermalAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Pipe*

|  |  |
| --- | --- |
| **Pipe** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |

* + - * 1. *ThermalProductTypeValue*

|  |
| --- |
| **ThermalProductTypeValue** |
| Package: NOT FOUND ThermalProductTypeValue |

#### 5.11.3 Externally governed code lists

There are not externally governed code list in this application schema.

* 1. **“Water Network” application schema**

#### Description

* + - 1. **Narrative Description**

Water Network application schema is structured containing:

* One concrete link object extending from an abstract Cable or Pipe featureType (shown in red color);
* One Appurtenance node object (green color) ;
* One UtilityNetwork object (green color);
* All codelists used by the featureType properties of this diagram (grey color):
  + Those used by the abstract UtilityLinkSet featureType properties;
  + Those used by the concrete cable or pipe and appurtenance featureType properties of the specific utility network;
  + Those used by the ―appurtenanceType‖ property of the Appurtenance object;
  + The ―UtilityNetworkTypeValue‖ used by the ―utilityNetworkType‖ property of the UtilityNetwork object..
    - 1. **UML Overview**

|  |
| --- |
| «codeList»  **WaterTypeValue** |
| + potable  + raw  + salt  + treated |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/WaterTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements:: UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/UtilityDeliveryTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::WarningTypeValue** |
| + net  + tape  + concretePaving |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/WarningTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 16 – UML class diagram: Overview of the “Water Networks”**



**class Water Network**

+pipes

«voidable» 0..\*

+networks

«voidable» 0..\*

+ appurtenanceType :AppurtenanceTypeValue

+ specificAppurtenanceType :SpecificAppurtenanceTypeValue [0..1]

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/WaterAppurtenanceTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ anode

+ clearWell

+ controlValve

+ fitting

+ hydrant

+ junction

+ lateralPoint

+ meter

+ pump

+ pumpStation

+ samplingStation

+ scadaSensor

+ storageBasin

+ storageFacility

+ surgeReliefTank

+ systemValve

+ thrustProtection

+ treatmentPlant

+ well

+ pressureRelieveValve

+ airRelieveValve

+ checkValve

+ waterExhaustPoint

+ waterServicePoint

+ fountain

+ pressureController

+ vent

+ recoilCheckValve

+ waterDischargePoint

«codeList»

**WaterAppurtenanceTypeValue**

«codeList»

**Common Utility Network Elements:: AppurtenanceTypeValue**

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

«featureType»

**Common Utility Network Elements::Appurtenance**

*Node UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityNode***

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

+ utilityFacilityReference :ActivityComplex [0..\*]

+ disclaimer :PT\_FreeText [0..\*]

«voidable»

+ utilityNetworkType :UtilityNetworkTypeValue

+ authorityRole :RelatedParty [1..\*]

«featureType»

**Common Utility Network Elements::UtilityNetwork**

+ geographicalName :GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

+ waterType :WaterTypeValue

«voidable»

«featureType»

**WaterPipe**

+ pipeDiameter :Measure

+ pressure :Measure [0..1]

«voidable»

«featureType»

**Common Utility Network Elements::Pipe**

+ utilityDeliveryType :UtilityDeliveryTypeValue [0..1]

+ warningType :WarningTypeValue

«voidable»

*Link Set UtilityNetwork Element*

«featureType»

***Common Utility Network Elements::UtilityLinkSet***

«voidable»

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Water Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| [*WaterAppurtenanceTypeValue*](#_bookmark103) | Water Network | «codeList» |
| [*WaterPipe*](#_bookmark102) | Water Network | «featureType» |
| [*WaterTypeValue*](#_bookmark104) | Water Network | «codeList» |

* + - 1. **Spatial object types**

*5.12.2.1.1. WaterPipe*

|  |  |
| --- | --- |
| **WaterPipe** | |
| Name: | water pipe |
| Subtype of: | Pipe |
| Definition: | A water pipe used to convey water from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: waterType**  Name: water type  Value type: WaterTypeValue Definition: Type of water.  Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *WaterAppurtenanceTypeValue*

|  |  |
| --- | --- |
| **WaterAppurtenanceTypeValue** | |
| Name: | water appurtenance type |
| Definition: | Classification of water appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WaterAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark103)  and additional values at any level defined by data providers. |

* + - * 1. *WaterTypeValue*

|  |  |
| --- | --- |
| **WaterTypeValue** | |
| Name: | water type |
| Definition: | Classification of water types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WaterTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in [*Annex C*](#_bookmark104)  and additional values at any level defined by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

*5.12.2.3.1. Pipe*

|  |  |
| --- | --- |
| **Pipe** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |

#### Externally governed code lists

There are not externally governed code list in this application schema.

# Reference systems, units of measure and grids

* 1. **Default reference systems, units of measure and grid**

The reference systems, units of measure and geographic grid systems included in this sub-section are the defaults to be used for all INSPIRE data sets, unless theme-specific exceptions and/or additional requirements are defined in section 6.2.

* + 1. **Coordinate reference systems**
       1. Datum

|  |
| --- |
| **IR Requirement**  *Annex II, Section 1.2*  **Datum for three-dimensional and two-dimensional coordinate reference systems**  For the three-dimensional and two-dimensional coordinate reference systems and the horizontal component of compound coordinate reference systems used for making spatial data sets available, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, or the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well documented relationship  between both systems, according to EN ISO 19111. |
| 6.1.1.2. Coordinate reference systems |

|  |
| --- |
| **IR Requirement**  *Annex II, Section 1.3*  **Coordinate Reference Systems**  Spatial data sets shall be made available using at least one of the coordinate reference systems specified in sections 1.3.1, 1.3.2 and 1.3.3, unless one of the conditions specified in section 1.3.4 holds.  **1.3.1. Three-dimensional Coordinate Reference Systems**   * Three-dimensional Cartesian coordinates based on a datum specified in 1.2 and using the parameters of the Geodetic Reference System 1980 (GRS80) ellipsoid. * Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.   **1.3.2. Two-dimensional Coordinate Reference Systems**  – Two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in  1.2 and using the parameters of the GRS80 ellipsoid.   * Plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system. * Plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system. * Plane coordinates using the ETRS89 Transverse Mercator coordinate reference system. |

|  |
| --- |
| **1.3.3. Compound Coordinate Reference Systems**   1. For the horizontal component of the compound coordinate reference system, one of the coordinate reference systems specified in section 1.3.2 shall be used. 2. For the vertical component, one of the following coordinate reference systems shall be used:  * For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope. Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS. * For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere, or other linear or parametric reference systems shall be used. Where other parametric reference systems are used, these shall be described in an accessible reference using EN ISO 19111-2:2012. * For the vertical component in marine areas where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as the reference surface. * For the vertical component in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 meters, the Mean Sea Level (MSL) or a well- defined reference level close to the MSL shall be used as the reference surface.   **1.3.4. Other Coordinate Reference Systems**  Exceptions, where other coordinate reference systems than those listed in 1.3.1, 1.3.2 or 1.3.3 may be used, are:   1. Other coordinate reference systems may be specified for specific spatial data themes in this Annex. 2. For regions outside of continental Europe, Member States may define suitable coordinate reference systems.   The geodetic codes and parameters needed to describe these coordinate reference systems and to allow conversion and transformation operations shall be documented and an identifier shall be  created, according to EN ISO 19111 and ISO 19127. |
| 6.1.1.3. Display |

|  |
| --- |
| **IR Requirement**  *Annex II, Section 1.4*  **Coordinate Reference Systems used in the View Network Service**  For the display of spatial data sets with the view network service as specified in Regulation No 976/2009, at least the coordinate reference systems for two-dimensional geodetic coordinates  (latitude, longitude) shall be available. |
| 6.1.1.4. Identifiers for coordinate reference systems |

|  |
| --- |
| **IR Requirement**  *Annex II, Section 1.5*  **Coordinate Reference System Identifiers**   1. Coordinate reference system parameters and identifiers shall be managed in one or several common registers for coordinate reference systems. 2. Only identifiers contained in a common register shall be used for referring to the coordinate   reference systems listed in this Section. |

|  |
| --- |
| These Technical Guidelines propose to use the http URIs provided by the Open Geospatial Consortium as coordinate reference system identifiers (see identifiers for the default CRSs below). These are based on and redirect to the definition in the EPSG Geodetic Parameter Registry ([*http://www.epsg-registry.org/*](http://www.epsg-registry.org/)). |
| **TG Requirement 2** The identifiers listed in [Table 2](#_bookmark109) shall be used for referring to the coordinate reference systems used in a data set. |
| NOTE CRS identifiers may be used e.g. in:   * data encoding, * data set and service metadata, and * requests to INSPIRE network services.   **Table 2. http URIs for the default coordinate reference systems** |

|  |  |  |
| --- | --- | --- |
| **Coordinate reference system** | **Short name** | **http URI identifier** |
| 3D Cartesian in ETRS89 | ETRS89-XYZ | [*http://www.opengis.net/def/crs/EPSG/0/4936*](http://www.opengis.net/def/crs/EPSG/0/4936) |
| 3D geodetic in ETRS89 on GRS80 | ETRS89-GRS80h | [*http://www.opengis.net/def/crs/EPSG/0/4937*](http://www.opengis.net/def/crs/EPSG/0/4937) |
| 2D geodetic in ETRS89 on GRS80 | ETRS89-GRS80 | [*http://www.opengis.net/def/crs/EPSG/0/4258*](http://www.opengis.net/def/crs/EPSG/0/4258) |
| 2D LAEA projection in ETRS89 on GRS80 | ETRS89-LAEA | [*http://www.opengis.net/def/crs/EPSG/0/3035*](http://www.opengis.net/def/crs/EPSG/0/3035) |
| 2D LCC projection in ETRS89 on GRS80 | ETRS89-LCC | [*http://www.opengis.net/def/crs/EPSG/0/3034*](http://www.opengis.net/def/crs/EPSG/0/3034) |
| 2D TM projection in ETRS89 on GRS80, zone 26N (30°W to 24°W) | ETRS89-TM26N | [*http://www.opengis.net/def/crs/EPSG/0/3038*](http://www.opengis.net/def/crs/EPSG/0/3038) |
| 2D TM projection in ETRS89 on  GRS80, zone 27N (24°W to 18°W) | ETRS89-TM27N | [*http://www.opengis.net/def/crs/EPSG/0/3039*](http://www.opengis.net/def/crs/EPSG/0/3039) |
| 2D TM projection in ETRS89 on GRS80, zone 28N (18°W to 12°W) | ETRS89-TM28N | [*http://www.opengis.net/def/crs/EPSG/0/3040*](http://www.opengis.net/def/crs/EPSG/0/3040) |
| 2D TM projection in ETRS89 on GRS80, zone 29N (12°W to 6°W) | ETRS89-TM29N | [*http://www.opengis.net/def/crs/EPSG/0/30*](http://www.opengis.net/def/crs/EPSG/0/30)*41* |
| 2D TM projection in ETRS89 on GRS80, zone 30N (6°W to 0°) | ETRS89-TM30N | [*http://www.opengis.net/def/crs/EPSG/0/3042*](http://www.opengis.net/def/crs/EPSG/0/3042) |
| 2D TM projection in ETRS89 on GRS80, zone 31N (0° to 6°E) | ETRS89-TM31N | [*http://www.opengis.net/def/crs/EPSG/0/3043*](http://www.opengis.net/def/crs/EPSG/0/3043) |
| 2D TM projection in ETRS89 on GRS80, zone 32N (6°E to 12°E) | ETRS89-TM32N | [*http://www.opengis.net/def/crs/EPSG/0/3044*](http://www.opengis.net/def/crs/EPSG/0/3044) |
| 2D TM projection in ETRS89 on GRS80, zone 33N (12°E to 18°E) | ETRS89-TM33N | [*http://www.opengis.net/def/crs/EPSG/0/3045*](http://www.opengis.net/def/crs/EPSG/0/3045) |
| 2D TM projection in ETRS89 on GRS80, zone 34N (18°E to 24°E) | ETRS89-TM34N | [*http://www.opengis.net/def/crs/EPSG/0/3046*](http://www.opengis.net/def/crs/EPSG/0/3046) |
| 2D TM projection in ETRS89 on GRS80, zone 35N (24°E to 30°E) | ETRS89-TM35N | [*http://www.opengis.net/def/crs/EPSG/0/3047*](http://www.opengis.net/def/crs/EPSG/0/3047) |
| 2D TM projection in ETRS89 on GRS80, zone 36N (30°E to 36°E) | ETRS89-TM36N | [*http://www.opengis.net/def/crs/EPSG/0/3048*](http://www.opengis.net/def/crs/EPSG/0/3048) |
| 2D TM projection in ETRS89 on GRS80, zone 37N (36°E to 42°E) | ETRS89-TM37N | [*http://www.opengis.net/def/crs/EPSG/0/3049*](http://www.opengis.net/def/crs/EPSG/0/3049) |
| 2D TM projection in ETRS89 on GRS80, zone 38N (42°E to 48°E) | ETRS89-TM38N | [*http://www.opengis.net/def/crs/EPSG/0/3050*](http://www.opengis.net/def/crs/EPSG/0/3050) |
| 2D TM projection in ETRS89 on GRS80, zone 39N (48°E to 54°E) | ETRS89-TM39N | [*http://www.opengis.net/def/crs/EPSG/0/3051*](http://www.opengis.net/def/crs/EPSG/0/3051) |
| Height in EVRS | EVRS | [*http://www.opengis.net/def/crs/EPSG/0/5730*](http://www.opengis.net/def/crs/EPSG/0/5730) |
| 3D compound: 2D geodetic in ETRS89 on GRS80, and EVRS  height | ETRS89-GRS80- EVRS | [*http://www.opengis.net/def/crs/EPSG/0/7409*](http://www.opengis.net/def/crs/EPSG/0/7409) |
|  | | |

**6.1.2 Temporal reference system**

|  |
| --- |
| **IR Requirement**  *Article 11*  **Temporal Reference Systems**  1. The default temporal reference system referred to in point 5 of part B of the Annex to Commission Regulation (EC) No 1205/2008 (20) shall be used, unless other temporal reference  systems are specified for a specific spatial data theme in Annex II. |
| NOTE 1 Point 5 of part B of the Annex to Commission Regulation (EC) No 1205/2008 (the INSPIRE Metadata IRs) states that the default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.  NOTE 2 ISO 8601 *Data elements and interchange formats – Information interchange – Representation of dates and times* is an international standard covering the exchange of date and time-related data. The purpose of this standard is to provide an unambiguous and well-defined method of representing dates and times, so as to avoid misinterpretation of numeric representations of dates and times, particularly when data is transferred between countries with different conventions for writing numeric dates and times. The standard organizes the data so the largest temporal term (the year) appears first in the data string and progresses to the smallest term (the second). It also provides for a standardized method of communicating time-based information across time zones by attaching an offset to Coordinated Universal Time (UTC).  EXAMPLE 1997 (the year 1997), 1997-07-16 (16th July 1997), 1997-07-16T19:20:30+01:00 (16th  July 1997, 19h 20‘ 30‘‘, time zone: UTC+1)  **6.1.3 Units of measure** |

|  |
| --- |
| **IR Requirement**  *Article 12*  **Other Requirements & Rules**  (…)  2. All measurement values shall be expressed using SI units or non-SI units accepted for use with the International System of Units, unless specified otherwise for a specific spatial data theme or  type. |
|  |

**6.2 Theme-specific requirements and recommendations**

There are no theme-specific requirements or recommendations on reference systems and grids.

## Data quality

This chapter includes a description of the data quality elements and sub-elements as well as the corresponding data quality measures that should be used to evaluate and document data quality for data sets related to the spatial data theme *Utility and Government Services* (section [7.1](#_bookmark114)).

20 OJ L 326, 4.12.2008, p. 12.

It may also define requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme *Utility and Government Services* (sections [7.2](#_bookmark129) and [7.3](#_bookmark130)).

In particular, the data quality elements, sub-elements and measures specified in section [7.1](#_bookmark114) should be used for

* evaluating and documenting data quality properties and constraints of spatial objects, where such properties or constraints are defined as part of the application schema(s) (see section 5);
* evaluating and documenting data quality metadata elements of spatial data sets (see section 8); and/or
* specifying requirements or recommendations about the targeted data quality results applicable for data sets related to the spatial data theme *Utility and Government Services* (see sections [7.2](#_bookmark129) and [7.3](#_bookmark130)).

The descriptions of the elements and measures are based on Annex D of ISO/DIS 19157 Geographic information – Data quality.

**7.1 Data quality elements**

[Table 3](#_bookmark115) lists all data quality elements and sub-elements that are being used in this specification. Data quality information can be evaluated at level of spatial object, spatial object type, dataset or dataset series. The level at which the evaluation is performed is given in the ―Evaluation Scope‖ column.

The measures to be used for each of the listed data quality sub-elements are defined in the following sub-sections.

**Table 3 – Data quality elements used in the spatial data theme *Utility and Government Services***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Section** | **Data quality element** | **Data quality sub-element** | **Definition** | **Evaluation Scope** |
| 7.1.1 | Completeness | Commission | excess data present in the dataset, as described by the scope | dataset series; dataset; spatial object type |
| 7.1.2 | Completeness | Omission | data absent from the dataset, as described by the scope | dataset series;  dataset; spatial object type |
| 7.1.3 | Logical consistency | Conceptual consistency | adherence to rules of the conceptual schema | dataset |
| 7.1.4 | Logical consistency | Domain consistency | adherence of values to the value domains | dataset |
| 7.1.5 | Logical consistency | Format consistency | degree to which data is stored in accordance with the physical structure of the dataset, as described by the scope | dataset |
| 7.1.6 | Logical consistency | Topological consistency | correctness of the explicitly encoded topological characteristics of the  dataset, as described by the scope | spatial object |
| 7.1.7 | Positional accuracy | Absolute or external accuracy | closeness of reported coordinate values to values accepted as or being true | spatial object |
| 7.1.8 | Positional accuracy | Relative or internal accuracy | closeness of the relative positions of features in the scope to their  respective relative positions accepted as or being true | spatial object |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7.1.9 | Thematic accuracy | Classification correctness | comparison of the classes assigned to features or their attributes to a universe of discourse | spatial object |
| 7.1.10 | Thematic accuracy | Non- quantitative attribute  correctness | correctness of non-quantitative attributes | spatial object |
| 7.1.11 | Thematic accuracy | Quantitative attribute accuracy | accuracy of quantitative attributes | spatial object |
| 7.1.12 | Temporal quality | Accuracy of a time  measurement | correctness of the temporal references of an item (reporting of  error in time measurement) | spatial object |
| 7.1.13 | Temporal quality | Temporal consistency | correctness of ordered events or sequences, if reported | spatial object |

|  |
| --- |
|  |
| **Recommendation 12** Where it is impossible to express the evaluation of a data quality element in a quantitative way, the evaluation of the element should be expressed with a textual statement as a data quality descriptive result. |
|  |

#### Completeness – Commission

|  |
| --- |
| **Recommendation 13** Commission should be evaluated and documented using Rate of excess items as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Rate of excess items** |
| Alternative name | – |
| Data quality element | Completeness |
| Data quality sub-element | Commission |
| Data quality basic measure | Error rate |
| Definition | Number of excess items in the dataset in relation to the number of items that should have been present |
| Description | No specific description for version 2.9 |
| Evaluation scope | spatial object type: all spatial object types dataset  dataset series |
| Reporting scope | spatial object type: all spatial object types dataset  dataset series |
| Parameter | – |
| Data quality value type | Real ; percentage ; ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 3 (ISO 19157) |

#### Completeness – Omission

|  |
| --- |
| **Recommendation 14** Omission should be evaluated and documented using Rate of missing items as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Rate of missing items** |
| Alternative name | – |
| Data quality element | Completeness |
| Data quality sub-element | Omission |
| Data quality basic measure | Error rate |
| Definition | Number of missing items in the dataset in relation to the number of items that should have been present |
| Description | No specific description for version 2.9 |
| Evaluation scope | spatial object type: all spatial object types dataset  dataset series |
| Reporting scope | spatial object type: all spatial object types dataset  dataset series |
| Parameter | – |
| Data quality value type | Real ; percentage ; ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 7 (ISO 19157) |

#### Logical consistency – Conceptual consistency

The Application Schema conformance class of the Abstract Test Suite in Annex I defines a number of tests to evaluate the conceptual consistency (tests A.1.1, A.1.2 and A.1.4-A.1.7) of a data set.

|  |  |
| --- | --- |
|  | |
| **Recommendation 15** For the tests on conceptual consistency, it is recommended to use the *Logical consistency – Conceptual consistency* data quality sub-element and the measure *Number of items not compliant with the rules of the conceptual schema* as specified in the table below. | |
|  | |
| **Name** |  |
| Alternative name | - |
| Data quality element | logical consistency |
| Data quality sub-element | conceptual consistency |
| Data quality basic measure | error count |
| Definition | count of all items in the dataset that are not compliant with the rules of the conceptual schema |
| Description | If the conceptual schema explicitly or implicitly describes rules, these rules shall be followed. Violations against such rules can be, for example, invalid placement of features within a defined tolerance, duplication of features and invalid overlap of features. |
| Evaluation scope | spatial object / spatial object type |
| Reporting scope | data set |
| Parameter | - |
| Data quality value type | integer |
| Data quality value structure | - |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example |  |
| Measure identifier | 10 |
|  | |

#### Logical consistency – Domain consistency

The Application Schema conformance class of the Abstract Test Suite in Annex I defines a number of tests to evaluate the domain consistency (test A.1.3) of a data set.

|  |  |
| --- | --- |
|  | |
| **Recommendation 16** For the tests on domain consistency, it is recommended to use the *Logical consistency – Domain consistency* data quality sub-element and the measure *Number of items not in conformance with their value domain* as  specified in the table below. | |
|  | |
| **Name** | **Number of items not in conformance with their value domain** |
| Alternative name | - |
| Data quality element | logical consistency |
| Data quality sub-element | domain consistency |
| Data quality basic measure | error count |
| Definition | count of all items in the dataset that are not in conformance with their value domain |
| Description |  |
| Evaluation scope | spatial object / spatial object type |
| Reporting scope | data set |
| Parameter | - |
| Data quality value type | integer |
|  | |

#### Logical Consistency – Format consistency

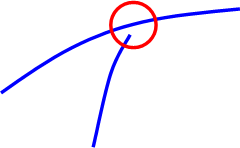
|  |
| --- |
| **Recommendation 17** Format consistency should be evaluated and documented using Physical structure conflict rate as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Physical structure conflict rate** |
| Alternative name | – |
| Data quality element | Logical consistency |
| Data quality sub-element | Format consistency |
| Data quality basic measure | Error rate |
| Definition | Number of items in the dataset that are stored in conflict with the  physical structure of the dataset divided by the total number of items |
| Description | No specific description for version 2.9 |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Real ; percentage ; ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 20 (ISO 19157) |

#### Logical Consistency – Topological consistency

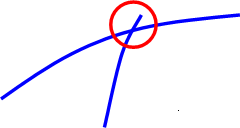
The following topological consistency quality sub-elements are required in order to ensure building a

―clean‖ and connected utility network while working with the Utility Networks Profile (or Extended Utility Networks).



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| **Recommendation 18** Topological consistency should be evaluated and documented using Number of missing connections due to undershoots, Number of missing connections due to overshoots, Number of invalid self-overlap errors as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Number of missing connections due to undershoots** |
| Alternative name | Undershoots |
| Data quality element | Logical consistency |
| Data quality sub-element | Topological consistency |
| Data quality basic measure | Error count |
| Definition | Count of items in the dataset that are mismatched due to undershoots, given the parameter *Connectivity tolerance* |
| Description | Lacks of connectivity exceeding the *Connectivity tolerance* are  considered as errors if the real features are connected in the utility network |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | Name: *Connectivity tolerance*  Definition: Search distance from the end of a dangling line. Description:  This parameter is specific for each data provider‘s dataset and must be reported as metadata in order to ensure automatic and unambiguous creation of centreline topology – connectivity - for the utility network.  Connectivity tolerance must be specified by the data provider using the following elements of the DQ\_TopologicalConsistency metadata element for the current measure:   * 102. measureDescription (type: free text):   Defined as ―*Description of the measure*‖.   * 107. Result (type DQ\_Result):   Defined as ―*Value (or set of values) obtained from applying a data quality measure or the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level*‖.  Specifically, the tolerance must be defined within the two elements:   * + 130. specification   + 131. Explanation from DQ\_Result class.   Note: Metadata elements defined in ISO 19115 |
| Data quality value type | Integer |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 1 |



|  |  |
| --- | --- |
|  | **Key**  1 Connectivity tolerance = 1:10 000 of the resolution of the dataset (cf. Metadata elements defined in ISO 19115) |
| Measure identifier | 23 (ISO 19157) |

|  |  |
| --- | --- |
| **Name** | **Number of missing connections due to overshoots** |
| Alternative name | Overshoots |
| Data quality element | Logical consistency |
| Data quality sub-element | Topological consistency |
| Data quality basic measure | Error count |
| Definition | Count of items in the dataset that are mismatched due to overshoots, given the parameter *Connectivity tolerance* |
| Description | Lacks of connectivity exceeding the *Connectivity tolerance* are considered as errors if the real features are connected in the utility network |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | Name: *Connectivity tolerance*  Definition: Search distance from the end of a dangling line. Description:  This parameter is specific for each data provider‘s dataset and must be reported as metadata in order to ensure automatic and unambiguous creation of centreline topology – connectivity - for the utility network.  Connectivity tolerance must be specified by the data provider using the following elements of the DQ\_TopologicalConsistency metadata element for the current measure:   * 102. measureDescription (type: free text):   Defined as ―*Description of the measure*‖.   * 107. Result (type DQ\_Result):   Defined as ―*Value (or set of values) obtained from applying a data quality measure or the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level*‖.  Specifically, the tolerance must be defined within the two elements:   * + 130. specification   + 131. Explanation from DQ\_Result class.   Note: Metadata elements defined in ISO 19115 |
| Data quality value type | Integer |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 1  **Key**  1 Connectivity tolerance = 1:10 000 of the resolution of the dataset (cf. Metadata elements defined in ISO 19115) |

|  |  |
| --- | --- |
| Measure identifier | 24 (ISO 19157) |

|  |  |
| --- | --- |
| **Name** | **Number of invalid self-overlap errors** |
| Alternative name | Kickbacks |
| Data quality element | Logical consistency |
| Data quality sub-element | Topological consistency |
| Data quality basic measure | Error count |
| Definition | Count of all items in the data that illegally self overlap |
| Description | No specific description for version 2.9 |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Integer |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | **Key**  a vertices |
| Measure identifier | 27 (ISO 19157) |

#### Positional accuracy – Absolute or external accuracy

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| --- |
| **Recommendation 19** Absolute or external accuracy should be evaluated and documented using Mean value of positional uncertainties, Rate of positional errors above a given threshold as specified in the tables below. |

The ―mean value of positional uncertainties‖ sub-element shows the closeness of reported coordinate values to values accepted as or being true. **It is used for the features of the Utility networks sub- theme only.**

|  |  |
| --- | --- |
| **Name** | **Mean value of positional uncertainties** |
| Alternative name | Mean value of positional uncertainties (1D, 2D and 3D) |
| Data quality element | Positional accuracy |
| Data quality sub-element | Absolute or external accuracy |
| Data quality basic measure | Not applicable |
| Definition | Mean value of the positional uncertainties for a set of positions where the positional uncertainties are defined as the distance between a measured position and what is considered as the  corresponding true position |
| Description | For a number of points (*N*), the measured positions are given as *xmi*, *ymi* and *zmi* coordinates depending on the dimension in which the position of the point is measured. A corresponding set of coordinates, *xti*, *yti* and *zti*, are considered to represent the true positions. The errors are calculated as  1D: *ei*=|*xmi*−*xti*|  2D: *ei*=[(*xmi*−*xti*)2+(*ymi*−*yti*)2]  3D: *ei*=[(*xmi*−*xti*)2+(*ymi*−*yti*)2+(*zmi*−*zti*)2]  The mean positional uncertainties of the horizontal absolute or |

|  |  |
| --- | --- |
|  | external  positions are then calculated as    A criterion for the establishing of correspondence should also be stated (e.g. allowing for correspondence to the closest position, correspondence on vertices or along lines). The criterion/criteria for finding the corresponding points shall be reported with the data quality evaluation result.  This data quality measure is different from the standard deviation. |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 28 (ISO 19157) |

The ―mean value of positional uncertainties‖ sub-element shows the closeness of reported coordinate values to values accepted as or being true. **It is used for the features of the Governmental services and Waste management sub-themes only.**

|  |  |
| --- | --- |
| **Name** | **Rate of positional errors above a given threshold** |
| Alternative name | – |
| Data quality element | Positional accuracy |
| Data quality sub-element | Absolute or external accuracy |
| Data quality basic measure | Not applicable |
| Definition | Number of positional uncertainties above a given threshold for a set of positions in relation to the total number of measured positions.  The errors are defined as the distance between a measured position and what is considered as the corresponding true position. |
| Description | For a number of points (*N*), the measured positions are given as *xmi*, *ymi* and *zmi* coordinates depending on the dimension in which the position of the point is measured. A corresponding set of coordinates, *xti*, *yti* and *zti*, are considered to represent the true positions. The calculation of *ei* is given by the data quality measure  ―mean value of positional uncertainties‖ in one, two and three dimensions.  All positional uncertainties above a defined threshold *e*max (*ei*>*e*max) are then counted as error. The number of errors is set in relation to the total number of measured points.  A criterion for the establishing of correspondence should also be stated (e.g. allowing for correspondence to the closest position, correspondence on vertices or along lines). The criterion/criteria for finding the corresponding points shall be reported with the data quality evaluation result. |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | Name: *e*max  Definition: is the threshold above which the positional uncertainties are counted  Value type: Number |
| Data quality value type | Real ; percentage ; ratio |

|  |  |
| --- | --- |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 25% of the nodes within the data quality scope have error distance greater than 1 metre |
| Measure identifier | 31 (ISO 19157) |

Once again, the POI nature of governmental services data and the needs expressed within the analyzed use cases have clear implications regarding their expected positional accuracy, in the sense that it can be stated that this parameter is not to be critical to assure their quality and their usability

#### Positional accuracy – Relative or internal accuracy

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| **Recommendation 20** Relative or internal accuracy should be evaluated and documented using Relative horizontal error as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Relative horizontal error** |
| Alternative name | Rel CE90 |
| Data quality element | Positional accuracy |
| Data quality sub-element | Relative or internal accuracy |
| Data quality basic measure | Not applicable |
| Definition | Closeness of the relative positions of features in the scope to their respective relative positions accepted as or being true, especially the evaluation of the random errors in the horizontal position of one  feature to another in the same dataset or on the same map/chart. |
| Description | A comparison of the data (measured) and the control (true) is calculated in the following manner:   1. Determine all possible point pair combinations: Point Pair Combinations = *m* = *n*(*n*-1)/2 2. Calculate the absolute error in the *X* and *Y* dimensions at each point:   Δ*Xi* = Measured *Xi* - True *Xi* for *i* = 1…*n* Δ*Yi* = Measured *Yi* - True *Yi* for *i* = 1…*n*   1. Calculate the relative error in X and Y for all point pair combinations:   Δ*X*rel *kj* = Δ*Xk* - Δ*Xj* for *k* = 1…m-1, *j* = *k*+1, … *m*  Δ*Y*rel *kj* = Δ*Yk* – Δ*yj* for *k* = 1…m-1, *j* = *k*+1, … *m*   1. Calculate the relative standard deviations in each axis:      1. Calculate the relative horizontal standard deviation:      1. Calculate the Relative CE by converting the sigma to a 90 % significance level:   Rel CE90 = 2,146 σH rel |

|  |  |
| --- | --- |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | Name: *n*  Definition: Sample size Value type: Integer |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality  Mapping, Charting and Geodesy Accuracy *[Department of Defense (US). Standard Practice: Mapping, Charting and Geodesy Accuracy. MIL STD 600001, 1990]* |
| Example | No specific example for version 2.9 |
| Measure identifier | 53 (ISO 19157) |

#### Thematic accuracy – Classification correctness

|  |
| --- |
| **Recommendation 21** Classification correctness should be evaluated and documented using Misclassification rate as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Misclassification rate** |
| Alternative name | – |
| Data quality element | Thematic accuracy |
| Data quality sub-element | Classification correctness |
| Data quality basic measure | Error rate |
| Definition | Average number of incorrectly classified features in relation to the number of features that are supposed to be within the dataset |
| Description | To be provided globally as an average value for the whole dataset |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Real, percentage, ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 61 (ISO 19157) |

#### Thematic accuracy – Non-quantitative attribute correctness

|  |
| --- |
| **Recommendation 22** Non-quantitative attribute correctness should be evaluated and documented using Rate of correct attribute values as specified in the tables  below. |

|  |  |
| --- | --- |
| **Name** | **Rate of correct attribute values** |
| Alternative name | – |
| Data quality element | Thematic accuracy |
| Data quality sub-element | Non-quantitative attribute correctness |
| Data quality basic measure | Correct items rate |
| Definition | Number of correct attribute values in relation to the total number of |

|  |  |
| --- | --- |
|  | attribute values |
| Description | No specific description for version 2.9 |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Real, percentage, ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 66 (ISO 19157) |

#### Thematic accuracy – Quantitative attribute accuracy

|  |
| --- |
| **Recommendation 23** Quantitative attribute accuracy should be evaluated and documented using Attribute value uncertainty at 50 % significance level, Attribute value uncertainty at 90 % significance level, Attribute value uncertainty at 99 %  significance level as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Attribute value uncertainty at 50 % significance level** |
| Alternative name | – |
| Data quality element | Thematic accuracy |
| Data quality sub-element | Quantitative attribute accuracy |
| Data quality basic measure | LE50 or LE50(r), depending on the evaluation procedure |
| Definition | Half length of the interval defined by an upper and a lower limit, in which the true value for the quantitative attribute lies with  probability 50 % |
| Description | Please, cf. Annex G § 3.2 ―One-dimensional random variable, Ζ‖ of the chapter ―Uncertainty-related data quality basic measures‖ of the ISO/DIS 19157 Geographic information – Data quality |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 69 (ISO 19157) |

|  |  |
| --- | --- |
| **Name** | **Attribute value uncertainty at 90 % significance level** |
| Alternative name | – |
| Data quality element | Thematic accuracy |
| Data quality sub-element | Quantitative attribute accuracy |
| Data quality basic measure | LE90 or LE90(r), depending on the evaluation procedure |
| Definition | Half length of the interval defined by an upper and a lower limit, in which the true value for the quantitative attribute lies with probability 90 % |
| Description | Please, cf. Annex G § 3.2 ―One-dimensional random variable, Ζ‖ of the chapter ―Uncertainty-related data quality basic measures‖ of  the ISO/DIS 19157 Geographic information – Data quality |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |

|  |  |
| --- | --- |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 70 (ISO 19157) |

|  |  |
| --- | --- |
| **Name** | **Attribute value uncertainty at 99 % significance level** |
| Alternative name | – |
| Data quality element | Thematic accuracy |
| Data quality sub-element | Quantitative attribute accuracy |
| Data quality basic measure | LE99 or LE99(r), depending on the evaluation procedure |
| Definition | Half length of the interval defined by an upper and a lower limit, in which the true value for the quantitative attribute lies with  probability 99 % |
| Description | Please, cf. Annex G § 3.2 ―One-dimensional random variable, Ζ‖ of  the chapter ―Uncertainty-related data quality basic measures‖ of the ISO/DIS 19157 Geographic information – Data quality |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 72 (ISO 19157) |

#### Temporal quality – Accuracy of a time measurement

Two different measuring elements are proposed:

* + - * Time accuracy at 50% significance level, for the use cases related to mapping and POI querying
      * Time accuracy at 95% significance level, for the use cases related to disaster management

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| **Recommendation 24** Accuracy of a time measurement should be evaluated and documented using Time accuracy at 50 % significance level, Time accuracy at 95 % significance level as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Time accuracy at 50 % significance level** |
| Alternative name | – |

|  |  |
| --- | --- |
| Data quality element | Temporal quality |
| Data quality sub-element | Accuracy of a time measurement |
| Data quality basic measure | LE50 or LE50(r), depending on the evaluation procedure |
| Definition | Half length of the interval defined by an upper and a lower limit, in which the true value for the time instance lies with probability 50 % |
| Description | Please, cf. Annex G § 3.2 ―One-dimensional random variable, Ζ‖ of the chapter ―Uncertainty-related data quality basic measures‖ of the ISO/DIS 19157 Geographic information – Data quality |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 55 (ISO 19157) |

|  |  |
| --- | --- |
| **Name** | **Time accuracy at 95 % significance level** |
| Alternative name | – |
| Data quality element | Temporal quality |
| Data quality sub-element | Accuracy of a time measurement |
| Data quality basic measure | LE95 or LE95(r), depending on the evaluation procedure |
| Definition | Half length of the interval defined by an upper and a lower limit, in which the true value for the time instance lies with probability 95 % |
| Description | Please, cf. Annex G § 3.2 ―One-dimensional random variable, Ζ‖ of  the chapter ―Uncertainty-related data quality basic measures‖ of the ISO/DIS 19157 Geographic information – Data quality |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |
| Data quality value type | Measure |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | No specific example for version 2.9 |
| Measure identifier | 57 (ISO 19157) |

#### Temporal quality – Temporal consistency

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| --- |
| **Recommendation 25** Temporal consistency should be evaluated and documented using Value domain conformance rate as specified in the tables below. |

|  |  |
| --- | --- |
| **Name** | **Value domain conformance rate** |
| Alternative name | – |
| Data quality element | Temporal quality |
| Data quality sub-element | Temporal consistency |
| Data quality basic measure | Correct items rate |
| Definition | Number of items in the dataset that are in conformance with their value domain in relation to the total number of items in the dataset |
| Description | No specific description for version 2.9 |
| Evaluation scope | dataset |
| Reporting scope | dataset |
| Parameter | – |

|  |  |
| --- | --- |
| Data quality value type | Real, percentage, ratio |
| Data quality value structure | Single value, Bag, Set, Sequence, Table, Matrix or Coverage |
| Source reference | ISO/DIS 19157 Geographic information – Data quality |
| Example | 0.0189 ; 98.11% ; 11:582 |
| Measure identifier | 17 (ISO 19157) |

### Minimum data quality requirements

No minimum data quality requirements are defined for the spatial data theme *Utility and Government Services*.

### Recommendation on data quality

No minimum data quality recommendations are defined.

## Dataset-level metadata

This section specifies dataset-level metadata elements, which should be used for documenting metadata for a complete dataset or dataset series.

NOTE Metadata can also be reported for each individual spatial object (spatial object-level metadata). Spatial object-level metadata is fully described in the application schema(s) (section 5).

For some dataset-level metadata elements, in particular those for reporting data quality and maintenance, a more specific scope can be specified. This allows the definition of metadata at sub- dataset level, e.g. separately for each spatial object type (see instructions for the relevant metadata element).

* 1. **Metadata elements defined in INSPIRE Metadata Regulation**

[Table 4](#_bookmark133) gives an overview of the metadata elements specified in Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata).

The table contains the following information:

* + - The first column provides a reference to the relevant section in the Metadata Regulation, which contains a more detailed description.
    - The second column specifies the name of the metadata element.
    - The third column specifies the multiplicity.
    - The fourth column specifies the condition, under which the given element becomes mandatory.

**Table 4 – Metadata for spatial datasets and spatial dataset series specified in Regulation 1205/2008/EC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Metadata Regulation**  **Section** | **Metadata element** | **Multiplicity** | **Condition** |
| 1.1 | Resource title | 1 |  |
| 1.2 | Resource abstract | 1 |  |
| 1.3 | Resource type | 1 |  |
| 1.4 | Resource locator | 0..\* | Mandatory if a URL is available to obtain more information on the resource, and/or access related services. |
| 1.5 | Unique resource identifier | 1..\* |  |
| 1.7 | Resource language | 0..\* | Mandatory if the resource includes textual information. |
| 2.1 | Topic category | 1..\* |  |
| 3 | Keyword | 1..\* |  |
| 4.1 | Geographic bounding box | 1..\* |  |
| 5 | Temporal reference | 1..\* |  |
| 6.1 | Lineage | 1 |  |
| 6.2 | Spatial resolution | 0..\* | Mandatory for data sets and data set series if an equivalent scale or a resolution distance can be specified. |
| 7 | Conformity | 1..\* |  |
| 8.1 | Conditions for access and use | 1..\* |  |
| 8.2 | Limitations on public access | 1..\* |  |
| 9 | Responsible organisation | 1..\* |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 10.1 | Metadata point of contact | 1..\* |  |
| 10.2 | Metadata date | 1 |  |
| 10.3 | Metadata language | 1 |  |
| Generic guidelines for implementing these elements using ISO 19115 and 19119 are available at [*http://inspire.jrc.ec.europa.eu/index.cfm/pageid/101*.](http://inspire.jrc.ec.europa.eu/index.cfm/pageid/101) The following sections describe additional theme- specific recommendations and requirements for implementing these elements. | | | |

|  |
| --- |
| **8.1.1 Conformity**  The *Conformity* metadata element defined in Regulation 1205/2008/EC requires to report the conformance with the Implementing Rule for interoperability of spatial data sets and services. In addition, it may be used also to document the conformance to another specification. |
| **Recommendation 26** Dataset metadata should include a statement on the overall conformance of the dataset with this data specification (i.e. conformance with all  requirements). |
|  |
| **Recommendation 27** The *Conformity* metadata element should be used to document conformance with this data specification (as a whole), with a specific conformance class defined in the Abstract Test Suite in Annex A and/or  with another specification. |
| The *Conformity* element includes two sub-elements, the *Specification* (a citation of the Implementing Rule for interoperability of spatial data sets and services or other specification), and the *Degree* of conformity. The *Degree* can be *Conformant* (if the dataset is fully conformant with the cited specification), *Not Conformant* (if the dataset does not conform to the cited specification) or *Not Evaluated* (if the conformance has not been evaluated). |
| **Recommendation 28** If a dataset is not yet conformant with all requirements of this data specification, it is recommended to include information on the conformance with the individual conformance classes specified in the Abstract Test Suite  in Annex A. |
|  |
| **Recommendation 29** If a dataset is produced or transformed according to an external specification that includes specific quality assurance procedures, the conformity with this specification should be documented using the *Conformity* metadata element. |
|  |
| **Recommendation 30** If minimum data quality recommendations are defined then the statement on the conformity with these requirements should be included using the *Conformity* metadata element and referring to the relevant data quality conformance class in the Abstract Test Suite. |
| NOTE Currently no minimum data quality requirements are included in the IRs. The recommendation above should be included as a requirement in the IRs if minimum data quality requirements are defined at some point in the future. |
| **Recommendation 31** When documenting conformance with this data specification or one of the conformance classes defined in the Abstract Test Suite, the *Specification* |

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| sub-element should be given using the http URI identifier of the conformance class or using a citation including the following elements:   * title: ―INSPIRE Data Specification on *Utility and Government Services* – Technical Guidelines – <name of the conformance class>‖ * date:   - dateType: publication  - date: 2013-12-10 |
| EXAMPLE 1: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the whole data specification on Addresses v3.0.1.  <gmd:DQ\_ConformanceResult>  **<gmd:specification href="**[**http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/tg**](http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/tg)**" />**  <gmd:explanation> (...) </gmd:explanation>  <gmd:pass> (...) </gmd:pass>  </gmd:DQ\_ConformanceResult> or (using a citation):  <gmd:DQ\_ConformanceResult>  **<gmd:specification>**  <gmd:CI\_Citation>  **<gmd:title>**  **<gco:CharacterString>INSPIRE Data Specification on Utility and Government Services – Technical Guidelines</gco:CharacterString>**  **</gmd:title>**  <gmd:date>  <gmd:date>  **<gco:Date>2013-12-10</gco:Date>**  </gmd:date>  <gmd:dateType>  **<gmd:CI\_DateTypeCode codeList="**[**http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resou**](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resou) **rces/Codelist/ML\_gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>**  </gmd:dateType>  </gmd:date>  </gmd:CI\_Citation>  **</gmd:specification>**  <gmd:explanation> (...) </gmd:explanation>  <gmd:pass> (...) </gmd:pass>  </gmd:DQ\_ConformanceResult>  EXAMPLE 2: The XML snippets below show how to fill the *Specification* sub-element for documenting conformance with the CRS conformance class of the data specification on Addresses v3.0.1.  <gmd:DQ\_ConformanceResult>  **<gmd:specification href="**[**http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/crs**](http://inspire.ec.europa.eu/conformanceClass/ad/3.0.1/crs)**" />**  <gmd:explanation> (...) </gmd:explanation>  <gmd:pass> (...) </gmd:pass>  </gmd:DQ\_ConformanceResult> or (using a citation):  <gmd:DQ\_ConformanceResult>  **<gmd:specification>**  <gmd:CI\_Citation>  **<gmd:title>**  **<gco:CharacterString>INSPIRE Data Specification on Utility and Government Services – Technical Guidelines – CRS</gco:CharacterString>**  **</gmd:title>**  <gmd:date>  <gmd:date> |

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| **<gco:Date>2013-12-10</gco:Date>**  </gmd:date>  <gmd:dateType>  **<gmd:CI\_DateTypeCode codeList="**[**http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_19139\_Schemas/resou**](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resou) **rces/Codelist/ML\_gmxCodelists.xml#CI\_DateTypeCode" codeListValue="publication">publication</gmd:CI\_DateTypeCode>**  </gmd:dateType>  </gmd:date>  </gmd:CI\_Citation>  **</gmd:specification>**  <gmd:explanation> (...) </gmd:explanation>  <gmd:pass> (...) </gmd:pass>  </gmd:DQ\_ConformanceResult>  **8.1.2 Lineage** |
| **Recommendation 32** Following the ISO/DIS 19157 Quality principles, if a data provider has a procedure for the quality management of their spatial data sets then the appropriate data quality elements and measures defined in ISO/DIS 19157 should be used to evaluate and report (in the metadata) the results. If not, the *Lineage* metadata element (defined in Regulation 1205/2008/EC) should be used to describe the overall quality of a spatial data set. |
| According to Regulation 1205/2008/EC, lineage ―is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity. The value domain of this metadata element is free text‖.  The Metadata Technical Guidelines based on EN ISO 19115 and EN ISO 19119 specifies that the statement sub-element of LI\_Lineage (EN ISO 19115) should be used to implement the lineage metadata element. |
| **Recommendation 33** To describe the transformation steps and related source data, it is recommended to use the following sub-elements of LI\_Lineage:   * For the description of the transformation process of the local to the common INSPIRE data structures, the LI\_ProcessStep sub-element should be used. * For the description of the source data the LI\_Source sub-element should be used. |
| NOTE 1 In order to improve the interoperability, domain templates and instructions for using these free text elements (descriptive statements) may be specified here and/or in an Annex of this data specification.  **8.1.3 Temporal reference**  According to Regulation 1205/2008/EC, at least one of the following temporal reference metadata sub- elements shall be provided: temporal extent, date of publication, date of last revision, date of creation. |
| **Recommendation 34** It is recommended that at least the date of the last revision of a spatial data set should be reported using the *Date of last revision* metadata sub-  element. |
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**8.2 Metadata elements for interoperability**

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| **IR Requirement**  Article 13  **Metadata required for Interoperability**  The metadata describing a spatial data set shall include the following metadata elements required for interoperability:   1. Coordinate Reference System: Description of the coordinate reference system(s) used in the data set. 2. Temporal Reference System: Description of the temporal reference system(s) used in the data set.   This element is mandatory only if the spatial data set contains temporal information that does not refer to the default temporal reference system.   1. Encoding: Description of the computer language construct(s) specifying the representation of data objects in a record, file, message, storage device or transmission channel. 2. Topological Consistency: Correctness of the explicitly encoded topological characteristics of the data set as described by the scope.   This element is mandatory only if the data set includes types from the Generic Network Model and does not assure centreline topology (connectivity of centrelines) for the network.   1. Character Encoding: The character encoding used in the data set.   This element is mandatory only if an encoding is used that is not based on UTF-8.   1. Spatial Representation Type: The method used to spatially represent geographic information. |
| These Technical Guidelines propose to implement the required metadata elements based on ISO 19115 and ISO/TS 19139.  The following TG requirements need to be met in order to be conformant with the proposed encoding. |
| **TG Requirement 3** Metadata instance (XML) documents shall validate without error against the used ISO 19139 XML schema. |
| NOTE Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schemas that are currently available. |
| **TG Requirement 4** Metadata instance (XML) documents shall contain the elements and meet the INSPIRE multiplicity specified in the sections below. |
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| **TG Requirement 5** The elements specified below shall be available in the specified ISO/TS 19139 path. |
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| **Recommendation 35** The metadata elements for interoperability should be made available together with the metadata elements defined in the Metadata Regulation  through an INSPIRE discovery service. | |
| NOTE While this not explicitly required by any of the INSPIRE Implementing Rules, making all metadata of a data set available together and through one service simplifies implementation and usability.  **8.2.1 Coordinate Reference System** | |
| **Metadata element name** | **Coordinate Reference System** |
| Definition | Description of the coordinate reference system used in the dataset. |
| ISO 19115 number and name | 13. referenceSystemInfo |
| ISO/TS 19139 path | referenceSystemInfo |
| INSPIRE obligation / condition | mandatory |
| INSPIRE multiplicity | 1..\* |
| Data type(and ISO 19115 no.) | 186. MD\_ReferenceSystem |
| Domain | To identify the reference system, the referenceSystemIdentifier (RS\_Identifier) shall be provided.  NOTE More specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be  agreed among Member States during the implementation phase to support interoperability. |
| Implementing instructions |  |
| Example | referenceSystemIdentifier: code: ETRS\_89  codeSpace: INSPIRE RS registry |
| Example XML encoding | <gmd:referenceSystemInfo>  <gmd:MD\_ReferenceSystem>  <gmd:referenceSystemIdentifier>  <gmd:RS\_Identifier>  <gmd:code>  <gco:CharacterString>ETRS89  </gco:CharacterString>  </gmd:code>  <gmd:codeSpace>  <gco:CharacterString>INSPIRE RS registry</gco:CharacterString>  </gmd:codeSpace>  </gmd:RS\_Identifier>  </gmd:referenceSystemIdentifier>  </gmd:MD\_ReferenceSystem>  </gmd:referenceSystemInfo> |
| Comments |  |
| **8.2.2 Temporal Reference System** | |
| **Metadata element name** | **Temporal Reference System** |
| Definition | Description of the temporal reference systems used in the dataset. |
| ISO 19115 number and name | 13. referenceSystemInfo |
| ISO/TS 19139 path | referenceSystemInfo |

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| INSPIRE obligation / condition | Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time. |
| INSPIRE multiplicity | 0..\* |
| Data type(and ISO 19115 no.) | 186. MD\_ReferenceSystem |
| Domain | No specific type is defined in ISO 19115 for temporal reference systems. Thus, the generic MD\_ReferenceSystem element and its reference SystemIdentifier (RS\_Identifier) property shall be provided.  NOTEMore specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be  agreed among Member States during the implementation phase to support interoperability. |
| Implementing instructions |  |
| Example | referenceSystemIdentifier: code: GregorianCalendar  codeSpace: INSPIRE RS registry |
| Example XML encoding | <gmd:referenceSystemInfo>  <gmd:MD\_ReferenceSystem>  <gmd:referenceSystemIdentifier>  <gmd:RS\_Identifier>  <gmd:code>  <gco:CharacterString>GregorianCalendar  </gco:CharacterString>  </gmd:code>  <gmd:codeSpace>  <gco:CharacterString>INSPIRE RS registry</gco:CharacterString>  </gmd:codeSpace>  </gmd:RS\_Identifier>  </gmd:referenceSystemIdentifier>  </gmd:MD\_ReferenceSystem>  </gmd:referenceSystemInfo> |
| Comments |  |
| **8.2.3 Encoding** | |
| **Metadata element name** | **Encoding** |
| Definition | Description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device or transmission channel |
| ISO 19115 number and name | 271. distributionFormat |
| ISO/TS 19139 path | distributionInfo/MD\_Distribution/distributionFormat |
| INSPIRE obligation / condition | mandatory |
| INSPIRE multiplicity | 1..\* |
| Data type (and ISO 19115 no.) | 284. MD\_Format |
| Domain | See B.2.10.4. The property values (name, version, specification) specified in section 5 shall be used to document the default and alternative encodings. |
| Implementing instructions |  |
| Example | name: <Application schema name> GML application schema version: version 3.0  specification: D2.8.III.6 Data Specification on *Utility and*  *Government Services* – Technical Guidelines |

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| Example XML encoding | <gmd:MD\_Format>  <gmd:name>  <gco:CharacterString>SomeApplicationSchema GML application schema</gco:CharacterString>  </gmd:name>  <gmd:version>  <gco:CharacterString>3.0</gco:CharacterString>  </gmd:version>  <gmd:specification>  <gco:CharacterString>D2.8.III.6 Data Specification on *Utility and Government Services* – Technical Guidelines</gco:CharacterString>  </gmd:specification>  </gmd:MD\_Format> |
| Comments |  |
| **8.2.4 Character Encoding** | |
| **Metadata element name** | **Character Encoding** |
| Definition | The character encoding used in the data set. |
| ISO 19115 number and name |  |
| ISO/TS 19139 path |  |
| INSPIRE obligation / condition | Mandatory, if an encoding is used that is not based on UTF-8. |
| INSPIRE multiplicity | 0..\* |
| Data type (and ISO 19115 no.) |  |
| Domain |  |
| Implementing instructions |  |
| Example | - |
| Example XML encoding | <gmd:characterSet>  <gmd:MD\_CharacterSetCode codeListValue="8859part2" codeList="<http://standards.iso.org/ittf/PubliclyAvailableStandards/I> SO\_19139\_Schemas/resources/Codelist/ML\_gmxCodelists.xml#C haracterSetCode">8859-2</gmd:MD\_CharacterSetCode>  </gmd:characterSet> |
| Comments |  |
| **8.2.5 Spatial representation type** | |
| **Metadata element name** | **Spatial representation type** |
| Definition | The method used to spatially represent geographic information. |
| ISO 19115 number and name | 37. spatialRepresentationType |
| ISO/TS 19139 path |  |
| INSPIRE obligation / condition | Mandatory |
| INSPIRE multiplicity | 1..\* |
| Data type (and ISO 19115 no.) | B.5.26 MD\_SpatialRepresentationTypeCode |
| Domain |  |
| Implementing instructions | Of the values included in the code list in ISO 19115 (vector, grid, textTable, tin, stereoModel, video), only vector, grid and tin should be used.  NOTE Additional code list values may be defined based on feedback from implementation. |
| Example | - |
| Example XML encoding |  |

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| Comments |  |
| **8.2.6 Data Quality – Logical Consistency – Topological Consistency**  See section [8.3.2](#_bookmark147) for instructions on how to implement metadata elements for reporting data quality. | |

### Recommended theme-specific metadata elements

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| **Recommendation 36** The metadata describing a spatial data set or a spatial data set series related to the theme *Utility and Government Services* should comprise the  theme-specific metadata elements specified in [Table 5](#_bookmark145). |
| The table contains the following information:   * The first column provides a reference to a more detailed description. * The second column specifies the name of the metadata element. * The third column specifies the multiplicity. |

**Table 5 – Optional theme-specific metadata elements for the theme *Utility and Government Services***

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| **Section** | **Metadata element** | **Multiplicity** |
| 8.3.1 | Maintenance Information | 0..1 |
| 8.3.2 | Logical Consistency – Conceptual Consistency | 0..\* |
| 8.3.2 | Logical Consistency – Domain Consistency | 0..\* |

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| **Recommendation 37** For implementing the metadata elements included in this section using ISO 19115, ISO/DIS 19157 and ISO/TS 19139, the instructions included in the  relevant sub-sections should be followed. |
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#### Maintenance Information

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| **Metadata element name** | **Maintenance information** |
| Definition | Information about the scope and frequency of updating |
| ISO 19115 number and name | 30. resourceMaintenance |
| ISO/TS 19139 path | identificationInfo/MD\_Identification/resourceMaintenance |
| INSPIRE obligation / condition | optional |
| INSPIRE multiplicity | 0..1 |
| Data type(and ISO 19115 no.) | 142. MD\_MaintenanceInformation |

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| Domain | This is a complex type (lines 143-148 from ISO 19115).  At least the following elements should be used (the multiplicity according to ISO 19115 is shown in parentheses):   * maintenanceAndUpdateFrequency [1]: frequency with which changes and additions are made to the resource after the initial resource is completed / domain value: MD\_MaintenanceFrequencyCode: * updateScope [0..\*]: scope of data to which maintenance is applied / domain value: MD\_ScopeCode * maintenanceNote [0..\*]: information regarding specific requirements for maintaining the resource / domain value: free   text |
| Implementing instructions |  |
| Example |  |
| Example XML encoding |  |
| Comments |  |

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| **8.3.2 Metadata elements for reporting data quality** |
| **Recommendation 38** For reporting the results of the data quality evaluation, the data quality elements, sub-elements and (for quantitative evaluation) measures defined  in chapter 7 should be used. |
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| **Recommendation 39** The metadata elements specified in the following sections should be used to report the results of the data quality evaluation. At least the information  included in the row ―Implementation instructions‖ should be provided. |
| The first section applies to reporting quantitative results (using the element DQ\_QuantitativeResult), while the second section applies to reporting non-quantitative results (using the element DQ\_DescriptiveResult). |
| **Recommendation 40** If a dataset does not pass the tests of the Application schema conformance class (defined in Annex A), the results of each test should be reported using one of the options described in sections [8.3.2.1](#_bookmark148) and [8.3.2.2.](#_bookmark149) |
| NOTE 1 If using non-quantitative description, the results of several tests do not have to be reported separately, but may be combined into one descriptive statement.  NOTE 2 The sections [8.3.2.1](#_bookmark148) and [8.3.2.2](#_bookmark149) may need to be updated once the XML schemas for ISO 19157 have been finalised.  The scope for reporting may be different from the scope for evaluating data quality (see section 7). If data quality is reported at the data set or spatial object type level, the results are usually derived or aggregated. |

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| **Recommendation 41** The scope element (of type DQ\_Scope) of the DQ\_DataQuality subtype should be used to encode the reporting scope.  Only the following values should be used for the level element of DQ\_Scope: Series, Dataset, featureType.  If the level is featureType the levelDescription/MDScopeDescription/features element (of type Set<  GF\_FeatureType>) shall be used to list the feature type names. | |
| NOTE In the level element of DQ\_Scope, the value featureType is used to denote spatial object type.  8.3.2.1. Guidelines for reporting quantitative results of the data quality evaluation | |
| **Metadata element name** | **See chapter 7** |
| Definition | See chapter 7 |
| ISO/DIS 19157 number and name | 3. report |
| ISO/TS 19139 path | dataQualityInfo/\*/report |
| INSPIRE obligation / condition | optional |
| INSPIRE multiplicity | 0..\* |
| Data type (and ISO/DIS 19157 no.) | Corresponding DQ\_xxx subelement from ISO/DIS 19157, e.g.  12. DQ\_CompletenessCommission |
| Domain | Lines 7-9 from ISO/DIS 19157   1. DQ\_MeasureReference (C.2.1.3) 2. DQ\_EvaluationMethod (C.2.1.4.) 3. DQ\_Result (C2.1.5.) |
| Implementing instructions | 39. nameOfMeasure  NOTE This should be the name as defined in Chapter 7.   1. evaluationMethodType 2. evaluationMethodDescription   NOTE If the reported data quality results are derived or aggregated (i.e. the scope levels for evaluation and reporting are different), the derivation or aggregation should also be specified using this property.  46. dateTime  NOTE This should be data or range of dates on which the data quality measure was applied.  63. DQ\_QuantitativeResult / 64. value  NOTE The DQ\_Result type should be DQ\_QuantitativeResult and the value(s) represent(s) the application of the data quality  measure (39.) using the specified evaluation method (42-43.) |
| Example | See Table E.12 — Reporting commission as metadata (ISO/DIS 19157) |
| Example XML encoding |  |
| 8.3.2.2. Guidelines for reporting descriptive results of the Data Quality evaluation | |
| **Metadata element name** | **See chapter 7** |

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| Definition | See chapter 7 |
| ISO/DIS 19157 number and name | 3. report |
| ISO/TS 19139 path | dataQualityInfo/\*/report |
| INSPIRE obligation / condition | optional |
| INSPIRE multiplicity | 0..\* |
| Data type (and ISO/DIS 19157 no.) | Corresponding DQ\_xxx subelement from ISO/DIS 19157, e.g.  12. DQ\_CompletenessCommission |
| Domain | Line 9 from ISO/DIS 19157  9. DQ\_Result (C2.1.5.) |
| Implementing instructions | 67. DQ\_DescripitveResult / 68. statement  NOTE The DQ\_Result type should be DQ\_DescriptiveResult  and in the statement (68.) the evaluation of the selected DQ sub-element should be expressed in a narrative way. |
| Example | See Table E.15 — Reporting descriptive result as metadata (ISO/DIS 19157) |
| Example XML encoding |  |
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## Delivery

### Updates

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| **IR Requirement** *Article 8* **Updates**   1. Member States shall make available updates of data on a regular basis. 2. All updates shall be made available at the latest 6 months after the change was applied in the source data set, unless a different period is specified for a specific spatial data theme in Annex   II. |

NOTE In this data specification, no exception is specified, so all updates shall be made available at the latest 6 months after the change was applied in the source data set.

* 1. **Delivery medium**

According to Article 11(1) of the INSPIRE Directive, Member States shall establish and operate a network of services for INSPIRE spatial data sets and services. The relevant network service types for making spatial data available are:

* *view services* making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata;
* *download services*, enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly;
* *transformation services*, enabling spatial data sets to be transformed with a view to achieving interoperability.

NOTE For the relevant requirements and recommendations for network services, see the relevant Implementing Rules and Technical Guidelines21.

EXAMPLE 1 Through the Get Spatial Objects function, a download service can either download a pre- defined data set or pre-defined part of a data set (non-direct access download service), or give direct access to the spatial objects contained in the data set, and download selections of spatial objects based upon a query (direct access download service). To execute such a request, some of the following information might be required:

* + the list of spatial object types and/or predefined data sets that are offered by the download service (to be provided through the Get Download Service Metadata operation),
  + and the query capabilities section advertising the types of predicates that may be used to form a query expression (to be provided through the Get Download Service Metadata operation, where applicable),
  + a description of spatial object types offered by a download service instance (to be provided through the Describe Spatial Object Types operation).

EXAMPLE 2 Through the Transform function, a transformation service carries out data content transformations from native data forms to the INSPIRE-compliant form and vice versa. If this operation is directly called by an application to transform source data (e.g. obtained through a download service) that is not yet conformant with this data specification, the following parameters are required:

Input data (mandatory). The data set to be transformed.

21The Implementing Rules and Technical Guidelines on INSPIRE Network Services are available at <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5>

* Source model (mandatory, if cannot be determined from the input data). The model in which the input data is provided.
* Target model (mandatory). The model in which the results are expected.
* Model mapping (mandatory, unless a default exists). Detailed description of how the transformation is to be carried out.

### Encodings

The IRs contain the following two requirements for the encoding to be used to make data available.

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| **IR Requirement** *Article 7* **Encoding**   1. Every encoding rule used to encode spatial data shall conform to EN ISO 19118. In particular, it shall specify schema conversion rules for all spatial object types and all attributes and association roles and the output data structure used. 2. Every encoding rule used to encode spatial data shall be made available. |
| NOTE ISO 19118:2011 specifies the requirements for defining encoding rules used for interchange of geographic data within the set of International Standards known as the ―ISO 19100 series‖. An encoding rule allows geographic information defined by application schemas and standardized schemas to be coded into a system-independent data structure suitable for transport and storage. The encoding rule specifies the types of data being coded and the syntax, structure and coding schemes used in the resulting data structure. Specifically, ISO 19118:2011 includes   * requirements for creating encoding rules based on UML schemas, * requirements for creating encoding services, and * requirements for XML-based encoding rules for neutral interchange of data.   While the IRs do not oblige the usage of a specific encoding, these Technical Guidelines propose to make data related to the spatial data theme *Utility and Government Services* available at least in the default encoding(s) specified in section [0.](#_bookmark154) In this section, a number of TG requirements are listed that need to be met in order to be conformant with the default encoding(s).  The proposed default encoding(s) meet the requirements in Article 7 of the IRs, i.e. they are conformant with ISO 19118 and (since they are included in this specification) publicly available. |

#### Default Encoding(s)

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| 9.3.1.1. Specific requirements for GML encoding  This data specification proposes the use of GML as the default encoding, as recommended in sections  7.2 and 7.3 of [DS-D2.7]. GML is an XML encoding in compliance with ISO 19118, as required in Article 7(1). For details, see [ISO 19136], and in particular Annex E (UML-to-GML application schema encoding rules).  The following TG requirements need to be met in order to be conformant with GML encodings. |
| **TG Requirement 6** Data instance (XML) documents shall validate without error against the provided XML schema. |
| NOTE 1 Not all constraints defined in the application schemas can be mapped to XML. Therefore, the following requirement is necessary. |

NOTE 2 The obligation to use only the allowed code list values specified for attributes and most of the constraints defined in the application schemas cannot be mapped to the XML sch. They can therefore not be enforced through schema validation. It may be possible to express some of these constraints using other schema or rule languages (e.g. Schematron), in order to enable automatic validation.

* + - 1. **Default encoding for application schema AdministrativeAndSocialGovernmentalServices**

**Name: AdministrativeAndSocialGovernmentalServices GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-govserv/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-govserv/3.0)

* + - 1. **Default encoding for application schema ExtensionAdministrativeAndSocialGovernmentalServices**

**Name: ExtensionAdministrativeAndSocialGovernmentalServices GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/draft-schemas/us-*](http://inspire.jrc.ec.europa.eu/draft-schemas/us-govserv/3.0)[*govserv/3.0*](http://inspire.jrc.ec.europa.eu/draft-schemas/us-govserv/3.0)

* + - 1. **Default encoding for application schema EnvironmentalManagementFacilities Name: EnvironmentalManagementFacilities GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-emf/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-emf/3.0)

* + - 1. **Default encoding for application schema CommonUtilityNetworkElements Name: CommonUtilityNetworkElements GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-*](http://inspire.jrc.ec.europa.eu/schemas/us-net-common/3.0)[*common/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-common/3.0)

* + - 1. **Default encoding for application schema Electricity Network Name: ElectricityNetwork GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-el/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-el/3.0)

* + - 1. **Default encoding for application schema Oil-Gas-Chemicals Network Name: Oil-Gas-Chemicals Network GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-ogc/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-ogc/3.0)

* + - 1. **Default encoding for application schema Sewer Network Name: Sewer Network GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-sw/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-sw/3.0)

* + - 1. **Default encoding for application schema Thermal Network Name: Thermal Network GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-th/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-th/3.0)

* + - 1. **Default encoding for application schema Water Network Name: Water Network GML Application Schema**

Version: 3.0

Specification: D2.8.III.6 Data Specification on Utility and Governmental Services – Technical Guidelines

Character set: UTF-8

The xml schema document is available from [*http://inspire.jrc.ec.europa.eu/schemas/us-net-wa/3.0*](http://inspire.jrc.ec.europa.eu/schemas/us-net-wa/3.0)

## Data Capture

***For Utility networks***

The data capture for utility networks refers a lot to any other network.

Then, please have a look to what has been written in *Transport Networks* data specification document, regarding network data capture, this will be relevant for this sub-theme too.

***For Administrative and social governmental services***

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| **Recommendation 42** All administrative and social governmental services data which fall under the INSPIRE scope shall be published |

Administrative and social governmental services data, due to their nature, may be captured and provided by different producers at different levels of (mainly) Public Administration, from local to European, depending on what is the level and the administrative scope of the correspondent responsible party.

Due to this fact, it is expected that data are provided at very different scales/resolutions, covering different sub-sets of service types and following different modelling approaches, depending on the concrete needs of their producers and target users. This way, it can not be expected that a single set of requirements may be established in order to harmonize this theme's data sets. In consequence, just the recommendations that follow are proposed:

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| **Recommendation 43** Data should be captured in such conditions that they may be classified into one or several of the service types listed within ServiceTypeValue codelist. |

In order to fulfill the previous recommendation:

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| **Recommendation 44** Datasets should be built by setting different sub-sets for each of the service types covered. |

If the dataset fulfills only administrative and social governmental services model, each one of the resulting sub-sets shall correspond to one of the service types included in, at least, main level of ServiceTypeValue codelist.

When data about an instance of administrative and social governmental services is located by means of a point or an address:

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| **Recommendation 45** Point or address locations should correspond to the main access point to the space where the service is provided from. |

In the case that different services are provided from a single building/facility, they may be located by different points/addresses by following the previous recommendation to each of those points/addresses. I.e: a hospital may consist of different buildings. If hospital service is modelled as a whole, its location point or address should correspond to that of the main entrance to the hospital. In the opposite, if different services (e.g. General hospital service or Specialized hospital service) within the hospital building or facility are modelled separately, their location references should correspond, whenever possible, to the main access point to each of those services.

With regards to data referring to hydrants or emergency call points, which are nodes of, respectively, water supply networks and communication networks, whenever possible:

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| **Recommendation 46** Data describing services provided from points within a facility network should be located, whenever possible, by referencing them to the  correspondent network node elements. |

***For Environmental Management Facilities***

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| **Recommendation 47** Given that it is not expected that all of the available datasets are captured, produced and publicized by a single level of Public Administration Bodies and that it may happen that these bodies may be responsible for just one or several sub-sets of data, not necessarily categorizing the Activities following the NACE Code List, data should be transformed in such a way that at least the main class of the model (linked with Activity Complex) should be categorized by at least one of the Activities listed within the NACE Code List. |

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| **Recommendation 48** If the current thematic Legislative Act fix certain parameters for accuracy in the Geographical location of the entities (Geographical Coordinates), these should be considered as the minimum level of accuracy under INSPIRE (e.g. *Location of the Holding* under REGULATION (EC) No 1166/2008) |

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| **Recommendation 49** In order to minimize the risk of geometrical and positional incoherence between different datasets Economical Activities, when data about an instance is located by means of GM\_Object, it is recommended to choose GM\_Point as default. |

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| **Recommendation 50** When data about an instance of Economical Activities is located by means of a point or an address geo-location, this should correspond to the main access point to the space where the service is provided from. Only contrasted geo-located locations against the reality should be provided in order to avoid errors and misunderstandings. |

## Portrayal

This clause defines the rules for layers and styles to be used for portrayal of the spatial object types defined for this theme. Portrayal is regulated in Article 14 of the IRs.

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| **IR Requirement** *Article 14* **Portrayal**   1. For the portrayal of spatial data sets using a view network service as specified in Commission Regulation No 976/2009 (22), the following shall be available:    1. the layers specified in Annex II for the theme or themes the data set is related to;    2. for each layer at least a default portrayal style, with as a minimum an associated title and a unique identifier. 2. For each layer, Annex II defines the following:    1. a human readable title of the layer to be used for display in user interface;    2. the spatial object type(s), or sub-set thereof, that constitute(s) the content of the layer. |
| In section 11.1, the *types* of layers are defined that are to be used for the portrayal of the spatial object types defined in this specification. A view service may offer several layers of the same type, one for each dataset that it offers data on a specific topic. |

22 OJ L 274, 20.10.2009, p. 9.

|  |
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| NOTE The layer specification in the IRs only contains the name, a human readable title and the (subset(s) of) spatial object type(s), that constitute(s) the content of the layer. In addition, these Technical Guidelines suggest keywords for describing the layer. |
| **Recommendation 51** It is recommended to use the keywords specified in section 11.1 in the  *Layers Metadata parameters* of the INSPIRE View service (see Annex III,  Part A, section 2.2.4 in Commission Regulation (EC) No 976/2009). |
| Section [11.2](#_bookmark160) specifies one style for each of these layers. It is proposed that INSPIRE view services support this style as the default style required by Article 14(1b). |
| **TG Requirement 7** For each layer specified in this section, the styles defined in section [11.2](#_bookmark160) shall be available. |
| NOTE The default style should be used for portrayal by the view network service if no user-defined style is specified in a portrayal request for a specific layer.  In section [11.2,](#_bookmark160) further styles can be specified that represent examples of styles typically used in a thematic domain. It is recommended that also these styles should be supported by INSPIRE view services, where applicable. |
| **Recommendation 52** In addition, it is recommended that, where applicable, INSPIRE view services also support the styles defined in section [11.2.](#_bookmark160) |
| Where XML fragments are used in the following sections, the following namespace prefixes apply:   * sld="[http://www.opengis.net/sld"](http://www.opengis.net/sld) (WMS/SLD 1.1) * se="[http://www.opengis.net/se"](http://www.opengis.net/se) (SE 1.1) * ogc="<http://www.opengis.net/ogc>" (FE 1.1) |

### Layers to be provided by INSPIRE view services

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| --- | --- | --- | --- |
| **Layer Name** | **Layer Title** | **Spatial object type(s)** | **Keywords** |
| US.UtilityNetwork | Utility Network | Appurtenance, Manhole, Tower, Pole, Cabinet, Duct, Pipe | Appurtenance, Manhole, Tower, Pole, Cabinet, Duct, Pipe |
| US.ElectricityNetwork | Electricity Network | Electricity Cable, Appurtenance (if included in an electricity network) | Electricity Network |
| US.  OilGasChemicalsNetw ork | Oil, Gas or Chemicals Network | OilGasChemicalsPipe, Appurtenance (if included in an oil, gas  or chemicals network) | Oil Pipe, Gas Pipe, Chemical Pipe. |
| US.SewerNetwork | Sewer Network | SewerPipe, Appurtenance (if included in a sewer  network) | Sewer Network |
| US.ThermalNetwork | Thermal Network | ThermalPipe, Appurtenance (if  included in a thermal network) | Thermal Network |
| US.WaterNetwork | Water Network | WaterPipe, | Water Network |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Appurtenance (if included in a water network) |  |
| US. <CodeListValue>23 *Example: US.PoliceService* | <human readable name>  *Example: Police*  *Service* | GovernmentalService *(serviceType: ServiceTypeValue)* | POI, Governmental Service, Administrative Service. |
| US.EnvironmentalMan agementFacility | Environemental Management Facility | EnvironmentalManage mentFacility | Treatment Plant,  Incineration Plant, Landfill, Biogas Plant, Classification Plant |

NOTE The table above contains several layers for the spatial object type GovernmentalService, which can be further classified using a code list-valued attribute. Such sets of layers are specified as described in Article 14(3) of the IRs.

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| **IR Requirement** *Article 14* **Portrayal**  (…)   1. For spatial object types whose objects can be further classified using a code list-valued attribute, several layers may be defined. Each of these layers shall include the spatial objects corresponding to one specific code list value. In the definition of such sets of layers in Annexes II-IV,    1. the placeholder <CodeListValue> shall represent the values of the relevant code list, with the first letter in upper case,    2. the placeholder <human-readable name> shall represent the human-readable name of the code list values;    3. the spatial object type shall include the relevant attribute and code list, in parentheses;    4. one example of a layer shall be given. |

#### Layers organisation

The layer ―Utility and governmental services‖ could be comprised of:

* Administrative and social governmental service;
* Environmental management facility;
* Utility network;
* Electricity network
* Oil, gas & Chemicals network
* Water network
* Sewer network
* Thermal network
* Telecommunications network

Best practices and specific recommendations for administrative and social governmental services:

23 One layer shall be made available for each code list value, in accordance with Art. 14(3).

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| **Recommendation 53** The organisation of layers for administrative and social governmental services shall correspond to the structure of the serviceTypeValue code  list. |

―correspond to the structure of the serviceTypeValue code list‖ means, that the layer structure:

1. contains only upper items (e.g. the main group items) or
2. (partly) refines the structure of the code list (e.g. regarding types of specialized hospitals) or
3. is a mixture of a) and b) or
4. is identical to the structure of the code list.

This recommendation causes an extensive number of layers but is conform to the fact, that the majority of governmental geo-portals contain a very fine-grained layer structure and a large number of layers.

Without any specific mention below, all objects from the ―Utility and governmental service‖ thematic will be represented with the default styles of the portrayal according to their type and geometry.

* 1. **Styles required to be supported by INSPIRE view services**
     1. **Styles for the layer “Administrative and social governmental services** Best practices and specific recommendations for administrative and social governmental services: The spatial attribute, which can be used for portrayal of GovernmentalServices is serviceLocation.

The location of the service shall be portrayed as point symbols. Depending on the chosen data type for serviceLocation, the position of the symbol can either be taken directly from a point geometry or can be computed by GIS functionality (e.g. by functions like ―centroid‖ or ―pointOnSurface‖).

The usage of point symbols has some relevant advantages:

* This visualisation suits the ―POI-nature‖ of administrative and social governmental services best.
* The visualisation as point separates the service (scope of INSPIRE theme US), which is provided e.g. inside a building from the building itself (which is under the scope of INSPIRE theme Buildings and is visualised as polygon). The simultaneous representation of the service as a polygon too would create some issues (e.g. interpretation conflicts, missing coherence due to different data sources).

 When dealing with different services being provided from the same site/building (multi-purpose ones) or from neighbour ones, the point representation will make it easier to understand this multiplicity of services, whilst the representation of several overlapping polygons may also cause confusion to the user.

In the example below, the overlapping of different GS data sub-layers on a complex background consisting of a set of different base maps and thematic layers could be rather difficult to understand if all of those services where portrayed as polygons, overlapping with building, street and hydrography polygons.



**Figure 17: Example of portrayal of a multiplicity of GS type data over a complex background (Source: webEIEL, from Diputación de A Coruña – Spain.** [**http://www.dicoruna.es/webeiel)**](http://www.dicoruna.es/webeiel))

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| **Recommendation 54** Administrative and social governmental services shall be visualised by point symbols, even if their spatial reference is modelled different from  GM\_Point. |

This specification doesn‘t provide default styles for the portrayal of spatial data sets corresponding to the sub-theme Administrative and social governmental services. This issue is discussed in Annex E.

To avoid misinterpretations by the users, it is proposed to have a fine-grained layer resolution (see clause 11.1) and layer structure (see clause 11.1.1). The GetFeatureInfo operation [ISO 19128] (see Recommendation 22) will additionally help users to interpret different symbols from different data providers.

#### Styles for the layer “Environmental Management Facilities”

|  |  |
| --- | --- |
| **Style Name** | **US.EnvironmentalManagementInstallation.Default** |
| **Default Style** | yes |
| **Style Title** | Environmental Management Facility – Installation Style |
| **Style Abstract** | Point geometries are rendered as a triangle with a size of 5 pixels, with a 50% grey (#808080) fill and a black outline |
| **Symbology** | <sld:NamedLayer>  <se:Name>US.EnvironmentalManagementInstallation</se:Name>  <sld:UserStyle>  <se:Name> US.EnvironmentalManagementInstallation </se:Name>  <sld:IsDefault>1</sld:IsDefault>  <se:FeatureTypeStyle version="1.1.0" xmlns:PS="urn:xinspire: specification:EnvironmentalManagementFacility:3.1">  <se:Description>  <se:Title> Environmental Man-agement Facility – Installation Style </se:Title>  <se:Abstract>Point geometries are rendered as a triangle with a size of 5 pixels, with a 50% grey (#808080) fill and a black outline.</se:Abstract>  </se:Description>  <se:FeatureTypeName>US:EnvironmentalManagementFacility</se:FeatureTypeName>  <se:Rule>US:EnvironmentalManagementFacility.type=‘installation‘</se:Rule>  <se:PointSymbolizer>  <se:Geometry>  <ogc:PropertyName>US:geometry</ogc:PropertyName>  </se:Geometry>  </se:PointSymbolizer>  </se:Rule>  </se:FeatureTypeStyle>  </sld:UserStyle>  </sld:NamedLayer> |
| **Minimum & maximum scales** | 1:50 000 – 1:20 000 |
| **Style Name** | **US.EnvironmentalManagementSite.Default** |
| **Default Style** | yes |
| **Style Title** | Environmental Management Facility – Site Style |
| **Style Abstract** | Point geometries are rendered as a triangle with a size of 5 pixels, with a 50% grey (#808080) fill and a black outline.  Line geometries are rendered as a solid black line with a stroke width of 1 pixel.  Polygon geometries are rendered using a 50% grey (#808080) fill and a solid black outline with a stroke width of 1 pixel |

|  |  |
| --- | --- |
| **Symbology** | <sld:NamedLayer>  <se:Name>US.EnvironmentalManagementInstallation</se:Name>  <sld:UserStyle>  <se:Name> US.EnvironmentalManagementInstallation </se:Name>  <sld:IsDefault>1</sld:IsDefault>  <se:FeatureTypeStyle version="1.1.0" xmlns:PS="urn:xinspire: specification:EnvironmentalManagementFacility:3.1">  <se:Description>  <se:Title> Environmental Man-agement Facility – Installation Style </se:Title>  <se:Abstract>Point geometries are rendered as a circle with a size of 7 pixels, with a 50% grey (#808080) fill and a black outline.  Line geometries are rendered as a solid black line with a stroke width of 1 pixel.  Polygon geometries are rendered using a 50% grey (#808080) fill and a solid black outline with a stroke width of 1pixel.</se:Abstract>  </se:Description>  <se:FeatureTypeName>US:EnvironmentalManagementFacility</se:FeatureTypeName>  <se:Rule>US:EnvironmentalManagementFacility.type=‘site‘</se:Rule>  <se:PointSymbolizer>  <se:Geometry>  <ogc:PropertyName>US:geometry</ogc:PropertyName>  </se:Geometry>  </se:PointSymbolizer>  </se:Rule>  </se:FeatureTypeStyle>  </sld:UserStyle>  </sld:NamedLayer> |
| **Minimum & maximum scales** | 1:50 000 – 1:20 000 |

* 1. **Other recommended styles**

No other well-defined styles are defined in this specification.

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[*http://inspire.jrc.ec.europa.eu/documents/Data\_Specifications/D2.5\_v3.4rc2.pdf*](http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/D2.5_v3.4rc2.pdf)

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[ISO 19107] EN ISO 19107:2005, Geographic information – Spatial schema (ISO 19107:2003) [ISO 19108] EN ISO 19108:2005 Geographic information - Temporal schema (ISO 19108:2002)

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003) [ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation [ISO 19157] ISO/DIS 19157, Geographic information – Data quality

[OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0

**Annex A**

(normative)

**Abstract Test Suite**

|  |
| --- |
| **Disclaimer**  While this Annex refers to the Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards  interoperability of spatial data sets and services, it does not replace the legal act or any part of it. |
| The objective of the Abstract Test Suite (ATS) included in this Annex is to help the conformance testing process. It includes a set of tests to be applied on a data set to evaluate whether it fulfils the requirements included in this data specification and the corresponding parts of Commission Regulation No 1089/2010 (implementing rule as regards interoperability of spatial datasets and services, further referred to as ISDSS Regulation). This is to help data providers in declaring the conformity of a data set to the ―degree of conformity, with implementing rules adopted under Article 7(1) of Directive 2007/2/EC‖, which is required to be provided in the data set metadata according to Commission Regulation (EC) No 2008/1205 (the Metadata Regulation).  **Part 1** of this ATS includes tests that provide **input for assessing conformity with the ISDSS regulation.** In order to make visible which requirements are addressed by a specific test, references to the corresponding articles of the legal act are given. The way how the cited requirements apply to US specification is described under the testing method.  In addition to the requirements included in ISDSS Regulation this Technical guideline contains TG requirements too. TG requirements are technical provisions that need to be fulfilled in order to be conformant with the corresponding IR requirement when the specific technical implementation proposed in this document is used. Such requirements relate for example to the default encoding described in section 9. **Part 2** of the ATS presents tests necessary for assessing the **conformity with TG requirements**.  NOTE Conformance of a data set with the TG requirement(s) included in this ATS implies conformance with the corresponding IR requirement(s).  The **ATS is applicable to the data sets that have been transformed** to be made available through INSPIRE download services (i.e. the data returned as a response to the mandatory ―Get Spatial Dataset‖ operation) rather than the original ―source‖ data sets.  The requirements to be tested are grouped in several *conformance classes*. Each of these classes covers a specific aspect: one conformance class contains tests reflecting the requirements on the application schema, another on the reference systems, etc. **Each conformance class is identified by a URI** (uniform resource identifier) according to the following pattern:  [http://inspire.ec.europa.eu/conformance-class/ir/US/<](http://inspire.ec.europa.eu/conformance-class/ir/US/)conformance class identifier>  EXAMPLE 1 The URI [*http://inspire.ec.europa.eu/conformance-class/ir/ef/rs*](http://inspire.ec.europa.eu/conformance-class/ir/ef/rs)identifies the Reference Systems ISDSS conformance class of the Environmental Monitoring Facilities (EF) data theme.  The results of the tests should be published referring to the relevant conformance class (using its URI).  When an INSPIRE data specification contains **more than one application schema,** the requirements  tested in a conformance class may differ depending on the application schema used as a target for the transformation of the data set. This will always be the case for the application schema conformance |

class. However, also other conformance classes could have different requirements for different application schemas. In such cases, a separate conformance class is defined for each application schema, and they are distinguished by specific URIs according to the following pattern:

[http://inspire.ec.europa.eu/conformance-class/ir/US/<](http://inspire.ec.europa.eu/conformance-class/ir/US/)conformance

<application schema namespace prefix>

class

identifier>/

EXAMPLE 2 The URI [*http://inspire.ec.europa.eu/conformance-class/ir/el/as/el-vec*](http://inspire.ec.europa.eu/conformance-class/ir/el/as/el-vec)identifies the conformity with the application schema (*as*) conformance class for the Elevation Vector Elements (*el- vec*) application schema.

An overview of the conformance classes and the associated tests is given in the table below.

* 1. [Application Schema Conformance Class](#_bookmark166) [129](#_bookmark166)
     1. [Schema element denomination test](#_bookmark167) [129](#_bookmark167)
     2. [Value type test](#_bookmark168) [129](#_bookmark168)
     3. [Value test](#_bookmark169) [130](#_bookmark169)
     4. [Attributes/associations completeness test](#_bookmark170) [130](#_bookmark170)
     5. [Abstract spatial object test](#_bookmark171) [130](#_bookmark171)
     6. [Constraints test](#_bookmark172) [131](#_bookmark172)
     7. [Geometry representation test](#_bookmark173) [131](#_bookmark173)
  2. [Reference Systems Conformance Class](#_bookmark174) [131](#_bookmark174)
     1. [Datum test](#_bookmark175) [131](#_bookmark175)
     2. [Coordinate reference system test](#_bookmark176) [131](#_bookmark176)
     3. [View service coordinate reference system test](#_bookmark177) [132](#_bookmark177)
     4. [Temporal reference system test](#_bookmark178) [132](#_bookmark178)
     5. [Units of measurements test](#_bookmark179) [133](#_bookmark179)
  3. [Data Consistency Conformance Class](#_bookmark180) [133](#_bookmark180)
     1. [Unique identifier persistency test](#_bookmark181) [133](#_bookmark181)
     2. [Version consistency test](#_bookmark182) [133](#_bookmark182)
     3. [Life cycle time sequence test](#_bookmark183) [134](#_bookmark183)
     4. [Validity time sequence test](#_bookmark184) [134](#_bookmark184)
     5. [Update frequency test](#_bookmark185) [134](#_bookmark185)
  4. [Data Quality Conformance Class](#_bookmark186) [134](#_bookmark186)
  5. [Metadata IR Conformance Class](#_bookmark187) [135](#_bookmark187)
     1. [Metadata for interoperability test](#_bookmark188) [135](#_bookmark188)
  6. [Information Accessibility Conformance Class](#_bookmark189) [135](#_bookmark189)
     1. [Code list publication test](#_bookmark190) [135](#_bookmark190)
     2. [CRS publication test](#_bookmark191) [135](#_bookmark191)
     3. [CRS identification test](#_bookmark192) [136](#_bookmark192)
  7. [Data Delivery Conformance Class](#_bookmark193) [136](#_bookmark193)
     1. [Encoding compliance test](#_bookmark194) [136](#_bookmark194)
  8. [Portrayal Conformance Class](#_bookmark195) [136](#_bookmark195)
     1. [Layer designation test](#_bookmark196) [136](#_bookmark196)
  9. [Technical Guideline Conformance Class](#_bookmark197) [138](#_bookmark197)
     1. [Multiplicity test](#_bookmark198) [138](#_bookmark198)
     2. [CRS http URI test](#_bookmark199) [138](#_bookmark199)
     3. [Metadata encoding schema validation test](#_bookmark200) [138](#_bookmark200)
     4. [Metadata occurrence test](#_bookmark201) [139](#_bookmark201)
     5. [Metadata consistency test](#_bookmark202) [139](#_bookmark202)
     6. [Encoding schema validation test](#_bookmark203) [139](#_bookmark203)
     7. [Style test](#_bookmark204) [139](#_bookmark204)

In order to be conformant to a conformance class, a data set has to pass **all** tests defined for that conformance class.

In order to be conformant with the ISDSS regulation the inspected data set needs to be conformant to **all** conformance classes in Part 1. The conformance class for overall conformity with the ISDSS regulation is identified by the URI [*http://inspire.ec.europa.eu/conformance-class/ir/US/.*](http://inspire.ec.europa.eu/conformance-class/ir/US/)

In order to be conformant with the Technical Guidelines, the dataset under inspection needs to be conformant to all conformance classes included both in Part 1 and 2. Chapter 8 describes in detail how to publish the result of testing regarding overall conformity and conformity with the conformance classes as metadata. The conformance class for overall conformity with the Technical Guidelines is identified by the URI [*http://inspire.ec.europa.eu/conformance-class/tg/US/x.y.(z).*](http://inspire.ec.europa.eu/conformance-class/tg/US/x.y.(z))

It should be noted that data providers are not obliged to integrate / decompose the original structure of the source data sets when they deliver them for INSPIRE. It means that a conformant dataset can contain less or more spatial object / data types than specified in the ISDSS Regulation.

**A dataset that contains less spatial object and/or data types** can be regarded conformant when the corresponding types of the source datasets after the necessary transformations fulfil the requirements set out in the ISDSS Regulation.

A **dataset that contain more spatial object and/or data types** may be regarded as conformant when

* all the spatial object / data types that have corresponding types in the source dataset after the necessary transformations fulfil the requirements set out in the ISDSS Regulation and
* all additional elements of the source model (spatial object types, data types, attributes, constraints, code lists and enumerations together with their values) do not conflict with any rule defined in the interoperability target specifications defined for any theme within INSPIRE.

The ATS contains a detailed list of abstract tests. It should be noted that some tests in the Application schema conformance class can be automated by utilising xml **schema validation tools.** It should be noted that failing such validation test does not necessary reflect non-compliance to the application schema; it may be the results of erroneous encoding.

Each test in this suit follows the same structure:

* + Requirement: citation from the legal texts (ISDSS requirements) or the Technical Guidelines (TG requirements);
  + Purpose: definition of the scope of the test;
  + Reference: link to any material that may be useful during the test;
  + Test method: description of the testing procedure.

According to ISO 19105:2000 all tests in this ATS are basic tests. Therefore, this statement is not repeated each time.

**Part 1**

(normative)

**Conformity with Commission Regulation No 1089/2010**

* 1. **Application Schema Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-govserv> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-emf> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-common> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-el> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-ogc> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-sw> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-th> <http://inspire.ec.europa.eu/conformance-class/ir/us/as/us-net-wa>

#### Schema element denomination test

1. Purpose: Verification whether each element of the dataset under inspection carries a name specified in the target application schema(s).
2. Reference: Art. 3 and Art.4 of Commission Regulation No 1089/2010
3. Test Method: Examine whether the corresponding elements of the source schema (spatial object types, data types, attributes, association roles, code lists, and enumerations) are mapped to the target schema with the correct designation of mnemonic names.

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

#### Value type test

1. Purpose: Verification whether all attributes or association roles use the corresponding value types specified in the application schema(s).
2. Reference: Art. 3, Art.4, Art.6(1), Art.6(4), Art.6(5) and Art.9(1)of Commission Regulation No 1089/2010.
3. Test Method: Examine whether the value type of each provided attribute or association role adheres to the corresponding value type specified in the target specification.

NOTE 1 This test comprises testing the value types of INSPIRE identifiers, the value types of attributes and association roles that should be taken from enumeration and code lists, and the coverage domains.

NOTE 2 Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

#### Value test

1. Purpose: Verify whether all attributes or association roles whose value type is a code list or enumeration take the values set out therein.
2. Reference: Art.4 (3) of Commission Regulation No 1089/2010.
3. Test Method: When an attribute / association role has an enumeration or code list as its type, compare the values of each instance with those provided in the application schema. To pass this tests any instance of an attribute / association role
   * shall not take any other value than defined in the enumeration table when its type is an enumeration.
   * shall take only values explicitly specified in the code list when the code list‘s extensibility is

―none‖.

* + shall take only a value explicitly specified in the code list or shall take a value that is narrower (i.e. more specific) than those explicitly specified in the application schema when the code list‘s extensibility is ―narrower‖.

NOTE 1 This test is not applicable to code lists with extensibility ―open‖ or ―any‖.

NOTE 2 When a data provider only uses code lists with narrower (more specific values) this test can be fully performed based on internal information.

#### Attributes/associations completeness test

1. Purpose: Verification whether each instance of spatial object type and data types include all attributes and association roles as defined in the target application schema.
2. Reference: Art. 3, Art.4(1), Art.4(2), and Art.5(2) of Commission Regulation No 1089/2010.
3. Test Method: Examine whether all attributes and association roles defined for a spatial object type or data type are present for each instance in the dataset.

NOTE 1 Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

NOTE 2 For all properties defined for a spatial object, a value has to be provided if it exists in or applies to the real world entity – either the corresponding value (if available in the data set maintained by the data provider) or the value of *void.* If the characteristic described by the attribute or association role does not exist in or apply to the real world entity, the attribute or association role does not need to be present in the data set.

#### Abstract spatial object test

1. Purpose: Verification whether the dataset does NOT contain abstract spatial object / data types defined in the target application schema(s).
2. Reference: Art.5(3) of Commission Regulation No 1089/2010
3. Test Method: Examine that there are NO instances of abstract spatial object / data types in the dataset provided.

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

#### Constraints test

1. Purpose: Verification whether the instances of spatial object and/or data types provided in the dataset adhere to the constraints specified in the target application schema(s).
2. Reference: Art. 3, Art.4(1), and Art.4(2) of Commission Regulation No 1089/2010.
3. Test Method: Examine all instances of data for the constraints specified for the corresponding spatial object / data type. Each instance shall adhere to all constraints specified in the target application schema(s).

NOTE Further technical information is in the Feature catalogue and UML diagram of the application schema(s) in section 5.2.

#### Geometry representation test

a) Purpose: Verification whether the value domain of spatial properties is restricted as specified in the Commission Regulation No 1089/2010.

1. Reference: Art.12(1), Annex III Section 6 of Commission Regulation No 1089/2010

c) Test Method: Check whether all spatial properties only use 0, 1 and 2-dimensional geometric objects that exist in the right 2-, 3- or 4-dimensional coordinate space, and where all curve interpolations respect the rules specified in the reference documents.

NOTE Further technical information is in OGC Simple Feature spatial schema v1.2.1 [06-103r4].

* 1. **Reference Systems Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformanceClass/ir/us/rs>

#### Datum test

a) Purpose: Verify whether each instance of a spatial object type is given with reference to one of the (geodetic) datums specified in the target specification.

c) Reference: Annex II Section 1.2 of Commission Regulation No 1089/2010

1. Test Method: Check whether each instance of a spatial object type specified in the application schema(s) in section 5 has been expressed using:
   * the European Terrestrial Reference System 1989 (ETRS89) within its geographical scope; or
   * the International Terrestrial Reference System (ITRS) for areas beyond the ETRS89 geographical scope; or
   * other geodetic coordinate reference systems compliant with the ITRS. Compliant with the ITRS means that the system definition is based on the definition of ITRS and there is a well- established and described relationship between both systems, according to the EN ISO 19111.

NOTE Further technical information is given in Section 6 of this document.

#### Coordinate reference system test

a) Purpose: Verify whether the two- and three-dimensional coordinate reference systems are used as defined in section 6.

1. Reference: Section 6 of Commission Regulation 1089/2010.
2. Test Method: Inspect whether the horizontal and vertical components of coordinates one of the corresponding coordinate reference system has been:
   * + - Three-dimensional Cartesian coordinates based on a datum specified in 1.2 and using the

parameters of the Geodetic Reference System 1980 (GRS80) ellipsoid.

* + - * Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height) based on a datum specified in 1.2 and using the parameters of the GRS80 ellipsoid.
      * Two-dimensional geodetic coordinates (latitude and longitude) based on a datum specified in

1.2 and using the parameters of the GRS80 ellipsoid.

* + - * Plane coordinates using the ETRS89 Lambert Azimuthal Equal Area coordinate reference system.
      * Plane coordinates using the ETRS89 Lambert Conformal Conic coordinate reference system.
      * Plane coordinates using the ETRS89 Transverse Mercator coordinate reference system.
      * For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope. Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS.
      * For the vertical component in marine areas where there is an appreciable tidal range (tidal waters), the Lowest Astronomical Tide (LAT) shall be used as the reference surface.
      * For the vertical component in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 meters, the Mean Sea Level (MSL) or a well- defined reference level close to the MSL shall be used as the reference surface.―
      * For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere, or other linear or parametric reference systems shall be used. Where other parametric reference systems are used, these shall be described in an accessible reference using EN ISO 19111-2:2012.

NOTE Further technical information is given in Section 6 of this document.

#### View service coordinate reference system test

1. Purpose: Verify whether the spatial data set is available in the two dimensional geodetic coordinate system for their display with the INSPIRE View Service.
2. Reference: Annex II Section 1.4 of Commission Regulation 1089/2010
3. Test Method: Check that each instance of a spatial object types specified in the application schema(s) in section 5 is available in the two-dimensional geodetic coordinate system

NOTE Further technical information is given in Section 6 of this document.

#### Temporal reference system test

1. Purpose: Verify whether date and time values are given as specified in Commission Regulation No 1089/2010.
2. Reference: Art.11(1) of Commission Regulation 1089/2010
3. Test Method: Check whether:
   * the Gregorian calendar is used as a reference system for date values;
   * the Universal Time Coordinated (UTC) or the local time including the time zone as an offset from UTC are used as a reference system for time values.

NOTE Further technical information is given in Section 6 of this document.

#### Units of measurements test

1. Purpose: Verify whether all measurements are expressed as specified in Commission Regulation No 1089/2010.
2. Reference: Art.12(2) of Commission Regulation 1089/2010
3. Test Method: Check whether all measurements are expressed in SI units or non-SI units accepted for use with the International System of Units.

NOTE 1 Further technical information is given in ISO 80000-1:2009.

NOTE 2 Degrees, minutes and seconds are non-SI units accepted for use with the International System of Units for expressing measurements of angles.

* 1. **Data Consistency Conformance Class**

<http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-govserv> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-emf> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-common> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-el> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-ogc> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-sw> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-th> <http://inspire.ec.europa.eu/conformance-class/ir/us/dc/us-net-wa>

#### Unique identifier persistency test

1. Purpose: Verify whether the namespace and localId attributes of the external object identifier remain the same for different versions of a spatial object.
2. Reference: Art. 9 of Commission Regulation 1089/2010.
3. Test Method: Compare the namespace and localId attributes of the external object identifiers in the previous version(s) of the dataset with the namespace and localId attributes of the external object identifiers of current version for the same instances of spatial object / data types; To pass the test, neither the namespace, nor the localId shall be changed during the life-cycle of a spatial object.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

NOTE 2 When using URI this test includes the verification whether no part of the construct has been changed during the life cycle of the instances of spatial object / data types.

NOTE 3 Further technical information is given in section 14.2 of the INSPIRE Generic Conceptual Model.

#### Version consistency test

1. Purpose: Verify whether different versions of the same spatial object / data type instance belong to the same type.
2. Reference: Art. 9 of Commission Regulation 1089/2010.

c) Test Method: Compare the types of different versions for each instance of spatial object / data type

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

#### Life cycle time sequence test

1. Purpose: Verification whether the value of the attribute beginLifespanVersion refers to an earlier moment of time than the value of the attribute endLifespanVersion for every spatial object / object type where this property is specified.
2. Reference: Art.10(3) of Commission Regulation 1089/2010.
3. Test Method: Compare the value of the attribute beginLifespanVersion with attribute endLifespanVersion. The test is passed when the beginLifespanVersion value is before endLifespanVersion value for each instance of all spatial object/data types for which this attribute has been defined.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

#### Validity time sequence test

1. Purpose: Verification whether the value of the attribute validFrom refers to an earlier moment of time than the value of the attribute validTo for every spatial object / object type where this property is specified.
2. Reference: Art.12(3) of Commission Regulation 1089/2010.
3. Test Method: Compare the value of the attribute validFrom with attribute validTo. The test is passed when the validFrom value is before validTo value for each instance of all spatial object/data types for which this attribute has been defined.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

#### Update frequency test

1. Purpose: Verify whether all the updates in the source dataset(s) have been transmitted to the dataset(s) which can be retrieved for the US using INSPIRE download services.
2. Reference: Art.8 (2) of Commission Regulation 1089/2010.
3. Test Method: Compare the values of beginning of life cycle information in the source and the target datasets for each instance of corresponding spatial object / object types. The test is passed when the difference between the corresponding values is less than 6 months.

NOTE 1 This test can be performed exclusively on the basis of the information available in the database of the data providers.

* 1. **Data Quality Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/dq>

* 1. **Metadata IR Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/md>

#### Metadata for interoperability test

1. Purpose: Verify whether the metadata for interoperability of spatial data sets and services described in 1089/2010 Commission Regulation have been created and published for each dataset related to the US data theme.
2. Reference: Art.13 of Commission Regulation 1089/2010
3. Test Method: Inspect whether metadata describing the coordinate reference systems, encoding, topological consistency and spatial representation type have been created and published. If the spatial data set contains temporal information that does not refer to the default temporal reference system, inspect whether metadata describing the temporal reference system have been created and published. If an encoding is used that is not based on UTF-8, inspect whether metadata describing the character encoding have been created.

NOTE Further technical information is given in section 8 of this document.

* 1. **Information Accessibility Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/ia>

#### Code list publication test

1. Purpose: Verify whether all additional values used in the data sets for attributes, for which narrower values or any other value than specified in Commission Regulation 1089/2010 are allowed, are published in a register.
2. Reference: Art.6(3)

b) Reference: Art.6(3) and Annex III Section 6

c) Test method: For each additional value used in the data sets for code list-valued attributes, check whether it is published in a register.

NOTE Further technical information is given in section 5 of this document.

#### CRS publication test

1. Purpose: Verify whether the identifiers and the parameters of coordinate reference system are published in common registers.
2. Reference: Annex II Section 1.5
3. Test method: Check whether the identifier and the parameter of the CRS used for the dataset are included in a register. .

NOTE Further technical information is given in section 6 of this document.

#### CRS identification test

1. Purpose: Verify whether identifiers for other coordinate reference systems than specified in Commission Regulation 1089/2010 have been created and their parameters have been described according to EN ISO 19111 and ISO 19127.
2. Reference: Annex II Section 1.3.4
3. Test method: Check whether the register with the identifiers of the coordinate reference systems is accessible.

NOTE Further technical information is given in section 6 of this document.

* 1. **Data Delivery Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/de>

#### Encoding compliance test

1. Purpose: Verify whether the encoding used to deliver the dataset comply with EN ISO 19118.
2. Reference: Art.7 (1) of Commission Regulation 1089/2010.
3. Test Method: Follow the steps of the Abstract Test Suit provided in EN ISO 19118.

NOTE 1 Datasets using the default encoding specified in Section 9 fulfil this requirement. NOTE 2 Further technical information is given in Section 9 of this document.

* 1. **Portrayal Conformance Class**

**Conformance class:**

<http://inspire.ec.europa.eu/conformance-class/ir/us/po>

#### Layer designation test

a) Purpose: verify whether each spatial object type has been assigned to the layer designated according to Commission Regulation 1089/2010.

1. Reference: Art. 14(1), Art14(2) and Annex II Section 6.
2. Test Method: Check whether data is made available for the view network service using the specified layers respectively:

|  |  |  |
| --- | --- | --- |
| **Layer Name** | **Layer Title** | **Spatial object type** |
| US.UtilityNetwork | Utility Network | Appurtenance, Manhole, Tower, Pole, Cabinet, Duct, Pipe |
| US.ElectricityNetwork | Electricity Network | Electricity Cable, Appurtenance (if included in an electricity network) |
| US. OilGasChemicalsNetwork | Oil, Gas or Chemicals Network | OilGasChemicalsPipe, Appurtenance (if included in an oil, gas or chemicals network) |

|  |  |  |
| --- | --- | --- |
| US.SewerNetwork | Sewer Network | SewerPipe, Appurtenance (if included in a sewer network) |
| US.ThermalNetwork | Thermal Network | ThermalPipe, Appurtenance (if included in a thermal network) |
| US.WaterNetwork | Water Network | WaterPipe, Appurtenance (if included in a water network) |
| US. <CodeListValue>24  *Example: US.PoliceService* | <human readable name>  *Example: Police Service* | GovernmentalService  *(serviceType: ServiceTypeValue)* |
| US.EnvironmentalManagemen tFacility | Environemental Management Facility | EnvironmentalManagementFacility |

NOTE Further technical information is given in section 11 of this document.

24 One layer shall be made available for each code list value, in accordance with Art. 14(3).

**Part 2**

(informative)

**Conformity with the technical guideline (TG) Requirements**

* 1. **Technical Guideline Conformance Class**

**Conformance class:**

[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-govserv*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-govserv)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-emf*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-emf)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-common*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-common)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-el*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-el)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-ogc*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-ogc)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-sw*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-sw)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-th*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-th)[*http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-wa*](http://inspire.ec.europa.eu/conformanceClass/tg/us/us-net-wa)

#### Multiplicity test

a) Purpose: Verify whether each instance of an attribute or association role specified in the application schema(s) does not include fewer or more occurrences than specified in section 5.

c) Reference: Feature catalogue and UML diagram of the application schema(s) in section 5 of this guideline.

b) Test Method: Examine that the number of occurrences of each attribute and/or association role for each instance of a spatial object type or data type provided in the dataset corresponds to the number of occurrences of the attribute / association role that is specified in the application schema(s) in section 5.

#### CRS http URI test

a) Purpose: Verify whether the coordinate reference system used to deliver data for INSPIRE network services has been identified by URIs according to the EPSG register.

c) Reference: Table 2 in Section 6 of this technical guideline

b) Test Method: Compare the URI of the dataset with the URIs in the table.

NOTE 1 Passing this test implies the fulfilment of test A6.2

NOTE 2 Further reference please see [*http://www.epsg.org/geodetic.html*](http://www.epsg.org/geodetic.html)

#### Metadata encoding schema validation test

a) Purpose: Verify whether the metadata follows an XML schema specified in ISO/TS 19139.

c) Reference: Section 8 of this technical guideline, ISO/TS 19139

b) Test Method: Inspect whether provided XML schema is conformant to the encoding specified in ISO 19139 for each metadata instance.

NOTE 1 Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schemas that are currently available.

#### Metadata occurrence test

a) Purpose: Verify whether the occurrence of each metadata element corresponds to those specified in section 8.

c) Reference: Section 8 of this technical guideline

b) Test Method: Examine the number of occurrences for each metadata element. The number of occurrences shall be compared with its occurrence specified in Section 8:

NOTE 1 Section 2.1.2 of the Metadata Technical Guidelines discusses the different ISO 19139 XML schema

#### Metadata consistency test

a) Purpose: Verify whether the metadata elements follow the path specified in ISO/TS 19139.

c) Reference: Section 8 of this technical guideline, ISO/TS 19139

b) Test Method: Compare the XML schema of each metadata element with the path provide in ISO/TS 19137.

NOTE 1 This test does not apply to the metadata elements that are not included in ISO/TS 19139.

#### Encoding schema validation test

a) Purpose: Verify whether the provided dataset follows the rules of default encoding specified in section 9 of this document

c) Reference: section 9 of this technical guideline

b) Test Method: Inspect whether provided encoding(s) is conformant to the encoding(s) for the relevant application schema(s) as defined in section 9:

NOTE 1 Applying this test to the default encoding schema described in section 9 facilitates testing conformity with the application schema specified in section 5. In such cases running this test with positive result may replace tests from A1.1 to A1.4 provided in this abstract test suite.

NOTE 2 Using Schematron or other schema validation tool may significantly improve the validation process, because some some complex constraints of the schema cannot be validated using the simple XSD validation process. On the contrary to XSDs Schematron rules are not delivered together with the INSPIRE data specifications. Automating the process of validation (e.g. creation of Schematron rules) is therefore a task and an opportunity for data providers.

#### Style test

1. Purpose: Verify whether the styles defined in section 11.2 have been made available for each specified layer.
2. Reference: section 11.2.
3. Test Method: Check whether the styles defined in section 11.2 have been made available for each specified layer.

**Annex B** (informative) **Use cases**

This annex describes the use cases that were used as a basis for the development of this data specification:

As mentioned in Annex E of the "―Data Specifications‖ Methodology for the development of data specifications", the TWG-US identified several use cases for some sub-themes that are hereunder referenced, or detailed within the checklist framework presented in another Annex (i.e. Annex C Check Lists for Data Interoperability").

* 1. **Use case for “Utility networks”**

##### Introduction

This document provides a use case of the subtheme ―Utility networks‖ within the INSPIRE theme

―Utility and Government services‖ (US).

This subtheme is described in the INSPIRE Feature Concept Dictionary as follows:

*“Utility services/networks: Physical construction for transport of defined products: These may include pipelines for transport of oil, gas, water, sewage or other pipelines. Transmission lines may include electrical, phone, cable-TV or other networks. Transmission lines for both land and at sea/water (bottom) is important. All kinds of transmission systems have nodes and are linked to facilities for production and treatment of different kinds of products. Despite being heavily interlinked, the themes in INSPIRE are treated separately – the production and treatment facilties are treated mainly in the theme production and industrial facilities. Transmission systems may be of different kinds;*

* + - * *Oil and gas pipelines: Major lines from oil and gas fields/extraction areas and storage sites. Important production and treatment facilities of such resources is linked to a such a transport network, such as nuclear power stations, power stations, transformer stations and oil tanks. GISCO, Energy/ industry authorities, Companies*
      * *Water pipelines: Location of water pipelines – large and local network. Large transmission lines are of interest here. Linked to production facilities for water for consumption/processes. Irrigation lines treated separately under agricultural facilities. Water supply institutions, Utilities/ health*
      * *Sewage pipelines: Sewage network, linked to sewerage facilities. Major lines of interest here. Utilities*
      * *Transmission lines- electrical: Data set showing larger transmission lines for electricity, both at land and sea. The location of lines is important knowledge for the energy sector itself, land use planners, construction, fisheries for sea cables. Parts of the information important in low flight hindrance databases. Large: national energy/industry institutions. Local authorities, Companies*
      * *Transmission lines-phone/ data/cable-TV: Location of phone/ data: Rough data needed in land planning. Important transmission nodes, e.g. antennas, may be seen as part of the network. The cables placement can conflict other natural resource utilization activities, e.g. fisheries. Technical data accuracy for local level Companies*

Rough pipeline and utility service databases exist at European level, e.g. GISCO database with scale 1:1.000.000. Data within countries is non-homogenous. There are examples of national portals warning on construction, distributing maps/data on location of pipelines. At local and regional level the responsibility of government offices or different operators/ firms. In some countries there are national portals for information about cables etc. in construction work.‖

##### Use case description: Use case TWG\_US\_UN\_KLIP

**Part 1: UML use case diagram**

Perform plan request Send plan request



Cables and lines information portal



Plan applicant

Confirm plan request

Define area of work

Managing Authoristies of Cables and Lines

Send plans

**Part 2: Narrative explanation of the use case**

The cables and pipes information portal (called KLIP) has been designed to unlock the information concerning cables and pipelines. This information is available with the managing authorities of the cables and pipes. The purpose of the information portal is to avoid excavation damage. Excavation damage may occur when a contractor digs and hits a cable or pipe. When a contractor hits a cable or pipe, this can cause environmental problems. When a sewage pipeline is hit, wastewater can flow into the environment. Also damaging oil, gas and chemical pipelines can cause severe environmental problems. When a water pipeline is hit, drinking water can get contaminated. Damaging an electricity cable poses also a big health risk for the people in the direct neighborhood. Therefore this KLIP portal is very important.

When a contractor plans excavation works he/she sends a plan request to the cables and pipes information portal. The information portal checks which managing authorities of cables and pipes are present in this area, and forwards the request to the managing authorities that are present in the area. This can be managing authorities of oil, gas and chemicals pipelines, water pipelines, sewage pipelines, transmission cables – electrical, telecommunication cables - phone/data/cable tv, etc. - and heating pipelines.

The cables and pipes information portal sends a confirmation to the contractor who asked for the plans. The managing authority checks if they have indeed cables and/or pipes in the defined area. The relevant plans in this area are selected. The managing authority sends the selected plans by mail. After the contractor has received the plans, he can start the works.

**Part 3: Detailed, structured description of the use case**

|  |  |
| --- | --- |
| **Use Case Description** | |
| Name | Cables and pipes information portal |
| Priority | <high/medium/low> |
| Description | This information portal has been designed to unlock the information concerning cables and pipes. This information is available with the managing authorities of the cables and pipes. The purpose of the information portal is to avoid excavation  damage. |
| Pre-condition | The managing authorities of cables and pipes indicate the zones where they manage cables and pipes. |
| **Flow of Events - Basic Path** | |
| Step 1 | The contractor goes to the information portal and defines the area of work. |
| Step 2 | The information portal checks which managing authorities of cables and pipes are present in this area and sends a request to these managing authorities. |
| Step 3 | The information portal also sends a confirmation to the contractor. |
| Step 4 | The managing authority checks if they have indeed cables and/or pipes in the defined area. The relevant plans in this area are selected. |

|  |  |
| --- | --- |
| Step 5 | The managing authority sends the selected plans by mail. After the contractor has received the plans, he can start the works. |
|  |  |
| **Flow of Events - Alternative Paths** | |
| Step 6 | In future View Services will be provided instead of paper maps |
|  |  |
| Post-condition | The contractor can start working in the area of work. |
| **Data source: Oil, gas and chemicals pipelines** | |
| Description | Location of oil, gas and chemicals pipelines |
| Data provider | Municipalities, private bodies managing the oil, gas and chemicals pipelines |
| Geographic scope | Europe |
| Thematic scope | See description |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |
| **Data source: Water pipelines** | |
| Description | Location of water pipelines |
| Data provider | Municipalities, private bodies managing the water pipelines |
| Geographic scope | Europe |
| Thematic scope | See description |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |
| **Data source: Sewage pipelines** | |
| Description | Location of sewage pipelines |
| Data provider | Municipalities, private bodies managing the sewage pipelines |
| Geographic scope | Europe |
| Thematic scope | See description |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |
| **Data source: Heating pipelines** | |
| Description | Location of heating pipelines |
| Data provider | Municipalities, private bodies managing the heating pipelines |
| Geographic scope | Europe |
| Thematic scope | See description |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |
| **Data source: Electricity cables** | |
| Description | Location of electricity cables |
| Data provider | Municipalities, private bodies managing the electrical transmission cables |
| Geographic scope | Europe |
| Thematic | See description |

|  |  |
| --- | --- |
| scope |  |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |
| **Data source: Telecommunication cables** | |
| Description | Location of phone/data/cable tv transmission cables |
| Data provider | Municipalities, private bodies managing the phone/data/cable tv transmission cables |
| Geographic scope | Europe |
| Thematic scope | See description |
| Scale, resolution | Local |
| Delivery | Map, View Services (map layer) |
| Documentation | <http://klip.agiv.be/Support/Default.aspx> |

* 1. **Use case for “Administrative and social governmental services”**

#### Introduction

This documents provides two use cases of the subtheme ―Government services‖ (GS) within the INSPIRE theme ―Utility and Government services‖ (US).

According to (D 2.6, p. 79) the theme and the subtheme respectively is ―A very broad INSPIRE theme including different kinds of objects …‖.

The subtheme is defined as follows (D 2.6, p. 81):

―Administrative and social governmental services such as public administrations, civil protection, sites, schools, hospitals. The kinds of sites are commonly presented in governmental and municipal portals and map system as "point of interest"-data, and may be point-based location of a variety of categories of municipal and governmental services and social infrastructure.

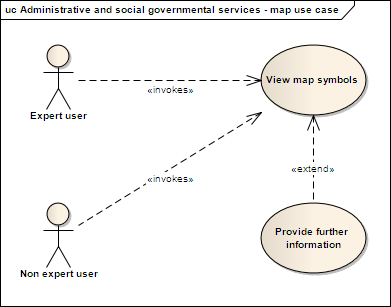
* + - * police stations,
      * fire fighter stations
      * hospitals
      * health care centres
      * care centres for the elderly
      * schools and kindergartens
      * renovation/ waste delivery sites
      * government and municipal offices‖

The given scope and use examples are (D 2.6, p. 82):

―Administrative and governmental service information is being used by the citizen and public information systems, in government and municipal management actions and in planning. The navigation databases used in cars commonly include such information.‖

Accordingly to this presetting, the spread of possible use cases is very wide, too. To capture this scope and to gain a basement for the next steps, the subgroup has decided to define first two generic, high level use cases. This two use cases may be refined in further work to fulfill special requirements. It should be mentioned, that the previous requirement survey by the JRC couldn‘t provide any use case for the subtheme.

#### Use case TWG\_US\_GS\_Map\_case

**Part 1: UML use case diagram**

**Part 2: Narrative explanation of the use case**

The data, which represent the scope, are usually used in governmental and municipal portals. The data are provided as map layers, optional supplemented by some thematic data (WMS GetFeatureInfo operation). The user (actor) searches for the layer using the functionality of a geoportal, selects the layer, navigates to a location and views (―consumes‖) the map. POI‘s are displayed as symbols. The actor can click at a symbol and gets some information to the POI (in case the layer is queryable).

In contrast to the majority of INSPIRE themes, the group of actors is as inhomogeneous as the interfaces they use. It varies from a GI-expert (PAB officer, private planning office staff, …), who wants to add the layer in its GIS to a layman, who uses a map application on its mobile phone. This diversity is addressed by the functionality of the map clients mainly, but has some influence to the data, too:

* The symbols for the POI‘s should be easy to understand.
* The map layer metadata should provide a list of keywords, so that the clients are able to support search by laymen (in an emergency case search for ―Doctor‖ should find

―Hospital‖, too).

* A minimum of thematic information is necessary for a lot of use cases in detail (e.g. kind of service, short explanation, contact information, service/office hours, URL, …). Usually the map applications don‘t include rich WFS clients, so this information should be provided by the INSPIRE View Service. It has to be mentioned, that the GetFeatureInfo operation is optional in INSPIRE View Services.

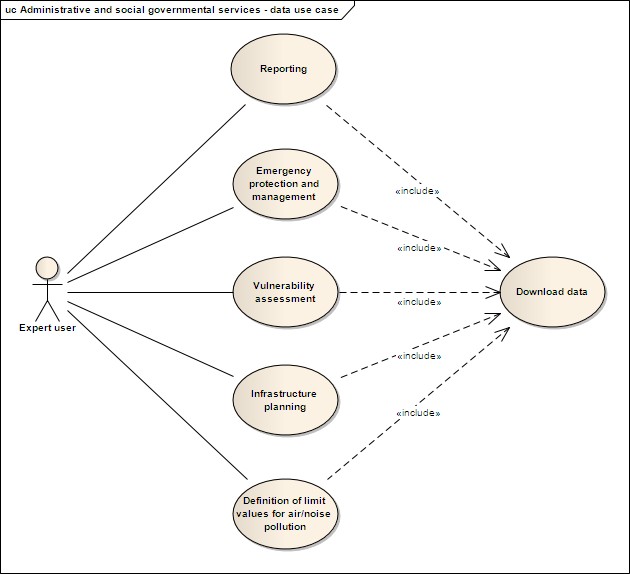
The purposes of use are different, but the flows of events are comparable.

**Part 3: Detailed, structured description of the use case**

|  |  |
| --- | --- |
| **Use Case Description** | |
| Name | TWG\_US\_GS\_map\_case |
| Priority | depending on the situation high, medium or low |
| Description | An actor is searching for a service (including government and municipal offices) for varying purposes and in different situations.  The actor wants to get a map layer, wherein the location of the service is marked with a symbol.  The actor wants to get some further information about the service. |
| Pre-condition | The data have to exist and have to be provided by an INSPIRE View Service, preferably with the GetFeatureInfo Interface.  The actor uses a map client with a base map. |
| **Flow of Events - Basic Path** | |
| Step 1 | The actor accesses to a geoportal. |
| Step 2 | The actor opens a base map and selects a map window (by map navigation, by means of a gazetteer, with the built-in GPS, ...). |
| Step 3 | The actor selects the map layer "Government services" and a subitem (e.g. "Hospitals"). |
| Step 4 | The desired layer is added to the map. |
| **Flow of Events - Alternative Paths** | |
| Step 5 | By clicking at the symbol some further information about the service are displayed. |
| Post-condition | none |
| **Data source: POI** | |
| Description | Data about "a variety of categories of municipal and governmental services and social infrastructure." (D 2.3.) This overall use case requires the type/subtype of the POI, its location (given as GM\_Point), the core attributes (see above) and some other attributes, depending on the specific use case. A portrayal rule is needed. To support thin GPS devices, the CRS ―WGS 84 / plate carrée‖ should be available. Usually the POI's location originally is given as a reference to an  address/building/cadastral parcel. In these cases the reference has to be mapped to coordinates. |
| Data provider | regions, communes, municipalities, private bodies |
| Geographic scope | Europe |
| Thematic scope | see description |
| Scale, resolution | local |
| Delivery | INSPIRE View Service (map layer), INSPIRE Download Service (for additional information) |
| Documentation | Partly in the documentation of the national base maps. |

#### Use case TWG\_US\_GS\_Data\_case

**Part 1: UML use case diagram**



**Part 2: Narrative explanation of the use case**

Unlike TWG\_US\_GD\_map\_case, the actor in this use case is a GIS user. He needs information about a service for varying purposes and in different situations and he wants to import the data into a GIS. Examples are:

* **planning** of governmental services (location allocation)
* **definition of limit values for air pollution**

Some government services (kindergartens, schools and hospitals) can be protected by stricter limit values.

(DIRECTIVE 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (Article 4): "Whereas the limit values laid down in this Directive are minimum requirements; whereas, in accordance with Article 130t of the Treaty, Member States may maintain or introduce more stringent protective measures; whereas, in particular, stricter limit values may be introduced to protect the health of particularly vulnerable categories of the population, such as children and hospital patients;")

([http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0030:EN:NOT)](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A31999L0030%3AEN%3ANOT))

* **emergency management**

Use case: A hospital/kindergarten/home for the elderly has to be evacuated: Which other facility is adequately equipped to host the people?

* **reporting**

Some governmental services (schools and hospitals) have to be part of noise maps. (Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002

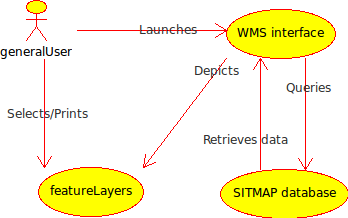
relating to the assessment and management of environmental noise (Annex IV)) ([*http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0049:EN:NOT*)](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32002L0049%3AEN%3ANOT))

**Part 3: Detailed, structured description of the use case**

|  |  |
| --- | --- |
| **Use Case Description** | |
| Name | TWG\_US\_GS\_data\_case |
| Priority | depending on the situation high, medium or low |
| Description | An actor wants to import data about a governmental service into his GIS. |
| Pre-condition | The data have to exist and have to be provided by an INSPIRE Download Service.  The actor uses a GIS. |
| **Flow of Events - Basic Path** | |
| Step 1 | Using a Metadata Information System (Catalog), the actor searches, finds and evaluates the data and the corresponding INSPIRE Download Service. |
| Step 2 | The actor uses the INSPIRE Download Service and imports the data in his GIS. |
| **Flow of Events - Alternative Paths** | |
|  | none |
| Post-condition | The actor is able to process the data for his purpose. |
| **Data source: POI** | |
| Description | Data about "a variety of categories of municipal and governmental services and social infrastructure." (D 2.3.) The use case requires the POI as feature data. Although a spatial reference by  coordinates is preferable, the reference can be given by a geographic identifier as well. In this case the actor has to use a gazetteer service first. |
| Data provider | regions, communes, municipalities, private bodies |
| Geographic scope | Europe |
| Thematic scope | see description |
| Scale, resolution | local |
| Delivery | INSPIRE Download Service |
| Documentation | Partly in the documentation of the national base maps. |

#### Use Case: SITMAP – Territorial Information System of Málaga Province (Spain)

**Part 1: UML use case diagram**



**Part 2: Narrative explanation of the use case**

SITMAP is the territorial information system that Diputación de Málaga (Málaga Province Council) has developed to both manage its territorial data, Málaga Province municipalities managing those same data and both of them, as well as general users, querying SITMAP database. This latter is the case that we are considering within this document, as it implies the use of web services and interfaces.

Moreover topological data, SITMAP database contains a broad set of data referring to utilities and public services. The contents of that set are basically structured accordingly to EIEL25 requirements, as approved by the Spanish Ministry for Territorial Policies and Public Administrations (MPT).

Nevertheless, SITMAP database contains also data regarding features which are currently not included within EIEL, but needed by Diputación de Málaga to manage different services. So SITMAP is broader in scope than EIEL.

Thus use case can be considered as a paradigmatic example between all of those that make use of EIEL database as support for local and provincial governments activities managing, namely ―BDT- EIEL‖ from Diputación de A Coruña or ―SITMUN‖ from Diputación de Barcelona.

**Part 3: Detailed, structured description of the use case**

|  |  |
| --- | --- |
| **Use Case Description** | |
| Name | TWG\_US\_GS\_SITMAP |
| Priority | depending on the situation high, medium or low |
| Description | An actor (be her a Local Level Public Sector one, a citizen or an employee from a company) is searching for territorial data about utilities and services (including government and municipal offices) for different purposes.  The actor wants to access the database, select a feature type (or a given instance of a feature type) and, through the appropriate interface, being able of getting some information about the existence or characteristics of instances location of the features in the database, or about the relationships between given features in different classes (e.g.: distance from schools to main roads, schools in a municipality,  etc). |
| Pre-condition | The data have to exist and have to be provided by means of an OGC compliant Web Mapping Service.  The data have to be referenced upon a standard System (WGS84, ED50, ETRS89) |

25EIEL: Spanish acronym for “ Enquiry on Local Infrastructures and Services”

|  |  |
| --- | --- |
|  | The actor uses a map client with a base map. |
| **Flow of Events - Basic Path** | |
| Step 1 | The actor accesses to a geoportal. |
| Step 2 | The actor opens a base map and selects a map window (by map navigation, by meaning of a gazetteer, with the built-in GPS, ...). |
| Step 3a | The actor selects one map layer (e.g. "Utilities") and a sub-item (e.g. "water supply networks"). |
| Step 4 | The desired layer is depicted on the map. |
| Step 5 | The actor clicks on a part of the layer and queries it about its attributes |
| Step 6 | The required attributes are shown in a data window |
| Step 7 | The actor prints the so built map, the contents of the data window or both of them |
| **Flow of Events - Alternative Paths** | |
| Step 3b | The actor selects several map layers and sub-items. She may also select layers being provided by third parties (e.g.: Cadastral parcels or orthoimagery) to add them to the base map as reference information. |
| Step 4b | The desired set of layers are depicted on the map |
| Step 5b | The actor selects different objects from the active map layers and queries the database about their atributes |
| Step 6b | The required attributes and the relations between geographical objects are shown in a data window |
| Step 7 | As above |
| Post-condition | none |
| **Data source: Multi-geometry** | |
| Description | Data about "a variety of categories of municipal and governmental services and social infrastructure." (D 2.3.)  This use case, given that it refers to local scales/resolutions, requires different kinds of geometries to represent the different feature classes, as well as their location (by  means of planar or geographic coordinates) and their descriptive attributes. |
| Data provider | Province Council, municipalities, third parties. |
| Geographic scope | Province |
| Thematic scope | see description |
| Scale, resolution | local |
| Delivery | INSPIRE View Service (map layer), INSPIRE Download Service (for additional information) |
| Documentation | TWG US/US\_Check-list\_UserRequirements\_Template\_MálagaProvinceCouncil.doc  at CIRCA Library/Drafting Team Folders/Data Specifications/Thematic Working Groups/Utility an...ices (US)/TWG US Use cases |

* 1. **Use case for “Waste Management”**

#### Introduction

Developing Use-Cases is a powerful method for creating information products, which has been adopted for INSPIRE data specification process. The INSPIRE Methodology for Data Specification

Development (D2.6) foresees a user-driven specification method based on use-case development. This approach has been followed during the development of the Annex I Data themes and is now followed by the Annex II and III Thematic Working Groups (TWGs).

Development of common Use-Cases would not only show possible inter-linkages and dependencies among INSPIRE Data themes, they also serve as a real demonstrator of the interoperability of the INSPIRE data specifications.

This document is related with the development, monitoring and disclosure of waste plans developed by different Members States, directly or transferred to Regional Governments, following the requirements stablished by the Directive **2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste.** As resume, this establishes the legislative framework for the handling of waste in the Community and the obligation for the member states to draw up waste managements plans as part of it. A more general extract of the Directive and its potential implication

There are several initiatives already accessible that show Geo-referenced information, different thematic covertures linked, as result of the implementation of these plans. Geographical information is also attached to other kind of formats where this plans are described.

Some real examples can be acceded here:

[*http://www.sepa.org.uk/waste/waste\_infrastructure\_maps.aspx*](http://www.sepa.org.uk/waste/waste_infrastructure_maps.aspx)

[*http://www.wicklow.ie/Apps/WicklowBeta/Publications/Environment/WasteManPlan/Final%202006-*](http://www.wicklow.ie/Apps/WicklowBeta/Publications/Environment/WasteManPlan/Final%202006-) *2011%20Waste%20Management%20Plan%20Volume%203.pdf*

[*http://www.walesregionalwasteplans.gov.uk/south\_west/regional\_waste\_plan\_first\_review.html*](http://www.walesregionalwasteplans.gov.uk/south_west/regional_waste_plan_first_review.html)[*http://www.legislation.gov.uk/uksi/2008/314/regulation/6/made*](http://www.legislation.gov.uk/uksi/2008/314/regulation/6/made)

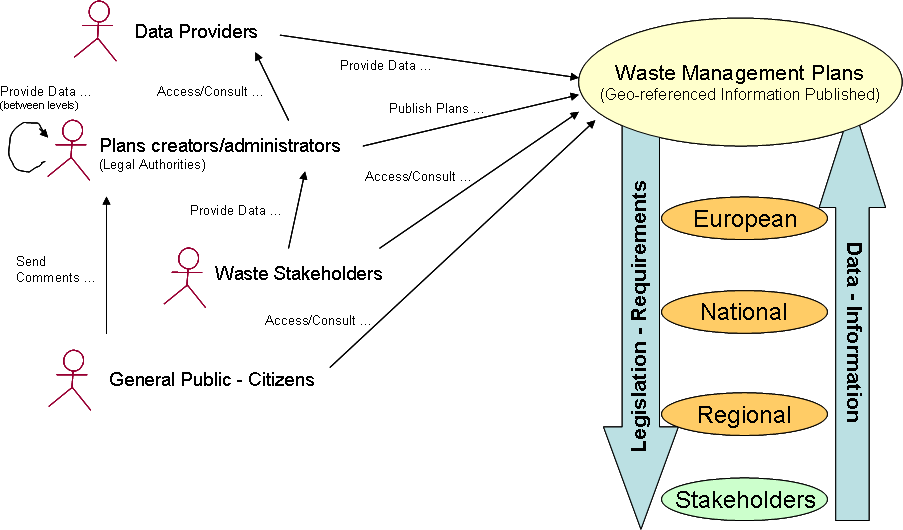
[*http://www.devon.gov.uk/index/environment/planning-*](http://www.devon.gov.uk/index/environment/planning-) *system/planning\_minerals\_and\_waste/waste\_planning/waste\_local\_plan-2.htm*

[*http://www.epa.ie/whatwedo/resource/hazardous/*](http://www.epa.ie/whatwedo/resource/hazardous/)

There are different approaches to this Use Case (definition, management, publication) like is explained.

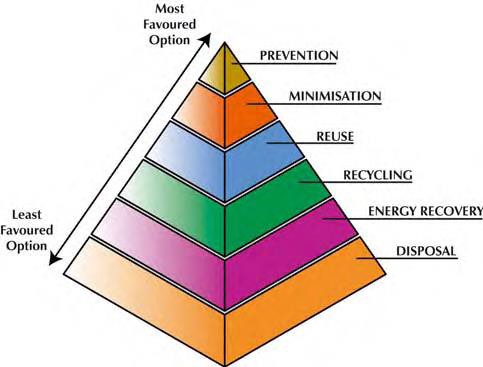
#### Use case description: Use case Waste Management Plans and Waste Shipments.

**Part 1: UML use case diagram**



**Part 2: Background Legislation**

*Directive 2008/98/EC* sets the basic concepts and definitions related to waste managament, such as definitions of waste, recycling, recovery. It explains when waste ceases to be waste and becomes a secondary raw material (so called end-of-waste criteria), and how to distinguish between waste and by-products. The Directive lays down some basic waste management principles: it requires that waste be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest. Waste legislation and policy of the EU Member States shall apply as a priority order the following waste management hierarchy:



***Figure.1 Graphical representation of the Waste Hierarchy (not included on the legal document)***

Waste management planning is the cornerstone of any national, regional or local policy on waste management. Indeed, the establishment of a plan allows, taking stock of the existing situation, to define the objectives that need to be met in the future, to formulate appropriate strategies and identify the necessary implementation means.

The drawing up of waste management plans is required by EU legislation on waste. The *Directive 2006/12/EC* on waste sets out the general requirement in Article 7, while specific provisions are laid down with regard to Hazardous waste in Article 6 of Directive *91/689/EEC* and Packaging and Packaging Waste in Article 6 of Directive *94/62/EC* .

Economic growth and globalization have led to a worldwide increase of waste transports across borders, whether on the road, by railway or ship. These waste movements or "shipments" sometimes involve hazardous wastes and can pose potential risks to the human health and the environment: ***Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006*** on shipments of waste - applicable since 12 July 2007.

|  |
| --- |
| **Recommendation 55** This information about legal acts was extracted from the European Commission wed site. For more detailed information you could visit the original site: [*http://ec.europa.eu/environment//waste/index.htm*](http://ec.europa.eu/environment//waste/index.htm) |

**Part 3: Main Geo-referenced Contents of Waste Plans**

Based on the analysis preformed, **o**nly have been referred the potential chapters or parts in which geographic information could be included and in consequence described as part of the Use Cases**:**

The most common administrative level of applicability is at National and Regional. Usually the National level set the guidelines to the Regional and it provides aggregated information of them, following the request of the directive, to be sent to the Commission (Art.35.2)

1. **Regional Overview Description:** This is usually a common chapter for all the projects that take place over a delimited territory. In general is focus to describe the territory covered by the plan from different points of view (Environmental, Physical, Economic, demographic, …). This involves links with different INSPIRE TWGs in three main ways:
   1. As source of information for the definition of the plan (Art.1.37)
   2. As base reference information to identify the Network over the territory (Art.31)
   3. As reference for the publication of related indicators (Art.35.2)

Examples of information required and related with other TWG that could be included on this chapter is: Geology - Hydrogeology (Water Quality Management Plans)

* + - Groundwater Vulnerability
    - Groundwater Protection Scheme
    - Groundwater Usage Hydrography

Mineral Resources

Transport Networks Infrastructure

* + - Road Network
    - Rail Network
    - Ports

Utilities and Governmental Services

* + - Water Supply
    - Sewerage Treatment Plants
    - Health Care Services Population and Settlement
    - Population
    - Household Numbers Economic Structure and Activities
    - Agriculture
    - Commercial Activity
    - Industrial Activity Statistical Units
    - Waste Production Indicators.
    - Waste Processing Indicators. Production and Industrial Facilities. Agricultural and Aquaculture Facilities.

Land Use Land Cover

Restriction Areas Risk Zones.

1. **Waste Inventory**: This part of the Plan should be focus on the source‘s description and categories of waste that are managed on the areas included under the plan. Potentially should include at least:

**Data Sources:** following the legislation, information referred to producers of waste is not mandatory depending of the quantity and classification of the waste (Art. 1.15). Anyway some information about it could be provided at different levels of Geographical detail, from Installations (detailed geo-referenced information detailed by activities that generate waste) to Global (at regional level, agglomeration or NUT Region). Different TWG could be related as providers of information.

* Household and Commercial Waste
* Industrial Waste
* Mining Waste
* Agricultural Waste Arising
* Ash and other incineration waste
* Contaminated Soil
* Construction and Demolition Waste
* Healthcare Waste
* Waste Electrical and Electronic Equipment (WEEE)
* Batteries
* Waste Oil
* PCBs
* Tyres
* End of Life Vehicles (ELV‘s)

**Waste Movements**

* Inter-Regional Waste Movement
* Exports of waste

All this chapters and descriptions can be linked to geographical entities, from Facilities to Statistical or reporting Areas.

1. **Management Plan:** Chapter focus on the actions to be proposed by the plan in order to improve the related indicators, based on the hierarchy (Infrastructure to be developed, Actions, Improvements…). The definition of these indicators could be related with geographical information from the Statistical point of view.

* Prevention and Minimization
* Recovery/Recycling/Reuse
* Energy Recovery
* Waste Disposal
* Waste Collection
* Sludge Management
* Hazardous Waste
* Waste Planning and Data Collection

1. **Waste Management Arrangements (Network)**: Chapter focused on the Waste Collection Facilities and Existing Waste Management Facilities Inventory. It should include apart the geo- referenced location, detailed information about the specific indicators related with the operation and activities that take place on them.

* Bring Sites.
* Recycling Centres.
* Transfer Stations.
* Landfills
* Operational EPA Licensed Waste Management Facilities
* Waste Permitted Facilities
* Licensing of Unauthorised Waste Disposal Site
* Others.

**Part 4: Detailed, structured description of the use case Use-Case: Waste Infrastructure Mapping**

|  |  |
| --- | --- |
| **Use Case Description** | |
| Name | Generic Waste Infrastructure mapping could be accessible for many different actors from Citizens to European Institutions. It could be required from analytical or reporting purposes to general consultancy information.  Actually, this is information is provided by several Public Administrations in different supporting formats, generally including some kind of geo-referenced information, and being used for many different purposes. |
| Priority | High / Medium |
| Description | A data provider (Generally Public Authority but not exclusively) or modeler will present information about the emplacement of Waste Infrastructures and their related information (Activities, Waste Capacities, Operations,..) in a spatial context to a wider community of potential interested stakeholders. |

|  |  |
| --- | --- |
| **Use Case Description** | |
| Pre-condition | The representation of all main waste cycle related elements, from the Socioeconomic of the region to which the plan apply to the position of the Waste facilities (all typologies including landfills or valorization plants) included on the waste network is needed to provide a map for orientation and to understand spatial relationships.  Feature classification may be required as reference data or defined rules to choose reference elements (features, dimensions).  Portrayal: Generalization and symbols rules for reference data and waste facilities related information  Alternatively a set of pre-defined raster data. Reference maps could be specified as context. |
| **Flow of Events – Basic Path** | |
| Step 1. | Public Authority defines the purpose of the information to be provided and the Thematic covertures (Bring Sites, Recycling Facilities, Statistical Information, Landfill Locations, Waste Production, Statistical Information about Waste,… ). |
| Step 2 | Complementary information: maps (SDI/ view service …) and for Environmental, Physical and Human related information such as Agglomerations, Urban Planning, Statistical information, Protected Sites, Species Distribution, etc |
| Step 3 | Several objects and thematic covertures are requested by the Waste Plan Manager for reference data at specific resolutions (Name and position of the urban and environmental elements, Production Sites, GIS-layer with topographic elements etc.) and Waste Infrastructures emplaced over the territory. Complementary information and classification criteria are of special relevance. |
| Step 4 | Generalization and symbol assignment rules should be applied, suitability waste infrastructure related information for each purpose should be checked by a competent authority to avoid false statements with respect to conclusions. |
| Step 5 | Data provider delivers requested layers |
| Step 6 | When thematic layers containing the same information from different providers there may be a requirement to manipulate data before merging, analyzing etc. (e.g. recalculation of values, classes) |
| **Flow of Events – Alternative Paths** | |
| Step 3 | Request, concurrent with delivery, a pre-defined target data model (e.g. features, values) to support merging, harmonization etc. |

|  |  |
| --- | --- |
| **Use Case Description** | |
| Step 4. | Pre-defined reference map selection |
| Step 5 | Delivery of seamless and as far as possible harmonized requested layer |
| Post-condition | Layers coming from different thematic databases should be merged to produce the reference map: e. g. Waste Infrastructures Network level information and verified by a competent authority. |
| **Data source: Thematic information for example relating to environmental aspects** | |
| Description | For example Restricted Areas, Soil, Species Distribution, Land Use. |
| Data provider | Thematic Data Providers, geo-referenced information should be harmonized. |
| Geographic scope | Various (Pan-European, cross-border, national, regional, local) |
| Thematic scope | Useful to answer waste question (related for example with capacity or the nearest places to transfer the waste). Urban Planning. |
| Scale, resolution | Various (depends on the purpose) |
| Delivery | GIS-Raster files, GIS-Vector-files, GML-files, WFS |
| Documentation | Metadata, Model description |

**Use Case: Waste Plan Definition**

|  |  |
| --- | --- |
| Name | Waste Plans as described in Directive 2006/12/EC.  The different aspects to be described or having into account during the process could be:   * Territory Description: Base information focus on describing the territory covered by the plan from different points of view (Environmental, Physical, Socio-Economic, Demographic, …). This involves links with different INSPIRE TWGs in two main ways:   + As source of information for the definition of the plan (Art.1.37)   + As base reference information to identify the Network over the territory (Art.31)   + As reference for the publication of related indicators (Art.35.2) * Waste Infrastructures Inventory: This part of the Plan should be focus on the source‘s description and categories of waste that are managed on the areas included under the plan. * Waste Management Arrangements (Network): Chapter focused on the Waste Collection Facilities and Existing Waste Management Facilities Inventory. It should include apart the geo-referenced location, detailed information about the specific indicators related with the activities, permissions and capacities for each of them: |
| Priority | High |
| Description | For the purposes of the Waste Directive, Waste Plans maps must show the geographic area covered by the plan with the distribution of the Waste Infrastructure (Pass, Actual and Projected) and the potential description of their impact on the environment.  The rates of treatment capacity in relation with the amount of waste generated (potentially received) and the operational descriptions.  Planning of future scenarios and improvements on the indicators. Background information for spatial orientation is needed.  A land use planner may have to refer to these in the definition of an area for development of a certain type relating to Member State planning regulation. |

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| Pre-condition | Collection and composition of basic data (hydrological, environmental data, population, land use, etc); determination of modeling-software (1D, 2D or couplings, 3D)  Feature classification as reference data or defined rules to choose reference elements (features, dimensions).  Portrayal: Generalisation and symbol assignment rules for reference data and waste infraestructures related information  Another possibility could be to have a set of pre-defined reference maps as raster data. |
| Flow of Events – Basic Path | |
| Step 1. | Screen, check and analyze existing material (analog and digital information) |
| Step 2 | Describe the Area from different points of view.  General Description: Administrative (Socio-Economic) and Geophysical. |
| Step 3 | Preliminary Waste Facilities Network: identify databases of registers and unregistered activities that are related with the waste cycle of life. Geo-referenced or not.  Identify the Waste Facilities by categories of Waste, Capacity of Process and Technical Installations or Treatments. |
| Step 4 | Calculate the geographical area which could be covert under different scenarios of waste generation. Rates and Statistical information.  Evaluation of improvements by different periods based on the Hierarchy established as waste best practices.  For each scenario: Prepare alternatives (projection of new Waste Infrastructures, Waste trans-border Movements estimations) |
| Step 5 | Define most appropriate map scale(s), definition of colors, symbols |
| Step 6 | Combine relevant thematic information with topographic reference information to build-up Waste Infrastructures Maps. |

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| Data sources: Legally Required information relating to Waste Plans | |
| Description | Carried out for different scenarios:   1. Authorized registration of actors related with Waste Treatment and transaction of movements derived from the legislation requirements. 2. Statistical Information related with the waste generation capacity in relation with the human activity (industrial, particular consumption, agricultural, …)   2. Described information in reference with potential entities damaged by the emplacement of this kind of activities. |
| Data provider | Competent authorities (e.g. Regional Governments, Registered Establishments), Mapping agencies, Meteorological Services |
| Geographic scope | In terms of INSPIRE: Pan-European, cross-border, national, regional, local |
| Thematic scope | Spatial information supporting Waste Plans developments |
| Scale, resolution | Generally 1:2.500 – 1.10.000 for detailed maps provided by MS. |
| Delivery | GIS-Vector files or GML-files, WMS |
| Documentation | Metadata, model description (it is very important to describe precisely the specification that form the boundary of the simulation used for scenarios because in terms of locations, conditions in the treatment (installations) there are an infinite number of possibilities) |
| Data source: Topographic Reference Data | |
| Description | For example Restricted Areas, Soil, Species Distribution, Land Use, Land Cover, Transport and Hydrographic Networks, Statistical Units and Population Distribution, Health and safety. |
| Data provider | Thematic Data Providers, geo-referenced information should be harmonized. |
| Geographic scope | Various (Pan-European, cross-border, national, regional, local) |
| Thematic scope | Useful to define (Public Administration or companies delegated on behalf of them) and communicate Waste Plans definition (Public Administration Web-portals, Documents). |
| Scale, resolution | Various (depends on the purpose) |

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| Delivery | GIS-Raster files, GIS-Vector-files, GML-files, WFS |
| Documentation | Metadata, Model description |

**Use Case: Waste Shipments**

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| Name | Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste - applicable since 12 July 2007.  This use case was proposed by the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), an international non-profit association of the environmental authorities of the EU Member States.  The purpose of the IMPEL-―Waste Sites‖ project was to exchange information and best practices on identification, inspection and compliance measures regarding upstream waste sites that are relevant for illegal waste exports, and by this to give input to the guidance tools (handbook and field manual) that are to be developed in the course of the project.  Cartography information provided under INSPIRE was pointed out as a very useful tools during the different stages in the project. |
| Priority | Medium. |

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| Description | The last years have seen an increase in problematic waste streams worldwide, notably of electronic waste, end-of-life vehicles and their components from Europe to Africa. Spot checks of waste shipments in transit ports and on motorways in the EU can often do no more than uncover the tip of an iceberg. This situation has prompted waste shipment experts to think more about targeting the sources of illegal waste streams and the ―upstream‖ facilities where such waste is collected, stored and/or treated before its export from the EU.  The main objective of the ―Waste Sites‖ project is to identify good practices and develop a practical guidance tool for the inspection of upstream waste sites, and for the promotion of compliance with waste law on these sites, by competent authorities in the IMPEL member countries. More specifically this means:   * Better understanding of problematic waste streams (especially WEEE, ELVs and their components, plastic waste and a few others) and the role of upstream waste sites in them, * Exchange of best practices concerning such waste sites, * Guidance on site identification, inspection and follow-up, in the form of a handbook and a field manual on inspections, * Better collaboration between relevant agencies (environmental licensing and inspection, police, customs and others) at national and international level.   Distributed access to information related to Waste Sites, could support all the objectives proposed by the project. |
| Pre-condition | Information should be accessible and detailed metadata information provided in order to guarantee its validity because of the sensible scope to which it would be applied. |
| Flow of Events – Basic Path | |
| Step 1. | Information about Waste Sites (Emplacement, Treatment Permissions, Process Capacities,..) is collected and served under INSPIRE |
| Step 2 | Transport permissions in which information about origin and destination sites, waste categorizations are requested for waste transport. These documents must be provided by drivers if requested by public authorities on the way (police, border controls, portuary authorities). |
| Step 3 | Based on the information contained on the transport documents, authorities should be able to verify the existence of the origin and destination sites and its correlation with the waste transported and the treatment – management capacity and permission in possession of the Site. |

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| Step 4 | Calculate the geographical area that could be covered by different scenarios of waste generation. Rates and Statistical information.  Evaluation of improvements by different periods based on the Hierarchy established as waste best practices.  For each scenario: Prepare alternatives (projection of new Waste Infrastructures, Waste trans-border Movements estimations) |
| **Data sources: Legally Required information relating to Waste Plans** | In terms of INSPIRE: Pan-European, cross-border, national, regional, local |
| Description | Spatial information supporting Waste Sites |
| Geographic scope | GIS-Vector files or GML-files, WMS |
| Data provider | Generally 1:2.500 – 1.10.000 for detailed maps provided by MS. |
| Thematic scope | Metadata, model description (it is very important to describe precisely the specification that form the boundary of the simulation used for scenarios because in terms of locations, conditions in the treatment (installations) there are an infinite number of possibilities) |
| Scale, resolution | Generally 1:2.500 – 1.25.000 for detailed maps provided by MS. |
| Delivery | In the directive there is no specification for Member States, WISE will use Google earth and other free available data |
| Documentation |  |
| **Data source: Topographic Reference Data** |  |
| Description | For example Restricted Areas, Soil, Species Distribution, Land Use, Land Cover, Transport and Hydrographic Networks, Statistical Units and Population Distribution, Health and safety. |
| Geographic scope | Thematic Data Providers, geo-referenced information should be harmonized and periodically updated and mainteined. |
| Data provider | Various (Pan-European, cross-border, national, regional, local) |
| Thematic scope | Useful to answer waste question (related for example with capacity or the nearest places to transfer the waste). Urban Planning. |
| Scale, resolution | Various (depends on the purpose) |

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| Delivery | GIS-Raster files, GIS-Vector-files, GML-files, WFS |
| Documentation | Metadata, Model description |

#### Cross Thematic Data requirements

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| --- | --- | --- |
| TWG | Affected? | Datasets affected |
| Administrative Units (AU) | Yes | Boundaries of administrative units from the cities to regional and national borders, including toponyms.  Competent Authorities for waste infrastructures permissions and inspections.  Municipalities and Authorities affected by events |
| Addresses (AD) | Yes | Address of competent authorities. Address of Waste Infrastructures.  Addresses of register producers. |
| Agricultural and aquacultural facilities (AF) | Yes | Producers registered. Manure Producers, Plastic, Oils, Nitratus, … |
| Area management/restriction/regulation zones and reporting units (AM) | Yes | River basin management  Units of management, Landfills restrictions, |
| Atmospheric conditions+Meteorological geographical features (AC-MF) | Yes | The design of Waste Water treatment plants and Storm ponds are closely connected with weather forecast systems (severe weather warnings) Incineration Plants location depends of Atmospheric simulations.  Landfills are quite susceptible of movements and lixiviation process. |
| Bio-geographical regions + Habitats and biotopes + Species distribution  (BR-HB-SD) | Yes | with regards to adverse consequences for environment. |
| Buildings | Yes | Related/included on the Waste Treatment Facilities – Stablishments, Installations. |
| Cadastral Parcels (CP) | Yes | Identification of Sites related with Facilities/Stablishments/Installations. |
| Coordinate reference systems | Yes | No specific related requirements. Only as geographical requirement. |
| Energy Resources | Yes | Reservoirs used for energy generation. Landfill as gas producers. |
| Environmental Monitoring Facilities (EMF) | Yes | Noise pollution, Points of Discharges, |
| Geographical grid systems | ? | Population density or similar coverage information |
| Geographical names (GN) | Yes | name of locations/regions included under the Waste Plan |

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| --- | --- | --- |
| TWG | Affected? | Datasets affected |
| Geology + Mineral resources (GE- MR) | Yes | Permeability  Landforms (geomorphology), Applicability to landfill emplacement.  Mining Activity: Waste producers. |
| Human Health and Safety (HH) | Yes | Location of potential detrimental health effects. |
| Hydrography (HY) | Yes | watercourses, river basins pipelines  sewerage systems. |
| LandCover (LC) | Yes | Small-scale comprehensive land-cover |
| LandUse (LU) | Yes | residential areas / zones/districts // rural communities  asset maps industrial areas asset maps agriculture asset maps |
| Natural Risk Zones | Yes | Prevention and Selection criteria for the establishment of infrastructures. |
| Production and industrial facilities (PF) | Yes | Register of Producers and Activities that handled Specific categories of waste.  Very close related information because some activities related with the waste management and processing are included under their scope. (e.g.  Recycling). |

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| TWG | Affected? | Datasets affected |
| Protected Sites (PS) | Yes | cultural heritage  protected areas as defined under article 6 and article 7 2000/60/EC respectively  article 6 2007/60/EC:   * Bathing (= bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC) * Birds (= areas as designated for the protection of wild birds under Directive 2009/147/EC) * Fish (= waterbodies as designated under 2006/44/EC ) * Shellfish (= areas as designated under Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (codified version)) * Habitats (= areas as designated for the protection of habitats under Directive 97/62/EC) * Nitrates (=areas as designated under Directive 91/676//EC) * UWWT (=sensitive areas which are subject to eutrophication as identified in Annex II.A(a) of 91/271/EEC) * WFD Art. 7 Abstraction for drinking water ( * Other European * National * local |
| Soil (SO) | Yes | transmissibility, permeability,  slack water, drainage. Quite important for Landfills. |
| Statistical Units + Population distribution, demography (SU-PD) | Yes | Publication of global indicator related with Waste treatment. From the production by categories to ratios of processing. |
| TransportNetwork (TN) | Yes | Transport network assets – road, railroad, .  Valid in extension related with the waste transport. |
| Utility and governmental services (US) | Yes | Water supply Sewerage system  Waste Infrastructures and Facilities Managed by governments |

**Annex C** (normative) **Code list values**

* 1. **INSPIRE Application Schema 'AdministrativeAndSocialGovernmentalServices'**

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| **Code List** |
| *ServiceTypeValue* |

ServiceTypeValue

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| Name: | service type value |
| Definition: | Codelist containing a classification of governmental services. |
| Extensibility: | narrower |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ServiceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and narrower values defined by data providers. |

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| --- | --- |
| **publicAdministrat**  Name: | **ionOffice**  public administration office |
| Definition: | Public administration offices (not further differentiated). |
| **generalAdministrationOffice**  Name: general administration office  Definition: General administration offices, e.g. town halls. Parent: publicAdministrationOffice | |
| **specializedAdministrationOffice**  Name: specialized administration office  Definition: Specialized administration offices which can not be allocated to the following areas: social service, education, health, environmental protection, public order and safety (e. g. surveying administration).  Parent: publicAdministrationOffice | |
| **publicOrderAndSafety**  Name: public order and safety  Definition: Services concerned with public order and safety. | |
| **administrationForPublicOrderAndSafety**  Name: administration for public order and safety  Definition: Administration offices concerned with public order and safety. Parent: publicOrderAndSafety | |
| **policeService**  Name: police service  Definition: Services concerned with police affairs. Parent: publicOrderAndSafety | |
| **fireProtectionService**  Name: fire-protection service  Definition: Services concerned with fire-prevention and fire-fighting affairs; operation of | |

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|  | regular and auxiliary fire brigades and of other fire-prevention and fire-fighting  services maintained by public authorities; operation or support of fire-prevention and fire-fighting training programmes. |
| Parent: | publicOrderAndSafety |
| **fireStation**  Name: fire station  Definition: Services concerned with a station housing fire fighters, their equipment and vehicles.  Parent: fireProtectionService | |
| **siren**  Name: siren  Definition: Stationary device, often electrically operated, for producing a penetrating sound for warning the public.  Parent: fireProtectionService | |
| **hydrant**  Name: hydrant  Definition: Special water access points of water supply networks that are specifically designed and built to serve as on-site water sources for fire fighting and other emergency services.  Parent: fireProtectionService | |
| **antiFireWaterProvision**  Name: anti-fire water provision  Definition: Location, installation or designated area from where water for fire-fighting is provided.  Parent: fireProtectionService | |
| **fireDetectionAndObservationSite**  Name: fire detection and observation site  Definition: Location, facility, construction or device for the detection and observation of fires. Parent: fireProtectionService | |
| **rescueService**  Name: rescue service  Definition: Services dedicated to the search-and-rescue of people, animals and goods in emergency situations.  Parent: publicOrderAndSafety | |
| **rescueStation**  Name: rescue station  Definition: Services concerned with the housing of technical staff, equipment and auxiliary elements of land rescue teams.  Parent: rescueService | |
| **rescueHelicopterLandingSite**  Name: Rescue helicopter landing site  Definition: A designated area from which rescue helicopters can take off and land. Parent: rescueService | |
| **marineRescueStation**  Name: marine rescue station  Definition: Services on the coast providing buildings, mooring areas or piers to host marine rescue teams and their equipment, boats and other marine crafts.  Parent: rescueService | |
| **civilProtectionSite**  Name: civil protection site  Definition: Site offering protection and shelter from disasters and emergency situations to the civilian population. | |

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| Parent: | publicOrderAndSafety |
| **emergencyCallPoint**  Name: emergency call point  Definition: Location of telephones in a box or on a post for the use of motorists in the event of an emergency situation.  Parent: publicOrderAndSafety | |
| **standaloneFirstAidEquipment**  Name: standalone First Aid equipment  Definition: First Aid element or set of elements or equipment made available to anyone who may need them, located in highly visible and accessible places.  Parent: publicOrderAndSafety | |
| **defence**  Name: defence  Definition: Services concerned with military defence. Parent: publicOrderAndSafety | |
| **barrack**  Name: barrack  Definition: Services concerned with the provision of buildings used especially for lodging soldiers in garrison.  Parent: defence | |
| **camp**  Name: camp  Definition: Place usually away from urban areas where tents or simple buildings (as cabins) are erected for shelter or for temporary residence or instruction of military forces.  Parent: defence | |
| **environmentalProtection**  Name: environmental protection  Definition: Services concerned with the administration, supervision, inspection, operation or support of activities relating to the protection and conservation of the environment. | |
| **administrationForEnvironmentalProtection**  Name: administration for environmental protection  Definition: Administration offices concerned with environmental protection. Parent: environmentalProtection | |
| **environmentalEducationCentre**  Name: environmental education centre  Definition: Institution engaged in developing programs and material to increase awareness about the environment and sustainable development.  Parent: environmentalProtection | |
| **health**  Name: health  Definition: Services concerned with health issues. | |
| **administrationForHealth**  Name: administration for health  Definition: This item comprises establishments primarily engaged in the regulation of activities of agencies that provide health care and overall administration of health policy.  Parent: health | |
| **medicalProductsAppliancesAndEquipment**  Name: "medical products, appliances and equipment"  Definition: Services concerned with medicaments, prostheses, medical appliances and equipment and other health-related products obtained by individuals or | |

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|  | households, either with or without a prescription, usually from dispensing  chemists, pharmacists or medical equipment suppliers. They are intended for consumption or use outside a health facility or institution. |
| Parent: | health |
| **outpatientService**  Name: outpatient service  Definition: Medical, dental and paramedical services delivered to outpatients by medical, dental and paramedical practitioners and auxiliaries. The services may be delivered at home, in individual or group consulting facilities, dispensaries or the outpatient clinics of hospitals and the like.Outpatient services include the medicaments, prostheses, medical appliances and equipment and other health- related products supplied directly to outpatients by medical, dental and paramedical practitioners and auxiliaries.  Parent: health | |
| **generalMedicalService**  Name: general medical service  Definition: General medical services delivered by general medical clinics and general medical practitioners.  Parent: outpatientService | |
| **specializedMedicalServices**  Name: specialized medical services  Definition: Specialized medical services delivered by specialized medical clinics and specialist medical practitioners. Specialized medical clinics and specialist medical practitioners differ from general medical clinics and general medical practitioners in that their services are limited to treatment of a particular condition, disease, medical procedure or class of patient.  Parent: outpatientService | |
| **paramedicalService**  Name: paramedical service  Definition: Provision of paramedical health services to outpatients; Administration, inspection, operation or support of health services delivered by clinics supervised by nurses, midwives, physiotherapists, occupational therapists, speech therapists or other paramedical personnel and of health services delivered by nurses, midwives and paramedical personnel in non-consulting rooms, in patients' homes or other non-medical institutions.  Parent: outpatientService | |
| **hospitalService**  Name: hospital service  Definition: Services concerned with hospitalization. Hospitalization is defined as occurring when a patient is accommodated in a hospital for the duration of the treatment. Hospital day-care and home-based hospital treatment are included, as are hospices for terminally ill persons.  Parent: health | |
| **generalHospital**  Name: general hospital  Definition: Hospital services that do not limit their services to a particular medical speciality. Parent: hospitalService | |
| **specializedHospital**  Name: specialized hospital  Definition: Hospital services that limit their services to a particular medical speciality. Parent: hospitalService | |
| **nursingAndConvalescentHomeService**  Name: nursing and convalescent home service  Definition: In-patient services to persons recovering from surgery or a debilitating disease or | |

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|  | condition that requires chiefly monitoring and administering of medicaments, physiotherapy and training to compensate for loss of function or rest. |
| Parent: | hospitalService |
| **medicalAndDiagnosticLaboratory**  Name: medical and diagnostic laboratory  Definition: This item comprises establishments primarily engaged in providing analytic or diagnostic services, including body fluid analysis and diagnostic imaging, generally to the medical profession or the patient on referral from a health practitioner.  Parent: health | |
| **education**  Name: education  Definition: Services concerned with educational affairs. These services include military schools and colleges where curricula resemble those of civilian institutions, police colleges offering general education in addition to police training. | |
| **administrationForEducation**  Name: administration for education  Definition: Administration offices concerned with educational matters. Parent: education | |
| **earlyChildhoodEducation**  Name: early childhood education  Definition: Services concerned with pre-primary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 0.  Parent: education | |
| **primaryEducation**  Name: primary education  Definition: Services concerned with primary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 1.  Parent: education | |
| **lowerSecondaryEducation**  Name: lower secondary education  Definition: Services concerned with lower secondary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 2.  Parent: education | |
| **upperSecondaryEducation**  Name: upper secondary education  Definition: Services concerned with upper secondary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 3.  Parent: education | |
| **postSecondaryNonTertiaryEducation**  Name: post-secondary non-tertiary education  Definition: Services concerned with post-secondary non-tertiary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 4.  Parent: education | |
| **shortCycleTertiaryEducation**  Name: short-cycle tertiary education  Definition: Services concerned with short-cycle tertiary education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 5.  Parent: education | |
| **bachelorOrEquivalentEducation**  Name: bachelor or equivalent education  Definition: Services concerned with bachelor or equivalent education at ISCED-2011 | |

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|  | (International Standard Classification of Education, 2011 revision) level 6. |
| Parent: | education |
| **masterOrEquivalentEducation**  Name: master or equivalent education  Definition: Services concerned with master or equivalent education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 7.  Parent: education | |
| **doctoralOrEquivalentEducation**  Name: doctoral or equivalent education  Definition: Services concerned with doctoral or equivalent education at ISCED-2011 (International Standard Classification of Education, 2011 revision) level 8.  Parent: education | |
| **educationNotElsewhereClassified**  Name: education not elsewhere classified  Definition: Services concerned with education not elsewhere classified in ISCED-2011 (International Standard Classification of Education, 2011 revision), referred to as ISCED-2011 level 9.  Parent: education | |
| **subsidiaryServicesToEducation**  Name: subsidiary services to education  Definition: Subsidiary services to education, services concerned with transportation, food, lodging, medical and dental care and related subsidiary services chiefly for students regardless of level.  Parent: education | |
| **socialService**  Name: social service  Definition: Services concerned with social protection. | |
| **administrationForSocialProtection**  Name: administration for social protection  Definition: Administration offices concerned with matters of social protection. Parent: socialService | |
| **specializedServiceOfSocialProtection**  Name: specialized service of social protection  Definition: Various specialized services concerned with transport, home-, day- and holiday- care for the disabled and people in need of care. Services specifically concerned with education and employment of people with disabilities.  Parent: socialService | |
| **housing**  Name: housing  Definition: Services concerned with any home, residence, facility, or premises which provide temporary, interim or permanent housing to various groups of persons.  Parent: socialService | |
| **childCareService**  Name: child care service  Definition: Services concerned with the day care of children. Parent: socialService | |
| **charityAndCounselling**  Name: charity and counselling  Definition: Institutions and services providing benefits in kind and/or counselling for the needy, e.g. people who are unemployed, the socially deprived, disaster victims, victims of assault and abuse, potential suicides, etc.  Parent: socialService | |

* 1. **INSPIRE Application Schema 'Environmental Management Facilities'**

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| --- |
| **Code List** |
| *EnvironmentalManagementFacilityTypeValue* |

EnvironmentalManagementFacilityTypeValue

|  |  |
| --- | --- |
| Name: | environmental facility classification |
| Definition: | Classification of environmental facilities, such as into sites and installations. |
| Extensibility: | narrower |
| Identifier: | <http://inspire.ec.europa.eu/codelist/EnvironmentalManagementFacilityTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and narrower values defined by data providers. |

|  |  |
| --- | --- |
| **site**  Name: | Site |
| Definition: | All land at a distinct geographic location under the management control of an organisation covering activities, products and services. |
| **installation**  Name: Installation  Definition: A technical unit, such as machinery, an apparatus, a device, a system installed, or a piece of equipment placed in position or connected for use. | |

* 1. **INSPIRE Application Schema 'Common Utility Network Elements'**

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| --- |
| **Code List** |
| *UtilityDeliveryTypeValue* |
| *UtilityNetworkTypeValue* |
| *WarningTypeValue* |

UtilityDeliveryTypeValue

|  |  |
| --- | --- |
| Name: | utility delivery type |
| Definition: | Classification of utility delivery types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/UtilityDeliveryTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

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| **collection**  Name: | collection |
| Definition: | Description of a type of utility network delivering its utility product via collection (e.g. for sewer utility networks, collecting sewer water from customers) |
| **distribution**  Name: distribution  Definition: Description of a type of utility network delivering its utility product via mainly local distribution (e.g. local distribution of electricity), connecting directly to consumers | |
| **private**  Name: private  Definition: Description of a type of utility network delivering its utility product via a small private network (e.g. owned by a private company) | |
| **transport**  Name: transport  Definition: Description of a type of utility network delivering its utility product via a large transport network (e.g. to convey oil-gas-chemicals products over larger distances) | |

UtilityNetworkTypeValue

|  |  |
| --- | --- |
| Name: | utility network type |
| Definition: | Classification of utility network types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/UtilityNetworkTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **electricity**  Name: | electricity |
| Definition: | Electricity networks. |
| **oilGasChemical**  Name: "oil, gas or chemical"  Definition: Oil, gas or chemical networks. | |
| **sewer**  Name: sewer  Definition: Sewer networks. | |
| **water**  Name: water  Definition: Water networks. | |
| **thermal**  Name: thermal  Definition: Thermal networks. | |
| **telecommunications**  Name: telecommunications  Definition: Telecommunications networks. | |

WarningTypeValue

|  |  |
| --- | --- |
| Name: | warning type |
| Definition: | Classification of warning types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WarningTypeValue> |

Values: The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers.

|  |  |
| --- | --- |
| **net**  Name: | net |
| Definition: | Warning netáfor protection of cables and pipes. |
| **tape**  Name: tape  Definition: Caution tapeá(also known asáwarning tape) is a resilient plastic tape of a signal colour or highly contrasting colour combination (such as yellow-black or red- white). | |
| **concretePaving**  Name: concrete paving  Definition: A set or paving of pavers or tiles in concrete material covering cables or pipes. | |

* 1. **INSPIRE Application Schema 'Electricity Network'**

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| **Code List** |
| *ElectricityAppurtenanceTypeValue* |

ElectricityAppurtenanceTypeValue

|  |  |
| --- | --- |
| Name: | electricity appurtenance type |
| Definition: | Classification of electricity appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ElectricityAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **capacitorControl**  Name: | capacitor control |
| Definition: | Capacitor control. |
| Description: | "Capacior control is usually done to achieve as many as possible of the following goals: reduce losses due to reactive load current, reduce kVA demand, decrease customer energy consumption, improve voltage profile, and increase revenue. Indirectly capacitor control also results in longer equipment lifetimes because of reduced equipment stresses." |
| **connectionBox**  Name: connection box  Definition: Connection box.  Description: Connection box protects and/or encloses electric circuits and equipment on the ground. | |
| **correctingEquipment**  Name: correcting equipment  Definition: Power factor correcting equipment.  Description: "Power distribution is more efficient if operated when the power factor (PF) is unity. An alternating voltage and the current causing it to flow should rise and fall  in value equally and reverse direction at the same instant. When this happens, | |

|  |  |
| --- | --- |
| the two waves are said to be in phase and the power factor is unity (1.0). However, various inductive effects, such as idle running induction motors or transformers, can lower the power factor." | |
| **deliveryPoint**  Name: | delivery point |
| Definition: | Delivery point. |
| Description: | Point the electric power is being delivered to. |
| **dynamicProtectiveDevice**  Name: dynamic protective device Definition: Dynamic protective device.  Description: "In addition to opening when a fault is detected, dynamic protective devices also reclose to attempt to re-establish service. If the fault remains after a prescribed number of reclosings, the device may lock open the circuit. Reclosing is designed to reduce or eliminate the effects of temporary faults. NOTE It may include following subtypes: Circuit Breakers, Fault Interrupter, Reclosers (Single Phase Hydraulic, etc.), and Sectionalizer" | |
| **fuse**  Name: fuse  Definition: Fuse.  Description: "Fuses are used to protect distribution devices from damaging currents. A fuse is an intentionally weakened spot in the electric circuit that opens the circuit at a predetermined current that is maintained for a predetermined amount of time. Fuses are not dynamic in that they remain open and do not reclose. By automatically interrupting the flow of electricity, a fuse prevents or limits damage caused by an overload or short circuit." | |
| **generator**  Name: generator  Definition: Generator.  Description: "Generator is an alternative, third-party power source feeding into the electrical network." | |
| **loadTapChanger**  Name: load tap changer Definition: Load tap changer.  Description: Load tap changer represents power transformer controls that change the primary to-secondary turns ratio of a transformer winding while the transformer is under load to regulate the flow of current and minimize voltage drop. Automatic loadtap changers in the power transformer provides voltage control on the substation bus. Control systems of voltage regulators and tap changing equipment beyond the substation usually have a line-drop compensator to simulate voltage drop between the substation and points in the distribution system. | |
| **mainStation**  Name: main station  Definition: Main station.  Description: "Electric station represents a building or fenced-in enclosure that houses the equipment that switches and modifies the characteristics of energy from a generation source. Distribution systems include primary feeders (circuits), transformer banks, and secondary circuits (overhead or underground) that serve a specified area." | |
| **netStation**  Name: net station  Definition: Net station. Description: Net station. | |
| **networkProtector**  Name: network protector | |

|  |  |
| --- | --- |
| Definition: | Network protector. |
| Description: | "Network transformers connect to the secondary network through a network protector. Network protector components may be the circuit breaker, relays, backup fuses and controls required for automatically disconnecting a transformer from the secondary network in response to predetermined conditions on primary feeder or transformer." |
| **openPoint**  Name: open point  Definition: Open point.  Description: "Open point contains information about a variety of insulated and shielded devices that connect high-voltage cables to apparatus, including transformers. Separable, load-break insulated connectors are used with primary bushings of submersible distribution transformers for safety. This is known as a dead-front configuration." | |
| **primaryMeter**  Name: primary meter  Definition: Primary meter.  Description: "Primary meters are installed if commercial customers elect to have power delivered at distribution voltages, such as 12.5 kV. Residential customers are generally billed for kilowatt hours (kWH) used. Commercial and industrial customers may additionally be billed for demand charges and power factor charges." | |
| **recloserElectronicControl**  Name: recloser electronic control Definition: Recloser electronic control.  Description: "Reclosers and sectionalizers isolate temporary and permanent faults in electric lines. Reclosers open circuits (trip) in case of a fault, and reclose after a predetermined time. The time-current characteristic, usually expressed in a curve, is based on temperature and fuse tolerances and is used to coordinate recloser operations. Reclosers allow (usually) four trip operations to clear temporary faults." | |
| **recloserHydraulicControl**  Name: recloser hydraulic control Definition: Recloser hydraulic control.  Description: Recloser hydraulic control is an intregral part of single-phase reclosers. A trip coil in series with the line is used to sense overcurrent and trip open the recloser contacts. The contacts close after a preset interval. | |
| **regulatorControl**  Name: regulator control Definition: Regulator control.  Description: Voltage provided by regulators is changed using a tap-changing switch to adjust the number of secondary windings. Line load can be regulated from 10 percent above to 10 percent below normal line voltage. Voltage regulators that control distribution system voltage are rated from 2.5 kV to 34.5 grd Y kV. Most feeder regulators have the 32-step design. | |
| **relayControl**  Name: relay control  Definition: Relay control.  Description: Protective relay systems detect and isolate faults. Time-delayed phase and ground relays are coordinated with fuses and reclosers further out on the circuit. They are instantaneous units with inverse TCCs to coordinate with fuses and reclosers further downstream. Relays are usually set to trip feeder breakers and protect the fuse in the event of temporary faults beyond the fuse. | |
| **sectionalizerElectronicControl** | |

|  |  |
| --- | --- |
| Name: | sectionalizer electronic control |
| Definition: | Sectionalizer electronic control. |
| Description: | "Sectionalizers are automatic circuit opening devices that are installed on the load side of fault-interrupting devices and count its fault-trip operations. Sectionalizers can be set to open after one, two, or three counts have been detected  with a predetermined time span. Sectionalizers are used in conjunction with fuses and reclosers and may have inrush current restraint features to prevent a false count when lines are re-energized." |
| **sectionalizerHydraulicControl**  Name: sectionalizer hydraulic control Definition: Sectionalizer hydraulic control.  Description: Sectionalizer controls store a pulse counter when the minimum actuating current drops to zero because a fault is interrupted by the recloser (or other protective device). Sectionalizers operate in conjunction with breakers and reclosers to lock out fault current after a predetermined number (usually three) of recloser operations (trips). | |
| **streetLight**  Name: street light  Definition: Street light.  Description: "A street light (or lamppost, street lamp, light standard, or lamp standard) is a raised source of light on the edge of a road, which is turned on or lit at a certain time every night." | |
| **subStation**  Name: sub station  Definition: Sub station.  Description: "An electrical substation is a subsidiary station of an electricity generation, transmission and distribution system where voltage is transformed from high to low or the reverse using transformers. Electric power may flow through several substations between generating plant and consumer, and may be changed in voltage in several steps. A substation that has a step-up transformer increases the voltage while decreasing the current, while a step-down transformer decreases the voltage while increasing the current for domestic and commercial distribution." | |
| **switch**  Name: switch  Definition: Switch.  Description: A switch disconnects circuits within the distribution | |
| **transformer**  Name: transformer  Definition: Transformer.  Description: "network and can be manually or power operated. Switches are either open or closed. Switches are critical to the electric distribution system to allow current interruption to allow system maintenance, redirecting current in case of emergency, or to isolate system failures. Switches may be automated and controlled remotely through SCADA operation." | |
| **voltageRegulator**  Name: voltage regulator Definition: Voltage regulator.  Description: "Transformers transfer electrical energy from one circuit to another circuit usually with changed values of voltage and current in the process. NOTE Subtypes include: Network, Single Phase Overhead, Single Phase Underground, Two Phase Overhead, Three Phase Overhead, Three Phase Underground, Step, and Power." | |

|  |  |
| --- | --- |
| **detectionEquipm**  Name: | **ent**  detection equipment |
| Definition: | Detection Equipment |
| Description: | "Voltage regulators vary the ac supply or source voltage to the customer to maintain the voltage within desired limits. Voltage provided by regulators is changed using a tap-changing switch to adjust the number of secondary windings. Bypass switches allow a regulator to be removed for normal service without interrupting the downstream load. NOTE Subtypes include: Single Phase Overhead, Two Phase Overhead, Three Phase Overhead, Three Phase Pad-Mounted." |
| **monitoringAndControlEquipment**  Name: monitoring and control equipment  Definition: Monitoring And Control Equipment | |

* 1. **INSPIRE Application Schema 'Oil-Gas-Chemicals Network'**

|  |
| --- |
| **Code List** |
| *OilGasChemicalsAppurtenanceTypeValue* |
| *OilGasChemicalsProductTypeValue* |

OilGasChemicalsAppurtenanceTypeValue

|  |  |
| --- | --- |
| Name: | oil, gas and chemicals appurtenance type |
| Definition: | Classification of oil, gas, chemicals appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/OilGasChemicalsAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **pump**  Name: | Pump |
| Definition: | Pump |
| **gasStation**  Name: Gas station  Definition: Gas station | |
| **node**  Name: Node  Definition: Node | |
| **compression**  Name: Compression  Definition: Compression | |
| **terminal**  Name: Terminal  Definition: Terminal | |
| **deliveryPoint**  Name: Delivery point  Definition: Delivery point | |
| **frontier** | |

|  |  |
| --- | --- |
| Name: | Frontier |
| Definition: | Frontier |
| **productionRegion**  Name: Production region  Definition: Production Region | |
| **plant**  Name: Plant  Definition: Plant | |
| **pumpingStation**  Name: Pumping station  Definition: Pumping Station | |
| **storage**  Name: Storage  Definition: Storage | |
| **marker**  Name: Marker  Definition: Marker | |

OilGasChemicalsProductTypeValue

|  |  |
| --- | --- |
| Name: | oil, gas and chemicals product type |
| Definition: | Classification of oil, gas and chemicals products. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/OilGasChemicalsProductTypeValue> |
| Values: |  |

The table below includes recommended values that may be used by data providers. Before creating new terms, please check if one of them can be used.

|  |  |
| --- | --- |
| **liquefiedNaturalG**  Name: | **as**  liquefied Natural Gas |
| Definition: | liquefied Natural Gas |
| **methane**  Name: methane  Definition: methane | |
| **naturalGas**  Name: natural Gas  Definition: natural Gas | |
| **naturalGasAndTetrahydrothiophene**  Name: natural Gas And Tetrahydrothiophene  Definition: natural Gas And Tetrahydrothiophene | |
| **nitrogenGas**  Name: nitrogen Gas  Definition: nitrogen Gas | |
| **residualGas**  Name: residual Gas  Definition: residual Gas | |
| **accetone**  Name: accetone  Definition: accetone | |
| **air** | |

|  |  |
| --- | --- |
| Name: | air |
| Definition: | air |
| **argon**  Name: argon  Definition: argon | |
| **butadiene**  Name: butadiene  Definition: butadiene | |
| **"butadiene1,3"**  Name: "butadiene1,3"  Definition: butadiene1,3 | |
| **butane**  Name: butane  Definition: butane | |
| **c3**  Name: c3  Definition: c3 | |
| **carbonMonoxide**  Name: carbon Monoxide  Definition: carbon Monoxide | |
| **chlorine**  Name: chlorine  Definition: chlorine | |
| **compressedAir**  Name: compressed Air  Definition: compressed Air | |
| **crude**  Name: crude  Definition: crude | |
| **dichloroethane**  Name: dichloroethane  Definition: dichloroethane | |
| **diesel**  Name: diesel  Definition: diesel | |
| **ethylene**  Name: ethylene  Definition: ethylene | |
| **gasFabricationOfCocs**  Name: gas Fabrication Of Cocs  Definition: gas Fabrication Of Cocs | |
| **gasHFx**  Name: gasH Fx  Definition: gasH Fx | |
| **gasoil**  Name: gasoil  Definition: gasoil | |
| **hydrogen**  Name: hydrogen  Definition: hydrogen | |

|  |  |
| --- | --- |
| **isobutane**  Name: | isobutane |
| Definition: | isobutane |
| **JET-A1**  Name: JET-A1  Definition: JET-A1 | |
| **kerosene**  Name: kerosene  Definition: kerosene | |
| **liquidAmmonia**  Name: liquid Ammonia  Definition: liquid Ammonia | |
| **liquidHydrocarbon**  Name: liquid Hydrocarbon Definition: liquid Hydrocarbon | |
| **multiProduct**  Name: multi Product  Definition: multi Product | |
| **MVC**  Name: MVC  Definition: MVC | |
| **nitrogen**  Name: nitrogen  Definition: nitrogen | |
| **oxygen**  Name: oxygen  Definition: oxygen | |
| **phenol**  Name: phenol  Definition: phenol | |
| **propane**  Name: propane  Definition: propane | |
| **propyleen**  Name: propyleen  Definition: propyleen | |
| **propylene**  Name: propylene  Definition: propylene | |
| **raffinate**  Name: raffinate  Definition: raffinate | |
| **refineryProducts**  Name: refinery Products  Definition: refinery Products | |
| **saltWater**  Name: salt Water  Definition: salt Water | |
| **saumur**  Name: saumur | |

|  |  |
| --- | --- |
| Definition: | saumur |
| **tetrachloroethane**  Name: tetrachloroethane  Definition: tetrachloroethane | |
| **unknown**  Name: unknown  Definition: unknown | |

* 1. **INSPIRE Application Schema 'Sewer Network'**

|  |
| --- |
| **Code List** |
| *SewerAppurtenanceTypeValue* |
| *SewerWaterTypeValue* |

SewerAppurtenanceTypeValue

|  |  |
| --- | --- |
| Name: | sewer appurtenance type |
| Definition: | Classification of sewer appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SewerAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **anode**  Name: | anode |
| Definition: | Anode. |
| **barrel**  Name: barrel  Definition: Barrel. | |
| **barScreen**  Name: bar screen  Definition: Bar screen. | |
| **catchBasin**  Name: catch basin  Definition: Catch basin. | |
| **cleanOut**  Name: clean out  Definition: Clean out. | |
| **dischargeStructure**  Name: discharge structure  Definition: Discharge structure. | |
| **meter**  Name: meter  Definition: Meter. | |
| **pump**  Name: pump  Definition: Pump. | |

|  |  |
| --- | --- |
| **regulator**  Name: | regulator |
| Definition: | Regulator. |
| **scadaSensor**  Name: scada sensor  Definition: SCADA sensor. | |
| **thrustProtection**  Name: thrust protection  Definition: Thrust protection. | |
| **tideGate**  Name: tide gate  Definition: Tide gate. | |
| **node**  Name: node  Definition: Node. | |
| **connection**  Name: connection  Definition: Connection. | |
| **specificStructure**  Name: specific structure Definition: Specific structure. | |
| **mechanicAndElectromechanicEquipment**  Name: mechanic and electromechanic equipment  Definition: Mechanic and electromechanic equipment. | |
| **rainwaterCollector**  Name: rainwater collector  Definition: Rainwater collector. | |
| **watertankOrChamber**  Name: watertank or chamber  Definition: Watertank or chamber. | |

SewerWaterTypeValue

|  |  |
| --- | --- |
| Name: | sewer water type |
| Definition: | Classification of sewer water types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SewerWaterTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **combined**  Name: | combined |
| Definition: | Combined sewer water. |
| **reclaimed**  Name: reclaimed  Definition: Reclaimed sewer water. | |
| **sanitary**  Name: sanitary  Definition: Sanitary sewer water. | |
| **storm**  Name: storm | |

|  |
| --- |
| Definition: Storm sewer water. |

* 1. **INSPIRE Application Schema 'Thermal Network'**

|  |
| --- |
| **Code List** |
| *ThermalAppurtenanceTypeValue* |

ThermalAppurtenanceTypeValue

|  |  |
| --- | --- |
| Name: | thermal appurtenance type value |
| Definition: | Codelist containing a classification of thermal appurtenances. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codeList/US/ThermalAppurtenanceTypeValue> |
| Parent: | AppurtenanceTypeValue |
| Values: |  |

* 1. **INSPIRE Application Schema 'Water Network'**

|  |
| --- |
| **Code List** |
| *WaterAppurtenanceTypeValue* |
| *WaterTypeValue* |

WaterAppurtenanceTypeValue

|  |  |
| --- | --- |
| Name: | water appurtenance type |
| Definition: | Classification of water appurtenances. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WaterAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below and additional values at any level defined by data providers. |

|  |  |
| --- | --- |
| **anode**  Name: | anode |
| Definition: | Anode. |
| Description: | "An anode is a feature (specifically, an electrical mechanism) that‘s applied to system components for the prevention of rust, pitting, and the corrosion of metal surfaces that are in contact with water or soil. A low-voltage current is applied to the water or soil in contact with the metal, such that the electromotive force renders the metal component cathodic. Corrosion is concentrated on the anodes instead of on the associated (and protected) water system components. This type of corrosion may occur in copper, steel, stainless steel, cast iron, and ductile iron pipes." |
| **clearWell**  Name: clear well  Definition: Clear well. | |

|  |  |
| --- | --- |
| Description: | A clear well is an enclosed tank that is associated with a treatment plant. Clear wells are used to store filtered water of sufficient capacity to prevent the need to vary the filtration rate with variations in demand. Clear wells are also used to provide chlorine contact time for disinfection. Pumps are used to move the water from the clear well to the treatment plant or to a distribution system. |
| **controlValve**  Name: control valve  Definition: Control valve.  Description: "Control valves represent set of valves that operate in special ways. There are three fundamental types of control valves: backflow control, air control, and altitude." | |
| **fitting**  Name: fitting  Definition: Fitting.  Description: The fitting represents the facility found at the joint between two lines where a transition of some sort must occur. The basic connecting devices between pipes; fittings are rarely used to control the flow of water through the network. | |
| **hydrant**  Name: hydrant  Definition: Hydrant.  Description: "A hydrant enables fire fighters to attach fire hoses to the distribution network. Hydrants also have secondary uses that include flushing main lines and laterals, filling tank trucks, and providing a temporary water source for construction jobs." | |
| **junction**  Name: junction  Definition: Junction.  Description: "The junction is a water network node where two or more pipes combine, or a point where water consumption is allocated and defined as demand." | |
| **lateralPoint**  Name: lateral point  Definition: Lateral point.  Description: A lateral point represents the location of the connection between the customer and the distribution system. | |
| **meter**  Name: meter  Definition: Meter.  Description: "A meter is a facility that is used to measure water consumption (volume). Being a facility, a meter plays the role of a junction on the active network. NOTE Meters are also much like hydrants as they also have an associated warehouse object, namely, a WarehouseMeter." | |
| **pump**  Name: pump  Definition: Pump.  Description: "A pump is a piece of equipment that moves, compresses, or alters the pressure of a fluid, such as water or air, being conveyed through a natural or artificial channel. NOTE Pump types include AxialFlow, Centrifugal, Jet, Reciprocating, Rotary, Screw, and Turbine." | |
| **pumpStation**  Name: pump station  Definition: Pump station.  Description: A pump station is a facility for pumping water on the network to transport to another part of the network (lift pump). | |
| **samplingStation** | |

|  |  |
| --- | --- |
| Name: | sampling station |
| Definition: | Sampling station. |
| Description: | "A sampling station is a facility that is used for collecting water samples. Sampling stations may be dedicated sampling devices, or they may be other devices of the system where a sample may be obtained." |
| **scadaSensor**  Name: scada sensor  Definition: SCADA sensor.  Description: "The SCADA sensor is a feature that‘s used to remotely measure the status of network components as part of a supervisory control and data acquisition (SCADA) system. SCADA systems provide alarms, responses, data acquisition, and control for collection and distribution systems. Operators use the SCADA system to monitor and adjust processes and facilities." | |
| **storageBasin**  Name: storage basin  Definition: Storage basin.  Description: A storage basin represents artificially enclosed area of a river or harbor designed so that the water level remains unaffected by tidal changes. | |
| **storageFacility**  Name: storage facility  Definition: Enclosed storage facility. | |
| **surgeReliefTank**  Name: surge relief tank  Definition: Surge relief tank.  Description: A surge relief tank is a piece of equipment used to absorb pressure increases in the water system. Surge relief tanks provide a buffer against throttling within the system by accepting water into a tank through a pressure valve. | |
| **systemValve**  Name: system valve  Definition: System valve.  Description: "A system valve is a facility that is fitted to a pipeline or orifice in which the closure member is either rotated or moved transversely or longitudinally in the waterway so as to control or stop the flow. System valves are used to regulate pressure, isolate, throttle flow, prevent backflow, and relieve pressure. NOTE System valve types include Gate, Plug, Ball, Cone, and Butterfly. These specific types may be classified as isolation valves." | |
| **thrustProtection**  Name: thrust protection  Definition: Thrust protection.  Description: "The thrust protection represents a type of line protector that‘s used to prevent pipe movement. Thrust protection is commonly implemented as thrust blocks (masses of concrete material) that are placed at bends and around valve structures. NOTE The types of thrust protection include Anchor, Blocking, Deadman, and Kicker." | |
| **treatmentPlant**  Name: treatment plant  Definition: Treatment plant. Description: Treatment plant. | |
| **well**  Name: well  Definition: Production well. Description: Production well. | |
| **pressureRelieveValve** | |

|  |  |
| --- | --- |
| Name: | pressure relieve valve |
| Definition: | Pressure relieve valve. |
| Description: | pressure Relieve Valve |
| **airRelieveValve**  Name: air relieve valve  Definition: Air relieve valve. Description: air Relieve Valve | |
| **checkValve**  Name: check valve  Definition: Check valve. Description: check Valve | |
| **waterExhaustPoint**  Name: water exhaust point  Definition: Water exhaust point. Description: water Exhaust Point | |
| **waterServicePoint**  Name: water service point Definition: Water service point.  Description: water Service Point | |
| **fountain**  Name: fountain  Definition: Fountain.  Description: fountain | |
| **fireHydrant**  Name: fire hydrant  Definition: Fire hydrant. Description: fire Hydrant | |
| **pressureController**  Name: pressure controller  Definition: Pressure controller. Description: pressure Controller | |
| **vent**  Name: vent  Definition: Vent.  Description: vent | |
| **recoilCheckValve**  Name: recoil check valve Definition: Recoil check valve.  Description: recoil Check Valve | |
| **waterDischargePoint**  Name: water discharge point  Definition: Water discharge point. Description: water Discharge Point | |

WaterTypeValue

|  |  |
| --- | --- |
| Name: | water type |
| Definition: | Classification of water types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WaterTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in the table below |

and additional values at any level defined by data providers.

|  |  |
| --- | --- |
| **potable**  Name: | potable |
| Definition: | Potable water. |
| **raw**  Name: raw  Definition: Raw water. | |
| **salt**  Name: salt  Definition: Salt water. | |
| **treated**  Name: treated  Definition: Treated water. | |

**Annex D**

(informative)

**ServiceTypeValue codelist**

**Note:** Items in red originate directly from COFOG

|  |  |  |  |
| --- | --- | --- | --- |
| **Main group** | **First level** | **Second level** | **COFOG** |
|  | | | |
| **public administration**  **office** | | |  |
|  | general administration office | |  |
| specialized administration office | |  |
|  | | | |
| **public order**  **and safety** | | | GF03 |
|  | administration for public order and safety | |  |
| police service | | GF0301 |
| fire-protection service | | GF0302 |
|  | fire station |  |
| siren |  |
| hydrant |  |
| anti-fire water provision |  |
| fire detection and observation site |  |
| rescue service | |  |
|  | rescue station |  |
| rescue helicopter landing site |  |
| marine rescue station |  |
| civil protection site | |  |
| emergency call point | |  |
| standalone First Aid equipment | |  |
| defence | |  |
|  | barrack |  |
| camp |  |
|  | | | |
| **environmental**  **protection** | | | GF05 |
|  | administration for environmental protection | |  |
| environmental education centre | |  |
|  | | | |
| **health** | | | GF07 |
|  | administration for health | |  |
| medical products, appliances and equipment | | GF0701 |
| outpatient service | | GF0702 |
|  | general medical service | GF070201 |
| specialized medical services | GF070202 |
| paramedical service | GF070204 |
| hospital service | | GF0703 |
|  | general hospital |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Main group** | **First level** | **Second level** | **COFOG** |
|  |  | specialized hospital |  |
| nursing and convalescent home service | GF070304 |
| medical and diagnostic laboratory | |  |
|  | | | |
| **education** | | | GF09 |
|  | administration for education | |  |
| early childhood education | |  |
| primary education | |  |
| lower secondary education | |  |
| upper secondary education | |  |
| post-secondary non-tertiary  education | | GF0903 |
| short-cycle tertiary education | |  |
| bachelor or equivalent education | |  |
| master or equivalent education | |  |
| doctoral or equivalent education | |  |
| education not elsewhere classified | |  |
| subsidiary services to education | | GF0906 |
|  | | | |
| **social service** | | | GF10 |
|  | administration for social protection | |  |
| specialized service of social protection | |  |
| housing | | GF1006 |
| child care service | |  |
| charity and counselling | |  |

**Annex E**

(informative)

**Checklists for data interoperability**

As mentioned in Annex F of the "―Data Specifications‖ Methodology for the development of data specifications", the TWG-US identified several user requirements for some sub-themes that are listed hereunder:

* 1. **User requirements for “Utility Networks”**
     1. Checklist for Flemish (Belgium) Environment Agency
  2. **User requirements for “Administrative and social governmental services”**
     1. Checklist for the Use case TWG\_US\_GD\_map\_case (ref. Annex B.1.2)
     2. Checklist for Spanish EIEL Database
     3. Checklist for Málaga (Spain) Province Council
     4. Checklist for French Statistical Environmental Observatory
     5. Checklist for German State‘s Administrations and Organizations concerned with security issues
  3. **User requirements for “Waste Management”**
     1. Checklist for Austrian Environmental Data Management System EDM
     2. Checklist for Piemonte (Italy) Regional Waste Information System

*Several tables, based on Annex F of the "“Data Specifications” Methodology for the development of data specifications" framework, have been developed, but due to the size of the current document, such requirement information will not be provided directly within the data specification.*

*Anyway, interested persons can contact the TWG members to get it if wanted.*

**Portrayal analysis**

Unfortunately no European-wide accepted standard for map symbolisation exists, which could be applied for the more than 50 different service types of the administrative and social governmental services application schema.

In a bachelor thesis [Kaden 201126] the great diversity of existing symbols in European geoportals and printed maps is shown. Figure E.1 contains some symbols, which are used for the portrayal of police stations:

|  |  |  |  |
| --- | --- | --- | --- |
| Symbol_hospital_PolSA | Symbol_hospital_PolSAKreis | Symbol_Poll_Sonne | Symbol_Poll_Ring |
| Symbol_Poll_MarkeS | Symbol_POL_Marke | Symbol_POL_SR | Symbol_POL_sP |
| Symbol_POL_PunktO | Symbol_POL_ME | Symbol_POL_Oval | Symbol_Poll_SonneKreis |
| Symbol_POL_blauSonne | Symbol_POL_PKreis | Symbol_POL_KFS | Symbol_POL_KFF |

**Figure F.1: Map symbols for police stations used in European geoportals and maps (sources see [Kaden 2011])**

Based on this survey, the TWG US has abstained from proposing a common style for the subtheme Governmental Services. The provision of a harmonized, widely accepted cartographic symbology of such a broad scope wasn't seen as a realistic aim. Instead of that a fine-grained layer structure according to the items of the ServiceTypeValue code list has been proposed (see chapter 11.1.1).

26 [Kaden 2011]

Nancy Kaden: ―Spezifikation von Darstellungsregeln für das INSPIRE-Thema "Versorgungswirtschaft und staatliche Dienste" (Bachelor Thesis)

[*http://www2.htw-dresden.de/~fegis/DA/DA\_KADEN\_2011/Bachelorarbeit.pdf*](http://www2.htw-dresden.de/~fegis/DA/DA_KADEN_2011/Bachelorarbeit.pdf)



|  |  |  |
| --- | --- | --- |
| **Comm** | | «codeList»  **on Extended Utility Network Elements:: ManholeCoverShapeTypeValue** |
| + | circle | |
| + | composite | |
| + | grid | |
| + | other | |
| + | rectangle | |
| + | square | |

**Annex G**

(informative)

**Extended Utility Networks Application Schemas**

* 1. **“Common Extended Utility Networks Elements” application schema**

#### UML Overview

|  |  |
| --- | --- |
| «codeList»  **Common Extended Utility Network Elements:: ManholeShaftAccessTypeValue** | |
| + | climbingIron |
| + | ladder |
| + | ladderFittings |
| + | noAccess |
| + | stairs |
| + | other |

|  |  |
| --- | --- |
| «codeList»  **Common Extended Utility Network Elements:: PoleTypeValue** | |
| + | hFrame |
| + | other |
| + | standard |
| + | streetLight |
| + | tower |
| + | veryHighVoltage |

|  |  |  |
| --- | --- | --- |
| **Common** | | «codeList»  **Extended Utility Network Elements:: PipeShapeTypeValue** |
| + | arched | |
| + | circle | |
| + | cunette | |
| + | other | |
| + | rectangle | |
| + | square | |
| + | trapezoid | |
| + | oval | |
| + | ovoid | |

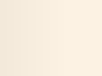
|  |  |
| --- | --- |
| «codeList»  **Common Extended Utility Network Elements:: ManholeShaftMaterialTypeValue** | |
| + | cement |
| + | concrete |
| + | fiberglass |
| + | masonry |
| + | other |
| + | plasteredMasonry |
| + | plastic |
| + | precastConcrete |
| + | reinforcedPolyester |

|  |  |  |
| --- | --- | --- |
| **Common** | | «codeList»  **Extended Utility Network Elements:: PoleMaterialTypeValue** |
| + | aluminiuim | |
| + | composite | |
| + | concrete | |
| + | fiberglass | |
| + | other | |
| + | steel | |
| + | wood | |

|  |  |  |
| --- | --- | --- |
| **Commo** | | «codeList»  **n Extended Utility Network Elements:: PipeCoatingTypeValue** |
| + | CPVC | |
| + | epoxy | |
| + | HDPE | |
| + | none | |
| + | other | |
| + | PVC | |

|  |  |  |
| --- | --- | --- |
| **Co** | | «codeList»  **mmon Extended Utility Network Elements:: ManholeCoverOpeningTypeValue** |
| + | bolts | |
| + | hooks | |
| + | lever | |
| + | socket | |
| + | other | |

**Figure 1 – UML class diagram: Overview of the “Extended Utility Networks - Extended Common Types”**



**class Extended Utility Networks - Extended Common Ty...**

+pipes

«voidable» 0..\*

*UtilityLink SequenceOrLink*

«featureType»

***Common Core Utility***

*UtilityLink SequenceOrLink*

«featureType»

**Common Core Utility**

+cables

**Network Elements::Pipe** +pipes

***Network Elements::Cable*** «voidable»

0..\*

«voidable»

+ pipeDiameter: Measure

0..\*

«voidable» + pressure: Measure [0..1] 0..\*

+cables

*UtilityLink SequenceOrLink*

«featureType» +ducts **Common Core Utility** «voidable» **Network Elements::Duct** 0..\*

«voidable»

+ ductWidth: Length

«featureType» **Common Extended Utility Network Elements:: CableExtended**

«featureType»

**Common Extended Utility Network Elements::PipeExtended**

«featureType»

**Common Extended Utility Network Elements::DuctExtended**

«featureType»

**Common Extended Utility Network Elements:: ManholeExtended**

«voidable»

+ capacity: Measure

«voidable» «voidable»

+ pipeCoatingType: PipeCoatingTypeValue + ductCasingType: DuctCasingTypeValue

+ pipeMaterialType: codevalue

+ pipeShapeType: PipeShapeTypeValue

+ ductType: DuctTypeValue

+ columns: Integer

+ rows: Integer

+ spacer: Length

Pipe & Duct Enumerations

«voidable»

+ manholeCoverLength: Length

+ manholeType: ManholeTypeValue

+ manholeCoverOpeningType: ManholeCoverOpeningTypeValue

+ manholeCoverWidth: Length

+ manholeCoverShapeType: ManholeCoverShapeTypeValue

+ manholeShaftAccessType: ManholeShaftAccessTypeValue

+ manholeShaftMaterialType: ManholeShaftMaterialTypeValue

+ manholeShaftHeight: Length

+ manholeShaftLength: Length

+ manholeShaftWidth: Length

Pole Enumerations

Manhole Enumerations

+ handhole

+ manhole

+ vault

«codeList»

**Common Extended Utility Network Elements:: ManholeTypeValue**

+ extraDeepInEarth

+ normallyInEarth

+ normalWithConcreteBackfill

+ onConcreteFoundation

+ other

«codeList»

**Common Extended Utility Network Elements:: PoleFoundationTypeValue**

+ concrete

+ directBuried

+ none

«codeList»

**Extended Electricity:: ElectricityCableConductorMaterialTypeValue:: DuctCasingTypeValue**

«codeList»

**Common Extended Utility Network Elements:: DuctTypeValue**

+ poleType: PoleTypeValue

+ poleMaterialType: PoleMaterialTypeValue

+ poleFoundationType: PoleFoundationTypeValue

+ poleDiameter: Length

+ hasAnchorGuy: Boolean

+ hasPushBrace: Boolean

+ hasRiser: Boolean

«voidable»

*UtilityNodeContainer*

«featureType»

**Common Extended Utility Network Elements:: PoleExtended**

«voidable»

+ cabinetHeight: Length

+ cabinetLength: Length

+ cabinetWidth: Length

«featureType»

**Common Extended Utility Network Elements:**

**:CabinetExtended**

*UtilityNodeContainer*

«featureType» **Common Core Utility Network Elements:: Cabinet**

+ poleHeight: Length

«voidable»

*UtilityNodeContainer*

«featureType» **Common Core Utility Network Elements::Pole**

*UtilityNodeContainer*

«featureType» **Common Core Utility Network Elements:: Manhole**

|  |  |
| --- | --- |
| «codeList»  **Common Extended Utility Network Elements:: PipeMaterialTypeValue** | |
| + | ABS |
| + | asbestos |
| + | blackIron |
| + | blackSteel |
| + | castIron |
| + | clay |
| + | compositeConcrete |
| + | concrete |
| + | CPVC |
| + | FRP |
| + | galvanizedSteel |
| + | masonry |
| + | other |
| + | PB |
| + | PE |
| + | PEX |
| + | PP |
| + | prestressedReinforcedConcrete |
| + | PVC |
| + | reinforcedConcrete |
| + | RPMP |
| + | steel |
| + | terracota |
| + | wood |

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Common Extended Utility Network Elements |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *CabinetExtended* | Common Extended Utility Network Elements | «featureType» |
| *CableExtended* | Common Extended Utility Network Elements | «featureType» |
| *DuctExtended* | Common Extended Utility Network Elements | «featureType» |
| *DuctTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *ManholeCoverOpeningTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *ManholeCoverShapeTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *ManholeExtended* | Common Extended Utility Network Elements | «featureType» |
| *ManholeShaftAccessTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *ManholeShaftMaterialTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *ManholeTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PipeCoatingTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PipeExtended* | Common Extended Utility Network Elements | «featureType» |
| *PipeMaterialTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PipeShapeTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PoleExtended* | Common Extended Utility Network Elements | «featureType» |
| *PoleFoundationTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PoleMaterialTypeValue* | Common Extended Utility Network Elements | «codeList» |
| *PoleTypeValue* | Common Extended Utility Network Elements | «codeList» |

* + - 1. **Spatial object types**
         1. *CabinetExtended*

|  |  |
| --- | --- |
| **CabinetExtended** | |
| Name: | Cabinet (Extended) |
| Subtype of: | Cabinet |
| Definition: | Extends the Cabinet feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: cabinetHeight**  Value type: Length  Definition: The height of the cabinet.  Description: The height is the vertical extend measuring accross the object - in this case, the cabinet - at right angles to the lenght.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: cabinetLength**  Value type: Length  Definition: The lenght of the cabinet.  Description: Lenght refers to the longest dimension of an object - in this case, the cabinet. Multiplicity: 1 | |

|  |  |
| --- | --- |
| **CabinetExtended** | |
| Stereotypes: | «voidable» |
| **Attribute: cabinetWidth**  Value type: Length  Definition: The width of the cabinet.  Description: The measurement of the object - in this case, the cabinet - from side to side. Multiplicity: 1  Stereotypes: «voidable» | |

* + - * 1. *CableExtended*

|  |  |
| --- | --- |
| **CableExtended** | |
| Name: | Cable (Extended) |
| Subtype of: | Cable |
| Definition: | Extends the Cable feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: capacity**  Value type: Measure  Multiplicity: 1  Stereotypes: «voidable» | |

* + - * 1. *DuctExtended*

|  |  |
| --- | --- |
| **DuctExtended** | |
| Name: | Duct (Extended) |
| Subtype of: | Duct |
| Definition: | Extends the Duct feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: ductCasingType**  Value type: DuctCasingTypeValue Definition: Type of the Duct casing. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: ductType**  Value type: DuctTypeValue Definition: Type of the Duct.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: columns**  Value type: Integer  Definition: Number of pipe columns. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: rows**  Value type: Integer  Definition: Number of pipe rows. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: spacer** | |

|  |  |
| --- | --- |
| **DuctExtended** | |
| Value type: | Length |
| Definition: | Spacer size, in case there's built-in spacers. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |

* + - * 1. *ManholeExtended*

|  |  |
| --- | --- |
| **ManholeExtended** | |
| Name: | Manhole (Extended) |
| Subtype of: | Manhole |
| Definition: | Extends the Manhole feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: manholeCoverLength**  Value type: Length  Definition: The lenght of the manhole cover.  Description: Lenght refers to the longest dimension of an object - in this case, the manhole cover.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeType**  Value type: ManholeTypeValue Definition: Type of the manhole. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeCoverOpeningType**  Value type: ManholeCoverOpeningTypeValue Definition: Manhole cover opening.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeCoverWidth**  Value type: Length  Definition: The width of the manhole cover.  Description: The measurement of the object - in this case, the manhole cover - from side to side.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeCoverShapeType**  Value type: ManholeCoverShapeTypeValue Definition: Manhole cover shape.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeShaftAccessType**  Value type: ManholeShaftAccessTypeValue Definition: Manhole shaft access.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeShaftMaterialType** | |

|  |  |
| --- | --- |
| **ManholeExtended** | |
| Value type: | ManholeShaftMaterialTypeValue |
| Definition: | Manhole shaft material. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |
| **Attribute: manholeShaftHeight**  Value type: Length  Definition: Manhole shaft height. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeShaftLength**  Value type: Length  Definition: Manhole shaft length. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: manholeShaftWidth**  Value type: Length  Definition: Manhole shaft width. Multiplicity: 1  Stereotypes: «voidable» | |

* + - * 1. *PipeExtended*

|  |  |
| --- | --- |
| **PipeExtended** | |
| Name: | Pipe (Extended) |
| Subtype of: | Pipe |
| Definition: | Extends the Pipe feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: pipeCoatingType**  Value type: PipeCoatingTypeValue Definition: Pipe coating.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: pipeMaterialType**  Value type: codevalue  Definition: Pipe material.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: pipeShapeType**  Value type: PipeShapeTypeValue Definition: Pipe shape.  Multiplicity: 1  Stereotypes: «voidable» | |

* + - * 1. *PoleExtended*

|  |  |
| --- | --- |
| **PoleExtended** | |
| Name: | Pole (Extended) |
| Subtype of: | PoleUtilityNodeContainer |

|  |  |
| --- | --- |
| **PoleExtended** | |
| Definition: | Extends the Pole feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: poleType**  Value type: PoleTypeValue Definition: Type of the pole.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: poleMaterialType**  Value type: PoleMaterialTypeValue Definition: Pole material.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: poleFoundationType**  Value type: PoleFoundationTypeValue Definition: Pole foundation type.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: poleDiameter**  Value type: Length  Definition: Diameter of the pole. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: hasAnchorGuy**  Value type: Boolean  Definition: Indicates whether a pole has anchor guy.  Description: An *anchor guy* is a wire or set of wires running from the top of the pole to an anchor installed in the ground and consists of wires, appropriate fastenings and the anchor. The anchor guy is usually installed at a distance from the pole that is  0.25 to 1.5 of the height of the attachment such that the slope is about 1:1. Sidewalk guys have a horizontal strut that is attached about halfway down the pole to provide pedestrian clearance. The guy runs from the top of the pole to the top of the strut, then down to the anchor.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: hasPushBrace**  Value type: Boolean  Definition: Indicates whether a pole has push braces.  Description: *Pushbraces* support or brace a pole when it is not feasible to use an anchor guy. A pushbrace is a pole or other member that is placed at an angle to help support the unbalanced pole and is often used on the inside curve of mountain roads. The poles that pushbraces support are grouped into classes based on their circumference 6 feet from the butt of the structure.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: hasRiser**  Value type: Boolean  Definition: Indicates whether a pole has risers. | |

|  |  |
| --- | --- |
| **PoleExtended** | |
| Description: | A *riser* is a cylindrical or channel enclosure attached to a pole or structure to provide protection for underground conduit as it transitions from overhead to underground. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |

* + - 1. **Code lists**
         1. *DuctTypeValue*

|  |  |
| --- | --- |
| **DuctTypeValue** | |
| Name: | Duct type value (Extended) |
| Definition: | Codelist containing a classification of duct types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/DuctTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in *Annex C* and additional values at any level defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ManholeCoverOpeningTypeValue*

|  |  |
| --- | --- |
| **ManholeCoverOpeningTypeValue** | |
| Name: | Manhole cover opening type value (Extended) |
| Definition: | Codelist containing a classification of manhole cover opening types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/ManholeCoverOpeningTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ManholeCoverShapeTypeValue*

|  |  |
| --- | --- |
| **ManholeCoverShapeTypeValue** | |
| Name: | Manhole cover shape type value (Extended) |
| Definition: | Codelist containing a classification of manhole cover shape types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/ManholeCoverShapeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ManholeShaftAccessTypeValue*

|  |  |
| --- | --- |
| **ManholeShaftAccessTypeValue** | |
| Name: | Manhole shaft access type value (Extended) |
| Definition: | Codelist containing a classification of manhole shaft access types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/ManholeShaftAccessTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ManholeShaftMaterialTypeValue*

|  |  |
| --- | --- |
| **ManholeShaftMaterialTypeValue** | |
| Name: | Manhole shaft material type value (Extended) |
| Definition: | Codelist containing a classification of manhole shaft material types. |
| Extensibility: | any |

|  |  |
| --- | --- |
| **ManholeShaftMaterialTypeValue** | |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/ManholeShaftMaterialTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ManholeTypeValue*

|  |  |
| --- | --- |
| **ManholeTypeValue** | |
| Name: | Manhole type value (Extended) |
| Definition: | Codelist containing a classification of manhole types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/ManholeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PipeCoatingTypeValue*

|  |  |
| --- | --- |
| **PipeCoatingTypeValue** | |
| Name: | Pipe coating type value (Extended) |
| Definition: | Codelist containing a classification of pipe coating types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PipeCoatingTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PipeMaterialTypeValue*

|  |  |
| --- | --- |
| **PipeMaterialTypeValue** | |
| Name: | Pipe material type value (Extended) |
| Definition: | Codelist containing a classification of pipe material types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PipeMaterialTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PipeShapeTypeValue*

|  |  |
| --- | --- |
| **PipeShapeTypeValue** | |
| Name: | Pipe shape type value (Extended) |
| Definition: | Codelist containing a classification of pipe shape types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PipeShapeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PoleFoundationTypeValue*

|  |  |
| --- | --- |
| **PoleFoundationTypeValue** | |
| Name: | Pole foundation type value (Extended) |
| Definition: | Codelist containing a classification of pole foundation types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PoleFoundationTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data |

|  |
| --- |
| **Duct** |
| Package: Common Utility Network Elements |

|  |
| --- |
| **PoleFoundationTypeValue** |
| providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PoleMaterialTypeValue*

|  |  |
| --- | --- |
| **PoleMaterialTypeValue** | |
| Name: | Pole material type value (Extended) |
| Definition: | Codelist containing a classification of pole material types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PoleMaterialTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *PoleTypeValue*

|  |  |
| --- | --- |
| **PoleTypeValue** | |
| Name: | Pole type value (Extended) |
| Definition: | Codelist containing a classification of pole types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/US/PoleTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Boolean*

|  |  |
| --- | --- |
| **Boolean** | |
| Package: | Truth |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *Cabinet*

|  |  |
| --- | --- |
| **Cabinet** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Simple cabinet object which may carry utility objects belonging to either single or multiple utility networks. |
| Description: | Cabinets represent mountable node objects that can contain smaller utility devices and cables. |

* + - * 1. *Cable*

|  |  |
| --- | --- |
| **Cable (abstract)** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence used to convey electricity or data from one location to another. |

|  |
| --- |
| **Measure** |
| Package: ProductionAndIndustrialFacilitiesExtension |

|  |  |
| --- | --- |
| **Duct** | |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence used to protect and guide cable and pipes via an encasing construction. |
| Description: | A Duct (or Conduit, or Duct-bank, or Wireway) is a linear object which belongs to the structural network. It is the outermost casing. A Duct may contain Pipe(s), Cable(s) or other Duct(s). Duct is a concrete feature class that contains information about the position and characteristics of ducts as seen from a manhole, vault, or a cross section of a trench and duct. |

* + - * 1. *DuctCasingTypeValue*

|  |  |
| --- | --- |
| **DuctCasingTypeValue** | |
| Package: | Extended Electricity |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Type of duct casings. |

* + - * 1. *Integer*

|  |  |
| --- | --- |
| **Integer** | |
| Package: | Numerics |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *Length*

|  |  |
| --- | --- |
| **Length** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *Manhole*

|  |  |
| --- | --- |
| **Manhole** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Simple container object which may contain either single or multiple utility networks objects. |
| Description: | Manholes perform following functions:   * Provide drainage for the conduit system so that freezing water does not damage the conduit or wires. * Provide a location for bending the conduit run without damaging the wires. * Provide a junction for conduits coming from different directions. * Provide access to the system for maintenance. |

|  |  |
| --- | --- |
| **Measure** | |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *Pipe*

|  |  |
| --- | --- |
| **Pipe** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence for the conveyance of solids, liquids, chemicals or gases from one location to another. A pipe can also be used as an object to encase several cables (a bundle of cables) or other (smaller) pipes. |

* + - * 1. *Pole*

|  |  |
| --- | --- |
| **Pole** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | Simple pole (mast) object which may carry utility objects belonging to either single or multiple utility networks. |
| Description: | Poles represent node objects that can support utility devices and cables. |

* + - * 1. *UtilityNodeContainer*

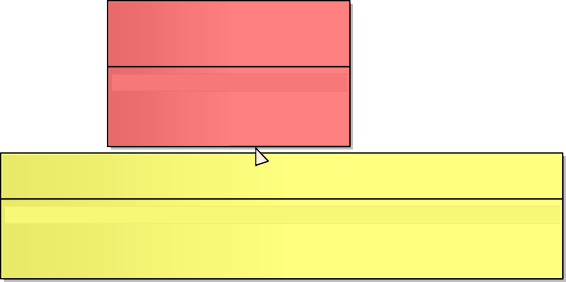
|  |  |
| --- | --- |
| **UtilityNodeContainer (abstract)** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A point spatial object which is used for connectivity, and also may contain other spatial objects (not neccessarily belonging to the same utility network). |
| Description: | Nodes are found at either end of the UtilityLink. |

* + - * 1. *codevalue*

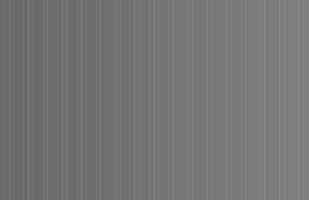
|  |  |
| --- | --- |
| **codevalue** | |
| Package: | EncodingRules |
| Reference: | Geographic information -- Encoding [ISO 19118:2011] |

* 1. **“Extended Electricity Network” application schema**

#### UML Overview



|  |
| --- |
| **class Extended Electricity Netw...**  *Cable*  «featureType»  **Electricity Network::ElectricityCable**  voidable»  + operatingVoltage: Measure  + nominalVoltage: Measure  «featureType»  **ElectricityCableExtended**  voidable»  + electricityCableType: ElectricityCableTypeValue  + electricityCableConductorMaterialType: ElectricityCableConductorMaterialTypeValue  + conductorSize: Length  «codeList»  **ElectricityCableTypeValue**  + P\_OH\_Single  + P\_OH\_Three  + P\_OH\_Two  + P\_UG\_Single  + P\_UG\_Three  + S\_OH\_Single  + S\_OH\_Three  + S\_UG\_Single  + S\_UG\_Three  + streetLightConductor  + other  **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/ElectricityCableTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 2 – UML class diagram: Overview of the “Electricity Networks”**

|  |
| --- |
| «codeList»  **ElectricityCableConductorMaterialTypeValue** |
| + aluminium  + copper  + steel |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/ElectricityCableConductorMaterialTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Extended Electricity |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *ElectricityCableConductorMaterialTypeValue* | Extended Electricity | «codeList» |
| *ElectricityCableExtended* | Extended Electricity | «featureType» |
| *ElectricityCableTypeValue* | Extended Electricity | «codeList» |

* + - 1. **Spatial object types**
         1. *ElectricityCableExtended*

|  |  |
| --- | --- |
| **ElectricityCableExtended** | |
| Name: | Electricity cable (Extended) |
| Subtype of: | ElectricityCable |
| Definition: | Extends the ElectricityCable feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: electricityCableType**  Value type: ElectricityCableTypeValue Definition: Type of electricity cable. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: electricityCableConductorMaterialType**  Value type: ElectricityCableConductorMaterialTypeValue | |

|  |  |
| --- | --- |
| **ElectricityCableExtended** | |
| Definition: | Cable conductor material type. |
| Multiplicity: | 1 |
| Stereotypes: | «voidable» |
| **Attribute: conductorSize**  Value type: Length  Definition: Size of the conductor. Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *ElectricityCableConductorMaterialTypeValue*

|  |  |
| --- | --- |
| **ElectricityCableConductorMaterialTypeValue** | |
| Name: | Electricity cable conductor material type value (Extended) |
| Definition: | Codelist containing a classification of electricity cable conductor material types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ElectricityCableConductorMaterialTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ElectricityCableTypeValue*

|  |  |
| --- | --- |
| **ElectricityCableTypeValue** | |
| Name: | Electricity cable type value (Extended) |
| Definition: | Codelist containing a classification of electricity cable types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ElectricityCableTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *ElectricityCable*

|  |  |
| --- | --- |
| **ElectricityCable** | |
| Package: | Electricity Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence used to convey electricity from one location to another. |

* + - * 1. *Length*

|  |  |
| --- | --- |
| **Length** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

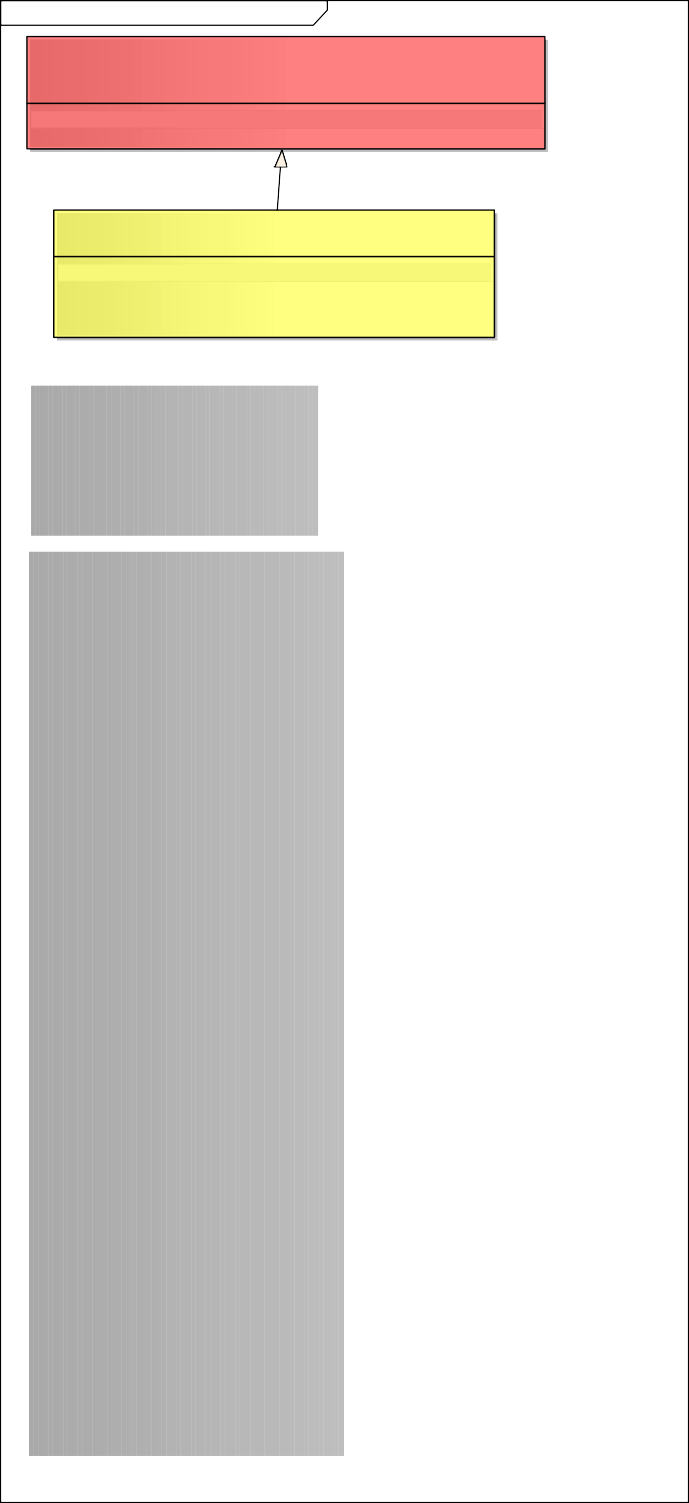
* 1. **“Extended Oil-Gas-Chemicals Network” application schema**

#### UML Overview

|  |
| --- |
| «codeList»  **OilGasChemicalsPipeTypeValue** |
|  |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/OilGasChemicalsPipeTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Oil-Gas-Chemicals Network::OilGasChemicalsProductTypeValue** |
| + liquefiedNaturalGas  + methane  + naturalGas  + naturalGasAndTetrahydrothiophene  + nitrogenGas  + residualGas  + accetone  + air  + argon  + butadiene  + butadiene1,3  + butane  + c3  + carbonMonoxide  + chlorine  + compressedAir  + crude  + dichloroethane  + diesel  + ethylene  + gasFabricationOfCocs  + gasHFx  + gasoil  + hydrogen  + isobutane  + JET-A1  + kerosene  + liquidAmmonia  + liquidHydrocarbon  + multiProduct  + MVC  + nitrogen  + oxygen  + phenol  + propane  + propyleen  + propylene  + raffinate  + refineryProducts  + saltWater  + saumur  + tetrachloroethane  + unknown  + empty |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/OilGasChemicalsProductTypeBaseValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 3 – UML class diagram: Overview of the “Oil-Gas-Chemicals Networks”**



**class Extended Oil, Gas & Chemicals Netw...**

*Pipe*

«featureType»

**Gas-Chemicals Network::OilGasChemicalsPipe**

+ oilGasChemicalsPipeType: OilGasChemicalsPipeTypeValue

+ averageVolume: Volume

+ maxCapacity: Measure

«voidable»

«featureType»

**ilGasChemicalsPipeExtended**

**O**

ductType: OilGasChemicalsProductTypeValue [1..\*]

alsPro

+ oilGasChemic

«voidable»

**Oil-**

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Extended Oil-Gas-Chemicals |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *OilGasChemicalsPipeExtended* | Extended Oil-Gas-Chemicals | «featureType» |
| *OilGasChemicalsPipeTypeValue* | Extended Oil-Gas-Chemicals | «codeList» |

* + - 1. **Spatial object types**
         1. *OilGasChemicalsPipeExtended*

|  |  |
| --- | --- |
| **OilGasChemicalsPipeExtended** | |
| Name: | Oil, gas and chemicals pipe (Extended) |
| Subtype of: | OilGasChemicalsPipe |
| Definition: | Extends the OilGasChemicalsPipe feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: oilGasChemicalsPipeType**  Value type: OilGasChemicalsPipeTypeValue Definition: Type of oil/gas/chemicals pipe. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: averageVolume**  Value type: Volume  Definition: Average volume of the pipe. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: maxCapacity**  Value type: Measure  Definition: Maximum capacity of the pipe. Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *OilGasChemicalsPipeTypeValue*

|  |  |
| --- | --- |
| **OilGasChemicalsPipeTypeValue** | |
| Name: | Oil, gas and chemicals pipe type value (Extended) |
| Definition: | Codelist containing a classification of oil, gas and chemical pipe types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/OilGasChemicalsPipeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Measure*

|  |  |
| --- | --- |
| **Measure** | |
| Package: | ProductionAndIndustrialFacilitiesExtension |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *OilGasChemicalsPipe*

|  |  |
| --- | --- |
| **OilGasChemicalsPipe** | |
| Package: | Oil-Gas-Chemicals Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A pipe used to convey oil, gas or chemicals from one location to another. |

* + - * 1. *Volume*

|  |  |
| --- | --- |
| **Volume** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* 1. **“Extended Thermal Network” application schema**

#### UML Overview

|  |  |  |
| --- | --- | --- |
| **T** | **her** | *Pipe*  «featureType»  **mal Network::ThermalPipe** |
|  |  |  |
| voidable» |  |  |
| + thermal | Pro | ductType: ThermalProductTypeValue |

|  |  |  |
| --- | --- | --- |
|  | **T** | «featureType»  **hermalPipeExtended** |
|  |  |  |
| voidable | » |  |
| + therm | alP | peType: ThermalPipeTypeValue |

|  |
| --- |
| «codeList»  **ThermalProductTypeExtendedValue** |
| + heatingSteam  + heatingWater  + coolingWater |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/ThermalProductTypeExtendedValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

**Figure 5 – UML class diagram: Overview of the “Extended Thermal Networks”**



**class Extended Thermal Netw...**

i

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/US/ThermalPipeTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

«codeList»

**ThermalPipeTypeValue**

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Extended Thermal |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *ThermalAppurtenanceTypeExtendedValue* | Extended Thermal | «codeList» |
| *ThermalPipeExtended* | Extended Thermal | «featureType» |
| *ThermalPipeTypeValue* | Extended Thermal | «codeList» |
| *ThermalProductTypeExtendedValue* | Extended Thermal | «codeList» |

* + - 1. **Spatial object types**
         1. *ThermalPipeExtended*

|  |  |
| --- | --- |
| **ThermalPipeExtended** | |
| Name: | Thermal pipe (Extended) |
| Subtype of: | ThermalPipe |

|  |  |
| --- | --- |
| **ThermalPipeExtended** | |
| Definition: | Extends the ThermalPipe feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: thermalPipeType**  Value type: ThermalPipeTypeValue Definition: Type of thermal pipe.  Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *ThermalAppurtenanceTypeExtendedValue*

|  |  |
| --- | --- |
| **ThermalAppurtenanceTypeExtendedValue** | |
| Name: | Thermal appurtenance type value (Extended) |
| Definition: | Codelist containing a classification of the extension of thermal appurtenance types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ThermalAppurtenanceExtendedTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in *Annex C* and additional values at any level defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ThermalPipeTypeValue*

|  |  |
| --- | --- |
| **ThermalPipeTypeValue** | |
| Name: | Thermal pipe type value (Extended) |
| Definition: | Codelist containing a classification of thermal pipe types. |
| Extensibility: | open |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ThermalPipeTypeValue> |
| Values: | The allowed values for this code list comprise the values specified in *Annex C* and additional values at any level defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - * 1. *ThermalProductTypeExtendedValue*

|  |  |
| --- | --- |
| **ThermalProductTypeExtendedValue** | |
| Name: | Thermal product type value (Extended) |
| Definition: | Codelist containing a classification of the extension of thermal product types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/ThermalProductTypeExtendedValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *ThermalPipe*

|  |  |
| --- | --- |
| **ThermalPipe** | |
| Package: | Thermal Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A pipe used to disseminate heating or cooling from one location to another. |

* 1. **“Extended Water Network” application schema**

#### UML Overview



|  |  |
| --- | --- |
| **Wate** | *Pipe*  «featureType»  **r Network::WaterPipe** |
| «voidabl | e» |
| + wate | rType: WaterTypeValue |

|  |  |  |
| --- | --- | --- |
|  | **W** | «featureType»  **aterPipeExtended** |
| «voidable | » |  |
| + wate  + avera  + maxC | Pip ge ap | eType: WaterPipeTypeValue Volume: Volume  acity: Measure |

|  |
| --- |
| «codeList»  **WaterPipeTypeValue** |
| + LL  + LL\_Commercial  + LL\_Domestic  + LL\_Fire  + LL\_HydrantLaterals  + LL\_Industrial  + LL\_Irrigation  + ML  + ML\_GM  + ML\_GM\_Carrier  + ML\_GM\_InLineStorage  + ML\_GM\_TransportPipe  + ML\_PM  + ML\_PM\_AirRelease  + ML\_PM\_BlowOff  + ML\_PM\_Bypass  + ML\_PM\_ChemicalInjection  + ML\_PM\_DistributionMain  + ML\_PM\_Interconnect  + ML\_PM\_PipeBridge  + ML\_PM\_SamplingStation  + ML\_PM\_TransmissionMain  + ML\_PM\_RawWaterTransport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/WaterPipeTypeValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Water Network::WaterTypeValue** |
| + potable  + raw  + salt  + treated |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/WaterTypeBaseValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| **class Extended Water Netw...**    r |

**Figure 6 – UML class diagram: Overview of the “Extended Water Networks”**

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Extended Water |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *WaterPipeExtended* | Extended Water | «featureType» |
| *WaterPipeTypeValue* | Extended Water | «codeList» |

* + - 1. **Spatial object types**
         1. *WaterPipeExtended*

|  |  |
| --- | --- |
| **WaterPipeExtended** | |
| Name: | Water pipe (Extended) |
| Subtype of: | WaterPipe |
| Definition: | Extends the WaterPipe feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: waterPipeType**  Value type: WaterPipeTypeValue Definition: Type of water pipe. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: averageVolume**  Value type: Volume  Definition: Average volume of the pipe. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: maxCapacity**  Value type: Measure  Definition: Maximum capacity of the pipe. Multiplicity: 1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *WaterPipeTypeValue*

|  |  |
| --- | --- |
| **WaterPipeTypeValue** | |
| Name: | Water pipe type value (Extended) |
| Definition: | Codelist containing a classification of water pipe types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/WaterPipeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Measure*

|  |  |
| --- | --- |
| **Measure** | |
| Package: | ProductionAndIndustrialFacilitiesExtension |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *Volume*

|  |  |
| --- | --- |
| **Volume** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

* + - * 1. *WaterPipe*

|  |  |
| --- | --- |
| **WaterPipe** | |
| Package: | Water Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A water pipe used to convey water from one location to another. |

* 1. **“Extended Sewer Network” application schema**

#### UML Overview

|  |
| --- |
| «codeList»  **SewerPipeTypeValue** |
| + LL  + LL\_Combination  + LL\_Commercial  + LL\_Domestic  + LL\_Irrigation  + LL\_Storm  + ML  + ML\_GM  + ML\_GM\_Collector  + ML\_GM\_Culvert  + ML\_GM\_InLineStorage  + ML\_GM\_Interceptor  + ML\_GM\_InvertedSiphon  + ML\_GM\_OpenChannel  + ML\_GM\_Outfall  + ML\_GM\_Overflow  + ML\_GM\_Tunnel  + ML\_PM  + ML\_PM\_ForceMain  + ML\_PM\_PipeBridge  + ML\_PM\_Pressure  + ML\_PM\_Vacuum |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/SewerPipeTypeValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| «codeList»  **Sewer Network::SewerWaterTypeValue** |
| + combined  + reclaimed  + sanitary  + storm |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/SewerWaterTypeBaseValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |
| --- |
| **class Extended Sewer Netw...**  *Pipe*  «featureType»  **Sewer Network::SewerPipe**  «voidable»  + sewerWaterType: SewerWaterTypeValue  «featureType»  **SewerPipeExtended**  «voidable»  + sewerPipeType: SewerPipeTypeValue  + averageVolume: Volume [0..1]  + maxCapacity: Measure [0..1] |

**Figure 6 – UML class diagram: Overview of the “Extended Sewer Networks”**

#### Feature catalogue

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Extended Sewer |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *SewerPipeExtended* | Extended Sewer | «featureType» |
| *SewerPipeTypeValue* | Extended Sewer | «codeList» |

* + - 1. **Spatial object types**
         1. *SewerPipeExtended*

|  |  |
| --- | --- |
| **SewerPipeExtended** | |
| Name: | Sewer pipe (Extended) |
| Subtype of: | SewerPipe |
| Definition: | Extends the SewerPipe feature in the Core Utility Network Profile. |
| Stereotypes: | «featureType» |
| **Attribute: sewerPipeType**  Value type: SewerPipeTypeValue Definition: Type of sewer pipe. Multiplicity: 1  Stereotypes: «voidable» | |
| **Attribute: averageVolume**  Value type: Volume  Definition: Average volume of the pipe. Multiplicity: 0..1  Stereotypes: «voidable» | |
| **Attribute: maxCapacity**  Value type: Measure  Definition: Maximum capacity of the pipe. Multiplicity: 0..1  Stereotypes: «voidable» | |

* + - 1. **Code lists**
         1. *SewerPipeTypeValue*

|  |  |
| --- | --- |
| **SewerPipeTypeValue** | |
| Name: | Sewer pipe type value (Extended) |
| Definition: | Codelist containing a classification of sewer pipe types. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/SewerPipeTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

* + - 1. **Imported types (informative)**

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - * 1. *Measure*

|  |  |
| --- | --- |
| **Measure** | |
| Package: | ProductionAndIndustrialFacilitiesExtension |
| Reference: | INSPIRE Data specification on Production and Industrial Facilities [DS-D2.8.III.8] |
| Definition: | Declared or measured quantity of any kind of physical entity. |

* + - * 1. *SewerPipe*

|  |  |
| --- | --- |
| **SewerPipe** | |
| Package: | Sewer Network |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A sewer pipe used to convey wastewater (sewer) from one location to another. |

* + - * 1. *Volume*

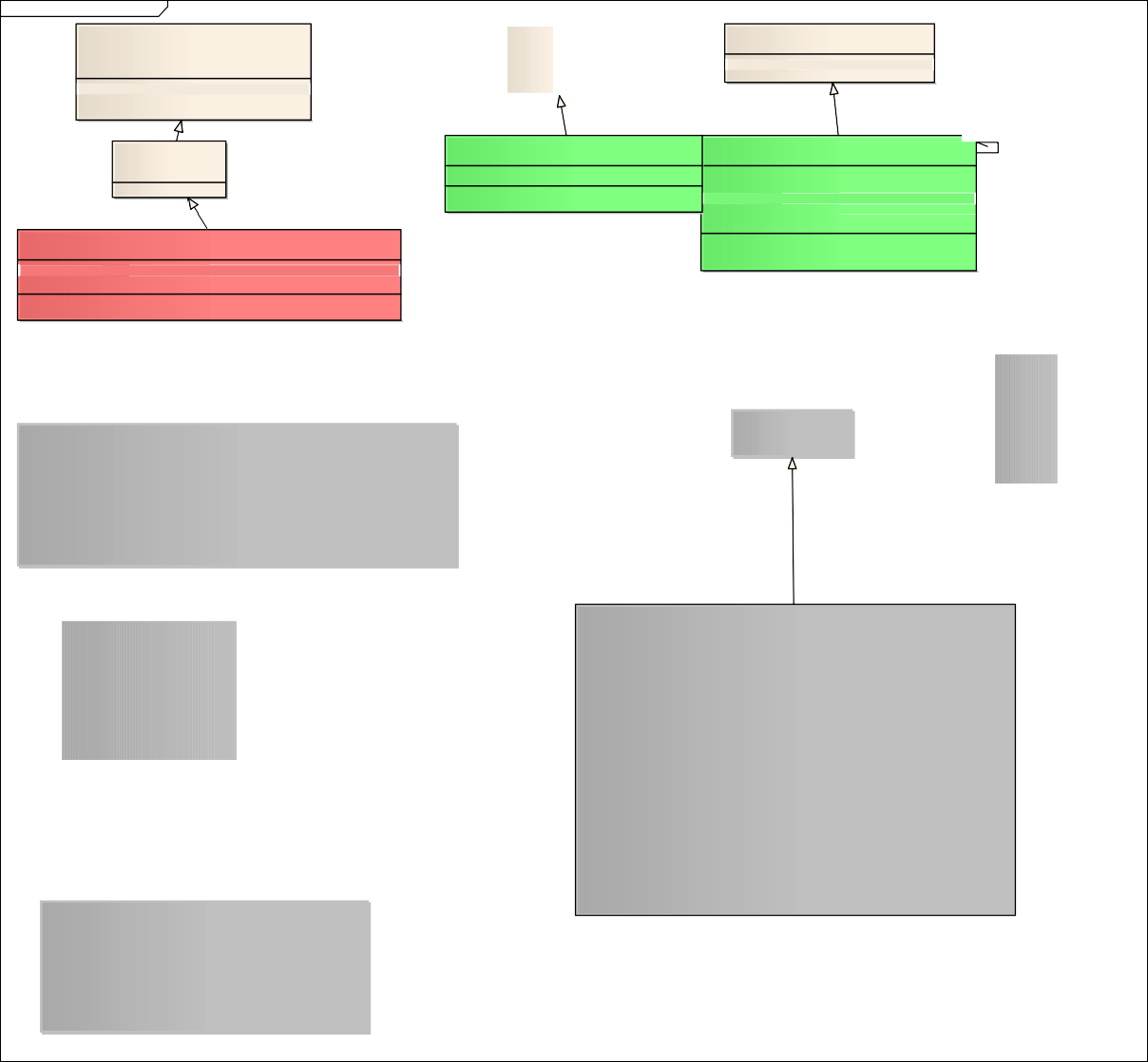
|  |  |
| --- | --- |
| **Volume** | |
| Package: | Units of Measure |
| Reference: | Geographic information -- Conceptual schema language [ISO/TS 19103:2005] |

**Annex H**

(informative)

**“Telecommunications Network” Application Schema**

* 1. **UML Overview**



**class Telecommunications Netw...**

+ geographic

iveryType: UtilityDeliveryTypeValue [0..1] ype: WarningTypeValue

+networks idable»

**Common Ut**

+ utilityNetworkTy

+ authorityRole:

+ utilityFacili

+ disclaimer:

**constraints**

{All utility network objects have inspireId}

{"telecommunications" value of "utilityNetworkType" is not in IR}

{"TelecommunicationsCabl

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/US/WarningTypeBaseValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ net

+ tape

+ concretePaving

«codeList»

**Common Utility Network Elements::WarningTypeValue**

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/US/TelecommunicationsCableMaterialTypeBaseValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ coaxial

+ opticalFiber

+ twistedPair

+ other

«codeList»

**TelecommunicationsCableMaterialTypeValue**

**tags**

asDictionary = true extensibility = any

vocabulary = <http://inspire.ec.europa.eu/codeList/US/TelecommunicationsAppurtenanceTypeBaseValue> xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions

+ antenna

+ copperMaintenanceLoop

+ copperRepeater

+ digitalCrossConnect

+ digitalLoopCarrier

+ exchange

+ fiberInterconnect

+ jointClosure

+ loadCoil

+ mainDistributionFrame

+ multiplexer

+ opticalMaintenanceLoop

+ opticalRepeater

+ patchPanel

+ spliceClosure

+ splitter

+ terminal

+ termination

+ noticeBoard

«codeList»

**TelecommunicationsAppurtenanceTypeValue**

«codeList»

**Common Utility Network Elements:: AppurtenanceTypeValue**

e" is not in IR}

**constraints**

bleMaterialType: TelecommunicationsCableMaterialTypeValue

onsCa

+ telecommunicati

«voidable»

«featureType»

**TelecommunicationsCable**

«featureType»

***Common Utility Network Elements::Cable***

tyReference: ActivityComplex [0..\*] PT\_FreeText [0..\*]

«voidable»

**constraints**

{"TelecommunicationsAppurtenanceTypeValue" is not in IR}

pe: UtilityNetworkTypeValue RelatedParty [1..\*]

+ appurtenanceType: AppurtenanceTypeValue

«vo

«featureType» 0..\*

**ility Network Elements::UtilityNetwork**

«featureType»

**Common Utility Network Elements::Appurtenance**

alName: GeographicalName [0..\*]

«voidable»

«featureType»

**Network::Network**

+ utilityDel

+ warningT

«voidable»

*Link Set UtilityNetwork Element*

«featureType»

***ity Network Elements::UtilityLinkSet***

***Util***

***Common***

*Node UtilityNetwork Element*

«featureType» ***Common Utility Network Elements:: UtilityNode***

|  |  |
| --- | --- |
| «codeList»  **Common Utility Network Elements:: UtilityNetworkTypeValue** | |
| + | electricity |
| + | oilGasChemicals |
| + | sewer |
| + | water |
| + | thermal |
| + | telecommunications [0..1] |
| + | crossTheme |

|  |
| --- |
| «codeList»  **Common Utility Network Elements::UtilityDeliveryTypeValue** |
| + collection  + distribution  + private  + transport |
| **tags**  asDictionary = true extensibility = any  vocabulary = <http://inspire.ec.europa.eu/codeList/US/UtilityDeliveryTypeBaseValue>  xsdEncodingRule = iso19136\_2007\_INSPIRE\_Extensions |

|  |  |
| --- | --- |
| **TelecommunicationsCableMaterialTypeValue** | |
| Name: | telecommunications cable material type |
| Definition: | Classification of telecommunications cable materials. |
| Extensibility: | any |

* 1. **Feature catalogue**

**Feature catalogue metadata**

|  |  |
| --- | --- |
| Application Schema | INSPIRE Application Schema Telecommunications Network |
| Version number | 3.0 |

**Types defined in the feature catalogue**

|  |  |  |
| --- | --- | --- |
| **Type** | **Package** | **Stereotypes** |
| *TelecommunicationsAppurtenanceTypeValue* | Telecommunications Network | «codeList» |
| *TelecommunicationsCable* | Telecommunications Network | «featureType» |
| *TelecommunicationsCableMaterialTypeValue* | Telecommunications Network | «codeList» |

#### Spatial object types

* + - 1. **TelecommunicationsCable**

|  |  |
| --- | --- |
| **TelecommunicationsCable** | |
| Name: | telecommunications cable |
| Subtype of: | Cable |
| Definition: | A utility link or link sequence used to convey data signals (PSTN, radio or computer) from one location to another. |
| Stereotypes: | «featureType» |
| **Attribute: telecommunicationsCableMaterialType**  Name: telecommunications cable material type Value type: TelecommunicationsCableMaterialTypeValue Definition: Type of cable material.  Multiplicity: 1  Stereotypes: «voidable» | |
| **Constraint: "TelecommunicationsCable" is not in IR**  Natural language:  OCL: | |

#### Code lists

* + - 1. **TelecommunicationsAppurtenanceTypeValue**

|  |  |
| --- | --- |
| **TelecommunicationsAppurtenanceTypeValue** | |
| Name: | telecommunications appurtenance type |
| Definition: | Classification of telecommunication appurtenances. |
| Extensibility: | any |
| Identifier: | <http://inspire.ec.europa.eu/codelist/TelecommunicationsAppurtenanceTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

|  |  |
| --- | --- |
| **TelecommunicationsCableMaterialTypeValue** | |
| Identifier: | <http://inspire.ec.europa.eu/codelist/TelecommunicationsCableMaterialTypeValue> |
| Values: | The allowed values for this code list comprise any values defined by data providers. *Annex C* includes recommended values that may be used by data providers. |

#### Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

* + - 1. **Cable**

|  |  |
| --- | --- |
| **Cable (abstract)** | |
| Package: | Common Utility Network Elements |
| Reference: | INSPIRE Data specification on Utility and Governmental Services [DS-D2.8.III.6] |
| Definition: | A utility link or link sequence used to convey electricity or data from one location to another. |

* 1. **INSPIRE-governed code lists**

#### Values of code list TelecommunicationsAppurtenanceTypeValue

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value** | **Name** | **Definition** | **Description** | **Parent**  **value** |
| antenna | antenna | Antenna. | An antenna (or aerial) is a transducer that transmits or receives electromagnetic waves. In other words, antennas convert  electromagnetic radiation into electric current, or vice versa. |  |
| copperMainte nanceLoop | copper Maintenance Loop | Copper (twisted-pair) maintenance  loop. | A copper maintenance loop is a coil of slack copper cable that is used to support future joining or other maintenance activities. |  |
| copperRepeat er | copper Repeater | Copper repeater. | A copper repeater is copper line conditioning equipment that amplifies the analog or digital input signal. |  |
| digitalCrossC onnect | digital Cross Connect | Digital cross connect (DXC). | A digital cross connect is a patch panel for copper cables that are used to provide digital service. Fibers in cables are connected to  signal ports in this equipment. |  |
| digitalLoopCa rrier | digital Loop Carrier | Digital loop carrier (DLC). | A digital loop carrier is a device that multiplexes an optical signal in to multiple lower level digital signals. Fibers in cables are connected to signal ports in this equipment. |  |
| exchange | exchange | Exchange (switch). | The exchange (central office) is the physical building used to house the inside plant equipment (distribution frames, lasers,  switches etc). |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value** | **Name** | **Definition** | **Description** | **Parent**  **value** |
| fiberInterconn ect | fiber Interconnect | Fiber interconnect (FIC). | A fiber interconnect terminates individual fibers or establishes a connection between two or more fiber cables. Fibers in cables are  connected to signal ports in the equipment. |  |
| jointClosure | joint Closure | Joint closure (copper of fiber). | A protective joint closure for either copper or fiber-optic cable joints. A cable joint consists of spliced conductors and a closure. |  |
| loadCoil | load Coil | Load coil. | A load coil is a copper line conditioning equipment. Standard voice phone calls degrade noticeably when the copper portion of a phone line is greater than 18 kilofeet long. In order to restore call quality, load coils are inserted at specific intervals along the  loop. |  |
| mainDistributi onFrame | main Distribution Frame | Main distribution frame (MDF). | A main distribution frame is often found at the local exchange (Central Office) and is used to terminate the copper cables running from the customer's site. The frame allows these cables to be cross connected using patch  cords to other equipment such as a concentrator or switch. |  |
| multiplexer | multiplexer | Multiplexer (MUX). | A multiplexer is a device that combines multiple inputs into an aggregate signal to be transported via a single transmission channel. Fibers in cables are connected to signal ports  in this equipment. |  |
| opticalMainte nanceLoop | optical Maintenance Loop | Optical maintenance loop. | An optical maintenance loop is a coil of slack fiber cable that is used to support future splicing or other maintenance activities. |  |
| opticalRepeat er | optical Repeater | Optical repeater. | An optical repeater is a device that receives an optical signal, amplifies it (or, in the case of a digital signal, reshapes, retimes, or otherwise reconstructs it), and retransmits it  as an optical signal. Fibers in cables are connected to signal ports in this equipment. |  |
| patchPanel | patch Panel | Patch panel. | A patch panel is device where connections are made between incoming and outgoing fibers. Fibers in cables are connected to  signal ports in this equipment. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value** | **Name** | **Definition** | **Description** | **Parent**  **value** |
| spliceClosure | splice Closure | Splice closure. | A splice closure is usually a weatherproof encasement, commonly made of tough plastic, that envelops the exposed area between spliced cables, i.e., where the jackets have been removed to expose the individual transmission media, optical or metallic, to be joined. The closure usually contains some device or means to maintain continuity of the tensile strength members of the cables involved, and also may maintain electrical continuity of metallic armor, and/or provide external connectivity to such armor for electrical grounding. In the case of fiber optic cables, it also contains a splice organizer to facilitate the splicing process and protect the exposed fibers from mechanical damage. In addition to the seals at its seams and points of cable entry, the splice closure  may be filled with an encapsulate to further retard the entry of water. |  |
| splitter | splitter | Splitter. | A splitter is a transmission coupling device for separately sampling (through a known coupling loss) either the forward (incident) or the backward (reflected) wave in a transmission line. Fibers in cables are  connected to signal ports in this equipment. |  |
| terminal | terminal | Terminal. | Terminals are in-loop plant hardware, specifically designed to facilitate connection and removal of distribution cable, drop or service wire to and from cable pairs at a particular location. Terminals are a class of equipment that establishes the end point of a section of the transmission network between  the CO and the customer. |  |
| termination | termination | Termination. | Terminations are a generic feature class for the end points of cables. These may be considered similar to service drops to buildings. They represent a point at which the telephone company network ends and connects with the wiring at the customer  premises. |  |
| noticeBoard | notice Board |  |  |  |

#### Values of code list TelecommunicationsCableMaterialTypeValue

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value** | **Name** | **Definition** | **Description** | **Parent**  **value** |
| coaxial | coaxial | Coaxial cable. | A coaxial cable, or coax, is an electrical cable with an inner conductor surrounded by a flexible, tubular insulating layer, surrounded by a tubular  conducting shield. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value** | **Name** | **Definition** | **Description** | **Parent**  **value** |
| optical Fiber | optical Fiber | Fibre-optic cable. | A fiber optic cable is composed of thin filaments of glass through which light beams are transmitted to carry large amounts of data. The optical fibers are surrounded by buffers, strength members, and jackets for protection, stiffness, and strength. A fiber-optic cable may be an all- fiber cable, or contain both optical fibers and  metallic conductors. |  |
| twisted Pair | twisted Pair | Twisted pair (copper) cable. | A copper cable is a group of metallic conductors (copper wires) bundled together that are capable of carrying voice and data transmissions. The copper wires are bound together, usually with a protective sheath, a strength member, and insulation between individual conductors and the  entire group. |  |
| other | other | Other. |  |  |

INSPIRE

Infrastructure for Spatial Information in Europe

**Technical Guidance for the implementation of INSPIRE View Services**

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**Creator** Initial Operating Capability Task Force Network Services

**Date** 2013-04-04

**Subject** INSPIRE View Services

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**Publisher** IOC Task Force for Network Services

**Type** Text

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**Contributor** Members of the INSPIRE Drafting Team for Network Services, members of the INSPIRE IOC Task Force for Network Services and the Initial Operating Capability Task Force Service Team.

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**Coverage** Project duration

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1 Currently with the European Maritime Safety Agency

**Foreword**

Directive 2007/2/EC of the European Parliament and of the Council [**Directive 2007/2/EC**], adopted on

14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonised and quality geographic information to support the formulation, implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment.

INSPIRE is based on the infrastructures for spatial information established and operated by the 27 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas.

* Metadata;
* The interoperability and harmonisation of spatial data and services for selected themes (as described in Annexes I, II, III of the Directive);
* Network Services;
* Measures on sharing spatial data and services;
* Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of the Directive):

1. *“discovery services search for spatial data sets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
2. *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial data sets and display legend information and any relevant content of metadata;*
3. *download services enabling copies of complete spatial data sets, or of parts of such sets, to be downloaded;*
4. *transformation services enabling spatial data sets to be transformed with a view to achieving interoperability;*
5. *invoke spatial data services" enabling data services to be invoked.”*

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies, and practices. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations. Figure 1 illustrates the relationship between the INSPIRE Regulations containing Implementing Rules and their corresponding Technical Guidance documents.

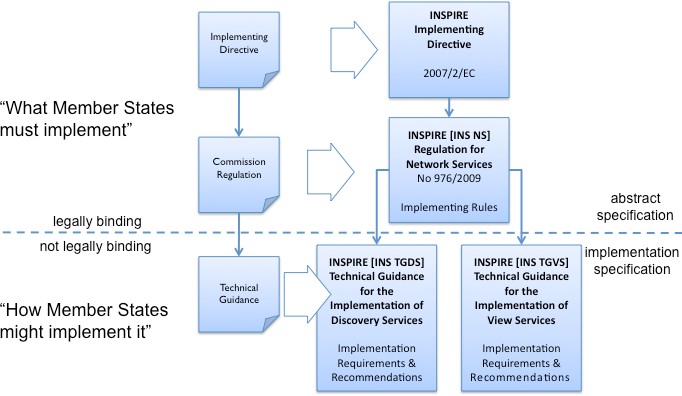


Figure 1: Relationship between INSPIRE Implementing Rules and Technical Guidance

Technical Guidance documents define how Member States might implement the Implementing Rules described in a Commission Regulation. Technical Guidance documents may include non-binding technical requirements that must be satisfied if a Member State chooses to conform to the Technical Guidance. Implementing this technical guidance will maximise the interoperability of INSPIRE services.

This Technical Guidance concerns the INSPIRE View Services. The Technical Guidance contains detailed technical documentation highlighting the mandatory and the recommended elements related to the implementation of INSPIRE View Services. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples.

|  |
| --- |
| This document will be publicly available as a ‘non-paper’, as it does not represent an official position of the Commission, and as such cannot be invoked in the context of legal procedures. |

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**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Release** | **Editor** | **Description** |
| 28Jul2009 | 2.0 | Network Services  Drafting Team |  |
| 17Jun2010 | 2.12 | Initial Operating Capability Task Force | The INSPIRE extended Capabilities XML schema has been included in Annex B.  Links with other technical components in INSPIRE have been described based on the INSPIRE domain model.  A new interpretation and recommended implementation of the Link Discovery Service operation has been described.  An approach to implement the required Language parameter has been recommended.  General editorial changes. |
| 24Jan2011 | 2.14 | IOC ST,  Graham Vowles | Editorial Review to improve accuracy and clarity |
| 28Jan2011 | 2.15 | IOC ST | Update to include edits made during IOC TF –  Services Meeting in Copenhagen |
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| 10Feb2011 | 2.18 | IOC ST,  Graham Vowles | Added use cases and rationale of extended  capabilities approach. Added INSPIRE Profile of WMTS 1.0.0. |
| 17Feb2011 | 2.19 | IOC ST,  Graham Vowles | Update to link view service, removal of unnecessary  Annexes. |
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| 15Mar2011 | 2.22 | IOC ST, EC JRC | Updated following the IOC TF comments. Changed sections on Coupled resource. There is now only one section referring to the Coupled  resource (4.2.3.3.1.5). |
| 16Mar2011 | 2.23 | IOC ST, EC JRC | The layer metadata element Geographic Bounding Box is mapped to <wms:BoundingBox> element and not to the  <wms: EX\_GeographicBoundingBox>. Updated Sections (4.2.3.3.1.8 and 4.2.3.3.4.4) and related examples.  Changed Recommendation in section 4.2.3.3.4.6  (Name of Layer) to Requirement |
| 17Mar2011 | 2.24 | IOC ST, EC JRC | Corrected examples for WMS 1.1.1 (Annex B) and WMS-C profile for WMS 1.1.1 (Annex A).  Added Example of Extended Capabilities Response Scenario 1 in Annex C and Example of Extended  Capabilities Response Scenario 2 in Annex D. |
| 20Mar2011 | 2.25 | IOC ST, EC JRC | Editorial review |
| 21Mar2011 | 2.26 | IOC ST, EC JRC,  Graham Vowles | Final editorial review. |
| 29Mar2011 | 3.0 | IOC Task Force | IOC TF Approved Version |
| 07Nov2011 | 3.1 | IOC ST, EC JRC | Added Chapter 6 on Quality of Services (QoS).  Deleted Annex F on QoS. |

|  |  |  |  |
| --- | --- | --- | --- |
| 07Nov2011 | 3.1 | EC JRC | Corrected Typographical errors in Section 4.1: xmlns:inspire\_commmon to xmlns:inspire\_common and xmlns:inspire\_ds="<http://inspire.ec.europa.eu/schema> s/inspire\_ds/1.0"  to  xmlns:inspire\_vs="<http://inspire.ec.europa.eu/schema> s/inspire\_vs/1.0" |
| 07Nov2011 | 3.1 | IOC TF | IOC TF Approved |
| 18Feb2013 | 3.11 | EC JRC | Replaced all instances of INSPIRECRS84QUAD in the XML examples with InspireCRS84Quad for  consistency |
| 18Feb2013 | 3.11 | EC JRC | Added explicit reference to schemas location and  namespace definitions for WMTS (Chapter 5) |
| 05Mar2013 | 3.11 | EC JRC | Added Figure 11 in Chapter 5.2.7.1 to illustrate the  GoogleCRS84Quad and for better clarifying the difference to InspireCRS84Quad |
| 15Mar2013 | 3.11 | EC JRC | The URN scheme urn:ogc:def:crs:OGC:1.3:CRS84 is now deprecated. All instances (Examples 40, 42, 43, 44 and Section 5.2.7.1) have been replaced with  [http://www.opengis.net/def/crs/OGC/1.3/CRS84.](http://www.opengis.net/def/crs/OGC/1.3/CRS84) |
| 15Mar2013 | 3.11 | EC JRC | Added recommendation in Section 5.1 to use http  URIs instead of URNs. |

1. **Introduction**

INSPIRE View Services allow users and computer programs to view spatial datasets. This document specifies Technical Guidance for Member States to implement INSPIRE View Services as mandated by the Regulation on INSPIRE Network Services [**INS NS**, Annex III].

Following this Technical Guidance will ensure that INSPIRE View Services are implemented in a consistent and compatible way across Europe. It is based on European and international standards, current practices in related stakeholder communities and relevant European initiatives such as e-Government, and the EU Interoperability Framework.

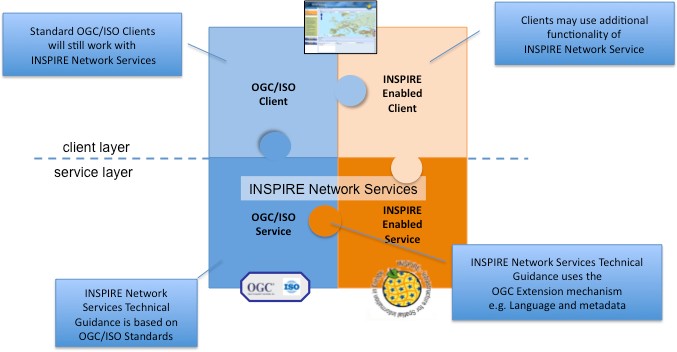


Figure 2: Extending ISO and OGC Standards for INSPIRE Requirements

This document specifies requirements and recommendations based on the European de jure standard [**ISO 19128**] – Web Map Service (WMS) 1.3.0. It defines an INSPIRE Profile of [**ISO 19128**] to implement the following operations:

* + Get View Services Metadata: Get metadata about a specific view service;
  + Get Map: Returns a map for a specified area;
  + Link View Service: Allows the linking of view services together.

The INSPIRE Profile of [ISO 19128] also make use of the OGC™ Styled Layer Descriptor Profile [**OGC SLD**], and the OGC™ Symbology Encoding Implementation Specification [**OGC SEIS**]. In addition this document defines how to handle multilingual aspects of INSPIRE View Services.

While the recommended approach to implement INSPIRE view services is the [**ISO 19128**] – Web Map Service (WMS) 1.3.0, an INSPIRE View Service may also be implemented based on the OGC™ WMS 1.1.1 or OGC™ Web Mapping Tiling Service - WMTS 1.0.0 specifications. An INSPIRE Profile of WMTS 1.0.0 is defined in Section 0 and examples of WMS-C (Tile Cashing WMS) profile for WMS 1.1.1 and WMS 1.1.1 are given in Annex A and Annex B respectively.

This is the initial version of the Technical Guidance document and it has been validated and tested in collaboration with the Initial Operating Capability Task Force. It may be used by the Member States for the initial implementation of the INSPIRE View Services.

1. **Normative references**

This technical guidance incorporates, by dated or undated references, provisions from other publications. For dated references, subsequent amendments to or revisions of any of these publications apply to this guide only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

These normative references are cited at the appropriate places in the text and the publications are listed hereafter:

INSPIRE, Implementing **Directive 2007/2/EC** of the European Parliament and of the Council as regards interoperability of spatial data sets and services

INSPIRE, **INS MD** Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata (Text with EEA relevance). See also Corrigendum to INSPIRE Metadata Regulation

INSPIRE, **INS NS,** Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services

INSPIRE, **INS DS,** Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services

INSPIRE, **INS MDTG**, INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119, v1.1 (2009-02-18)

INSPIRE, **INS GCM**, INSPIRE Generic Conceptual Model (D2.5\_v3.2).

INSPIRE, **INS DSTG**, Technical Guidance for the implementation of INSPIRE Discovery Services

**ISO 19115**: *2003: Geographic Information – Metadata*

**ISO 19119**: *2005, Geographic information – Services*

**ISO 19119: 2005 PDAM 1,** *Geographic information – Services*

**ISO 19128**: *2005, Geographic information — Web map server interface*

**ISO/IEC 2382-1**: *1993, Information technology – Vocabulary – Part 1: Fundamental terms*

OGC 05-077r4, **OGC SEIS**, OGC™ Symbology Encoding Implementation Specification, version 1.1.0 (Release 4)

OGC 05-078r4, **OGC SLD**, OGC™ Styled Layer Descriptor profile of the Web Map Service Implementation Specification, version 1.1.0 (Release 4) and its corrigendum1 for OGC Implementation Specification SLD 1.1.0 (07-123r1)

OGC 07-045, **CSW ISO AP,** OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0, version 1.0.0 (2007).

**OGC 07-057r7 –** OGC Web Map Tile Service (WMTS) 1.0.0

**OGC 06-121r3 –** OGC Web Services Common Specification (OWS) 1.1.0

**IETF RFC 4646** - Tags for Identifying Languages

1. **Terms and abbreviations**
   1. ***Terms***
2. **application profile**

set of one or more base standards and - where applicable - the identification of chosen clauses, classes, subsets, options and parameters of those base standards that are necessary for accomplishing a particular function [ISO 19101, ISO 19106]

1. **discovery services**

making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata [INSPIRE Directive]

1. **metadata**

information describing spatial data sets and spatial data services and making it possible to discover, inventory and use them [INSPIRE Directive]

1. **metadata element**

a discrete unit of metadata, in accordance with [ISO 19115]

1. **network services**

network services should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services [INSPIRE Directive]

1. **queryable**

a metadata element that can be queried upon

1. **spatial data**

data with a direct or indirect reference to a specific location or geographic area [INSPIRE Directive]

1. **spatial data set**

identifiable collection of spatial data [INSPIRE Directive]

1. **view service**

making it possible, as a minimum, to display, navigate, zoom in/out, pan, or overlay viewable spatial data sets and to display legend information and any relevant content of metadata [INSPIRE Directive]

* 1. ***Abbreviations***

GET HTTP Get Method

INSPIRE Infrastructure for Spatial Information in Europe IOC Initial Operations Capability

ISO International Organisation for Standardisation MD Metadata

NS Network Services

OGC Open Geospatial Consortium OWS OGC Web Services

SLD Styled Layer Descriptor

TF Task Force

URL Universal Resource Locator UUID Universal Unique Identifier WMS Web Map Service

WMS-C WMS Tile Cashing WMTS Web Map Tiling Service

XML eXtended Markup Language

* 1. ***Verbal forms for the expression of provisions***

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

* + - “shall” / “shall not”: a requirement, mandatory to comply with the technical guidance
    - “should” / “should not”: a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so
    - “may” / “need not”: a permission

**Implementation Requirements and Recommendations notation**

To make it easier to identify the requirements and the recommendations for INSPIRE View Services within this technical guidance, they are highlighted and numbered as shown below:

**Implementation Requirements #** are shown using this style

**Implementation Recommendations #** are shown using this style.

It is important to note that, implementation requirements and implementation recommendations may refer to either service or client implementations.

**Note**: It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‘implementation requirement’ and ‘implementation recommendation’ to indicate what is technically required or recommended to conform to the Technical Guidance.

**XML Example notation**

XML Examples are shown using Courier New on a grey background as below:

</inspire:example>

<inspire:highlight>

Highlighted Text for emphasis

</inspire:highlight>

<inspire:example>

**Note**: XML Examples are informative and are provided for information only and are expressly not normative. A reference implementation of the example XML is available on the following link:

<http://inspire.ec.europa.eu/schemas/>

* 1. ***References***

To aid readability for a non-technical audience, references within this document are denoted using “Section” or “Annex”. For example, Section 5.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 3 and use the abbreviated title as indicated in **Bold** text. For example, [**CSW ISO AP**] uses the abbreviated title for the document as shown below:

OGC 07-045, **CSW ISO AP**, OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0, version 1.0.0 (2007).

References within other documents are show as above using the abbreviated title, together with the appropriate section within the document. For example, [**CSW ISO AP,** Section 8.2.3.1], refers to Section 8.2.3.1 within the document as listed above.

1. **INSPIRE Profile of ISO 19128**
   1. ***General background***

The base specification of an INSPIRE View Service relies on the [**ISO 19128**] International standard.

**Implementation Requirement 1** An INSPIRE View Service shall implement the minimal mandatory behaviour from an [**ISO 19128**] service, extended with the extensions required by the INSPIRE Directive and the Implementing Rules for View services.

Section 4.2 and subsequent sections specify required extensions to the base specification. They are laid down following the [**ISO 19128,** Section 6.9] document structure.

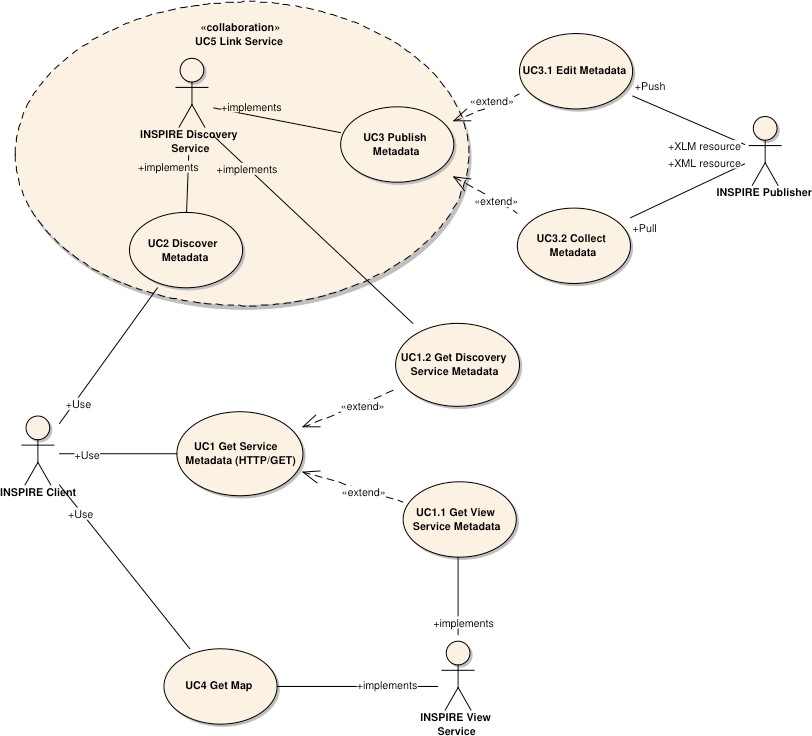


Figure 3: INSPIRE Generic Use Case

Figure 3 illustrates use cases for the creation and publication of metadata, their discovery through a discovery service and viewing of spatial data sets via an INSPIRE View service.

**Implementation Requirement 2** The use of [**ISO 19128**] de jure standard as a basis for implementing an INSPIRE View service means that this service shall comply with the “basic WMS” conformance class as defined in this de jure standard.

Compliance with the “basic WMS” conformance class should augment the feasibility of reaching Initial Operation Capability (IOC) by the legal deadline of May 9th 2011 as INSPIRE conformant WMSs can be built based on available software that has obtained certification for this standard.

**Rationale behind the choice of an INSPIRE Schema for implementing the extended capabilities of INSPIRE Network Services**

The INSPIRE Network Service Regulation [**INS NS**] requires a Network Service to respond to a Get Network Service Metadata request with a response that contains as one of its parameters the Network Service INSPIRE metadata.

At the time of writing this Technical Guidance the OGC GetCapabilities response document does not include all required INSPIRE metadata for the Network Service and in order to do so the Extended Capabilities mechanism is used. Through this mechanism it is possible to link INSPIRE metadata with the GetCapabilities response, either by including the missing INSPIRE metadata elements of the Network Service, or by including a reference to the INSPIRE Network Service metadata record.

The initial approach was to re-use, for extended capabilities elements, the ISO 19139 data types. The Advantages of using the ISO 19139 data types are:

* new data types do not need to be defined
* existing client applications already have the necessary bindings to read and write the information. Type redefinition was however necessary for the following elements:
  + INSPIRE Service Type (implemented as gco:GenericName\_PropertyType)
  + Languages
  + CurrentLanguage
  + TemporalReference

Which, however breaks compatibility with existing clients. The disadvantages of this approach on the other hand are:

* ISO 19139 data types currently have a double implementation;
  + The schemas from ISO 19139 version 2005-DIS (Draft International Standard) dated 2006 May 4 (20060504/) depend on the unofficial GML 3.2.0 version, but on the other hand is used in ISO AP 1.0 for CSW;
  + The ISO/TS 19139 Schemas dated 2007 April 17 (20070417/) depend on the official GML version 3.2.1 which relies on a different namespace but does not make available the implementation for the “srv” namespace for service metadata;
* CSW schema version 2.0.2 includes OGC filter version 1.1.0 which in turn includes GML version 3.1.1;
* An INSPIRE View Service may also be implemented using WMS 1.1.1. The WMS 1.1.1 schema however is officially implemented only through DTD technology. There is no official DTD implementation for ISO 19139.

As a result for the discovery service capabilities document this approach would require reference to three different versions of GML in the same document.

**It has therefore been decided to use a custom INSPIRE schema for the missing INSPIRE metadata elements in the Extended Capabilities section. This allows for an easy integration with all OGC services and full validation of INSPIRE compliance using standard XML validation.** Table 3 **shows the mapping between the INSPIRE metadata elements and the ISO 19128 Capabilities metadata elements.**

**Note: the schema will be aligned to the relevant standards once these support the INSPIRE requirements. Alignment between The OGC OWS Common Implementation specification and ISO 19119 should also help addressing some of the issues.**

The custom INSPIRE schemas are available at <http://inspire.ec.europa.eu/schemas/>

This Technical Guidance uses the following namespace definitions:

xmlns:inspire\_vs="<http://inspire.ec.europa.eu/schemas/inspire_vs/1.0>" xmlns:inspire\_common="<http://inspire.ec.europa.eu/schemas/common/1.0>"

The following sections specify the required extensions to the given specifications.

* 1. ***View service operations***

**Implementation Requirement 3** The following ISO 19128 operations shall be implemented for an INSPIRE View service: GetCapabilities; GetMap.

Table 1: View Service Operations

|  |  |
| --- | --- |
| **INSPIRE View Service operations** | **ISO 19128 WMS operations** |
| Get View Service Metadata | GetCapabilities |
| Get Map | GetMap |
| Link View Service | See Section 4.2.5 |

The first two operations use parameters defined in the [**ISO 19128**] WMS standard, but this section specifies the role of some parameters in the INSPIRE context. As stated in [**ISO 19128,** Section 6.3.1] support for the GET method is mandatory.

**Implementation Recommendation 1** It is recommended that the GET method is used for the view service operations.

* + 1. **Common requests parameters for the View Service operations**

**Common request parameters for the View Service operations:**

VERSION The VERSION parameter specifies the protocol version number. It is optional for the GetCapabilities operation and mandatory for the GetMap operation.

REQUEST The mandatory REQUEST parameter indicates which service operation is being invoked. The value shall be the name of one of the operations offered by the Web Map Server.

FORMAT The FORMAT parameter specifies the output format of the response to an operation. It is optional for the GetCapabilities operation and mandatory for the GetMap operation.

EXCEPTIONS The optional EXCEPTIONS request parameter states the format in which to report errors.

SERVICE The SERVICE parameter specifies the type of service and shall have the value “WMS” LANGUAGE See Section 0 Language Requirements (INSPIRE extension)

* + 1. **View service exceptions**

Internationalisation of service exceptions is optional.

**Implementation Recommendation 2** If service exceptions are internationalised then the error messages (exceptions) are either expressed in the service’s default language (suppose that the request is incorrect and the LANGUAGE parameter has not been interpreted before issuing the error/exception text) or in the preferred (requested) language in other cases.

See also Section 4.3.2 Common concept for other operations.

* + 1. **Get View Service Metadata operation**
       1. **General**

According to [**INS NS**, Annex III, Section 2.2] the Get View Service Metadata shall contain the following sets of parameters:

* + - * + View Service Metadata, containing at least the INSPIRE metadata elements of the View Service;
        + Operations Metadata to provide metadata about the operations implemented by the View Service;
        + Languages, including the Supported languages and Response language; and
        + Layers Metadata parameters;

Figure 4 illustrates the Get View Service metadata use case.

**Implementation Requirement 4** The metadata response parameters shall be provided through the service Capabilities, as defined in the WMS Standard [**ISO 19128**, Section 7.2.4]. These capabilities are mandatory and defined when a WMS is set up. They consist of service information, supported operations and parameters values. The extended capabilities section shall be used to fully comply with the INSPIRE View Service metadata requirements (see section 4.2.3.3.1).

* + - 1. **GetCapabilities operation**

**Implementation Requirement 5** The operation for implementing INSPIRE “Get View Service Metadata” operation is the GetCapabilities operation. The parameters defined within the [**ISO 19128**] standard shall be used to convey relevant information in order to get the expected responses as described in [**INS NS**, Annex III, Section 2.2] of the Regulation on INSPIRE Network Services.

Table 2: GetCapabilities core parameters

|  |  |  |
| --- | --- | --- |
| **Request parameter** | **Mandatory**  **/ optional** | **Description** |
| VERSION=version | O | Request version: 1.3.0 |
| SERVICE=WMS | M | Service type. Fixed value: WMS.  The ServiceType for an ISO 19128:2005(E) – WMS1.3.0 is fixed to “WMS”. |
| REQUEST=GetCapabilities | M | Request name. Fixed value: GetCapabilities |
| LANGUAGE=code | O | Request language (INSPIRE extension). |
| FORMAT=MIME\_type | O | Output format of service metadata. Defaults to text/xml. |

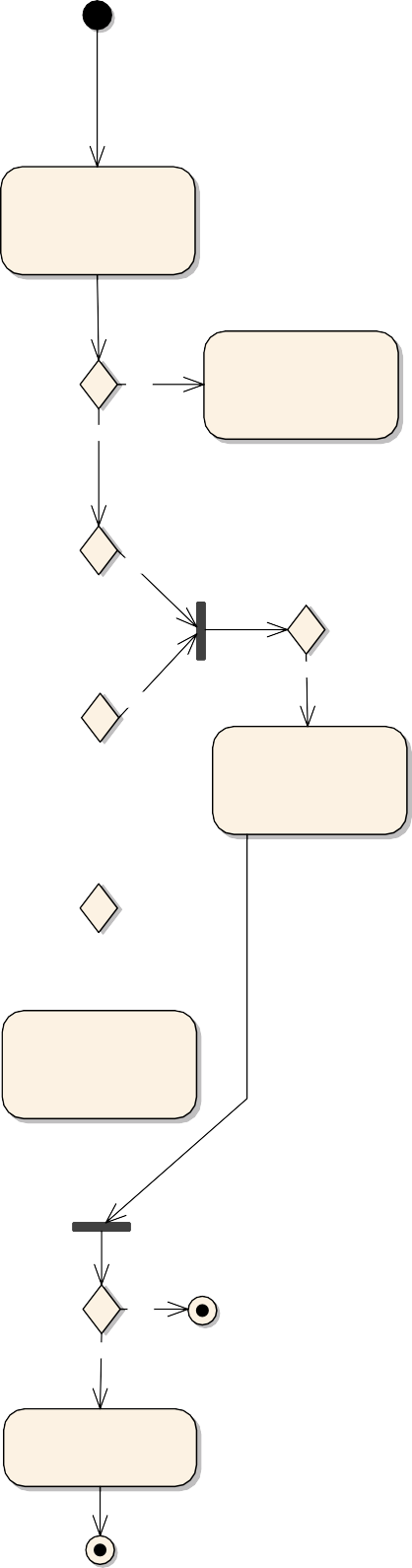


Figure 4: Get View Service Metadata Use Case (UC1)

* + - 1. **GetCapabilities response**
         1. View service metadata

Two scenarios have been identified for publishing View Service metadata conforming to the Regulation on INSPIRE Network Services [**INS NS**] and on Metadata [**INS MD**]. It is up to the Member State to choose which scenario best fits its needs. As these scenarios are not mutually exclusive, a Member State may choose to implement both.

**Scenario 1: INSPIRE network service metadata in a Discovery Service is referenced through an extended capability.**

This scenario involves adding a reference to an online INSPIRE metadata resource in the extended INSPIRE capabilities.

**Implementation Requirement 6** The <inspire\_common:MetadataURL> element within the extended INSPIRE capabilities of an [**ISO 19128**] – WMS 1.3.0 <wms:Capability> element shall be used to reference the INSPIRE service metadata available through an INSPIRE Discovery Service. Mandatory [**ISO 19128**] – WMS 1.3.0 metadata elements shall be mapped to INSPIRE metadata elements to implement a consistent interface.

**Scenario 2: Use (extended) capabilities to map all INSPIRE metadata elements to the [ISO 19128] – WMS1.3.0 elements.**

This scenario involves mapping all INSPIRE metadata elements to [**ISO 19128**] – WMS 1.3.0 elements.

**Implementation Requirement 7** INSPIRE metadata are mapped to WMS capabilities elements to its full extent. It is mandatory to use the mapping provided in this Technical Guideline (described in Section 4.2.3.3.1.1 to 4.2.3.3.1.16. INSPIRE metadata elements that cannot be mapped to available [**ISO 19128**] – WMS1.3.0 elements are implemented as Extended Capabilities. Metadata are published through a service's capabilities document and can be harvested by an INSPIRE Discovery service.

**Implementation Requirement 8** Regardless of the scenario chosen to be implemented, a language section shall be added in the extended capability of the service to fulfil the language requirements of the Network Services Regulation [**INS NS**].

In scenario 1, INSPIRE View service metadata are managed in an INSPIRE Discovery catalogue and need to be partially mapped to [**ISO 19128**] – WMS 1.3.0 elements and extended capabilities.

In scenario 2, INSPIRE service metadata are fully mapped to [**ISO 19128**] – WMS 1.3.0 elements and extended capabilities and are managed through service capabilities.

A graphical illustration of the XML schema for the extended capabilities for both scenarios as required for the INSPIRE View Services is shown in Figure 5. Examples of extended capabilities response for both scenarios are provided in Annexes Annex C and Annex D.

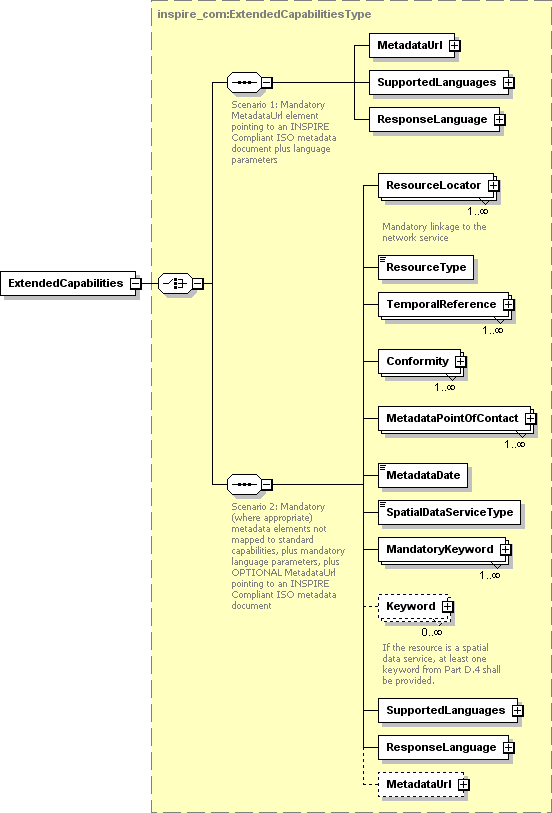


Figure 5: Illustration of the Extended Capabilities for Scenario 1 and 2 for INSPIRE View Services

**Implementation Requirement 9** Regardless of the scenario chosen to be implemented View Service Metadata shall be published in an INSPIRE Discovery Service. This is required to support a) the INSPIRE View Link service operation and b) discovery of View services by client applications such as the INSPIRE geoportal

**Implementation Requirement 10** An INSPIRE View service shall contain the INSPIRE metadata elements set out in the Metadata Regulation [**INS MD**] as shown in Table 3.

INSPIRE metadata are mapped to the <WMS\_Capabilities> element of the GetCapabilities response as illustrated in Table 3. In Sections 4.2.3.3.1.1 through 4.2.3.3.1.16 the mandatory mappings for supporting these scenarios are described in detail.

Table 3: Mapping between INSPIRE metadata elements and [ISO 19128] WMS elements

|  |  |
| --- | --- |
| **INSPIRE Metadata elements (Mandatory - Conditional)** | **ISO 19128 elements of**  **<WMS\_Capabilities>** |
| Resource Title (M) | wms:Title |
| Resource Abstract (M) | wms:Abstract |
| Resource Type (M) | inspire\_common:ResourceType (ExtendedCapabilities) |
| Resource Locator (C) | inspire\_common:ResourceLocator (ExtendedCapabilities) |
| Coupled Resource (C) | wms:MetadataURL (Layer property) |
| Spatial Data Service Type (M) | inspire\_common:SpatialDataServiceType (ExtendedCapabilities) |
| Keyword (M) | wms:Keyword; inspire\_common:Keyword |
| Geographic Bounding Box (M) | wms:EX\_GeographicBoundingBox (Layer property) |
| Temporal Reference (M) | inspire\_common:TemporalReference (ExtendedCapabilities) |
| Spatial Resolution (C) | wms:Abstract |
| Conformity (M) | inspire\_common:Conformity (ExtendedCapabilities) |
| Conditions for Access and Use (M) | wms:Fees |
| Limitations on Public Access (M) | wms:AccessConstraints |
| Responsible Organisation (M) | wms:ContactInformation |
| Metadata Point of Contact (M) | inspire\_common:MetadataPointOfContact (ExtendedCapabilities) |
| Metadata Date (M) | inspire\_common:MetadataDate (ExtendedCapabilities) |
| Metadata Language (M) | inspire\_common:SupportedLanguages (ExtendedCapabilities) |

RESOURCE TITLE

This is a characteristic and often-unique name by which the resource is known. It is mapped with the

<wms:Title> element.

Example 1: Resource title

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

...

</wms:Service>

</wms:WMS\_Capabilities>

<wms:Title>Member State INSPIRE View Service</wms:Title>

RESOURCE ABSTRACT

This is a brief narrative summary of the content of the resource. It is mapped with the

<wms:Abstract> element.

Example 2: Resource abstract

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

<wms:Title>Member State INSPIRE View Service</wms:Title>

...

</wms:Service>

</wms:WMS\_Capabilities>

<wms:Abstract>

View Service for protected sites spatial data theme

</wms:Abstract>

RESOURCE TYPE

This is the type of the resource being described by the metadata. The value domain of this metadata element is defined in [INS MD, Part D.1]

**Implementation Requirement 11** Within the scope defined by the INSPIRE directive the value of the Resource Type shall be fixed to ‘service’ for spatial data services. As the Resource Type is not supported by [**ISO 19128**] – WMS 1.3.0, an extension shall be used to map this to an

<inspire\_common:ResourceType> element within an

<inspire\_vs:ExtendedCapabilities> element.

RESOURCE LOCATOR

The Resource Locator defines the link, commonly expressed as a Uniform Resource Locator(s) (URL) to the service. The Resource Locator may be one of the following:

A link to the service capabilities document;

A link to the service WSDL document (SOAP Binding);

A link to a web page with further instructions;

A link to a client application that directly accesses the service.

The <wms:OnlineResource> element within the <wms:Service> element would be the preferred choice for mapping the Resource Locator metadata element. But, for consistency with the INSPIRE Discovery service metadata in the capabilities document it has been decided that:

**Implementation Requirement 12** An extension shall be used to map Resource Locator to an

<inspire\_common:ResourceLocator> element within an

<inspire\_vs:ExtendedCapabilities> element.

COUPLED RESOURCE

The Coupled Resource identifies, where relevant, the target spatial data sets of the service through their unique resource identifiers.

**Implementation Requirement 13** Coupled Resource shall be mapped to the <MetadataURL> elements of the Layer elements of the service capabilities. If linkage to the data sets or series on which the service operates are available, then the linkage to these resources shall be provided as stated by the INSPIRE Metadata Technical Guidance [**INS MDTG**].

**Implementation Requirement 14** Each of the <MetadataURL> elements shall be populated with a URL that allows access to an unambiguous metadata record. The URL shall be either an HTTP/GET call on the GetRecordById operation of the Discovery Service or a direct link to the ISO 19139 metadata document.

Example:

For the spatial data set protectedSites.NL. A metadata document describing this spatial dataset is available through a discovery service. The metadata includes a metadata identifier “ac9f8250- 3ae5-49e5-9818-d14264a4fda4” and a unique resource identifier protectedSites.NL. The view service exposes the spatial dataset through a layer PS.ProtectedSite (harmonized name defined in the IR on interoperability of spatial data sets and services). As part of the capabilities metadata, the layer includes a MetadataURL pointing to the metadata document in the discovery service:

[http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2) &id=ac9f8250-3ae5-49e5-9818-d14264a4fda4 &[outputSchema=http://www.isotc211.org/2005/gmd&elementSetName=full](http://www.isotc211.org/2005/gmd%26elementSetName%3Dfull)

Example 3: Coupled resource (MetadataURL)

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

<wms:Title>Transport networks: Road Area</wms:Title>

<wms:Abstract>

View Service for making available a road transport network…

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

...

</wms:KeywordList>

...

<wms:EX\_GeographicBoundingBox>

<wms:westBoundLongitude>-31.2</wms:westBoundLongitude>

<wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>

|  |
| --- |
| <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ... |
| <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.o](http://www.w3.org/1999/xlink)rg/1999/xlink" xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL> |
| ...  </wms:Layer>  </wms:Capability>  </wms:WMS\_Capabilities> |

SPATIAL DATA SERVICE TYPE

Given that [**ISO 19128**] – WMS 1.3.0 has been identified as one of the relevant standards to implement INSPIRE View Services, the technical spatial data service type defined by [**ISO 19128**] – WMS 1.3.0 is mapped to the <wms:Name> element and has a fixed “WMS” value.

**Implementation Requirement 15** For the Spatial Data Service Type as defined by the INSPIRE Metadata Regulation [**INS MD**] (‘view’) an extension shall be used to map this to an

<inspire\_common:SpatialDataServiceType> element within an

<inspire\_vs:ExtendedCapabilities> element. For an INSPIRE View Service the Spatial Data Service Type shall have a fixed value “view” according to INSPIRE Metadata Regulation [INS MD Part 3].

KEYWORD

Commonly used word(s), formalized word(s) or phrase(s) used to describe the resource.

**Implementation Requirement 16** The INSPIRE Metadata Regulation [**INS MD**] mandates that in the case of spatial data services at least one keyword from the "Classification of Spatial data Services" (Part D.4 from **INS MD**] shall be provided.

**Implementation Recommendation 3** Additional keywords may be described as a free text or may originate from any Controlled Vocabulary. If they originate from a Controlled Vocabulary, for example GEMET, then the citation of the originating Controlled Vocabulary shall be provided in the extended capabilities.

**Implementation Requirement 17** If additional keywords are provided they shall be mapped with the

<wms:KeywordList> element, the individual keywords shall be mapped to the <wms:Keyword>

element, the referenced vocabulary shall be mapped to the ‘vocabulary’ attribute of the

<wms:Keyword> element.

Example 4: Keyword

</wms:Service>

</wms:WMS\_Capabilities>

<!-- vocabulary in WMS 1.3.0 only -->

<wms:Keyword vocabulary="ISO"> infoMapAccessService

</wms:Keyword>

<wms:Keyword vocabulary="GEMET">keyword</wms:Keyword>

<wms:Keyword> keyword</wms:Keyword>

...

</wms:KeywordList>

...

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

<wms:Title>Member State INSPIRE View Service</wms:Title>

<wms:Abstract>

Service for making available INSPIRE spatial data themes

</wms:Abstract>

<wms:KeywordList>

Typing keywords according to the Metadata Technical Guidance and [**ISO 19115**] allow for the detailed description of the thesaurus a keyword belongs to. To provide this functionality and to keep a similar interface as for the Discovery Service, this approach for describing keywords is provided as an extended capability.

**Implementation Requirement 18** The keywords shall be mapped to the capabilities extension

<inspire\_common:Keyword> and <inspire\_common:MandatoryKeyword> within an

<inspire\_vs:ExtendedCapabilities> element.

GEOGRAPHIC BOUNDING BOX

**Implementation Requirement 19** Geographic Bounding Box shall be mapped to the

EX\_GeographicBoundingBox element of Layer elements.

Note that this metadata element is different to the Layer Metadata Geographic Bounding Box element which is mapped to the <wms:BoundingBox> element (see Section 4.2.3.3.4.4)

Example 5: Geographic bounding box

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

<wms:Title>Transport networks: Road Area</wms:Title>

<wms:Abstract>

View Service for making available a road transport network…

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

...

</wms:KeywordList>

<wms:EX\_GeographicBoundingBox>

<wms:westBoundLongitude>-31.2</wms:westBoundLongitude>

<wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>

<wms:southBoundLatitude>27.2</wms:southBoundLatitude>

<wms:northBoundLatitude>80.9</wms:northBoundLatitude>

</wms:EX\_GeographicBoundingBox>

...

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

TEMPORAL REFERENCE

The creation, publishing or revision date of the INSPIRE View Service.

**Implementation Requirement 20** To be compliant with the INSPIRE Metadata Regulation [**INS MD**] and with [**ISO 19115**] one of following dates shall be used: date of publication, date of last revision, or the date of creation. Date of last revision is preferred. The date shall be expressed in conformity with the [**INS MD**]

INSPIRE also allows the use of a Temporal Extent as Temporal Reference, which is not supported by [**ISO 19115**].

**Implementation Requirement 21** As the Temporal Reference is not directly supported by [**ISO 19128**] – WMS 1.3.0 an extension shall be used to map this to an

<inspire\_common:TemporalReference> element within an

<inspire\_vs:ExtendedCapabilities> element.

SPATIAL RESOLUTION

Spatial resolution refers to the level of detail of the data set. As stated by the INSPIRE Metadata Technical Guidance [**INS MDTG**], it is not possible to express the restriction of a service concerning the spatial resolution in the current version of [**ISO 19119**].

**Implementation Recommendation 4** While this issue is being addressed by the standardisation community, spatial resolution restrictions for services shall be written in the Abstract as mandated by the Metadata Technical Guidance [**INS MDTG**]. Spatial Resolution restrictions at service metadata level shall be declaratively described in the <wms:Abstract> element.

Nevertheless is it possible to describe the Spatial Resolution of an individual Layer in the “resx” and “resy” attributes of a <wms:BoundingBox> element. Additional to any Spatial Resolution restrictions expressed in the <wms:Abstract> element, the Spatial Resolution for every published Layer may be documented in the in the “resx” and “resy” attributes of the <wms:BoundingBox> for this Layer. This is not required by INSPIRE Regulations at this moment.

CONFORMITY

**Implementation Requirement 22** The INSPIRE Metadata Regulation [**INS MD**] requires that metadata shall include information on the degree of conformity with the implementing rules provided in Art. 7.1 (Interoperability of spatial data sets and services) of the INSPIRE Directive [**Directive 2007/2/EC**].

The INSPIRE Metadata Regulation [**INS MD**, Part D 5] defines three degrees of conformity which shall be reported in the capabilities:

“conformant” or “not conformant” : When the conformity to the cited Specification has been evaluated, it shall be reported as a domain consistency element. In that case, if the evaluation has passed, the degree is confomant, otherwise it is not conformant.

“not evaluated”: When the conformity to the cited Specification has not been evaluated it shall it shall be reported as a domain consistency element with a value of “not evaluated”. Note that in the INSPIRE Metadata Technical Guidance [**INS MDTG]**, the absence of [**ISO 19115**] metadata related to the conformity to an INSPIRE specification implies that the conformity has not been evaluated.

There is no element available in [**ISO 19128**] – WMS 1.3.0 that allows the description of the degree of conformity with a specific specification.

**Implementation Requirement 23** An extension shall be used to map this to an

<inspire\_common:Conformity> element within an <inspire\_vs:ExtendedCapabilities>

element.

CONDITIONS FOR ACCESS AND USE

Defines the conditions for access and use of spatial data sets and services, and where applicable, corresponding fees

**Implementation Requirement 24** This metadata element shall be mapped to the <wms:Fees> element of the capabilities. If no conditions apply to the access and use of the resource, "no conditions apply" shall be used. If conditions are unknown "conditions unknown" shall be used.

Example 6: Conditions for access and use

</wms:Service>

</wms:WMS\_Capabilities>

<wms:Fees>no conditions apply</wms:Fees>

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

<wms:Title>Member State INSPIRE View Service</wms:Title>

<wms:Abstract>

Service for making available INSPIRE spatial data themes

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword>keyword</wms:Keyword>

...

</wms:KeywordList>

...

LIMITATIONS ON PUBLIC ACCESS

This metadata element shall provide information on the limitations (if they exist) and the reasons for such limitations. It is mapped with <wms:AccessConstraints> element.

No precise syntax has been defined for the text content of these elements in [**ISO 19128**].

**Implementation Recommendation 5** The use of “None” is recommended when no limitations on public access apply. When constraints are imposed, the MD\_RestrictionCode codelist names may be used as defined in [**ISO 19115**, Annex B – Data Dictionary, Section 5.24].

Example 7: Limitations on public access

</wms:Service>

</wms:WMS\_Capabilities>

<wms:AccessConstraints>None</wms:AccessConstraints>

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

<wms:Title>Member State INSPIRE View Service</wms:Title>

<wms:Abstract>

Service for making available INSPIRE spatial data themes

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword>keyword</wms:Keyword>

...

</wms:KeywordList>

...

<wms:Fees>no conditions apply</wms:Fees>

RESPONSIBLE ORGANISATION

Description of the organisation responsible for the establishment, management, maintenance and distribution of the resource. It shall be mapped to the <wms:ContactInformation> element where the most relevant properties are:

Organisation

Role

Contact address: postal address

Phone

Email: It is recommended to use an organisation level email address. Personal email addresses are not recommended.

|  |
| --- |
| **Implementation Requirement 25** Responsible Party as described in the INSPIRE Metadata Regulation [**INS MD**] shall be mapped to the <wms:ContactOrganization> element of the  <wms:ContactPersonPrimary> within the <wms:ContactInformation> element. |

**Implementation Requirement 26** The value domain of the Responsible Party role shall comply with the INSPIRE Metadata Regulation [**INS MD,** Part D6]. The Responsible Party Role shall be mapped to the <wms:ContactPosition> of the <wms:ContactInformation> element.

Example 8: Responsible organisation

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

<wms:Name>WMS</wms:Name>

<wms:Title>Member State INSPIRE View Service</wms:Title>

<wms:Abstract>

Service for making available INSPIRE spatial data themes

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword>keyword</wms:Keyword>

...

</wms:KeywordList>

...

<wms:ContactInformation>

<ContactPersonPrimary>

<ContactPerson>person or department</ContactPerson>

<ContactOrganization>organisation</ContactOrganization>

</ContactPersonPrimary>

<ContactPosition>custodian</ContactPosition>

<wms:ContactAddress>

<wms:AddressType>postal</AddressType>

<wms:Address>Street nr., Street name</wms:Address>

<wms:City>City</wms:City>

<wms:StateOrProvince>if relevant or empty</wms:StateOrProvince>

<wms:PostCode>postal code</wms:PostCode>

<wms:Country>MS name</wms:Country>

</wms:ContactAddress>

<wms:ContactVoiceTelephone>Phone number</wms:ContactVoiceTelephone>

<wms:ContactElectronicMailAddress> [contactPoint@organisation.country](mailto:contactPoint@organisation.country)

</wms:ContactElectronicMailAddress>

</wms:ContactInformation>

<wms:Fees>no conditions apply</wms:Fees>

<wms:AccessConstraints>None</wms:AccessConstraints>

</wms:Service>

...

</wms:WMS\_Capabilities>

METADATA POINT OF CONTACT

The Metadata Point Of Contact describes the organisation responsible for the creation and maintenance of the metadata [INS MD].

**Implementation Requirement 27** INSPIRE is more demanding than [**ISO 19115**] by mandating both the name of the organisation, and a contact e-mail address. The role of the responsible party serving as a metadata point of contact is out of scope of the Metadata Regulation [INS MD], but this property is mandated by [**ISO 19115**]. Its value shall be defaulted to “pointOfContact”.

**Implementation Requirement 28** Since only one <wms:ContactInformation> element is allowed in [**ISO 19128**] – WMS 1.3.0 (to which Responsible Organisation is mapped), an extension shall be used to map this to an <inspire\_common:MetadataPointOfContact> element within an

<inspire\_vs:ExtendedCapabilities> element.

METADATA DATE

The date when the INSPIRE View Service metadata was created or updated. [**ISO 19115**] is more restrictive because this element shall only contain the “date that the metadata was created”. The INSPIRE Metadata Implementing Rules also allows the date it was updated. The update date is preferred.

**Implementation Requirement 29** As the Metadata Date is not supported by [**ISO 19128**] – WMS 1.3.0, an extension shall be used to map this to an <inspire\_common:MetadataDate> element within an <inspire\_vs:ExtendedCapabilities> element. The date shall be expressed in conformity with the [INS MD].

* + - * 1. Operations Metadata

The operations metadata are mapped with the <wms:Request> element. There are two mandatory operations to be defined in the Operations Metadata: “Get View Service Metadata” implemented with the GetCapabilities WMS operation and “Get Map” implemented with the GetMap WMS operation.

The third mandatory operation “Link View Service”, which allows a Public Authority or a Third Party to declare a view Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public Authority or the Third party location, shall be implemented through the “Discover Metadata” operation of the Discovery Service which allows for View service metadata to be retrieved.

GETCAPABILITIES OPERATIONS METADATA

**Implementation Requirement 30** GetCapabilities operation metadata shall be mapped to the

<wms:GetCapabilities> element.

Example 9: Operations metadata

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

<wms:Request>

...

</wms:Capability>

</wms:WMS\_Capabilities>

<wms:GetCapabilities>

<wms:Format>text/xml</wms:Format>

...

<wms:DCPType>

<wms:HTTP>

<wms:Get>

<wms:OnlineResource xmlns:xlink="<http://www.w3.org/1999/xlink>" xlink:type="simple" [xlink:href="http://hostname/path?"](http://hostname/path)

/>

</wms:Get>

</wms:HTTP>

</wms:DCPType>

</wms:GetCapabilities>

</wms:Request>

GETMAP OPERATION METADATA

**Implementation Requirement 31** GetMap operation metadata shall be mapped to the

<wms:GetMap> element. Either PNG or GIF format (without LZW compression) with transparency shall be supported by the View service [**INS NS**, Annex III, Part B].

**Implementation Recommendation 6** If PNG format is supported; the View service may select an appropriate bit depth for the returned PNG image. For layers with up to 256 colours, the recommended format is 8-bit indexed PNG. For layers with more than 256 colours, a higher bit depth should be used.

Example 10: GetMap operation metadata

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

<wms:Request>

<wms:GetCapabilities>

<wms:Format>text/xml</wms:Format>

...

<wms:DCPType>

<wms:HTTP>

<wms:Get>

<wms:OnlineResource xmlns:xlink="<http://www.w3.org/1999/xlink>" xlink:type="simple" [xlink:href="http://hostname/path?"](http://hostname/path)

/>

</wms:Get>

</wms:HTTP>

</wms:DCPType>

</wms:GetCapabilities>

<wms:GetMap>

<wms:Format>image/png</wms:Format>

...

<wms:DCPType>

<wms:HTTP>

<wms:Get>

<wms:OnlineResource xmlns:xlink="<http://www.w3.org/1999/xlink>" xlink:type="simple" [xlink:href="http://hostname/path?"](http://hostname/path)

/>

</wms:Get>

</wms:HTTP>

</wms:DCPType>

</wms:GetMap>

</wms:Request>

...

</wms:Capability>

</wms:WMS\_Capabilities>

LINK VIEW SERVICE OPERATION METADATA

**Implementation Recommendation 7** The use of the “Discover Metadata” operation of the INSPIRE Discovery service is recommended for implementing the Link View Service operation.

The mechanism for publishing a view service’s service metadata and discovering a View Service through its service metadata is described in [**INS DSTG**].

* + - * 1. Languages

Refer to METADATA LANGUAGE element in Table 3.

* + - * 1. Layers Metadata

The metadata elements listed in Table 3 of the INSPIRE Network Services regulation [**INS NS**, Annex III] shall be provided for each layer (see

Table 4 below). The layers metadata are mapped with the <wms:Layer> element.

Example 11: Layers Metadata

</wms:Capability>

</wms:WMS\_Capabilities>

<wms:Layer>

...

</wms:Layer>

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

**Implementation Requirement 32** The description of a layer shall use elements defined for the service capabilities in the [**ISO 19128**] standard. This description shall specify the role of some parameters for the INSPIRE View Service as stated in the Regulation on INSPIRE Network Services [**INS NS**].

Table 4: Mapping between INSPIRE layer metadata elements and ISO 19128 WMS elements

|  |  |
| --- | --- |
| **Metadata elements** | **ISO 19128 standard elements of**  **<wms:Layer>** |
| Resource Title | wms:Title |
| Resource Abstract | wms:Abstract |
| Keyword | wms:KeywordList |
| Geographic Bounding Box | wms:BoundingBox |
| Unique Resource Identifier | wms:Identifier + wms:AuthorityURL |
| Name | wms:Name |
| Coordinate Reference Systems | wms:CRS |
| Styles | wms:Style |
| Legend URL | wms:Style/wms:LegendURL |
| Dimension Pairs | wms:Dimension[@name,@units] |

In addition to the above layer metadata elements the Coupled Resource View Service metadata element (see section 4.2.3.3.1.5) is mapped to the MetadataURL of the ISO 19128 standard elements of <wms:Layer>.

RESOURCE TITLE

The title of the layer, used for human communication, for presentation of the layer e.g. in a menu.

**Implementation Requirement 33** It is mapped with <wms:Title>. The harmonised title of a layer for an INSPIRE spatial data theme is defined by [**INS DS**] and shall be subject to multilingualism (translations shall appear in each mono-lingual capabilities localised documents).

Example 12: Resource title

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

<wms:Title>Transport networks: Road Area</wms:Title>

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

RESOURCE ABSTRACT

Layer abstract.

**Implementation Requirement 34** Text describing the layer. Subject to multilingualism. It shall be mapped with the <wms:Abstract> element.

Example 13: Resource abstract

<wms:Abstract>

View Service for making available a road transport network…

</wms:Abstract>

<wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

<wms:Title>The road network theme: roads</wms:Title>

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

KEYWORD

Additional Keywords describing the layer.

**Implementation Requirement 35**, It shall be mapped to the <wms:KeywordList> element.

**Implementation Recommendation 8** It is recommended to harmonise the Additional Keywords with the INSPIRE service metadata element Keyword, to facilitate searches.

Example 14: Keyword

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

...

</wms:KeywordList>

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

<wms:Title>Transport networks: Road Area</wms:Title>

<wms:Abstract>

View Service for making available a road transport network…

</wms:Abstract>

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

GEOGRAPHIC BOUNDING BOX

Minimum bounding rectangle in all supported Coordinate reference systems (CRS) of the area covered by the layer.

**Implementation Requirement 36** This Layer metadata element shall be mapped to the

<wms:BoundingBox> element. The minimum bounding rectangle of the area covered by the Layer in all supported CRS shall be given.

Example 15: Geographic bounding box

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

...

<wms:Title>Transport networks: Road Area</wms:Title>

<wms:Abstract>

...

</wms:Abstract>

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

...

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

<wms:BoundingBox CRS="**CRS:84**" minx="**2.56**" miny="**50.65**" maxx="**5.94**" maxy="**51.50**" />

<wms:BoundingBox CRS="**EPSG:4326**" minx="**2.56**" miny="**50.65**" maxx="**5.94**" maxy="**51.50**" />

<wms:BoundingBox CRS="**EPSG:4258**" minx="**2.56**" miny="**50.65**" maxx="**5.94**" maxy="**51.50**" />

<wms:BoundingBox CRS="**EPSG:31370**" minx="**22000**" miny="**150000**" maxx="**259000**" maxy="**245000**" />

<wms:BoundingBox CRS="**EPSG:3812**" minx="**52000**" miny="**650000**" maxx="**759000**" maxy="**745000**" />

<wms:BoundingBox CRS="**EPSG:3043**" minx="**469000**" miny="**5610000**" maxx="**704000**" maxy="**5710000**" />

</wms:KeywordList>

...

<wms:EX\_GeographicBoundingBox>

<wms:westBoundLongitude>2.56</wms:westBoundLongitude>

<wms:eastBoundLongitude>5.94</wms:eastBoundLongitude>

<wms:southBoundLatitude>50.65</wms:southBoundLatitude>

<wms:northBoundLatitude>51.50</wms:northBoundLatitude>

</wms:EX\_GeographicBoundingBox>

UNIQUE RESOURCE IDENTIFIER

The Unique Resource Identifier of the resource used to create the layer. In [**INS MD**] the Identifier type is defined as an external unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. This type minimally consists of:

A local identifier, assigned by the data provider. The local identifier is unique within the namespace, to ensure that no other spatial object carries the same unique identifier.

A Namespace uniquely identifying the data source of the spatial object.

**Implementation Requirement 37** The [**INS MD**] Regulation defines a Unique Resource Identifier as a value uniquely identifying an object within a namespace. The code property shall be specified at a minimum, and a codeSpace (namespace) property may be provided.

**Implementation Recommendation 9** If a codeSpace is provided, the data type to be used shall be RS\_Identifier. The value of the “id” attribute assigned to the MD\_DataIdentification element should be used for cross-references within the document, or as the fragment identifier in links to the element from external resources.

Sample from INS MD Regulation demonstrating this concept:

Example 16: Sample from Metadata Technical Guidance [INS MDTG] demonstrating this concept

<gmd:MD\_Metadata …

…

<gmd:identificationInfo>

<gmd:MD\_DataIdentification id="image2000\_1\_nl2\_multi" >

<gmd:citation>

<gmd:CI\_Citation>

…

<gmd:identifier>

<gmd:RS\_Identifier>

<gmd:code>

<gco:CharacterString>image2000\_1\_nl2\_multi</gco:CharacterString>

</gmd:code>

<gmd:codeSpace>

[<gco:CharacterString>http://image2000.jrc.it</gco:CharacterString>](http://image2000.jrc.it/)

</gmd:codeSpace>

</gmd:RS\_Identifier>

</gmd:identifier>

</gmd:CI\_Citation>

</gmd:citation>

…

</gmd:MD\_DataIdentification>

</gmd:identificationInfo>

…

</gmd:MD\_Metadata>

**Implementation Requirement 38** To be able to map the concept of a responsible body/codeSpace and local identifier/code to [**ISO 19128**]), AuthorityURL and Identifier elements shall be used. The authority name and explanatory URL shall be defined in a separate AuthorityURL element, which may be defined once and inherited by subsidiary layers. Identifiers themselves are not inherited.

**Implementation Recommendation 10** The usage of a UUID (Universal Unique Identifier, as specified by IETF (http://www.ietf.org)) is recommended to ensure identifier’s uniqueness.

Example 17: Authority URL

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

<wms:Name>HY.PHYSICALWATERS.WATERBODIES</wms:Name>

<wms:Title>Hydrography Physical Waters : Waterbodies</wms:Title>

<AuthorityURL name="AGIVId">

<OnlineResource xmlns:xlink=<http://www.w3.org/1999/xlink> xlink:type="simple" xlink:href="[http://www.agiv.be/index.html"/>](http://www.agiv.be/index.html)

</AuthorityURL>

<MetadataURL type="ISO19115:2003”>

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"

/>

</MetadataURL>

<wms:Layer>

<wms:Name> HY.PHYSICALWATERS.WATERBODIES.WATERCOURSE

</wms:Name>

<wms:Title>

The hydrography physical waters theme : waterbodies

</wms:Title>

|  |
| --- |
| <wms:Abstract>As defined by TWG</wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”>GEMET keyword</wms:Keyword>  ...  </wms:KeywordList>  ...  <wms:EX\_GeographicBoundingBox>  <*wms:westBoundLongitude>-31.2</wms:westBoundLongitude>*  *<w*ms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ... |
| <!-- Identifier whose meaning is defined in an AuthorityURL element -->  <Identifier authority="AGIVId"> 06B42F5-9971-441B-BB4B-5B382388D534  </Identifier> |
| **<**MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL>  ...  </wms:Layer>  <wms:Layer>  <wms:Name> HY.PHYSICALWATERS.WATERBODIES.STANDINGWATER  </wms:Name>  <wms:Title>  The hydrography physical waters theme:standing water  </wms:Title>  <wms:Abstract>As defined by TWG</wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”>GEMET keyword</wms:Keyword>  ...  </wms:KeywordList>  ...  <wms:EX\_GeographicBoundingBox>  <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>  <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ... |
| <Identifier authority="AGIVId"> 0245A84E-15B8-4228-B11E-334C91ABA34F  </Identifier> |
| <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet)  Name=full" |

/>

</MetadataURL>

...

</wms:Layer>

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

NAME

The harmonised name of a layer for an INSPIRE spatial data theme as defined by [**INS DS**].

**Implementation Requirement 39** Name shall be mapped with the <wms:Name> element. The harmonised name of a layer shall comply with the Layer requirements of the [**INS DS,** Article 14]

Table 5: Annexes I harmonised name examples

|  |  |
| --- | --- |
| **Theme** | **Examples of layer names** |
| Geographical names | GN.GeographicalNames |
| Administrative units | AU.AdministrativeUnit |
| Addresses | AD.Address |
| Cadastral parcels | CP.CadastralParcel |
| Transport networks | TN.RoadTransportNetwork.RoadArea |
| Hydrography | HY.Network |
| Protected sites | PS.ProtectedSite |

Example 18: Name

<wms:Title> Transport networks : Road Area</wms:Title>

<wms:Abstract>As defined by TWG</wms:Abstract>

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

...

</wms:KeywordList>

...

<wms:EX\_GeographicBoundingBox>

<wms:westBoundLongitude>-31.2</wms:westBoundLongitude>

<wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>

<wms:southBoundLatitude>27.2</wms:southBoundLatitude>

<wms:northBoundLatitude>90</wms:northBoundLatitude>

</wms:EX\_GeographicBoundingBox>

...

<MetadataURL type="ISO19115:2003”>

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id)

<wms:Name>TN.RoadTransportNetwork.RoadArea</wms:Name>

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>

...

</wms:Service>

<wms:Capability>

...

<wms:Layer>

[TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"

/>

</MetadataURL>

...

</wms:Layer>

</wms:Capability>

</wms:WMS\_Capabilities>

COORDINATE REFERENCE SYSTEMS

List of Coordinate Reference Systems in which the layer is available: coordinate reference system as defined in Annex I of the INSPIRE Directive [**Directive 2007/2/EC]** .

**Implementation Requirement 40** It is mandatory to use geographical coordinate system based on ETRS89 in continental Europe and ITRS outside continental Europe.

The value of the CRS parameter depends on the coordinate reference systems catalogue being used, for example, using EPSG repository ([http://www.epsg.org/),](http://www.epsg.org/)) the relevant code would be: “EPSG:4258”

**Implementation Recommendation 11** As two types of CRS identifiers are permitted ("label" with EPSG, CRS and AUTO2 namespaces, and "URL" identifiers as fully-qualified Uniform Resource Locator that references a publicly-accessible file containing a definition of the CRS that is compliant with ISO 19111), it is recommended to set up a register for the INSPIRE framework.

Table 6: CRS recommended codes

|  |  |
| --- | --- |
| **CRS value** | **Usage** |
| EPSG:4258 | ETRS89 geographic (Continental Europe) |
| EPSG:4326 | WGS 84 (World), Low resolution datasets |
| CRS:84 | WGS 84 (Outside continental Europe) |

Example 19: Coordinate reference systems

|  |
| --- |
| <wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)  <wms:Service>  ...  </wms:Service>  <wms:Capability>  ...  <wms:Layer>  <wms:Name>TN.ROADTRANSPORTNETWORK.ROADAREA</wms:Name>  <wms:Title>Transport networks : Road Area</wms:Title>  <wms:Abstract>As defined by TWG</wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>  ...  </wms:KeywordList> |
| <wms:CRS>EPSG:4258</wms:CRS>  <wms:CRS>EPSG:4326</wms:CRS>  <wms:CRS>CRS:84</wms:CRS> |
| <wms:EX\_GeographicBoundingBox>  <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>  <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ... |

<MetadataURL type="ISO19115:2003”>

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"

/>

</MetadataURL>

...

</wms:Layer>

</wms:Capability>

STYLES

List of the rendering styles available for the layer. A style shall be composed of a title and a unique identifier [INS NS].

**Implementation Requirement 41** A Style shall be composed of a Title and a Unique Identifier.

**Implementation Requirement 42** An <inspire\_common:DEFAULT> style for each theme shall be as defined in the "Portrayal" section of the [**INS DS,** Article 14].

**Implementation Requirement 43** For layers with no associated default style, the INSPIRE Generic Conceptual Model [**INS GCM**] defines simple styles shall be used in data portrayal, derived from Symbology Encoding Implementation Specification [**OGC SEIS**]: Point: grey square, 6 pixels; Curve: black solid line, 1 pixel; Surface: black solid line, 1 pixel, grey fill.

**Implementation Recommendation 12** In addition to the <inspire\_common:DEFAULT> style, the View Service should provide additional thematic or national styles for each layer, for example IGNF:TN.ROADTRANSPORTNETWORKS.ROADS.

**Implementation Requirement 44** If no style is specified in the request or the style parameter is empty, the <inspire\_common:DEFAULT> style shall be used in layer rendering.

**Implementation Requirement 45** A legend shall be provided for each style and supported language defined in the View Service.

**Implementation Requirement 46** Style shall be mapped to the <wms:Style> element. The human- readable name shall be mapped to the <wms:Title> element and the Unique Identifier shall be mapped to the <wms:Name> element.

Example 20: Styles

|  |
| --- |
| <wms:WMS\_Capabilities version="1.3.0" [xmlns:wms=”http://www.opengis.net/wms](http://www.opengis.net/wms)>  <wms:Service>  ...  </wms:Service>  <wms:Capability>  ...  <wms:Layer>  <wms:Name>TN.ROADTRANSPORTNETWORK.ROADAREA</wms:Name>  <wms:Title>Transport networks : Road Area</wms:Title>  <wms:Abstract>  ...  </wms:Abstract>  <wms:KeywordList>  ...  </wms:KeywordList> |
| <wms:CRS>EPSG:4258</wms:CRS>  <wms:CRS>EPSG:4326</wms:CRS>  <wms:CRS>CRS:84</wms:CRS> |
| <wms:EX\_GeographicBoundingBox>  ...  </wms:EX\_GeographicBoundingBox>  ... |
| <wms:Style>  <wms:Name>inspire\_common:DEFAULT</wms:Name>  <wms:Title>Style for roads</wms:Title>  ...  </wms:Style> |
| ...  </wms:Layer>  </wms:Capability>  </wms:WMS\_Capabilities> |

LEGEND URL

Location of the legend for each style, language and dimension pairs.

**Implementation Requirement 47** As the capabilities document is a mono-lingual document, internationalized legend may be placed in a different capabilities document for each value of the LANGUAGE parameter. It shall be mapped with the <wms:LegendURL> element.

**Implementation Recommendation 13** It is recommended to use "image/png" or "image/gif" mime types for a legend.

Example 21: Legend URL

<wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)

<wms:Service>...</wms:Service>

<wms:Capability>

...

<wms:Layer>

<wms:Name>TN.ROADTRANSPORTNETWORK.ROADAREA</wms:Name>

<wms:Title>Transport networks : Road Area</wms:Title>

<wms:Abstract>As defined by TWG</wms:Abstract>

<wms:KeywordList>

<wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>

|  |
| --- |
| ... |
| </wms:KeywordList>  <wms:CRS>EPSG:4258</wms:CRS>  <wms:CRS>EPSG:4326</wms:CRS>  <wms:CRS>CRS:84</wms:CRS> |
| <wms:EX\_GeographicBoundingBox>  <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>  <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ...  <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc](http://www.isotc211.org/2005/gmd%26elementSet)211.org/2005/gmd&elementSet Name=full"  />  </MetadataURL>  ...  <wms:Style>  <wms:Name>inspire\_common:DEFAULT</wms:Name>  <wms:Title>Style for roads</wms:Title> |
| <wms:LegendURL width="100" height="100">  <wms:Format>image/png</wms:Format>  <wms:OnlineResource xmlns:xlink="<http://www.w3.org/1999/xlink>" xlink:type="simple"  xlink:href="URL"  />  <wms:LegendURL> |
| </wms:Style>  ...  </wms:Layer>  </wms:Capability>  </wms:WMS\_Capabilities> |

DIMENSION PAIRS

Indicates the supported two dimensional axis pairs for multi-dimensional spatial data sets and spatial data sets series; some geographic information may be available at other dimensions (for example, satellite images in different wavelength bands).

**Implementation Recommendation 14** The optional <wms:Dimension> element should be used in service metadata to declare that one or more dimensional parameters are relevant to a layer or group of layers.

For more information, refer to [**ISO 19128**, Annex C].

**Implementation Recommendation 15** When the map is fully defined by its two-dimensional axis (defined in the CRS), this metadata element should not be provided.

**Implementation Requirement 48** In other cases such as time and elevation, <wms:Dimension>

shall be used according to [**INS NS**].

Example 22: Dimension Pairs

|  |
| --- |
| <wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)  <wms:Service>  ...  </wms:Service>  <wms:Capability>  ...  <wms:Layer>  <wms:Name>TN.ROADTRANSPORTNETWORK.ROADAREA</wms:Name>  <wms:Title>Transport networks : Road Area</wms:Title>  <wms:Abstract>  ...  </wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”> GEMET keyword</wms:Keyword>  ...  </wms:KeywordList> |
| <wms:CRS>EPSG:4258</wms:CRS>  <wms:CRS>EPSG:4326</wms:CRS>  <wms:CRS>CRS:84</wms:CRS> |
| <wms:EX\_GeographicBoundingBox>  <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>  <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox> |
| <wms:Dimension name="time" units="ISO8601" defaults="2009-06-16"> 2005-01-01/2012-01-01/PID  </wms:Dimension> |
| ...  <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL>  ...  <wms:Style>  <wms:Name>inspire\_common:DEFAULT</wms:Name>  <wms:Title>Style for roads</wms:Title>  <wms:LegendURL width="100" height="100">  <wms:Format>image/png</wms:Format>  <wms:OnlineResource xmlns:xlink="<http://www.w3.org/1999/xlink>"  xlink:type="simple" xlink:href="URL"  />  <wms:LegendURL>  </wms:Style>  ...  </wms:Layer>  </wms:Capability>  </wms:WMS\_Capabilities> |

CATEGORY LAYER

**Implementation Recommendation 16** Category Layers should be used to describe a layer including more than one featuretype (e.g. Hydrography Layers in INSPIRE Regulation as regards interoperability of spatial data sets and services [**INS DS**]) or a layer consisting of regional separated spatial datasets.

**Implementation Requirement 49** A containing Category Layer itself includes a Name by which a map portraying all of the nested layers can be requested at once. If a metadata description of this category composition exists then the MetadataURL for the Category Layer shall be provided.

For instance, the Category Layer Hydrography Physical Waters Waterbodies could contain HY.PhysicalWaters.Waterbodies.Watercourse and HY.PhysicalWaters.Waterbodies.StandingWater nested layers.

Example 23: Category layer

|  |
| --- |
| <wms:WMS\_Capabilities version=“1.3.0” [xmlns:wms=”http://www.opengis.net/wms>](http://www.opengis.net/wms)  <wms:Service>  ...  </wms:Service>  <wms:Capability>  ... |
| <wms:Layer>  <wms:Name>HY.PHYSICALWATERS.WATERBODIES</wms:Name>  <wms:Title>Hydrography Physical Waters : Waterbodies</wms:Title>  <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL> |
| <wms:Layer> |
| <wms:Name> HY.PHYSICALWATERS.WATERBODIES.WATERCOURSE  </wms:Name>  <wms:Title>  The hydrography physical waters theme : waterbodies  </wms:Title> |
| <wms:Abstract>  ...  </wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”>GEMET keyword</wms:Keyword>  ...  </wms:KeywordList>  ...  <wms:EX\_GeographicBoundingBox>  <*wms:westBoundLongitude>-31.2</wms:westBoundLongitude>*  *<w*ms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ...  **<**MetadataURL type="ISO19115:2003”> |

|  |
| --- |
| <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) TADATA\_IDENTIFIER][&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL>  ...  </wms:Layer>  <wms:Layer> |
| <wms:Name> HY.PHYSICALWATERS.WATERBODIES.STANDINGWATER  </wms:Name>  <wms:Title>  The hydrography physical waters theme:standing water  </wms:Title> |
| <wms:Abstract>  ...  </wms:Abstract>  <wms:KeywordList>  <wms:Keyword vocabulary=”GEMET”>GEMET keyword</wms:Keyword>  ...  </wms:KeywordList>  ...  <wms:EX\_GeographicBoundingBox>  <wms:westBoundLongitude>-31.2</wms:westBoundLongitude>  <wms:eastBoundLongitude>69.1</wms:eastBoundLongitude>  <wms:southBoundLatitude>27.2</wms:southBoundLatitude>  <wms:northBoundLatitude>90</wms:northBoundLatitude>  </wms:EX\_GeographicBoundingBox>  ...  <MetadataURL type="ISO19115:2003”>  <Format>text/xml</Format>  <OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"  xlink:href=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"  />  </MetadataURL>  ...  </wms:Layer> |
| </wms:Layer> |
| </wms:Capability>  </wms:WMS\_Capabilities> |

* + 1. **Get Map Operation**
       1. **GetMap operation**

The GetMap operation returns a map. Upon receiving a GetMap request, a WMS shall either satisfy the request or issue a service exception.

[**INS NS**] states that “…*this map is an image spatially referenced*”: the GetMap request is geo- referencing the returned image at least by the use of the Bounding box and Coordinate Reference System parameters.

Table 7 shows the INSPIRE parameters that shall be used within the WMS GetMap operation according to the [**INS NS**]:

Table 7 INSPIRE and ISO 19128 parameters mapping

|  |  |
| --- | --- |
| **INSPIRE parameters** | **ISO 19128 parameters** |
| Layers | LAYERS |
| Styles | STYLES |
| Coordinate Reference System | CRS |
| Bounding box | BBOX |
| Image width | WIDTH |
| Image height | HEIGHT |
| Image format | FORMAT |
| Language | None. See LANGUAGE section |
| Dimension Pair | TIME, ELEVATION or other sample dimension(s).  In case of 2D request, the standard does not require this parameter. |

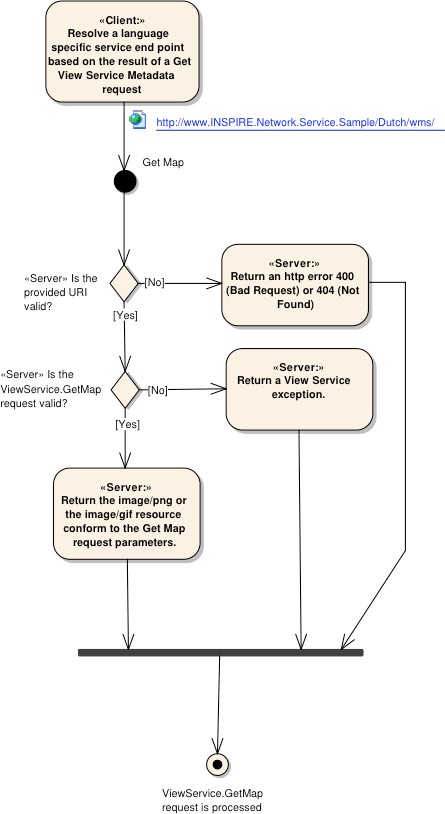


Figure 6: Get Map Activity (Use case 4)

* + - * 1. GetMap request parameters

Table 8: GetMap core parameters

|  |  |  |
| --- | --- | --- |
| **Request parameter** | **Mandatory/ optional** | **Description** |
| VERSION=1.3.0 | M | Request version |
| REQUEST=GetMap | M | Request name |
| LAYERS=name,name | M | Comma-separated list of one or more map layers names. Names are harmonized INSPIRE layers names. |
| STYLES=name,name | M | Comma-separated list of one rendering style per layer requested. When the STYLES parameter is left blank in the GetMap request, the INSPIRE default styling applies in the GetMap response to all layers (inspire\_common:DEFAULT) |
| CRS=namespace:identifier | M | Coordinate reference system |
| BBOX=minx,miny,maxx,maxy | M | Bounding box corners (lower left, upper right) in CRS units and in the axis order of the CRS |
| WIDTH=output\_width | M | Width in pixels of map picture |
| HEIGHT=output\_height | M | Height in pixels of map picture |
| FORMAT=output\_format | M | Output format of map. At least supported : Portable Network Graphics format(PNG; MIME type "image/png") or the GIF (Graphics Interchange Format) without LZW compression (MIME type "image/gif") |
|  |  |  |
| TRANSPARENT=TRUE|FALSE | O | Background transparency of map (default=FALSE) |
| BGCOLOR=color\_value | O | Hexadecimal red-green-blue colour value for the background color (default=0xFFFFFF) |
| EXCEPTIONS=error\_format | O | The format in which exceptions are to be reported by the WMS (default=XML) |
| TIME=time | C | Time value of layer desired |
| ELEVATION=elevation | C | Elevation of layer desired |
| Other sample dimension(s) | C | Value of other dimensions as appropriate |

VERSION

**Implementation Requirement 50** The mandatory VERSION parameter. The value "1.3.0" shall be used for GetMap requests that comply with the [**ISO 19128**] standard.

REQUEST

**Implementation Requirement 51** The mandatory REQUEST parameter is defined in [**ISO 19128**, Section 6.9.2]. To invoke the GetMap operation, the value "GetMap" shall be used to comply with the [**ISO 19128**] standard.

LAYERS

**Implementation Requirement 52** The mandatory LAYERS parameter lists the map layer(s) to be returned by this GetMap request. The value of the LAYERS parameter shall be a comma-separated list of one or more valid INSPIRE harmonized layer names.

STYLES

**Implementation Requirement 53** The mandatory STYLES parameter lists the style in which each layer is to be rendered. The value of the STYLES parameter shall be a comma-separated list of one or more valid INSPIRE style names. A client may request the default Style using a null value (as in "STYLES=").

CRS

**Implementation Requirement 54** The CRS request parameter states what Layer CRS applies to the BBOX request parameter. Values must be CRS that are defined in the INSPIRE Annex I, theme 1, Coordinate Reference System.

Recommended CRS are listed in Section 4.2.3.3.4.7.

BBOX

**Implementation Requirement 55** The mandatory BBOX parameter allows a Client to request a particular Bounding Box. The value of the BBOX parameter in a GetMap request shall be a list of comma-separated real numbers in the form "minx,miny,maxx,maxy". These values specify the minimum X, minimum Y, maximum X, and maximum Y values of a region in the Layer CRS of the request. The units, ordering and direction of increment of the X and Y axes shall be as defined by the Layer CRS. The four bounding box values indicate the outside limits of the region.

WIDTH AND HEIGHT

**Implementation Requirement 56** The mandatory WIDTH and HEIGHT parameters specify the size in integer pixels of the map to be produced.

FORMAT

**Implementation Requirement 57** The mandatory FORMAT parameter states the desired format of the map. The [**INS NS**, Annex III, Part B, Section 2] Image format states that at least one of “image/png” or “image/gif” must be supported and therefore advertised in the GetCapabilities operation.

TRANSPARENT

**Implementation Requirement 58** The optional TRANSPARENT parameter specifies whether the map background is to be made transparent or not. The service is required to implement this.

BGCOLOR

The optional BGCOLOR parameter is a string that specifies the color to be used as the background (nodata) pixels of the map.

EXCEPTIONS

**Implementation Requirement 59** The default value shall be "XML" if this parameter is absent from the request. Other valid values are INIMAGE and BLANK.

TIME, ELEVATION AND OTHER SAMPLE DIMENSION(S)

Used when issuing a request using the Temporal coordinate system, height coordinate system or other dimensions. For more information, see [**ISO 19128**, Annexes C and D].

In case of a 2D request, the standard does not require this parameter.

* + 1. **Link View Service operation**

**Implementation Requirement 60** As stated in [**INS NS]**, the Link View Service operation allows a Public Authority or a Third Party to declare a View Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public Authority or the Third party location. Furthermore, the Link View Service parameter shall provide all information about the Public Authority’s or Third Party’s View Service compliant with this regulation, enabling the Member State View Service to get a map from the Public Authority’s or Third Party’s View Service and to collate it with other maps.

The above INSPIRE requirement defines the need for a mechanism that allows third parties to publish their View Services to the INSPIRE network through a Member State INSPIRE network service. If a Third Party publishes its View Service metadata through a Member State Discovery Service, it shall be possible to view Third Party resources by discovering the Third Party’s View Service metadata in the Member State’s Discovery Service. The retrieval of this View Service metadata can be handled by the client through a search on View Service metadata in a Member State’s Discovery Service.

**Implementation Requirement 61** This operation shall be implemented with the Discover Metadata operation of the Discovery Service.

Based on the View Service’s service metadata obtained from a Discovery Service through the Discover Metadata (CSW GetRecords) operation, the capabilities document of a remote INSPIRE View Service may be requested and resources published as Layers defined in this View Service can be consumed by a View Service client.

Example 24: Link View Service – View Service search (CSW.GetRecords request)

<csw:GetRecords [xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"](http://www.opengis.net/cat/csw/2.0.2) service="CSW" resultType="results"

outputFormat="application/xml" [outputSchema="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd)

startPosition="1" maxRecords="10">

<csw:Query typeNames="gmd:MD\_Metadata">

<csw:ElementSetName typeNames="gmd:MD\_Metadata">full</csw:ElementSetName>

<csw:Constraint version="1.1.0">

<ogc:Filter [xmlns:ogc="http://www.opengis.net/ogc">](http://www.opengis.net/ogc)

<ogc:And>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:Language</ogc:PropertyName>

<ogc:Literal>eng</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:ServiceType</ogc:PropertyName>

<ogc:Literal>view</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:And>

</ogc::Filter>

</csw:Constraint>

</csw:Query>

</csw:GetRecords>

If the Member State’s View Service supports cascading, the Member State can publish the Third Party’s View Service as part of its own capabilities document. In this case Third Party View Services can be consumed through the Member State’s View Service. To let the View Service client choose whether he wants to consume the Third Party’s View Service directly at the Third Party location or via a cascading View Service at the Member State’s location, the View Service metadata of the Third Party’s View Service shall be published in a Discovery Service that is part of the network via the Discovery Publish Metadata operation (see **[INS DSTG]** for more information on this operation).

In general there are three possible scenarios: the centralised, the view client and the View Service scenario.

* + - 1. **Centralised scenario**

If the Member State provides all View Service metadata, viewing capabilities and View Services centralised at national level, then the link View Service operation as required by the INSPIRE Regulation [**INS NS**] is implicitly fulfilled.

*Response Parameters*

GetCapabilities Response:

No additional parameters are required.

* + - 1. **View client scenario**

In this case the collation of maps served by different View Services is handled by the client application. The client consumes View Services that are discovered via the Discover Metadata operation at the Member State’s location and are published at different locations.

Disadvantages:

* Get Map request/responses for remote View Services have to be processed by every client.
* View Services which are not directly accessible (e.g. running behind a firewall in an intranet) cannot be accessed.

Advantages:

* View Services can be processed by the client: so the client has more control over the Get Map operation.

The response time of a single Get Map request may be more predictable as no hidden requests to third party View Services are involved.

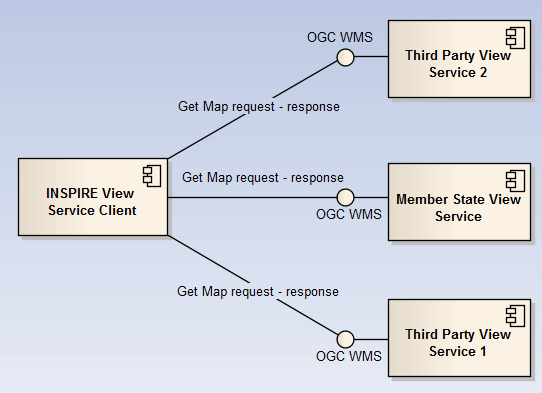


Figure 7: Client approach

*Response Parameters*

GetCapabilities Response:

No additional parameters are required.

* + - 1. **View Service scenario**

In this case the Member State’s View Service supports cascading and is responsible for collating the maps from third party View Service providers.

**Implementation Requirement 62** In the case where it is more preferable to collate maps in a View Service (for example: the Member State View Service collates maps that are served locally with maps that are served remote by a Third Party), the Member State’s View Service shall include the service’s layer metadata in his own service metadata (capabilities document).

**Implementation Requirement 63** The “cascaded” attribute of the <wms:Layer> element shall be used to indicate that the layer is hosted by a remote View Service.

**Implementation Requirement 64** Every time a map from a View Service is cascaded through another View Service the value of the “cascaded” attribute shall be incremented by 1. The actual collation of maps is out-of-scope for this Technical Guideline.

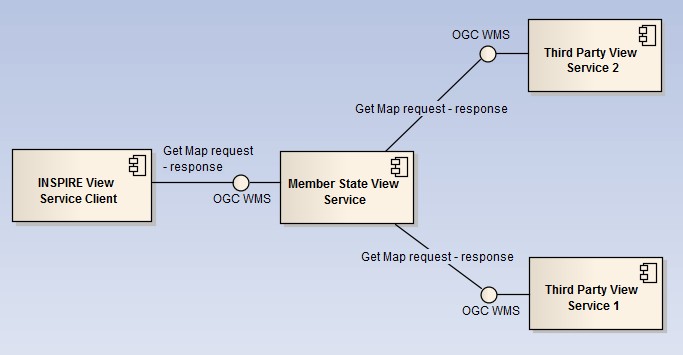


Figure 8: Service approach

Disadvantages:

* The Member State’s View Service has to support the cascading of View Services.
* Get Map requests/responses must be processed by every View Service in the cascade.
* The response time for a single Get Map request may be less predictable as possibly hidden requests to (potentially slow) third party View Services are involved.

Advantages:

* View Services behind a firewall can be accessed via the Member State’s View Service.
* Get Map request/responses for remote View Services don’t have to be processed by every client.

*Response Parameters*

GetCapabilities Response:

No additional parameters are required.

* + - 1. **General requirement when collating maps**

**Implementation Requirement 65** To support collation with other maps for both supported image formats (GIF and PNG), the transparency parameter (TRANSPARENT) of the WMS GetMap request shall be set to “true” and the background parameter (BGCOLOR) for all layers shall be set to the same colour.

* 1. ***Language Requirements***

The Network Services Regulation requires that multilingual aspects for network services are supported [**INS NS**]. As there is no standard way to deal with multilingualism within the current ISO or OGC specifications, the following basic principle shall be used for INSPIRE Network Services:

**Implementation Requirement 66** A network service metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported.

**Implementation Requirement 67** A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. It the requested language is not supported by the service, then this parameter shall be ignored.

* + 1. **GetCapabilities-Operation**

**GetCapabilities-Request:**

The HTTP/GET binding of the GetCapabilities-Operation is extended by an additional parameter that indicates the client’s preferred language.

**Implementation Requirement 68** The name of this parameter shall be “LANGUAGE”. The parameter values are based on ISO 639-2/B alpha 3 codes as used in [**INS MDTG**].

Table 9: Language parameter

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Parameter Value** | **Is mandatory for a Client Request?** | **Is mandatory to support for the Service?** |
| LANGUAGE | Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2.  Use only three-letter codes from in ISO 639-2/B (bibliographic codes),  The list of codes for the 23 official EU languages and EFTA Countries is: Bulgarian – **bul** Italian – **ita** Czech – **cze** Latvian – **lav**  Danish – **dan** Liechenstein – **ger** Dutch – **dut** Lithuanian – **lit** English – **eng** Maltese – **mlt** Polish – **pol** Norwegian – **nor** Estonian – **est** Portuguese – **por** Finnish – **fin** Romanian – **rum**  French – **fre** Romansh - **roh** German – **ger** Slovak – **slo** Greek – **gre** Slovenian – **slv** Hungarian – **hun** Spanish – **spa** Irish – **gle** Swedish – **swe** Icelandic – **ice**  The list of all the codes is defined at <http://www.loc.gov/standards/iso639-2/> Regional languages also are included in this list. | No, it is optional. | Yes, it is mandatory to be supported and shall be processed if the parameter is present in a client’s request with a supported language code. If the parameter is absent in a clients request or it requested an unsupported language the service shall response in the service default language. |

|  |
| --- |
| Schema:  [OCG-GetCapabilities-Request]&LANGUAGE=<ISO 639-2/B alpha 3 code>  Example: [http://inspire.network.service.example/service?SERVICE=](http://inspire.network.service.example/service?SERVICE)[...]&VERSION=[...]&LANGUAGE=eng |

**GetCapabilities-Response:**

If a client request specifies a supported language the following fields of the GetCapabilties-Response are affected:

* + - * Titles
      * Abstracts

**Implementation Requirement 69** If a client request specifies an unsupported language, or the parameter is absent in the request, the above fields shall be provided in the service default language.

This behaviour ensures backward compatibility so that any existing clients may interact with the service using the default OGC standard.

**Extended Capabilities**

To advertise the supported languages the service shall respond with Extended Capabilities:

**Implementation Requirement 70** The Extended Capabilities shall indicate the **response language**

used for the GetCapabilities-Response: Depending on the **requested language** the value of the

<inspire\_common:ResponseLanguage> corresponds to the current used language. If a supported language was requested, <inspire\_common:ResponseLanguage> shall correspond to that requested language. If an unsupported language was requested or if no specific language was requested <inspire\_common:ResponseLanguage> shall correspond to the **service default language <inspire\_common:DefaultLanguage>**

**Implementation Requirement 71** The Extended Capabilities shall contain the **list of supported languages** indicated in <inspire\_common:SupportedLanguages>.

This **list of supported languages** shall consist of

1. exact one element <inspire\_common:DefaultLanguage> indicating the service default language, and
2. zero or more elements <inspire\_common:SupportedLanguage> to indicate all additional supported languages.

Regardless of the response language, the **list of supported languages** is invariant for each GetCapabilities-Response.

**Implementation Requirement 72** The Extended Capabilities shall use the XML Schema as defined in the INSPIRE online schema repository.

**Examples:**

A service supports French and English and the service default language is French: Example 25: Response to [OGC-GetCapabilities-Request]&LANGUAGE=eng

<inspire\_vs:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage

…

</inspire\_vs:ExtendedCapabilities>

Example 26: Response to [OGC-GetCapabilities-Request] or [OGC-GetCapabilities-Request]&LANGUAGE=fre

<inspire\_vs:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

…

</inspire\_vs:ExtendedCapabilities>

A service supports only German:

Example 27: Response to any GetCapabilities-Request

<inspire\_vs:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

…

</inspire\_vs:ExtendedCapabilities>

**4.3.1.1 GetMap-Operation**

Neither the INSPIRE Network Services [**INS NS**] Regulation or the Regulation as regards interoperability of spatial data sets and services [**INS DS**] require that text rendered on the map has to be in a specific language.

**Implementation Requirement 73** If any portrayal rules require language support for rendered text -

e.g. by further amendments for Annex II or Annex III - INSPIRE View Services shall implement the common concept as stated in Section 4.3.2.

* + 1. **Common concept for other operations (optional)**

Although further multilingual support is not required for INSPIRE Network Services, it may be desired by a service provider to implement further multilingual support such as:

* + - * multilingual error messages
      * multilingual support for additional Operations including HTTP/POST- and HTTP/GET-Binding For that reason a further implementation concept for multilingual aspects is recommended as follows:

The recommended INSPIRE Extension described before already provides language specific capabilities for a service.

**Implementation Recommendation 17** For further language support for other operation it is recommended to replace the operation-online-resources in each language specific GetCapabilities- Response by a specific operation-online-resource for that language. To support the additional operation-online-resources the service shall listen at the language specific operation end-points to distinguish for the requested languages.

An example of this behaviour is given below, showing how to extend the WMS.getMap() operation to support multilingual error messages.

1. The client sends the initial Request for Capabilities: [OCG-GetCapabilities-Request]
2. The service responses with extended Capabilities including the supported Languages:

Example 28: Service response including supported languages

<inspire\_vs:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>fre</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>eng</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:SupportedLanguage>dut</inspire\_common:SupportedLanguage>

<inspire\_common:ResponseLanguage>eng</inspire\_common:ResponseLanguage>

…

</inspire\_vs:ExtendedCapabilities>

1. The Client sends a language specific request for capabilities [OCG-GetCapabilities-Request]&LANGUAGE=eng
2. The service response with language specific capabilities containing:
   1. translated natural language fields (titles, abstracts)
   2. **language specific entry points** for the language specific operations using this concept.

Example 29: Response to [OCG-GetCapabilities-Request]&LANGUAGE=eng or [OCG-GetCapabilities-Request

<WMS\_Capabilities[…]

<Capability>

<Request>[…]

<GetMap>[…]

<DCPType>

<HTTP>

<Get>

<OnlineResource [xlink:href="http://someHOST.example/](http://someHOST.example/eng/GetMap)**eng**/GetMap?" />

</Get>

</HTTP>

</DCPType>

</GetMap>[…]

</Request>[…]

<Capability>[…]

</WMS\_Capabilities>

Example 30: Response to [OCG-GetCapabilities-Request]&LANGUAGE=ger

<WMS\_Capabilities[…]

<Capability>

<Request>[…]

<GetMap>[…]

<DCPType>

<HTTP>

<Get>

<OnlineResource [xlink:href="http://someHOST.example/](http://someHOST.example/ger/GetMap)**ger**/GetMap?" />

</Get>

</HTTP>

</DCPType>

</GetMap>[…]

</Request>[…]

<Capability>[…]

</WMS\_Capabilities>

1. The Client sends an invalid request to either the English or the German operation endpoint.
   1. English operation end point: Request:

[http://someHOST.example/**eng**/GetMap?SERVICE=WMS&LAYERS=nonexistentL](http://someHOST.example/eng/GetMap?SERVICE=WMS&LAYERS=nonexistentL) ayer&[...]

Response:

The service responses with an exception including an English exception message: e.g. “The request is invalid. Reason is … ”.

* 1. German operation end point: Request:

[http://someHOST.example/**ger**/GetMap?SERVICE=WMS&LAYERS=nonexistentL](http://someHOST.example/ger/GetMap?SERVICE=WMS&LAYERS=nonexistentL) ayer&[...]

Response:

The service responses with an exception including a German exception message: e.g. “Die Anfrage ist fehlerhaft aufgrund …”.

* + 1. **Further Perspectives**

With the ongoing development of OWS Common it is expected that future versions of OGC Standards will include language support. For specific technical reasons, the concepts used for OWS common are not suitable to extend the current standards. However, with the availability of future versions of the OGC base standards the recommended approach to support multilingualism may need to be revisited.

IETF RFC 4646 is supported by OGC standards relying upon OWS 1.1.0.

**Implementation Recommendation 18** The support of IETF RFC 4646 is recommended wherever the support of ISO/639 B alpha3 for languages infringes the conformity with the standard used for implementing the [**INS NS**].

Table 10: Mapping between ISO 639/B alpha 3 and the two forms of IETF RFC 4646 supported by OWS 1.1.0

|  |  |  |
| --- | --- | --- |
| ISO639/B alpha 3 | IETF RFC 4646 short | IETF RFC 4646 long |
| bul | bg | bg-BG |
| cze | cs | cs-CZ |
| dan | da | da-DK |
| dut | nl | nl-NL |
| eng | en | en-GB |
| est | et | et-EE |
| fin | fi | fi-FI |
| fre | fr | fr-CH, fr-FR |
| ger | de | de-AT, de-CH, de-DE, de-LI |
| gre | el | el-GR |
| hun | hu | hu-HU |
| gle | ga | ga-IE |
| ice | is | Is-IS |
| ita | it | it-CH, it-IT |
| lav | lv | lv-LV |
| lit | lt | lt-LT |
| mlt | mt | mt-MT |
| nor | no | no-NO |
| pol | pl | pl-PL |
| por | pt | pt-PT |
| roh | rm | rm-CH |
| rum | ro | ro-RO |
| slo | sk | sk-SK |
| slv | sl | sl-SI |
| spa | es | es-ES |
| swe | sv | sv-SE |

1. **INSPIRE Profile of WMTS 1.0.0**

This section specifies requirements and recommendations based on the OGC standard [**OGC 07- 057r7**] – Web Map Tile Service (WMTS) 1.0.0. It defines an INSPIRE Profile of [**OGC 07-057r7**] to implement the following operations:

* Get View Services Metadata: Get metadata about a specific view service;
* Get Map: Returns a map for a specified area;
* Link View Service: Allows the linking of view services together.

The custom INSPIRE schemas are available at <http://inspire.ec.europa.eu/schemas/>

This Technical Guidance uses the following namespace definitions in WMTS:

xmlns:inspire\_vs=“<http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0>” xmlns:inspire\_common=“<http://inspire.ec.europa.eu/schemas/common/1.0>”

The following sections specify the required extensions to the given specifications.

* 1. ***General background***

**Implementation Requirement 74** An INSPIRE View Service shall implement the mandatory behaviour from an **[OGC 07-057r7]** service, extended with the extensions required by the INSPIRE Directive and the Implementing Rules for View services.

**Implementation Recommendation 19** It is recommended that http URIs be used instead of URNs2.

* 1. ***View service operations***

**Implementation Requirement 75** The following **[OGC 07-057r7]** operations shall be implemented for an INSPIRE View service: GetCapabilities; GetTile.

Table 11: View Service Operations

|  |  |
| --- | --- |
| **INSPIRE View Service operations** | **OCG WMTS operations** |
| Get View Service Metadata | GetCapabilities |
| Get Map | GetTile |
| Link View Service |  |

**Implementation Requirement 76** The Link View Service operation shall be handled by the INSPIRE Discovery Service [**INS DSTG**].

As stated in [**OGC 07-057r7,** Section 7.4] support for the GET method is available for a WMTS service operations.

**Implementation Recommendation 20** It is recommended that the GET method is used for the view service operations.

2 In June 2010 OGC revised the naming policy to use http URIs to identify persistent OGC resources instead of URNs. For more information see [http://www.opengeospatial.org/projects/groups/ogcnasc.](http://www.opengeospatial.org/projects/groups/ogcnasc)

* + 1. **Common requests parameters for the View Service operations**

**Implementation Requirement 77** Common request parameters for the View Service operations:

**SERVICE** The SERVICE parameter is the service type identifier. The value shall be “WMTS”.

**REQUEST** The mandatory REQUEST parameter indicates which service operation is being invoked. The value shall be the name of one of the operations offered by the Web Map Tile Service.

**LANGUAGE** See Section 0 Language Requirements (INSPIRE extension)

* + 1. **View service exceptions**

Identical to INSPIRE Profile of OGC WMTS.

Note: As described in [**OGC 06-121r3,** Section 8] – OGC Web Services Common, WMTS exceptions MAY contain a *lang* element. This element describes the language used by all included exception text values. The values of this element are language codes as specified by [**IETF RFC 4646**].

* + 1. **Get View Service Metadata operation**
       1. **General**

**Implementation Requirement 78** The following metadata response parameters shall be contained in a Get View Service Metadata response:

* View Service Metadata;
* Operations Metadata;
* Layers Metadata;
* Languages.

Most of the necessary metadata can be provided through the service Capabilities, as defined in the WMTS Standard [**OGC 07-057r7**, Section 7.1.1]. These capabilities are mandatory and defined when a WMTS is set up. They consist of server's information, supported operations and parameters values.

**Implementation Requirement 79** Layers shall provide a link to the metadata description of the spatial dataset using the “ows:Metadata” element as part of the layer metadata. This element shall be populated with a URL that allows access to an unambiguous metadata record. The URL may be either: A HTTP/GET call on the GetRecordById operation of the Discovery Service using the identifier of the metadata document; or a direct link to the metadata document.

**Example**:

The use of the ows:Metadata element of [**OGC 06-121r3**] – OGC Web Services Common Specification (OWS) 1.1.0 is explicitly described in the [**OGC 07-057r7**] – Web Map Tile Service (WMTS) 1.0.0.

...

</Layer>

<ows:Metadata xlink:href="[http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [[METADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSetName=f](http://www.isotc211.org/2005/gmd%26elementSetName%3Df) ull"/>

<Layer>

<ows:Title>etopo2</ows:Title>

...

Note: The metadata on the spatial dataset explain the spatial dataset itself; however they do not replace the other metadata on the layer as part of the capabilities.

* + - 1. **GetCapabilities operation**

Table 12: GetCapabilities core parameters

|  |  |  |
| --- | --- | --- |
| **Request parameter** | **Mandatory / optional** | **Description** |
| SERVICE=WMTS | M | Service type. Fixed value: WMTS.  The ServiceType for an OGC 06-121r3 – WMTS is fixed to “WMTS”. |
| REQUEST=GetCapabilities | M | Request name. Fixed value: GetCapabilities |
| ACCEPTVERSIONS | O | Prioritized sequence of one or more standard versions accepted by client, with preferred versions listed first.  Value is list of “x.y.z” version values. SHALL contain "1.0.0". When omitted, latest supported version is implied. |
| SECTIONS | O | Unordered list of zero or more names of requested sections in complete service metadata document.  Value is list of section names. Allowed section names are in [**OGC 06-121r3**] Table 18. When omitted or not supported by server, return complete service metadata document. |
| UPDATESEQUENCE | O | Service metadata document version, value is “increased” whenever any change is made in complete service metadata document.  Values are selected by each server, and are always opaque to clients. When omitted or not supported by server, return latest service metadata document. |
| ACCEPTFORMATS | O | Prioritized sequence of zero or more response formats desired by client, with preferred formats listed first.  Value is list of format identifiers. Identifiers are MIME types of formats useful for service metadata documents. When omitted or not supported by server, return service metadata document using MIME type "application/xml". |
| LANGUAGE=code | O | Request language (INSPIRE extension). |

* + - 1. **GetCapabilities response**
         1. View service metadata

A scenario has been identified for publishing View Service metadata conform with the Regulation on INSPIRE Network Services [**INS NS**] and on Metadata [**INS MD**].

[**OGC 06-121r3**] 7.1.1 describes the response document of a GetCapabilities request called the WMTS *ServiceMetadata* document. This document based on [**OGC 06-121r3**] OWS specifications contains the following structures:

*ServiceIdentification* (from [**OGC 06-121r3**] OWS Service Identification)

*ServiceProvider* (from [**OGC 06-121r3**] OWS Service Provider)

*OperationsMetadata* (from [**OGC 06-121r3**] OWS Operations Metadata)

*Contents* (from [**OGC 06-121r3**] OWS Contents)

*Themes* (WMTS GetCapabilities specific) It also contains the following elements:

Version

updateSequence

WSDL

serviceMetadataURL

Example 31: WMTS GetCapabilities structure

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0) [xmlns:ows="http://www.opengis.net/](http://www.opengis.net/ows/1.1)ows/1.1" [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [xmlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs\_ows11/1.0"](http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0) version="1.0.0" [xsi:schemaLocation="http://www.opengis.net/wmts/1.0](http://www.opengis.net/wmts/1.0) <http://schemas.opengis.net/wmts/1.0/wmtsGetCapabilities_response.xsd> <http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0> [http://inspire.ec.europa.eu/schemas/inspire\_vs\_ows11/1.0/inspire\_vs\_ows\_11.](http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0/inspire_vs_ows_11) xsd">

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>...</Contents>

<Themes>...</Themes>

<WSDL xlink:href="..."/>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

To allow a WMTS instance using the INSPIRE Profile to supply the required metadata concerning the service, an Extended Capabilities element is added in the place provided by OGC OWS 1.1 specification:

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

</ows:OperationsMetadata>

<Contents>...</Contents>

<Themes>...</Themes>

<WSDL xlink:href="..."/>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

The schema file for inspire\_vs:ExtendedCapabilities defined for OWS 1.1 based services is attached at the end of this document.

* + - * 1. Operations Metadata

Operations metadata are mapped to the <ows:OperationsMetadata> element. There are two mandatory operations in the Operations Metadata: “Get View Service Metadata” implemented with the GetCapabilities WMTS operation and “Get Map” implemented with the GetTile WMTS operation.

**Implementation Requirement 80** The third mandatory operation “Link View Service”, which allows a Public Authority or a Third Party to declare a view Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public Authority or the Third party location, shall be implemented through the “Discover Metadata” operation of the Discovery Service which allows for View service metadata to be retrieved.

GETCAPABILITIES OPERATION METADATA

**Implementation Requirement 81** The GetCapabilities operation metadata shall be mapped to the

<ows:Operation name="GetCapabilities"> element.

Example 32: GetCapabilities Operation Metadata

...

</ows:OperationsMetadata>

<ows:Operation name="GetCapabilities">

<ows:DCP>

<ows:HTTP>

<ows:Get [xlink:href="http://www.maps.bob/cgi](http://www.maps.bob/cgi-bin/MiraMon5_0.cgi)-[bin/MiraMon5\_0.cgi?">](http://www.maps.bob/cgi-bin/MiraMon5_0.cgi)

<ows:Constraint name="GetEncoding">

<ows:AllowedValues>

<ows:Value>KVP</ows:Value>

</ows:AllowedValues>

</ows:Constraint>

</ows:Get>

</ows:HTTP>

</ows:DCP>

</ows:Operation>

<ows:OperationsMetadata>

GETTILE OPERATION METADATA

**Implementation Requirement 82** The GetTile operation metadata shall be mapped to the

<ows:Operation name="GetTile"> element. Either PNG or GIF format (without LZW compression) shall be supported by the View service [**INS NS**, Annex III, Part B ].

Example 33: GetMap operation metadata

<ows:Operation name="GetTile">

<ows:DCP>

<ows:HTTP>

<ows:Get [xlink:href="http://www.maps.bob/cgi](http://www.maps.bob/cgi-)- bin/MiraMon5\_0.cgi?">

<ows:Constraint name="GetEncoding">

<ows:AllowedValues>

<ows:Value>KVP</ows:Value>

</ows:AllowedValues>

</ows:Constraint>

</ows:Get>

</ows:HTTP>

<ows:OperationsMetadata>

...

...

</ows:OperationsMetadata>

</ows:DCP>

</ows:Operation>

In the case of a WMTS service the output format is specific to a layer. The constraint on output format shall be enforced inside the WMTS GetCapabilities elements *Layer.*

LINK VIEW SERVICE OPERATION METADATA

**Implementation Requirement 83** The use of the “Discover Metadata” operation of the INSPIRE Discovery service is recommended for implementing the Link View Service operation.

* + - * 1. Languages

Example 34: Languages

<inspire\_vs:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>pol</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

…

</inspire\_vs:ExtendedCapabilities>

* + - * 1. Layers Metadata

These metadata are mapped with the <Layer> element of the <Contents> structure.

Example 35: Layers Metadata

<Layer>

...

</Layer>

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

**Implementation Requirement 84** The description of a layer shall use elements defined for the service capabilities in the [**OGC 07-057r7**] standard. This description shall specify the role of some parameters for the INSPIRE View Service as stated in the Regulation on INSPIRE Network Services [**INS NS**]:

Table 13: Mapping between INSPIRE layer metadata elements and OGC WMTS elements

|  |  |
| --- | --- |
| **Metadata elements** | **OGC WMTS standard elements of**  **<wmts:Layer>** |
| Resource Title | ows:Title |
| Resource Abstract | ows:Abstract |
| Keyword | ows:Keywords |
| Geographic Bounding Box | ows:WGS84BoundingBox |
| Unique Resource Identifier | ows:Identifier |
| Name | ows:Identifier |
| Coordinate Reference Systems | TileMatrixSetLink |
| Styles | Style |
| Legend URL | Style/LegendURL |
| Dimension Pairs | Dimension[@name,@units] |

RESOURCE TITLE

**Implementation Requirement 85** The Resource title of the layer, used for human communication, for exmple presentation of the layer in a menu. It is mapped with <ows:Title>. The harmonised title of a layer for an INSPIRE spatial data theme is defined by [**Directive 2007/2/EC**] and shall be subject to multilingualism (translations shall appear in each mono-lingual capabilities localized documents).

Example 36: Resource title

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

...

</Layer>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

<ows:Title>Transport networks : Road Area</ows:Title>

RESOURCE ABSTRACT

**Implementation Requirement 86** Layer abstract: text describing the layer. Subject to multilingualism. It shall be mapped with the <ows:Abstract> element.

Example 37: Resource abstract

...

</Layer>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

<ows:Abstract>As defined by TWG</ows:Abstract>

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.](http://www.opengis.net/wmts/1.0)0"

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<ows:Title>Transport networks : Road Area</ows:Title>

KEYWORDS

**Implementation Requirement 87** Additional Keywords: list of keywords describing the layer, to support catalog search (to be harmonised the INSPIRE metadata element Keyword Value, see [**INS DSTG,** Section 3.2.3] It shall be mapped to the <ows:Keywords> element.

Example 38: Keywords

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>As defined by TWG</ows:Abstract>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

...

</Layer>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

GEOGRAPHIC BOUNDING BOX

**Implementation Requirement 88** Geographic Bounding Box element is used to facilitate geographic searches. It shall be mapped to the <ows:WGS84BoundingBox> element. The minimum bounding rectangle in decimal degrees of the area covered by the Layer shall be supplied regardless of what CRS the tileMatrixSet may define and shall use WGS:84 as Coordinate Reference System.

Example 39: Geographic Bounding Box

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

…

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>As defined by TWG</ows:Abstract>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

<ows:WGS84BoundingBox>

<ows:LowerCorner>-180 -90</ows:LowerCorner>

<ows:UpperCorner>180 90</ows:UpperCorner>

</ows:WGS84BoundingBox>

...

</Layer>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

UNIQUE RESOURCE IDENTIFIER

[**OGC 07-057r7**] states that the Layer identifier SHALL be **unique** for each layer listed in the GetCapabilities response. Therefore, this identifier, which has previously been mapped to the Name metadata of the layer, can also be used as the unique resource identifier metadata of the layer.

Example 40: Unique resource identifier

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>As defined by TWG</ows:Abstract>

<ows:Identifier>

TN.RoadTransportNetwork.RoadArea

</ows:Identifier>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

<ows:WGS84BoundingBox>

<ows:LowerCorner>-180 -90</ows:LowerCorner>

<ows:UpperCorner>180 90</ows:UpperCorner>

</ows:WGS84BoundingBox>

<ows:Metadata

xlink:href="=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"/>

<TileMatrixSetLink>

<TileMatrixSet>InspireCRS84Quad</TileMatrixSet>

</TileMatrixSetLink>

<Style>

<ows:Title>Style for roads</ows:Title>

<ows:Identifier>inspire\_common:DEFAULT</ows:Identifier>

<LegendURL format="image/png" [xlink:href="http://www.maps.bob/etopo2/legend.png"](http://www.maps.bob/etopo2/legend.png) />

...

</Style>

...

</Layer>

<TileMatrixSet>

<ows:Identifier>InspireCRS84Quad</ows:Identifier>

<ows:SupportedCRS> <http://www.opengis.net/def/crs/OGC/1.3/CRS84>

</ows:SupportedCRS>

<TileMatrix>

...

</TileMatrix>

...

</TileMatrixSet>

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

Consequently, the resource unique identifier will be an INSPIRE harmonized name in the case of a WMTS Server.

NAME

It is mapped to the <ows:Identifier> element.

Example 41: Name

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</:Inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>As defined by TWG</ows:Abstract>

<ows:Identifier>

TN.RoadTransportNetwork.RoadArea

</ows:Identifier>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

<ows:WGS84BoundingBox>

<ows:LowerCorner>-180 -90</ows:LowerCorner>

<ows:UpperCorner>180 90</ows:UpperCorner>

</ows:WGS84BoundingBox>

<ows:Metadata

xlink:href="=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&el](http://www.isotc211.org/2005/gmd%26elementSet)ementSet Name=full"/>

...

</Layer>

...

</Contents>

<Themes>

...

</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

COORDINATE REFERENCE SYSTEMS

**Implementation Requirement 89** It is mandatory to use geographical coordinate system based on ETRS89 in continental Europe and ITRS outside continental Europe.

Each layer of a WMTS Server is linked to a unique *TileMatrixSet* which defines the tiles pyramid structure.

A *TileMatrixSet* is a collection of tile matrices defined at different scales for a unique CRS.

A *TileMatrix* is a collection of tiles for a fixed scale.

A *Tile* is a rectangular pictorial representation of geographic data, often part of a set of such elements, covering a spatially contiguous extent and sharing similar information content and graphical styling, which can be uniquely defined by a pair of indices for the column and row along with an identifier for the tile matrix.

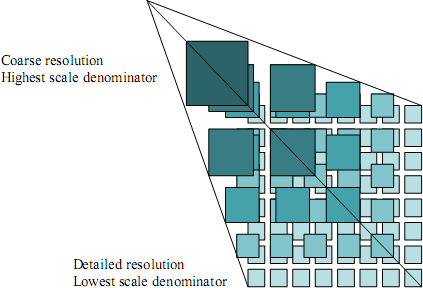


Figure 9: TILEMATRIXSET concept

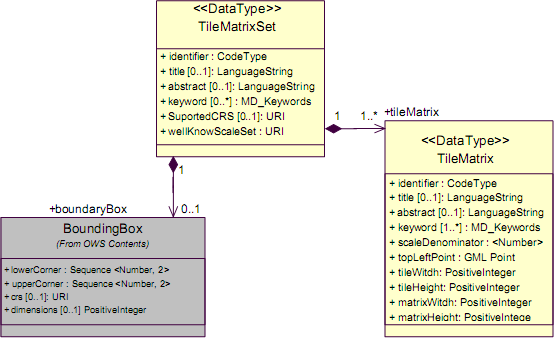


Figure 10: TILEMATRIXSET concept

As a result, the unique link between a layer and a *TileMatrixSet* implicitly defines the CRS for this layer.

Example 42: Link to TILEMATRIXSET on the spatial dataset

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)  ...  <ows:ServiceIdentification>  ...  </ows:ServiceIdentification>  <ows:ServiceProvider>  ...  </ows:ServiceProvider>  <ows:OperationsMetadata>  ...  <inspire\_vs:ExtendedCapabilities>  ...  </inspire\_vs:ExtendedCapabilities>  </ows:OperationsMetadata>  <Contents>  <Layer>  ...  <Title>Transport networks : Road Area</Title>  <ows:Abstract>As defined by TWG</ows:Abstract>  <ows:Identifier>  TN.RoadTransportNetwork.RoadArea  </ows:Identifier>  <ows:Keywords>  <ows:Keyword>GEMET keyword </ows:Keyword>  ...  </ows:Keywords>  <ows:WGS84BoundingBox>  <ows:LowerCorner>-180 -90</ows:LowerCorner>  <ows:UpperCorner>180 90</ows:UpperCorner>  </ows:WGS84BoundingBox>  <ows:Metadata  xlink:href="=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"/> |
| <TileMatrixSetLink>  <TileMatrixSet>InspireCRS84Quad</TileMatrixSet>  </TileMatrixSetLink> |
| ...  </Layer> |
| <TileMatrixSet>  <ows:Identifier>InspireCRS84Quad</ows:Identifier>  <ows:SupportedCRS> <http://www.opengis.net/def/crs/OGC/1.3/CRS84>  </ows:SupportedCRS>  <TileMatrix>  ...  </TileMatrix>  ...  </TileMatrixSet> |
| </Contents>  <Themes>  ...  </Themes>  <ServiceMetadataURL xlink:href="..."/>  </Capabilities> |

STYLES

**Implementation Requirement 90** Style shall be mapped to the <Style> element. The human- readable name shall be mapped to the <ows:Title> element and the Unique Identifier shall be mapped to the <ows:Identifier> element.

Example 43: Styles

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>...</ows:ServiceIdentification>

<ows:ServiceProvider>...</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>brief summary of the service</ows:Abstract>

<ows:Identifier> TN.RoadTransportNetwork.RoadArea

</ows:Identifier>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

<ows:WGS84BoundingBox>

<ows:LowerCorner>-180 -90</ows:LowerCorner>

<ows:UpperCorner>180 90</ows:UpperCorner>

</ows:WGS84BoundingBox>

<ows:Metadata xlink:href="="

[http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"/>

<TileMatrixSetLink>

<TileMatrixSet>InspireCRS84Quad</TileMatrixSet>

</TileMatrixSetLink>

<Style>

<ows:Title>Style for roads</ows:Title>

<ows:Identifier>inspire\_common:DEFAULT</ows:Identifier>

...

</Style>

...

</Layer>

<TileMatrixSet>

<ows:Identifier>InspireCRS84Quad</ows:Identifier>

<ows:SupportedCRS><http://www.opengis.net/def/crs/OGC/1.3/CRS84>

</ows:SupportedCRS>

<TileMatrix>...</TileMatrix>

...

</TileMatrixSet>

</Contents>

<Themes>...</Themes>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

LEGEND URL

**Implementation Requirement 91** As the capabilities document is a mono-lingual document, internationalized legend may be placed in different capabilities document for each value of the LANGUAGE parameter. It shall be mapped with the <ows:LegendURL> element.

Example 44: Legend URL

<?xml version="1.0" encoding="UTF-8"?>

<Capabilities [xmlns="http://www.opengis.net/wmts/1.0"](http://www.opengis.net/wmts/1.0)

...

<ows:ServiceIdentification>

...

</ows:ServiceIdentification>

<ows:ServiceProvider>

...

</ows:ServiceProvider>

<ows:OperationsMetadata>

...

<inspire\_vs:ExtendedCapabilities>

...

</inspire\_vs:ExtendedCapabilities>

</ows:OperationsMetadata>

<Contents>

<Layer>

...

<Title>Transport networks : Road Area</Title>

<ows:Abstract>As defined by TWG</ows:Abstract>

<ows:Identifier>

TN.RoadTransportNetwork.RoadArea

</ows:Identifier>

<ows:Keywords>

<ows:Keyword>GEMET keyword </ows:Keyword>

...

</ows:Keywords>

<ows:WGS84BoundingBox>

<ows:LowerCorner>-180 -90</ows:LowerCorner>

<ows:UpperCorner>180 90</ows:UpperCorner>

</ows:WGS84BoundingBox>

<ows:Metadata

xlink:href="=" [http://.../discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id=[ME](http://./discovery?Service=CSW&Request=GetRecordById&Version=2.0.2&id) [TADATA\_IDENTIFIER]&outputSchema=http://www.isotc211.org/2005/gmd&elementSet](http://www.isotc211.org/2005/gmd%26elementSet) Name=full"/>

<TileMatrixSetLink>

<TileMatrixSet>InspireCRS84Quad</TileMatrixSet>

</TileMatrixSetLink>

<Style>

<ows:Title>Style for roads</ows:Title>

<ows:Identifier>inspire\_common:DEFAULT</ows:Identifier>

<LegendURL format="image/png" [xlink:href="http://www.maps.bob/etopo2/legend.png"](http://www.maps.bob/etopo2/legend.png) />

...

</Style>

...

</Layer>

<TileMatrixSet>

<ows:Identifier>InspireCRS84Quad</ows:Identifier>

<ows:SupportedCRS> <http://www.opengis.net/def/crs/OGC/1.3/CRS84>

</ows:SupportedCRS>

<TileMatrix>

...

</TileMatrix>

...

</TileMatrixSet>

</Contents>

<Themes>

...

</Themes>

<WSDL xlink:href="..."/>

<ServiceMetadataURL xlink:href="..."/>

</Capabilities>

* + 1. **Get Map Operation**

INSPIRE Get Map operation is mapped with the GetTile operation of OGC WMTS.

* + - 1. **GetTile operation**

The GetTile operation allows WMTS clients to request a particular tile of a particular tile matrix set in a predefined format.

**Implementation Requirement 92** Table 15 shows INSPIRE parameters that shall be used within the WMTS GetTile operation according to the [**INS NS**]:

Table 14: INSPIRE and WMS parameters mapping

|  |  |
| --- | --- |
| **INSPIRE parameters** | **OGC 07-057r7 parameters** |
| Layers | LAYER |
| Styles | STYLE |
| Coordinate Reference System | TILEMATRIXSET |
| Bounding box | TILEMATRIX + TILEROW / TILECOL |
| Image width | TILEMATRIXSET |
| Image height | TILEMATRIXSET |
| Image format | FORMAT |
| Language | None. See LANGUAGE section |
| Dimension Pair | TIME, ELEVATION or other sample dimension(s). |

* + - * 1. GetTile request parameters

Table 15: GetTile core parameters

|  |  |  |
| --- | --- | --- |
| **Request parameter** | **Mandatory/ optional** | **Description** |
| VERSION=1.0.0 | M | Request version |
| REQUEST=GetTile | M | Request name |
| LAYER=name | M | Identifier that is defined in the ServiceMetadata document |
| STYLE=name | M | Identifier that is defined in the ServiceMetadata document. When the STYLES parameter is left blank in the GetTile request, the INSPIRE default styling applies in the GetMap response to all layers (inspire\_common:DEFAULT) |
| FORMAT=image/png | M | Value that is defined in theServiceMetadata document |
| TILEMATRIXSET=  InspireCRS84Quad | M | Identifier that is defined in theServiceMetadata document |
| TILEMATRIXSET=integer | M | Value that is defined in theServiceMetadata document |
| TILEROW=integer | M | value between 0 and MatrixHeight-1 of this tile matrix defined in the ServiceMetadata document |
| TILEROW=integer | M | value between 0 and MatrixWidth-1 of this tile matrix defined in the ServiceMetadata document |
| Other sample dimension(s) | O | Value allowed for this dimension  A single value from a list or a range defined in the ServiceMetadata document. |

* + 1. **Link View Service operation**

This operation will be implemented using the Discover Metadata operation of a Discovery Service.

* + 1. **Language Requirements**
       1. **GetCapabilities**

[**OGC 06-121r3**] OWS specification suggests to use the **xml:lang** to define the content language of an XML element in a Capabilities document.

<ServiceIdentification>

<Title xml:lang="en">Acme Corp. Map Server</Title>

<Title xml:lang="fr">Serveur de Carte par Acme Corp.</Title>

Using this simple method for the following elements is possible and will lead to a multilingual ServiceMetadata document in any case :

* Titles
* Abstracts
* Descriptions

WMTS follows INSPIRE language requirements as shown in INSPIRE Profile of ISO 19128

* + - 1. **Exceptions**

[**OGC 06-121r3**] OWS specification suggests to use the **xml:lang** to define the content language of an ExceptionReport element.

<ExceptionReport [xmlns="http://www.opengis.net/ows/1.1"](http://www.opengis.net/ows/1.1) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" [xsi:schemaLocation="http://www.opengis.net/ows/1.1](http://www.opengis.net/ows/1.1)

owsExceptionReport.xsd" version="1.0.0" xml:lang="en">

* + 1. **Interoperability: TileMatrixSet**

**Implementation Recommendation 21** Every layer offered by a INSPIRE WMTS should use the

InspireCRS84Quad MatrixSet

This document specifies a *TileMatrixSet :* InspireCRS84Quad.

The main reason for recommending a common *TileMatrixSet* for every INSPIRE WMTS is to ensure that every INSPIRE WMTS layer will be available with the same resolutions pyramid (and with the same CRS). The interoperability between different INSPIRE will consequently be eased.

The [**OGC 07-057r7**] specification offers four *Well Known Scale Sets* :

* Two of these scale sets are “irregular” global CRS84 scales sets designed, for cartographic purposes.
* The third one is defined to allow quad-tree pyramids in CRS84. In addition, this pyramid offers the same Scale Denominator than the ones used by Google.
* The last scale set is the usual Google scale set in Pseudo-Mercator (EPSG:3857).

The *TileMatrixSet* described here is based on the third *Well Known Scale Sets* of [**OGC 07-057r7**] (GoogleCRS84Quad). The difference between InspireCRS84Quad scale set and GoogleCRS84Quad is also explained.

* + - 1. **InspireCRS84Quad**

Table 16: InspireCRS84Quad – Pixel size for each level

|  |  |
| --- | --- |
| **Level** | **Pixel Size (degrees)** |
| 0 | 0,703125000000000000 |
| 1 | 0,351562500000000000 |
| 2 | 0,175781250000000000 |
| 3 | 0,087890625000000000 |
| 4 | 0,043945312500000000 |
| 5 | 0,021972656250000000 |
| 6 | 0,010986328125000000 |
| 7 | 0,005493164062500000 |
| 8 | 0,002746582031250000 |
| 9 | 0,001373291015625000 |
| 10 | 0,000686645507812500 |
| 11 | 0,000343322753906250 |
| 12 | 0,000171661376953125 |
| 13 | 0,000085830688476563 |
| 14 | 0,000042915344238281 |
| 15 | 0,000021457672119141 |
| 16 | 0,000010728836059570 |
| 17 | 0,000005364418029785 |

**CRS:** <http://www.opengis.net/def/crs/OGC/1.3/CRS84>

**TILING ORIGIN:** (-180, 90)

**EXTENT:** (-180,180); (-90,90)

**PIXEL SIZE FORMULA:**

𝟐 𝟖+𝒊

𝟏𝟖𝟎

**TILE HEIGHT:** 256 pixels

**TILE WIDTH:** 256 pixels

**DIFFERENCE BETWEEN GoogleCRS84Quad AND InspireCRS84Quad**

Level 0 of InspireCRS84Quad is similar to level 1 of GoogleCRS84Quad with a change in the origin of the tiles. Level 1 of GoogleCRS84Quad allows representing the whole world in a four 256x256 pixels tiles where the first 128 lines of the top tiles and last 128 lines of the bottom tiles are left blank.

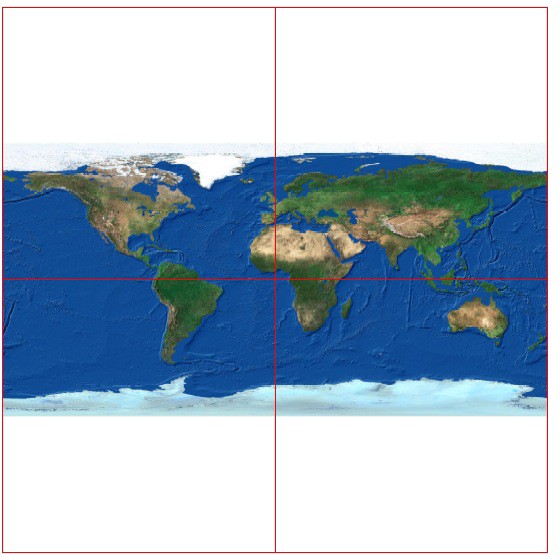


Figure 11: Level 1 GoogleCRS84Quad, Four 256x256 pixels tiles

To avoid this situation the level 0 of InspireCRS84Quad is composed of two tiles representing exactly the whole world.

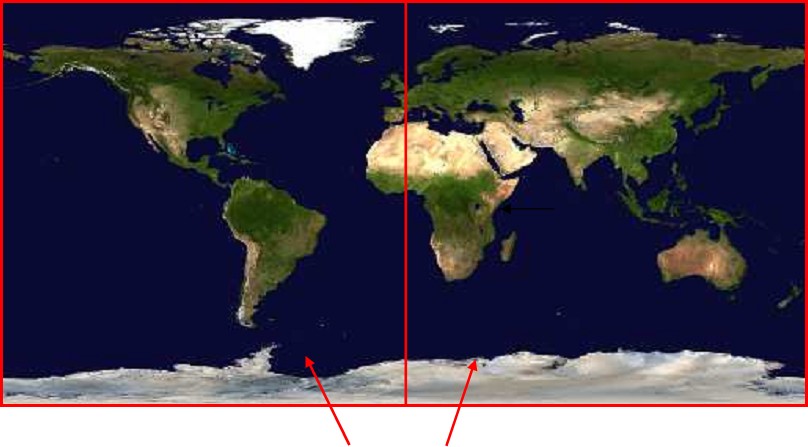


Figure 12: Level 0 InspireCRS84Quad. Two 256x256 pixels tiles.

* + - 1. **Schema definition for extended capabilities for OWS 1.1 (inspire\_vs\_ows\_11.xsd)**

<?xml version="1.0" encoding="UTF-8"?>

<schema [xmlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs\_ows11/1.0"](http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0) [xmlns:inspire\_com="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [xmlns:ows="http://www.opengis.net/ows/1.1"](http://www.opengis.net/ows/1.1) [xmlns="http://www.w3.org/2001/XMLSchema"](http://www.w3.org/2001/XMLSchema) [xmlns:xlink="http://www.w3.or](http://www.w3.org/1999/xlink)g/1999/xlink" [targetNamespace="http://inspire.ec.europa.eu/schemas/inspire\_vs\_ows11/1.0"](http://inspire.ec.europa.eu/schemas/inspire_vs_ows11/1.0) elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.0.0">

<import [namespace="http://www.opengis.net/ows/1.1"](http://www.opengis.net/ows/1.1) [schemaLocation="http://schemas.opengis.net/ows/1.1.0/owsAll.xsd"/>](http://schemas.opengis.net/ows/1.1.0/owsAll.xsd)

<import [namespace="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) schemaLocation="../../common/1.0/common.xsd"/>

<element name="ExtendedCapabilities" type="inspire\_com:ExtendedCapabilitiesType" substitutionGroup="ows:ExtendedCapabilities"/>

</schema>

1. **Quality of Services**

Since quality of service (QoS) depends on the specific testing procedure for a given service, this section describes and normalizes the testing procedure that is to be applied for the assessment of QoS for a given INSPIRE view service.

The monitoring parameter NSi4 in the Commission decision for monitoring and reporting measures the conformity of all network services with the implementing rules. The conformity of a network

service requires the compliance with the Quality of Service as defined in Annex I of the NS regulation (in particular NSi4.1 and NSi4.2 for the current monitoring period).

* 1. ***General requirements***

Two options exist for the measurements of Quality of Services:

1. Quality of Services requirements are measured at the service side exposed to the Internet.
2. Quality of Services requirements are measured from a central network node within the infrastructure.

NOTE 1: If a member state uses a central network node in the testing infrastructure (option 2), it shall take into account the network transport time, such that:

Performance = Response time from network node to central node - network transport time

The network transport time is denoted X. In this case, a member state should initiate a comparison between sample measures from the central node to sample measures at the service side, to find a realistic value of X for the specific national setting.

NOTE 2: Option 2 was included for practical reasons. Based on the evaluation of experiences the IOC TF will revisit this option.

* 1. ***Performance***
     1. **Implementation requirements mandated by the Implementing Rule**

*“For a 470 Kilobytes image (e.g. 800x600 pixels with a colour depth of 8 bits), the response time for sending the initial response to a Get Map Request to a view service shall be maximum 5 seconds in normal situation.*

*[…]*

*Normal situation represents periods out of peak load. It is set at 90% of the time.”*

* + 1. **Normalized testing procedure**

Performance shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime.

Structure of the sample reference request:

- The reference request shall request images of 800x600 pixels with a colour depth of 8 bits according to the image formats mandated by the regulation.

- The reference request shall request only 1 layer at a time.

The structure of the sample reference request is recommended to:

- Be based on varying BBOX parameters.

Evaluation and assessment criteria:

* The response of the service shall be valid according to the source data of the service and to the parameters in the capabilities for the requested area, i.e. min-max scale.
* A blank image is not valid if data is present for the given request parameters (BBOX, scale, etc.)
* The initial response time of 5 seconds refer to first byte returned by the service to the internet.
* A minimum of 90% of the initial services responses have to comply with the mandated 5 seconds response time, thus, a normal situation is identified by the 90% best performing sample reference requests.

NOTE It is assumed that the request is completely processed by the service before the first byte is delivered. At the server side the network transport time is negligible compared to the request processing time. Therefore, it is seen as equal to measure the last byte returned

* 1. ***Capacity***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The minimum number of served simultaneous service requests to a view service according to the performance quality of service shall be 20 per second.”*

* + 1. **Normalized testing procedure**

Capacity shall be measured consistently based on sample reference request packages to a given service. The amount of request per package shall be 20 per second and shall be issued every second during a measurement timeframe of 1 min. A measurement shall take place at least once before launching the service in a production environment and monitored at regular intervals thereof to ensure that the compliance with the capacity requirement is still ensured.

NOTE: The result of capacity measurements in a production system may be ambiguous due to the amount of user load that the service processes at the same time and therefore it is recommended capacity tests to be processed during maintenance time frames only.

The frequency of the capacity tests is recommended to be monthly, e.g., during systems maintenance.

Structure of the sample reference request packages:

- For a Get Map request, the reference request shall request images of 800x600 pixels with a colour depth of 8 bits according to the image formats mandated by the regulation.

The structure of the sample reference request packages is recommended to:

- Be composed of composed of 10% Get View Service Metadata requests and 90% Get Map requests.

The measured capacity shall fulfil the requirements of the regulation (both capacity and performance) for all operations that are provided by the service.

* 1. ***Availability***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The probability of a Network Service to be available shall be 99% of the time.”*

* + 1. **Normalized testing procedure**

Availability shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime.

The sample request issued to the service to measure performance can be used to measure availability as well, thus also fulfilling the same evaluation and assessment criteria.

The availability shall be based on a time frame of one year meaning a maximum unplanned downtime of 3.63 days per year. Periods of planned downtime e.g. because of system maintenance, shall not be included in the measure. Downtime is considered planned when notified to the community well in advance (minimum 1 week), e.g. via notifications to registered users or on portals.

NOTE: It is assumed that the availability is calculated in the following way:

100% ↔ 365 x 24 - (planned downtime),

99% ↔ [365 x 24 - (planned downtime)] \* 0.99, etc.

Planned downtime is recommended to be less than 10 hours per month (i.e. less than 120 hours per year).

The following table shows the maximum downtime according to the implementing rules:

**Table 17: Downtime per week, month, year**

|  |  |  |  |
| --- | --- | --- | --- |
| %Uptime | Max. Downtime/week | Max. Downtime/month | Max. Downtime/year |
| 98% | 3.4 hours | 14.55 hours | 7.27 days |
| 98.6% | 2.4 hours | 10.19 hours | 5.09 days |
| 99% | 1.7 hours | 7.27 hours | 3.63 days |
| 99.5% | 0.8 hours | 3.64 hours | 1.82 days |
| 99.9% | 10 minutes | 0.73 hours | 8.73 hours |
| 99.99% | 1 minute | 4 minutes | 52 minutes |
| 99.999% | 6 seconds | 26 seconds | 5 minutes |

**Annex A INSPIRE Profile of Tiling WMS**

*This annex is to be considered for future work.*

*Note: Operating a WMS can be demanding for a Member State infrastructure particularly when Member State’s datasets are large and the INSPIRE performance requirements have to be met. In order to overcome the performance issues associated with view services, as an alternative a tiling service may be used. Since OGC has already published a tiling service standard called WMTS (Web Map Tile Service) WMTS 1.0 shall be a primary choice for tiling. For those who still operate a previous version of WMS (1.1.1) a lightweight profile of WMS may be used to lower the initial effort to bring datasets to the network.*

***WMS-C profile for WMS 1.1.1***

*As a result of FOSS4G 2007 and based on OGC's WMS 1.1.1, it is possible to use a Tile caching service as defined in* [*http://wiki.osgeo.org/wiki/Tile\_Map\_Service\_Specification*](http://wiki.osgeo.org/wiki/Tile_Map_Service_Specification) *or a Cache WMS as defined in* [*http://wiki.osgeo.org/wiki/WMS\_Tiling\_Client\_Recommendation.*](http://wiki.osgeo.org/wiki/WMS_Tiling_Client_Recommendation)

*The main differences with the ISO 19128:2005(E) are in the GetCapabilities and GetMap operations :*

1. *The GetMap operation supports a new parameter called TILED whose value is always TRUE ;*
2. *The CRS parameter of GetMap operation is now named SRS, but values for the INSPIRE view service are still relevant. It is worth noting that WMS 1.1.1 allows only EPSG and AUTO namespaces ;*

**Implementation Recommendation 22** It is recommended to use ETRS89 ellipsoidal coordinate reference system when using a tile cache map service : "EPSG:4258".

*The most important point bound to the SRS is the tiling scheme definition (pyramid resolutions and tiles width and height).*

**Implementation Recommendation 23** *It is recommended to InspireCRS84Quad as he tiling scheme definition*

Example 45: INSPIRE Profile for Tiling WMS

<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE WMT\_MS\_Capabilities SYSTEM ["http://schemas.opengeospatial.net/wms/1.1.1/WMS\_MS\_Capabilities.dtd"](http://schemas.opengeospatial.net/wms/1.1.1/WMS_MS_Capabilities.dtd) [

<!ELEMENT VendorSpecificCapabilities (inspire\_vs:ExtendedCapabilities, TileSet\*)>

<!-- Scenario 1: Mandatory MetadataUrl element pointing to an INSPIRE Compliant ISO metadata document plus language parameters -->

<!-- Scenario 2: Mandatory (where appropriate) metadata elements not mapped to standard capabilities, plus mandatory language parameters, plus OPTIONAL MetadataUrl pointing to an INSPIRE Compliant ISO metadata document -->

<!ELEMENT inspire\_vs:ExtendedCapabilities ((

inspire\_common:MetadataUrl,

inspire\_common:SupportedLanguages,

inspire\_common:ResponseLanguage

) | (

inspire\_common:ResourceLocator+,

inspire\_common:ResourceType,

inspire\_common:TemporalReference+,

inspire\_common:Conformity+,

inspire\_common:MetadataPointOfContact+,

inspire\_common:MetadataDate,

inspire\_common:SpatialDataServiceType,

inspire\_common:MandatoryKeyword+,

inspire\_common:Keyword\*,

inspire\_common:SupportedLanguages,

inspire\_common:ResponseLanguage,

))>

inspire\_common:MetadataUrl?

<!ATTLIST inspire\_vs:ExtendedCapabilities xmlns:inspire\_vs CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0'>](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0%27)

<!ELEMENT inspire\_common:MetadataUrl (inspire\_common:URL, inspire\_common:MediaType\*)>

<!ATTLIST inspire\_common:MetadataUrl xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'](http://inspire.ec.europa.eu/schemas/common/1.0%27)

xmlns:xsi CDATA #FIXED ['http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-)- instance'

xsi:type CDATA #FIXED 'inspire\_common:resourceLocatorType'>

<!ELEMENT inspire\_common:URL (#PCDATA)>

<!ATTLIST inspire\_common:URL xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:MediaType content: text/plain

text/html text/xml application/xml application/json application/pdf

application/rdf+xml application/json application/soap+xml

application/vnd.eu.europa.ec.inspire.resource+xml application/vnd.google-earth.kml+xml application/vnd.google-earth.kml application/vnd.google-earth.kmx application/vnd.msword

application/vnd.ms-excel application/vnd.ms-powerpoint application/vnd.oasis.opendocument.text

application/vnd.oasis.opendocument.spreadsheet application/vnd.oasis.opendocument.presentation application/vnd.oasis.opendocument.graphics application/gml+xml

application/vnd.ogc.wms\_xml application/vnd.ogc.csw\_xml application/vnd.ogc.csw.capabilities.response\_xml application/vnd.ogc.csw.GetRecordByIdResponse\_xml application/vnd.ogc.csw.GetRecordsResponse\_xml application/vnd.ogc.wfs\_xml application/vnd.ogc.se\_xml application/vnd.iso.19139+xml

-->

<!ELEMENT inspire\_common:MediaType (#PCDATA)>

<!ATTLIST inspire\_common:MediaType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:SupportedLanguages (inspire\_common:DefaultLanguage, inspire\_common:SupportedLanguage\*)>

<!ATTLIST inspire\_common:SupportedLanguages xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:DefaultLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:DefaultLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:SupportedLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:SupportedLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:ResponseLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:ResponseLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:Language:

bul cze dan dut eng est fin fre ger gre hun gle ita lav lit mlt pol por rum slo slv spa swe

-->

<!ELEMENT inspire\_common:Language (#PCDATA)>

<!ATTLIST inspire\_common:Language xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:ResourceLocator (inspire\_common:URL, inspire\_common:MediaType\*)>

<!ATTLIST inspire\_common:ResourceLocator xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:ResourceType content: service

-->

<!ELEMENT inspire\_common:ResourceType (#PCDATA)>

<!ATTLIST inspire\_common:ResourceType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:TemporalReference (inspire\_common:DateOfCreation?, inspire\_common:DateOfLastRevision?, inspire\_common:DateOfPublication\*, inspire\_common:TemporalExtent\*)>

<!ATTLIST inspire\_common:TemporalReference xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfCreation (#PCDATA)>

<!ATTLIST inspire\_common:DateOfCreation xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfLastRevision (#PCDATA)>

<!ATTLIST inspire\_common:DateOfLastRevision xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfPublication (#PCDATA)>

<!ATTLIST inspire\_common:DateOfPublication xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:TemporalExtent (inspire\_common:IndividualDate | inspire\_common:IntervalOfDates)>

<!ATTLIST inspire\_common:TemporalExtent xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:IndividualDate (#PCDATA)>

<!ATTLIST inspire\_common:IndividualDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:IntervalOfDates (inspire\_common:StartingDate, inspire\_common:EndDate)>

<!ATTLIST inspire\_common:IntervalOfDates xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:StartingDate (#PCDATA)>

<!ATTLIST inspire\_common:StartingDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:EndDate (#PCDATA)>

<!ATTLIST inspire\_common:EndDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Conformity (inspire\_common:Specification, inspire\_common:Degree)>

<!ATTLIST inspire\_common:Conformity xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Specification (inspire\_common:Title,

(

inspire\_common:DateOfPublication

|

inspire\_common:DateOfCreation

|

inspire\_common:DateOfLastRevision

),

inspire\_common:URI\*, inspire\_common:ResourceLocator\*)>

<!ATTLIST inspire\_common:Specification xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Title (#PCDATA)>

<!ATTLIST inspire\_common:Title xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:URI (#PCDATA)>

<!ATTLIST inspire\_common:URI xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:Degree content:

conformant notConformant notEvaluated

-->

<!ELEMENT inspire\_common:Degree (#PCDATA)>

<!ATTLIST inspire\_common:Degree xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:MetadataPointOfContact (inspire\_common:OrganisationName, inspire\_common:EmailAddress)>

<!ATTLIST inspire\_common:MetadataPointOfContact xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:OrganisationName (#PCDATA)>

<!ATTLIST inspire\_common:OrganisationName xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:EmailAddress (#PCDATA)>

<!ATTLIST inspire\_common:EmailAddress xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:MetadataDate (#PCDATA)>

<!ATTLIST inspire\_common:MetadataDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:SpatialDataServiceType content: discovery

view download

transformation invoke

other

-->

<!ELEMENT inspire\_common:SpatialDataServiceType (#PCDATA)>

<!ATTLIST inspire\_common:SpatialDataServiceType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:MandatoryKeyword (inspire\_common:KeywordValue)>

<!ATTLIST inspire\_common:MandatoryKeyword xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:KeywordValue content for inspire\_common:MandatoryKeywords: chainDefinitionService

comEncodingService comGeographicCompressionService comGeographicFormatConversionService comMessagingService

comRemoteFileAndExecutableManagement comService

comTransferService humanCatalogueViewer humanChainDefinitionEditor humanFeatureGeneralizationEditor humanGeographicDataStructureViewer humanGeographicFeatureEditor humanGeographicSpreadsheetViewer humanGeographicSymbolEditor humanGeographicViewer humanInteractionService humanServiceEditor humanWorkflowEnactmentManager infoCatalogueService infoCoverageAccessService infoFeatureAccessService infoFeatureTypeService infoGazetteerService infoManagementService infoMapAccessService infoOrderHandlingService infoProductAccessService infoRegistryService infoSensorDescriptionService infoStandingOrderService metadataGeographicAnnotationService metadataProcessingService metadataStatisticalCalculationService spatialCoordinateConversionService spatialCoordinateTransformationService spatialCoverageVectorConversionService spatialDimensionMeasurementService spatialFeatureGeneralizationService spatialFeatureManipulationService spatialFeatureMatchingService

spatialImageCoordinateConversionService spatialImageGeometryModelConversionService spatialOrthorectificationService spatialPositioningService spatialProcessingService spatialProximityAnalysisService spatialRectificationService spatialRouteDeterminationService spatialSamplingService spatialSensorGeometryModelAdjustmentService spatialSubsettingService spatialTilingChangeService subscriptionService

taskManagementService temporalProcessingService temporalProximityAnalysisService temporalReferenceSystemTransformationService temporalSamplingService temporalSubsettingService thematicChangeDetectionService thematicClassificationService thematicFeatureGeneralizationService thematicGeocodingService thematicGeographicInformationExtractionService thematicGeoparsingService

thematicGoparameterCalculationService thematicImageManipulationService thematicImageProcessingService thematicImageSynthesisService thematicImageUnderstandingService thematicMultibandImageManipulationService thematicObjectDetectionService thematicProcessingService thematicReducedResolutionGenerationService thematicSpatialCountingService thematicSubsettingService workflowEnactmentService

-->

<!ELEMENT inspire\_common:KeywordValue (#PCDATA)>

<!ATTLIST inspire\_common:KeywordValue xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Keyword (inspire\_common:OriginatingControlledVocabulary?, inspire\_common:KeywordValue)>

<!ATTLIST inspire\_common:Keyword xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'](http://inspire.ec.europa.eu/schemas/common/1.0%27)

xmlns:xsi CDATA #FIXED ['http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-)- instance'

xsi:type (

<!--

inspire\_common:inspireTheme\_bul| inspire\_common:inspireTheme\_cze| inspire\_common:inspireTheme\_dan| inspire\_common:inspireTheme\_dut| inspire\_common:inspireTheme\_eng| inspire\_common:inspireTheme\_est| inspire\_common:inspireTheme\_fin| inspire\_common:inspireTheme\_fre| inspire\_common:inspireTheme\_ger| inspire\_common:inspireTheme\_gre| inspire\_common:inspireTheme\_hun| inspire\_common:inspireTheme\_gle| inspire\_common:inspireTheme\_ita| inspire\_common:inspireTheme\_lav| inspire\_common:inspireTheme\_lit| inspire\_common:inspireTheme\_mlt| inspire\_common:inspireTheme\_pol| inspire\_common:inspireTheme\_por| inspire\_common:inspireTheme\_rum| inspire\_common:inspireTheme\_slo| inspire\_common:inspireTheme\_slv| inspire\_common:inspireTheme\_spa| inspire\_common:inspireTheme\_swe

) #IMPLIED>

inspire\_common:Title content's : GEMET - INSPIRE themes => inspire\_common:DateOfPublication content's : 2008-06-01

-->

<!ELEMENT inspire\_common:OriginatingControlledVocabulary (inspire\_common:Title,

(

inspire\_common:DateOfPublication

|

inspire\_common:DateOfCreation

|

inspire\_common:DateOfLastRevision

),

inspire\_common:URI\*,

inspire\_common:ResourceLocator\*)>

<!ATTLIST inspire\_common:OriginatingControlledVocabulary xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT TileSet (SRS, BoundingBox?, Resolutions, Width, Height, Format, Layers\*, Styles\*) >

<!ELEMENT Resolutions (#PCDATA) >

<!ELEMENT Width (#PCDATA) >

<!ELEMENT Height (#PCDATA) >

<!ELEMENT Layers (#PCDATA) >

<!ELEMENT Styles (#PCDATA) >

]>

<WMT\_MS\_Capabilities version="1.1.1">

<Service>

<Name>WMS</Name>

<Title>INSPIRE View Service ...</Title>

<Abstract>Service for making available INSPIRE themes</Abstract>

<KeywordList>

<Keyword>view</Keyword>

<Keyword>tiled</Keyword>

<Keyword>infoMapAccessService</Keyword><!-- ISO -->

<Keyword>keyword</Keyword><!-- for themes exposed -->

</KeywordList>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlin](http://www.w3.org/1999/xlink)k" xlink:type="simple" xlink:href="serviceURL"/>

<ContactInformation>

[<ContactElectronicMailAddress>contactPoint@organisation.country</ContactEle](mailto:contactPoint@organisation.country) ctronicMailAddress>

</ContactInformation>

<Fees>none|no conditions apply|...</Fees>

<AccessConstraints>none|need a key/token

...|...</AccessConstraints>

</Service>

<Capability>

<Request>

<GetCapabilities>

<Format>text/xml</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="URL"

/>

</Get>

</HTTP>

</DCPType>

</GetCapabilities>

<GetMap>

<Format>image/png</Format>

<Format>image/gif</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="URL"

/>

</Get>

</HTTP>

</DCPType>

</GetMap>

</Request>

<Exception>

<Format>application/vnd.ogc.se\_xml</Format>

</Exception>

<VendorSpecificCapabilities>

<inspire\_vs:ExtendedCapabilities x[mlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0">](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0)

<!-- SC1: link INSPIRE metadata for this NS -->

<inspire\_common:MetadataUrl [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" xsi:type="inspire\_common:resourceLocatorType">

<inspire\_common:URL xmlns:inspire\_comm[on="http://inspire.ec.europa.eu/schemas/common/1.0">disco](http://inspire.ec.europa.eu/schemas/common/1.0) veryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;Version=2.0.2&amp; [id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc211.org/2005/gmd&am](http://www.isotc211.org/2005/gmd%26am) p;elementSetName=full</inspire\_common:URL>

<inspire\_common:MediaType [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">appli](http://inspire.ec.europa.eu/schemas/common/1.0) cation/vnd.ogc.csw.GetRecordByIdResponse\_xml</inspire\_common:MediaType>

</inspire\_common:MetadataUrl>

<inspire\_common:SupportedLanguages [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">](http://inspire.ec.europa.eu/schemas/common/1.0)

<inspire\_common:DefaultLanguage>

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/schem](http://inspire.ec.europa.eu/schemas/common/1.0)as/common/1.0">fre</ inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/sch](http://inspire.ec.europa.eu/schemas/common/1.0)emas/common/1.0">eng</ inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage [xmlns:inspire\_common="http://inspire.ec.europa.eu/s](http://inspire.ec.europa.eu/schemas/common/1.0)chemas/common/1.0">

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">eng</](http://inspire.ec.europa.eu/schemas/common/1.0) inspire\_common:Language>

</inspire\_common:ResponseLanguage>

</inspire\_vs:ExtendedCapabilities>

<TileSet>

<SRS>EPSG:4258</SRS>

<BoundingBox SRS="EPSG:4258" minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX" />

<Resolutions>x 2x 4x ...</Resolutions><!--TODO: fix resolutions in INSPIRE impl.-->

<Width>256</Width>

<Height>256</Height>

<Format>image/png|image/gif</Format>

<Layers>HARMONIZED.NAME ...</Layers>

</TileSet>

</VendorSpecificCapabilities>

<Layer>

<Title>Layers of Web Map Service Cached for MS</Title>

<Layer>

<Name>HARMONIZED.NAME</Name>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<SRS>EPSG:4258</SRS><!-- in WMS 1.1.1 + aliases -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<!-- if needed :

<Dimension name="time" units="ISO8601" defaults="2009-06- 16">2005-01-01/2012-01-01/PID</Dimension>

-->

<MetadataURL type="TC211"><!-- in WMS 1.1.1 -->

<!-- INSPIRE: the URL + ID is then processed to issue a

discovery query -->

<Format>text/xml</Format>

<OnlineResource

[xmlns:xlink="http://www.w3.org/19](http://www.w3.org/1999/xlink)99/xlink" xlink:type="simple" xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"/>

</MetadataURL>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</LegendURL>

</Style>

</Layer>

<!-- Compound layer : -->

<Layer>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<SRS>EPSG:4258</SRS><!-- in WMS 1.1.1 + aliases -->

<!-- WMS 1.1.1 : extent of aggregation -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<!-- if needed :

<Dimension name="time" units="ISO8601" defaults="2009-06- 16">2005-01-01/2012-01-01/PID</Dimension>

-->

<MetadataURL type="TC211"><!-- in WMS 1.1.1 -->

<!-- INSPIRE: the URL + ID is then processed to issue a

discovery query -->

<Format>text/xml</Format>

<OnlineResource

[xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V

ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"/>

</MetadataURL>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</LegendURL>

</Style>

<!-- aggregation of : 1..\*-->

<Layer>

<Name>HARMONIZED.NAME</Name><!--several sub-layers may have the same name nothing prevents that in the standard so far-->

<Title>Data specification theme title</Title>

<!-- WMS 1.1.1 : its extent -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<MetadataURL type="TC211"><!-- in WMS 1.1.1 -->

<!-- INSPIRE: the URL + ID is then processed to issue a discovery query -->

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"/>

</MetadataURL>

<!--FIXME: ScaleHint to help-->

</Layer>

</Layer>

</Layer>

</Capability>

</WMT\_MS\_Capabilities>

**Annex B Capabilities extension for other profiles**

**WMS 1.1.1 Profile**

Example 46: WMS 1.1.1 Profile

<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE WMT\_MS\_Capabilities SYSTEM ["http://schemas.opengeospatial.net/wms/1.1.1/WMS\_MS\_Capabilities.dtd"](http://schemas.opengeospatial.net/wms/1.1.1/WMS_MS_Capabilities.dtd) [

<!ELEMENT VendorSpecificCapabilities (inspire\_vs:ExtendedCapabilities)>

<!-- Scenario 1: Mandatory MetadataUrl element pointing to an INSPIRE Compliant ISO metadata document plus language parameters -->

<!-- Scenario 2: Mandatory (where appropriate) metadata elements not mapped to standard capabilities, plus mandatory language parameters, plus OPTIONAL MetadataUrl pointing to an INSPIRE Compliant ISO metadata document -->

<!ELEMENT inspire\_vs:ExtendedCapabilities ((

inspire\_common:MetadataUrl,

inspire\_common:SupportedLanguages,

inspire\_common:ResponseLanguage

) | (

inspire\_common:ResourceLocator+,

inspire\_common:ResourceType,

inspire\_common:TemporalReference+,

inspire\_common:Conformity+,

inspire\_common:MetadataPointOfContact+,

inspire\_common:MetadataDate,

inspire\_common:SpatialDataServiceType,

inspire\_common:MandatoryKeyword+,

inspire\_common:Keyword\*,

inspire\_common:SupportedLanguages,

inspire\_common:ResponseLanguage,

))>

inspire\_common:MetadataUrl?

<!ATTLIST inspire\_vs:ExtendedCapabilities xmlns:inspire\_vs CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0'>](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0%27)

<!ELEMENT inspire\_common:MetadataUrl (inspire\_common:URL, inspire\_common:MediaType\*)>

<!ATTLIST inspire\_common:MetadataUrl xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'](http://inspire.ec.europa.eu/schemas/common/1.0%27)

xmlns:xsi CDATA #FIXED ['http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-)- instance'

xsi:type CDATA #FIXED 'inspire\_common:resourceLocatorType'>

<!ELEMENT inspire\_common:URL (#PCDATA)>

<!ATTLIST inspire\_common:URL xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:MediaType content: text/plain

text/html text/xml application/xml

application/json application/pdf application/rdf+xml application/json application/soap+xml

application/vnd.eu.europa.ec.inspire.resource+xml application/vnd.google-earth.kml+xml application/vnd.google-earth.kml application/vnd.google-earth.kmx application/vnd.msword

application/vnd.ms-excel application/vnd.ms-powerpoint application/vnd.oasis.opendocument.text

application/vnd.oasis.opendocument.spreadsheet application/vnd.oasis.opendocument.presentation application/vnd.oasis.opendocument.graphics application/gml+xml

application/vnd.ogc.wms\_xml application/vnd.ogc.csw\_xml application/vnd.ogc.csw.capabilities.response\_xml application/vnd.ogc.csw.GetRecordByIdResponse\_xml application/vnd.ogc.csw.GetRecordsResponse\_xml application/vnd.ogc.wfs\_xml application/vnd.ogc.se\_xml application/vnd.iso.19139+xml

-->

<!ELEMENT inspire\_common:MediaType (#PCDATA)>

<!ATTLIST inspire\_common:MediaType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:SupportedLanguages (inspire\_common:DefaultLanguage, inspire\_common:SupportedLanguage\*)>

<!ATTLIST inspire\_common:SupportedLanguages xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:DefaultLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:DefaultLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:SupportedLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:SupportedLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:ResponseLanguage (inspire\_common:Language)>

<!ATTLIST inspire\_common:ResponseLanguage xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:Language: bul

cze dan dut eng est fin fre ger gre hun gle ita

lav lit mlt pol por rum slo slv spa swe

-->

<!ELEMENT inspire\_common:Language (#PCDATA)>

<!ATTLIST inspire\_common:Language xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:ResourceLocator (inspire\_common:URL, inspire\_common:MediaType\*)>

<!ATTLIST inspire\_common:ResourceLocator xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:ResourceType content:

service

-->

<!ELEMENT inspire\_common:ResourceType (#PCDATA)>

<!ATTLIST inspire\_common:ResourceType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:TemporalReference (inspire\_common:DateOfCreation?, inspire\_common:DateOfLastRevision?, inspire\_common:DateOfPublication\*, inspire\_common:TemporalExtent\*)>

<!ATTLIST inspire\_common:TemporalReference xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfCreation (#PCDATA)>

<!ATTLIST inspire\_common:DateOfCreation xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfLastRevision (#PCDATA)>

<!ATTLIST inspire\_common:DateOfLastRevision xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:DateOfPublication (#PCDATA)>

<!ATTLIST inspire\_common:DateOfPublication xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:TemporalExtent (inspire\_common:IndividualDate | inspire\_common:IntervalOfDates)>

<!ATTLIST inspire\_common:TemporalExtent xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:IndividualDate (#PCDATA)>

<!ATTLIST inspire\_common:IndividualDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:IntervalOfDates (inspire\_common:StartingDate, inspire\_common:EndDate)>

<!ATTLIST inspire\_common:IntervalOfDates

xmlns:inspire\_common CDATA #FIXED ['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:StartingDate (#PCDATA)>

<!ATTLIST inspire\_common:StartingDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:EndDate (#PCDATA)>

<!ATTLIST inspire\_common:EndDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Conformity (inspire\_common:Specification, inspire\_common:Degree)>

<!ATTLIST inspire\_common:Conformity xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Specification (inspire\_common:Title,

(

inspire\_common:DateOfPublication

|

inspire\_common:DateOfCreation

|

inspire\_common:DateOfLastRevision

),

inspire\_common:URI\*, inspire\_common:ResourceLocator\*)>

<!ATTLIST inspire\_common:Specification xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Title (#PCDATA)>

<!ATTLIST inspire\_common:Title xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'](http://inspire.ec.europa.eu/schemas/common/1.0%27)>

<!ELEMENT inspire\_common:URI (#PCDATA)>

<!ATTLIST inspire\_common:URI xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:Degree content:

conformant notConformant notEvaluated

-->

<!ELEMENT inspire\_common:Degree (#PCDATA)>

<!ATTLIST inspire\_common:Degree xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:MetadataPointOfContact (inspire\_common:OrganisationName, inspire\_common:EmailAddress)>

<!ATTLIST inspire\_common:MetadataPointOfContact xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:OrganisationName (#PCDATA)>

<!ATTLIST inspire\_common:OrganisationName xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:EmailAddress (#PCDATA)>

<!ATTLIST inspire\_common:EmailAddress xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- YEAR MONTH DAY-TIME-FRACTIONAL SECONDS-TIME ZONE -->

<!ELEMENT inspire\_common:MetadataDate (#PCDATA)>

<!ATTLIST inspire\_common:MetadataDate xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:SpatialDataServiceType content: discovery

view download

transformation invoke

other

-->

<!ELEMENT inspire\_common:SpatialDataServiceType (#PCDATA)>

<!ATTLIST inspire\_common:SpatialDataServiceType xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:MandatoryKeyword (inspire\_common:KeywordValue)>

<!ATTLIST inspire\_common:MandatoryKeyword xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!-- inspire\_common:KeywordValue content for inspire\_common:MandatoryKeywords: chainDefinitionService

comEncodingService comGeographicCompressionService comGeographicFormatConversionService comMessagingService comRemoteFileAndExecutableManagement comService

comTransferService humanCatalogueViewer humanChainDefinitionEditor humanFeatureGeneralizationEditor humanGeographicDataStructureViewer humanGeographicFeatureEditor humanGeographicSpreadsheetViewer humanGeographicSymbolEditor humanGeographicViewer humanInteractionService humanServiceEditor humanWorkflowEnactmentManager infoCatalogueService infoCoverageAccessService infoFeatureAccessService infoFeatureTypeService infoGazetteerService infoManagementService infoMapAccessService infoOrderHandlingService infoProductAccessService infoRegistryService infoSensorDescriptionService infoStandingOrderService metadataGeographicAnnotationService metadataProcessingService metadataStatisticalCalculationService spatialCoordinateConversionService spatialCoordinateTransformationService spatialCoverageVectorConversionService spatialDimensionMeasurementService spatialFeatureGeneralizationService

spatialFeatureManipulationService spatialFeatureMatchingService spatialImageCoordinateConversionService spatialImageGeometryModelConversionService spatialOrthorectificationService spatialPositioningService spatialProcessingService spatialProximityAnalysisService spatialRectificationService spatialRouteDeterminationService spatialSamplingService spatialSensorGeometryModelAdjustmentService spatialSubsettingService spatialTilingChangeService subscriptionService

taskManagementService temporalProcessingService temporalProximityAnalysisService temporalReferenceSystemTransformationService temporalSamplingService temporalSubsettingService thematicChangeDetectionService thematicClassificationService thematicFeatureGeneralizationService thematicGeocodingService thematicGeographicInformationExtractionService thematicGeoparsingService thematicGoparameterCalculationService thematicImageManipulationService thematicImageProcessingService thematicImageSynthesisService thematicImageUnderstandingService thematicMultibandImageManipulationService thematicObjectDetectionService thematicProcessingService thematicReducedResolutionGenerationService thematicSpatialCountingService thematicSubsettingService workflowEnactmentService

-->

<!ELEMENT inspire\_common:KeywordValue (#PCDATA)>

<!ATTLIST inspire\_common:KeywordValue xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

<!ELEMENT inspire\_common:Keyword (inspire\_common:OriginatingControlledVocabulary?, inspire\_common:KeywordValue)>

<!ATTLIST inspire\_common:Keyword xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'](http://inspire.ec.europa.eu/schemas/common/1.0%27)

xmlns:xsi CDATA #FIXED ['http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-)- instance'

xsi:type (

inspire\_common:inspireTheme\_bul| inspire\_common:inspireTheme\_cze| inspire\_common:inspireTheme\_dan| inspire\_common:inspireTheme\_dut| inspire\_common:inspireTheme\_eng| inspire\_common:inspireTheme\_est| inspire\_common:inspireTheme\_fin| inspire\_common:inspireTheme\_fre|

<!--

inspire\_common:inspireTheme\_ger| inspire\_common:inspireTheme\_gre| inspire\_common:inspireTheme\_hun| inspire\_common:inspireTheme\_gle| inspire\_common:inspireTheme\_ita| inspire\_common:inspireTheme\_lav| inspire\_common:inspireTheme\_lit| inspire\_common:inspireTheme\_mlt| inspire\_common:inspireTheme\_pol| inspire\_common:inspireTheme\_por| inspire\_common:inspireTheme\_rum| inspire\_common:inspireTheme\_slo| inspire\_common:inspireTheme\_slv| inspire\_common:inspireTheme\_spa| inspire\_common:inspireTheme\_swe

) #IMPLIED>

inspire\_common:Title content's : GEMET - INSPIRE themes => inspire\_common:DateOfPublication content's : 2008-06-01

-->

<!ELEMENT inspire\_common:OriginatingControlledVocabulary (inspire\_common:Title,

(

inspire\_common:DateOfPublication

|

inspire\_common:DateOfCreation

|

inspire\_common:DateOfLastRevision

),

inspire\_common:URI\*,

inspire\_common:ResourceLocator\*)>

<!ATTLIST inspire\_common:OriginatingControlledVocabulary xmlns:inspire\_common CDATA #FIXED

['http://inspire.ec.europa.eu/schemas/common/1.0'>](http://inspire.ec.europa.eu/schemas/common/1.0%27)

]>

<WMT\_MS\_Capabilities version="1.1.1">

<Service>

<Name>WMS</Name>

<Title>INSPIRE View Service ...</Title>

<Abstract>Service for making available INSPIRE themes</Abstract>

<KeywordList>

<Keyword>view</Keyword>

<Keyword>infoMapAccessService</Keyword><!-- ISO -->

<Keyword>keyword</Keyword><!-- for themes exposed -->

</KeywordList>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="serviceURL"/>

<ContactInformation>

[<ContactElectronicMailAddress>contactPoint@organisation.country</ContactEle](mailto:contactPoint@organisation.country) ctronicMailAddress>

</ContactInformation>

<Fees>none|no conditions apply|...</Fees>

<AccessConstraints>none|need a key/token

...|...</AccessConstraints>

</Service>

<Capability>

<Request>

<GetCapabilities>

<Format>text/xml</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="URL"

/>

</Get>

</HTTP>

</DCPType>

</GetCapabilities>

<GetMap>

<Format>image/png</Format>

<Format>image/gif</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="URL"

/>

</Get>

</HTTP>

</DCPType>

</GetMap>

</Request>

<Exception>

<Format>application/vnd.ogc.se\_xml</Format>

</Exception>

<VendorSpecificCapabilities>

<inspire\_vs:ExtendedCapabilities [xmlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0">](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0)

<!-- SC1: link INSPIRE metadata for this NS -->

<inspire\_common:MetadataUrl [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [xmlns:xsi="http://www.w3.org/2001](http://www.w3.org/2001/XMLSchema-instance)/XMLSchema-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:type="inspire\_common:resourceLocatorType">

<inspire\_common:URL [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">disco](http://inspire.ec.europa.eu/schemas/common/1.0) veryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;Version=2.0.2&amp; [id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc211.org/2005/gmd&am](http://www.isotc211.org/2005/gmd%26am) p;elementSetName=full</inspire\_common:URL>

<inspire\_common:MediaType [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">appli](http://inspire.ec.europa.eu/schemas/common/1.0) cation/vnd.ogc.csw.GetRecordByIdResponse\_xml</inspire\_common:MediaType>

</inspire\_common:MetadataUrl>

<inspire\_common:SupportedLanguages [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">](http://inspire.ec.europa.eu/schemas/common/1.0)

<inspire\_common:DefaultLanguage>

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">fre</](http://inspire.ec.europa.eu/schemas/common/1.0) inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">eng</](http://inspire.ec.europa.eu/schemas/common/1.0) inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0">](http://inspire.ec.europa.eu/schemas/common/1.0)

<inspire\_common:Language [xmlns:inspire\_common="http://inspire.ec.europa.eu/schem](http://inspire.ec.europa.eu/schemas/common/1.0)as/common/1.0">eng</ inspire\_common:Language>

</inspire\_common:ResponseLanguage>

</inspire\_vs:ExtendedCapabilities>

</VendorSpecificCapabilities>

<Layer>

<Title>Layers of Web Map Service for MS</Title>

<!-- Layer made up by one dataset : -->

<Layer>

<Name>HARMONIZED.NAME</Name>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<SRS>EPSG:4258</SRS><!-- in WMS 1.1.1 + aliases -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<!-- if needed :

<Dimension name="time" units="ISO8601" defaults="2009-06- 16">2005-01-01/2012-01-01/PID</Dimension>

-->

<MetadataURL type="TC211">

<!-- INSPIRE: the URL + ID is then processed to issue a

discovery query -->

<Format>text/xml</Format>

<OnlineResource

[xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"

/>

</MetadataURL>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple"

xlink:href="URL"

/>

</LegendURL>

</Style>

</Layer>

<!-- Compound layer : -->

<Layer>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<SRS>EPSG:4258</SRS><!-- in WMS 1.1.1 + aliases -->

<!-- WMS 1.1.1 : extent of aggregation -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<!-- if needed :

<Dimension name="time" units="ISO8601" defaults="2009-06- 16">2005-01-01/2012-01-01/PID</Dimension>

-->

<MetadataURL type="TC211">

<!-- INSPIRE: the URL + ID is then processed to issue a

discovery query -->

<Format>text/xml</Format>

<OnlineResource

[xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"/>

</MetadataURL>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource xmln[s:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</LegendURL>

</Style>

<!-- aggregation of : 1..\*-->

<Layer>

<Name>HARMONIZED.NAME</Name><!--several sub-layers may have the same name nothing prevents that in the standard so far-->

<Title>Data specification theme title</Title>

<!-- WMS 1.1.1 : its extent -->

<LatLonBoundingBox minx="LON\_MIN" miny="LAT\_MIN" maxx="LON\_MAX" maxy="LAT\_MAX"/>

<MetadataURL type="TC211"><!-- in WMS 1.1.1 -->

<!-- INSPIRE: the URL + ID is then processed to issue a discovery query -->

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="discoveryServiceURL?Service=CSW&amp;Request=GetRecordById&amp;V ersion=2.0.2&amp;id=METADATA\_IDENTIFIER&amp;outputSchema=http://www.isotc21 1.org/2005/gmd&amp;elementSetName=full"/>

</MetadataURL>

<!--FIXME: ScaleHint to help-->

</Layer>

</Layer>

</Layer>

</Capability>

</WMT\_MS\_Capabilities>

**Annex C Example of Extended Capabilities Response Scenario 1**

Example 47: Extended Capabilities Response Scenario 1

<?xml version="1.0" encoding="UTF-8"?>

<WMS\_Capabilities version="1.3.0" [xmlns="http://www.opengis.net/wms"](http://www.opengis.net/wms) [xmlns:inspire\_common="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [xmlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0"](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0) [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" xsi:schemaLocation=["http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0) [http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0/inspire\_vs.xsd">](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0/inspire_vs.xsd)

<Service>

<Name>WMS</Name>

<Title>BE INSPIRE View Service ...</Title>

<Abstract>Service for making available INSPIRE themes</Abstract>

<KeywordList>

<Keyword vocabulary="ISO">infoMapAccessService</Keyword>

<Keyword>keyword</Keyword>

</KeywordList>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" [xlink:href="http://www.company.country"/>](http://www.company.country/)

<ContactInformation>

[<ContactElectronicMailAddress>contactPoint@organisation.country</ContactE](mailto:contactPoint@organisation.country) lectronicMailAddress>

</ContactInformation>

</Service>

<Capability>

<Request>

<GetCapabilities>

<Format>text/xml</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</Get>

</HTTP>

</DCPType>

</GetCapabilities>

<GetMap>

<Format>image/png</Format>

<Format>image/gif</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</Get>

</HTTP>

</DCPType>

</GetMap>

</Request>

<Exception>

<Format>XML</Format>

</Exception>

<inspire\_vs:ExtendedCapabilities>

<inspire\_common:MetadataUrl xsi:type="inspire\_common:resourceLocatorType">

[<inspire\_common:URL>http://discoveryServiceURL.be?Service=CSW&amp;Request](http://discoveryServiceURL.be/?Service=CSW&amp%3BRequest)

=GetRecordById&amp;Version=2.0.2&amp;id=qc7f8260-3pe9-66e0-9031- [d15699a4fda4&amp;outputSchema=http://www.isotc211.org/2005/gmd&amp;elementS](http://www.isotc211.org/2005/gmd%26amp%3BelementS) etName=full</inspire\_common:URL>

<inspire\_common:MediaType>application/vnd.ogc.csw.GetRecordByIdResponse\_x ml</inspire\_common:MediaType>

</inspire\_common:MetadataUrl>

<inspire\_common:SupportedLanguages xsi:type="inspire\_common:supportedLanguagesType">

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>dut</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>dut</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

</inspire\_vs:ExtendedCapabilities>

<!-- Compound layer : -->

<Layer>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<CRS>CRS:84</CRS>

<CRS>EPSG:4326</CRS>

<CRS>EPSG:4258</CRS>

<CRS>EPSG:31370</CRS>

<CRS>EPSG:3812</CRS>

<CRS>EPSG:3043</CRS>

<EX\_GeographicBoundingBox>

<westBoundLongitude>2.56</westBoundLongitude>

<eastBoundLongitude>5.94</eastBoundLongitude>

<southBoundLatitude>50.65</southBoundLatitude>

<northBoundLatitude>51.50</northBoundLatitude>

</EX\_GeographicBoundingBox>

<BoundingBox CRS="CRS:84" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4326" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4258" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:31370" minx="22000" miny="150000" maxx="259000" maxy="245000"/>

<BoundingBox CRS="EPSG:3812" minx="52000" miny="650000" maxx="759000" maxy="745000"/>

<BoundingBox CRS="EPSG:3043" minx="469000" miny="5610000" maxx="704000" maxy="5710000"/>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</LegendURL>

</Style>

<!-- aggregation of : 1..\*-->

<Layer>

<Name>HARMONIZED.NAME</Name>

<Title>Data specification theme title</Title>

<CRS>CRS:84</CRS>

<CRS>EPSG:4326</CRS>

<CRS>EPSG:4258</CRS>

<CRS>EPSG:31370</CRS>

<CRS>EPSG:3812</CRS>

<CRS>EPSG:3043</CRS>

<BoundingBox CRS="CRS:84" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4326" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4258" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:31370" minx="22000" miny="150000" maxx="259000" maxy="245000"/>

<BoundingBox CRS="EPSG:3812" minx="52000" miny="650000" maxx="759000" maxy="745000"/>

<BoundingBox CRS="EPSG:3043" minx="469000" miny="5610000" maxx="704000" maxy="5710000"/>

<MetadataURL type="ISO19115:2005">

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" [xlink:href="http://discoveryServiceURL.be?Service=CSW&amp;Request=GetRecord](http://discoveryServiceURL.be/?Service=CSW&amp%3BRequest=GetRecord) ById&amp;Version=2.0.2&amp;id=ac9f8250-3ae5-49e5-9818- [d14264a4fda4&amp;outputSchema=http://www.isotc211.org/2005/gmd&amp;elementS](http://www.isotc211.org/2005/gmd%26amp%3BelementS) etName=full"/>

</MetadataURL>

</Layer>

</Layer>

</Capability>

</WMS\_Capabilities>

**Annex D Example of Extended Capabilities Response Scenario 2**

Example 48: Extended Capabilities Response Scenario 2

<?xml version="1.0" encoding="UTF-8"?>

<WMS\_Capabilities version="1.3.0" [xmlns="http://www.opengis.net/wms"](http://www.opengis.net/wms) [xmlns:inspire\_common="http://inspire.ec.europa.eu/schem](http://inspire.ec.europa.eu/schemas/common/1.0)as/common/1.0" [xmlns:inspire\_vs="http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0"](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0) [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" [xsi:schemaLocation="http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0) [http://inspire.ec.europa.eu/schemas/inspire\_vs/1.0/inspire\_vs.xsd">](http://inspire.ec.europa.eu/schemas/inspire_vs/1.0/inspire_vs.xsd)

<Service>

<Name>WMS</Name>

<Title>BE INSPIRE View Service ...</Title>

<Abstract>Service for making available INSPIRE themes</Abstract>

<KeywordList>

<Keyword vocabulary="ISO">infoMapAccessService</Keyword>

<Keyword>keyword</Keyword>

</KeywordList>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" [xlink:href="http://www.company.country"/>](http://www.company.country/)

<ContactInformation>

[<ContactElectronicMailAddress>con](mailto:contactPoint@organisation.country)[tactPoint@organisation.country</ContactE](mailto:tactPoint@organisation.country) lectronicMailAddress>

</ContactInformation>

</Service>

<Capability>

<Request>

<GetCapabilities>

<Format>text/xml</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</Get>

</HTTP>

</DCPType>

</GetCapabilities>

<GetMap>

<Format>image/png</Format>

<Format>image/gif</Format>

<DCPType>

<HTTP>

<Get>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</Get>

</HTTP>

</DCPType>

</GetMap>

</Request>

<Exception>

<Format>XML</Format>

</Exception>

<inspire\_vs:ExtendedCapabilities>

<inspire\_common:ResourceLocator>

[<inspire\_common:URL>http://ogc.beta.agiv.be/ogc/wms/vrbgINSP?</inspire\_co](http://ogc.beta.agiv.be/ogc/wms/vrbgINSP) mmon:URL>

<inspire\_common:MediaType>application/vnd.ogc.wms\_xml</inspire\_common:Med iaType>

</inspire\_common:ResourceLocator>

<inspire\_common:ResourceType>service</inspire\_common:ResourceType>

<inspire\_common:TemporalReference>

<inspire\_common:DateOfCreation>2003-01- 01</inspire\_common:DateOfCreation>

<inspire\_common:DateOfPublication>2003-01- 01</inspire\_common:DateOfPublication>

<inspire\_common:TemporalExtent>

<inspire\_common:IndividualDate>2003-01- 01T09:30:47Z</inspire\_common:IndividualDate>

</inspire\_common:TemporalExtent>

</inspire\_common:TemporalReference>

<inspire\_common:Conformity>

<inspire\_common:Specification xsi:type="inspire\_common:citationInspireNSRegulation\_dut">

<inspire\_common:Title>Verordening (EG) nr. 976/2009 van de Commissie van 19 oktober 2009 tot uitvoering van Richtlijn 2007/2/EG van het Europees Parlement en de Raad wat betreft de netwerkdiensten</inspire\_common:Title>

<inspire\_common:DateOfPublication>2009-10- 19</inspire\_common:DateOfPublication>

<inspire\_common:URI>CELEX:32009R0976:NL:NOT</inspire\_common:URI>

<inspire\_common:ResourceLocator>

<inspire\_[common:URL>http://eur](http://eur-/)- lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009R0976:NL:NOT</inspire

\_common:URL>

<inspire\_common:MediaType>text/html</inspire\_common:MediaType>

</inspire\_common:ResourceLocator>

</inspire\_common:Specification>

<inspire\_common:Degree>notEvaluated</inspire\_common:Degree>

</inspire\_common:Conformity>

<inspire\_common:MetadataPointOfContact>

<inspire\_common:OrganisationName>MScontact

</inspire\_common:OrganisationName>

<inspire\_common:EmailAddress> [con](mailto:contactPoint@organisation.country)[tactPoint@organisation.country](mailto:tactPoint@organisation.country)

</inspire\_common:EmailAddress>

</inspire\_common:MetadataPointOfContact>

<inspire\_common:MetadataDate>2010-11-27</inspire\_common:MetadataDate>

<inspire\_common:SpatialDataServiceType>view</inspire\_common:SpatialDataSe rviceType>

<inspire\_common:MandatoryKeyword xsi:type="inspire\_common:classificationOfSpatialDataService">

<inspire\_common:KeywordValue>infoMapAccessService</inspire\_common:Keyword Value>

</inspire\_common:MandatoryKeyword>

<inspire\_common:Keyword xsi:type="inspire\_common:inspireTheme\_dut">

<inspire\_common:OriginatingControlledVocabulary xsi:type="inspire\_common:originatingControlledVocabularyGemetInspireThemes"

>

<inspire\_common:Title>GEMET - INSPIRE themes</inspire\_common:Title>

<inspire\_common:DateOfPublication>2008-06- 01</inspire\_common:DateOfPublication>

</inspire\_common:OriginatingControlledVocabulary>

<inspire\_common:KeywordValue>Administratieve eenheden</inspire\_common:KeywordValue>

</inspire\_common:Keyword>

<inspire\_common:Keyword>

<inspire\_common:KeywordValue xsi:type="inspire\_common:topicCategory">boundaries</inspire\_common:KeywordV alue>

</inspire\_common:Keyword>

<inspire\_common:SupportedLanguages xsi:type="inspire\_common:supportedLanguagesType">

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>dut</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>dut</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

</inspire\_vs:ExtendedCapabilities>

<!-- Compound layer : -->

<Layer>

<Title>Data specification theme title</Title>

<Abstract>As defined by Data specification</Abstract>

<KeywordList>

<Keyword>GEMET keyword</Keyword>

</KeywordList>

<CRS>CRS:84</CRS>

<CRS>EPSG:4326</CRS>

<CRS>EPSG:4258</CRS>

<CRS>EPSG:31370</CRS>

<CRS>EPSG:3812</CRS>

<CRS>EPSG:3043</CRS>

<EX\_GeographicBoundingBox>

<westBoundLongitude>2.56</westBoundLongitude>

<eastBoundLongitude>5.94</eastBoundLongitude>

<southBoundLatitude>50.65</southBoundLatitude>

<northBoundLatitude>51.50</northBoundLatitude>

</EX\_GeographicBoundingBox>

<BoundingBox CRS="CRS:84" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4326" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4258" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:31370" minx="22000" miny="150000" maxx="259000" maxy="245000"/>

<BoundingBox CRS="EPSG:3812" minx="52000" miny="650000" maxx="759000" maxy="745000"/>

<BoundingBox CRS="EPSG:3043" minx="469000" miny="5610000" maxx="704000" maxy="5710000"/>

<Style>

<Name>inspire\_common:DEFAULT</Name>

<Title>Data specification theme style title</Title>

<LegendURL width="100" height="100">

<Format>image/png</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" xlink:href="URL"/>

</LegendURL>

</Style>

<!-- aggregation of : 1..\*-->

<Layer>

<Name>HARMONIZED.NAME</Name>

<Title>Data specification theme title</Title>

<CRS>CRS:84</CRS>

<CRS>EPSG:4326</CRS>

<CRS>EPSG:4258</CRS>

<CRS>EPSG:31370</CRS>

<CRS>EPSG:3812</CRS>

<CRS>EPSG:3043</CRS>

<BoundingBox CRS="CRS:84" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4326" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:4258" minx="2.56" miny="50.65" maxx="5.94" maxy="51.50"/>

<BoundingBox CRS="EPSG:31370" minx="22000" miny="150000" maxx="259000" maxy="245000"/>

<BoundingBox CRS="EPSG:3812" minx="52000" miny="650000" maxx="759000" maxy="745000"/>

<BoundingBox CRS="EPSG:3043" minx="469000" miny="5610000" maxx="704000" maxy="5710000"/>

<MetadataURL type="ISO19115:2005">

<Format>text/xml</Format>

<OnlineResource [xmlns:xlink="http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink) xlink:type="simple" [xlink:href="http://discoveryServiceURL.be?Service=CSW&amp;Request=GetRecord](http://discoveryServiceURL.be/?Service=CSW&amp%3BRequest=GetRecord) ById&amp;Version=2.0.2&amp;id=ac9f8250-3ae5-49e5-9818- d14264a4fda4&amp;outpu[tSchema=http://www.isotc211.org/2005/gmd&amp;elementS](http://www.isotc211.org/2005/gmd%26amp%3BelementS) etName=full"/>

</MetadataURL>

</Layer>

</Layer>

</Capability>

</WMS\_Capabilities>

**Annex E Examples of SLD usage**

The following XML description is an example of SLD (Styled Layer Descriptor) to define a symbol for a point representing a borehole (FeatureType : BSS\_Sondage). Three rules are used to define this symbol according to values of some properties.

Example 49: Examples of SLD usage

<StyledLayerDescriptor version="1.1.0" [xmlns:ogc="http://www.opengis.net/ogc"](http://www.opengis.net/ogc) [xmlns:xlink="http://www.w3.org/1999/xlink">](http://www.w3.org/1999/xlink)

<NamedLayer>

<Name>BSS\_Sondages</Name>

<UserStyle>

<FeatureTypeStyle>

<FeatureTypeName>BSS\_Sondage</FeatureTypeName>

|  |
| --- |
| *Rule #1: If there is more than one image (NB\_IMAGES>1) then a border is drawn (border.gif)* |

<Rule>

<ogc:Filter>

<ogc:PropertyIsGreaterThan>

<ogc:PropertyName>NB\_IMAGES</ogc:PropertyName>

<ogc:Literal>0</ogc:Literal>

</ogc:PropertyIsGreaterThan>

</ogc:Filter>

<PointSymbolizer>

<Graphic>

<ExternalGraphic>

<OnlineResource xlink:type="simple" [xlink:href="http://.../images/bss/bordure.gif"/>](http://./images/bss/bordure.gif)

<Format>image/gif</Format>

</ExternalGraphic>

<Size>15</Size>

</Graphic>

</PointSymbolizer>

</Rule>

|  |
| --- |
| *Rule #2 : If a « COUPE »(borehole description or drawing) is available then the symbol is filled with the*  *« remp.gif » background* |

<Rule>

<ogc:Filter>

<ogc:Or>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>COUPE\_GEOLOGIQUE</ogc:PropertyName>

<ogc:Literal>Presente</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>COUPE\_SIMPLIFIEE</ogc:PropertyName>

<ogc:Literal>Presente</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:Or>

</ogc:Filter>

<PointSymbolizer>

<Graphic>

<ExternalGraphic>

<OnlineResource xlink:type="simple" [xlink:href="http://.../images/bss/remp.gif"/>](http://./images/bss/remp.gif)

<Format>image/gif</Format>

</ExternalGraphic>

<Size>15</Size>

</Graphic>

</PointSymbolizer>

</Rule

|  |
| --- |
| *Rule #3 : If the borehole is an « OUVRAGE » then the symbol « croix.gif » is drawn* |

<Rule>

<ogc:Filter>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>OUVRAGE</ogc:PropertyName>

<ogc:Literal>OUI</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:Filter>

<PointSymbolizer>

<Graphic>

<ExternalGraphic>

<OnlineResource xlink:type="simple" [xlink:href="http://.../images/bss/croix.gif"/>](http://./images/bss/croix.gif)

<Format>image/gif</Format>

</ExternalGraphic>

<Size>15</Size>

</Graphic>

</PointSymbolizer>

</Rule>

</FeatureTypeStyle>

</UserStyle>

</NamedLayer>

</StyledLayerDescriptor>

**Annex F INSPIRE Network Services Regulation Compliance**

This compliance matrix shows how the View Service Technical Guidance within the main body of this document conforms to the INSPIRE Network Services Regulation [INS NS].

Table 18: INSPIRE Network Services Regulation Compliance

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **INSPIRE Network Services Regulation [INS NS] - Annex III** | **Technical Guidance for View Service** | | |
|  | VIEW SERVICES |  |  |  |
|  | PART A |  |  |  |
|  | Operations |  |  |  |
|  | 1.LISTOFOPERATIONS |  | WMS | WMTS |
| 1 | In order to be in conformity with Article 11(1) of Directive 2007/2/EC, the View Service shall provide the operations listed in Table 1: Get View Service Metadata:Provides all necessary information about the service and describes service capabilities; Get Map:Returns a map containing the geographic and thematic information coming from the available spatial  datasets. This map is an image spatially referenced | Section | 4.2 | 5.2.3 |
| 2 | In order to be in conformity with Article 12 of Directive 2007/2/EC, the view Service shall support the operations listed in Table 2 of this Annex: Link View Service Allows a Public Authority or a Third Party to declare a view Service for the viewing of its resources through the Member State View Service while maintaining the viewing capability at the Public  Authority or the Third party location | Section | 4.2.5 | 5.2.5 |
| 3 | The request and response parameters of each operation complete the description of each operation and form an integral part of the View Service technical  specification. | Section | 4.2 | 5.2.3.2 |
|  | 2. GETVIEWSERVICEMETADATAOPERATION |  |  |  |
|  | 2.1. Get View Service Metadata Request |  |  |  |
| 4 | 2.1.1. Get View Service Metadata Request parameters: The Get View Service Metadata Request parameter indicates the natural language requested for the content of the Get View Service Metadata  Response. | Section | 4.2.3 | 5.2.3 |
| 5 | 2.2.Get View Service Metadata Response parameters: The Get View Service Metadata Response shall contain the following set of parameters:- View Service  Metadata, - Operations Metadata, - Languages, - Layers Metadata. | Section | 4.2.3 | 5.2.3 |
| 6 | 2.2.1. View Service Metadata parameters The View Service Metadata parameters shall at least contain the INSPIRE metadata elements of the View Service. | Section | 4.2.3 | 5.2.3 |
| 7 | 2.2.2. Operations Metadata parameters: The Operation Metadata parameter describes the operations of the View Service and shall contain as a minimum a description of the data exchanged and the  network address of each operation. | Section | 4.2.3.2 | 5.2.3.2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 8 | 2.2.3. Languages parameters Two language parameters shall be provided:- the Response Language parameter indicating the natural language used in the Get Service Metadata Response parameters,- the Supported Languages parameter containing the list of the natural languages supported  by this view service. | Section | 0 | 5.2.6 |
| 9 | 2.2.4. Layers Metadata parameters The metadata elements listed in Table 3 shall be provided for each  layer. | Section | 4.2.3.2 | 5.2.3.2 |
| 10 | Table 3:Resource Title [etc]…The layer specific  parameters listed in Table 4 shall be provided for each layer .Name [etc]… | Section | 4.2.3.2 | 5.2.3.2 |
|  | 3. GETMAPOPERATION |  |  |  |
|  | 3.1. Get Map Request |  |  |  |
|  | 3.1.1. Get Map Request parameters |  |  |  |
| 11 | The Get Map Request parameters listed in Table 5  shall be provided. Table 5 Layers [etc]… | Section | 0 | 5.2.4 |
|  | PART B |  |  |  |
|  | Other characteristics |  |  |  |
|  | The View Service shall have the following  characteristics. |  |  |  |
| 12 | 1. Coordinate Reference Systems: The layers shall be simultaneously viewed using a single coordinate reference system and the View Service shall support at least the Coordinate Reference Systems in Annex I, point 1 of Directive 2007/2/EC. | Section | 0 | 5.2.4 |
| 13 | 2. Image Format The View Service shall support at least one of the following image formats:- the Portable Network Graphics (PNG) format, - the Graphics Interchange Format (GIF), without compression. | Section | 0 | 5.2.4 |

INSPIRE

Infrastructure for Spatial Information in Europe

**Technical Guidance for the implementation of INSPIRE Download Services**

|  |  |
| --- | --- |
| **Title** | Technical Guidance for the implementation of INSPIRE Download Services |
| **Creator** | Initial Operating Capability Task Force for Network Services |
| **Date** | 09-08-2013 |
| **Subject** | INSPIRE Download Services |
| **Status** | Published, Version 3.1 |
| **Publisher** | Initial Operating Capability Task Force |
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| **Source** | Technical Guidance for the Implementation of INSPIRE Download Services (version 3.1) |
| **Rights** | Public |
| **Identifier** | Technical\_Guidance\_Download\_Services\_v3.1 |
| **Language** | EN |
| **Relation** | COMMISSION REGULATION (EU) No 1088/2010 of 23 November 2010  amending Regulation (EC) No 976/2009 as regards download services and transformation services |
| **Coverage** | Project duration |

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**Foreword**

Directive 2007/2/EC of the European Parliament and of the Council [**Directive 2007/2/EC**], adopted on

14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonised and quality geographic information to support the formulation, implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment.

INSPIRE is based on the infrastructures for spatial information established and operated by the 27 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative ―regional‖ approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas.

Metadata;



The interoperability and harmonisation of spatial data and services for selected themes (as described in Annexes I, II, III of the Directive);

Network Services;



Measures on sharing spatial data and services; Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of the Directive):

1. *“discovery services search for spatial datasets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
2. *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial datasets and display legend information and any relevant content of metadata;*
3. *download services enabling copies of complete spatial datasets, or of parts of such sets, to be downloaded;*
4. *transformation services enabling spatial datasets to be transformed with a view to achieving interoperability;*
5. *invoke spatial data services" enabling data services to be invoked.”*

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies, and practices. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations. [Figure 1](#_bookmark258). illustrates the relationship between the INSPIRE Regulations containing Implementing Rules and their corresponding Technical Guidance documents.

|  |  |  |  |
| --- | --- | --- | --- |
| INSPIRE | Technical Guidance for INSPIRE Download Services 3.1 | | |
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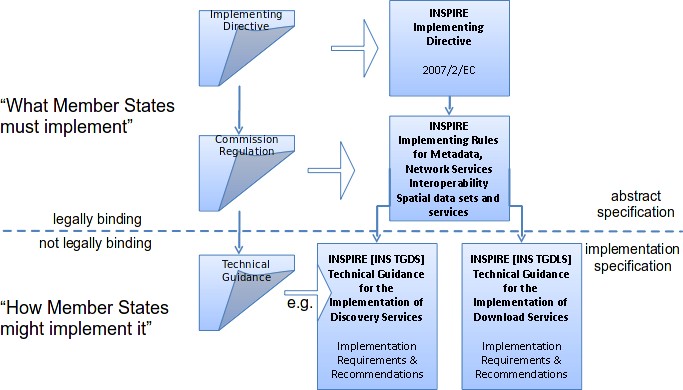


Figure 1: Relationship between INSPIRE Implementing Rules and Technical Guidance

Technical Guidance documents define how Member States might implement the Implementing Rules described in a Commission Regulation. Technical Guidance documents may include non-binding technical requirements that must be satisfied if a Member State chooses to conform to the Technical Guidance. Implementing this technical guidance will maximise the interoperability of INSPIRE services.

This Technical Guidance concerns the INSPIRE Download Services. The Technical Guidance contains detailed technical documentation highlighting the mandatory and the recommended elements related to the implementation of INSPIRE Download Services. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples.

*Note that while the guidance in this document meets all the download service requirements for Annex I themes it may not be so suitable for some of the data in Annex II and III themes. If later data specifications relating to Annex II or Annex III themes should require additional functionality, like those covered by the OGC Web Coverage Service (WCS) or the OGC Sensor Observation Service (SOS), this Technical Guidance document will be extended accordingly. Likewise, other implementations (e.g. Linked Data) may be considered in future extensions of this Technical Guidance.*

|  |
| --- |
| This document will be publicly available as a ‗non-paper‘, as it does not represent an official position of the Commission, and as such cannot be invoked in the context of legal procedures. |

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Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.

**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Relea se** | **Editor** | **Description** |
| 25 Sep 2009 | 2.0 | Network Services Drafting Team | Draft Technical Guidance (Published) |
| 14 Dec 2011 | 2.1 | Dominic Lowe | Aligned structure with View and Download guidance. Added Atom guidance and mappings.  General editorial changes. |
| 9 Jan 2012 | 2.2 | Dominic Lowe | Major restructuring following IOC TF meeting. |
| 18 Jan 2012 | 2.3 | Dominic Lowe | Further Atom guidance and WFS guidance. General editorial changes and formatting. |
| 2 Feb 2012 | 2.4 | Dominic Lowe | Editing following teleconference and review by IOC TF members. Significant edits to Atom section. Restructured language requirements. Added table of WFS to IR mapping. |
| 10 Feb 2012 | 2.5 | Dominic Lowe | Numerous detail edits in preparation for wider review. Added implementation roadmap diagram and extended capabilities section. |
| 17 Feb 2012 | 2.6 | Dominic Lowe | Substantially revised mapping to IR section. Fixed issues with numbering of requirements and recommendations. |
| 02 Apr 2012 | 2.6.5 | Dominic Lowe | Interim version for internal review, following 2.6 consultation. Major changes to Atom chapter. |
| 05 Apr 2012 | 2.7 | Dominic Lowe | Added OpenSearch section, addressed many outstanding comments, Added section on Media types/compression. |
| 03 May 2012 | 2.8 | Dominic Lowe | Many editorial changes and clarifications, changes to GeoRSS, OpenSearch sections, Diagrams. |
| 04 May 2012 | 3.0rc | Dominic Lowe | Updated milestones. Edits in response to JRC comments. |
| 11 Jun 2012 | 3.0rc2 | Dominic Lowe | Edited in response to IOC TF comments. |
| 12 Jun 2012 | 3.0 | Dominic Lowe | Minor final corrections. |
| 16 Jul 2012 | 3.0.1 | Dominic Lowe | Corrected georss:polygon coordinates in examples [Example 2:](#_bookmark272), [Example 12:](#_bookmark277) and [Example 20:](#_bookmark280) as follows:  <georss:polygon>47.202 5.755 55.183 5.755 55.183  15.253 47.202 15.253 47.202 5.755  </georss:polygon>  Section [5.4](#_bookmark288), [Example 35:](#_bookmark289) (previously not numbered), OpenSearch Description document:  Changed from:  <Url type="application/atom+xml" rel="results" template=["h](http://xyz.org/search.php?q)t[tp://xyz.org/search.php?q=](http://xyz.org/search.php?q){searchTerms  }"/>  to: |

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| **Date** | **Relea se** | **Editor** | **Description** |
|  |  |  | <Url type="text/html" rel="results" template=["h](http://xyz.org/search.php?q)t[tp://xyz.org/search.php?q=](http://xyz.org/search.php?q){searchTerms  }"/> |
| 21 Feb 2013 | 3.0.2 | Ioannis Kanellopoulos | Added Chapter 8 on Quality of Services |
| 9 Aug 2013 | 3.1 | Angelo Quaglia, Michael Lutz, Alexander Kotsev | Updated sections 4 and 4.2 to enable the possibility of a ―hybrid implementation‖ based on Atom for Part A and WFS for Parts B and C.  Added pointer to the demo instance of an Atom based Download Service at the beginning of Chapter 5.  Changed ―application/vnd.iso.19139+xml‖ to  ―application/xml‖ in text and examples in section 5.1.3.  Added note on metadata in Atom and WFS for  ―hybrid implementations‖ in section 5.1.3.  Added motivation for html alternative representation in section 5.1.7.  Removed reference to  ―application/vnd.ogc.csw.GetRecordByIdResponse\_x ml‖ in TG Requirement 6.  Added new sub-section 5.1.16. Download Service Feed: entry ‗link‘ to WFS implementation, valid for hybrid implementations only.  Added explanation about how the OpenSearch document is introduced to satisfy the Network Service Regulation and about the fact that no requirements are placed on the technology used to implement the search script. Added note about the fact that the sample script uses content negotiation in section 5.4.  Extended section 5.4.2 on the generic search template; changed type to ―text/html‖ in TG Requirement 41.  Explained machine-to-machine interaction for the Describe Spatial Data Set operation in section 5.4.3.  Added default values for CRS and language parameters in section 5.4.5, TG Requirement 43 and Example 40:.  Changed language code ‗en-GB‘ to ‗en‘ in Example 43:.  Changed ‗application/zip‘ to ‗application/x-filegdb‘ in Example 35:, Example 40: and Annex A.  Added ‗Croatian‘ language in Table 1 and Table 2.  Added recommendation for single Stored Query with predefined identifier in Chapter 6.4 ―Stored Query Support‖.  Modified TG Requirement 51 to include |

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Relea se** | **Editor** | **Description** |
|  |  |  | ‗DataSetIdCode‘ and ‗DataSetIdNamespace‘ parameters instead of the previously existing  ‗DataSetId‘.  Added requirement for WFS-based Predefined data set download services that they only serve one data set per endpoint in Chapter 6.5 ―INSPIRE Datasets and WFS Features‖.  Removed dependency of Conformance class 3 on conformance class 2 in section 7 and TG Requirement 61.  Moved subsections 6.2.2 ―DescribeFeatureType Operation (language requirements)‖ and 6.6.3  ―GetFeature Operation (language requirements‖ to Chapter 7.9.  Added new sub-section 7.10 for WFS metadata in case of hybrid Atom/WFS implementations. |

1. **Introduction**

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007.

The purpose of the infrastructure is to enable the formulation, implementation, monitoring activities and evaluation of Community environmental policies at all levels – European, national and local – and to provide public information.

INSPIRE builds on the infrastructures for spatial information that have already been created by the Member States. The components of those infrastructures include: metadata, spatial data themes (as described in Annexes I, II, III of the Directive), network services and technologies; agreements on data sharing, access and use; coordination and monitoring mechanisms, processes and procedures.

The guiding principles of INSPIRE are:

 that the infrastructures for spatial information in the Member States should be designed to ensure that spatial data are stored, made available and maintained at the most appropriate level;

 that it is possible to combine spatial data from different sources across the Community in a consistent way and share them between several users and applications;

 that it is possible for spatial data collected at one level of public authority to be shared between all the different levels of public authorities;

 that spatial data are made available under conditions that do not restrict their extensive use; and

 that it is easy to discover available spatial data, to evaluate their fitness for purpose and to know the conditions applicable to their use.

The text of the INSPIRE Directive is available from available from the European Union Law website (EU-LEX) [http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0002:EN:NOT](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A32007L0002%3AEN%3ANOT). The Directive identifies what needs to be achieved, and Member States have two years from the date of adoption to bring into force national legislation, regulations, and administrative procedures that define how the agreed objectives will be met taking into account the specific situation of each Member State. To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas. Implementing Rules are adopted as Commission Decisions, and are binding in their entirety.

According to Article 5(4) of the Directive, the INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements.

The scope of this document is to detail the INSPIRE technical requirements for **Download Services** from the Implementing Rules, such that these services can be implemented consistently across Europe.

These Implementing Rules are, as much as possible, in conformance with European and international standards, current practices in stakeholder communities and relevant European initiatives such as e-Government, and the EU interoperability framework.

1. **Normative references**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

INSPIRE, Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial datasets and services, **INSPIRE Directive**

IETF RFC 4287 The Atom Syndication Format, **ATOM**

GeoRSS-Simple The Simple Serialization of GeoRSS, <http://www.georss.org/simple> **GeoRSS**

OpenSearch Description Document format, <http://www.opensearch.org/Specifications/OpenSearch/1.1>

**OpenSearch**

ISO 19142:2010 Geographic information -- Web Feature Service, **ISO 19142**

ISO 19143:2010 Geographic information -- Filter encoding, **ISO 19143**

INSPIRE Network Services Regulation, **INS NS,** COMMISSION REGULATION (EU) No 976/2009 of 23 November 2010 as amended by Regulation (EC) No 1088/2010 as regards download services and transformation services

INSPIRE Metadata Regulation, **INS MD,** COMMISSION REGULATION (EC) No 1205/2008 of 3

December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata. See also Corrigendum to INSPIRE Metadata Regulation.

INSPIRE Metadata Implementing Rules, **IR MDTG,** Guidelines based on EN ISO 19115 and EN ISO 19119 for Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

INSPIRE spatial datasets and services Regulation, **INS SDS,** COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial datasets and services

W3C Protocol for Web Description Resources (POWDER): Description Resources, [http://www.w3.org/TR/powder-dr/,](http://www.w3.org/TR/powder-dr/) **POWDER**

1. **Terms and abbreviations**
   1. ***Terms***
2. **download services**

enabling copies of spatial datasets, or parts of such sets, to be downloaded and, where practicable, accessed directly [INSPIRE Directive]

1. **INSPIRE registry**

the official registry containing definitions for terms and feature concepts in INSPIRE. [http://inspire-](http://inspire-/) registry.jrc.ec.europa.eu/

1. **metadata**

information describing spatial datasets and spatial data services and making it possible to discover, inventory and use them [INSPIRE Directive]

1. **network services**

network services should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services [INSPIRE Directive]

1. **spatial data**

data with a direct or indirect reference to a specific location or geographic area [INSPIRE Directive]

1. **spatial dataset**

identifiable collection of spatial data [INSPIRE Directive]

1. **dataset**

short term sometimes used instead of ‗spatial dataset‘, same meaning as ‗spatial dataset‘.

* 1. ***Abbreviations***

CRS Coordinate Reference System

FE Filter Encoding, referring to ISO 19143 GeoRSS GeoRSS-Simple

GET HTTP Get Method

GML Geography Markup Language HTTP Hypertext Transfer Protocol

INSPIRE Infrastructure for Spatial Information in Europe IR Implementing Rule

ISO International Organisation for Standardisation JRC Joint Research Centre

NS Network Services

OGC Open Geospatial Consortium

OWS OGC Web Services Common Specification WFS Web Feature Service, referring to ISO 19142

* 1. ***Verbal forms for the expression of provisions***

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

 ―shall” / ―shall not” : a requirement, mandatory to comply with the technical guidance

 ―should” / ―should not” : a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so

 ―may” / ―need not” : a permission

**Technical Guidance Conformance Classes notation**

The Technical Guidance in this document is divided into Conformance Classes, so that it is possible to declare conformance to specific parts of the Technical Guidance. *To conform to a Conformance Class it is necessary to meet all of the Requirements (see next section) in that Conformance Class.*

Conformance Classes are identified in the document as follows:

**TG Conformance Class #: [TITLE]** conformance classes are shown using this style

**Technical Guidance Requirements and Recommendations notation**

Requirements and the recommendations for INSPIRE Download Services within this technical guidance are highlighted and numbered as shown below:

**TG Requirement #** requirements are shown using this style

|  |
| --- |
| TG Recommendation # recommendations are shown using this style. |

It is important to note that, implementation requirements and implementation recommendations may refer to either service or client implementations. Requirements and recommendations belong to the conformance class in which they are found in this document.

**Note**: It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‗TG requirement‘ and ‗TG recommendation‘ to indicate what is technically required or recommended to conform to the Technical Guidance.

**XML Example notation**

XML Examples are shown using Courier New on a grey background with yellow for emphasis as below:

</inspire:example>

<inspire:highlight>

Highlighted Text for emphasis

</inspire:highlight>

<inspire:example>

**Note**: XML Examples are informative and are provided for information only and are expressly not normative.

* 1. ***References***

References within this document are denoted using ―Section‖ or ―Annex‖. For example, Section 5.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 3 and use the abbreviated title as indicated in **Bold** text. For example, [**INS NS**] uses the abbreviated title for the document as shown below:

INSPIRE Network Services Regulation, **INS NS,** COMMISSION REGULATION (EU) No 1088/2010 of 23 November 2010 amending Regulation (EC) No 976/2009 as regards download services and transformation services

References within other documents are show as above using the abbreviated title, together with the appropriate section within the document. For example, [**INS NS,** Section 2.2.3], refers to Section 2.2.3 within the document as listed above.

* 1. ***Future updates of this document***

There are some issues that are foreseen, but are not covered or only partially covered in this version of the Technical Guidance.

These are:

 Pre-defined download of datasets contained in multiple physical files.

o Although some provision for multiple links is given in the current Atom guidance, it is foreseen that this solution may not be scalable for very large numbers of files and also that there is no way to provide metadata for individual files (e.g. geographic, temporal coverage). Other solutions will be explored.

 More WFS examples for Stored Queries and Direct Download.

 Guidance for Spatial Object Types that may be more suited to delivery via Web Coverage Services or Sensor Observation Services.

1. **INSPIRE Download Services**

This document provides Technical Guidance for the implementation of technical service interfaces for INSPIRE Download Services. This guidance is based on the abstract model established in the INSPIRE Network Services Regulation [**INS NS**].

The Network Services Regulation describes the following four download operations [**INS NS**, Annex IV, Part A] that *must* be implemented by Download Services:

 Get Download Service Metadata  Get Spatial Dataset

 Describe Spatial Dataset  Link Download Service

The Network Services Regulation also states that *where practicable*, the following two operations [**INS NS**, Annex IV, Part B] *shall* be implemented by Download Services:

 Get Spatial Object

 Describe Spatial Object Type

Furthermore, *if* the *Get Spatial Object* and *Describe Spatial Object Type* operations are implemented then particular search capabilities [**INS NS**, Annex IV, Part C] shall also be implemented. These capabilities include the ability to search by:

 URI of Spatial Dataset

 Key attributes of spatial objects, including URI and date/time of update  Bounding Box

 Spatial data theme

 Combinations of the above

In practice therefore, this means there are *two* types of Download Services that may be implemented; those that satisfy the minimum functional requirements from the Regulation [**INS NS**, Annex IV, Part A] and those that satisfy the full functional requirements [**INS NS**, Annex IV, Parts A, B & C]. As stated in the Regulation, the later should be implemented *where practicable*.

For the remainder of this document these two types of Download Service are referred to as follows:  ―Pre-defined dataset download service(s)‖*;*

*A pre-defined dataset download service provides for the simple download of pre- defined datasets (or pre-defined parts of a dataset) with no ability to query datasets or select user-defined subsets of datasets. A pre-defined dataset or a pre-defined part of a dataset could be (for example) a file stored in a dataset repository, which can be downloaded as a complete unity with no possibility to change content, whether encoding, the CRS of the coordinates, etc.*

 ―Direct access download service(s)‖;

*A direct access download service extends the functionality of a pre-defined dataset download service to include the ability to query and download subsets of datasets. The direct access download service allows more control over the download than the simple download of a pre-defined dataset or pre-defined part of a dataset. It can therefore be considered to be more „advanced‟ than pre-defined dataset download. In this case, the spatial information is typically stored in a repository (e.g. a database) and only accessible through a middleware data management system (although the precise implementation may vary). The term direct access is used to mean the capability of a client application or client service to interact directly with the contents of*

*the repository, e.g. by retrieving parts of the repository based upon a query. The query can be based upon spatial or temporal criteria, or by specific properties of the instances of the spatial object types contained in the repository.*

In addition to the above definitions, a pre-defined dataset or a pre-defined part of a dataset is characterised by two conditions:

 *It has a metadata record and can be discovered using an INSPIRE conformant discovery service.*

 *The metadata contains a link (URL – uniform resource locator) whereby the dataset or part of dataset can be immediately downloaded by a simple HTTP-protocol GET-request. The URL can optionally link to a resource where rights management services can be invoked prior to the simple download by use of HTTP-protocol.*

Furthermore, note that the phrase ‗part(s) of a dataset‘ refers only to *logical* parts of a dataset. It does *not* refer to *physical* parts of a dataset, for example where a large dataset has been split into multiple files for storage or access reasons.

As an example, a logical ‗part of a dataset‘ could be a road network for a single administrative region. This ‗part dataset‘ would have its own metadata record as described above and would effectively act as a normal dataset in the INSPIRE infrastructure. This is in contrast to say, if a road network was split into 100 tiles for storage efficiency. In the latter case, the physical parts of the logical dataset would not be exposed with metadata records.

Of course there may be a correspondence between the logical and physical parts of a dataset.

The precise definition of what constitutes a particular pre-defined dataset or pre-defined part of datasets is a matter for individual data providers and will vary according to the context. However as indicated above an example of usage could be where the pre-defined dataset is a dataset conforming to one of the INSPIRE themes covering the whole Member State, while a pre-defined part of the dataset could be a subset of this, covering for instance an administrative subdivision of the Member State.

*NOTE: For readability purposes, the short phrase “pre-defined dataset” is often used in this document. Whenever this phrase is encountered it should be interpreted as meaning the longer phrase “pre- defined dataset or a pre-defined part of a dataset”. Where reference is made to physical parts of a dataset this is made explicit.*

Figure 2 shows a typical sequence of operations used when downloading data from a pre-defined dataset download service.

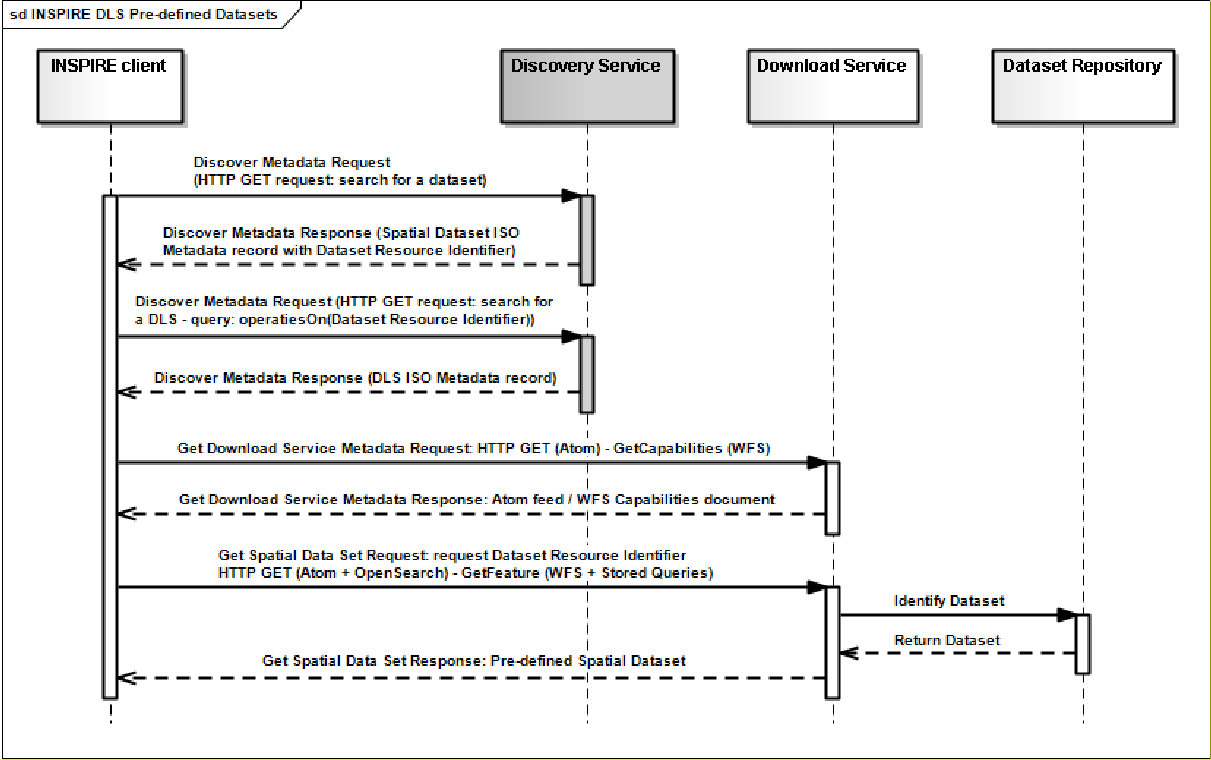


Figure 2: Simple sequence diagram showing download of datasets via a pre-defined download service

Figure 3 shows a typical sequence of operations used when downloading data from a direct access dataset download service.

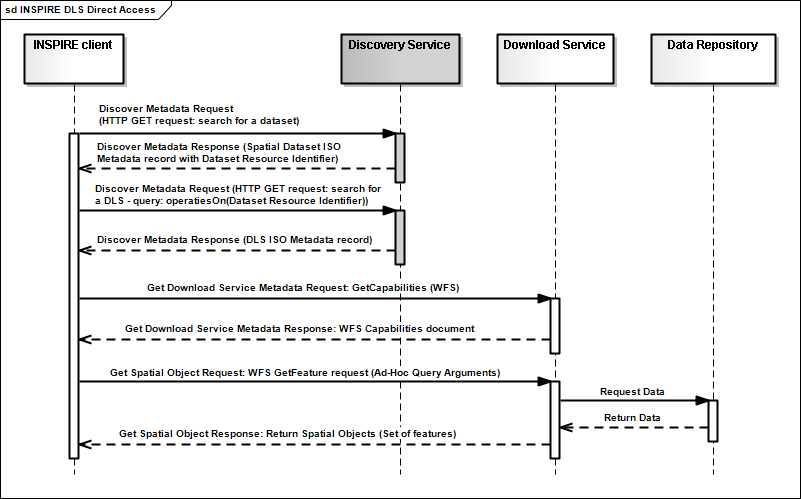


Figure 3: Simple sequence diagram showing a typical sequence of operations to download spatial data objects from a direct access dataset download service.

In both cases above, the end point for the *Get Download Service Metadata Request* (i.e. the Atom feed or the WFS GetCapabilities) is taken from the Download Service ISO Metadata retrieved from the Discovery Service. More specifically the Resource Locator Metadata element shall include the link to the *Get Download Service Metadata Request.*

The following sections of this document provide detailed Technical Guidance for implementing Download Services using existing standards:

 *Chapter 5* contains Technical Guidance for implementing pre-defined dataset download services using the Atom syndication format [**ATOM**]

 *Chapter 6* contains Technical Guidance for implementing pre-defined dataset download services using the ISO 19142 Web Feature Service [**ISO 19142]** and ISO 19143 Filter Encoding Specification [**ISO 19143]**

 *Chapter 7* contains Technical Guidance for implementing direct access download services using the ISO 19142 Web Feature Service [**ISO 19142]** and ISO 19143 Filter Encoding [**ISO 19143]**

Anybody implementing Download Services following this Technical Guidance should therefore choose to do one (or more, but at least one) of the following for each Download Service provided:

 Satisfy the minimum functional requirements of the Regulation [**INS NS**, Annex IV, Part A] by following the Technical Guidance in Chapter 5 (using Atom).

 Satisfy the minimum functional requirements of the Regulation [**INS NS**, Annex IV, Part A] by following the Technical Guidance in Chapter [6](#_bookmark292) (using WFS).

 Satisfy the full functional requirements of the Regulation [**INS NS**, Annex IV, Parts A, B & C] by following the Technical Guidance in Chapters [6](#_bookmark292) *and* 7 (using WFS & Filter Encoding).

 Satisfy the full functional requirements of the Regulation [**INS NS**, Annex IV, Parts A, B & C] by following the Technical Guidance in Chapters 5 *and* 7 (using Atom and WFS & Filter Encoding). This case will be referred to as a ―hybrid implementation‖ in this Technical Guidance.

Table 1 illustrates the relationship between the parts of the Regulation [**INS NS**, Annex IV] and the implementation choices presented in this document.

|  |  |  |
| --- | --- | --- |
| ***Implementation choices*** | **Part A (mandatory)** | **Parts B & C (where practicable)** |
| ***ATOM*** | Chapter 5 | Not possible with Atom |
| ***WFS*** | Chapter [6](#_bookmark292) | Chapter 7 |

Table 1: Possible implementation choices for Download Services

In addition, the Network Services Regulation contains requirements for Quality of Service [**INS NS**, Annex I]. Technical Guidance for this is given in Chapter [8](#_bookmark297) and this Technical Guidance must be followed in addition to any Technical Guidance given in Chapters 5-7.

* 1. ***How the Technical Guidance maps to the Implementing Rules***

The purpose of this Technical Guidance is to provide practical guidance for implementation that is guided by, and satisfies, the requirements of the underlying legislation. The tables in the following three sections demonstrate how the Atom and WFS implementations described in this document satisfy the legal requirements of the Network Services Regulation [**INS NS**]. The underlying legislation is rarely referred to in the rest of this document, so these tables should be referred back to if necessary.

* + 1. **Mapping the Atom-based Technical Guidance to the Implementing Rules**

The following set of tables shows how the guidance for Atom implementations given in Chapter [5](#_bookmark268) satisfies the Network Services Regulation. Each operation is in a separate table.

|  |  |  |
| --- | --- | --- |
| **Get Download Service Metadata** | | **M/O/C1** |
| **Description in INS NS (Annex IV, Part A)**  Provides all necessary information about the service, the available Spatial Datasets, and describes the service capabilities.  **Request parameters**   * Natural language to be used for the content of the response   **Response parameters**   * Download Service Metadata * Operations Metadata * Languages * Spatial Data Sets Metadata | | M |
| ***Recommended Atom-based implementation***  ***(satisfies pre-defined download only)*** | |  |
| ***Get Download Service Metadata Request*** | Metadata records for Download Services shall be available in a Discovery Service. The Resource Locator metadata element for the Download Service shall contain a link to the Atom feed.  The Get Download Service Metadata request is an HTTP GET request to the Download Service to retrieve the Atom feed. |
| ***Get Download Service Metadata Response*** | The response from the Download Service will be an Atom feed which includes the download service INSPIRE metadata, operations metadata, response and supported languages, spatial data sets metadata and their corresponding CRS. See Section [5.1](#_bookmark271). |

Table 2: Get Download Service Metadata – Atom Implementation

|  |  |  |
| --- | --- | --- |
| **Get Spatial Data Set** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  The Get Spatial Data Set operation allows the retrieval of a Spatial Dataset.  **Request parameters**   * Language * Spatial Data Set Identifier * Coordinate Reference System   **Response parameters**   * Requested Spatial Data Set in the requested language and CRS | | M |
| ***Recommended Atom-based implementation***  ***(satisfies pre-defined download only)*** | |  |
| ***Get Spatial Data Set*** | Pre-defined spatial datasets can be retrieved using the URL |

1 Mandatory/Optional/Conditional to conform with Network Services Regulation [**INS NS**]

|  |  |
| --- | --- |
| ***Request*** | template identified by rel=‖results‖ in the OpenSearch description document. The request contains the CRS, Spatial Data Set Identifier and language as parameters.  Pre-defined spatial datasets can also be retrieved by following link elements in Atom feed entries as described in Section [5.2.2](#_bookmark283)  An HTTP GET request is made to the link target. |
| ***Get Spatial Data Set Response*** | The response will be a pre-defined spatial dataset in the requested language and CRS. |

Table 3: Get Spatial Data Set – Atom Implementation

|  |  |  |
| --- | --- | --- |
| **Describe Spatial Dataset** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  This operation returns the description of all the types of Spatial Objects contained in the Spatial Dataset.  **Request parameters**   * Language * Spatial Data Set Identifier   **Response parameters**   * Description of the Spatial Objects in the requested Spatial Data Set and requested language | | M |
| ***Recommended Atom-based implementation***  ***(satisfies pre-defined download only)*** | |  |
| ***Describe Spatial Data Set Request*** | The Describe Spatial Data Set Request is issued using the URL template identified by rel=‖describedby‖ in the OpenSearch description document. The request contains the Spatial Data Set Identifier and Language as parameters. |
| ***Describe Spatial Data Set Response*** | The response is another Atom Feed (a ―Dataset Feed‖ ) containing links to descriptions of the Spatial Object Types in the <link rel=‖describedby‖> element. Reference to the INSPIRE Registry as described in Section [5.2.1](#_bookmark282) should be made where possible. |

Table 4: Describe Spatial Data Set – Atom Implementation

|  |  |
| --- | --- |
| **Link Download Service** | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  Allows the declaration, by a Public Authority or a Third Party, of the availability of a Download Service for downloading Spatial Datasets or, where practicable, Spatial Objects, through the Member State‘s Download Service while maintaining the downloading capability at the Public Authority or the Third Party location. | M |
| ***Recommended Atom-based implementation***  ***(satisfies pre-defined download only)*** |  |
| To be implemented by uploading the appropriate metadata to the INSPIRE network as referred to in Article 11 using the PublishMetadata function of an INSPIRE compliant discovery service |

Table 5: Link Download Service – Atom Implementation

* + 1. **Mapping the WFS-based Technical Guidance to the Implementing Rules**

The following set of tables shows how the guidance for WFS implementations given in Chapters 6 and 7 satisfies the Network Services Regulation. Again, each operation is in a separate table.

|  |  |  |
| --- | --- | --- |
| **Get Download Service Metadata** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  Provides all necessary information about the service, the available Spatial Datasets, and describes the service capabilities.  **Request parameters**   * Natural language to be used for the content of the response   **Response parameters**   * Download Service Metadata * Operations Metadata * Languages * Spatial Data Sets Metadata | | M |
| ***Recommended WFS-based implementation*** | |  |
| ***Get Download Service Metadata Request*** | Metadata records for Download Services shall be available in a Discovery Service. The Resource Locator metadata element for the Download Service shall contain a link to the GetCapabilities of the WFS..  The Get Download Service Metadata request is a GetCapabilities request to the WFS indicated in the metadata record. |
| ***Get Download Service Metadata Response*** | The Get Download Service Metadata Response will be a WFS capabilities document, which includes the download service INSPIRE metadata, operations metadata, response and supported languages, spatial data sets metadata and their corresponding CRS. |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get |

Table 6: Get Download Service Metadata - WFS Implementation

|  |  |
| --- | --- |
| **Get Spatial Data Set** | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  The Get Spatial Data Set operation allows the retrieval of a Spatial Dataset.  **Request parameters**   * Language * Spatial Data Set Identifier * Coordinate Reference System   **Response parameters**   * Requested Spatial Data Set in the requested language and CRS | M |

|  |  |
| --- | --- |
| ***Recommended WFS-based implementation*** | |
| ***Get Spatial Data Set Request*** | Pre-defined spatial datasets in different CRS/DataSetIdCode/ DataSetIdNamespace/language combinations can be retrieved using Stored Queries as described in Section [6.4](#_bookmark294)  A GetFeature request shall be made to a WFS that uses a StoredQuery for the pre-defined dataset. |
| ***Get Spatial Data Set Response*** | The WFS shall return a set of features corresponding to the pre- defined dataset in the requested language and CRS. |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get ISO 19143: Query |

Table 7: Get Spatial Data Set - WFS Implementation

|  |  |  |
| --- | --- | --- |
| **Describe Spatial Dataset** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  This operation returns the description of all the types of Spatial Objects contained in the Spatial Dataset.  **Request parameters**   * Language * Spatial Data Set Identifier   **Response parameters**   * Description of the Spatial Objects in the requested Spatial Data Set and requested language. | | M |
| ***Recommended WFS-based implementation*** | |  |
| ***Describe Spatial Data Set Request*** | The spatial object types are described in the GetCapabilities response of the WFS.  A GetCapabilities request is made to a WFS. |
| ***Describe Spatial Data Set Response*** | The WFS shall return a valid Capabilities document in the requested language, which identifies the Spatial Object types available. |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get |

Table 8: Describe Spatial Data Set - WFS Implementation

|  |  |  |
| --- | --- | --- |
| **Link Download Service** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part A)**  Allows the declaration, by a Public Authority or a Third Party, of the availability of a Download Service for downloading Spatial Datasets or, where practicable, Spatial Objects, through the Member State‘s Download Service while maintaining the downloading capability at the Public Authority or the Third Party location. | | M |
| ***Recommended WFS-based implementation*** | |  |
| To be implemented by uploading the Download Service INSPIRE metadata to the INSPIRE network as referred to in Article 11 using the PublishMetadata function of an INSPIRE compliant discovery service. The Resource Locator metadata element of the Download Service metadata record shall contain a link to the Atom Feed and/or the WFS GetCapabilities document. | |
| ***WFS/FE Conformance Classes*** | None |

|  |  |  |
| --- | --- | --- |
| **Get Spatial Object** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part B)**  This operation allows the retrieval of Spatial Objects based upon a query.  **Request parameters**   * Language * Spatial Data Set Identifier * Coordinate Reference System * Query   **Response parameters**   * Spatial Objects Set * Spatial Objects Set Metadata | | O  (Direct access download only) |
| ***Recommended WFS-based implementation*** | |  |
| ***Get Spatial Object Request*** | The WFS provides support for ad-hoc queries as defined in TG Requirement 63.  A GetFeature request with required query arguments is made to the WFS. |
| ***Get Spatial Object Response*** | The WFS returns a set of features that meet the requirements of the query expression. |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get  ISO 19143: Query, Ad hoc Query |

Table 10: Get Spatial Object - WFS Implementation

|  |  |  |
| --- | --- | --- |
| **Describe Spatial Object Type** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part B)**  This operation returns the description of the specified Spatial Objects types [sic].  **Request parameters**   * Language * Spatial Object Type   **Response parameters**   * Description of the Spatial Object Type in conformity with regulation (EU) No.1089/2010 | | O  (Direct access download only) |
| ***Recommended WFS-based implementation*** | |  |
| ***Request*** | A DescribeFeatureType request is made to the WFS. |
| ***Response*** | The WFS responds with the XML schema for the requested Spatial Object types |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get |

|  |  |  |
| --- | --- | --- |
| **Search Criteria for the Get Spatial Object Operation** | | **M/O/C** |
| **Description in INS NS (Annex IV, Part C)**  For the purposes of the Get Spatial Object Operation of the Download Service, the following search criteria shall be implemented:   * Unique Resource Identifier\* of Spatial Dataset, * all relevant key attributes and the relationship between Spatial Objects as set out in Regulation (EU) No 1089/2010; in particular the Unique Identifier of Spatial Object and the temporal dimension characteristics, including the date of update, * bounding box, expressed in any of the Coordinate Reference Systems listed in Regulation (EU) No 1089/2010, * Spatial Data Theme.   To allow for discovering spatial objects through a combination of search criteria, logical and comparison operators shall be supported.  \* The phrase 'Unique Identifier of Spatial Object' should be interpreted in this Technical Guidance as being the 'External unique object identifier' as set out in section 2.1 of Annex I of (EU) No 1089/2010 [INS SDS]. | | O  (Direct access download only) |
| ***Recommended WFS-based implementation*** | |  |
| ***Request*** | Various ad hoc query capabilities are provided by the Filter Encoding Specification (TG Requirement 63 to TG Requirement 68).  A GetFeature request may be made with Query arguments. |
| ***Response*** | The WFS returns a set of features that meet the requirements of the query expression. |
| ***WFS/FE***  ***Conformance Classes*** | ISO 19142: Simple WFS, HTTP Get, Basic WFS  ISO 19143: Query, Ad hoc Query, Resource Identification, Minimum Standard Filter, Minimum Spatial Filter, Minimum Temporal Filter, Minimum XPath |

Table 12: Search Capabilities - WFS Implementation

* + 1. **Mapping of Spatial Data Set Identifier parameter**

The Spatial Data Set Identifier parameter is defined in the Network Service regulation [**INS NS**] as *“The Spatial Data Set Identifier parameter shall contain the Unique Resource Identifier of the Data Set”*

The following table demonstrates how the Spatial Data Set Identifier is mapped between the Atom and WFS based Technical Guidance and the corresponding ISO metadata of the spatial data set. The Spatial Data Set Identifier parameter maps to either the RS\_Identifier or the MD\_Identifier depending on what type of Spatial Data Set Identifier is used in the corresponding ISO metadata.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **INSPIRE Download Service** | **RS\_Identifier** | **MD\_Identifier** |
| **WFS** | inspire\_dls:SpatialDataSetIdentifier/inspire\_common  :Code | gmd:RS\_Identifier  /code | gmd:MD\_Identifier  /code |
| inspire\_dls:SpatialDataSetIdentifier/inspire\_common  :Namespace | gmd:RS\_Identifier  /codespace |  |
| **ATOM** | spatial\_dataset\_identifier\_code | gmd:RS\_Identifier  /code | gmd:MD\_Identifier  /code |
| spatial\_dataset\_identifier\_namespace | gmd:RS\_Identifier  /codespace |  |

* 1. ***Conformance Classes for Download Services Technical Guidance***

In order to declare a level of conformance with this Technical Guidance it is necessary to meet the requirements of any conformance class to which conformance is declared.

The following conformance classes are defined in this document.

|  |  |  |  |
| --- | --- | --- | --- |
| **Conformance Class** | **Description** | **M/O/C** | **Chapter** |
| 1: Pre-defined Atom | Implementation of pre-defined download service using Atom | C, shall be M if ―WFS pre- defined‖ is not conformed to | 5 |
| 2: Pre-defined WFS | Implementation of pre-defined download service using WFS | C, shall be M if ―Atom pre- defined‖ is not conformed to | [6](#_bookmark292) |
| 3: Direct WFS | Implementation of direct access download service using WFS | O | 7 |
| 4: Quality of Service | Quality of Service criteria and requirements | M | [8](#_bookmark297) |

Table 14: Conformance Classes for Download Service Technical Guidance

Conformance may be declared in the Download Service ISO 19139 metadata record. Since the metadata record requires conformance to a specification rather than a part of a specification, it is suggested that the form *technicalGuidance#levelN* is used, where *technicalGuidance* refers to this document and *N* refers to the conformance class (e.g. *technicalGuidance#level2*).

Also the conformance with several conformance classes can be specified. For example, for a ―hybrid‖ implementation based on Atom for Part A and WFS for Parts B and C, which meets the quality of service requirements could declare conformance with *technicalGuidance#level1, technicalGuidance#level3 and technicalGuidance#level4.*

If a WFS service does not conform to Part A of [**INS NS,** Annex IV], it cannot on its own be considered compliant with the requirements of the Regulation. Only the combination of an Atom or WFS service conformant with part A with a WFS conformant to Parts B and C can be considered compliant.

* 1. ***Language Requirements***

The Network Services Regulation requires that multilingual aspects for network services are supported [**INS NS**]. As there is no standard way to deal with multilingualism within the current ISO or OGC specifications, the following basic principles shall be used for INSPIRE Network Services (including Download Services):

*A network service [Download Service] metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported*.

*A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. If the requested language is not supported by the service, then this parameter shall be ignored.*

For each relevant Conformance Class in this document these statements are defined as requirements and additional implementation guidance is given.

* 1. ***Implementation Roadmap for Download Services***

*Note: This section is entirely informative and is here simply to assist with practical implementations. It has no legal basis and is not any way intended to supplement, modify or replace any legally binding statements made elsewhere.*

The milestones (including dates) for implementation of all INSPIRE Services are outlined in the INSPIRE Implementation Roadmap which can be found at:

<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/44>

In order to provide clear Technical Guidance for implementation it is useful to expand upon the meaning and practical implications of the roadmap milestones that relate to Download Services.

*Note that the INSPIRE Implementation Roadmap does not make any distinction between pre-defined dataset download services and direct access download services as described in this document. The timescales and milestones for both are the same, the only discriminator being that direct access download services should be implemented where practicable*.

In the initial stages of the INSPIRE Implementation Roadmap, datasets made available via Download Services are not required to be compliant with the thematic Data Specifications and may be provided via Download Services in existing formats ‗as-is‘. So for convenience we shall refer to these here as

―*non-interoperable*‖ Download Services.

In later stages of the INSPIRE Implementation Roadmap datasets made available via Download Services *are* expected to be compliant with the thematic Data Specifications, i.e. the *data* delivered via these services must conform to the requirements of the thematic Data Specifications. So, again for convenience only, we shall refer to these here as ―*interoperable*‖ Download Services.

Since the timescales for Annex I, II and III themes differ there is some overlap between the implementation timescales of non-interoperable and interoperable Download Services.

Sections 4.4.1 to [4.4.3](#_bookmark266) provide additional guidance to help with the interpretation of those milestones, which are relevant to the provision of Download Services.

* + 1. **Roadmap for “non-interoperable” Download Services**

The milestones in [Table 15](#_bookmark263) (below) can be interpreted to mean that datasets should be made available for download via Download Services but the datasets *do not* have to be formatted according to the INSPIRE Data Specifications\*.

\**This interpretation was clarified during the workshop on legal issues held on the 17th of June 2010 in Brussels with Q&A available at:* <http://inspire.jrc.ec.europa.eu/documents/INSPIRE_/INSPIRE_legal_issues.PDF>*(page 18, final question and question part (c) page 28)*

For the latest dates of these milestones please refer to the INSPIRE Implementation Roadmap.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Milestone*** | ***Article\**** | ***Technical Guidance*** |
| **MS1** | **Member States shall provide the Download Services with initial operating capability** | 16 | For *Annex I and II* datasets, Download Services shall be provided, although these services need not fully comply with the Network Services implementing rules at this point. The *data* delivered by these services do not need to comply with the thematic Data Specifications. |
| **MS2** | **Download services operational** | 16 | For *Annex I and II* datasets, fully compliant (with IR NS) Download Services shall be provided. The *data* delivered by these services do not need to comply with the thematic Data Specifications. |

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Milestone*** | ***Article\**** | ***Technical Guidance*** |
| **MS3** | **Metadata available for spatial datasets and services corresponding to Annex III** | 6(b) | For Annex III datasets, fully compliant (with IR NS) Download Services shall be provided. The *data* delivered by these services do not need to comply with the thematic Data Specifications. |

Table 15: Milestones for "non-interoperable" Download Services

\*From the INSPIRE Directive

* + 1. **Roadmap for “interoperable” Download Services**

The milestones in [Table 16](#_bookmark265) (below) can be interpreted to mean that datasets should be made available for download via Download Services in a way that is *compliant* with the requirements of the Data Specifications as well as the Network Services requirements.

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Milestone*** | ***Article\**** | ***Technical Guidance*** |
| **MS4** | **Implementation of Commission Regulation (EU) No 102/2011 of 4 February 2011 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial datasets and services for newly collected and extensively restructured Annex I spatial datasets available** | 7§3, 9(a) | Newly collected or extensively restructured Annex I datasets shall be made available via Download Services in a way that is compliant with both Data Specifications and Network Services requirements. |
| **MS5** | ***Newly collected and extensively restructured Annex II and III spatial datasets available*** | 7§3, 9(b) | Newly collected or extensively restructured Annex II and III datasets shall be made available via Download Services in a way that is compliant with both Data Specifications and Network Services requirements. |
| **MS6** | **Implementation of Commission Regulation (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial datasets and services for other Annex I spatial datasets still in use at the date of adoption** | 7§3, 9(a) | All Annex I datasets still in use shall be made available via Download Services in a way that is compliant with both Data Specifications and Network Services requirements. |
| **MS7** | **Other Annex II and III spatial datasets available in accordance with IRs for Annex II and III** | 7§3, 9(b) | All Annex II and III datasets still in use shall be made available via Download Services in a way that is compliant with both Data Specifications and Network Services requirements. |

Table 16: Milestones for "interoperable" Download Services

\*From the INSPIRE Directive

* + 1. **Illustrative Roadmap for all Download Services**

The roadmap described above in sections [4.4.1](#_bookmark262) and [4.4.2](#_bookmark264) is further illustrated in [Figure 4](#_bookmark267):

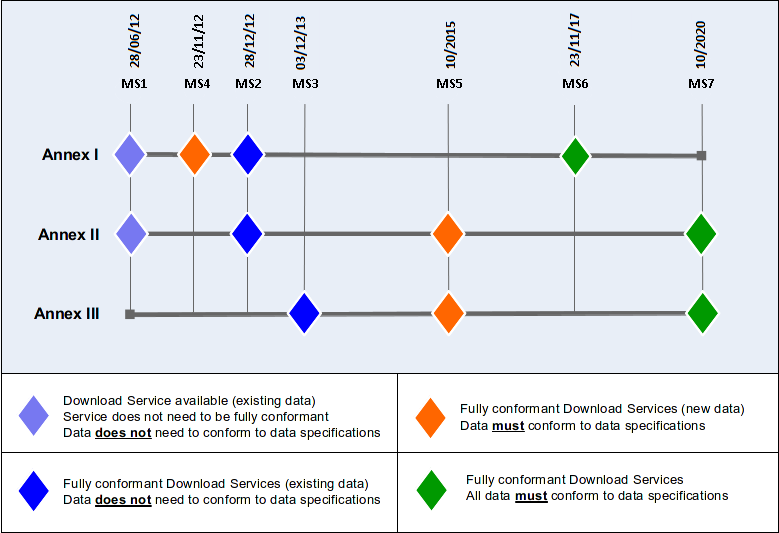


Figure 4: Illustration of Implementation Roadmap\*

*\*Dates in this figure are accurate at the time of publication. For definitive dates refer to the roadmap published on the INSPIRE website: (*[*http://inspire.jrc.ec.europa.eu/index.cfm/pageid/44*](http://inspire.jrc.ec.europa.eu/index.cfm/pageid/44)*)*

1. **Atom Implementation of Pre-defined Dataset Download Service**

**TG Conformance Class 1: Pre-defined Atom:** Implement Pre-Defined Dataset Download Service (―Part A‖) using Atom

*This conformance class is inclusive of: TG Requirement 1 to* [*TG Requirement 45*](#_bookmark291)

[*TG Recommendation 1*](#_bookmark273) *to* [*TG Recommendation 12*](#_bookmark286)

An operational implementation of an INSPIRE Atom based Download Service implementation is available on the INSPIRE Geoportal:

|  |  |
| --- | --- |
| Demo | <http://inspire-geoportal.ec.europa.eu/demos/ccm/> |
| Top feed | [http://inspire-](http://inspire-geoportal.ec.europa.eu/demos/ccm/democcmdownloadservice.atom.en.xml) [geoportal.ec.europa.eu/demos/ccm/democcmdownloadservice.atom.en.xml](http://inspire-geoportal.ec.europa.eu/demos/ccm/democcmdownloadservice.atom.en.xml) |
| Code inspector | <http://inspire-geoportal.ec.europa.eu/demos/ccm/codeview.html>  This web page displays the source code of the Atom feeds and of the OpenSearch description document of the demo. When clicking on specific rows of the code or description, the text of the relevant requirement is displayed. |

This Technical Guidance recommends the Atom syndication format [**ATOM**] as one way to implement pre-defined dataset download services with a minimal implementation cost and complexity. Section

[4.1.1](#_bookmark260) contains a descriptive mapping between the Network Services Regulation [**INS NS**] and the guidance in this chapter.

The Atom syndication format provides a simple, widely understood mechanism for publishing information on the web in the form of feeds in a way that is compatible with existing web architecture and many tools. In addition Atom is supplemented in this guidance by OpenSearch which provides a service-type interface to the static atom documents.

As described in the Atom standard [**ATOM**], Atom is an XML-based document format that describes lists of related information known as "feeds". These feeds are then composed of a number of items, known as "entries", each with an extensible set of elements that contain information about the entry. For example, each entry has a title. Entries may also contain additional feeds.

*Example 1: Sample Atom feed, containing two entries:*

<entry>

<title>My first Atom entry</title>

<?xml version="1.0" encoding="utf-8"?>

<feed [xmlns="http://www.w3.org/2005/Atom">](http://www.w3.org/2005/Atom)

<title>Simple Atom feed example</title>

<link [href="http://myexample.com/"/>](http://myexample.com/)

<updated>2011-12-14T13:16:32Z</updated>

<author>

<name>A. N. Other</name>

</author>

<id>urn:uuid:8fa70ca0-2659-11e1-bfc2-0800200c9a66</id>

<entry>

<title>My second Atom entry</title>

<link [href="http://myexample.com/atom456xyz"/>](http://myexample.com/atom456xyz)

<id>urn:uuid: f80b23d0-2659-11e1-bfc2-0800200c9a66</id>

<updated>2011-12-14T13:16:32Z</updated>

<summary>This is another entry in a feed</summary>

</entry>

</feed>

<link [href="http://myexample.com/atom123abc"/>](http://myexample.com/atom123abc)

<id>urn:uuid:c53a6970-2659-11e1-bfc2-0800200c9a66 </id>

<updated>2011-12-14T13:15:02Z</updated>

<summary>This is an entry in a feed</summary>

</entry>

This Technical Guidance recommends using Atom feeds to make available pre-defined datasets in a consistent manner. The guidance in this chapter can be summarised at a high-level as follows:

 A single Atom feed is published as a top-level ―Download Service Feed2‖.

 This feed contains a link to an OpenSearch description document which provides operations metadata for the Download Service. The OpenSearch description document provides information about the operations implemented by the download service.

 This feed contains one or more Atom entries: one per pre-defined data set.

 Each of these Atom entries shall contain a link to *another* Atom Feed (a ―Dataset Feed‖) that describes the particular pre-defined data set.

 Each of these ―Dataset Feeds‖ shall contain Atom Entries with links to download the pre- defined dataset in different formats (e.g. in GML, ShapeFile, etc.) and in different Coordinate Reference Systems. One link shall be provided for each format/CRS combination.

 Feeds may be provided in multiple languages (as described in Section [5.3](#_bookmark287)) This pattern is illustrated further in [Figure 5.](#_bookmark270)

**TG Requirement 1** Pre-defined Dataset Download Service implementations shall publish separate datasets as individual entries within an Atom feed.

**TG Requirement 2** All Atom feeds (and entries in feeds) shall conform to all the requirements in the Atom specification, RFC 4287.

In addition the Atom feeds are supplemented with GeoRSS information to enable integration in tools that support this format (e.g. Google Earth).

**TG Requirement 3** All GeoRSS information in Atom feeds shall conform to the GeoRSS-Simple specification.

2 the terms ―Download Service Feed(s)‖ and ―Dataset Feed(s)‖ are used in this chapter to differentiate between the two types of feed. However the terms have no wider meaning in INSPIRE (legally or otherwise).

In addition the Atom feeds are supplemented with OpenSearch information to as a way to specify operations for the Download Service.

**TG Requirement 4** All OpenSearch information in Atom feeds shall conform to the OpenSearch specification.

It is also possible to enrich the Atom feeds with XML content from other schemes although discussion of this is beyond the scope of the Technical Guidance.

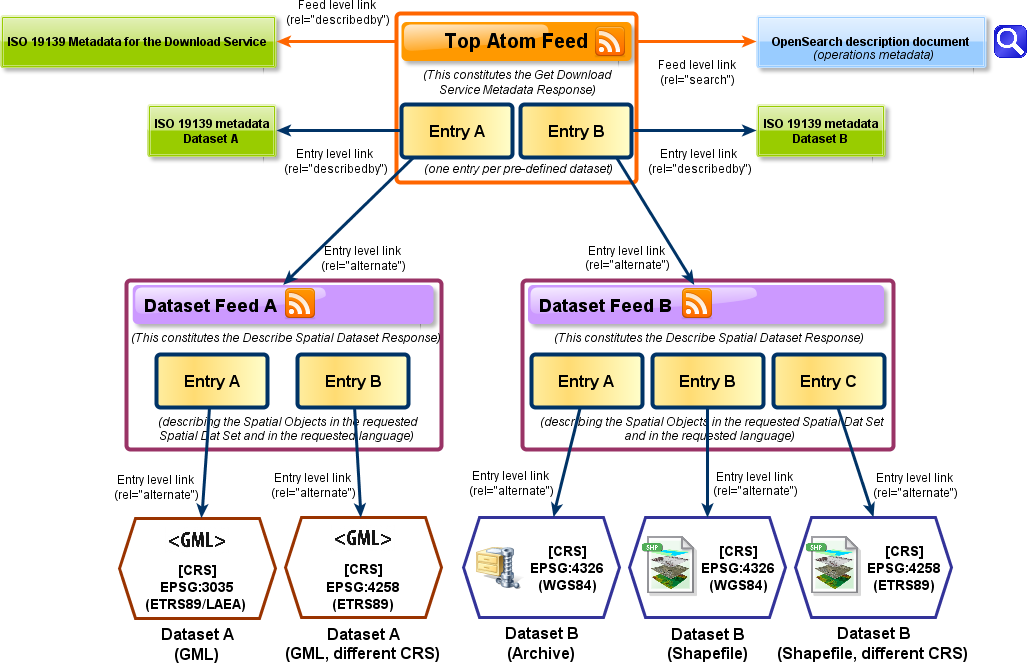


Figure 5 Overview of Atom feed structures

* 1. ***Atom “Download Service Feed” containing an entry for a Pre- defined dataset***

The following Download Service Feed example contains a single Atom entry which points to the Dataset Feed for a pre-defined dataset, in this case a Hydrography dataset. The Dataset Feed is described in Section [5.2.](#_bookmark281) This example is conformant to the Pre-defined Atom conformance class and can be used as a template for implementation.

*Example 2: Sample “Download Service Feed” (Atom) with an entry for a Hydrography dataset*

|  |
| --- |
| <!-- Example "Download Service Feed" --> |
| <feed [xmlns="http://www.w3.org/2005/Atom"](http://www.w3.org/2005/Atom) [xmlns:georss="http://www.georss.org/georss"](http://www.georss.org/georss)  [xmlns:inspire\_dls="http://inspire.ec.europa.eu/schemas/inspire\_dls/1.0"](http://inspire.ec.europa.eu/schemas/inspire_dls/1.0)  xml:lang="en"> |
| <!-- feed title --> |
| <title>XYZ Example INSPIRE Download Service</title> |

|  |
| --- |
| <!-- feed subtitle --> |
| <subtitle>INSPIRE Download Service of organisation XYZ providing Hydrography data</subtitle> |
| <!-- link to download service ISO 19139 metadata --> |
| <link h[ref="http://xyz.org/metadata/iso19139\_document.xml"](http://xyz.org/metadata/iso19139_document.xml) rel="describedby" type="application/xml"/> |
| <!-- self-referencing link to this feed --> |
| <link [href="http://xyz.org/download/en.xml"](http://xyz.org/download/en.xml) rel="self" type="application/atom+xml"  hreflang="en" title="This document"/> |
| <!-- link to Open Search definition file for this service--> |
| <link rel="search" [href="http://xyz.org/search/opensearchdescription.xml"](http://xyz.org/search/opensearchdescription.xml) type="application/opensearchdescription+xml" title="Open Search Description  for XYZ download service"/> |
| <!-- link to this feed in another language --> |
| <link [href="http://xyz.org/download/de.xml"](http://xyz.org/download/de.xml) rel="alternate" type="application/atom+xml" hreflang="de"  title="The download service information in German"/> |
| <!-- link to another representation of this feed (HTML) --> |
| <link [href="http://xyz.org/download/index.html"](http://xyz.org/download/index.html) rel="alternate" type="text/html" hreflang="en"  title="An HTML version of this document"/> |
| <!-- link to this feed in HTML in another language--> |
| <link [href="http://xyz.org/download/index.de.html"](http://xyz.org/download/index.de.html) rel="alternate" type="text/html" hreflang="de"  title="An HTML version of this document in German"/> |
| <!-- identifier --> |
| [<id>http://xyz.org/download/en.xml](http://xyz.org/download/en.xml)</id> |
| <!-- rights, access restrictions --> |
| <rights>Copyright (c) 2012, XYZ; all rights reserved</rights> |
| <!-- date/time this feed was last updated --> |
| <updated>2012-03-31T13:45:03Z</updated> |
| <!-- author contact information --> |
| <author>  <name>John Doe</name>  [<email>doe@xyz.org</email>](mailto:doe@xyz.org)  </author> |
| <!-- entry for a "Dataset Feed" for a pre-defined dataset --> |
| <entry> |
| <!-- title for "Dataset Feed" for pre-defined dataset --> |
| <title>Water network ABC Dataset Feed</title> |
| <!--Spatial Dataset Unique Resource Identifier for this dataset--> |
| <inspire\_dls:spatial\_dataset\_identifier\_code>wn\_id1</inspire\_dls:spatial\_ dataset\_identifier\_code>  <inspire\_dls:spatial\_dataset\_identifier\_namespace[>http://xyz.org/</inspire\_](http://xyz.org/)  dls:spatial\_dataset\_identifier\_namespace> |
| <!-- link to dataset metadata record --> |
| <link [href="http://xyz.org/metadata/abcISO19139.xml"](http://xyz.org/metadata/abcISO19139.xml) rel="describedby" type="application/xml"/> |
| <!-- link to "Dataset Feed" for pre-defined dataset --> |

|  |
| --- |
| <link rel="alternate" [href="http://xyz.org/data/waternetwork\_feed.xml"](http://xyz.org/data/waternetwork_feed.xml) type="application/atom+xml"  hreflang="en" title="Feed containing the pre-defined waternetwork dataset (in one or more downloadable formats)"/> |
| <!-- link to related WFS implementing Direct Access operations --> |
| <link rel="related" href="[http://xyz.org/wfs?request=GetCapabilities&amp;service=WFS&amp;versio](http://xyz.org/wfs?request=GetCapabilities&amp%3Bservice=WFS&amp%3Bversio) n=2.0.0" type="application/xml" title="Service implementing Direct Access  operations"/> |
| <!-- identifier for "Dataset Feed" for pre-defined dataset --> |
| [<id>http://xyz.org/data/waternetwork\_feed.xml</id>](http://xyz.org/data/waternetwork_feed.xml) |
| <!-- rights, access info for pre-defined dataset --> |
| <rights>Copyright (c) 2002-2011, XYZ; all rights reserved</rights> |
| <!-- last date/time this entry was updated --> |
| <updated>2012-03-31T13:45:03Z</updated> |
| <!-- summary --> |
| <summary>This is the entry for water network ABC Dataset</summary> |
| <!-- optional GeoRSS-Simple polygon outlining the bounding box of the pre-defined dataset described by the entry. Must be lat lon --> |
| <georss:polygon>47.202 5.755 55.183 5.755 55.183 15.253 47.202  15.253 47.202 5.755</georss:polygon> |
| <!-- CRSs in which the pre-defined Dataset is available --> |
| <category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89 / UTM zone 32N"/>  <category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>  </entry> |
| <!-- Any number of "Dataset Feeds" for different pre-defined datasets may be added here as separate entries --> |
| </feed> |

Note that only some of the mandatory INSPIRE Metadata elements for the Download service have been mapped to the Atom feed files.

|  |  |
| --- | --- |
| **INSPIRE Metadata elements**  **(Mandatory - Conditional)** | **Atom implementation** |
| Resource Title (M) | /feed/title |
| Resource Abstract (M) | /feed/subtitle |
| Resource Type (M) | Not mapped |
| Resource Locator (C) | Feed level link in the top Atom feed  /feed/link[@rel="self"] |
| Coupled Resource (C) | Entry level link in the top Atom feed  /feed/entry/link[@rel="describedby"] |
| Spatial Data Service Type (M) | Not mapped |
| Keyword (M) | Not mapped |

|  |  |
| --- | --- |
| **INSPIRE Metadata elements**  **(Mandatory - Conditional)** | **Atom implementation** |
| Geographic Bounding Box (C) | Not mapped |
| Temporal Reference (M) | Not mapped |
| Spatial Resolution (C) | Not mapped |
| Conformity (M) | Not mapped |
| Conditions for Access and Use (M) | Not mapped |
| Limitations on Public Access (M) | Feed level link in the top Atom feed  /feed/rights |
| Responsible Organisation (M) | Feed level link in the top Atom feed  /feed/author |
| Metadata Point of Contact (M) | Not mapped |
| Metadata Date (M) | Feed level link in the top Atom feed  /feed/updated |
| Metadata Language (M) | Feed level link in the top Atom feed  /feed/link[@rel="self"]/@hreflang |

Table 17: Mapping of INSPIRE Metadata elements to Atom

All the required INSPIRE metadata elements are to be found in the linked ISO 19139 metadata document for the Download service as explained in Section [5.1.3](#_bookmark274).

The following sections explain in more detail how this example Atom feed is formed and what must be done to meet particular Technical Guidance requirements.

* + 1. **Download Service Feed: feed „title‟ element**

The title element shall be used to provide a title for the feed as a whole. Typically this will correspond with the ‗Resource Title‘ in the corresponding service metadata record.

*Example 3: Sample feed title*

<title>XYZ Example INSPIRE Download Service</title>

<!-- feed title -->

**TG Requirement 5** The ‗title‘ element of an Atom feed shall be populated with a human readable title for the feed.

* + 1. **Download Service Feed: feed „subtitle‟ element**

The subtitle element may be used to provide a subtitle (containing additional information) for the feed as a whole. Typically this will correspond with the ‗Resource Abstract‘ in the corresponding service metadata record.

*Example 4: Sample feed subtitle*

<subtitle>INSPIRE Download Service of organisation XYZ providing Hydrography data</subtitle>

<!-- feed subtitle -->

|  |
| --- |
| TG Recommendation 1 The ‗subtitle‘ element of an Atom feed may be populated with a human readable subtitle for the feed. |

* + 1. **Download Service Feed: feed „link‟ element – service metadata**

Every Download Service must have a corresponding Metadata record in a discovery service.

An Atom link element shall be provided that links to the metadata record for this Download Service. This should be a discovery service metadata record. The value of the ‗rel‘ attribute for this link shall be

―describedby‖ [**POWDER**] The value of the ‗type‘ attribute shall be ―application/xml‖ or

―application/vnd.ogc.csw.GetRecordByIdResponse\_xml‖.

*Example 5: Example service metadata link*

<link [href="http://xyz.org/metadata/iso19139\_document.xml"](http://xyz.org/metadata/iso19139_document.xml) rel="describedby" type="application/xml"/>

<!-- link to service ISO 19139 metadata -->

**TG Requirement 6** The ―Download Service Feed‖ shall contain an Atom ‗link‘ element that links to the metadata record for this Download Service. The value of the ‗rel‘ attribute of this element shall be ―describedby‖ and the value of the ‗type‘ attribute shall be either "application/xml".

NOTE In case of a ―hybrid implementation‖ based on Atom and WFS for Parts B and C, only the Atom service needs to be described through metadata in a discovery service. The link to the WFS implementations shall be established through the ―related‖ link element in the Atom feed (see [TG](#_bookmark278) [Requirement 16](#_bookmark278)).

* + 1. **Download Service Feed: feed „link‟ element – self-reference**

The feed shall have a link element which contains an HTTP URI for the feed document itself. This URI shall provide the location of the feed and resolve to the feed. The value of the ‗rel‘ attribute for this link shall be ―self‖.

*Example 6: Example reference to feed*

<link [href="http://xyz.org/download/en.xml"](http://xyz.org/download/en.xml) rel="self" type="application/atom+xml"

hreflang="en" title="This document"/>

<!-- self-referencing link to this feed -->

**TG Requirement 7**

The ―Download Service Feed‖ shall contain an Atom ‗link‘ element that contains an HTTP URI for the ―Download Service Feed‖ document. The value of the ‗rel‘ attribute of this element shall be ―self‖, the ‗hreflang‘ attribute shall use the appropriate language code and the value of the ‗type‘ attribute shall be ―application/atom+xml‖.

* + 1. **Download Service Feed: feed „link‟ element – OpenSearch Description Document**

A link element shall be provided that links to an OpenSearch description document for the Download Service. The value of the ‗rel‘ attribute of this link shall be ―search‖. The structure of the OpenSearch description document is described separately in Section [5.4.](#_bookmark288)

**TG Requirement 8** The ―Download Service Feed‖ shall contain an Atom ‗link‘ element that contains a link to an OpenSearch description document for the Download Service. The value of the ‗rel‘ attribute of this element shall be ―search‖, the

‗hreflang‘ attribute shall use the appropriate language code and the value of the ‗type‘ attribute shall be ―application/opensearchdescription+xml‖.

* + 1. **Download Service Feed: feed „link‟ element – alternative languages**

If the feed is available in different languages a link element shall be provided to each alternative language version of the document. This is described in detail in Section [5.3](#_bookmark287) (Language Requirements for Atom Implementation).

* + 1. **Download Service Feed: feed „link‟ element – alternative representation formats**

It is possible, although not a requirement of this guidance, to provide alternative representations of the feeds, for example in HTML. In this case the ―alternate‖ value shall again be used for the ‗rel‘ attribute.

*Example 7: Alternative links to HTML versions of a document (in both English and German).*

|  |
| --- |
| <!-- link to another representation of this feed (HTML) --> |
| <link [href="http://xyz.org/download/index.html"](http://xyz.org/download/index.html) rel="alternate" type="text/html" hreflang="en"  title="An HTML version of this  document"/> |
| <!-- link to this feed in HTML in another language--> |
| <link [href="http://xyz.org/download/index.de.html"](http://xyz.org/download/index.de.html) rel="alternate" type="text/html" hreflang="de"  title="An HTML version of this  document in German"/> |

The HTML representation is useful to control how Atom feeds are displayed in different browsers and to be sure that all download links are easily accessible.

For example, in Internet Explorer the link to dataset feeds are not clickable.

The two screenshots shown in [Figure 6](#_bookmark275) and [Figure 7](#_bookmark276) illustrate that, when using the HTML representations, feed visualization is consistent between browsers, and download links (boxed in red) are accessible from the top feed.

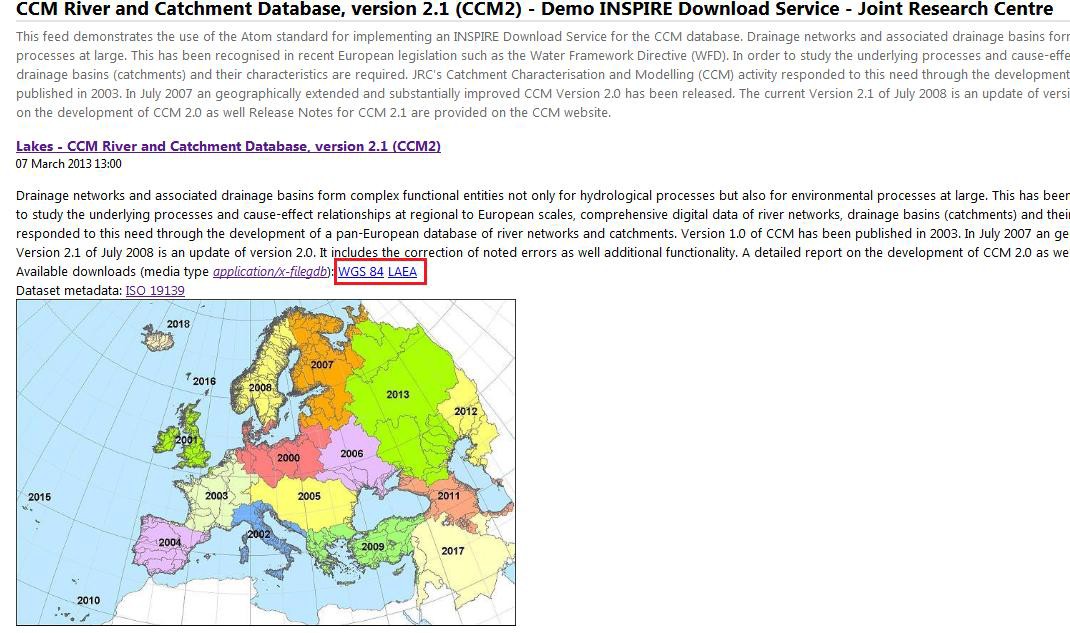


Figure 6. Atom feed viewed in Firefox

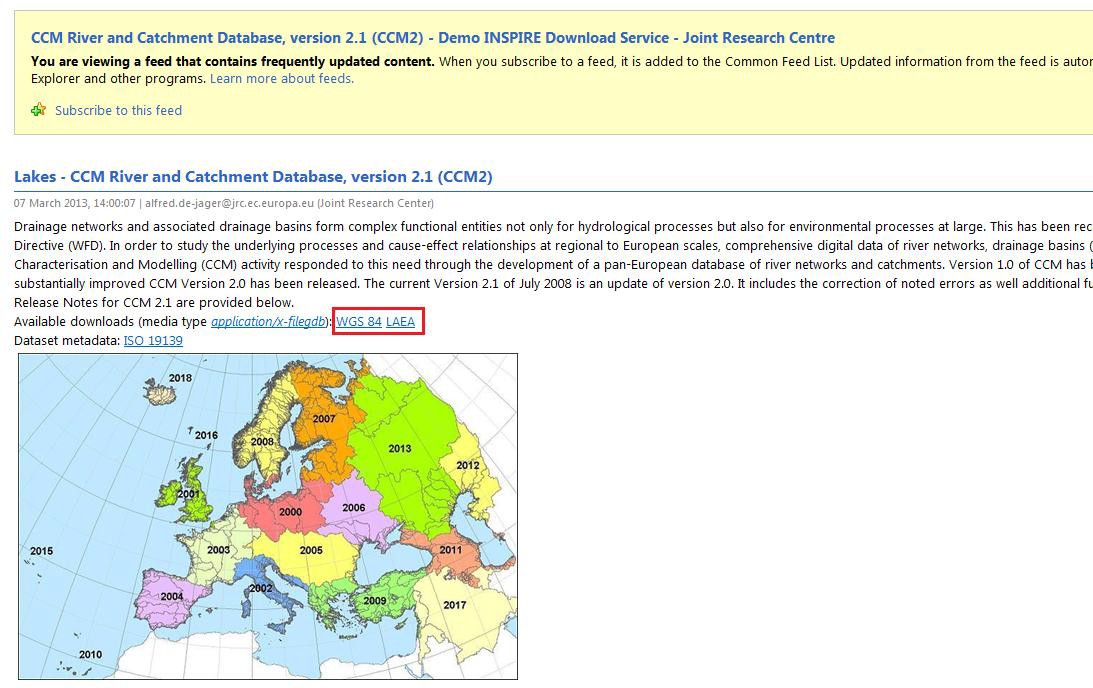


Figure 7. Atom feed viewed in Internet Explorer

|  |
| --- |
| TG Recommendation 2 Alternative representations (for example HTML) should be provided as links.  Where this is done the ‗rel‘ attribute should have the value ―alternate‖. |

NOTE In the Apple Safari browser, Atom feed support has been removed starting in version 6. The open source and free Vienna RSS/Atom feed reader application [(http://www.vienna-rss.org/](http://www.vienna-rss.org/)) has been successfully tested as a replacement of the functionality previously available in Safari.

* + 1. **Download Service Feed: feed „id‟ element**

An identifier shall be provided for the feed as a whole. This identifier shall be the same HTTP URI that was used for the ‗self‘ reference and shall therefore also dereference to the feed itself.

(In the Atom standard it is not required that the ‗id‘ matches the ‗self‘ reference but since this Download TG requires the use of HTTP URIs to identify feeds they are the same as a consequence).

*Example 8: Example feed id element*

[<id>http://xyz.org/download/en.xml</id>](http://xyz.org/download/en.xml)

<!-- identifier -->

**TG Requirement 9** The ‗id‘ element of a feed shall contain an HTTP URI which dereferences to the feed

* + 1. **Download Service Feed: feed „rights‟ element**

The ‗rights‘ element shall be used to capture any information about rights or restrictions to the Download Service. Typically this will correspond with the value of ‗accessConstraints‘ in the corresponding service metadata record. Note that rights and restrictions may also be applied to individual pre-defined datasets in the linked ―Dataset feed‖.

*Example 9: Example feed rights element*

<rights>Copyright (c) 2012, XYZ; all rights reserved</rights>

<!-- rights, access restrictions -->

**TG Requirement 10** The ‗rights‘ element of a feed shall contain information about rights or restrictions for that feed.

* + 1. **Download Service Feed: feed „updated‟ element**

The ‗updated‘ element shall contain the date and time of the most recent changes to the feed.

*Example 10: Example updated element*

<updated>2012-03-31T13:45:03Z</updated>

<!-- date/time this feed was last updated -->

**TG Requirement 11** The ‗updated‘ element of a feed shall contain the date, time and timezone at which the feed was last updated.

* + 1. **Download Service Feed: feed „author‟ element**

The ‘author‘ element shall contain the contact information for the author of the feed. This may be contact information for an individual or organisation responsible for the feed. More than one author element may be provided.

*Example 11: Example feed author element*

<author>

<name>John Doe</name>

[<email>doe@xyz.org</e](mailto:doe@xyz.org)mail>

</author>

<!-- author contact information -->

**TG Requirement 12** The ‗author‘ element of a feed shall contain current contact information for an individual or organisation responsible for the feed. At the minimum, a name and email address shall be provided as contact information.

* + 1. **Download Service Feed: feed „entry‟ element**

As per [TG Requirement 1](#_bookmark269) an entry shall be included for each pre-defined dataset.

*Example 12: Example entry showing a link to a single “Dataset Feed”*

|  |
| --- |
| <!-- entry for a "Dataset Feed" for a pre-defined dataset --> |
| <entry> |
| <!-- title for "Dataset Feed" for pre-defined dataset --> |
| <title>Water network ABC Dataset Feed</title> |
| <!—Spatial Dataset Unique Resourse Identifier for this dataset--> |
| <inspire\_dls:spatial\_dataset\_identifier\_code>wn\_id1</inspire\_dls:spatial\_ dataset\_identifier\_code>  <inspire\_dls:spatial\_dataset\_identifier\_namespace[>http://xyz.org/</inspire\_](http://xyz.org/)  dls:spatial\_dataset\_identifier\_namespace> |
| <!-- link to dataset metadata record --> |
| <link [href="http://xyz.org/metadata/abcISO19139.xml"](http://xyz.org/metadata/abcISO19139.xml) rel="describedby" type=‖application/xml‖/> |
| <!-- link to "Dataset Feed" for pre-defined dataset --> |
| <link rel="alternate" [href="http://xyz.org/data/waternetwork\_feed.xml"](http://xyz.org/data/waternetwork_feed.xml) type="application/atom+xml"  hreflang="en" title="Feed containing the pre-defined waternetwork dataset (in one or more downloadable formats)"/> |
| <!-- identifier for this entry --> |
| [<id>http://xyz.org/data/abc/waternetwork](http://xyz.org/data/abc/waternetwork)</id> |
| <!-- rights, access info for pre-defined dataset --> |
| <rights>Copyright (c) 2002-2011, XYZ; all rights reserved</rights> |
| <!-- last date/time this entry was updated --> |
| <updated>2012-03-31T13:45:03Z</updated> |
| <!-- optional GeoRSS-Simple polygon defining the bounding box of the pre-defined dataset. Must be lat lon --> |
| <georss:polygon>47.202 5.755 55.183 5.755 55.183 15.253 47.202  15.253 47.202 5.755</georss:polygon>  </entry> |

* + 1. **Download Service Feed: entry INSPIRE identifier elements**

Each entry in the download service feed shall contain the INSPIRE Spatial Dataset Unique Resource Identifier for the dataset described by that entry. This is the Spatial Dataset Unique Resource Identifier as described in the INSPIRE Metadata Regulation [**INS MD**]. This shall be provided in two parts, the code (*inspire\_dls:spatial\_dataset\_identifier\_code*) and namespace (*inspire\_dls:dsid\_namspace*). The *inspire\_dls* namespace is defined as in the feed as follows:

*Example 13: Namespace declaration for inspire\_dls*

[xmlns:inspire\_dls="http://inspire.ec.europa.eu/schemas/inspire\_dls/1.0](http://inspire.ec.europa.eu/schemas/inspire_dls/1.0)"

*Example 14: Example Spatial Dataset URI*

<inspire\_dls:spatial\_dataset\_identifier\_code>wn\_id1</inspire\_dls:spatial\_da taset\_identifier\_code>

<inspire\_dls:spatial\_dataset\_identifier\_namespace><http://xyz.org/data></insp ire\_dls:spatial\_dataset\_identifier\_namespace>

<!—Spatial Dataset Unique Resourse Identifier for this dataset-->

**TG Requirement 13** Each feed ‗entry‘ in a ―Download Service Feed‖ shall contain *spatial\_dataset\_identifier\_code* and *spatial\_dataset\_identifier\_namespace* elements which together contain the Spatial Dataset Unique Resource Identifier for the dataset described by the feed. These elements are defined in the *inspire\_dls* schema which shall be included in the namespace declarations of the feed.

* + 1. **Download Service Feed: entry „link‟ to dataset metadata record**

Each entry shall contain a link to a (ISO 19139) dataset metadata record. There shall be only one such link in each feed entry.

*Example 15: Example link to a dataset metadata record*

<link [href="http://xyz.org/metadata/abcISO19139.xml"](http://xyz.org/metadata/abcISO19139.xml) rel="describedby" type=‖application/xml‖/>

<!-- link to dataset metadata record -->

**TG Requirement 14** Each feed ‗entry‘ in a ―Download Service Feed‖ shall contain a link to a Dataset metadata record. This link shall have a ‗rel‘ attribute with a value of

―describedby‖ and a ‗type‘ attribute with a value ―application/xml‖

* + 1. **Download Service Feed: entry „link‟ to dataset feed**

Each entry shall contain a link to a ―Dataset Feed‖ (Dataset Feeds are described in Section [5.2](#_bookmark281)). There shall be only one such link in each feed entry.

*Example 16: Example link to a single “Dataset Feed”*

<link rel="alternate" [href="http://xyz.org/data/waternetwork\_feed.xml"](http://xyz.org/data/waternetwork_feed.xml) type="application/atom+xml"

<!-- link to "Dataset Feed" for pre-defined dataset -->

hreflang="en" title="Feed containing the pre-defined waternetwork dataset (in one or more downloadable formats)"/>

**TG Requirement 15** Each feed ‗entry‘ in a ―Download Service Feed‖ shall contain a single link to a

―Dataset Feed‖. This link shall have a ‗rel‘ attribute with a value of ―alternate‖ and a ‗type‘ attribute with a value ―application/atom+xml‖

* + 1. **Download Service Feed: entry „link‟ to WFS implementation (only for “hybrid implementations”)**

If the Atom implementation is complemented by one or several WFS for the Direct Access operations Get Spatial Object and Describe Spatial Object Type (―hybrid implementation‖, see section [4](#_bookmark259)), a link needs to be established to the service offering these additional operations.

**TG Requirement 16** In case of a ―hybrid implementation‖ based on Atom for Part A of [**INS NS**, Annex IV] and WFS for Parts B and C of [**INS NS**, Annex IV], a link shall be provided to the WFS Capabilities document. Where this is done the ‗*rel‟* attribute shall have the value ―related‖ and the *„type‟* attribute shall have the value ―application/xml‖

*Example 17: Example link to a WFS implementation for the Direct Access operations*

<link rel="related" href="[http://xyz.org/wfs?request=GetCapabilities&amp;service=WFS&amp;versio](http://xyz.org/wfs?request=GetCapabilities&amp%3Bservice=WFS&amp%3Bversio) n=2.0.0" type="application/xml" title="Service implementing Direct Access operations"/>

<!-- link to related WFS implementing Direct Access operations -->

* + 1. **Download Service Feed: entry, additional elements**

The guidance for id, title and updated elements for each entry is equivalent to the guidance for the same elements in the enclosing feed and can be summarised by the following requirements and recommendations:

**TG Requirement 17** The ‗id‘ element of a feed entry in a Download Service Feed shall contain an identifier for that feed entry.

**TG Requirement 18** The ‗title‘ element of a feed entry in a Download Service Feed shall be populated with a human readable title for the feed entry.

**TG Requirement 19** The ‗updated‘ element of a feed entry in a Download Service Feed shall contain the date, time and timezone at which the feed entry was last updated.

Since the ‗rights‘ information may often be the same for all entries in a feed this element may be omitted for each individual entry if it is present in the enclosing feed. The rights in this case refer to the pre-defined dataset the feed entry describes.

|  |
| --- |
| TG Recommendation 3 The ‗rights‘ element of a feed entry may contain information about rights or restrictions specific to that feed entry. |

In the case where ‗rights‘ information is not given for individual entries, the entries assume the rights of the enclosing feed.

Similarly, the ‗author‘ information may often be the same for all entries in a feed so this element may also be omitted for each individual entry.

|  |
| --- |
| TG Recommendation 4 The ‗author‘ element of a feed entry may contain information about the author specific to that feed entry. |

Again, in the case where ‗author‘ information is not given for individual entries, the entries assume the author properties of the enclosing feed.

* + 1. **Download Service Feed: entry „summary‟ element**

The ‘summary‘ element may contain additional human-readable information about the feed entry.

*Example 18: Example summary element*

<summary>This is the entry for water network ABC Dataset</summary>

<!-- summary -->

|  |
| --- |
| TG Recommendation 5 The ‗summary‘ element of a feed entry should contain a summary description of the feed entry. |

* + 1. **Download Service Feed: entry „georss‟ element**

To enable GeoRSS [**GeoRSS**] tools to display INSPIRE Atom feeds we recommend augmenting the Atom feed entries with GeoRSS elements to show the geographic extent of the datasets.

|  |
| --- |
| TG Recommendation 6 GeoRSS-Simple should be used in feed entries to indicate the geographic extent of the dataset. |

Since georss:box is not well supported in common tools it is recommended to use georss:polygon to define bounding boxes, and georss:point when a dataset‘s geometric extent is represented by a single point location. It is not recommended to use georss:box.

|  |
| --- |
| TG Recommendation 7 The bounding box of the dataset described by a feed entry should be provided using a georss:polygon, unless the geographic extent is a single point in which case georss:point should be used. |

As determined by the GeoRSS specification, the extent of the dataset must be in WGS84 lat-lon. This extent should correspond with the ‗Geographic Bounding Box‘ in the corresponding dataset metadata record.

*Example 19: GeoRSS-Simple Point*

<georss:point>53.1 10.2</georss:point>

<!—example GeoRSS-Simple Point -->

*Example 20: GeoRSS-Simple Polygon*

<georss:polygon>47.202 5.755 55.183 5.755 55.183 15.253 47.202 15.253

47.202 5.755</georss:polygon>

<!— a bounding box expressed as a GeoRSS-Simple Polygon -->

Note that the polygon describing a rectangular bounding box contains five points, the last being the same as the first.

* + 1. **Download Service Feed: entry „category‟ element – CRSs**

The category element shall be used within the feed entry to indicate the CRSs in which the pre-defined dataset is available.

*Example 21: Example CRS descriptions*

<category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89

/ UTM zone 32N"/>

<category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>

<!-- CRSs in which the pre-defined Dataset is available -->

**TG Requirement 20** Each feed entry shall contain an Atom ‗category‘ element for each CRS in which the pre-defined dataset is available. This category element shall refer to a well-known definition of a coordinate reference system.

This Technical Guidance places no requirements on the coordinate reference systems in which data should be made available. Guidance and requirements for coordinate reference systems is given in the thematic Data Specifications and the regulation on the interoperability of spatial datasets and services **[INS SDS]**.

* 1. ***Atom “Dataset feed” containing download links to a pre- defined dataset***

The following ―Dataset feed‖ example contains the description of the spatial objects in the pre-defined dataset and entries, which point to the pre-defined dataset in a variety of CRS and format combinations. This example is conformant to the Pre-defined Atom conformance class and can be used as a template for implementation.

*Example 22: Example “Dataset Feed” containing links to a pre-defined dataset*

|  |
| --- |
| <!-- Example "Dataset Feed" --> |
| <feed [xmlns="http://www.w3.org/2005/Atom"](http://www.w3.org/2005/Atom) [xmlns:georss="http://www.georss.org/georss"](http://www.georss.org/georss) xml:lang="en"> |
| <!-- feed title --> |
| <title>XYZ Example INSPIRE Dataset ABC Download</title> |
| <!-- feed subtitle --> |
| <subtitle>INSPIRE Download Service, of organisation XYZ providing dataset ABC for the Hydrography theme</subtitle> |
| <!-- links to INSPIRE Spatial Object Type definitions for this pre- defined dataset --> |
| <link [href="http://inspire](http://inspire-/)- registry.jrc.ec.europa.eu/registers/FCD/items/105" rel="describedby" type=‖text/html‖/>  <link [href="http://inspire](http://inspire-/)- registry.jrc.ec.europa.eu/registers/FCD/items/412" rel="describedby"  type=‖text/html‖/> |
| <!-- self-referencing link to this feed --> |

|  |
| --- |
| <link [href="http://xyz.org/data/abc/en.xml"](http://xyz.org/data/abc/en.xml) rel="self" type="application/atom+xml"  hreflang="en" title="This document"/> |
| <!-- link to this feed in another language --> |
| <link [href="http://xyz.org/data/abc/de.xml"](http://xyz.org/data/abc/de.xml) rel="alternate" type="application/atom+xml" hreflang="de"  title="This document in German"/> |
| <!—‗upward‘ link to the corresponding download service feed --> |
| <link [href="http://xyz.org/download/en.xml"](http://xyz.org/download/en.xml) rel="up" type="application/atom+xml" hreflang="en" title="The parent service feed  document"/> |
| <!-- identifier --> |
| [<id>http://xyz.org/data/abc/waternetwork.xml</id>](http://xyz.org/data/abc/waternetwork.xml) |
| <!-- rights, access restrictions --> |
| <rights>Copyright (c) 2012, XYZ; all rights reserved</rights> |
| <!-- date/time this feed was last updated --> |
| <updated>2012-03-31T13:45:03Z</updated> |
| <!-- author contact information --> |
| <author>  <name>John Doe</name>  [<email>doe@xyz.org</email>](mailto:doe@xyz.org)  </author> |
| <!-- download the pre-defined dataset in GML format in CRS EPSG:25832 -  -> |
| <entry>  <title>Water network in CRS EPSG:25832 (GML)</title>  <link rel=‖alternate" [href="http://xyz.org/data/abc/waternetwork\_25832.gml"](http://xyz.org/data/abc/waternetwork_25832.gml) type="application/gml+xml;version=3.2" hreflang="en" length=‖34987‖ title="Water network dataset encoded as a GML 3.2 document in ETRS89 UTM zone 32N [(http://www.opengis.net/def/crs/EPSG/0/25832)"/>](http://www.opengis.net/def/crs/EPSG/0/25832))  <id>[http://xyz.org/data/abc/waternetwork\_25832.gml</id>](http://xyz.org/data/abc/waternetwork_25832.gml)  <updated>2011-06-15T11:12:34Z</updated>  <category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89 / UTM zone 32N"/>  </entry> |
| <!-- download the same pre-defined dataset in GML format in CRS EPSG:4258--> |
| <entry>  <title>Water network in CRS EPSG:4258 (GML)</title>  <!--file download link-->  <link rel="alternate" [href="http://xyz.org/data/abc/waternetwork\_WGS84.gml"](http://xyz.org/data/abc/waternetwork_WGS84.gml) type="application/gml+xml;version=3.2" hreflang="en" length=‖37762‖ title="Water Network encoded as a GML 3.2 document in WGS84 geographic coordinates [(http://www.opengis.net/def/crs/OGC/1.3/CRS84)"/>](http://www.opengis.net/def/crs/OGC/1.3/CRS84))  [<id>http://xyz.org/data/abc/waternetwork\_WGS84.gml</id>](http://xyz.org/data/abc/waternetwork_WGS84.gml)  <updated>2011-06-14T12:22:09Z</updated>  <category [term="http://www.opengis.net/def/crs/EPSG/0/](http://www.opengis.net/def/crs/EPSG/0/4258)4258" label="ETRS89"/>  </entry> |

|  |
| --- |
| <!-- download the same pre-defined dataset in ShapeFile format in CRS  EPSG:25832, ShapeFile is in a single zip archive.--> |
| <entry>  <title>Water network in CRS EPSG:25832 (ShapeFile)</title>  <link rel=‖alternate" [href="http://xyz.org/data/abc/waternetwork\_25832.](http://xyz.org/data/abc/waternetwork_25832.zip)zip" type="application/x- shapefile" hreflang="en" length=‖89274‖  title="Water network dataset encoded as a ShapeFile in ETRS89 UTM zone 32N [(http://www.opengis.net/def/crs/EPSG/0/25832)"/>](http://www.opengis.net/def/crs/EPSG/0/25832))  <id><http://xyz.org/data/abc/waternetwork_25832.zip></id>  <updated>2011-06-15T11:12:34Z</updated>  <category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89 / UTM zone 32N"/>  </entry> |
| <!-- download the same pre-defined dataset in ShapeFile format in CRS EPSG:4258, ShapeFile is in a single zip archive.--> |
| <entry>  <title>Water network in CRS EPSG:4258 (ShapeFile)</title>  <link rel="alternate" [href="http://xyz.org/data/abc/waternetwork\_WGS84.](http://xyz.org/data/abc/waternetwork_WGS84.zip)zip" type="application/x- shapefile" hreflang="en" length=‖78973‖ title="Water Network encoded as a ShapeFile in WGS84 geographic coordinates [(http://www.opengis.net/def/crs/OGC/1.3/CRS84)"/>](http://www.opengis.net/def/crs/OGC/1.3/CRS84))  [<id>http://xyz.org/data/abc/waternetwork\_WGS84.](http://xyz.org/data/abc/waternetwork_WGS84.zip)zip</id>  <updated>2011-06-14T12:22:09Z</updated>  <category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>  </entry>  </feed> |

The guidance for the *title*, *subtitle*, *id*, *rights*, *updated* and *author* elements is the same as for the Dataset Download Feed and the corresponding sections should be referred to. The requirements are summarised as follows:

**TG Requirement 21** The ‗title‘ element of a ―Dataset Feed‖ shall be populated with a human readable title for the feed.

|  |
| --- |
| TG Recommendation 8 The ‗subtitle‘ element of a ―Dataset Feed‖ may be populated with a human readable subtitle for the feed. |

**TG Requirement 22** The ‗id‘ element of a ―Dataset Feed‖ shall contain an HTTP URI which dereferences to the feed

**TG Requirement 23** The ‗rights‘ element of a ―Dataset Feed‖ shall contain information about rights or restrictions for that feed.

**TG Requirement 24** The ‗updated‘ element of a ―Dataset Feed‖ shall contain the date, time and timezone at which the feed was last updated.

**TG Requirement 25** The ‗author‘ element of a ―Dataset Feed‖ shall contain current contact information for an individual or organisation responsible for the feed. At the minimum, a name and email address shall be provided as contact information.

The pre-defined datasets (e.g. as GML files) are made available for download within a feed ‗entry‘ of the Dataset Feed.

**TG Requirement 26** Each ―Dataset Feed‖ shall contain at least one feed entry containing links to download the pre-defined dataset (e.g. as a GML file).

If the pre-defined dataset is available to download in different formats or different Coordinate Reference Systems then a separate entry must be provided for each available format/CRS combination.

**TG Requirement 27** Each "Dataset Feed" shall contain separate entries for each format/CRS combination in which the pre-defined dataset is available to download.

* + 1. **Dataset Feed: „link‟ element: link to Spatial Object descriptions**

For each Spatial Object Type in the dataset Atom links shall be provided to the corresponding Spatial Object Type definition in the INSPIRE registry. Where a dataset is not an interoperable format described by the Data Specifications then a local scheme should be used to identify the spatial object type. These links shall use the ‗describedby‘ relation type and the appropriate media type for the resource. For definitions in the INSPIRE registry the media type shall be ―text/html‖.

*Example 23: Links to the INSPIRE registry (for Watercourse and Standing Water)*

|  |
| --- |
| <!—links to INSPIRE Spatial Object Type definitions for this pre-defined  dataset --> |
| <link [href="http://inspire](http://inspire-/)- registry.jrc.ec.europa.eu/registers/FCD/items/105" rel="describedby" type=‖text/html‖/>  <link [href="http://inspire](http://inspire-/)- registry.jrc.ec.europa.eu/registers/FCD/items/412" rel="describedby" type=‖text/html‖/> |
| <!— Example of a non-conformant spatial object type ―riversegment‖ --> |
| <link [href="http://mydomain.com/glossary/riversegment"](http://mydomain.com/glossary/riversegment) rel="describedby" type=‖text/html‖/> |

**TG Requirement 28** Each feed shall contain an Atom ‗link‘ element for each INSPIRE Spatial Object Type in the dataset. The link shall refer to the INSPIRE Registry unless the data does not conform to any Data Specification in which case a link to a local definition of the Spatial Object Type shall be used instead. The value of the ‗rel‘ attribute of this element shall be ―describedby‖. For definitions in the INSPIRE registry the value of the ‗type‘ attribute shall be ―text/html‖.

* + 1. **Dataset Feed: optional „link‟ element: link to Download feed**

In order to facilitate the reverse navigation between the Dataset feed and its ‗parent‘ Download feed it is recommended that a link element is included in the Dataset feed that links back to the parent Download feed. This link should have a ‗rel‘ value of ―up‖ and a type attribute with a value

―application/atom+xml‖.

*Example 24: Optional upward link to download service feed*

<link [href="http://xyz.org/download/en.xml"](http://xyz.org/download/en.xml) rel="up" type="application/atom+xml" hreflang="en" title="The parent service feed document"/>

<!—‗upward‘ link to the corresponding download service feed -->

|  |
| --- |
| TG Recommendation 9 A link element should be included that links to the ‗parent‘ Dataset feed. This link should have a ‗rel‘ attribute with a value of ―up‖ and a ‗type‘ attribute with  a value of ―application/atom+xml‖. |

* + 1. **Dataset Feed: Entry „link‟ element: link to pre-defined dataset**

The link element of an entry is also used to provide a link which resolves to the pre-defined dataset. This shall be a direct link to the dataset (e.g. to a file). If the pre-defined dataset is available in different encoding formats (e.g. GML, ShapeChange, NetCDF) or in different Coordinate Reference Systems (CRS) then separate entries shall be used for each available combination of CRS and format.

*Example 25: Example link to pre-defined dataset*

|  |
| --- |
| <!-- download link for pre-defined dataset --> |
| <link rel="alternate" [href="http://xyz.org/data/waternetwork.gml"](http://xyz.org/data/waternetwork.gml) type="application/gml+xml;version=3.2" hreflang="en" length=‖34987‖ title="The  dataset encoded as a GML 3.2 document in ETRS89 UTM zone 32N [(http://www.opengis.net/def/crs/EPSG/0/25832)"/>](http://www.opengis.net/def/crs/EPSG/0/25832))  <id>[http://xyz.org/data/abc/waternetwork\_25832.gml</id>](http://xyz.org/data/abc/waternetwork_25832.gml)  <updated>2011-06-15T11:12:34Z</updated>  <category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89 / UTM zone 32N"/> |
| <!-- download the same pre-defined dataset in ShapeFile format in CRS EPSG:4258, ShapeFile is in a single zip archive.--> |
| <entry>  <title>Water network in CRS EPSG:4258 (ShapeFile)</title>  <link rel="alternate" hre[f="http://xyz.org/data/abc/waternetwork\_WGS84.](http://xyz.org/data/abc/waternetwork_WGS84.zip)zip" type="application/x-  shapefile" hreflang="en" title="Water Network encoded as a ShapeFile in |

WGS84 geographic coordinates [(http://www.opengis.net/def/crs/OGC/1.3/CRS84)"/>](http://www.opengis.net/def/crs/OGC/1.3/CRS84))

[<id>http://xyz.org/data/abc/waternetwork\_WGS84.](http://xyz.org/data/abc/waternetwork_WGS84.zip)zip</id>

<updated>2011-06-14T12:22:09Z</updated>

<category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>

</entry>

Note that if a dataset spans more than one physical file (e.g. if it is stored in tiles or some other sub- division for practical purposes) then additional link elements may be provided within the entry for that dataset, one link per physical file according to the additional guidance in Section [5.2.4](#_bookmark285).

**TG Requirement 29** Each feed entry shall contain an Atom ‗link‘ element that links to the pre- defined dataset file described by the entry. The value of the ‗rel‘ attribute of this element shall be ―alternate‖ and a ―length‖ attribute (providing the length of the linked resource in octets\*) shall be provided if possible. Where a dataset is provided in multiple physical files, additional ‗link‘ elements shall be provided in the feed entry, one link for each physical file.

\*1 octet = 8 bits (usually synonymous with 1 byte)

The ‗type‘ attribute of the link element shall be used to indicate the media type of the resource that will be returned if the link is resolved. For example, ‗application/gml+xml‘ (see also Section [5.2.4](#_bookmark285) below).

**TG Requirement 30** The ‗type‘ attribute of the link element shall be used to indicate the media type of resource that will be returned if the link is resolved. A valid media type must be used for the value of this attribute; if the media type is not registered with IANA it should still follow the conventions for unregistered media types.

In the case where pre-defined datasets are provided in multiple languages, a different link element shall be used for each language and the ‗hreflang‘ attribute shall be used with the appropriate language code.

**TG Requirement 31** Where alternative language representations of datasets are linked to, the

‗hreflang‘ attribute of the link element shall be used to indicate the language of the target dataset as described in the Atom specification.

* + 1. **Dataset Feed: guidance for datasets which contain multiple files.**

Where a dataset is provided in multiple physical files and it is not desirable or practical to deliver them within a single download (e.g. as a zip), then it is also possible to deliver the individual files separately by adding multiple ‗link‘ elements to the feed entry. This may be useful, for example, if there are a large number of files. There should be a separate ‗link‘ element for each file. These links shall have a

‗rel‘ value equal to ―section‖.

**TG Requirement 32** Where a dataset is provided in multiple physical files: each file shall be linked to via a separate ‗link‘ element. Each of these ‗link‘ elements shall have a ‗rel‘ value equal to ―section‖.

Additionally there is a need to provide a description of the structure of the collection of files. This description shall either be provided as free text within a ‗content‘ element, or as another link, with a

‗rel‘ value of ―alternate‖. This link shall point to a descriptive document that describes how the parts of the dataset fit together. This Technical Guidance places no restrictions on the type or contents of this descriptive document. However when such a link is added an appropriate media type shall be used for the ‗type‘ attribute.

**TG Requirement 33** Where a dataset is provided in multiple physical files: a description of the dataset structure shall be provided EITHER in an atom ‗content‘ element as free text, OR in an external document which is the target of another ‗link‘ element. Where a ‗link‘ element is used this element shall have a ‗rel‘ value equal to ―alternate‖ and a suitable media type shall be used for the ‗type‘ value.

For the purposes of differentiating between files, optional ‗bbox‘ and/or ‗time‘ attributes may be added to the link elements. Where a ‗bbox‘ attribute is used the value of this shall be formatted in the same way as georss:box element, and when a ‗time‘ attribute is used it shall be formatted as a ISO 8601 time strings.

*Example 26: Use of bbox and time attributes*

<link rel="section" [href="http://xyz.org/data/file](http://xyz.org/data/file.tif).tif" bbox=‖50.0 5.0 50.9 5.9‖ time=‖2012-06-01T13:00:00Z‖ type="image/tiff" hreflang="en" title="example file"/>

<!—example use of bbox and time attributes -->

|  |
| --- |
| TG Recommendation 10 Where a dataset is provided in multiple physical files: a ‗bbox‘ attribute may be used to describe the geospatial extent of a particular file. If this is used, then the value of this attribute should be structured according to the georss:box structure. |

|  |
| --- |
| TG Recommendation 11 Where a dataset is provided in multiple physical files: a ‗time‘ attribute may be used to describe the temporal extent of a particular file. If this is used, then the value of this attribute should be structured according to the ISO 8601 standard. |

The following example entry shows a dataset that is in three parts each with a separate bounding box, along with a content element describing the dataset.

*Example 27: Multi-part dataset described by a content element*

<entry>

<title>Water network in GeoTIFF</title>

<content>This dataset consists of three GeoTIFF files. Each file has data for a different geospatial area, identified by the bbox attribute.</content>

<link rel="section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part1.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part1.tif) bbox=‖50.0 5.0

50.9 5.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 1"/>

<link rel="section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part2.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part2.tif) bbox=‖50.0 6.0

50.9 6.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 2"/>

<!—3 part dataset in GeoTIFF format (with content element)-->

<link rel‖section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part3.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part3.tif) bbox=‖50.0 7.0

50.9 7.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 3"/>

[<id>http://xyz.org/data/abc/waternetwork\_WGS84</id>](http://xyz.org/data/abc/waternetwork_WGS84)

<updated>2011-06-14T12:22:09Z</updated>

<category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>

</entry>

And here is the same example but using the ‗alternate‘ link instead of the ‗content‘ element.

*Example 28: Multi-part dataset described by an external document*

<entry>

<title>Water network in GeoTIFF</title>

<link rel="alternate" [href="http://xyz.org/data/abc/waternetwork\_description.html"type="text/html](http://xyz.org/data/abc/waternetwork_description.html) title="Description of Water Network files"/>

<link rel="section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part1.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part1.tif) bbox=‖50.0 5.0

50.9 5.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 1"/>

<link rel="section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part2.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part2.tif) bbox=‖50.0 6.0

50.9 6.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 2"/>

<link rel‖section" [href="http://xyz.org/data/abc/waternetwork\_WGS84\_part3.tif"](http://xyz.org/data/abc/waternetwork_WGS84_part3.tif) bbox=‖50.0 7.0

50.9 7.9‖ type="image/tiff" hreflang="en" title="Water Network encoded as a GeoTiff – part 3"/>

[<id>http://xyz.org/data/abc/waternetwork\_WGS84</id>](http://xyz.org/data/abc/waternetwork_WGS84)

<updated>2011-06-14T12:22:09Z</updated>

<category [term="http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258) label="ETRS89"/>

</entry>

<!—3 part dataset in GeoTIFF format (with alternate link)-->

* + 1. **Dataset Feed: guidance on media types**

The media type of a spatial data file referenced in a (atom) link shall be indicated in the type attribute of the link (as per [TG Requirement 30](#_bookmark284)).

To facilitate interoperability in INSPIRE, only media types listed in the INSPIRE media type registry shall be used. This registry will be maintained at the following URI:

<http://inspire.ec.europa.eu/media-types>

**TG Requirement 34** Only media types listed in the INSPIRE media-types register shall be used.

*Example 29: GML download*

*For example, the media type for a GML file is "application/gml+xml" with additional (optional) parameters for the character set used and the GML version.*

application/gml+xml;charset=utf-8;version=3.2

*Example 30: Zipped media*

*For example, no registered media type exists for zipped Esri ShapeFiles or File Geodatabases so media types such as application/x-shapefile or application/x-filegdb might be used in INSPIRE as a stopgap until common practice emerges. (see the registry at* <http://inspire.ec.europa.eu/media-types> for actual media types).

application/x-shapefile

application/x-filegdb

If transfer of compressed data is desirable for particular uncompressed files then compression as supported by HTTP 1.1 may be used. It is recommended that clients wishing to benefit from HTTP compression shall set their HTTP Accept-Encoding header to ―gzip, deflate‖.

|  |
| --- |
| TG Recommendation 12 For files that are made available uncompressed, compression is offered by HTTP 1.1 server and clients. As spatial data sets may be large, clients should set their HTTP Accept-Encoding header to include "gzip, deflate" in each request for uncompressed files. |

* + 1. **Dataset Feed: entry „georss‟ element**

The guidance on georss for Download Service Feeds in section [5.1.19](#_bookmark279) is also applicable to Dataset Feeds. Any TG Requirements and TG Recommendations in this section also apply here.

* + 1. **Dataset Feed: entry „category‟ element**

Finally, each entry uses the category element to identify the CRS.

*Example 31: Using the category element to refer to an EPSG code (registered at OGC)*

<category [term="http://www.opengis.net/def/crs/EPSG/0/25832"](http://www.opengis.net/def/crs/EPSG/0/25832) label="ETRS89

/ UTM zone 32N">

**TG Requirement 35** Each CRS representation shall have a ‗category‘ element which refers to the CRS definition and code.

* 1. ***Language Requirements for Atom Implementation***

The following two requirements are mandatory for all Download Services. In the case of the Atom implementation they are automatically met if the remaining requirements in this Section ([5.3](#_bookmark287)) are followed.

**TG Requirement 36** A Download Service metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported.

**TG Requirement 37** A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. If the requested language is not supported by the service, then this parameter shall be ignored.

If an Atom feed is available in different languages a link element shall be provided linking to each alternative language version of the document. The following guidance is applicable to ―Download Service Feeds‖ and ―Dataset Feeds‖.

The value of the ‗rel‘ attribute of these elements shall be ―alternate‖ and the ‗hreflang‘ attribute must be populated with the appropriate language code for the linked document in each case.

*Example 32: Alternative representation is available in German (hreflang=“de”)*

<link href="<http://xyz.org/download/de.xml>" rel="alternate"

type="application/atom+xml" hreflang="de" title="The download service information in German"/>

**TG Requirement 38** Where a feed is made available in alternative languages, links shall be provided to these alternative representations. These links shall each use the

‗hreflang‘ attribute to indicate the language of the alternative representation. The value of the ‗rel‘ attribute for these link elements this element shall be

―alternate‖.

Note that where documents are available in multiple languages the ‗self‘ link refers to the version of the document in which it is found.

So while an English feed may contain the following self and alternate link elements:

*Example 33: English feed with alternative version in German*

<link href="<http://xyz.org/download/en.xml>" rel="self" type="application/atom+xml"

hreflang="en" title="This document"/>

<link href="<http://xyz.org/download/de.xml>" rel="alternate" type="application/atom+xml" hreflang="de" title="The download service information in German"/>

The corresponding German version of the feed inverts the self and alternate link elements so that ‗self‘ refers to the German feed and ‗alternate‘ to the English.

*Example 34: German feed with alternative version in English*

<link href="<http://xyz.org/download/de.xml>" rel="self" type="application/atom+xml" hreflang="de" title="Dieses Dokument/>

<link href="<http://xyz.org/download/en.xml>" rel="alternate"

type="application/atom+xml" hreflang="en" title=" Die Informationen zum Downloaddienst in Englisch"/>

* 1. ***OpenSearch Document structure.***

In order to provide 'operations' in a conventional sense and document them as required by the Network Services Regulation [**INS NS**], the Open Search standard is proposed, which makes it possible to specify, via an xml document with a well-known structure, operations with custom parameters in an interoperable way. OpenSearch engines are also recognized by the major browsers like Mozilla Firefox, Internet Explorer, Safari and Chrome.

This Open Search description document is linked to from the ―Download Service Feed‖. In addition to the descriptive document it is necessary to implement a simple service to satisfy the Get Spatial Data Set and Describe Spatial Data Set operations. Example code can be found in Annex A.

This Technical Guidance does not place any requirements on the technology used to implement the simple service.

The example given in Annex A uses content negotiation to identify which operation to perform. This means that even though the operation endpoint is only one, i.e. [http://xyz.org/search.php,](http://xyz.org/search.php) the client has to set the HTTP ―Accept‖ Header to the correct value in order to receive the expected result.

**TG Requirement 39** A simple service to perform the Describe Spatial Dataset and Get Spatial Data Set operations shall be provided and described by an OpenSearch description document.

*Example 35: Open Search description document*

|  |
| --- |
| <OpenSearchDescription [xmlns="http://a9.com/](http://a9.com/-/spec/opensearch/1.1/)-[/spec/opensearch/1.1/"](http://a9.com/-/spec/opensearch/1.1/) xmlns:inspire\_dls[="http://inspire.ec.europa.eu/schemas/inspire\_dl](http://inspire.ec.europa.eu/schemas/inspire_dls/1.0)s[/1.0"](http://inspire.ec.europa.eu/schemas/inspire_dls/1.0) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" [xsi:schemaLocation="http://a9.com/](http://a9.com/-/spec/opensearch/1.1/)-[/spec/opensearch/1.1/](http://a9.com/-/spec/opensearch/1.1/) OpenSearch.xsd">  <ShortName>INSPIRE Demo Download Service.</ShortName>  <Description>Search Description for Demo INSPIRE Download Service</Description> |
| <!--URL of this document--> |
| <Url type="application/opensearchdescription+xml" rel="self" [template="http://xyz.org/opensearchdescription.xml"/>](http://xyz.org/opensearchdescription.xml) |
| <!--Generic URL template for browser integration--> |
| <Url type="text/html" rel="results" [template="http://xyz.org/search.php?q={searchTerms}"/>](http://xyz.org/search.php?q) |
| <!--Describe Spatial Data Set Operation request URL template to be used in order to retrieve the description of Spatial Object Types in a Spatial  Dataset--> |
| <Url type="application/atom+xml" rel="describedby" [template="http://xyz.org/search.php?spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code)={inspir e\_dls:spatial\_dataset\_identifier\_code?}&amp;spatial\_dataset\_identifier\_name space={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&amp;crs={inspire\_  dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"/> |
| <!--Get Spatial Data Set Operation request URL template to be used in order to retrieve a Spatial Dataset--> |
| <Url type="application/x-filegdb" rel="results" [template="http://xyz.org/search.php?spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code)={inspir e\_dls:spatial\_dataset\_identifier\_code?}&amp;spatial\_dataset\_identifier\_name space={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&amp;crs={inspire\_ dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"/>  [<Contact>support@xyz.org</Contact>](mailto:support@xyz.org)  <Tags>waternetwork\_abc</Tags>  <LongName>WaterNetwork ABC from Organisation XYZ</LongName> |

|  |
| --- |
| <Image height="16" width="16"  type="image/png">[http://xyz.org/waternetworkSearch.png</Image>](http://xyz.org/waternetworkSearch.png) |
| <!--List of available Spatial Dataset Identifiers --> |
| <Query role="example" inspire\_dls:spatial\_dataset\_identifier\_namespace[="http://xyz.org/"](http://xyz.org/) inspire\_dls:spatial\_dataset\_identifier\_code="waternetwork" inspire\_dls:crs="EPSG:4258" language="en" title="Waternetwork\_abc" count="1"/>  <Developer>European Commission - Joint Research Centre</Developer> |
| <!--Languages supported by the service. The first language is the default language--> |
| <Language>en-gb</Language>  <Language>de</Language>  </OpenSearchDescription> |

* + 1. **OpenSearch Description: „Url‟ element: link to self**

The OpenSearch Description shall contain a ‗Url‘ element which contains an HTTP URI for the OpenSearch document itself. This URI shall provide the location of the document and resolve to the document. The value of the ‗rel‘ attribute for this link shall be ―self‖.

*Example 36: Example reference to self*

<Url type="application/opensearchdescription+xml" rel="self" [template="http://xyz.org/opensearchdescription.xml"/>](http://xyz.org/opensearchdescription.xml)

<!--URL of this document-->

**TG Requirement 40** The OpenSearch description shall contain a ‗Url‘ element that describes an HTTP URI for the OpenSearch Description document. The value of the ‗rel‘ attribute of this element shall be ―self‖, the value of the ‗type‘ attribute shall be

―application/opensearchdescription+xml‖ and the value of the ‗template‘ attribute shall be the HTTP URI of the document.

* + 1. **OpenSearch Description: Generic search template**

A generic search template shall be supplied for browser integration.

It enables search clients like Internet Explorer or Firefox to integrate the download service as an additional search engine.

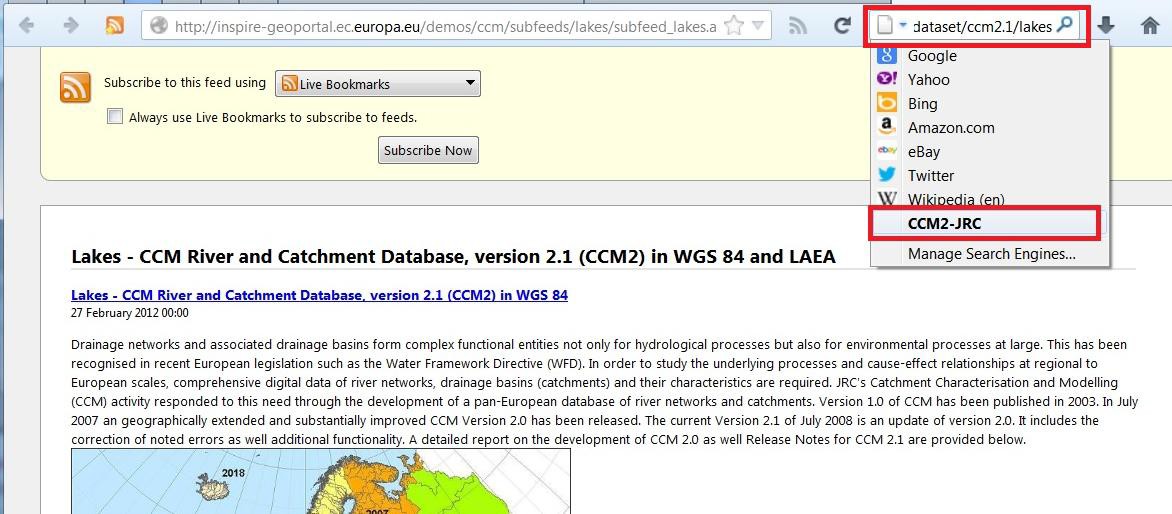


Figure 8. Download service integrated as a search engine in Internet Explorer

The availability of an OpenSearch engine can be advertised in an html page by adding a link element similar to the following one to the HEAD section of the html page:

<link rel="search" type="application/opensearchdescription+xml" title="CCM2" href="opensearchdescription.xml">

The automatic detection of the OpenSearch engine has been tested for a number of popular browsers. [Table 18](#_bookmark290) gives an overview of the testing results.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Browser** | **Version tested** | **Platform** | **Requires plugin** | **Comments** |
| Internet Explorer | 8 | Windows | No |  |
| Firefox | 21.0 | Windows | No |  |
| Safari | 6.0.5 | Mac OS X | Yes | Automatic detection of the OpenSearch engine has been successfully tested with the plugin OpenSearchForSafari |
| Chrome | 27.0 | Windows | No | The OpenSearch engine is automatically discovery only if the html page is at the root of the web site domain |

Table 18: Testing of the detection of the OpenSearch engine in the most popular browsers

*Example 37: Example generic URL search template*

<Url type="text/html" rel="results" [template="http://xyz.org/search.php?q={searchTerms}"/>](http://xyz.org/search.php?q)

<!--Generic URL template for browser integration-->

**TG Requirement 41** The OpenSearch description shall contain a ‗Url‘ element that describes a template URL for generic search queries. The value of the ‗rel‘ attribute of this element shall be ―results‖, the value of the ‗type‘ attribute shall be ―text/html‖.

* + 1. **OpenSearch Description: Describe Spatial Data Set Operation template**

A search template shall be supplied that provides the request mechanism for a Describe Spatial Data Set Operation.

*Example 38: Example Describe Spatial Data Set template*

<Url type="application/atom+xml" rel="describedby" [template="http://xyz.org/search.php?spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code)={inspir e\_dls:spatial\_dataset\_identifier\_code?}&amp;spatial\_dataset\_identifier\_name space={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&amp;language={lan guage?}&amp;q={searchTerms?}"/>

<!--Describe Spatial Data Set Operation request URL template to be used in order to retrieve the description of Spatial Object Types in a Spatial Dataset-->

**TG Requirement 42** The OpenSearch description shall contain a ‗Url‘ element that describes a template URL for the Describe Spatial Data Set operation. This template shall accept the INSPIRE parameters ―spatial\_dataset\_identifier\_code‖,

―spatial\_dataset\_identifier\_namespace‖ and the OpenSearch ―language‖ parameter. The ‗Url‘ element shall have an attribute ‗type‘ with a value of

―application/atom+xml‖ and an attribute ‗rel‘ with the value ―describedby‖.

The Describe Spatial Data Set response shall be the description of the Spatial Objects in the requested Spatial Dataset and in the requested language. i.e. it shall be the relevant atom ―Dataset Feed‖ corresponding to the specified spatial\_dataset\_identifier\_code, spatial\_dataset\_identifier\_namespace and language.

In a machine-to-machine interaction, if a client wants to issue a Describe Spatial Data Set request, it will read the Open Search document, extract the ‗Url‘ element with the attributes rel=‖describedby‖ and type=‖application/xml‖. It will then replace the template arguments with the actual values for the Spatial Dataset Identifier code and namespace, and language.

*Example 39: Using an OpenSearch template for building a Describe Spatial Data Set request*

*If a client is looking for the description of the Spatial Data Set identified by the code “mycode” and the namespace “mynamespace” in the English language, the following template:*

[http://xyz.org/search.php?spatial\_dataset\_identifier\_code={inspire\_dls:spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code=%7binspire_dls%3Aspatial_dataset_identifier_code%3F%7d&spatial_dataset_identifier_namespace=%7binspire_dls%3Aspatial_dataset_identifier_namespace%3F%7d&language=%7blanguage%3F%7d&q=%7bsearchTerms%3F%7d)

[?}&spatial\_dataset\_identifier\_namespace={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&langu](http://xyz.org/search.php?spatial_dataset_identifier_code=%7binspire_dls%3Aspatial_dataset_identifier_code%3F%7d&spatial_dataset_identifier_namespace=%7binspire_dls%3Aspatial_dataset_identifier_namespace%3F%7d&language=%7blanguage%3F%7d&q=%7bsearchTerms%3F%7d) [age={language?}&q={searchTerms?}](http://xyz.org/search.php?spatial_dataset_identifier_code=%7binspire_dls%3Aspatial_dataset_identifier_code%3F%7d&spatial_dataset_identifier_namespace=%7binspire_dls%3Aspatial_dataset_identifier_namespace%3F%7d&language=%7blanguage%3F%7d&q=%7bsearchTerms%3F%7d)

*will be used to form the actual URL as follows:*

[http://xyz.org/search.php?spatial\_dataset\_identifier\_code=mycode&spatial\_dataset\_identifier\_namesp](http://xyz.org/search.php?spatial_dataset_identifier_code=mycode&spatial_dataset_identifier_namespace=mynamespace&language=eng) [ace=mynamespace&language=eng](http://xyz.org/search.php?spatial_dataset_identifier_code=mycode&spatial_dataset_identifier_namespace=mynamespace&language=eng)

*The response will be the appropriate data set atom feed.*

* + 1. **OpenSearch Description: Get Spatial Data Set Operation template**

A search template shall be supplied that provides the request mechanism for a Get Spatial Data Set Operation.

*Example 40: Example Get Spatial Data Set template*

<Url type="application/x-filegdb" rel="results" [template="http://xyz.org/search.php?spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code)={inspir

<!--Get Spatial Data Set Operation request URL template to be used in order to retrieve a Spatial Data Set-->

e\_dls:spatial\_dataset\_identifier\_code?}&amp;spatial\_dataset\_identifier\_name space={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&amp;crs={inspire\_ dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"/>

**TG Requirement 43** The OpenSearch description shall contain a ‗Url‘ element that describes a template URL for the Get Spatial Data Set operation. This template shall accept the INSPIRE parameters ―crs‖, ―spatial\_dataset\_identifier\_code‖,

―spatial\_dataset\_identifier\_namespace‖ and the OpenSearch ―language‖ parameter. The ‗Url‘ element shall have an attribute ‗type‘ with a value corresponding to the media type of the result and an attribute ‗rel‘ with the value ―results‖.

When a dataset is not downloadable as a single file, but is a multipart dataset, then the OpenSearch result for the Get Spatial Dataset operation allows for multiple results to be returned.

In order to avoid an HTTP multipart response, which is not supported by browsers and would require specific clients, the Get Spatial Dataset operation shall return an Atom feed containing the links to the files to be downloaded instead of the files themselves as in the following example.

*Example 41: OpenSearch URL template returning an Atom feed.*

<Url type=" application/atom+xml " rel="results" [template="http://xyz.org/search.php?spatial\_dataset\_identifier\_code](http://xyz.org/search.php?spatial_dataset_identifier_code)={inspir e\_dls:spatial\_dataset\_identifier\_code?}&amp;spatial\_dataset\_identifier\_name space={inspire\_dls:spatial\_dataset\_identifier\_namespace?}&amp;crs={inspire\_ dls:crs?}&amp;language={language?}&amp;q={searchTerms?}"/>

* + 1. **OpenSearch Description: Spatial Dataset Identifiers**

Available Spatial Dataset Identifiers shall be indicated using the OpenSearch ―example‖ query mechanism.

*Example 42: Example Get Spatial Data Set template*

<Query role="example" inspire\_dls:spatial\_dataset\_identifier\_namespace[="http://xyz.org/"](http://xyz.org/) inspire\_dls:spatial\_dataset\_identifier\_code="waternetwork" [inspire\_dls:crs="http://www.opengis.net/def/crs/EPSG/0/4326"](http://www.opengis.net/def/crs/EPSG/0/4326) language="en" title="Waternetwork\_abc" count="1"/>

<!--List of available Spatial Dataset Identifiers -->

**TG Requirement 44** For each dataset available the OpenSearch description shall contain a ‗Query‘ element that has a ‗role‘ attribute with the value ―example‖ and

‗spatial\_dataset\_identifier\_code‘ and ‗spatial\_dataset\_identifier\_namespace‘ attributes together containing unique spatial dataset identifier. The value of the

‗crs‘ and ‗language‘ attributes shall be set to the values considered as the default ones by the service provider.

The Get Spatial Data Set response shall be the file corresponding to the specified spatial\_dataset\_identifier\_code, spatial\_dataset\_identifier\_namespace, crs and language, as declared in the relevant atom ―Dataset Feed‖.

* + 1. **OpenSearch Description: Available Languages**

The languages supported by the service shall be indicated in the OpenSearch description. The first language in the list is the default language.

*Example 43: Example Language support*

<Language>en</Language>

<Language>de</Language>

<!-- Supported Languages, Default Language -->

<!--Languages supported by the service. The first language is the Default Language-->

**TG Requirement 45** For each language supported by the download service, the OpenSearch description shall contain a ‗Language element that contains the language code. The first ‗Language‘ element shall contain the Default Language.

1. **Web Feature Service and Filter Encoding Implementation of Pre-defined Dataset Download Service**

**TG Conformance Class 2: Pre-defined WFS:** Implement Pre-Defined Dataset Download Service (―Part A‖) using ISO 19142 Web Feature Service and 19143 Filter Encoding.

*This conformance class is inclusive of:*

*TG Requirement 46 to TG Requirement 60*

*TG Recommendation 14 to TG Recommendation 15*

An alternative way to implement pre-defined dataset download services is by deploying an ISO 19142 Web Feature Service [**ISO 19142**] supporting ISO 19143 Filter Encoding [**ISO 19143**] in line with the Technical Guidance contained in this chapter. Rather than repeat large parts of the WFS and FE specifications in this document, references are made to conformance classes from the WFS and FE specifications which shall be implemented. Where additional functionality is required, as is the case with multi-lingual requirements then this is described below.

*Note that ISO 19142 is also known as OGC Web Feature Service 2.0 and ISO 19143 is also known as OGC Filter Encoding 2.0*

* 1. ***Conformance to ISO 19142 „Simple WFS‟ Conformance Class***

In order to implement pre-defined access using ISO 19142 WFS and ISO 19143 FE it is necessary to conform to the ‗Simple WFS‘ conformance classes as described in the 19142 standard [**ISO 19142**].

**TG Requirement 46** Implementations shall conform to ISO 19142 Conformance Class ‗Simple WFS‘

* 1. ***Conformance to ISO 19143 „Query‟ Conformance Class***

In order to implement pre-defined download services using ISO 19142 WFS and ISO 19143 FE it is necessary to conform to the ‗Query‘ conformance classes as described in the 19143 standard [**ISO 19143**].

**TG Requirement 47** Implementations shall conform to ISO 19143 Conformance Class ‗Query‘

* 1. ***Conformance to ISO 19142 „HTTP GET‟ Conformance Class***

In order to implement pre-defined download services using ISO 19142 WFS and ISO 19143 FE it is necessary to conform to the ‗HTTP GET‘ conformance classes as described in the 19142 standard [**ISO 19142**].

**TG Requirement 48** Implementations shall conform to ISO 19142 Conformance Class ‗HTTP Get‘

* 1. ***Stored Query Support***

ISO 19142 describes the use of pre-defined stored queries in WFS to access features via a Web Feature Service. To enable the download of pre-defined datasets it is necessary to provide some pre- defined stored queries to access the pre-defined datasets.

ISO 19142 describes the operations ListStoredQueries and DescribeStoredQueries. The former is used to retrieve a list of stored queries that are available and the latter is used to request more information about a particular stored query (or queries) such as the parameter arguments that are required to make a GetFeature request using the stored query.

**TG Requirement 49** Pre-defined Stored Queries shall be provided to make pre-defined datasets available.

Any implementation shall ensure that all possible (i.e. available) combinations of CRS/DataSetIdCode/ DataSetIdNamespace/language should be available through a pre-defined stored query.

**TG Requirement 50** Any possible (i.e. available) combinations of CRS/DataSetIdCode/ DataSetIdNamespace/language shall be made available through pre-defined stored queries.

Every instance of a WFS-based pre-defined dataset download service should define only one Stored Query for serving pre-defined Spatial Data Sets in order to make it easier for clients who already know the identifier of the Stored Query.

|  |
| --- |
| TG Recommendation 13 The following identifier should be used to identify the Stored Query for serving pre-defined Spatial Data Sets: <http://inspire.ec.europa.eu/operation/download/GetSpatialDataSet> |

The parameter names for the arguments of the Stored Query shall be consistent as proposed in the following requirement:

**TG Requirement 51** Pre-defined Stored Queries shall use the parameter names ―CRS‖,

―DataSetIdCode‖, ―DataSetIdNamespace‖ and ―Language‖ to identify the CRS, dataset ID code, dataset ID namespace and language components of a query.

For example the following stored query takes arguments for the parameters DataSetIdCode (mycode), DatasetIdNamespace (mynamespace), CRS (EPSG:4326) and Language (English).

*Example 44: Custom stored query requesting a dataset by ID and CRS (informative only)*

[http://www.myinspirewfs.com/request=getFeature&storedquery\_id=](http://www.myinspirewfs.com/request%3DgetFeature%26storedquery_id%3D) <http://inspire.ec.europa.eu/operation/download/GetSpatialDataSet> &DataSetIdCode=mycode&DataSetIdNamespace=mynamespace&CRS=EPSG:4326&Language

=eng

Beyond these four mandated parameter names this Technical Guidance does not place any requirements on other parameter names as they may be dataset specific.

* 1. ***INSPIRE Datasets and WFS Features***

WFS is designed around the feature paradigm (spatial objects in INSPIRE terminology). There is no concept of ‗datasets‘, only a single data store that contains the features. Therefore, it is common practice that a separate WFS ‗endpoint‘ is provided for each dataset. An endpoint in this context means the base URL of the WFS service i.e. the URL to which a GetCapabilities request is made.

i.e: for a WFS service that can be called as follows:

[http://my-wfs.com/mydata?request=getCapabilities&service=WFS&.](http://my-wfs.com/mydata?request=getCapabilities&service=WFS).. The endpoint in this context would be:

<http://my-wfs.com/mydata>

**TG Requirement 52** A separate WFS endpoint shall be provided for each INSPIRE dataset thus providing one dataset per GetCapabilities response.

* 1. ***Publishing INSPIRE metadata using ows:ExtendedCapabilities***

In order to make the Download Service INSPIRE metadata elements available via a standard WFS it is necessary to use ows:ExtendedCapabilites in the WFS capabilities response and publish the INSPIRE metadata according to an extension schema within an *inspire\_dls:ExtendedCapabilities* element. The INSPIRE extension schema and example instance documents can be found at: <http://inspire.ec.europa.eu/schemas/inspire_dls/>

The schema document itself is at <http://inspire.ec.europa.eu/schemas/inspire_dls/1.0/inspire_dls.xsd>

There are two possible options that may be used and it is up to the implementing Member State to decide which is more appropriate according to need.

The first option is to use the ows:ExtendedCapabilities to publish a link to a Download Service metadata record. (e.g. in a discovery service). This should be done using a

<inspire\_common:MetadataURL> in the extended capabilities section.

The second option is to publish all the metadata elements directly in the WFS capabilities (and ows:ExtendedCapabilities) using the mapping in the following table.

|  |  |
| --- | --- |
| **INSPIRE Metadata elements (Mandatory - Conditional)** | **ISO 19142 elements of**  **<WFS\_Capabilities>** |
| Resource Title (M) | ows:ServiceIdentification/ows:Title |
| Resource Abstract (M) | ows:ServiceIdentification/ows:Abstract |
| Resource Type (M) | inspire\_common:ResourceType (ExtendedCapabilities) |
| Resource Locator (C) | inspire\_common:ResourceLocator  (ExtendedCapabilities) |
| Coupled Resource (C) | wfs:MetadataURL (per feature type) |
| Spatial Data Service Type (M) | inspire\_common:SpatialDataServiceType  (ExtendedCapabilities) |
| Keyword (M) | ows:Keywords/ows:Keyword; inspire\_common:Keyword |

|  |  |
| --- | --- |
| **INSPIRE Metadata elements (Mandatory - Conditional)** | **ISO 19142 elements of**  **<WFS\_Capabilities>** |
| Geographic Bounding Box (M) | ows:WGS84BoundingBox (Layer property) |
| Temporal Reference (M) | inspire\_common:TemporalReference (ExtendedCapabilities) |
| Spatial Resolution (C) | ows:ServiceIdentification/ows:Abstract |
| Conformity\* (M)  \*refers to conformity of to the Data Specificaitons | inspire\_common:Conformity (ExtendedCapabilities) |
| Conditions for Access and Use (M) | ows:ServiceIdentification/ows:Fees |
| Limitations on Public Access (M) | ows:ServiceIdentification/ows:AccessConstraints |
| Responsible Organisation (M) | ows:ServiceProvider/ows:ProviderName and:  ows:ServiceProvider/ows:ServiceContact/ows:Cont actInfo |
| Metadata Point of Contact (M) | inspire\_common:MetadataPointOfContact (ExtendedCapabilities) |
| Metadata Date (M) | inspire\_common:MetadataDate (ExtendedCapabilities) |
| Metadata Language (M) | inspire\_common:SupportedLanguages  (ExtendedCapabilities) |
| Unique Resource Identifier (M) | inspire\_dls:SpatialDataSetIdentifier/inspire\_co mmon:Code  inspire\_dls:SpatialDataSetIdentifier/inspire\_co mmon:Namespace  (ExtendedCapabilities) |

Table 19: Mapping INSPIRE Metadata elements to ISO 19142 WFS

**TG Requirement 53** INSPIRE Metadata for the Download Service shall EITHER be linked to via an

<inspire\_common:MetadataURL> in an extended capabilities section, OR the extended capabilities section shall contain all the INSPIRE Metadata for the Download Service in accordance with Table 4 and the inspire\_dls:ExtendedCapabilities schema.

The following example shows an inspire\_dls:ExtendedCapabilities section.

*Example 45: Extended capabilities*

<!—example extended capabilities -->

<ows:ExtendedCapabilities>

<inspire\_dls:ExtendedCapabilities>

<inspire\_common:ResourceLocator>

<inspire\_common:URL>test</inspire\_common:URL>

</inspire\_common:ResourceLocator>

<inspire\_common:ResourceType>service</inspire\_common:ResourceType>

<inspire\_common:TemporalReference/>

<inspire\_common:Conformity>

<inspire\_common:Specification>

<inspire\_common:Title>Please enter a title</inspire\_common:Title>

<inspire\_common:DateOfPublication>0000-01- 01</inspire\_common:DateOfPublication>

</inspire\_common:Specification>

<inspire\_common:Degree>notEvaluated</inspire\_common:Degree>

</inspire\_common:Conformity>

<inspire\_common:MetadataPointOfContact>

<inspire\_common:OrganisationName/>

[<inspire\_common:EmailAddress>someone@somewhere.org</inspire\_common:EmailAdd](mailto:someone@somewhere.org) ress>

</inspire\_common:MetadataPointOfContact>

<inspire\_common:MetadataDate>0000-01- 01</inspire\_common:MetadataDate>

<inspire\_common:SpatialDataServiceType>view</inspire\_common:SpatialDataServ iceType>

<inspire\_common:MandatoryKeyword>

<inspire\_common:KeywordValue> infoFeatureAccessService

</inspire\_common:KeywordValue>

</inspire\_common:MandatoryKeyword>

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>pol</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

<inspire\_dls:SpatialDataSetIdentifier>

<inspire\_common:Code>mycode</inspire\_common:Code>

[<inspire\_common:Namespace>http://myuri.org</inspire\_common:Namespace>](http://myuri.org/)

</inspire\_dls:SpatialDataSetIdentifier>

<inspire\_dls:SpatialDataSetIdentifier>

<inspire\_common:Code>mycode2</inspire\_common:Code>

<ins[pire\_common:Namespace>http://myuri.org</inspire\_common:Namespace>](http://myuri.org/)

</inspire\_dls:SpatialDataSetIdentifier>

</inspire\_dls:ExtendedCapabilities>

</ows:ExtendedCapabilities>

* 1. ***Language Requirements for WFS/FE Implementation of Pre- defined Download.***

Language requirements for Network Services were introduced in Section [4.3](#_bookmark261) and are expanded upon here as TG Requirements for the Pre-defined WFS Conformance Class:

**TG Requirement 54** A network service [Download Service] metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported.

**TG Requirement 55** A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. It the requested language is not supported by the service, then this parameter shall be ignored.

To meet these requirements using 19142 WFS it is necessary to extend some operations of the WFS as follows:

* + 1. **GetCapabilities-Operation (language requirements)**

**GetCapabilities-Request:**

The HTTP/GET binding of the GetCapabilities-Operation is extended by an additional parameter that indicates the client‘s preferred language.

**TG Requirement 56** The name of this parameter shall be ―LANGUAGE‖. The parameter values are based on ISO 639-2/B alpha 3 codes as used in [**INS MDTG**].

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Parameter Value** | **Mandatory for a Client Request?** | **Mandatory support by the Service?** |
| LANGUAGE | Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2.  Use only three-letter codes from in ISO 639- 2/B (bibliographic codes),  The list of codes for the 24 official EU languages and the languages of the EFTA Countries is:  Bulgarian – **bul** Italian – **ita** Czech – **cze** Latvian – **lav** Danish – **dan** Liechenstein– **ger** Dutch – **dut** Lithuanian – **lit** English – **eng** Maltese – **mlt** Polish – **pol** Norwegian – **nor** Estonian – **est** Portuguese – **por** Finnish – **fin** Romanian – **rum**  French – **fre** Romansh - **roh** German – **ger** Slovak – **slo** Greek – **gre** Slovenian – **slv** Hungarian – **hun** Spanish – **spa** Irish – **gle** Swedish – **swe**  Croatian - **hrv** Icelandic – **ice** The complete list of codes is defined at <http://www.loc.gov/standards/iso639-2/>  Regional languages are also included in this list. | No, it is optional. | Yes, it is mandatory to be supported and shall be processed if the parameter is present in a client‘s request with a supported language code. If the parameter is absent in a client‘s request or it requested an unsupported language the service shall response in the service default language. |

Table 20: Language parameter

|  |
| --- |
| Schema:  [OCG-GetCapabilities-Request]&LANGUAGE=<ISO 639-2/B alpha 3 code> Example:  [http://inspire.network.service.example/service?SERVICE=](http://inspire.network.service.example/service?SERVICE)[...]&VERSION=[...]&LANGUAGE=eng |

**GetCapabilities-Response:**

If a client request specifies a supported language the following fields of the GetCapabilties-Response are affected:

Titles Abstracts



**TG Requirement 57** If a client request specifies an unsupported language, or the parameter is absent in the request, the above fields [Title, Abstract] shall be provided in the service default language.

This behaviour ensures backwards compatibility so that any existing clients may interact with the service using the default OGC standard.

**Extended Capabilities**

To advertise the supported languages the service shall respond to GetCapabilites requests with Extended Capabilities as follows:

*Example 46: Extended Capabilities structure*

...

<ows:OperationsMetadata>

...

<ows:ExtendedCapabilities>

...

<inspire\_dls:ExtendedCapabilities>

<inspire\_common:MetadataUrl>

[<inspire\_common:URL>http://www.csw.de</inspire\_common:URL>](http://www.csw.de/)

</inspire\_common:MetadataUrl>

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

</inspire\_dls:ExtendedCapabilities>

...

</ows:ExtendedCapabilities>

...

</ows:OperationsMetadata>

...

**TG Requirement 58** The Extended Capabilities shall indicate the response language used for the GetCapabilities-Response: Depending on the requested language the value of the <inspire\_common:ResponseLanguage> corresponds to the current used language. If a supported language was requested,

<inspire\_common:ResponseLanguage> shall correspond to that requested language. If an unsupported language was requested or if no specific language was requested <inspire\_common:ResponseLanguage> shall correspond to the service default language

<inspire\_common:DefaultLanguage>

**TG Requirement 59** The Extended Capabilities shall contain the **list of supported languages**

indicated in <inspire\_common:SupportedLanguages>.

This

**list**

**of**

**supported**

**languages**

shall

consist

of

1. exactly one element <inspire\_common:DefaultLanguage> indicating the service default language, and
2. zero or more elements <inspire\_common:SupportedLanguage> to indicate all additional supported languages.

Regardless of the response language, the **list of supported languages** is invariant for each GetCapabilities-Response.

**TG Requirement 60** The Extended Capabilities shall use the XML Schema as defined in the INSPIRE online schema repository.

**Examples:**

A service supports French and English and the service default language is French:

*Example 47: Response to [OGC-GetCapabilities-Request]&LANGUAGE=eng*

<inspire\_dls:ExtendedCapabilities>

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage

…

</inspire\_dls:ExtendedCapabilities>

*Example 48: Response to [OGC-GetCapabilities-Request] or [OGC-GetCapabilities- Request]&LANGUAGE=fre*

<inspire\_dls:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

…

</inspire\_dls:ExtendedCapabilities>

A service supports only German:

*Example 49: Response to any GetCapabilities-Request (only German supported)*

<inspire\_dls:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

…

</inspire\_dls:ExtendedCapabilities>

* + 1. **Common concept for other operations (optional)**

Although further multilingual support is not required for INSPIRE Network Services, it may be desired by a service provider to implement further multilingual support such as:

multilingual error messages



multilingual support for additional Operations including HTTP/POST- and HTTP/GET-Binding

For that reason a further implementation concept for multilingual aspects is recommended as follows:

The recommended INSPIRE Extension described before already provides language specific capabilities for a service.

|  |
| --- |
| TG Recommendation 14 For further language support for other operations it is recommended to replace the operation-online-resources in each language specific GetCapabilities-Response by a specific operation-online-resource for that language. To support the additional operation-online-resources the service shall listen at the language specific operation end-points to distinguish for the requested languages. |

An example of this behaviour is given below, showing how to extend the WFS.getCapabilities() operation to support multilingual error messages.

* + - 1. The client sends the initial Request for Capabilities: [OCG-GetCapabilities-Request]
      2. The service responses with extended Capabilities including the supported Languages:

*Example 50: Service response including supported languages*

<inspire\_dls:ExtendedCapabilities>

…

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>fre</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>eng</inspire\_common:SupportedLanguage>

<inspire\_common:SupportedLanguage>dut</inspire\_common:SupportedLanguage>

<inspire\_common:ResponseLanguage>eng</inspire\_common:ResponseLanguage>

</inspire\_common:SupportedLanguages>

…

</inspire\_dls:ExtendedCapabilities>

* + - 1. The Client sends a language specific request for capabilities [OCG-GetCapabilities-Request]&LANGUAGE=eng
      2. The service response with language specific capabilities containing:
         1. translated natural language fields (titles, abstracts)
         2. **language specific entry points** for the language specific operations using this concept.

*Example 51: Response to [OCG-GetCapabilities-Request]&LANGUAGE=eng or [OCG-GetCapabilities-Request]*

<WFS\_Capabilities> […]

<ows:OperationsMetadata>

<ows:Operation name="GetFeature">

<ows:DCP>

<ows:HTTP>

<ows:Get xlink:type="simple" [xlink:href="http://someHOST.example/eng?‖/>](http://someHOST.example/eng)

</ows:HTTP>

</ows:DCP>

</ows:Operation> […]

</ows:OperationsMetadata>

</WFS\_Capabilities>

*Example 52: Response to [OCG-GetCapabilities-Request]&LANGUAGE=ger*

<WFS\_Capabilities> […]

<ows:OperationsMetadata>

<ows:Operation name="GetFeature">

<ows:DCP>

<ows:HTTP>

<ows:Get xlink:type="simple" [xlink:href="http://someHOST.example/ger?‖/>](http://someHOST.example/ger)

</ows:HTTP>

</ows:DCP>

</ows:Operation> […]

</ows:OperationsMetadata>

</WFS\_Capabilities>

* + - 1. The Client sends an invalid request to either the English or the German operation endpoint.
         1. English operation end point: Request:

[http://someHOST.example/**eng**?](http://someHOST.example/eng) SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&STOREDQUERY\_ID=urn:og

c:def:query:OGC-WFS::GetFeatureById&ID=[nonexistentFeatureId]

b.

Response:

The service responses with an exception including an English exception message: e.g.

―The request is invalid. Reason is … ‖.

1. German operation end point: Request:

[http://someHOST.example/**ger**?](http://someHOST.example/ger) SERVICE=WFS&VERSION=2.0.0&REQUEST=GetFeature&STOREDQUERY\_ID=urn:og

c:def:query:OGC-WFS::GetFeatureById&ID=[nonexistentFeatureId]

1. Response:

The service responses with an exception including a German exception message: e.g.

―Die Anfrage ist fehlerhaft aufgrund …‖.

* + 1. **Language support in OWS**

With the on-going development of OWS Common it is expected that future versions of OGC Standards will include language support. For specific technical reasons, the concepts used for OWS common are not suitable to extend the current standards. However, with the availability of future versions of the OGC base standards the recommended approach to support multilingualism may need to be revisited.

IETF RFC 4646 is supported by OGC standards relying upon OWS 1.1.0.

|  |
| --- |
| TG Recommendation 15 The support of IETF RFC 4646 is recommended wherever the support of ISO/639 B alpha3 for languages infringes the conformity with the standard used for implementing the [INS NS]. |

|  |  |  |
| --- | --- | --- |
| ISO639/B alpha 3 | IETF RFC 5646 short | IETF RFC 5646 long |
| bul | bg | bg-BG |
| cze | cs | cs-CZ |
| dan | da | da-DK |
| dut | nl | nl-NL |
| eng | en | en-GB |
| est | et | et-EE |
| fin | fi | fi-FI |
| fre | fr | fr-CH, fr-FR |
| ger | de | de-AT, de-CH, de-DE, de-LI |
| gre | el | el-GR |
| hrv | hr | hr-HR |
| hun | hu | hu-HU |
| gle | ga | ga-IE |
| ice | is | Is-IS |
| ita | it | it-CH, it-IT |
| lav | lv | lv-LV |
| lit | lt | lt-LT |
| mlt | mt | mt-MT |
| nor | no | no-NO |
| pol | pl | pl-PL |
| por | pt | pt-PT |
| roh | rm | rm-CH |
| rum | ro | ro-RO |
| slo | sk | sk-SK |
| slv | sl | sl-SI |
| spa | es | es-ES |
| swe | sv | sv-SE |

Table 21: Mapping between ISO 639/B alpha 3 and the two forms of IETF RFC 4646 supported by OWS 1.1.0

1. **Web Feature Service and Filter Encoding implementation of Direct Access Download Service.**

**TG Conformance Class 3: Direct WFS:** Implement Direct Access Download Service (―Parts B & C‖) using ISO 19142 Web Feature Service and ISO 19143 Filter Encoding.

*This conformance class is inclusive of:*

*TG Requirement 61 to* [*TG Requirement 68*](#_bookmark296)

Direct Access download services (that satisfy Parts B and C of the IR) should be implemented where practicable. This may be done using ISO 19142 WFS [**ISO 19142**] and ISO 19143 Filter Encoding [**ISO 19143**] as described here. In order to be fully conformant with [**INS NS**], it is necessary to also provide an implementation satisfying Part A, either based on Atom/OpenSearch (Chapter [5](#_bookmark268)) or WFS (Chapter [6](#_bookmark292)).

* 1. ***Necessary elements from WFS-based Pre-defined dataset download service***

Direct access Download Services provide additional functionality beyond what is provided by Pre- defined Download Services. Because both Pre-defined dataset and Direct Access Download services are both based on [**ISO 19142**] there is an overlap of requirements for both types of solutions ensuring the ability to exist independent of each other.

**TG Requirement 61** Implementations shall meet [TG Requirement 48](#_bookmark293) (conformance to [**ISO 19142**]

‗HTTP GET‘ conformance class) and [TG Requirement 52](#_bookmark295) (one endpoint for each INSPIRE dataset).

* 1. ***Conformance to ISO 19142 „Basic WFS‟ Conformance Class***

In order to implement direct access download services using ISO 19142 WFS and ISO 19143 FE it is necessary to conform to the ‗Basic WFS‘ conformance classes as described in the 19142 standard [**ISO 19142**].

**TG Requirement 62** Implementations shall conform to ISO 19142 Conformance Class ‗Basic WFS‘

* 1. ***Conformance to ISO 19143 „Ad hoc Query‟ Conformance Class***

Ad hoc query support shall be implemented to enable user-defined requests for spatial objects in a WFS.

**TG Requirement 63** A Direct Access Download Service shall conform to ISO 19143 ‗Ad hoc Query‘ Conformance Class.

* 1. ***Conformance to ISO 19143 „Resource Identification‟ Conformance Class***

The referencing of resources by identifier shall be supported as described in ISO 19143

**TG Requirement 64** A Direct Access Download Service shall conform to ISO 19143 ‗Resource Identification‘ Conformance Class.

* 1. ***Conformance to ISO 19143 „Minimum Standard Filter‟ Conformance Class***

Querying with Comparison and logical operators shall be supported by the Direct Access Download Services as described in ISO 19143.

**TG Requirement 65** A Direct Access Download Service shall conform to ISO 19143 ‗Minimum Standard Filter‘ Conformance Class.

* 1. ***Conformance to ISO 19143 „Minimum Spatial Filter‟ Conformance Class***

Spatial querying of the Download Service shall be supported by the Direct Access Download Services as described in ISO 19143.

**TG Requirement 66** A Direct Access Download Service shall conform to ISO 19143 ‗Minimum Spatial Filter‘ Conformance Class.

* 1. ***Conformance to ISO 19143 „Minimum Temporal Filter‟ Conformance Class***

Temporal querying of the Download Service shall be supported by the Direct Access Download Services as described in ISO 19143.

**TG Requirement 67** A Direct Access Download Service shall conform to ISO 19143 ‗Minimum Temporal Filter‘ Conformance Class.

* 1. ***Conformance to ISO 19143 „Minimum XPath‟ Conformance Class***

Querying of the Download Service using XPath shall be supported by the Direct Access Download Services as described in ISO 19143.

**TG Requirement 68** A Direct Access Download Service shall conform to ISO 19143 ‗Minimum XPath‘ Conformance Class.

* 1. ***Language requirements for Direct Access Download Services***

The language requirements defined in **[INS NS]** for Direct Access Download Services are addressed by WFS instances as described in the following sub-sections.

* + 1. **DescribeFeatureType Operation (language requirements)**

This operation as specified by ISO 19142 implements the Describe Spatial Object Type operation of [**INS NS**].

In the implementing rule, a language parameter is specified, but as a DescribeFeatureType operation returns a description of the spatial object types in schema language, a parameter related to a natural language is not relevant.

* + 1. **GetFeature Operation (language requirements)**

This operation as specified by ISO 19142 implements the Get Spatial Object operation of **[INS NS].**

In the implementing rule, a language parameter is specified, but INSPIRE application schemas are modelled in a way so that in cases where multiple languages are possible for a feature property, the values in all languages may be provided simultaneously (e.g. for geographical names). i.e., if multilingual data is provided by a download service, all languages are provided by the download service. As a result, this parameter is not applicable in practice.

* 1. ***WFS metadata for “hybrid implementations”***

In case of a ―hybrid implementation‖ based on Atom and WFS for Parts B and C, in addition to the Atom service, it is possible to also document the WFS service through metadata in a discovery service. In this case, the link between the Atom and WFS implementations can be established through the ‗coupled resource‘ metadata element, which points to the same data set.

|  |
| --- |
| TG Recommendation 16 In addition, a textual reference to the Atom service implementing part A should be included in the ‗abstract‘ metadata element of the WFS. |

1. **Quality of Service**

**TG Conformance Class 4: Quality of Service:** Meet Quality of Service requirements.

Since quality of service (QoS) depends on the specific testing procedure for a given service, this section describes and normalizes the testing procedure that is to be applied for the assessment of QoS for a given INSPIRE download service.

The monitoring parameter NSi4 in the Commission decision for monitoring and reporting measures the conformity of all network services with the implementing rules. The conformity of a network service requires the compliance with the Quality of Service as defined in Annex I of the NS regulation (in particular NSi4,1 and NSi4,2 for the current monitoring period).

* 1. ***General requirements***

Two options exist for the measurements of Quality of Services:

1. Quality of Services requirements are measured at the service side exposed to the Internet.
2. Quality of Services requirements are measured from a central network node within the infrastructure.

Option 2 above was included for practical reasons. If a Member State uses a central network node in the testing infrastructure, it shall take into account the network transport time. For a detailed overview of the testing procedure when using a central node, see Figure 6. Based on the evaluation of experiences this option may be revisited in the future.

For feasibility reasons the testing procedure is based on the following simplifications:

 For the transport of a small size of data over the network, the network latency can be considered as a constant value and is denoted x. So each network transport (request and response) is considered to consume the duration of x/2.

* In case of option 1, x shall be set to 0.
* In case of option 2, a member state should initiate a comparison between sample measures from the central node to sample measures at the service side, to find a realistic value of x for the specific national setting.

 It is assumed that the network transport rate is not slower than the rate of the service response output stream to avoid any data jam at the production stream.

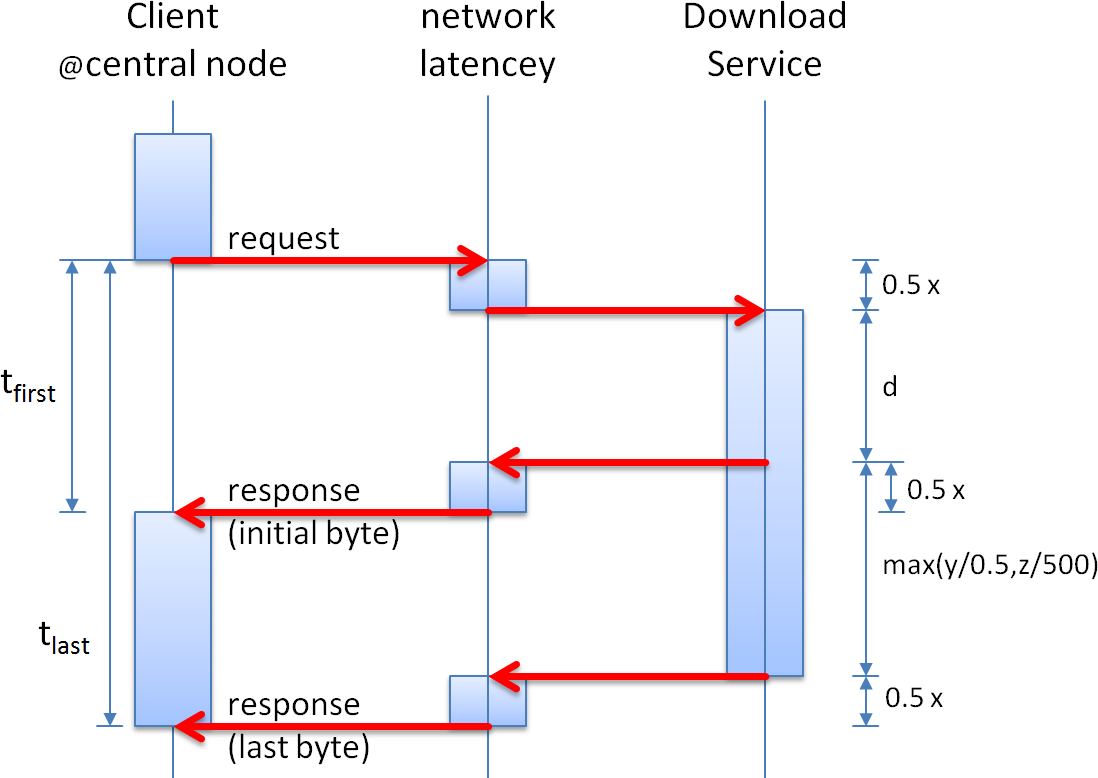


Figure 9: Detailed Sequence Diagram Download Service

* 1. ***Performance***
     1. **Implementation requirements mandated by the Implementing Rule**

*“For the Get Download Service Metadata operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation.*

*For the Get Spatial Data Set operation and for the Get Spatial Object operation, and for a query consisting exclusively of a bounding box, the response time for sending the initial response shall be maximum 30 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0,5 Megabytes per second or greater than 500 Spatial Objects per second.*

*For the Describe Spatial Data Set operation and for the Describe Spatial Object Type operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0,5 Megabytes per second or greater than 500 descriptions of Spatial Objects per second.*

*[…]*

*The normal situation represents periods out of peak load. It is set at 90 % of the time.”*

* + 1. **Normalized testing procedure**

**TG Requirement 69** Performance shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime during the period of testing.

To respect long running operations, the number of requests may be reduced. In such cases, a new request can be issued maximum 6 minutes after the previous request has finished.

*Example 53:* Performance tests for long-running operations

*If a previous Get Spatial Data Set operation requesting a 1 GB data set was issued at 8:00 and lasts until 8:30, the next reference request shall be issued at the latest at 8:36.*

NOTE: The result of performance measurements in a production system may be ambiguous due to the amount of user load that the service processes at the same time and therefore it is recommended capacity tests to be processed during maintenance time frames only.

|  |
| --- |
| TG Recommendation 17 The frequency of the performance tests is recommended to be monthly, e.g., during systems maintenance. |

**TG Requirement 70** Performance shall be measured using the Get Download Service Metadata, Get Spatial Data Set, Get Spatial Object, Describe Spatial Data Set and Describe Spatial Object Type operations.

|  |
| --- |
| TG Recommendation 18 The structure of the sample reference request packages is recommended to be composed of: 10% Get Download Service Metadata requests, 10% Describe Spatial Data Set or Describe Spatial Object Type and 80% Get Spatial Data Set or Get Spatial Object. At least 2% of the requests should be Get Spatial Data Set. |

NOTE: This composition is assumed to represent a ―normal situation‖.

**TG Requirement 71** For Get Spatial Object operations, the sample reference request shall Contain a BBOX parameter.

**TG Requirement 72** If a download service serves more than one feature type, only one feature type shall be requested by a Get Spatial Object operation.

**TG Requirement 73** If a download service serves more than one (pre-defined) spatial data set, only one spatial data set shall be requested by a Get Spatial Data Set operation.

NOTE 1: It is assumed that the feature type or data set requested in a reference request results in a representative measure for a specific download service.

NOTE 2: For both the Get Spatial Data Set and Get Spatial Object operations, the default language and CRS shall be used.

|  |
| --- |
| TG Recommendation 19 For Get Spatial Object operations, the sample reference request is recommended to return at least 1 MB.  For the Get Spatial Object operation, if the BBOX parameter is random it is recommended that the last 100 responses to a reference request have an average of at least 1 MB. |

According to Figure 6, the performance requirements are described by the following formulas:

**Initial byte:**

* *tfirst ≤ x/2 + d + x/2 = x + d*
* *tfirst – x ≤ d*

**Last byte:**

* *tlast ≤ x/2 + d + max (y/0.5, z/500) + x/2 = x + d + max( y/0.5 , z/500)*
* *tlast – x – d ≤ max( y/0.5 , z/500)*

 

where,

*tfirst* is the measured duration of time between initiating the request and receiving the initial byte of the response in seconds,

*tlast* is the measured duration of time between initiating the request and receiving the last byte of the response in seconds,

**d** is the time required to send the initial response at service side and shall be set to

10 seconds (operations: Get Download Service Metadata, Describe Spatial Data Set, Describe Spatial Object Type) or 30 seconds (operations: Get Spatial Data Set, Get Spatial Object),

1. is the time estimated for the network latency (x=0s if measured at the service side).
2. is the size of data in MB,
3. is the size of data in count of objects or object descriptions,

**TG Requirement 74** Evaluation and assessment criteria:

The ―response time for sending the initial response‖ is

*tfirst – x* and shall be maximum d (10 seconds or 30 seconds depending on operation).

The throughput of the ―maintained sustained response‖ is



and shall be greater than **0.5 MB/s or**

and shall be greater than **500 spatial objects / descriptions per second.**

All in normal situation, which shall be identified by the 90% best performing sample reference requests.

*Example 54: Get Spatial Data Set operation*

With a network latency set to *x* = 5s, the duration *tfirst* from issuing the request at client side till the first byte returned to the client side shall be *tfirst* ≤ 35 seconds and the duration *tlast* from issuing a request at client side till the complete download (last byte returned) to the client side depends on the size of the data set and shall be according to one of the tables below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| size of data set | Maximum duration till complete download  finished |  | size of data set | Maximum duration till complete download  finished |
| 100 KB | 35 s | 100 objects | 35 s |
| 1 MB | 37 s | 1,000 objects | 37 s |
| 10 MB | 55 s | 10,000 objects | 55 s |
| 100 MB | 4 min | 100,000 objects | 4 min |
| 1 GB | 34 min | 1,000,000 objects | 34 min |

* 1. ***Capacity***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The minimum number of simultaneous requests to a download service to be served in accordance with the quality of service performance criteria shall be 10 requests per second. The number of requests processed in parallel may be limited to 50.”*

* + 1. **Normalized testing procedure**

**TG Requirement 75** Capacity shall be measured consistently based on sample reference request packages to a given service.

Requests shall be made to the service at the rate of 10 new requests per second, using different types of requests according to the profile of the sample reference request packages. This rate shall be sustained throughout a measurement timeframe of 1 minute. In order to provide consistent and comparable measures, the capacity test shall restrict the number of requests being processed at any one time to a maximum of 50. A measurement shall take place at least once before launching the service in a production environment and monitored at regular intervals thereof to ensure that the compliance with the capacity requirement is still ensured.

NOTE: The result of capacity measurements in a production system may be ambiguous due to the amount of user load that the service processes at the same time and therefore it is recommended capacity tests to be processed during maintenance time frames only.

|  |
| --- |
| TG Recommendation 20 The frequency of the capacity is recommended to be monthly, e.g., during systems maintenance. |

|  |
| --- |
| TG Recommendation 21 The structure of the sample reference request packages is recommended to be composed of 10% Get Download Service Metadata requests, 10% Describe Spatial Data Set or Describe Spatial Object Type and 80% Get Spatial Data Set or Get Spatial Object. At least 2% of the requests should be Get Spatial Data Set. |

NOTE: This composition is assumed to represent a ―normal situation‖.

**TG Requirement 76** The measured capacity shall fulfil the requirements of the regulation (both capacity and performance) for all operations that are provided by the service.

* 1. ***Availability***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The probability of a Network Service to be available shall be 99% of the time.”*

* + 1. **Normalized testing procedure**

**TG Requirement 77** Availability shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime.

To respect long running operations, the number of requests may be reduced. In such cases, a new request can be issued maximum 6 minutes after the previous request has finished.

*Example 55: Availability tests for long-running operations*

*If a previous Get Spatial Data Set operation requesting a 1 GB data set was issued at 8:00 and lasts until 8:30, the next reference request shall be issued at the latest at 8:36.*

|  |
| --- |
| TG Recommendation 22 The sample request issued to the service to measure performance can be used to measure availability as well, thus also fulfilling the same evaluation and assessment criteria. |

**TG Requirement 78** The availability shall be based on a time frame of one year meaning a maximum unplanned downtime of 3.63 days per year. Periods of planned downtime e.g. because of system maintenance, shall not be included in the measure. Downtime is considered planned when notified to the community well in advance (minimum 1 week), e.g. via notifications to registered users or on portals.

NOTE It is assumed that the availability is calculated in the following way:

100% ↔ 365 x 24 - (planned downtime)

99% ↔ [365 x 24 - (planned downtime)] \* 0.99 etc.

|  |
| --- |
| TG Recommendation 23 Planned downtime is recommended to be less than 10 hours per month (i.e., less than 120 hours per year). |

**Annex A: Example OpenSearch script**

The following code shows a sample server side script to implement the search engine needed for the OpenSearch implementation. This is a simple example implementation in a particular language (PHP), however any programming language may be used for the OpenSearch implementation. *This example is purely informative and does not constitute a normative part of this Technical Guidance.*

Sample PHP script for the search engine

<?php

$returnFile = false;

foreach (apache\_request\_headers() as $name => $value) {

//echo("$name: $value\n");

if ($name=="Accept" && $value=="application/x-filegdb"){

$returnFile = true;

}

}

echo ("returnFile: $returnFile");

$q= $\_GET['q'];

$uriCode = $\_GET['spatial\_dataset\_identifier\_code']; if (!$uriCode)

{

if (!$q)

{

header("Location: democcmdownloadservice.atom.en.xml"); exit;

}

$uriCode = $q;

}

$uriNamespace= $\_GET['spatial\_dataset\_identifier\_namespace'];

$crs= $\_GET['crs'];

$language= $\_GET['language'];

if (!$language || $language == "\*"){

$language = "en";

}

if ($language != 'en' && $language != 'it'){

die( "Only en and it languages are supported" );

}

if ($uriCode == "ccm2.1\_2000"){ if ($returnFile){

header("Location: files/CCM21\_WGS84\_window2000.zip");

} else{

header("Location: subfeed2000.atom.en.xml");

}

exit;

}

if ($uriCode == "ccm2.1\_2001"){ if ($returnFile){

header("Location: files/CCM21\_WGS84\_window2001.zip");

} else{

header("Location: subfeed2001.atom.en.xml");

}

exit;

}

if ($uriCode == "ccm2.1\_2002"){ if ($returnFile){

header("Location: files/CCM21\_WGS84\_window2002.zip");

} else{

header("Location: subfeed2002.atom.en.xml");

}

exit;

}

if ($uriCode == "ccm2.1\_2003"){ if ($returnFile){

header("Location: files/CCM21\_WGS84\_window2003.zip");

} else{

header("Location: subfeed2003.atom.en.xml");

}

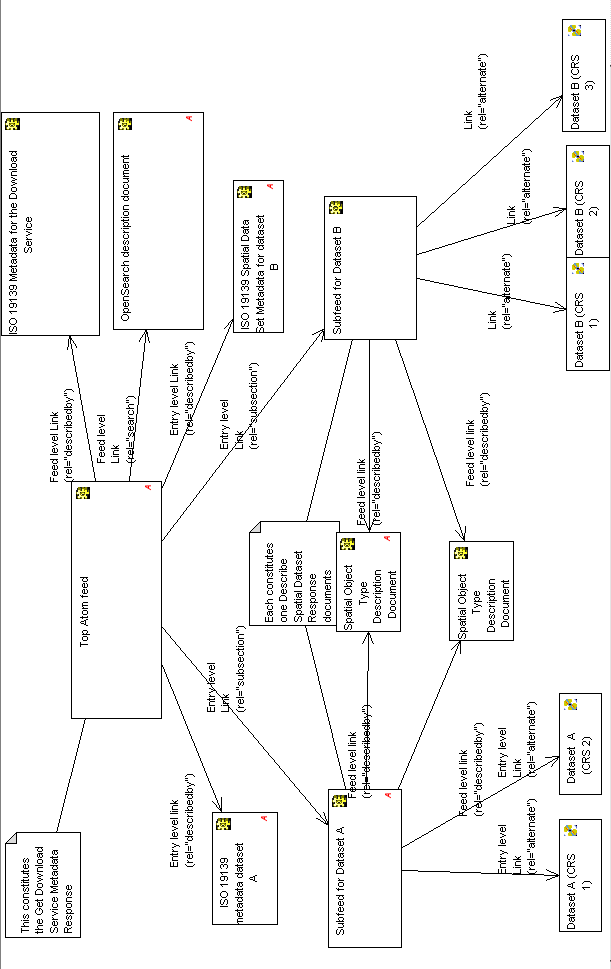
exit;

}

echo 'Not found';

?>

**Annex B: UML Atom/OpenSearch Deployment Diagram**



INSPIRE

Infrastructure for Spatial Information in Europe

**Technical Guidance for the implementation of INSPIRE Download Services using Web Coverage Services (WCS)**

|  |  |
| --- | --- |
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1 France will submit this document to a national stakeholder consultation (until end of January 2017), as foreseen as an option under the workflow of the MIWP 2014-2016.

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**Foreword**

Directive 2007/2/EC of the European Parliament and of the Council [**INS DIR**], adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonised and quality geographic information to support the formulation, implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment.

INSPIRE is based on the infrastructures for spatial information established and operated by the 28 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas.

* + - Metadata;
    - The interoperability and harmonisation of spatial data and services for selected themes (as described in Annexes I, II, III of **[INS DIR]**);
    - Network Services;
    - Measures on sharing spatial data and services;
    - Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are legally binding.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of **[INS DIR]**):

1. *discovery services search for spatial data sets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
2. *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial data sets and display legend information and any relevant content of metadata;*
3. *download services enabling copies of complete spatial data sets, or of parts of such sets, to be downloaded;*
4. *transformation services enabling spatial data sets to be transformed with a view to achieving interoperability;*
5. *invoke spatial data services "enabling data services to be invoked.”*

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies and practices in order to support the technical implementation process. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations. In other words, these Technical Guidance documents are supporting material to assist in the technical implementation of the INSPIRE Directive but no additional obligations can be derived from these documents over and above the obligations set out in the Directive and the Implementing Rules. The Technical Guidance documents are also not intended to interpret legal obligations. Figure 1 illustrates the relationship between the INSPIRE Regulations containing Implementing Rules and their corresponding Technical Guidance documents.

The scope of this document is to provide Technical Guidance for the implementation of the requirements related to download services included in [**INS NS**] using Web Coverage Services (WCS), such that these services can be implemented consistently across Europe. Other Technical Guidance exist for describing implementations of the requirements for download services using other specifications, such as for Atom Syndication Format, and WFS.

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Implementing this Technical Guidance are designed to maximise the interoperability of INSPIRE services. Technical Guidance documents describe how Member States might implement the Implementing Rules described in a Commission Regulation. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples. Technical Guidance documents may also include non-binding technical recommendations that should be satisfied if a Member State chooses to conform to the Technical Guidance. However, these recommendations have no legally binding effect.

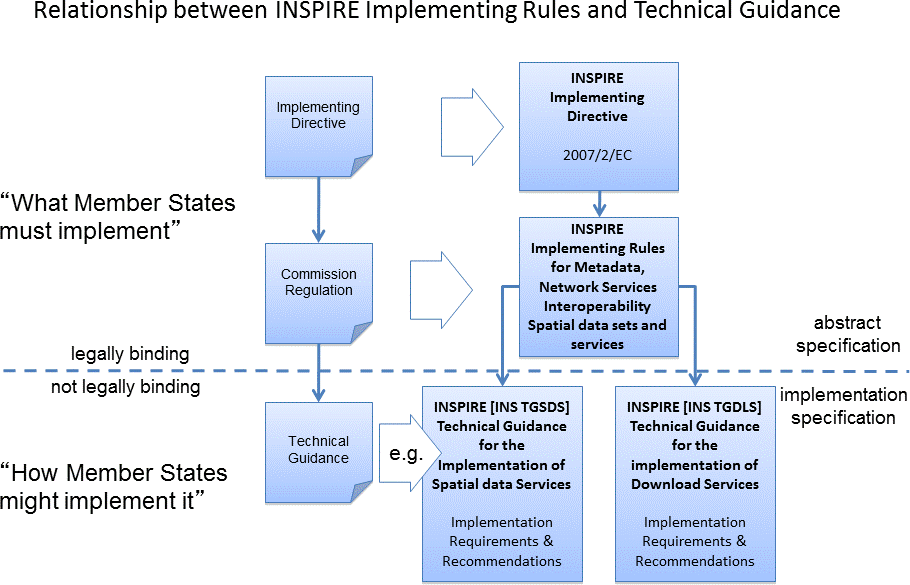


Figure 1: Relationship between the INSPIRE Implementing Rules and the associated Technical Guidance.

|  |
| --- |
| **Disclaimer**  This document has been developed collaboratively through the INSPIRE maintenance and implementation framework, involving experts of the European Commission services, the European Environment Agency, EU Member States, the Accession and EFTA Countries. The document should be regarded as presenting an informal consensus position on best practice agreed by all partners. However, the document does not necessarily represent the official, formal position of any of the partners. To the extent that the European Commission's services provided input to this technical document, such input does not necessarily reflect the views of the European Commission and its services. This document does not bind the Commission and its services, nor can the Commission and its services be held responsible for any use which may be made of the information contained herein.  The technical document is intended to facilitate the implementation of Directive 2007/2/EC and is not legally binding. Any authoritative reading of the law should only be derived from Directive 2007/2/EC itself and other applicable legal texts or principles such as the related Implementing Rules. Only the Court of Justice of the European Union is competent to authoritatively interpret Union legislation. |

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**Revision history**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Release** | **Editor** | **Description** |
| 2015-11-24 | 0.1 | James Passmore | Initial work on creating a structure for the document based on the template used in the SOS TG. Some attempt made at commenting on extended capabilities section |
| 2015-12-16 | 0.2 | James Passmore | Added the suggested mapping of WCS operations to the [**INS NS]** download operations. Fleshed out normative references |
| 2016-01-22 | 0.3 | James Passmore | Substantial reworking of the document structure. Updates to language handling including error responses. Details given on how WCS operations can be constructed to adhere to [**INS NS]** download operations and requirements. Comments on issues to be addressed in QoS. |
| 2016-01-26 | 0.4 | James Passmore | Started section on CRS, corrected typos elsewhere |
| 2016-01-26 | 0.5 | James Passmore | Added time slice example, formatting corrections |
| 2016-01-29 | 0.6 | James Passmore | Added background information in the intro based on the ToR draft, corrected typos copied over from existing TG. Updated terms listing. |
| 2016-02-05 | 0.7 | James Passmore | First stab at correct acknowledgements, removed Coveragecollections section, removed many inline comments replacing with suggested text etc. informative section on describe spatial object type added. |
| 2016-02-23 | 0.8 | James Passmore | Corrections and amendments following MIWP formal review. Substantial edit to QoS section, mapping requirements to WCS operations. Update to sections in relation to conditional operations. |
| 2016-03-21 | 0.9 | James Passmore | Tidying up text for language response codes, incorporating comments from ML and AK |
| 2016-03-22 | 0.10 | James Passmore | Adding further clarification to schematic diagram. |
| 2016-03-23 | 1.0-RC1 | James Passmore | Corrected formatting, removed citing of CRS from [**INS ISSDS**] in 4.4 as changes to this IR are mooted |
| 2016-09-21 | 1.0-RC2 | James Passmore | Addressed comments from MIG-T feedback |
| 2016-12-12 | 1.0 | Michael Lutz | Editorial changes for publication |

Table 1: Revision history

1. **Introduction**

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official Journal on the 25th April 2007. The INSPIRE Directive entered into force on the 15th May 2007.

The purpose of the infrastructure is to enable the formulation, implementation, monitoring activities and evaluation of Community environmental policies at all levels – European, national and local – and to provide public information.

INSPIRE builds on the infrastructures for spatial information that have already been created by the Member States. The components of those infrastructures include: metadata, spatial data themes (as described in Annexes I, II, III of **[INS DIR]**), network services and technologies; agreements on data sharing, access and use; coordination and monitoring mechanisms, processes and procedures.

The guiding principles of INSPIRE are:

* + that the infrastructures for spatial information in the Member States should be designed to ensure that spatial data are stored, made available and maintained at the most appropriate level;
  + that it is possible to combine spatial data from different sources across the Community in a consistent way and share them between several users and applications;
  + that it is possible for spatial data collected at one level of public authority to be shared between all the different levels of public authorities;
  + that spatial data are made available under conditions that do not restrict their extensive use; and
  + that it is easy to discover available spatial data, to evaluate their fitness for purpose and to know the conditions applicable to their use.

The text of the INSPIRE Directive is available from available from the European Union Law website (EU- LEX) [http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007L0002.](http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32007L0002) The Directive identified what needed to be achieved, and Member States had two years from the date of adoption to bring into force national legislation, regulations, and administrative procedures that define how the agreed objectives will be met taking into account the specific situation of each Member State. To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas. Implementing Rules are adopted as Commission Decisions, and are binding in their entirety.

According to Article 5(4) of the Directive, the INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements.

The scope of this document is to provide Technical Guidance based on the Implementing Rules for the implementation of service interfaces for INSPIRE Download Services using Web Coverage Services (WCS), such that these services can be implemented consistently across Europe. Other Technical Guidance exist for describing implementations using other service interfaces, such as for Atom Syndication Format, and WFS.

These Implementing Rules are, as much as possible, in conformance with European and international standards, current practices in stakeholder communities and relevant European initiatives such as e-Government, and the EU interoperability framework.

* 1. ***Background***

Many INSPIRE spatial data themes (Orthoimagery, Elevation, Geology, Atmospheric conditions/Meteorological geographical features, Oceanographic geographical features, Soil, Land cover, Natural risk zones, Energy resources) include data that, according to the INSPIRE data specifications, have to be made available as coverages. The ‘Habitats and biotopes’ and Environmental monitoring facilities’ specifications mention that the use of coverage model should be considered once mature implementations appear.

Other data specifications such as 'Sea regions' whilst not mandating data should be provided as coverages, would benefit from having the ability to provide data as coverages.

Whilst coverage data can be provided using Atom feeds or WFS, these options are not well suited for many coverage data sets, because single coverages are often several GB or even TB in size and users are typically only interested in some sub-set of the data, e.g. as defined by

* a user-defined bounding box or time period (trimming)
* queries that reduce the dimension of the result coverage (slicing), e.g. extracting a temperature surface at a certain depth from a 3D ocean temperature coverage

This technical guidance shows how the operations required by the [**INS NS**] for download services can be mapped to the WCS 2.0 standard. A second document will be provided to show how the data specifications that have a requirement to provide coverage data, might encode their data to provision it through an INSPIRE conformant download service based on WCS as documented in this guidance.

The below tables give a fuller description of the spatial data themes defined by the [**INS DIR**] which are likely to provision data as coverages. None of the Annex I spatial data themes are believed to be directly in scope.

Table 2: Annex II spatial data themes with coverage data

|  |  |
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| **SPATIAL DATA THEMES in [INS DIR, Annex II]** | |
| Spatial data theme (common abbreviation) | Definition of the Spatial data theme |
| Spatial Object Types (*and data types*) thought to be in scope for the Spatial data theme |
| Elevation (EL) | Digital elevation models for land, ice and ocean surface. Includes terrestrial elevation, bathymetry and shoreline. |
| ElevationGridCoverage  ElevationTIN |
|  | Geology characterised according to composition and structure. Includes bedrock, |
|  | aquifers and geomorphology. |
| Geology | HydrogeologicalObject (*HydrogeologicalSurface, PiezometricState*) |
| (GE) | GeophProfile |
|  | GeophSwath |
|  | GeophStation |
| Land cover (LC) | Physical and biological cover of the earth's surface including artificial surfaces, agricultural areas, forests, (semi-)natural areas, wetlands, water bodies |
| LandCoverGridCoverage |
| Orthoimagery (OI) | Geo-referenced image data of the Earth's surface, from either satellite or airborne sensors. |
| OrthoimageCoverage |

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| **SPATIAL DATA THEMES in [INS DIR, Annex III]** | |
| Spatial data theme (common abbreviation) | Definition of the Spatial data theme |
| Spatial Object Types (*and data types*) thought to be in scope for the Spatial data theme |
| Soil (SO) | Soils and subsoil characterised according to depth, texture, structure and content of particles and organic material, stoniness, erosion, where appropriate mean slope and anticipated water storage capacity. |
| SoilThemeCoverage  SoilThemeDescriptiveCoverage |
| Land use (LU) | Territory characterised according to its current and future planned functional dimension or socio-economic purpose (e.g. residential, industrial, commercial,  agricultural, forestry, recreational). |
| ExistingLandUseGrid |
| Environmental monitoring facilities (EF) | Location and operation of environmental monitoring facilities includes observation and measurement of emissions, of the state of environmental media and of other ecosystem parameters (biodiversity, ecological conditions of vegetation, etc.) by  or on behalf of public authorities. |
| EnvironmentalMonitoringFacility |
| Natural risk zones (NZ) | Vulnerable areas characterised according to natural hazards (all atmospheric, hydrologic, seismic, volcanic and wildfire phenomena that, because of their location, severity, and frequency, have the potential to seriously affect society),  e.g. floods, landslides and subsidence, avalanches, forest fires, earthquakes,  volcanic eruptions. |
| ExposedElementCoverage |
|  | HazardCoverage |
|  | ObservedEventCoverage |
|  | RiskCoverage |
| Atmospheric conditions (AC) | Physical conditions in the atmosphere. Includes spatial data based on measurements, on models or on a combination thereof and includes  measurement locations. |
| SamplingCoverageObservation (PointObservation) SamplingCoverageObservation (PointTimeSeriesObservation) SamplingCoverageObservation (MultiPointObservation) SamplingCoverageObservation (GridObservation) SamplingCoverageObservation (GridSeriesObservation) SamplingCoverageObservation (ProfileObservation)  SamplingCoverageObservation (TrajectoryObservation) |
| Meteorological geographical features (MF) | Weather conditions and their measurements; precipitation, temperature, evapotranspiration, wind speed and direction. |
| SamplingCoverageObservation (PointObservation) SamplingCoverageObservation (PointTimeSeriesObservation) SamplingCoverageObservation (MultiPointObservation)  SamplingCoverageObservation (GridObservation) |

|  |  |
| --- | --- |
|  | SamplingCoverageObservation (GridSeriesObservation)  SamplingCoverageObservation (ProfileObservation) SamplingCoverageObservation (TrajectoryObservation) |
| Oceanographic geographical features (OF) | Physical conditions of oceans (currents, salinity, wave heights, etc.). |
| SamplingCoverageObservation (PointObservation) SamplingCoverageObservation (PointTimeSeriesObservation) SamplingCoverageObservation (MultiPointObservation) SamplingCoverageObservation (GridObservation)  SamplingCoverageObservation (GridSeriesObservation) |
| Sea regions (SR) | Physical conditions of seas and saline water bodies divided into regions and sub- regions with common characteristics. |
| MarineLayer  SeaBedArea SeaSurfaceArea |
| Habitats and biotopes (HB) | Geographical areas characterised by specific ecological conditions, processes, structure, and (life support) functions that physically support the organisms that live there. Includes terrestrial and aquatic areas distinguished by geographical,  abiotic and biotic features, whether entirely natural or semi-natural. |
| Habitat |
| Energy resources (ER) | Energy resources including hydrocarbons, hydropower, bio-energy, solar, wind, etc., where relevant including depth/height information on the extent of the resource. |
| RenewableAndWastePotentialCoverage |

Table 3: Annex III spatial data themes with coverage data

The Spatial Object Types defined in [**INS ISSDS**] that can be mapped as coverages for these Spatial data themes are discussed elsewhere.

* 1. ***What is a coverage***

Coverages are used to describe characteristics of real-world phenomena that vary over space and/or time. In practice, the notion of coverages encompasses regular and irregular grids, point clouds, and general meshes. Typical examples are 1-D temperature (time series or vertical profile)2, 2-D elevation, 2-D precipitation, 2-D imagery, 2-D x/y/t image timeseries and x/y/z geophysical voxel data, and 4-D x/y/z/t weather data. A coverage contains a set of such values, each associated with one of the elements in a spatial, temporal or spatio-temporal domain. Typical spatial domains are point sets (e.g. sensor locations), curve sets (e.g. isolines), grids (e.g. orthoimages, elevation models), etc.

In INSPIRE application schemas, coverages are defined according to ISO 19123.To improve alignment with coverage standards on the implementation level (e.g. ISO 19136 and the OGC Web Coverage Service) and to improve the cross-theme harmonisation on the use of coverages in INSPIRE, an application schema for coverage types is included in the Generic Conceptual Model in 9.9.4. This application schema contains the following coverage types:

* *RectifiedGridCoverage*: coverage whose domain consists of a rectified grid – a grid for which there is an affine transformation between the grid coordinates and the coordinates of a coordinate reference system (see Figure 2, left).
* *ReferenceableGridCoverage*: coverage whose domain consists of a referenceable grid – a grid associated with a transformation that can be used to convert grid coordinate values to values of coordinates referenced to a coordinate reference system (see Figure 2, centre).

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| (Source: ISO 19136:2007) | (Source: GML 3.3.0) | (Source: CIS 1.1) |

Figure 2: Examples of a rectified grid (left) and a referenceable grid (center) and an orthoimage timeseries (right)

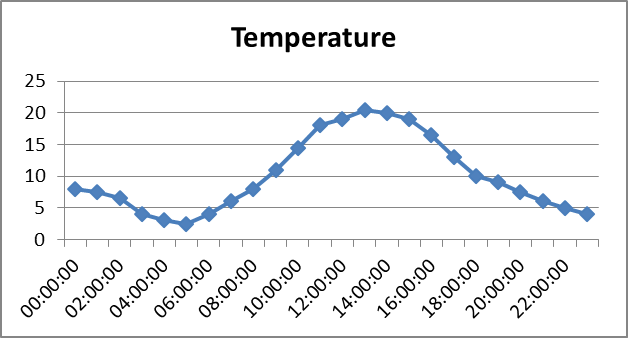


Figure 3: Example of a time series which might be a sample or a WCS timeseries extracted from, e.g., a 3-D x/y/t orthoimage timeseries or an x/y/z/t weather forecast

2 These can also be encoded in, e.g., WaterML and be served via SOS.

**[CIS 1.0]** states that: *Coverages represent digital geospatial information representing space/time- varying phenomena. OGC Abstract Topic 6 [OGC 07-011] – which is identical to ISO 19123 – defines an abstract model of coverages. Coverage instances may be encoded using the Geography Markup Language (GML) 3.2 [07-036], an XML grammar written in XML Schema for the description of application schemas as well as the transport and storage of geographic information.*

*However, the definition contained in GML 3.2.1 has turned out to not contain sufficient information to describe coverage instances in a flexible, interoperable, and harmonized manner.*

With the OGC “GML 3.2.1 Application Schema – coverages” standard (meanwhile renamed to Coverage Implementation Schema [**CIS 1.0**]) the OGC WCS group developed an extension to the conceptual model of GML 3.2.1, which can be mapped to GML or any other suitable format. The structure of a coverage so described by this standard is shown in the below [Figure 4.](#_bookmark298)

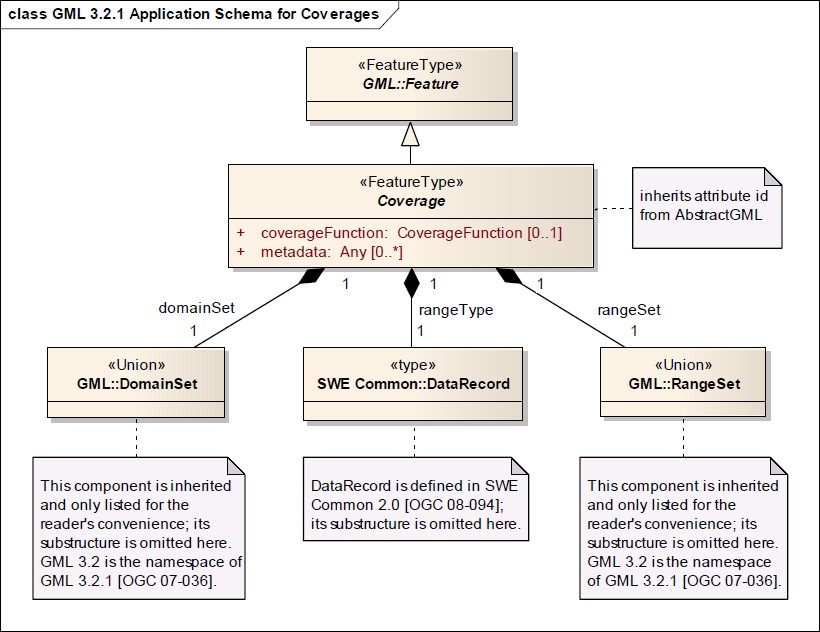


Figure 4: Structure of a CIS 1.0 coverage (taken from [**CIS 1.0**])

Within the WCS 2.0 interface standard the term coverage is intended to mean a coverage as defined by [**CIS 1.0**] – in other words, WCS 2.0 can serve coverages adhering to the [**CIS 1.0**] specification**.**

Where possible, only these coverage types (or a subtype thereof) are used in INSPIRE application schemas.

1. **References**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

* 1. ***Normative references***

INSPIRE Directive, **INS DIR**, Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

INSPIRE Network Services Regulation, **INS NS**, COMMISSION REGULATION (EU) No 976/2009 of 23 November 2010 as amended by Regulation (EC) No 1088/2010 as regards download services and transformation services

INSPIRE Metadata Regulation, **INS MD**, COMMISSION REGULATION (EC) No 1205/2008 of 3

December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata. See also Corrigendum to INSPIRE Metadata Regulation.

INSPIRE Metadata Implementing Rules, **IR MDTG**, Guidelines based on EN ISO 19115 and EN ISO 19119 for Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

INSPIRE Regulation on the interoperability of spatial data sets and services Regulation, **INS ISSDS,** COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services

Commission Decision 2009/442/EC, **INS M&R**, Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting

* 1. ***Technical references***

D2.8.I.1 Data Specification on Coordinate Reference Systems – Technical Guidelines, **INS CRS**

D2.5: Generic Conceptual Model, **INS GCM**

ISO 19135-1:2005, **ISO 19135,** Geographic information — Procedures for item registration

ISO 19101-1:2014, **ISO 19101,** Geographic information -- Reference model -- Part 1: Fundamentals ISO/TS 19103:2005, **ISO/TS 19103,** Geographic information -- Conceptual schema language

ISO 19107:2003, **ISO 19107**, Geographic information -- Spatial schema ISO 19115:2003, **ISO 19115**, Geographic information -- Metadata

OGC 06-121r9, **OWS 2**, OGC Web Services Common Standard, version 2.0

OGC 09-110r4, **OGC WCS**, OGC WCS 2.0 Interface Standard – Core, version 2.0

OGC 09-149r1, **WCS XML**, OGC Web Coverage Service 2.0 Interface Standard – XML/SOAP Protocol Binding Extension, version 1.0,

OGC 09-147r3, **WCS KVP**, WCS 2.0 Interface Standard – KVP Protocol Binding Extension, version 1.0

OGC 09-146r2, **CIS 1.0**, (Coverage Implementation Schema 1.0 or CIS 1.0, formerly known as GML

3.2.1 Application Schema Coverages or GMLCOV)

OGC 12-100r1, **GT COV**, GML Application Schema - Coverages – GeoTIFF Coverage Encoding Profile

OGC 08-059r4, **WCS PE**, OGC Web Coverage Service WCS Interface Standard - Processing Extension, version 2.0

1. **Terms and abbreviations**
   1. ***Terms***
2. **application schema**

conceptual schema for data required by one or more applications [**ISO 19101**]

1. **conceptual model**

model that defines concepts of a universe of discourse [**ISO 19101**]

1. **conceptual schema**

formal description of a **conceptual model** [**ISO 19101**]

EXAMPLE ISO 19107 contains a formal description of geometrical and topological concepts using the conceptual schema language UML.

1. **conceptual schema language**

formal language based on a conceptual formalism for the purpose of representing **conceptual schemas**

[**ISO 19101**]

EXAMPLE UML, EXPRESS, ORM and INTERLIS are examples of conceptual schema languages.

1. **coordinate reference system**

System for uniquely referencing spatial information in space as a set of coordinates (x, y, z) and/or latitude and longitude and height, based on a geodetic horizontal and vertical datum [**INS DIR**]

NOTE While INSPIRE considers CRSs to be spatial only, OGC coverages can be spatio-temporal. Technically, this is reflected by OGC coverages having n additional time axis in the CRS where needed.

1. **coverage**

**spatial object** that acts as a function to return values from its range for any direct position within its spatial, temporal or spatiotemporal domain, in accordance with ISO 19123:2007 [**INS ISDSS**]

EXAMPLE Orthoimage, Image time series, digital elevation model (as grid or TIN), point grids etc.

1. **data set**

identifiable collection of data [**ISO 19115**]

Note sometimes used instead of ‘spatial data set’, same meaning as ‘spatial data set’.

1. **domain**

well-defined set [**ISO/TS 19103**]

1. **download service**

**network service** enabling copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly [**INS DIR**]

1. **feature**

abstraction of a real world phenomenon [I**SO 19101**]

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1. **function**

rule that associates each element from a domain (source or domain of the function) to a unique element in another domain (target, co-domain or range) [**ISO 19107**]

1. **geographical grid system**

harmonised multi-resolution grid with a common point of origin and standardised location and size of grid cells. [**INS DIR**]

NOTE 1 Geographical grid systems are not limited to rectified grids or grids using cell axes parallel to the meridians.

NOTE 2 The [**INS GCM**] document adopts the definition of the 2003 Workshop on European Reference Grids, which includes not only the grid describing the domain of a coverage but also its range. Thus, a 'geographical grid' is equivalent to an ISO 19123 coverage. The unqualified term 'grid' may refer either to a grid geometry or a geographical grid (coverage) depending on the context.

1. **INSPIRE application schema**

**application schema** specified in an INSPIRE data specification [**INS GCM**]

1. **metadata**

information describing spatial data sets and spatial data services and making it possible to discover, inventory and use them [**INS DIR**]

1. **network service**

*Network services are necessary for sharing spatial data between the various levels of public authority in the Community. Those network services* ***should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services****. The services of the network should work in accordance with commonly agreed specifications and minimum performance criteria in order to ensure the interoperability of the infrastructures established by the Member States. The network of services should also include the technical possibility to enable public authorities to make their spatial data sets and services available.* [**INS DIR**]

1. **range** [of a coverage]

set of feature attribute values associated by a function with the elements of the domain of a coverage [**ISO 19123**]

1. **register**

set of files containing identifiers assigned to items with descriptions of the associated items [**ISO 19135**]

1. **registry**

information system on which a **register** is maintained [**ISO 19135**]

EXAMPLE the **INSPIRE registry,** the official registry containing definitions for terms and feature concepts in INSPIRE. <http://inspire.ec.europa.eu/registry>

1. **spatial data**

any data with a direct or indirect reference to a specific location or geographic area [**INS DIR**]

NOTE The use of the word ‘spatial’ in INSPIRE is unfortunate as in the everyday language its meaning goes beyond the meaning of ‘geographic’, which is considered by the Drafting Team as the intended

scope, and includes subjects such as medical images, molecules, or other planets to name a few. However, since the term is used as a synonym for geographic in the Directive, this document uses the term ‘spatial data’ as a synonym for the term ‘geographic data’ used by the ISO 19100 series of International Standards and which is defined as ‘data with implicit or explicit reference to a location relative to the Earth’. Further, spatial data – and particularly coverages, such as weather data – may also have a temporal dimension.

1. **spatial data service**

operations which may be performed, by invoking a computer application, on the spatial data contained in spatial data sets or on the related metadata [**INS DIR**]

1. **spatial data set**

an identifiable collection of spatial data [**INS DIR**]

1. **spatial object**

an abstract representation of a real world phenomenon related to a specific location or geographical area [**INS DIR**]

NOTE The term ‘(geographic) feature’ as used in the ISO 19100 series of International Standards, in other specifications like IHO S-57, and in the [**INS GCM**] document is used synonymously with **spatial object.** [Note modified from **INS GCM**]

1. **spatial object type**

classification of **spatial objects**

NOTE In the conceptual schema language UML a spatial object type will be described by a class with stereotype <<featureType>>.

* 1. ***Abbreviations***

CIS Coverage Implementation Schema CRS Coordinate Reference System DLS Download Service

GCM INSPIRE Generic Conceptual Model, referring to D2.5\_v3.4 GET HTTP GET method, referring to IETF rfc7230

GML Geography Markup Language

GMLCOV GML Application Schema for Coverages, referring to OGC 09-146r2 HEAD HTTP HEAD method, referring to IETF rfc7230

HTTP Hypertext Transfer Protocol, referring to IETF rfc7230 IETF Internet Engineering Task Force

INSPIRE Infrastructure for Spatial Information in Europe IR Implementing Rule

ISO International Organisation for Standardisation JRC Joint Research Centre

KVP Key/Value Pair

NS Network Services

OGC Open Geospatial Consortium

OWS OGC Web Services Common Standard, referring to OGC 06-121r9 POST HTTP POST method, referring to IETF rfc7230

WCS Web Coverage Service, referring to OGC 09-110r4 XML eXtensible Markup Language

* 1. ***Verbal forms for the expression of provisions***

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

* + - “shall” / “shall not”: a requirement, mandatory to comply with the technical guidance
    - “should” / “should not”: a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so
    - “may” / “need not”: a permission

**Technical Guidance Conformance Classes notation**

The Technical Guidance in this document is divided into Conformance Classes, so that it is possible to declare conformance to specific parts of the Technical Guidance. *To conform to a Conformance Class it is necessary to meet all of the Requirements (see next section) in that Conformance Class.*

Conformance Classes are identified in the document as follows:

**TG Conformance Class #: [TITLE]** conformance classes are shown using this style

**Technical Guidance Requirements and Recommendations notation**

Requirements and the recommendations for INSPIRE Download Services within this technical guidance are highlighted and numbered as shown below:

**TG Requirement #** requirements are shown using this style

|  |
| --- |
| TG Recommendation # recommendations are shown using this style. |

It is important to note that, implementation requirements and implementation recommendations may refer to either service or client implementations. Requirements and recommendations belong to the conformance class in which they are found in this document.

**Note**: It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‘TG requirement’ and ‘TG recommendation’ to indicate what is technically required or recommended to conform to the Technical Guidance.

**XML Example notation**

XML Examples are shown using Courier New on a grey background with yellow for emphasis as below:

</inspire:example>

<inspire:highlight>

Highlighted Text for emphasis

</inspire:highlight>

<inspire:example>

**Note**: XML Examples are informative and are provided for information only and are expressly not normative.

* 1. ***References***

References within this document are denoted using “Section” or “Annex”. For example, Section 5.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 3 and use the abbreviated title as indicated in **Bold** text. For example, [**INS NS**] uses the abbreviated title for the document as shown below:

INSPIRE Network Services Regulation, **INS NS,** COMMISSION REGULATION (EU) No 1088/2010 of 23 November 2010 amending Regulation (EC) No 976/2009 as regards download services and transformation services

References within other documents are show as above using the abbreviated title, together with the appropriate section within the document. For example, [**INS NS,** Section 2.2.3], refers to Section 2.2.3 within the document as listed above.

* 1. ***Future updates of this document***

There are some issues that are foreseen, but are not covered or only partially covered in this version of the Technical Guidance.

These are:

* + - Extensions to the Coverage Data Model (GML 3.2.1 Application Schema - Coverages version 1.0.1, OGC 09-146r2, is advanced to Coverage Implementation Schema 1.1)
    - WCS 2.1 standard publication which reflects inclusion of CIS 1.1
    - CIS and WCS becoming ISO standards

1. **INSPIRE Download Services**

This document provides Technical Guidance for the implementation of technical service interfaces for INSPIRE Download Services using WCS. Other Technical Guidance exists for describing implementations using other service interfaces such as for Atom Syndication Format, WFS, and SOS (unpublished). This WCS guidance is based on the abstract model established in the INSPIRE Network Services Regulation [**INS NS**].

The Network Services Regulation describes the following four download operations [**INS NS**, Annex IV, Part A] that *must* be implemented by *all* Download Services:

* + Get Download Service Metadata
  + Get Spatial Data Set
  + Describe Spatial Data Set
  + Link Download Service

The [**INS DIR,** Article 11] when talking about download services tell us that they enable *copies of spatial data sets, or parts of such sets, to be downloaded and, where practicable, accessed directly.*

The Network Services Regulation states that where a direct access download service is provided, the following two operations [**INS NS**, Annex IV, Part B] *shall* be implemented:

* + Get Spatial Object
  + Describe Spatial Object Type

Furthermore, for the *Get Spatial Object* operation particular search capabilities [**INS NS**, Annex IV, Part C] shall also be implemented; that is in addition to support for the standard request query parameters used in a Get Spatial Data Set operation (language, coordinate reference system, and spatial data set identifier).

These capabilities include the ability to search by:

* + Unique identifier of the Spatial Data Set
  + Key attributes of spatial objects, and temporal dimensions including the date of update
  + Bounding Box
  + Spatial data theme
  + Combinations of the above

[**INS NS**] defines a direct access download service as a download service which provides access to the Spatial Objects in Spatial Data Sets based upon a query. The query acts on predefined coverages according to the coverage identifiers made accessible through the service. The query does not imply any actual transformation of the coverage data. Data transformation and the creation of new data sets is covered in [**INS NS,** Annex V].

In practice therefore, this means there are *two* types of Download Services that may be implemented; those that satisfy the minimum functional requirements from the Regulation [**INS NS**, Annex IV, Part A] and those that satisfy the full functional requirements [**INS NS**, Annex IV, Parts A, B & C], as summarized in table 4.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Operations defined by IR** | **Get Download Service Metadata** | **Get Spatial Data Set** | **Describe Spatial**  **Data Set** | **Link Download Service** | **Get**  **Spatial Object** | **Describe Spatial Object Type** |
| ***Restrictions*** *on Request (Query) parameters* | N/A | **Constrained** | N/A | N/A | **Open** | N/A |
| ***Direct access***  *download services* | SHALL SUPPORT | | | | | |
| ***Other*** *download services* | SHALL SUPPORT | | | | NOT SUPPORTED  This is by definition, if a service can support both of these operations it becomes a Direct Access DLS | |

Table 4: Summary of operations that SHALL be supported by download services

There are no additional operational requirements for a direct access service over those required for any other type of download service. The differences between the two types of services are generally seen in the results of any data fetching operation. When a service has indirect access to the data set, or when the data set is a static file, the result of a data request (query) will most likely be predefined, that is the same request will fetch the same set of data, a typical example would be the provision of download service as an Atom feed. Conversely, when a service has access to a live database or dynamic file system (for example one in which coverage data is being continuously updated), the same request (for example a simple GetCoverage request), may result in a different set of data being delivered (for the same coverage) in separate requests.

|  |
| --- |
|  |

Figure 5: Schematic diagram showing the process of mapping of the real world through the classification of spatial objects to the delivery of data through a download service.

In these guidelines we map the term “coverage” to the digital data set (the classified representation of the real world), as shown in the red circle in figure 5, in other words a coverage can be mapped to the term spatial object.

The encoding rules in figure 5 are mapped to the data specifications. They provide the interface to the coverage data/spatial objects, through which a user can access or query the data in a harmonized way to allow integration with other similar data sets.

The following sections of this document provide detailed Technical Guidance for implementing Download Services using existing standards:

* + *Chapter 5* contains Technical Guidance for implementing the mandatory download operations for data set download services using the OGC Web Coverage Service core interface standard **[OGC WCS]** and OGC Web Coverage Service interface standard extensions.
  + *Chapter 6* contains Technical Guidance for implementing the additional download operations that are required when you provision a direct access download services using the OGC Web Coverage Service core interface standard **[OGC WCS]** and OGC Web Coverage Service interface standard extensions.
  1. ***How the Technical Guidance maps to the Implementing Rules***

The purpose of this Technical Guidance is to provide practical guidance for implementation that is guided by, and satisfies, the requirements of the underlying legislation. The tables in the following sections demonstrate how the WCS implementations described in this document satisfy the legal requirements of the Network Services Regulation [**INS NS**]. The underlying legislation is rarely referred to in the rest of this document, so these tables should be referred back to if necessary.

* + 1. **Mapping the WCS-based Technical Guidance to the Implementing Rules**

The following set of tables shows how the guidance for WCS implementations given in Chapters 5 and 6 satisfy the Network Services Regulation [**INS NS**]. Each operation is listed in a separate table.

* + - 1. Mandatory download operations

|  |  |  |
| --- | --- | --- |
| **Get Download Service Metadata** | | **M/O/C3** |
| **Description in [INS NS (Annex IV, Part A)]**  Provides all necessary information about the service, the available Spatial Data Sets, and describes the service capabilities.   * **Request**   + The Get Download Service Metadata request parameter shall indicate the natural language to be used for the content of the Get Download Service Metadata response * **Response**   The Get Download Service Metadata response shall contain the following sets of parameters   * + Download Service Metadata *(which shall contain at least the INSPIRE metadata elements)*   + Operations Metadata   + Languages *(which shall include the natural language used by the response and a list of the natural languages supported by the download service)*   + Spatial Data Sets Metadata *(which shall contain for each data set a list of the supported CRS and which must include at least one required CRS as referred to in Regulation (EU) no 1089/2010.)* | | M |
| ***Recommended WCS-based implementation*** | |  |
| ***Get Download Service Metadata Request*** | Metadata records for Download Services shall be available in a Discovery Service. The Resource Locator metadata element for the Download Service shall contain a link to the service endpoint, to which a WCS GetCapabilities request can be made.  The Get Download Service Metadata request shall be a GetCapabilities request to the WCS indicated in the metadata record. |
| ***Get Download Service Metadata Response*** | The Get Download Service Metadata Response shall be a WCS capabilities document, which includes the download service INSPIRE metadata, operations metadata, response and supported languages, and the spatial data sets metadata, or links to resources that provide such metadata.  Additional metadata for the coverage data provided by the service may be retrieved in a WCS DescribeCoverage response document. |

3 M = Mandatory, O = Optional, C = Conditional

|  |  |
| --- | --- |
| ***WCS***  ***Conformance Classes*** | WCS 2.0 Core |

Table 5: Get Download Service Metadata - WCS Implementation

|  |  |  |
| --- | --- | --- |
| **Get Spatial Data Set** | | **M/O/C** |
| **Description in [INS NS (Annex IV, Part A)]**  The Get Spatial Data Set operation allows the retrieval of a Spatial Data Set.   * **Request** (the request shall contain the following parameters)   + Language *(which shall indicate the natural language requested for the response)*   + Spatial Data Set Identifier *(the parameter shall contain the Unique Resource Identifier of the Spatial Data)*   + Coordinate Reference System *(which shall contain one of the required CRS listed as supported by the data set in its metadata response*) * **Response**   + Requested Spatial Data Set in the requested language and CRS | | M |
| ***Recommended WCS-based implementation*** | |  |
| ***Get Spatial Data Set Request*** | Spatial data sets (coverages) and subsets of these data sets in different CRS/Language combinations shall be requested through a WCS GetCoverage request |
| ***Get Spatial Data Set Response*** | The WCS shall return a coverage or a subset of a coverage corresponding to the requested Spatial Data Set Identifier, Language, and CRS. |
| ***WCS Conformance Classes*** | WCS 2.0 Core |

Table 6: Get Spatial Data Set - WCS Implementation

|  |  |  |
| --- | --- | --- |
| **Describe Spatial Data Set** | | **M/O/C** |
| **Description in [INS NS (Annex IV, Part A)]**  This operation returns the description of all the types of Spatial Objects contained in the Spatial Data Set.   * **Request** *(the request shall contain the following parameters)*   + Language   + Spatial Data Set Identifier * **Response**   + Description of the Spatial Objects in the requested Spatial Data Set and in the requested language. | | M |
| ***Recommended WCS-based implementation*** | |  |
| ***Describe Spatial Data Set Request*** | Spatial data sets (coverages) shall be described in different language combinations, through a WCS DescribeCoverage request. |
| ***Describe Spatial Data Set Response*** | The WCS shall return one or more coverage descriptions corresponding to the requested Spatial Data Set Identifiers and Language. |

|  |  |
| --- | --- |
| ***WCS Conformance Classes*** | WCS 2.0 Core |

Table 7: Describe Spatial Data Set - WCS Implementation

|  |  |  |
| --- | --- | --- |
| **Link Download Service** | | **M/O/C** |
| **Description in [INS NS (Annex IV, Part A)]**  Allows the declaration, by a Public Authority or a Third Party, of the availability of a Download Service for downloading Spatial Data Sets or, where practicable, Spatial Objects, through the Member State’s Download Service while maintaining the downloading capability at the Public Authority or the Third Party location. | | M |
| ***Recommended WCS-based implementation*** | |  |
| This operation allows the declaration of the availability of a Download Service compliant with the IR, for the download of resources through the Member State’s Download Service while maintaining the resources at the owner location.   * **Request** (the request shall provide all information about the Public Authority’s or Third Party’s Download Service to provide access to Spatial Data Sets and where practicable to Spatial Objects from the Download service   To be implemented by uploading the Download Service INSPIRE metadata and the INSPIRE data set or data series metadata for coverages provided by the service, to the INSPIRE network as referred to in Article 11 using the PublishMetadata function of an INSPIRE compliant discovery service. The resource locator metadata element of the Download service metadata record shall contain a link to the service end point of the WCS to which appropriate GetCapabilities request parameters can be appended or where practicable to which GetCoverage request parameters can be appended. | |
| ***WCS Conformance Classes*** | None |

Table 8: Link Download Service - WCS Implementation

* + - 1. Conditional download operations

|  |  |  |
| --- | --- | --- |
| **Describe Spatial Object Type** | | **M/O/C** |
| **Description in [INS NS (Annex IV, Part B)]**  This operation returns the description of the specified Spatial Objects types [sic].   * **Request** *(The Describe Spatial Object Type request shall contain the following parameters)*   + Language *(which shall indicate the natural language requested for the description of the Spatial Object type)*   + Spatial Object Type *(which shall the language-neutral name of the Spatial Object Type as specified in EU 1089/2010. Where the parameter is not provided, it shall be assumed that all types of Spatial Objects have been selected)* * **Response**   + Description of the Spatial Object Type in conformity with regulation (EU) No.1089/2010 | | C  (Direct access download only) |
| ***Recommended WCS-based implementation*** | |  |
| It is not possible to completely map the Describe Spatial Object Type operation to any WCS  2.0 core operation or any extension of WCS 2.0; however the WCS DescribeCoverage operation provides sufficient information to be able to construct a query to enable a Get Spatial Object operation.  [Annex B](#_bookmark299) discusses possibilities for implementing a Describe Spatial Type operation to be used as part of a Direct Access Download service to ensure full compliance. | |
| ***WCS Conformance Classes*** | None |

Table 9: Describe Spatial Object Type - WCS Implementation

|  |  |  |
| --- | --- | --- |
| **Get Spatial Object** | | **M/O/C** |
| **Description in [INS NS (Annex IV, Part B)]**  This operation allows the retrieval of Spatial Objects based upon a query.   * **Request** *(The Get Spatial Object request shall support the following parameters)*   + Language *(which shall indicate the natural language requested for the spatial objects)*   + Spatial Data Set Identifier *(which shall contain the Unique Resource Identifier of the required Spatial Data Set. When the parameter is not provided it shall be assumed that all available Spatial Data Sets have been selected)*   + Coordinate Reference System *(which shall contain one of the required CRS)*   + Query *(which shall support the ability to search on Unique Resource Identifiers, Spatial Data Theme, bounding box, temporal dimensions, and all key attributes and relationships set out in EU regulation No 1089/2010)* * **Response** *(the Get Spatial Object response shall contain the following parameters)*   + Spatial Objects Set *(which shall be the set of Spatial Objects which fulfil the search criteria in the requested language, and the requested Coordinate Reference System)*.   + Spatial Objects Set Metadata *(which shall contain at least the INSPIRE metadata elements of the set of Spatial Objects)* | | C  (Direct access download only) |
| ***Recommended WCS-based implementation*** | |  |
| ***Get Spatial Object Request*** | Spatial objects (coverages) and subsets of these spatial objects in different CRS/Language combinations and shall be requested as part of a query of Spatial Objects and their properties through a WCS ProcessCoverages request. |
| ***Get Spatial Object Response*** | The WCS shall return a coverage or a subset of a coverage corresponding to the query. |
| ***WCS Conformance Classes*** | WCS 2.0 Core, WCS Processing Extension |

Table 10: Get Spatial Object - WCS Implementation

* + 1. **Mapping of Spatial Data Set Identifier parameter**

The Spatial Data Set Identifier parameter is defined in the Network Service regulation [**INS NS**] as *“The Spatial Data Set Identifier parameter shall contain the Unique Resource Identifier of the Data Set”*

The following table demonstrates how the Spatial Data Set Identifier is mapped between the WCS based Technical Guidance and the corresponding ISO metadata of the spatial data set. The Spatial Data Set Identifier parameter maps to either the RS\_Identifier or the MD\_Identifier depending on what type of Spatial Data Set Identifier is used in the corresponding ISO metadata.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **INSPIRE Download Service** | **RS\_Identifier** | **MD\_Identifier** |
| **WCS** | inspire\_dls:SpatialDataSetIdentifier/inspire\_common  :Code | gmd:RS\_Identifier  /code | gmd:MD\_Identifier  /code |
| inspire\_dls:SpatialDataSetIdentifier/inspire\_common  :Namespace | gmd:RS\_Identifier  /codespace |  |

Table 11: Mapping the Spatial Data Set Identifier parameter

Note that the [**INS NS**] term ‘*Unique Resource Identifier’ does NOT imply a ‘Uniform Resource Identifier’*

(as defined by the IETF RFC2396 document Uniform Resource Identifiers (URI): Generic Syntax);

although an IETF URI may be used as an INSPIRE unique resource identifier, in which case it is placed in the ‘code’ field.

* 1. ***Conformance Classes for Download Services Technical Guidance***

In order to declare a level of conformance with this Technical Guidance it is necessary to meet the requirements of any conformance class to which conformance is declared.

The following conformance classes are defined in this document.

|  |  |  |  |
| --- | --- | --- | --- |
| **Conformance Class** | **Description** | **M/O/C** | **Chapter** |
| WCS-MAN:  Download Operations | Implementation of required download operations in a download service using WCS | C, shall be M if no other service such as Atom, WFS, or SOS is conformed to | 5 |
| WCS-CON:  Direct Access Download Operations | Implementation of direct access download operations in a download service using WCS | C, shall be M if the download service provides direct access to spatial data sets, otherwise can be omitted | 6 |
| WCS-QOS:  Quality of Service | Quality of Service criteria and requirements | M | 7 |

Table 12: Conformance Classes for Download Service Technical Guidance

Conformance may be declared in the Download Service ISO 19139 metadata record.

If a WCS service does not conform to [**INS NS,** Annex IV, Part A], it cannot on its own be considered compliant with the requirements of the Regulation. Only the combination of another service conformant with part A with a WCS conformant to Parts B and C can be considered compliant.

* 1. **Language Requirements**

The Network Services Regulation requires that multilingual aspects for network services are supported [**INS NS**], the following basic principles shall be used for INSPIRE Network Services (including Download Services):

*A network service [Download Service] metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported*.

*A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language.*

For each relevant Conformance Class in this document these statements are defined as requirements and additional implementation guidance is given.

* + 1. **Optional language considerations**

Although further multilingual support is not required for INSPIRE Network Services, it may be desired by a service provider to implement further multilingual support such as:

* multilingual error messages
* multilingual support for additional Operations including HTTP/POST, HTTP/GET, HTTP-HEAD bindings

WCS 2.0 services that are more than *trivially conformant* to the language handling functionality described in [**OWS 2**] may in addition to the AcceptLanguages parameter (or technically instead of, though this is normally seen as a fall-back position) allow requests for languages through the HTTP **Accept-Language** header field, or through an **HTTP\_ACCEPT\_LANGUAGE** environment variable instead.

Use of these HTTP methods for language negotiation, further allows a weighting to be applied to the language preference, as in the below example, something that is not possible using the AcceptLanguages parameter of a WCS request.

|  |
| --- |
| *Accept-Language: da, en-gb;q=0.8, en;q=0.7*  *Would mean: "I prefer Danish, but will accept British English and other types of English".* |

Example 1: Use of weighting measure for language negotiation

Ref: <https://tools.ietf.org/html/rfc7231#section-5.3.5>

The Accept-Language parameter is one of the optional HTTP request headers, an example of how such an HTTP client request might look like is shown below.

|  |
| --- |
| HEAD /cgi-bin/some-service/ows?service=WCS&acceptversions=2.0.1, 2.0.0&request=GetCapabilities& HTTP/1.1  User-Agent: curl/7.37.1 Host: ogcdev.bgs.ac.uk Accept: \*/\*  Accept-Language: en-gb, en-us;q=0.9, en;q=0.5 |

Example 2: Use of Accept-Language parameter in an HTTP HEAD request

|  |
| --- |
| TG Recommendation 1 Services should support language negotiation of the WCS response through the HTTP header. |

For error reports the [**OWS 2**] Service exception report allows for the optional reporting of the language of the response using the xml:lang attribute. The language shall be a populated as an IETF RFC 4646 identifier. [**OWS 2**] also tells us that if the language is unknown the xml:lang attribute shall be specified as an empty string.

|  |
| --- |
| TG Recommendation 2 Exception reports should report the language of the response.  TG Recommendation 3 In multi-lingual services, exception reports should be in the language of the request. |

<?xml version="1.0" encoding="UTF-8"?>

<ows:ExceptionReport xmlns:ows=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0) xmlns:xsd=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xmlns:xlink=["http://www.w3.org/1999/xlink"](http://www.w3.org/1999/xlink)

version="2.0.0"

xml:lang="en" xsd:schemaLocation=["http://www.opengis.net/ows/2.0](http://www.opengis.net/ows/2.0)

[http://schemas.opengis.net/ows/2.0/owsExceptionReport.xsd"](http://schemas.opengis.net/ows/2.0/owsExceptionReport.xsd)>

<ows:Exception exceptionCode="InvalidRequest">

<ows:ExceptionText>No WCS version specified.</ows:ExceptionText>

</ows:Exception>

</ows:ExceptionReport>

Example 3: Exception report showing language of the response

* 1. ***Requirements for coordinate reference systems***

The requirements for coordinate reference systems (CRS) used by INSPIRE data sets is defined in Annex II of *‘INSPIRE Regulation on the interoperability* of *spatial data sets and services,* [**INS ISSDS]*,*** *COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services’.*

The following identifiers are suggested for coordinate reference systems (and components therein) defined in the IR under sections 1.3.1, 1.3.2, and 1.3.3, to fulfil those requirements

|  |  |  |
| --- | --- | --- |
| **Coordinate reference**  **system** | **Short name** | **HTTP-URI identifier** |
| ***Three-dimensional Coordinate Reference Systems*** | | |
| *Cartesian in ETRS89 (X,Y,Z)* | *ETRS89-XYZ* | [*http://www.opengis.net/def/crs/EPSG/0/4936*](http://www.opengis.net/def/crs/EPSG/0/4936) |
| *geodetic in ETRS89 on GRS80*  *(Latitude, Longitude, Ellipsoidal height)* | *ETRS89- GRS80h* | [*http://www.opengis.net/def/crs/EPSG/0/4937*](http://www.opengis.net/def/crs/EPSG/0/4937) |
| ***Two-dimensional Coordinate Reference Systems*** | | |
| *geodetic in ETRS89 on*  *GRS80 (Latitude, Longitude)* | *ETRS89-GRS80* | [*http://www.opengis.net/def/crs/EPSG/0/4258*](http://www.opengis.net/def/crs/EPSG/0/4258) |
| *LAEA projection in ETRS89*  *on GRS80 (Y,X)* | *ETRS89-LAEA* | [*http://www.opengis.net/def/crs/EPSG/0/3035*](http://www.opengis.net/def/crs/EPSG/0/3035) |
| *LCC projection in ETRS89*  *on GRS80 (N,E)* | *ETRS89-LCC* | [*http://www.opengis.net/def/crs/EPSG/0/3034*](http://www.opengis.net/def/crs/EPSG/0/3034) |
| *TM projection in ETRS89 on*  *GRS80, zone 26N (30°W to 24°W) (N,E)* | *ETRS89-TM26N* | [*http://www.opengis.net/def/crs/EPSG/0/3038*](http://www.opengis.net/def/crs/EPSG/0/3038) |
| *TM projection in ETRS89 on GRS80, zone 27N (24°W to*  *18°W) (N,E)* | *ETRS89-TM27N* | [*http://www.opengis.net/def/crs/EPSG/0/3039*](http://www.opengis.net/def/crs/EPSG/0/3039) |
| *TM projection in ETRS89 on GRS80, zone 28N (18°W to*  *12°W) (N,E)* | *ETRS89-TM28N* | [*http://www.opengis.net/def/crs/EPSG/0/3040*](http://www.opengis.net/def/crs/EPSG/0/3040) |
| *TM projection in ETRS89 on GRS80, zone 29N (12°W to*  *6°W) (N,E)* | *ETRS89-TM29N* | [*http://www.opengis.net/def/crs/EPSG/0/3041*](http://www.opengis.net/def/crs/EPSG/0/3041) |
| *TM projection in ETRS89 on GRS80, zone 30N (6°W to*  *0°) (N,E)* | *ETRS89-TM30N* | [*http://www.opengis.net/def/crs/EPSG/0/3042*](http://www.opengis.net/def/crs/EPSG/0/3042) |

|  |  |  |
| --- | --- | --- |
| *TM projection in ETRS89 on*  *GRS80, zone 31N (0° to 6°E) (N,E)* | *ETRS89-TM31N* | [*http://www.opengis.net/def/crs/EPSG/0/3043*](http://www.opengis.net/def/crs/EPSG/0/3043) |
| *TM projection in ETRS89 on GRS80, zone 32N (6°E to*  *12°E) (N,E)* | *ETRS89-TM32N* | [*http://www.opengis.net/def/crs/EPSG/0/3044*](http://www.opengis.net/def/crs/EPSG/0/3044) |
| *TM projection in ETRS89 on GRS80, zone 33N (12°E to*  *18°E) (N,E)* | *ETRS89-TM33N* | [*http://www.opengis.net/def/crs/EPSG/0/3045*](http://www.opengis.net/def/crs/EPSG/0/3045) |
| *2D TM projection in ETRS89*  *on GRS80, zone 34N (18°E to 24°E) (N,E)* | *ETRS89-TM34N* | [*http://www.opengis.net/def/crs/EPSG/0/3046*](http://www.opengis.net/def/crs/EPSG/0/3046) |
| *2D TM projection in ETRS89 on GRS80, zone 35N (24°E*  *to 30°E) (N,E)* | *ETRS89-TM35N* | [*http://www.opengis.net/def/crs/EPSG/0/3047*](http://www.opengis.net/def/crs/EPSG/0/3047) |
| *2D TM projection in ETRS89 on GRS80, zone 36N (30°E*  *to 36°E) (N,E)* | *ETRS89-TM36N* | [*http://www.opengis.net/def/crs/EPSG/0/3048*](http://www.opengis.net/def/crs/EPSG/0/3048) |
| *TM projection in ETRS89 on GRS80, zone 37N (36°E to*  *42°E)* | *ETRS89-TM37N* | [*http://www.opengis.net/def/crs/EPSG/0/3049*](http://www.opengis.net/def/crs/EPSG/0/3049) |
| *TM projection in ETRS89 on*  *GRS80, zone 38N (42°E to 48°E) (N,E)* | *ETRS89-TM38N* | [*http://www.opengis.net/def/crs/EPSG/0/3050*](http://www.opengis.net/def/crs/EPSG/0/3050) |
| *TM projection in ETRS89 on GRS80, zone 39N (48°E to*  *54°E) (N,E)* | *ETRS89-TM39N* | [*http://www.opengis.net/def/crs/EPSG/0/3051*](http://www.opengis.net/def/crs/EPSG/0/3051) |
| ***Vertical component (Compound Coordinate Reference Systems)*** | | |
| *Height in EVRS (H)* | *EVRS* | [*http://www.opengis.net/def/crs/EPSG/0/5730*](http://www.opengis.net/def/crs/EPSG/0/5730) |
| *Depth referred to LAT (D)* | *LAT* | [*http://www.opengis.net/def/crs/EPSG/0/5861*](http://www.opengis.net/def/crs/EPSG/0/5861) |
| *Depth referred to MSL (D)* | *MSL* | [*http://www.opengis.net/def/crs/EPSG/0/5715*](http://www.opengis.net/def/crs/EPSG/0/5715) |
| *Pressure coordinate in the*  *free atmosphere (P)* | *ISA* | *<http URI Identifier>* |
| **Three-dimensional *Compound Coordinate Reference Systems*** | | |
| 2D geodetic in ETRS89 on GRS80, and EVRS height (Latitude, Longitude, H) | ETRS89- GRS80-EVRS | [*http://www.opengis.net/def/crs/EPSG/0/7409*](http://www.opengis.net/def/crs/EPSG/0/7409) |

Table 13: HTTP-URI identifiers for 2D, 3D, and Compound coordinate reference systems; modified from [**INS CRS**].

Other variants of coordinate reference systems are possible, for example the MetOcean application profile supports n axes through the use of compound coordinate references.

[**INS ISSDS**, Annex II, Section 2] also defines a preferred geographical grid system (based on ETRS89 Lambert Azimuthal Equal Area (ETRS89-LAEA) for use as a geo-referencing framework. This grid system is out of scope for the delivery of coverage data as part of download service. It applies to tiling systems such as an OGC WMTS service, such as might be used to provide Orthrectified aerial photographs.

1. **Web Coverage Service Implementation of required download operations for a Download Service**

**TG Conformance WCS-MAN: Mandatory Download Operations**

Implement download operations (“Part A”) in a download service using a Web Coverage Service.

*This conformance class is inclusive of: TG Requirement 1 to TG Requirement 12*

*TG Recommendation 1 to TG Recommendation 4*

* 1. ***Conformance to ‘Core WCS’ Conformance Class***

In order to implement access using WCS it is necessary to conform to the ‘core WCS’ conformance classes as described in [**OGC WCS**].

Note that the *OGC WCS 2.0 Core* specification in turn requires conformance to the following classes OGC 07-036, *Geography Markup Language (GML) Encoding Standard*, version 3.2.1

Conformance classes used:

* + - GML writing

OGC 06-121r9, *OGC Web Service Common Specification*, version 2.0 Conformance classes used:

* + - GetCapabilities operation (Clause 7)

OGC 09-146r2, *OGC® GML Application Schema for Coverages*, version 1.0 Conformance classes used:

* + - gml-coverage

**TG Requirement 1**

The WCS download service instance shall conform to WCS 2.0 Conformance Class ‘core WCS’

The WCS core specification specifies the core operations required to be implemented by any WCS, remaining agnostic of the request encoding; but does not specify any protocol binding, protocol bindings are WCS extensions.

Three protocol bindings are currently supported by WCS 2.0:

* + - OGC 09-148r1, OGC Web Coverage Service 2.0 Interface Standard – POST Protocol Binding Extension, version 1.0

Note that the *POST Protocol Binding Extension* specification in addition to conforming to WCS core also conforms to the following classes:

OGC 06-121r9, *OGC Web Service Common Specification*, version 2.0

Conformance classes used:

o HTTP POST

Support for this protocol binding is indicated in a WCS GetCapabilities response as:

</ows:Profile>

<http://www.opengis.net/spec/WCS_protocol-binding_post-xml/1.0>

<ows:Profile>

* + - OGC 09-149r1, OGC Web Coverage Service 2.0 Interface Standard – XML/SOAP Protocol Binding Extension, version 1.0

Note that the *XML/SOAP Protocol Binding Extension* specification in addition to conforming to WCS core also conforms to the following classes:

OGC 06-121r9, *OGC Web Service Common Specification*, version 2.0 Conformance classes used:

* + - * HTTP POST
      * SOAP encoding

Support for this protocol binding is indicated in a WCS GetCapabilities response as:

</ows:Profile>

<http://www.opengis.net/spec/WCS_protocol-binding_soap/1.0>

<ows:Profile>

* + - OGC 09-147r3, WCS 2.0 Interface Standard – KVP Protocol Binding Extension, version 1.0

Note that the *KVP Protocol Binding Extension* specification in addition to conforming to WCS core also conforms to the following classes:

OGC 06-121r9, *OGC Web Service Common Specification*, version 2.0 Conformance classes used:

* + - * HTTP GET
      * KVP encoding

Support for this protocol binding is indicated in a WCS GetCapabilities response as:

</ows:Profile>

<http://www.opengis.net/spec/WCS_protocol-binding_get-kvp/1.0.1>

<ows:Profile>

NOTE A WCS REST binding is proposed as unofficial draft on the OGC Coverages.DWG wiki4, but due to fundamental discussions of RESTfulness has not been adopted as of yet.

An implementation must support one of these bindings to have a working service.

4 <https://portal.opengeospatial.org/files/?artifact_id=51832>

**TG Requirement 2**

The WCS download service instance shall support at least one of the WCS protocol bindings, KVP, POST or XML/SOAP.

We do not specify any conformance to any single output format here. GML is already included as part of WCS core, i.e. if you make a GetCoverage request and do not specify any output format the range set will be delivered in XML. However for large gridded data sets XML is not appropriate, so individual INSPIRE data specifications or profiles may make support of one of more output formats an additional conformance requirement.

The following table shows reasons for the support of particular output formats, that might be specified in the INSPIRE data specifications.

|  |  |
| --- | --- |
| TIFF/GeoTIFF | Referenced and non-referenced imagery |
| JPEG 2000 | Referenced and non-referenced imagery (such as Orthoimagery) |
| NetCDF | general data (such as 3-D x/y/t image time series cut outs) |
| GML | canonical metadata and for 1-D extracts |
| JSON | canonical metadata and for 1-D extracts |
| PNG | browser display of 2-D data |
| GRIB 1/2 | weather model data |
| HDF5 | raw weather radar data |
| ASCII GRID | 2-D model output |
| BAG | A profile of HDF5 for bathymetric data (elevation + uncertainty) |

Table 14: List of common output formats, and type of coverage data they can best provide

* + 1. **Get Download Service Metadata operation**

In a WCS the Get Download Service Metadata operation is provided through the GetCapabilities operation, which allows a WCS client to retrieve service metadata and coverages offered by a WCS server.

The minimum parameters to send to a service to obtain service metadata (through a GetCapabilities request and response) is the *service* type parameter value which will always be ‘**WCS**’, and the *request* type parameter value which will always be ‘**GetCapabilities**’.

Note that in OGC services KVP syntax (**name**=**value**&) it is the **value** that is case sensitive, the parameter **name** is not case sensitive. In XML syntax the element name is also case sensitive. In this document we use the spelling of the XML element names to ensure compliance with the specifications.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCapabilities** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0) [http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**">

</wcs:**GetCapabilities**>

Example 4: Minimal GetCapabilities request using XML/POST

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?service=**WCS**&request=**GetCapabilities**&](http://myserver.ac.uk/some/folders/ows?service=WCS&request=GetCapabilities) |

Example 5: Minimal GetCapabilities request using KVP/GET

By default in a request to a WCS where the version of the service implementation is not specified, the service should reply with a response in the highest version of the standard supported by the service. To express a preference for the version (or versions) that a client wishes to receive a request must also include one or more values in an *AcceptVersions* parameter. When specifying multiple versions those specified first have precedence over those that come later. Note, A version number shall contain three non-negative integers separated by decimal points, in the form "x.y.z". The integers y and z shall not exceed 99.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCapabilities** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0) [http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**">

<ows:AcceptVersions xmlns:ows=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)>

<ows:Version>**2.0.1**</ows:Version>

<ows:Version>**2.0.0**</ows:Version>

</ows:AcceptVersions>

</wcs:**GetCapabilities**>

Example 6: GetCapabilities request with version negotiation using XML/POST

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**GetCapabilities**& AcceptVersions=**2.0.1**, **2.0.0**& |

Example 7: GetCapabilities request with version negotiation using KVP/GET

By default in a request to a WCS where the language of the service implementation is not specified, the service shall return a human readable text in a language of the server’s choice. To express a preference for a response in a language or languages of your choice a request should also include one or more language values in an *AcceptLanguages* parameter, or alternatively as part of an HTTP HEAD request such as with the *Accept-Language* header or with an HTTP\_ACCEPT\_LANGUAGE

environment variable.

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**GetCapabilities**& AcceptVersions=**2.0.1**, **2.0.0**& AcceptLanguages=**sk,en,\***& |

Example 8: GetCapabilities request with version and language negotiation using KVP/GET

XML/POST

|  |  |  |  |
| --- | --- | --- | --- |
| <?xml version="1.0" encoding="UTF-8"?>  <wcs:**GetCapabilities** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0) [http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**">  <ows:AcceptVersions xmlns:ows=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)> | | | |
| <ows:Version>2.0.1</ows:Version> | | |  |
| <ows:Version>2.0.0</ows:Version> | | |
| </ows:AcceptVersions>  <AcceptLanguages xmlns=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)> | | | |
| <Language>sk</Language> | |  | |
| <Language>en</Language> | |
| <Language>\*</Language> |  |
| </AcceptLanguages>  </wcs:GetCapabilities> | | | |

Example 9: GetCapabilities request with version and language negotiation using XML/POST

**TG Requirement 3**

If a client provides a language as part of a request and if that language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language.

* + - 1. Further considerations for language request parameters in download service operations

The AcceptLanguages request parameter as defined by the [**OWS 2**] standard used by [**OGC WCS**] accepts one or more RFC 4646 5 language codes and an optional special character “**\***” as input values. The AcceptLanguages parameter is intended to be useable on all operation requests, not just in language negotiation in an initial GetCapabilities response. The intention within the [**OWS 2**] standard is to allow multi-lingual responses in any operation; it is different in that respect from interface version negotiation ~ you can only ever have one version of a WCS respond from any single request, but in theory a response can have mixed languages. For INSPIRE conformance though the requirement is for a service to only respond in a single language in any operation.

For INSPIRE conformance, if a client request specifies a supported language the following fields of the GetCapabilities-Response are affected:

* + - * + Titles
        + Abstracts

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Parameter Value** | **Mandatory for a Client Request?** | **Mandatory support by the Service?** |
| AcceptLanguages | Codelist values shall be RFC 4646 5 character codes either, complete (e.g.  en-GB), or abbreviated 2 character codes (e.g. en). In addition to the RFC 4646 codes, the server shall support the single special value **\*** which is used to indicate any language.  The list of codes for the 24 official EU languages and the languages of the EFTA Countries is:  Bulgarian – **bg** Italian – **it**  Czech – **cs** Latvian – **lv**  Danish – **da** Liechtenstein– **de**  Dutch – **nl** Lithuanian – **lt**  English – **en** Maltese – **mt**  Polish – **pl** Norwegian – **no** Estonian – **et** Portuguese – **pt** Finnish – **fi** Romanian – **ro**  French – **fr** Romansh - **roh**  German – **de** Slovak – **sk**  Greek – **el** Slovenian – **sl** Hungarian – **hu** Spanish – **es** Irish – **ga** Swedish – **sv**  Croatian - **hr** Icelandic – **is** | No, it is optional. | Yes, it is mandatory to be supported and shall be processed if the parameter is present in a client’s request with a supported language code. If the parameter is absent in a client’s request or it requested an unsupported language the service shall response in the service default language. |

Table 15: Codes for the language request parameter

* + - 1. Publishing INSPIRE metadata in the GetCapabilities response (using ows:ExtendedCapabilities)

In order to make the Download Service INSPIRE metadata elements available via a standard WCS it is necessary to use ows:ExtendedCapabilites in the WCS capabilities response and publish the INSPIRE metadata according to an extension schema within an *inspire\_dls:ExtendedCapabilities* element. The INSPIRE extension schema and example instance documents can be found at: <http://inspire.ec.europa.eu/schemas/inspire_dls/> The schema document itself is at <http://inspire.ec.europa.eu/schemas/inspire_dls/1.0/inspire_dls.xsd>

There are two possible options that may be used for providing service metadata through a GetCapabilities response and it is up to the implementing Member State public authority to decide which is more appropriate according to need. In both cases metadata is populated into the ows:ExtendedCapabilities section of the GetCapabilities response document.

**TG Requirement 4**

The Extended Capabilities shall be valid against the XML Schema for download services as defined in the INSPIRE online schema repository.

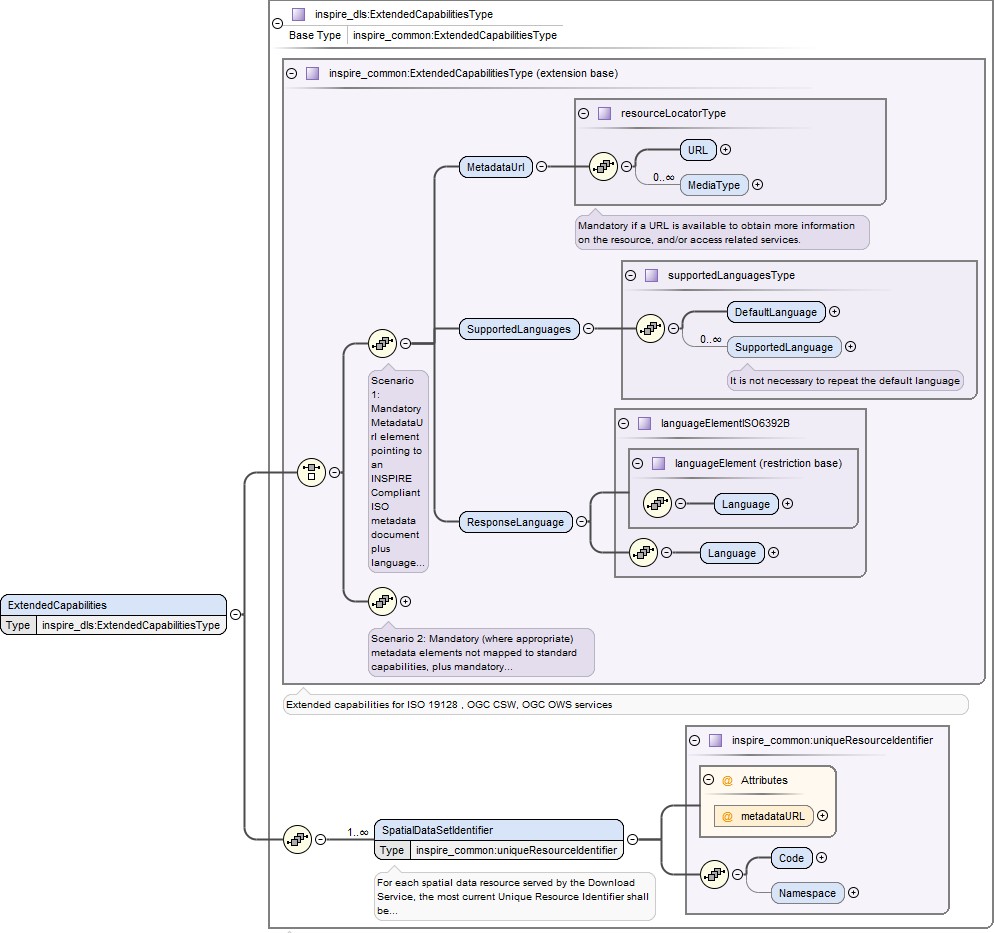


Figure 6: Structure of the extended capabilities schema for download services, with detail for a scenario 1 metadata response.

The first option (scenario 1) is to publish a minimal amount of metadata within the service, limited to the language (or languages) supported by the service, together with a link to a Download Service metadata record. (for example in a discovery service). This metadata link should be published using a

<inspire\_common:MetadataUrl> in the extended capabilities section. The full structure of the metadata required under the scenario 1 option is shown in the below diagram. The second option (scenario 2) is to publish all the metadata elements directly in the WCS capabilities response document. The scenario 2 option is collapsed in figure 6, but expanded in figure 7.

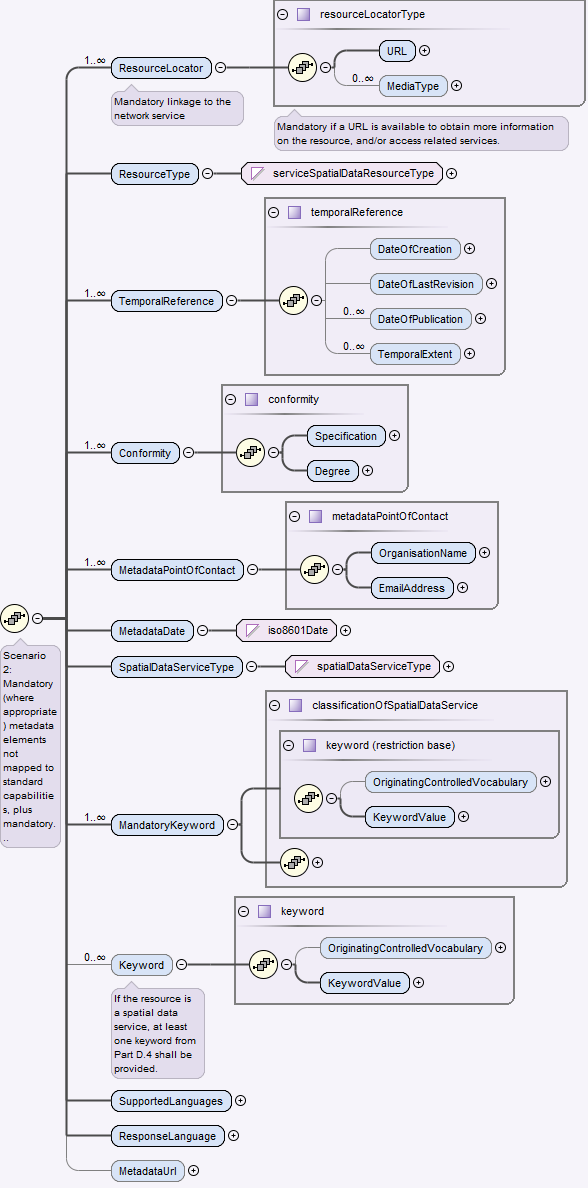


Figure 7: Structure detail for a scenario 2 metadata response as part of the extended capabilities schema for download services.

The mapping of the mandatory and conditional INSPIRE metadata to the elements of WCS capabilities response including the extended capabilities section for a scenario 2 response is shown in the following table.

|  |  |
| --- | --- |
| **INSPIRE**  **Metadata elements**  **(Mandatory - Conditional)** | **ISO 19142 elements of**  **<WCS\_Capabilities>** |
| Resource Title (M) | ows:ServiceIdentification/ows:Title |
| Resource Abstract (M) | ows:ServiceIdentification/ows:Abstract |
| Resource Type (M) | inspire\_common:ResourceType (*ExtendedCapabilities*) |
| Resource Locator (C) | inspire\_common:ResourceLocator (*ExtendedCapabilities*) |
| Coupled Resource (C) | ows:Metadata (*per coverage*) |
| Spatial Data Service Type (M) | inspire\_common:SpatialDataServiceType (*ExtendedCapabilities*) |
| Keyword (M) | ows:ServiceIdentification/ows:Keywords/ows:Keyword; AND  inspire\_common:MandatoryKeyword/ inspire\_common:KeywordValue  (*ExtendedCapabilities*) |
| Geographic Bounding Box (M) | ows:BoundingBox (CoverageSummary) |
| Temporal Reference (M) | inspire\_common:TemporalReference (*ExtendedCapabilities*) |
| Spatial Resolution (C) | ows:ServiceIdentification/ows:Abstract |
| Conformity\*  \*refers to conformity  to the Data Specifications (M) | inspire\_common:Conformity (*ExtendedCapabilities*) |
| Conditions for Access & Use (M) | ows:ServiceIdentification/ows:Fees |

|  |  |
| --- | --- |
| **INSPIRE**  **Metadata elements**  **(Mandatory - Conditional)** | **ISO 19142 elements of**  **<WCS\_Capabilities>** |
| Limitations on Public Access (M) | ows:ServiceIdentification/ows:AccessConstraints |
| Responsible Organisation (M) | ows:ServiceProvider/ows:ProviderName AND  ows:ServiceProvider/ows:ServiceContact/ows:ContactInfo |
| Metadata Point of Contact (M) | inspire\_common:MetadataPointOfContact  *(ExtendedCapabilities)* |
| Metadata Date (M) | inspire\_common:MetadataDate  *(ExtendedCapabilities)* |
| Metadata Language (M) | inspire\_common:SupportedLanguages  *(ExtendedCapabilities)* |
| Unique Resource Identifier (M) | inspire\_dls:SpatialDataSetIdentifier/inspire\_common:Code AND *(optional)*  inspire\_dls:SpatialDataSetIdentifier/inspire\_common:Namespace  *(ExtendedCapabilities)* |

Table 16: Mapping INSPIRE Metadata elements to the WCS GetCapabilities response elements

**TG Requirement 5**

**TG Requirement 6**

A Download Service metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are supported

INSPIRE Metadata for the Download Service shall EITHER be linked to via an

<inspire\_common:MetadataUrl> in an extended capabilities section, OR the extended capabilities section shall contain all the INSPIRE Metadata for the Download Service in accordance with Table 16 and the

inspire\_dls:ExtendedCapabilities schema.

<ows:ExtendedCapabilities>

<inspire\_dls:ExtendedCapabilities>

<inspire\_common:MetadataUrl>

<inspire\_common:URL> <http://someplace.ac.uk/metadata.xml>

</inspire\_common:URL>

<inspire\_common:MediaType> application/xml

</inspire\_common:MediaType>

</inspire\_common:MetadataUrl>

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

<inspire\_dls:SpatialDataSetIdentifier

metadataURL=["http://link](http://link-to-a-resolver-service/csw)-[to-a-resolver-service/csw?"](http://link-to-a-resolver-service/csw)>

<!-- gmd:MD\_Identifier -->

<inspire\_common:Code>

ba209999-0c6c-11d2-97cf-00c04f8eea45

</inspire\_common:Code>

</inspire\_dls:SpatialDataSetIdentifier>

<inspire\_dls:SpatialDataSetIdentifier>

<!-- gmd:RS\_Identifier -->

<inspire\_common:Code>

local-identifier-for-dataset

</inspire\_common:Code>

<inspire\_common:Namespace>

ftps://some/place/to/resolve-resourceids/

</inspire\_common:Namespace>

</inspire\_dls:SpatialDataSetIdentifier>

</inspire\_dls:ExtendedCapabilities>

</ows:ExtendedCapabilities>

Example 10: inspire\_dls:ExtendedCapabilities section in a scenario 1 response

<!— Example (scenario 2 extended capabilities response) -->

<ows:ExtendedCapabilities>

<inspire\_dls:ExtendedCapabilities>

<inspire\_common:ResourceLocator>

<inspire\_common:URL><http://earthserver.bgs.ac.uk/rasdaman/ows>?

</inspire\_common:URL>

</inspire\_common:ResourceLocator>

<inspire\_common:ResourceType>service

</inspire\_common:ResourceType>

<inspire\_common:TemporalReference>

<inspire\_common:DateOfLastRevision>2014-07-01

</inspire\_common:DateOfLastRevision>

</inspire\_common:TemporalReference>

<inspire\_common:Conformity>

<inspire\_common:Specification>

<inspire\_common:Title>

Technical Guidance for INSPIRE Download Services 3.1

</inspire\_common:Title>

<inspire\_common:DateOfLastRevision>2013-08-09

</inspire\_common:DateOfLastRevision>

</inspire\_common:Specification>

<inspire\_common:Degree>notEvaluated

</inspire\_common:Degree>

</inspire\_common:Conformity>

<inspire\_common:MetadataPointOfContact>

<inspire\_common:OrganisationName>British Geological Survey

</inspire\_common:OrganisationName>

<inspire\_common:EmailAddress>[enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)

</inspire\_common:EmailAddress>

</inspire\_common:MetadataPointOfContact>

<inspire\_common:MetadataDate>2012-11-26</inspire\_common:MetadataDate>

<inspire\_common:SpatialDataServiceType>download

</inspire\_common:SpatialDataServiceType>

<inspire\_common:MandatoryKeyword>

<inspire\_common:KeywordValue>infoCoverageAccessService

</inspire\_common:KeywordValue>

</inspire\_common:MandatoryKeyword>

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

<inspire\_dls:SpatialDataSetIdentifier>

<inspire\_common:Code>fc929094-8a30-2617-e044-002128a47908

</inspire\_common:Code>

</inspire\_dls:SpatialDataSetIdentifier>

<inspire\_dls:SpatialDataSetIdentifier>

<inspire\_common:Code>13603180</inspire\_common:Code>

<inspire\_common:Namespace><http://data.bgs.ac.uk/id/dataHolding/>

</inspire\_common:Namespace>

</inspire\_dls:SpatialDataSetIdentifier>

</inspire\_dls:ExtendedCapabilities>

</ows:ExtendedCapabilities>

Example 11: inspire\_dls:ExtendedCapabilities section in a scenario 2 response

A SpatialDataSetIdentifier with Code only should be interpreted as representing a gmd:MD\_Identifier, a SpatialDataSetIdentifier with Code and Namespace should be interpreted representing a RS\_Identifier.

|  |
| --- |
| TG Recommendation 4 A WCS shall use the **infoCoverageAccessService** keyword for the inspire\_common:MandatoryKeyword |

* + - 1. Language requirements for GetCapabilities responses from a WCS

**TG Requirement 7**

If a client request does not specify the AcceptLanguages parameter in the request, or otherwise provides a language parameter unknown to the server, the above fields [Title, Abstract] shall be provided in the service default language.

This behaviour ensures backwards compatibility so that any existing clients may interact with the service using the default OGC standard.

|  |  |
| --- | --- |
| **Parameter Name** | **Parameter Value** |
| <inspire\_common:Language> | Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2. Use only three-letter codes from ISO 639-2/B (bibliographic codes).  The list of codes for the 24 official EU languages and the languages of the EFTA Countries is:  Bulgarian – **bul** Italian – **ita**  Czech – **cze** Latvian – **lav** Danish – **dan** Liechtenstein– **ger** Dutch – **dut** Lithuanian – **lit** English – **eng** Maltese – **mlt** Polish – **pol** Norwegian – **nor** Estonian – **est** Portuguese – **por** Finnish – **fin** Romanian – **rum**  French – **fre** Romansh - **roh** German – **ger** Slovak – **slo** Greek – **gre** Slovenian – **slv** Hungarian – **hun** Spanish – **spa** Irish – **gle** Swedish – **swe** Croatian - **hrv** Icelandic – **ice**  The complete list of codes is defined at <http://www.loc.gov/standards/iso639-2/> Regional languages are also included in this list. |

Table 17: Codes for language response parameters

The INSPIRE common schema (<http://inspire.ec.europa.eu/schemas/common/1.0/common.xsd>) should also contain these language codes to help with validation of XML responses, where applicable, but it is noted that presently some of the language codes seem to be missing from the enumeration list for euLanguageISO6392B.

**TG Requirement 8**

The Extended Capabilities shall contain the **list of supported languages**

indicated in <inspire\_common:SupportedLanguages>.

This **list of supported languages** shall consist of

1. exactly one element <inspire\_common:DefaultLanguage> indicating the service default language, and
2. zero or more elements <inspire\_common:SupportedLanguage> to indicate all additional supported languages.

Regardless of the response language, the **list of supported languages** is invariant for each GetCapabilities-Response.

**TG Requirement 9**

The Extended Capabilities shall indicate the response language used for the GetCapabilities-Response: Depending on the requested language the value of the <inspire\_common:ResponseLanguage> corresponds to the current used language. If a supported language was requested,

<inspire\_common:ResponseLanguage> shall correspond to that requested language. If an unsupported language was requested or if no specific language was requested <inspire\_common:ResponseLanguage> shall correspond to the service default language

<inspire\_common:DefaultLanguage>

**Examples**

For a service that only supports German the service must provide a response that gives the default language (as a ISO 639-2/B alpha 3 code) and also the response language as German using the same code.

|  |
| --- |
| <inspire\_dls:ExtendedCapabilities>  …  <inspire\_common:SupportedLanguages>  <inspire\_common:DefaultLanguage> |
| <inspire\_common:Language>**ger**</inspire\_common:Language> |
| </inspire\_common:DefaultLanguage>  </inspire\_common:SupportedLanguages>  <inspire\_common:ResponseLanguage> |
| <inspire\_common:Language>**ger**</inspire\_common:Language> |
| </inspire\_common:ResponseLanguage>  …  </inspire\_dls:ExtendedCapabilities> |

Example 12: Response to any GetCapabilities-Request (only German supported)

A service supports French and English and the service default language is French. In such a service a

request using the AcceptLanguages parameter asking for an English response (using the RFC 4646 language code), shows the response language as English (as a ISO 639-2/B alpha 3 code), the default language as French and English as a supported language (as shown in Example 13).

|  |
| --- |
| <inspire\_dls:ExtendedCapabilities>  …  <inspire\_common:SupportedLanguages>  <inspire\_common:DefaultLanguage> |
| <inspire\_common:Language>**fre**</inspire\_common:Language> |
| </inspire\_common:DefaultLanguage>  <inspire\_common:SupportedLanguage> |
| <inspire\_common:Language>**eng**</inspire\_common:Language> |
| </inspire\_common:SupportedLanguage>  </inspire\_common:SupportedLanguages>  <inspire\_common:ResponseLanguage> |
| <inspire\_common:Language>**eng**</inspire\_common:Language> |

</inspire\_common:ResponseLanguage

…

</inspire\_dls:ExtendedCapabilities>

Example 13: Response to OGC-GetCapabilities-Request for English (en) in a multi-lingual service)

A service supports French and English and the service default language is French. In such a service a

request using the AcceptLanguages parameter asking for a French response (using the RFC 4646 language code), shows the response language as French (as a ISO 639-2/B alpha 3 code), the default language as French and English as a supported language (as shown in Example 14).

|  |
| --- |
| <inspire\_dls:ExtendedCapabilities>  …  <inspire\_common:SupportedLanguages>  <inspire\_common:DefaultLanguage> |
| <inspire\_common:Language>**fre**</inspire\_common:Language> |
| </inspire\_common:DefaultLanguage>  <inspire\_common:SupportedLanguage> |
| <inspire\_common:Language>**eng**</inspire\_common:Language> |
| </inspire\_common:SupportedLanguage>  </inspire\_common:SupportedLanguages>  <inspire\_common:ResponseLanguage> |
| <inspire\_common:Language>**fre**</inspire\_common:Language> |
| </inspire\_common:ResponseLanguage>  …  </inspire\_dls:ExtendedCapabilities> |

Example 14: Response to OGC-GetCapabilities-Request for French (fr)

* + 1. **Describe Spatial Data Set operation**

In a WCS the Describe Spatial Data Set operation is provided through the DescribeCoverage operation. A DescribeCoverage request submits a list of one or more coverage identifiers (Spatial Data Set Identifiers) from the list of identifiers provided in the GetCapabilities response and returns, for each identifier a description of the coverage.

The minimum parameters to send to a service to obtain a data set description (through a DescribeCoverage request and response) is the *service* type parameter value which will always be ‘**WCS**’, the *request* type parameter value which will always be ‘**DescribeCoverage**’, the *version* number in x.y.z format, which must be one of the versions reported in the GetCapabilities response, and which must be at least 2.0.0 to be INSPIRE compliant, and at least one of the coverage identifiers reported in the GetCapabilities response.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**DescribeCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:CoverageId>**glasgow\_bron\_b**</wcs:CoverageId>

<wcs:CoverageId>**glasgow\_bron\_t**</wcs:CoverageId>

</wcs:**DescribeCoverage**>

Example 15: DescribeCoverage request for two coverages using XML/POST

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**DescribeCoverage**& version=**2.0.1**&  CoverageId=**glasgow\_bron\_t**,**glasgow\_bron\_b**& |

Example 16: DescribeCoverage request for two coverages using GET/KVP

Where a service reports through its GetCapabilities response that it can supply responses in more than one language, a client can express a language preference in the request based on the reported languages supported. To express a preference for a response in a language or languages a request should also include one or more language values in an AcceptLanguages parameter, or alternatively as part of an HTTP HEAD request such as with the Accept-Language header or with an HTTP\_ACCEPT\_LANGUAGE environment variable, as described elsewhere in this document.

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**DescribeCoverage**& version=**2.0.1**&  CoverageId=**glasgow\_bron\_t**,**glasgow\_bron\_b**& AcceptLanguages=**en,\***& |

Example 17: DescribeCoverage request for two coverages, with language negotiation (GET/KVP)

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**DescribeCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:Extension>

<AcceptLanguages xmlns=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)>

<Language>**en**</Language>

<Language>**\***</Language>

</AcceptLanguages>

</wcs:Extension>

<wcs:CoverageId>**glasgow\_bron\_b**</wcs:CoverageId>

<wcs:CoverageId>**glasgow\_bron\_t**</wcs:CoverageId>

</wcs:**DescribeCoverage**>

Example 18: DescribeCoverage request for two coverages, with language negotiation (XML/POST)

* + 1. **Get Spatial Data Set operation**

In a WCS the Get Spatial Data Set operation is provided through the GetCoverage operation. A GetCoverage request submits a coverage identifier (Spatial Data Set Identifier) from the list of identifiers provided in the GetCapabilities response together with any domain subsetting parameters needed to constrain the response to an envelope (or “bounding box”), and the response is a derived coverage.

The minimum parameters to send to a service to obtain a data set (a coverage) through a GetCoverage request and response) is the *service* type parameter value which will always be ‘**WCS**’, the *request* type parameter value which will always be ‘**GetCoverage**’, the *version* number in x.y.z format, which must be one of the versions reported in the GetCapabilities response, and which must be at least 2.0.0 to be INSPIRE compliant, and one of the coverage identifiers reported in the GetCapabilities response.

The coverage data provided in the response to such a GetCoverage request is supplied in the native coordinate reference system, as advertised in the DescribeCoverage response (Describe Spatial Data Set operation) within the srsName of the GML::DomainSet.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:CoverageId>**glasgow\_bron\_b**</wcs:CoverageId>

</wcs:**GetCoverage**>

Example 19: GetCoverage request (XML/POST)

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**GetCoverage**& version=**2.0.1**& CoverageId=**glasgow\_bron\_b**& |

Example 20: GetCoverage request (KVP/GET)

Where a service reports through its GetCapabilities response that it can supply responses in more than one language, a client can express a language preference in the request based on the reported languages supported. To express a preference for a response in a language or languages a request should also include one or more language values in an AcceptLanguages parameter, or alternatively as part of an HTTP HEAD request such as with the Accept-Language header or with an HTTP\_ACCEPT\_LANGUAGE environment variable, as described elsewhere in this document.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:Extension>

<AcceptLanguages xmlns=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)>

<Language>**en**</Language>

<Language>**\***</Language>

</AcceptLanguages>

</wcs:Extension>

<wcs:CoverageId>**glasgow\_bron\_b**</wcs:CoverageId>

</wcs:**GetCoverage**>

Example 21: GetCoverage request with language negotiation (XML/POST)

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& request=**GetCoverage**& version=**2.0.1**& CoverageId=**glasgow\_bron\_b**& AcceptLanguages=**en**,**\***& |

Example 22: GetCoverage request with language negotiation (KVP/GET)

Whilst it is common for OGC web services to support reprojection of the data sets it operates on, it is important to note that it is not a requirement for any INSPIRE download service to provide any transformation capabilities, including reprojection. It is a recommendation of the INSPIRE D2.8.I.1 Data Specification on Coordinate Reference Systems – Technical Guidelines document that *projections referred in section 1.3.2 of Annex II of Commission Regulation (EU) No 1089/2010) are available in INSPIRE transformation services.* These Technical Guidelines tell us too that *Users may benefit of INSPIRE download and transformation services to get and re-project data sets according their aims. Moreover, different INSPIRE themes or applications where INSPIRE compliant data is integrated should use appropriate map projections. This is especially important when analysis is being done in large scales*.

A data supplier then may choose to make available their large coverage data set in a single CRS which for INSPIRE compliance must be one of CRS defined in [**INS ISSDS**] (see Section 4 for a summary) which is most suited for analysis, and not offer any transformation. This decision to provide no reprojection in the download service may also be for performance reasons, but whatever the reason there is no requirement for there to be any transformation operations in a download service.

Where the WCS service lists support for Coordinate transformation in its GetCapabilities response, a client can request a coverage transformation operation as part of a GetCoverage operation, according to the list of supported CRSs, that is, they can request a reprojection to any of the CRS listed in the GetCapabilities response.

Support for the extension is indicated in the GetCapabilities response by the following profile information:

*</ows:Profile>*

<http://www.opengis.net/spec/WCS_service-extension_crs/1.0/conf/crs>

*<ows:Profile>*

*</ows:Profile>*

[*http://www.opengis.net/spec/WCS\_service-extension\_crs/1.0/conf/crs-gridded-*](http://www.opengis.net/spec/WCS_service-extension_crs/1.0/conf/crs-gridded-) *coverage*

*<ows:Profile>*

…

<wcs:Extension>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/4326>

</crs:crsSupported>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/3031>

</crs:crsSupported>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/3034>

</crs:crsSupported>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/3413>

</crs:crsSupported>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/3857>

</crs:crsSupported>

<crs:crsSupported> <http://www.opengis.net/def/crs/EPSG/0/4258>

</crs:crsSupported>

</wcs:Extension>

Example 23: Section of a GetCapabilities response showing CRS that are supported for reprojection of coverages in a service

The list of reported supported CRS is NOT in any order and cannot be used to imply the native CRS of any coverage.

XML/POST

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xmlns:wcscrs=["http://www.opengis.net/wcs/service](http://www.opengis.net/wcs/service-extension/crs/1.0)-[extension/crs/1.0"](http://www.opengis.net/wcs/service-extension/crs/1.0) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:Extension>

<AcceptLanguages xmlns=["http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)>

<Language>**en**</Language>

</AcceptLanguages>

<wcscrs:outputCrs>

[**http://www.opengis.net/def/crs/EPSG/0/4258**](http://www.opengis.net/def/crs/EPSG/0/4258)

</wcscrs:outputCrs>

</wcs:Extension>

<wcs:CoverageId>

**BGS\_EMODNET AdriaticIonianCentralMedMCol**

</wcs:CoverageId>

</wcs:**GetCoverage**>

Example 24: GetCoverage with reprojection request and with language negotiation (XML/POST)

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**& |

|  |
| --- |
| request=**GetCoverage**& version=**2.0.1**&  CoverageId=**BGS\_EMODNET\_AegeanLevantineSeasMCol**& AcceptLanguages=**en,\***&  outputCrs= [**http://www.opengis.net/def/crs/EPSG/0/4258**&](http://www.opengis.net/def/crs/EPSG/0/4258%26) |

Example 25: GetCoverage with reprojection request and with language negotiation (KVP/GET)

If the service cannot support a coordinate transformation then the coverage must be available in a coordinate reference system defined by [**INS ISSDS,** Annex II]. A service provider may choose to supply the same coverage data in one or more predefined CRS, rather than allow on-the-fly coordinate transformation for performance reasons, in such a situation at least one of these coverages must be available in a CRS defined by [**INS ISSDS,** Annex II].

In the future (through the proposed Coveragecollections extension) there will be a way to group coverages into collections; such collections could be used to group a set of coverages that differ only in their projection.

A request without an outputCrs parameter is implicitly asking for the native projection, that is, in the CRS as the coverage is stored in the server.

A GetCoverage request may also include one or more domain subsetting parameters to return a part of the coverage. Such a subsetting request can be made using any of axes advertised in the DescribeCoverage response (Describe Spatial Data Set operation) for the coverage; the request must use the axisLabels reported.

For example in the following response part (from a DescribeCoverage request for a coverage with id of BGS\_EMODNET\_AegeanLevantineSeasMCol) the axes are labelled *‘Lat’* and *‘Long’*, so any subsetting request must use these labels (which are case sensitive). Each subsetting parameter shall operate on a single axis, and only one subsetting parameter for each axis is allowed in any GetCoverage request.

<gml:domainSet xmlns:gml=["http://www.opengis.net/gml/3.2"](http://www.opengis.net/gml/3.2)>

<gml:RectifiedGrid dimension="2"

gml:id="grid\_BGS\_EMODNET\_AegeanLevantineSeasMCol">

<gml:limits>

<gml:GridEnvelope>

<gml:low>0 0</gml:low>

<gml:high>3479 2637</gml:high>

</gml:GridEnvelope>

</gml:limits>

<gml:axisLabels>Lat Long</gml:axisLabels>

<gml:origin>

<gml:Point

gml:id="grid\_origin\_BGS\_EMODNET\_AegeanLevantineSeasMCol" srsName=["http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258)>

<gml:pos>41.389583 22.235417</gml:pos>

</gml:Point>

</gml:origin>

<gml:offsetVector srsName=["http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258)>

0 0.004167

</gml:offsetVector>

<gml:offsetVector srsName=["http://www.opengis.net/def/crs/EPSG/0/4258"](http://www.opengis.net/def/crs/EPSG/0/4258)>

-0.004167 0

</gml:offsetVector>

</gml:RectifiedGrid>

</gml:domainSet>

Example 26: GML Domain Set response from a DescribeCoverage request showing the names of the axes that must be used in any subsetting request

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**&  version=**2.0.1**& request=**GetCoverage**&  CoverageId=**BGS\_EMODNET\_AegeanLevantineSeasMCol**& subset=**Lat(34.53627,38.88686)**& subset=**Long(25.43366,31.32234)**& |

Example 27: GetCoverage subsetting request applying a trim on two axes, assuming default CRS for the subsetting axes (KVP/GET)

XML/POST

|  |  |  |  |
| --- | --- | --- | --- |
| <?xml version="1.0" encoding="UTF-8"?>  <wcs:**GetCoverage** xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)  [http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">  <wcs:CoverageId>**BGS\_EMODNET\_AegeanLevantineSeasMCol**</wcs:CoverageId> | | | |
| <wcs:DimensionTrim> |  | | |
| <wcs:Dimension>Lat</wcs:Dimension> | |  | |
| <wcs:TrimLow>34.53627</wcs:TrimLow> | | |  |
| <wcs:TrimHigh>38.88686</wcs:TrimHigh>  </wcs:DimensionTrim>  <wcs:DimensionTrim>  <wcs:Dimension>Long</wcs:Dimension>  <wcs:TrimLow>25.43366</wcs:TrimLow>  <wcs:TrimHigh>31.32234</wcs:TrimHigh>  </wcs:DimensionTrim>  </wcs:**GetCoverage**> | | | |

Example 28: GetCoverage subsetting request applying a trim on two axes (XML/POST)

The request can be made using only the axis labels and subsetting coordinates, omitting the coordinate reference system URI; in such a situation the coverage is returned in the native coordinate reference system.

KVP/GET

|  |
| --- |
| [http://myserver.ac.uk/some/folders/ows?](http://myserver.ac.uk/some/folders/ows) service=**WCS**&  version=**2.0.1**& request=**GetCoverage**&  CoverageId=**BGS\_EMODNET\_AegeanLevantineSeasMCol**& subset=**L**[**at,h**](http://www.opengis.net/def/crs/EPSG/0/4258(34.53627%2C38.88686)%26)**ttp**[**://www.opengis.net/def/crs/EPSG/0/4258(34.53627,38.88686)**&](http://www.opengis.net/def/crs/EPSG/0/4258(34.53627%2C38.88686)%26) subset=**Long**[**,ht**](http://www.opengis.net/def/crs/EPSG/0/4258(25.43366%2C31.32234)%26)**t**[**p://www.opengis.net/def/crs/EPSG/0/4258(25.43366,31.32234)**&](http://www.opengis.net/def/crs/EPSG/0/4258(25.43366%2C31.32234)%26) |

Example 29: GetCoverage subsetting request applying a trim on two axes, explicitly supplying CRS of the subsetting axes (KVP/GET)

Domain subsetting can be performed on any of the data set dimensions, so if for example your data set deals with a phenomenon (range) that varies in x,y,time dimensions (crudely speaking representing a cube of data) you can slice the data at any point on any of those axes. The below example shows such a slicing operation at a point in time. The result is a 2D data set (each slicing operation in a request reduces the number of axes by one in the result set) with the values in the coverage along the x,y axes at the slice point.

XML/POST

<wcs:format>**image/geotiff**</wcs:format>

</wcs:**GetCoverag**e>

<wcs:DimensionSlice>

<wcs:Dimension>**time**</wcs:Dimension>

<wcs:SlicePoint>**2016-01-14T00:00:00.000Z**</wcs:SlicePoint>

</wcs:DimensionSlice>

<?xml version="1.0" encoding="UTF-8"?>

<wcs:**GetCoverage** [xmlns:wcs="http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) [xmlns:xsi="http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-instance" [xsi:schemaLocation="http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0)

[http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="**WCS**" version="**2.0.1**">

<wcs:CoverageId>**mycoverage**</wcs:CoverageId>

Example 30: GetCoverage subsetting request applying a slice on one axis (XML/POST)

KVP/GET

|  |
| --- |
| [http://myserver/geoserver/gdd/wcs?](http://myserver/geoserver/gdd/wcs) service=**WCS**&  version=**2.0.1**& request=**GetCoverage**& CoverageId=**mycoverage**& format=**image/geotiff**&  SUBSET=**time**("**2016-01-14T00:00:00.000Z**")& |

Example 31: GetCoverage subsetting request applying a slice on one axis (KVP/GET)

1. **Web Coverage Service and service extensions**

**implementation of Direct Access Download Service**

A direct access service is effectively defined by [**INS NS,** (Annex IV)] as a service that allows a client/user to directly query a set of spatial data through a service according to a specific set of search criteria as defined in [**INS NS,** Part C**]** , to allow the retrieval of a data set (or part of a data set). The principal requirement here is to allow the querying of all relevant key attributes and the relationship between the Spatial Objects set out in [**INS ISSDS]**

Where the WCS service is a direct access service, in addition to the download operations specified by [**INS NS,** Annex IV, Part A] that are covered in Chapter 5 services, shall support two other download operations as covered by [**INS NS,** Annex IV Part B].

More simply the two operations can be thought of as a discovery operation and a retrieval operation; the Describe Spatial Object Type operation lets you discover what Spatial Object types are available in the service and what properties are supported/included, so that you can subsequently construct a search query using those object types and properties as part of a Get Spatial Object operation.

If a network service cannot support both of these two additional operations it cannot be classified as an INSPIRE direct access download service. In such a situation a hybrid network service may be employed where one or other (or both) of the operations is supplied by a different services.

**TG Conformance Class WCS-CON: Direct Access Download Operations**

Implement download operations (“Part B”) in a download service using a Web Coverage Service.

*This conformance class is inclusive of: TG Requirement 13*

*TG Recommendation 5 to TG Recommendation 10*

* + 1. **Describe Spatial Object Type operation**

It is not possible to completely map the Describe Spatial Object Type operation to any WCS 2.0 core operation or any extension of WCS 2.0; however the WCS DescribeCoverage operation provides sufficient information to be able to construct a query to enable a Get Spatial Object operation.

[Annex B](#_bookmark299) discusses possibilities for implementing a Describe Spatial Type operation to be used as part of a Direct Access Download service to ensure full compliance.

* + 1. **Get Spatial Object operation**

In addition to WCS 2.0 core operations the following extension must also be available to enable the Get Spatial Object Operation:

*OGC Web Coverage Service WCS Interface Standard - Processing Extension, version 2.0*

Support for the extension is indicated in the GetCapabilities response by the following profile information:

</ows:Profile>

<http://www.opengis.net/spec/WCS_service-extension_processing/2.0/conf/processing>

<ows:Profile>

The following conformance classes dependencies apply to the processing extension:

* + - * OGC 09-146r2, GML 3.2.1 Application Schema for Coverages, version 1.0
      * OGC 09-110, OGC Web Coverage Service 2.0 Interface Standard -Core, version 2.0
      * OGC 08-068r2, OGC Web Coverage Processing Service (WCPS) Language Interface Standard, version 2.0

The Get Spatial Object requirements for Download services as defined by [**INS NS** (Annex IV parts B and C)] do not deal with any transformational queries, the requirements are solely for defining search criteria. **[INS NS]** deals separately with transformational services in Annex V, however discussion of requirements for such transformational services is out of scope for these technical guidelines. Discussions on range subsetting, scaling, and even CRS transformation are therefore out of scope, and extensions that support such operations are not required to be supported by any INSPIRE Download Service operation.

In a WCS the Get Spatial object operation is provided through the ProcessCoverages operation. A ProcessCoverages request submits a coverage identifier from the list of identifiers provided in the GetCapabilities response together with any domain subsetting parameters needed to constrain the response to an envelope (or “bounding box”), and the response is a derived coverage.

The minimum parameters to send to a service to obtain a data set (a coverage) through a ProcessCoverages request and response) is the *service* type parameter value which will always be ‘**WCS**’, the *request* type parameter value which will always be ‘**ProcessCoverages**’, the *version* number in x.y.z format, which must be one of the versions reported in the GetCapabilities response, and which must be at least 2.0.0 to be INSPIRE compliant, and a *query* string expressed in WCPS Abstract Syntax.

Whilst the GET/KVP encoding is supported with the ProcessCoverages extension, it should be noted that **[WCS PE]** tells us that *it may be unwieldy or even impossible to transmit complex, large data structures like coverage as parameters using GET/KVP; it is recommended to use a POST encoding instead. A main use case is simple scalar parameter passing.*

XML/POST

</abstractSyntax>

</**query**>

</**ProcessCoveragesRequest**>

for *c* in (**glasgow\_bron\_th**) return

encode (

*c*[E:"<http://www.opengis.net/def/crs/EPSG/0/27700>"(260000), N:"<http://www.opengis.net/def/crs/EPSG/0/27700>"(665000)], "csv"

)

<?xml version="1.0" encoding="UTF-8"?>

<**ProcessCoveragesRequest** service="**WCS**" version="**2.0.1**"

xmlns="<http://www.opengis.net/wcps/1.0> [http://schemas.opengis.net/wcps/1.0/wcpsProcessCoverages.xsd"](http://schemas.opengis.net/wcps/1.0/wcpsProcessCoverages.xsd)>

<**query**>

<abstractSyntax>

Example 32: A slicing query on a coverage using a ProcessCoverages request (XML/POST)

Whilst there is a requirement as part of Get Spatial object operation to be able to query on the date of update (of a spatial object) and whilst the WCS 2.0 standard (through the **[OWS 2]** capabilities

operations) has a method to report an update date, the meaning of such a date stamp is thought to be too ambiguous. For a service where there the data sets provisioned are static files, the updateSequence date might align closely to an update of the coverage data, but in a service with direct access to a live database there is likely to be no relationship between the sequence date and the coverages provided. Similarly a service may (is likely to) operate on more than one coverage, each updating at a different time. Use of the updateSequence should be restricted therefore to advertising changes to the service metadata, not the coverages themselves.

<wcs:GetCapabilities xmlns:wcs=["http://www.opengis.net/wcs/2.0"](http://www.opengis.net/wcs/2.0) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.opengis.net/wcs/2.0](http://www.opengis.net/wcs/2.0) [http://schemas.opengis.net/wcs/2.0/wcsAll.xsd"](http://schemas.opengis.net/wcs/2.0/wcsAll.xsd) service="WCS" updateSequence="xyz123">

Example 33: GetCapabilities response showing updateSequence

|  |
| --- |
| TG Recommendation 5 The WCS GetCapabilities updateSequence should not be used to advertise the date that a coverage has been updated.  The date of update of a coverage should be advertised in the coverage metadata. |

1. **Quality of Service**

**TG Conformance Class WCS-QOS: Quality of Service**

Meet Quality of Service requirements.

*This conformance class is inclusive of:*

*TG Requirement 14 to TG Requirement 26*

[**INS NS**, Annex I] lists a set of criteria relating to performance, capacity and availability of any INSPIRE network service that shall apply to ensure the expected quality of service (QoS). Third party network services linked to the service under inspection shall not be taken into account in any QoS appraisal.

Since quality of service (QoS) depends on the specific testing procedure for a given service, this section describes the testing procedure that is to be applied for the assessment of QoS for a given INSPIRE download service.

The monitoring parameter NSi4 in [**INS M&R]** measures the conformity of all network services with the implementing rules. The conformity of a network service requires the compliance with the Quality of Service as defined in [**INS NS** Annex I]

* 1. ***General requirements***

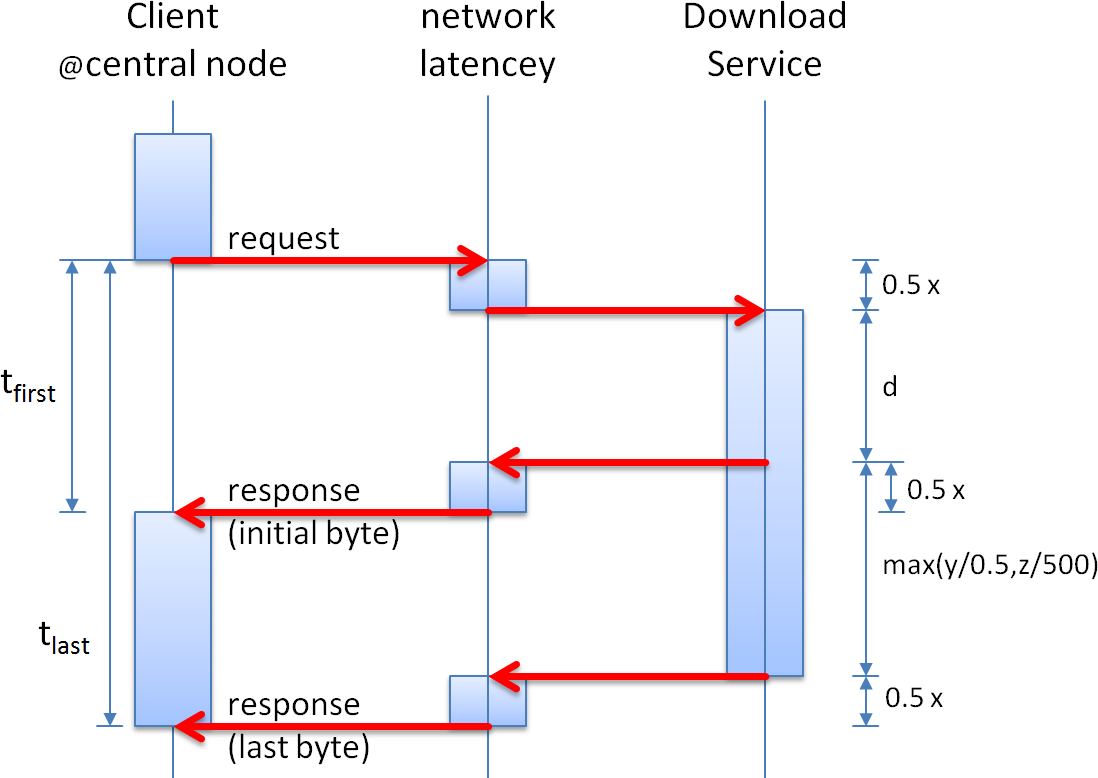
Two options exist for the measurements of Quality of Services:

* + - Option 1. Quality of Services requirements are measured at the service side exposed to the Internet.
    - Option 2. Quality of Services requirements are measured from a central network node within the infrastructure.

Option 2 above was included for practical reasons. If a Member State uses a central network node in the testing infrastructure, it shall take into account the network transport time. For a detailed overview of the testing procedure when using a central node, see Figure 5. Based on the evaluation of experiences this option may be revisited in the future.

For feasibility reasons the testing procedure is based on the following simplifications:

* + - For the transport of a small size of data over the network, the network latency can be considered as a constant value and is denoted x. So each network transport (request and response) is considered to consume the duration of x/2.
      * In case of option 1, x shall be set to 0.
      * In case of option 2, a member state should initiate a comparison between sample measures from the central node to sample measures at the service side, to find a realistic value of x for the specific national setting.
    - It is assumed that the network transport rate is not slower than the rate of the service response output stream to avoid any data jam at the production stream.



Network Latency

Figure 8: Detailed Sequence Diagram Download Service

* 1. ***Performance***
     1. **Implementation requirements mandated by the Implementing Rule**

*The normal situation represents periods out of peak load. It is set at 90 % of the time.*

*The response time for sending the initial response to a discovery service request shall be maximum 3 seconds in normal situation.*

*For a 470 Kilobytes image (e.g. 800 × 600 pixels with a colour depth of 8 bits), the response time for sending the initial response to a Get Map Request to a view service shall be maximum 5 seconds in normal situation.*

*For the Get Download Service Metadata operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation.*

*For the Get Spatial Data Set operation and for the Get Spatial Object operation, and for a query consisting exclusively of a bounding box, the response time for sending the initial response shall be maximum 30 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0,5 Megabytes per second or greater than 500 Spatial Objects per second.*

*For the Describe Spatial Data Set operation and for the Describe Spatial Object Type operation, the response time for sending the initial response shall be maximum 10 seconds in normal situation then, and still in normal situation, the download service shall maintain a sustained response greater than 0,5 Megabytes per second or greater than 500 descriptions of Spatial Objects per second.*

These [**INS NS]** rules are translated into the below requirements for the operations of a Web Coverage Service. Each operation criterion is measured independently.

* + - 1. **Service Performance (peak load)**

**TG Requirement 10** A download service should ensure that it is sufficiently performant to ensure that peak load occurs for only 10% of its uptime.

* + - 1. **GetCapabilities**

**TG Requirement 11** The response to a WCS GetCapabilities request shall take no longer than 10 seconds to start to respond, in normal operation.

* + - 1. **DescribeCoverage**

**TG Requirement 12** The response to a DescribeCoverage request, for a single coverage, shall take no longer than 10 seconds to start to respond, in normal operation.

**TG Requirement 13** Once initiated a DescribeCoverage response shall, in normal operation, maintain a sustained response of greater than 0.5 MB per second.

* + - 1. **GetCoverage**

**TG Requirement 14** The response to a GetCoverage request, for a single coverage, with or without any subsetting operations shall take no longer than 30 seconds to start to respond, in normal operation.

**TG Requirement 15** Once initiated a GetCoverage response shall maintain a sustained response of greater than 0.5 MB per second, in normal operation.

* + - 1. **ProcessCoverages**

**TG Requirement 16** The response to a ProcessCoverages request, for a single coverage, with or with without any subsetting operations shall take no longer than 30 seconds to start to respond, in normal operation.

**TG Requirement 17** Once initiated a ProcessCoverages response shall maintain a sustained response of greater than 0.5 MB per second, in normal operation.

* + - 1. **Measuring performance**

Details on how to configure your service to ensure it is sufficiently performant, and details on how to measure the performance of a WCS service are generally out of scope for this technical guidance. It is generally regarded as quite difficult to measure the response time for the first byte of any network service response, so any guidance given here should be regarded as indicative only.

One method to help you quantify the response times from your service is to use an HTTP HEAD request (this is essentially the same as an HTTP GET request but the response does not include the data). Tools such as the console based cURL (<https://curl.haxx.se/>) may be used to generate the request and have it give you a measured time for the start of data transfer.

|  |
| --- |
| curl  --silent  --write-out "%{time\_starttransfer}"  --request HEAD "[http://your.wcs/ows?service=WCS&request=...&](http://your.wcs/ows?service=WCS&request=.)" |

Example 34: Using cURL to send an HTTP HEAD request to help quantify a WCS operation response time

* 1. ***Capacity***

**7.3.1 Implementation requirements mandated by the Implementing Rule**

*The minimum number of simultaneous requests to a download service to be served in accordance with the quality of service performance criteria shall be 10 requests per second. The number of requests processed in parallel may be limited to 50.*

**TG Requirement 18** The measured capacity shall fulfil the requirements of the regulation (both capacity and performance) for all operations that are provided by the service.

* 1. ***Availability***

**7.4.1 Implementation requirements mandated by the Implementing Rule**

*“The probability of a Network Service to be available shall be 99% of the time.”*

**TG Requirement 19** A service should normally be expected to be available for 99% of the time. i.e. In any year period the service should have a cumulative outage period of no greater than 5256 minutes.

**Annex A Abstract Test Suites**

This chapter only contains the structure of the Abstract Test Suites and the contained Conformance Classes for testing the download service instances against the requirements of this specification. The Test Cases for the Conformance Classes are provided in a separate repository5.

***Conformance Class WCS-MAN: Mandatory download operations***

This section contains test cases covering all the TG Requirements of Conformance Class WCS-MAN: Mandatory download operations ([http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-](http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-mandatory) [mandatory](http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-mandatory)).

***Conformance Class WCS-CON: Direct access download operations***

This section contains test cases covering all the TG Requirements of Conformance Class WCS-CON: Direct access download operations ([http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-](http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-direct) [direct](http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0/wcs-direct)).

5 At the time of writing, the test cases for these Conformance Classes were not yet published. The repository for the Conformance Classes will be made available at [http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0.](http://inspire.ec.europa.eu/id/ats/download-service-wcs/1.0)

**Annex B Options for implementing a Describe Spatial Object Type operation**

For those coming from a background of WFS this might at first appear a bit odd, but what you need to remember is that in a WCS each coverage is a feature with its own feature type, and you can have multiple coverages each representing a single spatial object type in a slightly different (yet conformant to the spatial object type definition) encoding; whereas in a WFS for any spatial object type represented there is a single feature type with multiple features. In a WFS to represent different variants of a Spatial Object Type you need to give each variant feature type a different name, or provide them in a different service. To be able to build a query of the feature members of a feature type in a WFS you need some description of the properties of the feature type, whereas in a WCS you only need a description of the feature itself. In a WFS you therefore need a DescribeFeatureType operation (which maps well to the INSPIRE Describe Spatial Object Type operation), but in a WCS there is no such need and therefore no such equivalent operation. Indeed there is the added complication that because you can have multiple encodings of the same Spatial Object Type in a WCS that it would a Describe Spatial Object Type operation might return more than one answer.

The WCS DescribeCoverage operation is regarded as not being in scope here, because it technically returns information on a feature and not on a feature type (or spatial object type).

The below is informative to show the type of operation that is required here and to assist with a service operator provisioning such a service.

A pseudo KVP/GET request might look like:

|  |
| --- |
| [http://my.network.service/ows?](http://my.network.service/ows) service=OWS& request=**DescribeSpatialObjectType**& typename=**RiskCoverage**& |

Example 35: Pseudo DescribeSpatialObjectType request with Spatial Object Type specified.

In such a request the required response is a description of the RiskCoverage spatial object type provided by the service. The response is not a coverage of type RiskCoverage.

Alternatively, a pseudo KVP/GET request might look like:

|  |
| --- |
| [http://my.network.service/ows?](http://my.network.service/ows) service=**WPS**& request=Execute& language=en-GB&  identifier=**DescribeSpatialObjectType**& datainputs=someservicemetadata& |

Example 36: Pseudo DescribeSpatialObjectType request no Spatial Object Type specified

In such a request, where no Spatial Object Type is specified, the required response is a description of the ALL spatial object types provided by the service. The response is not a coverage of any type.

Metadata for the Spatial Object Types supported by a service could be added to its metadata record (like in the below example) and thus be exposed to the discovery service operations.

<gmd:descriptiveKeywords xmlns:gmd=["http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd)>

<gmd:MD\_Keywords>

<gmd:keyword>

<gco:CharacterString>RenewableAndWastePotentialCoverage</gco:CharacterStrin g>

</gmd:keyword>

<gmd:keyword>

<gco:CharacterString>RiskCoverage</gco:CharacterString>

</gmd:keyword>

<gmd:type>

<gmd:MD\_KeywordTypeCode codeList=["http://inspire.ec.europa.eu/featureconcept"](http://inspire.ec.europa.eu/featureconcept) codeListValue="Coverage">Spatial Object Types</gmd:MD\_KeywordTypeCode>

</gmd:type>

<gmd:thesaurusName>

<gmd:CI\_Citation>

<gmd:title>

<gco:CharacterString>COMMISSION REGULATION (EU) No 1253/2013 of 21 October 2013 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC as regards interoperability of spatial data sets and services</gco:CharacterString>

</gmd:title>

<gmd:alternateTitle>

<gco:CharacterString>INS ISDSS</gco:CharacterString>

</gmd:alternateTitle>

<gmd:date>

<gmd:CI\_Date>

<gmd:date>

<gco:Date>2013-10-21</gco:Date>

</gmd:date>

<gmd:dateType>

<gmd:CI\_DateTypeCode codeList=["http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO\_1913](http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_1913) 9\_Schemas/resources/Codelist/gmxCodelists.xml#CI\_DateTypeCode" codeListValue="revision">revision</gmd:CI\_DateTypeCode>

</gmd:dateType>

</gmd:CI\_Date>

</gmd:date>

</gmd:CI\_Citation>

</gmd:thesaurusName>

</gmd:MD\_Keywords>

</gmd:descriptiveKeywords>

Example 37: ISO 19139 metadata excerpt showing how Spatial Object Types supported by a service could be advertised.

Similarly metadata for the Spatial Object Types supported by a service could be added to an Atom feed (like in the below example) and linked to from a metadata hook in the GetCapabilities response either for the service or per coverage (in the coverage summary).

<?xml version="1.0" encoding="UTF-8"?>

<feed xmlns=["http://www.w3.org/2005/Atom"](http://www.w3.org/2005/Atom) xmlns:xsi=["http://www.w3.org/2001/XMLSchema](http://www.w3.org/2001/XMLSchema-instance)-[instance"](http://www.w3.org/2001/XMLSchema-instance) xsi:schemaLocation=["http://www.w3.org/2005/Atom](http://www.w3.org/2005/Atom)

<http://www.ogcnetwork.net/schemas/atom/2005/atom.xsd>" xml:lang="en">

<link title="service implementing download operations"

href=["http://my.ogc.wcs.service/ows?request=](http://my.ogc.wcs.service/ows?request)

GetCapabilities&amp;service=WCS&amp;" rel="related"

type="text/xml"></link>

<category term="SpatialObjectType" scheme=["http://inspire.ec.europa.eu/glossary/"](http://inspire.ec.europa.eu/glossary/)

label="spatial object type" xml:lang="en-GB"/>

<category term="Coverage" scheme=["http://inspire.ec.europa.eu/featureconcept"](http://inspire.ec.europa.eu/featureconcept) label="Coverage"

xml:lang="en-GB"/>

<title type="text" xml:lang="en">INSPIRE spatial object types</title>

<subtitle type="text" xml:lang="en-GB">

A listing of spatial object types supported by the referenced WCS, and

a description of their representation</subtitle>

<!—- updated date is date of update of feed metadata not

update of coverage data -->

<updated xml:lang="en-GB">2006-05-04T18:13:51.0</updated>

<!— The following links are definitions of Spatial Object Types NOT

descriptions of the Spatial Object Types -->

<link title="Definition of referenced INSPIRE spatial object type"

href=["http://inspire.ec.europa.eu/featureconcept/CoverageByDomainAndRange"](http://inspire.ec.europa.eu/featureconcept/CoverageByDomainAndRange) rel="definedBy" hreflang="en"

type="text/html; charset=UTF-8" length="16182"

xml:lang="en-GB">Coverage (Domain And Range Representation)</link>

<link href=["http://inspire.ec.europa.eu/featureconcept/RiskCoverage"](http://inspire.ec.europa.eu/featureconcept/RiskCoverage) rel="definedBy" hreflang="en"

type="text/html; charset=UTF-8"

title="Definition of referenced INSPIRE spatial object type" length="15753"

xml:lang="en-GB">Risk coverage</link>

</feed>

Example 38: Use of an Atom feed to provide information on spatial object types supported by a service.

[xlink:href="http://feed.defining.spatial.object.types/atom.xml"](http://feed.defining.spatial.object.types/atom.xml)

[about="http://inspire.ec.europa.eu/glossary/SpatialObjectType"](http://inspire.ec.europa.eu/glossary/SpatialObjectType)

[xmlns:ows="http://www.opengis.net/ows/2.0"](http://www.opengis.net/ows/2.0)

[xmlns:xlink="http://www.w3.org/1999/xlink"/>](http://www.w3.org/1999/xlink)

</CoverageSummary>

<ows:Metadata

<CoverageSummary>

<CoverageId>glasgow\_kel\_b</CoverageId>

<CoverageSubtype>RectifiedGridCoverage</CoverageSubtype>

<CoverageSubtypeParent>

<CoverageSubtype>AbstractDiscreteCoverage</CoverageSubtype>

<CoverageSubtypeParent>

<CoverageSubtype>AbstractCoverage</CoverageSubtype>

</CoverageSubtypeParent>

</CoverageSubtypeParent>

Example 39: Use of the coverage summary in a GetCapabilities response to link to an Atom feed listing the spatial object types that are supported by the coverage.

Descriptions of the spatial object types could similarly be added to the service metadata record, or perhaps better to the metadata for coverage within the service and accessed through XPath operations. Below we list some simple example XPath expressions that might be used to query the Coverage description and metadata to extract information that could be used to construct a subsequent query of the spatial objects.

|  |
| --- |
| ***//wcs:formatSupported*** |
|  |
| <wcs:formatSupported>application/netcdf</wcs:formatSupported>  <wcs:formatSupported>image/jp2</wcs:formatSupported>  <wcs:formatSupported>image/tiff</wcs:formatSupported>  <wcs:formatSupported>application/gml+xml</wcs:formatSupported> |

Example 40: List all formats supported by the service (GetCapabilities)

|  |
| --- |
| ***//wcs:CoverageSummary/wcs:CoverageId*** |

Example 41: List all coverage identifiers (Spatial Data Set Identifiers) provided by the service (GetCapabilities)

|  |
| --- |
| ***//wcs:CoverageSummary/wcs:CoverageSubtype*** |

Example 42: List all Coverage sub types provided by the service (GetCapabilities)

Complete information concerning the default CRS, axis labels, units of measure for each axis and the number of dimensions etc. Can be extracted by using the below XPATH expression on a query of the DescribeCoverage response.

|  |
| --- |
| ***//gml:Envelope*** |
|  |
| <Envelope srsName=["http://www.opengis.net/def/crs/EPSG/0/27700"](http://www.opengis.net/def/crs/EPSG/0/27700) axisLabels="E N"  uomLabels="metre metre"  srsDimension="2">  <lowerCorner>254750 659824.9</lowerCorner>  <upperCorner>265250 670024.9</upperCorner>  </Envelope> |

Example 43: List the Envelope information for a Coverage (DescribeCoverage)

Aspects of the envelope can be extracted by adding specific attributes as below.

|  |
| --- |
| ***//gml:Envelope@srsName*** |
|  |
| srsName=["http://www.opengis.net/def/crs/EPSG/0/27700"](http://www.opengis.net/def/crs/EPSG/0/27700) |

Example 44: List the default SRS for a coverage (DescribeCoverage)

The spatial data theme for the coverage can be added to the metadata, along with any other metadata required to describe the coverage in greater detail, and then extracted like below.

|  |
| --- |
| ***//ows:DatasetDescriptionSummary/ows:Identifier*** |
|  |
| <gmlcov:metadata>  <gmlcov:Extension xmlns:gsmlst=["http://xmlns.geosciml.org/GeologicStructure/3.2"](http://xmlns.geosciml.org/GeologicStructure/3.2) xmlns:gsml=["http://xmlns.geosciml.org/GeoSciML](http://xmlns.geosciml.org/GeoSciML-Core/3.2)-[Core/3.2"](http://xmlns.geosciml.org/GeoSciML-Core/3.2) xmlns:gco=["http://www.isotc211.org/2005/gco"](http://www.isotc211.org/2005/gco) xmlns:gsmlgu=["http://xmlns.geosciml.org/GeologicUnit/3.2"](http://xmlns.geosciml.org/GeologicUnit/3.2) xmlns:gsmlga=["http://xmlns.geosciml.org/GeologicAge/3.2"](http://xmlns.geosciml.org/GeologicAge/3.2) xmlns:gsmlem=["http://xmlns.geosciml.org/EarthMaterial/3.2"](http://xmlns.geosciml.org/EarthMaterial/3.2) xmlns:gsmlu=["http://xmlns.geosciml.org/Utilities/3.2"](http://xmlns.geosciml.org/Utilities/3.2)>  <ows:DatasetDescriptionSummary>  <ows:Identifier>Geology</ows:Identifier>  </ows:DatasetDescriptionSummary>  <gsmlst:Contact gml:id="BRON-BASE"> |

Example 45: List the Spatial Data Theme (DescribeCoverage)

The result of any Describe Spatial Object Type operation needs to be informative to the user or client wishing to make a subsequent ProcessCoverages request. There is no requirement for it to be an XML schema, but an XML schema that describes the implementation of the spatial object type in a feature type (or groups of feature types) may be in scope.



**Rob Walker Consultancy**

**Technical Guidance for the**

**INSPIRE Schema Transformation Network Service**

**EC JRC Contract Notice 2009/S 107-153973**

**Authors: Mark Howard, Simon Payne, Richard Sunderland**

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**Document Information**

This is the Technical Guidance for the INSPIRE Schema Transformation Network Service.

**Purpose**

This technical guidance document provides a concrete interface specification and supporting documentation for INSPIRE Transformation Network Services (TNS). This will enable interoperability by alleviating ambiguities that could arise from different interpretations of required operations and parameters. It forms the second deliverable within the scope of work for the EC JRC Contract Notice 2009/S 107-153973, as awarded to RSW Geomatics, 1Spatial and Rob Walker Consultancy.

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**Technical Guidance**

1. **Executive Summary**

The INSPIRE Directive (2007/2/EC) [[1]](#_bookmark384) aims to establish a European ‘Spatial Data Infrastructure’ (SDI) based on existing National SDI in member states. The European SDI will support policy-making for the protection of the environment.

INSPIRE aims to achieve harmonisation of spatial datasets and infrastructure through the provision of interoperable services. These services will enable users to find, browse, share and download digital spatial data held in heterogeneous data repositories using a standard set of methods and techniques.

The INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) outlines the functional requirements of an INSPIRE Transformation Network Service. This report provides an illustration of how these functional requirements can be achieved and how a Schema Transformation Network Service can be realised.

This guidance captures key use cases and an architecture for implementing a Schema Transformation Network Service. It details a network service that loads source data from a Web Feature Service (WFS) [[34]](#_bookmark412) or an FTP Site, performs a transformation based on a mapping definition and outputs the INSPIRE-schema compliant data to a Transactional WFS (WFS-T) [[35]](#_bookmark413) or an FTP Site.

This Technical Guidance has focused on using open standards, and, where possible, standards common to the wider (non-spatial) community. For this reason, it recommends the use of standard web service technologies such as SOAP/WSDL and WS-Addressing.

Accordingly, it has not adopted the Web Processing Service (WPS) model which is specific to the geospatial community.

By documenting precise interface specifications, logical software components and the system qualities that must be considered for an implementation of an INSPIRE Schema Transformation Network Service, the following conclusions have been reached:

* 1. The mapping definitions will be provided in W3C Rule Interchange Format (RIF) [[39].](#_bookmark417) This will enable the expression of the complex transformations required to map between domestic schemas and the INSPIRE schemas. RIF is an open standard designed for interoperability and interchange, so is ideally suited to the definition of a generic Schema Transformation Network Service. It is also extensible to include spatial predicates and functions. The mapping functionality capabilities of RIF are comparable to those identified in the State of the Art Analysis [[9]](#_bookmark391) and tool vendor survey.
  2. Source schema descriptions will be provided as ISO GML application schemas. These are defined in Section 6.2 of [[26].](#_bookmark406) These can be imported directly into the RIF mapping definitions, providing a standard interoperable interchange format and supporting spatial types and concepts.
  3. Configuration items (all of which are XML encoded) such as the mapping and schema definitions, will be managed though an XML repository. This improves the decoupling of services and encourages collaboration between service providers and users. In addition, it provides better management of multiple versions of mapping and schema definitions.

1. **Introduction**

This section gives an overview and general introduction to the Technical Guidance for Schema Transformation Network Services.

* 1. **Purpose**

This technical guidance document provides a concrete interface specification and supporting documentation for the Schema Transformation Network Service. This will enable interoperability by alleviating ambiguities that could arise from different interpretations of required operations and parameters.

It forms the second deliverable within the scope of work for the EC JRC Contract Notice 2009/S 107-153973, as awarded to RSW Geomatics, 1Spatial and Rob Walker Consultancy.

* 1. **Scope**

This document provides a proposal to Member States for the implementation of a Network Service of type Schema Transformation in accordance with the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4].](#_bookmark387) This applies to Legally-Mandated Organisations (LMO) who wish to publish their data "as is" according to their local logical schemas, and make provision for data consumers to transform the data as part of a download request.

This document details the technical aspects of the interfaces and characteristics of the Schema Transformation Network Service. It does not detail how the Service is combined or orchestrated with other services, nor how the Service should be implemented internally. Note also that testing of the prototype is not describe in this document but instead is detailed in the Prototype Report [[62].](#_bookmark435)

Transformation Network Services can be categorised into different areas of functionality: for example, transforming data formats (e.g. from a proprietary format to GML), coordinate reference systems (CRS) and logical schemas.

This technical guidance applies only to the transformation of logical schemas. It assumes that other types of transformation, such as data encoding format and CRS, are handled by other services; the technical guidance available for those other categories (see e.g. [[1](#_bookmark392)1], [[12])](#_bookmark393) complements the guidance presented in this document. These other transformations are performed prior to the schema transformation.

The technical challenges of schema transformation are greater than for other forms of transformation such as coordinate reference system and natural language transformation. This is because of the enormous variety of data models, encodings, transfer and storage formats and other factors that are required in order to achieve harmonisation of data in a common, European format as mandated by INSPIRE. For this reason, the technical guidance has become of necessity longer and more complex than for other INSPIRE network services.

* 1. **Intended Audience**

This document is aimed at Schema Transformation Network Service implementers and service integrators working on behalf of INSPIRE LMOs (see definition of service integrator in Section [4.3)](#_bookmark320).

Readers are assumed to have a general understanding of the INSPIRE directives and, for some sections, an understanding of web services and related technology.

* 1. **Terms and Definitions**

The following definitions are the same as those detailed in [[9]](#_bookmark391) and are reproduced here for convenience.

|  |  |
| --- | --- |
| **Term** | **Definition** |
| Data model | A model of the (geographic) data that is stored and/or exchanged. |
| Conceptual model | A model that defines concepts of a universe of discourse. |
| Conceptual schema | A platform-independent (or platform-specific), conceptual model expressed using a formal modelling language (such as UML). |
| Logical or application schema | A platform-specific description of the structure and constraints applicable to the storage of data for one or more applications (expressed, for example, as an XML Schema (XSD)). |
| Physical data model | Synonym for logical or application schema. |
| Physical schema | The concrete, implementation-specific description of how the data is organised in the storage technology of choice (expressed, for example, as SQL DDL). |
| Data instance | A single item of data expressed in a concrete storage format (for example, an XML element or database record) which corresponds in some way to an object in the real world such that it is capable of being expressed as an object in an ontology, rather than merely as a predicate or attribute of an object. |
| Instance data | A collective term for data instances, sometimes known as “row-level data” (especially in a database context). |
| Schema | A general-purpose term, rather imprecise in nature, that may refer to a generic data model, ontology or database storage structure, depending on the context. |
| INSPIRE Application | Software using INSPIRE network services (without access to a portal). NB This is the same definition as that given in Section 4.1 of [6]. |

*Table 1 Terms and definitions*

* 1. **Structure of the Document**

This document presents the architecture of a Schema Transformation Network Service as a series of views. These capture the interface specification and supplementary information that will be required by vendors who are implementing or integrating the Schema Transformation Network Service. These views are presented with supporting UML diagrams and sample XML code. The remainder of the document is divided into the following sections:

|  |  |  |
| --- | --- | --- |
| ***Section/Page*** | ***Title*** | ***Description*** |
| Section [3](#_bookmark308) | Architectural Goals and Constraints | A brief overview of the main goals and constraints of an INSPIRE compliant Schema Transformation Network Service. |
| Section [4](#_bookmark316) | Use Case View | Details of the requirements of the Schema Transformation Network Service, presented as a series of use cases, traced from the operations mandated in the INSPIRE Regulation [[3]](#_bookmark386) (as amended by [[4]).](#_bookmark387) These use cases described interactions with the system, detailing the pre and post |

|  |  |  |
| --- | --- | --- |
| ***Section/Page*** | ***Title*** | ***Description*** |
|  |  | conditions. They focus on describing the purpose and context of an interaction, rather than detailing the request and response parameters. |
| Section [5](#_bookmark327) | Logical View | An overview of the Schema Transformation Network Service’s components, including a detailed textual description of the system’s primary components and the operations it supports.  Details of open standards or languages used within the interface and any extensions to these standards or languages. Use case realisations illustrate how the logical schema contributes to the successful implementation of the use cases. |
| Section [6](#_bookmark347) | Data View | Specific details of the schema description and mapping languages, including details of how they should be used together.  Includes best practices for the construction of successful and unambiguous transformations. |
| Section [7](#_bookmark353) | System Qualities | Details of a number of system qualities which must be considered during the implementation of the INSPIRE Schema Transformation Network Service. |
| Section [8](#_bookmark363) | Implementation View (Informative) | An illustration for an INSPIRE-compatible Schema Transformation Network Service that is implemented using existing transformation tools. |
| Section [9](#_bookmark369) | Deployment View (Informative) | Options for physical network configurations on which the Schema Transformation Network Service will run, to aid service integrators in determining which approach will be the most suitable (see definition of service integrator in Section [4.3).](#_bookmark320) |
| Appendix A | Interface Specifications | Full interface specifications in a suitable format for importing directly into an implementation. |
| Appendix B | Sample SOAP Requests | Example Schema Transformation Network Service request and response parameters, including details of schema mappings. |
| Appendix C | Rationale | Further details of significant decisions made in the process of constructing the technical guidance. |
| Appendix D | GML-RIF  Compatibility | A worked example showing the compatibility between GML schema description language and RIF mapping definition format. |

|  |  |  |
| --- | --- | --- |
| ***Section/Page*** | ***Title*** | ***Description*** |
| Appendix E | Common Transformations | Common transformations expressed using RIF. |
| Appendix F | Definitions | Definitions, acronyms, abbreviations and initialisms. |
| Appendix G | References | Referential section. |

*Table 2 Document Sections*

The majority of this technical guidance document contains recommendations for the construction of the Schema Transformation Network Service. To aid service implementers and service users, additional information has been included where it may be useful. Such sections are marked clearly throughout this document with the suffix “(Supplementary)”.

1. **Architectural Goals and Constraints**

This section identifies generic, high level features, technical risks or overarching constraints of the Schema Transformation Network Service, of a kind that are expected to have a significant architectural impact.

* 1. **EC Regulations**

A Network Service of type Transformation must meet the provisions of the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4].](#_bookmark387)

The Schema Transformation Network Service must fulfil the needs of this Regulation relating to logical schemas. This includes the transformation of data from a source logical schema to the INSPIRE logical schema.

* 1. **Mapping Flexibility**

This guidance seeks to define an interface that is rich enough to allow implementations to support transformation of datasets held in a wide variety of source schemas into equivalent INSPIRE schemas. Although the interface must support this range of complexity, each implementation of the Schema Transformation Network Service will have limitations imposed by its supporting technologies and, as such, may only support a subset of the source and INSPIRE schemas.

The INSPIRE schemas are defined by the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4],](#_bookmark387) as guided by the INSPIRE data specifications [[8].](#_bookmark390) They should include all themes (including those that are currently, or will in future be, under development). The source schema is determined by the data providers, typically following their standard data capture and logical and conceptual schema development processes. This may change over time.

As a result, it should be possible to configure the Schema Transformation Network Service to work with a wide variety of source and target schemas. The configuration must be flexible enough to support those types of schema transformation identified in the State of the Art Analysis [[9]](#_bookmark391) Appendix B “Schema Transformation Levels”.

* 1. **Open Interfaces**

In order to enable interoperability within INSPIRE based projects, the Schema Transformation Network Service should be implemented based on the common interface specification defined in the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) and share the common characteristics described therein (including metadata requirements). These must not be tied to a particular transformation system’s software (commercial or open-source). It should be possible to create multiple implementations of the Schema Transformation Network Service, each using a different underlying transformation engine.

If the transformation engine has to be replaced (for example, due to performance, cost or other features) or, alternatively, another Schema Transformation Network Service is to be consumed, then it should be possible to do so without re-writing the schema mapping definitions.

* 1. **Statelessness**

This guidance describes a stateless interface. In effect, this means that all the information that a service requires to perform a transformation is provided in the initial operation request; thus, there is no need for the client to perform any other interaction with the service. To this end, the service does not store the transformed data; instead, the transformed data is transferred to a location (either WFS-T or FTP site) nominated by the client in the initial operation request.

Stateless design has important implications in terms of scalability and resilience, because it makes the service more amenable to load balancing (a process whereby requests to a single virtual service are routed automatically to one of several actual services).

Another import facet of this stateless approach is that the service is never responsible for the storage of persistent data. This means that any data cached during the transformation process can be, and should have been, discarded before the operation completes. This simplifies questions of data management and should help to minimise licensing issues associated with the storage and processing of the spatial data.

* 1. **Separation of Control Messages from Data Transfer**

The XML encodings of web service requests and responses are typically small (a few kilobytes or less). Modern web service development platforms have been designed with this as an assumption and therefore, for speed and ease of use, they process the request in memory.

However, spatial datasets are different in that, when they are encoded in XML, they can grow to be very large (many hundreds of megabytes). If the spatial datasets were to be embedded directly in either the request message or the response message of a Schema Transformation Network Service, they would be too large to be processed directly in memory.

This guidance defines an interface that is designed to be implemented using any modern web services platform. To this end, spatial datasets are never passed directly through the service interface (either in the request or the response) but are, instead, passed by reference. This allows the most appropriate technology to be used when handling the actual transfer of the spatial data.

A further advantage is that, in order to support audit and debug, web service infrastructure may persist a record of the messages sent to and received from a service. If the spatial datasets were passed by value through the interface, this would mean that the whole dataset would have be handled – and, possibly, stored - by intermediate infrastructural components. If however, only references were passed, the infrastructure would be able to make a precise and compact record of service activity.

Spatial dataset schemas (when expressed as GML application schemas), and also mapping definitions, can be relatively large, and so passage of these parameters by reference is recommended for these artefacts as well.

**Recommendation: Passage of parameters should be by reference for reasons of performance, flexibility of deployment and service manageability.**

* 1. **Schema Agnostic**

This guidance describes an interface that is entirely schema-agnostic. That is, to say, it embeds no knowledge of the structure of any source schema or any INSPIRE schema in the request message. This allows the interface definition to remain constant even when these schemas change. A consequence of this is that all data transformed by the system is considered equal; specifically, the system will handle identifiers, data and metadata in the same manner – all INSPIRE identifiers, data and metadata must be derived from the identifiers, data and metadata available in the source datasets.

* 1. **Automated Process**

The Schema Transformation Network Service should be supported by an operating environment that includes features such as orchestration of services, security, rights management and quality of service provisions, that function as automated network services This enables it to provide robust, accessible online services that are safe and secure, without requiring constant manual intervention.

1. **Use Case View**

This section documents scenarios within which the Schema Transformation Network Service must operate. These all represent significant aspects of Schema Transformation Network Service functionality. This section is based on an analysis of the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) and proposals for the Schema Transformation Network Service. Each use case describes what happens during the interaction, what the client (actor) does and how the system responds. It also identifies the list of pre-conditions that must be met before a use case can start, and a list of post-conditions that will be true once the use case has finished.

* 1. **Correspondence Between Use Cases and INSPIRE Regulation**

This section maps the operations identified in the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) onto the use cases proposed by this guidance. It contains only an overview for the purposes of traceability. Further details of the expected parameter datatypes and their permitted contents are given in Section [5.12.](#_bookmark341)

* + 1. **Use Case Traceability**

The Schema Transformation Network Service presented in this guidance conforms to the abstract service definition established in the Draft INSPIRE Regulation. In the following table, the mapping is presented from the abstract operations introduced in the Draft INSPIRE Regulation to the use cases described in this section.

|  |  |
| --- | --- |
| ***Abstract Operation*** | ***System Use Case*** |
| Get Transformation Service Metadata | Gather Technical Information |
| Transform | Store Configuration |
| Transform Data |
| Link Transformation Service | Link Transformation Service |

*Table 3 Operations and Use Cases*

* + 1. **Get Transformation Service Metadata**

Although the Schema Transformation Network Service is responsible for returning the metadata defined by the Draft INSPIRE Regulation’s Get Transformation Service Metadata operation, this operation has been included in the slightly more wide-ranging Gather Technical Information use case. It is expected that this use case will form part of a larger set of use cases that describe the process of integrating the Schema Transformation Network Service with existing spatial infrastructure. This larger set of integration related use cases is beyond the scope of this guidance.

|  |  |  |
| --- | --- | --- |
| ***Abstract Parameter*** | ***Type*** | ***System Parameter*** |
| Language | Request | Accept-Language HTTP Header (see [[6](#_bookmark436)3]). When this is set, the content of the metadata will reflect the language (if supported); however, the standard WSDL material will remain unchanged. If the language is not supported, the metadata will be supplied in the default language of the service. Browsers will normally configure this attribute automatically so that users will see the metadata in their natural language by default (if supported). |
| Transformation Service Metadata | Response | This will be included in the body of the WSDL response. The client will be able to differentiate this from the standard WSDL material because it will be in the INSPIRE namespace. |
| Operations Metadata | Response | This will be included in the body of the WSDL response. The client will be able to differentiate this from the standard WSDL material because it will be in the INSPIRE namespace. |
| Languages | Response | This will be included in the body of the WSDL response. The client will be able to differentiate this from the standard WSDL material because it will be in the INSPIRE namespace. |

*Table 4 Mapping of Parameters for the Get Transformation Service Metadata Operation*

See Section [4.6](#_bookmark325) for more details.

* + 1. **Transform**

The logical Transform operation has been mapped to two system use cases: the Store Configuration use case and the Transform Data use case. This reflects the fact that the Store Configuration use case is only used when the mappings are being designed or maintained, whereas the Transform Data use case is used every time a transformation is required (whether or not the mapping has changed).

The mapping of abstract to actual parameters for the Transform operation is shown in this table.

|  |  |  |
| --- | --- | --- |
| ***Abstract Parameter*** | ***Type*** | ***System Parameter*** |
| Input Spatial Data Set | Request | soap:Envelope/soap:Body/tns:TransformReque st/ sourceDataset/WFSReference/capabilitiesURL  soap:Envelope/soap:Body/tns:TransformReque st/  sourceDataset/WFSReference/layer  soap:Envelope/soap:Body/tns:TransformReque st/  sourceDataset/WFSReference/maxFeatures |
| Source Model | Request | Derived from source dataset |
| Target Model | Request | soap:Envelope/soap:Body/tns:TransformReque st/  targetDataset/directDownload/schema |
| Model Mapping | Request | soap:Envelope/soap:Body/tns:TransformReque st/  mapping/directDownload |
| Spatial Data Set | Response (logically, although in practice this is an Out parameter passed in the Request) | soap:Envelope/soap:Body/tns:TransformReque st/  targetDataset/directDownload/url |

*Table 5 Mapping of Parameters for the Transform Operation*

In the above table, the Input Spatial Data Set is expressed in the interface as a WFSReference, which is a complex type for which the formal description is given within the WSDL in Appendix A.

Note that the capabilitiesURL element gives the location for retrieving information about the layers and services provided by the WFS. The layer element is a comma-separated string value containing the prefixes and names of the layers included in the source dataset. Also, the maxFeatures with value –1 (minus one) implies no upper limit on the number of source features being transformed. A value in this field greater than or equal to zero implies an upper limit on the same.

The Source Model and Target Model parameters are essential because the mapping itself does not contain sufficient information for the transformation engine to understand the model over which the mapping is applied.

Whereas in the abstract operation, Spatial Data Set is a response parameter, it has been modified in the WSDL to be a request parameter in order to permit the use of WS-Addressing

[[25]](#_bookmark405) headers which support the asynchronous invocation of the Transform operation. Thus, the client specifies the location to which the Service will output the transformed data.

* + 1. **Link Transformation Service**

The INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) lists the Link Transformation Service operation as a mandatory part of the Schema Transformation Network Service, giving the following explanation of its role: “Allows the declaration of availability of a Transformation Service for Transforming Spatial Data Sets through the Member State's Transformation Services while maintaining the Transformation capability at the Public Authority or the Third party location.” The mapping of abstract to actual parameters for the Link Transformation Service operation is as shown in this table.

|  |  |  |
| --- | --- | --- |
| ***Abstract Parameter*** | ***Type*** | ***System Parameter*** |
| Information About | Request | soap:Envelope/soap:Body/ |
| Public Or Third-Party |  | tns:LinkTransformationServiceRequest/request |
| Transformation |  |  |
| Service |  |  |

*Table 6 Mapping of Parameters for the Link Transformation Service Operation*

If the request parameter supplied contains a non-null URL, the service will forward all future requests to the specified delegate (except for future calls to this operation). Conversely, if the request parameter is null, the forwarding is cancelled. Note that, because this service accesses resources using pass-by-reference, to be successful the delegate service must have access to any specified resources.

However, notwithstanding the above possibilities, it is recommended that service linking be done as part of the installation and configuration phase of a service’s deployment, rather than as part of its run-time operation using a web service interface. Various technologies exist for forwarding web service requests from one environment to another. Hence, if (as appears to be the case) the purpose of this operation is to support location transparency and service virtualisation, there is no need for this to be implemented by the service itself. The existing IT infrastructure of the organisations involved will influence the selection of service virtualisation technology and, as such, it would be inappropriate to recommend a particular solution.

**Recommendation: Service linking should be addressed as part of service installation and configuration, rather than be performed using a web service interface.**

* 1. **Query Transformation**

The INSPIRE Network Services Draft Implementing Rules [[5]](#_bookmark388) describe some usage scenarios that require a query expressed in the INSPIRE schema to be translated to run against a source dataset. However, analysis of this requirement has led to a conclusion that the Technical Guidance should not support this functionality.

Query transformation is effectively a process of reverse-engineering the mapping definition. For simple class or attribute renaming, this would be trivial. However, the Schema Transformation Network Service interface must be general, and not constrained to these simple cases. For more complicated mappings that require class splitting, aggregation or spatial joins, the process of reverse-engineering the mapping definition by automated means is - at best - complex and, in some cases, computationally intractable.

Furthermore, there are many practical challenges, both technical and performance-related, to the concept of fully-automated, on-the-fly processes that involve transformation. These issues are compounded by a lack of clear evidence of a business use case. It is not clear who is responsible for providing integrated, query-supporting services with continuous support, nor who gives access to their raw data, nor how it should integrate with other transformation processes (e.g. edge-matching).

A more feasible solution to these problems would be to construct a managed system for transforming an entire dataset (potentially orchestrated with other services such as data quality with metadata, or manual fixup) and then to ask clients to access this cache.

The State Of The Art Analysis [[9]](#_bookmark391) highlighted the general architectural issues in terms of the strengths and weaknesses of the proposed architectures. The focus of this Technical Guidance is on schema transformation definitions and processes rather than wider business case analysis or architectural issues. Hence, this document avoids further detailed analysis and discussion of this matter.

* 1. **Actors**

The actors and their responsibilities associated with the Schema Transformation Network Service are shown in the following table.

|  |  |
| --- | --- |
| ***Actor*** | ***Description*** |
| **Data Expert** | A user who has a detailed knowledge of a source dataset and is capable of working out the mapping required from the source dataset to the INSPIRE schema. This user would typically be a member of an LMO or a third-party agent acting for an LMO, or a team of both. |
| **Client** | A client application or system that accesses the Schema Transformation Network Service on behalf of the end user. This could be an INSPIRE application, an orchestration framework, or a download service that includes an integrated transformation step.  The client could be operated by a private individual, academic institution, government agency, commercial or non-profit organisation.  Also, note that the INSPIRE geoportal is a mandatory client to the Service (see Paragraph 20 of INSPIRE Directive [[1]](#_bookmark384) and also [[60]).](#_bookmark433) |
| **Service Integrator** | A developer who is responsible for creating an INSPIRE application (see the Client actor above). |

*Table 7 Actors' Responsibilities*

These actors express roles rather than user identities. A role may, depending on the requirements, be performed either by a system component or a human actor. It is possible that a person, organisation or system may, in practice, represent more than one actor (e.g. if the service integration and data expertise aspects are handled by the same service integrator).

* 1. **Use Case: Store Configuration**

This section describes the Store Configuration use case.

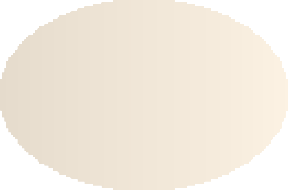


**uc TNS - Store Configuration**

**Store Configuration**

**Data Expert**

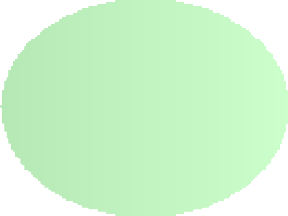
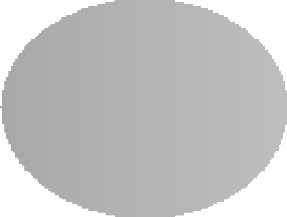
*Figure 1 Store Configuration Use Case*



|  |  |  |
| --- | --- | --- |
| **Brief Description** | | |
| It is recommended that the source and target logical schemas and mapping definition documents be stored so that they are available for use when performing data transformation.  A **Data Expert** may need to update the stored logical schemas or mapping definition in cases where:   * The source logical schema has changed (either because new feature classes and/or attributes are available for transformation or as an incremental improvement and reduction in transformational data loss), * The target data model has changed (e.g. for maintenance or updates of INSPIRE data specifications), * The existing mapping definition does not identify all the data that is available for transformation in the source logical schema (or, possibly, it identifies data that is no longer available in the source logical schema). | | |
| **Basic Flow of Events** | | |
| **Step** | **Actor Interaction** | **System Responsibilities** |
| 1 | The **Data Expert** decides to be INSPIRE compliant in view of the requirements set out in the INSPIRE directive ([[1])](#_bookmark384) and the associated Regulation [[3]](#_bookmark386) as amended by [[4].](#_bookmark387) |  |
| 2 | The **Data Expert** requests that the system store a new version of a configuration item (i.e. a source or target logical schema or mapping definition), using a new and unique record identifier as the reference under which to store it. | System stores the new version of the configuration item. |
| **Pre-Conditions** | | |
| Pre1 | The **Data Expert** has a configuration item that is well-formed and valid. | |
| **Post-Conditions** | | |
| Post1 | The system has a copy of the configuration item, which may be used subsequently during data transformation. | |

*Table 8 Store Configuration*

[Figure 1](#_bookmark322) shows the data flow diagram for Store Configuration.



**dfd Store Configuration**

source schema,

mapping definition

**Store**

**Configuration**

source schema, mapping definition

**XML**

**Repository**

**Mapping Definition Process**

*Figure 2 Data Flow Diagram for “Store Configuration” Use Case*

* 1. **Use Case: Transform Data**

This section describes the Transform Data use case.

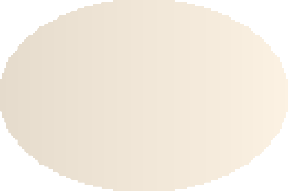


**uc TNS - Transform Data**

**Transform Data**

**Client**

*Figure 3 Transform Data Use Case*



|  |  |  |
| --- | --- | --- |
| **Brief Description** | | |
| This use case describes the main data transformation process. This involves orchestrating the sub- systems that need to work together to fulfil the request, such as retrieving the source dataset, logical schema mappings and schema descriptions, tasking specific software tools with the execution of a transformation and returning the result. | | |
| **Basic Flow of Events** | | |
| The use case starts when the **Client** wishes to transform a dataset into the INSPIRE logical schema as part of a chain of transformations which may include file format transformation, CRS transformation, natural language transformation, edge matching and other processes which aim to produce a harmonised dataset. The user invokes the Schema Transformation Network Service with a valid set of parameters and is informed when the process is complete. | | |
| **Step** | **Actor Interaction** | **System Responsibilities** |
| 1 | **Client** invokes the transform web service operation on the Schema Transformation Network Service. | Syntactically validates the parameters (source and target logical schemas, transformation definition, source data location, target data location).  A single source dataset may not contain all information required for the target schema, and therefore it may be necessary to reference the union of multiple source datasets in the mapping. Conversely, a single source dataset may contain data that is required in multiple target schemas.  The source location information is required when data is being passed by reference, which is the recommended scenario; where data is passed by value, it is not necessary to specify the location. The target location information is necessary in all cases so that the client can know where to obtain the transformed data. |
| 2 |  | Retrieves the source data, performs the transformation and writes out the transformed data. |
| 3 | Processes the call-back message. | Informs the user that the process is complete, returning metadata about the processing and any error messages. |
| **Pre-Conditions** | | |
| Pre1 | The source data must be exposed and accessible as either GML 3.1.1 or GML 3.2.1. | |
| Pre2 | The source logical schema must be exposed in an appropriate format. That is, to say, it is recommended to be described as a valid GML application schema using either GML 3.1.1 or GML 3.2.1. | |
| Pre3 | The target logical schema must be defined and available in the system (this could be accessed as an online resource, e.g. the INSPIRE Registry). This must refer to the current INSPIRE application schema. | |

|  |  |
| --- | --- |
| Pre4 | The types defined in the source logical schema must include the non-voidable attributes required in the target logical schema as per the regulation Implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services (see [[3]](#_bookmark386) as amended by [[4]).](#_bookmark387) |
| Pre5 | Transformation definition must be defined and available in the system. This must be applicable to source logical schema. |
| Pre6 | Resources must be available for storing the transformed data. |
| **Post-Conditions** | |
| Post1 | The transformed dataset is available. All the mappings supplied to the service have been performed successfully without any unexpected data losses. The completeness of the transformed dataset is constrained by the data available in the source datasets and the thoroughness of the mapping definition. |
| Post2 | The transformed dataset is conformant to the INSPIRE application schema. |

*Table 9 Transform Data*

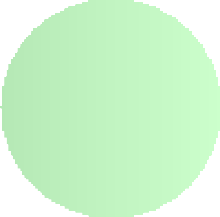
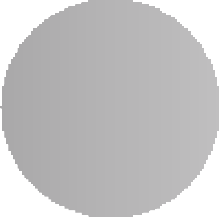
There is no need for the client to perform a GET TRANSFORMATION SERVICE METADATA OPERATION, or equivalent operation. This is because the proposed interface is fully defined using SOAP/WSDL. When clients are generated, standard frameworks (like .NET [[57]](#_bookmark430) and JAXB2.0 [[58])](#_bookmark431) generate client-binding code automatically; this is a once-off activity that is performed at compilation time, and not during day-to-day interaction between the client and service.

The Transform Data operation also covers the functionally of the logical IS TRANSFORMABLE operation. In practice, it is only by considering the source schema, the source data and the target schema that it is possible to determine whether a mapping is possible. The service will only have access to the source data during the transform operation; the IS TRANSFORMABLE and TRANSFORM operations have therefore been combined.

Even though a mapping may be possible logically, it may not be supported by a particular implementation of the Schema Transformation Network Service due to limitations in its supporting technology.

To support efficient creation of the mapping definition, it is expected that any mapping testing that could be performed by consulting the source and target schemas (but not source data), would be performed by the external mapping definition client.

[Figure 4](#_bookmark324) shows the data flow diagram for Transform Data.



**dfd Transform Data**

**XML**

**Repository**

web service message

source/target schemas & mapping

**Transform Data**

source data (GML 3.1.1

or 3.2.1)

transformed data (GML 3.2.1 )

**Source Data Repository**

**Target Data Repository**

**Client Process**

*Figure 4 Data Flow Diagram for "Transform Data" Use Case*

* 1. **Use Case: Gather Technical Information**

This section describes the Gather Technical Information use case.

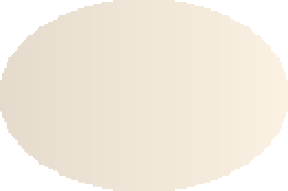


**uc TNS - Gather Technical Information**

**Gather Technical Information**

**Service Integrator**

*Figure 5 Gather Technical Information Use Case*



|  |  |  |
| --- | --- | --- |
| **Brief Description** | | |
| The **Service Integrator** is starting an integration process and needs to gather information about the Schema Transformation Network Service in order to do this. This will support decision making about which service to invoke and with what parameters. This use case maps to the abstract Get Transformation Service Metadata operation defined in the Draft INSPIRE Regulation [4]. | | |
| **Basic Flow of Events** | | |
| * The use case starts when the **Service Integrator** decides that they require metadata on the capabilities of the Schema Transformation Network Service. * The **Service Integrator** queries the system to obtain details of the supported operations. * The **Service Integrator** queries the system to obtain details of the configured schemas and mapping definitions. | | |
| **Step** | **Actor Interaction** | **System Responsibilities** |
| 1 | Requests details of the supported operations | Provides these details in a machine readable format |
| 2 | Requests details of the configured data models and mappings | Provides these details in a machine- readable format. |
| **Pre-Conditions** | | |
| Pre1 | Data models and mappings have been configured | |
| **Post-Conditions** | | |
| Post1 | The **Service Integrator** is aware of:   * Operations supported by the Schema Transformation Network Service * Source and target schema registered with the XML Repository. * Mappings configured in the XML Repository. | |

*Table 10 Gather Technical Information*

Note that it is the service integrator and not the client actor that is charged with performing the Gather Technical Information use case. This is because it is not appropriate for the client to attempt to assemble the required information. The client will not necessarily be in possession either of the logical schema expertise, nor the technical information required to assess the capabilities of the Schema Transformation Network Service. This shows a major difference between the Schema Transformation Network Service and other INSPIRE services (such as the View, Download and Discovery Services). Whilst those services are amenable to automated discovery of their capabilities, transformation deals with a more complex and diverse challenge.

[Figure 6](#_bookmark326) shows the data flow diagram for Gather Technical Information.

**dfd Gather Technical Information**

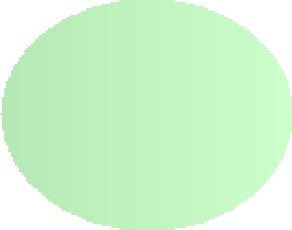
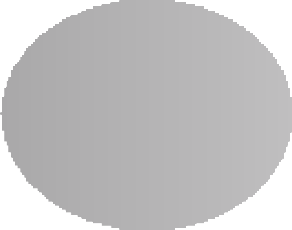
service metadata

**Gather Technical Information**

Metadata includes supported operations, configured schemas and mappings

**Integration Process**

*Figure 6 Data Flow Diagram for "Gather Technical Information" Use Case*



1. **Logical View**

This section describes the significant aspects of a Schema Transformation Network Service, including the detailed interface specifications.

* 1. **Referenced Standards**

This subsection gives an overview of standards used by the Schema Transformation Network Service and details of specific version numbers or references to further information. A prefix is defined for each standard, which will be used in the interface specifications below.

* + - ***SOAP and WSDL***

SOAP [[*24*]](#_bookmark404) is a protocol for exchanging structured information, based on XML. The SOAP versions and technical details should follow the INSPIRE Network Services SOAP Framework technical report [[*7*](#_bookmark389)]. The SOAP framework is well placed to meet the needs of relatively complicated services that have a relatively small user base. The rigorous nature of the interface definition allows significant parts of the client implementations to be automatically generated (in a range of languages). Simple services that have very large user bases can benefit from alternative approaches (like RESTful interfaces), however this does not seem a good fit for the technical complexity and demographic of the INSPIRE community.

* + - ***WS-Addressing***

WS-Addressing [[*25*]](#_bookmark405) is the leading standard to aid the creation of asynchronous methods in SOAP web services*.* It is a well-documented open standard with increasingly effective tools support. Although tools support is not as mature as for foundational technologies like SOAP/WSDL there is no reasonable alternative for asynchronous web service integration.

WS-Addressing provides the mechanism by which the requester is informed of the outcome of the Transform request. A SOAP header is prepended to the Request message which contains the callback location at which the requester will expect the Schema Transformation Network Service to register a callback and indicate the execution status of the asynchronous operation. The Service persists the parameterised data in its internal state during the Transform operation, and the manner in which it stores its state is implementation-dependent (this could be, for example, a queueing-system or relational database). However, once the Transform operation has completed, the requester has been informed and the transformed data has been transferred to the target (either WFS-T or FTP), the Service is free to discard any temporary internal storage. If the Service encounters problems during the transformation, it will inform the requester via the callback and release any temporary internal storage.

The Prototype Report [[62]](#_bookmark435) Section 2.2 describes the version of WS-Addressing that was used during the prototyping exercise and its suitability for the purpose specified.

* + - ***Rule Interchange Format (RIF)***

The W3C Rule Interchange Format (RIF), see [[13],](#_bookmark394) is highly suited to the task of representation of schema mapping definitions as collections of business rules. This document will make a recommendation that it be adopted as the interchange format for mappings (see Section 10.1.3 infra). Of the available RIF dialects, Production Rule Dialect (PRD) [[18](#_bookmark398) is the most suited to the combination of rule conditions and consequent actions. See Appendix C for a more detailed justification for this choice. This is purely an interchange format – it is anticipated that most Schema Transformation Network Service implementers will make use of existing spatial tools rather than redefine their implementation based on RIF. Where this is the case, the Schema Transformation Network Service implementation must provide functionality to translate between RIF and the implementer’s internal format. The Schema Transformation Network Service State of the Art Analysis [[9]](#_bookmark391) identified that there is no commonly-used interchange format for mapping definitions, but most surveyed tools were capable of performing a wide variety of transformations. RIF provides a good, vendor neutral format for interchange of mapping definitions. For further details, refer to:

Section [6.2](#_bookmark349) Schema Mapping Interchange Format. Appendix C Rationale for use of Rule Interchange Format.

Appendix D Worked example showing the compatibility between RIF and GML. Appendix E Common Transformations: use of RIF to define schema mappings.

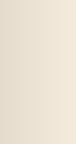
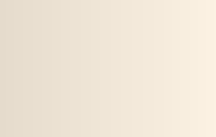
* + - ***Geography Markup Language (GML)***

Schema definitions will be provided to the Schema Transformation Network Service in the format of GML [[26]](#_bookmark406) application schemas.

Further details of the schema description and choice of standards are provided in Section [6.1.](#_bookmark348)

* 1. **Component Diagram**

Components that are outside the scope of the Schema Transformation Network Service (but required for successful operation of a the service) are indicated with the preface (External Component). For example, the XML repository component provides storage and versioning of configuration data (e.g. models and mappings); it could be implemented by more than one physical service, such as the online INSPIRE Registry [[27]](#_bookmark407) which could, in future, include INSPIRE schemas.



**cmp Component Model**

**«External» Backoffice Tools**

**«External» Schema Mapping Designer**

**Schema Transformation Network Service**

**«External» Service Registry**

**«External» Target Datastore**

Provides storage of the

transformed data, in INSPIRE format

Provides access to the source

data that needs to be transformed.

**«External» Source Datastore**

Provides lookups of specific addresses of

required services, such as the source and target datastore instances.

Performs the schema

transformation operation based on schema descriptions and mapping descriptions stored in the repository. Implements a standard web service interface to allow interoperability.

Provides storage and versioning

of configuration data required by the transformation service, specifically model descriptions and mapping descriptions

**«External» ClientApplication**

Note that Client Application,

Supporting Systems and Backoffice Tools are required but are out of scope of this Technical Guidance hence not discussed beyond showing their involvement in use case realizations

**«External» Supporting Systems**

*Figure 7 Component Model*

In the above diagram, note that the source and target logical schemas and mapping definition do not need to be available in the same external repository: it is merely a logical convenience to refer to them as in a single repository; they could, in practice, be in different repositories.

See Section [5.3.1.3](#_bookmark331) for more information.

Note that the Source Datastore must expose its data as GML 3.1.1 or 3.2.1 (see precondition 1 to the Transform Data use case).

The following sub-sections provide guidance for the implementation of each of these components, including detailed interface specifications where appropriate. This is a logical overview of the service components and therefore may not directly reflect implementation components; in particular, implementations may choose to package several components within a single application.

* 1. **Transformation Service**

This section describes the realization of the Transformation Service component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **Transformation Service** |
| **Responsibilities** | * Creating data that is conformant with the schema described in the INSPIRE data specifications based on source data that is provided in a different schema. * Provide a standard interface for transformations that may be used by other INSPIRE applications, including orchestration systems. Note that the INSPIRE geoportal (see Paragraph 20 of INSPIRE Directive [[1]](#_bookmark384) and also [[60])](#_bookmark433) is a mandatory client to the Schema Transformation Network Service. |
| **Collaborations** | * The *Source Datastore* is used to obtain source data, which must be exposed as either GML 3.1.1 or 3.2.1. * The *Target Datastore* is used to store transformed data. * The *Repository* is used to store definitions of the source and target schema and also the definition of the mapping between these logical schemas. |
| **Rationale** | * This is the main service required by a Schema Transformation Network Service. |

*Table 11 Transformation Service Component*

The remainder of this section gives an overview of technical principles used within the service, and details of standards referenced or used by the service. A detailed description of all the operations within the service is located in Section [5.12](#_bookmark341).

Further details are available in these sections of the document:

* + - Section [6](#_bookmark347) Data View: How to use the service and develop its configuration.
    - Section [6.1](#_bookmark348) Schema Description Language.
    - Appendix D: Compatibility of RIF and GML.
    1. **Technical Principles**

The following technical principles underpin the implementation of the Schema Transformation Network Service as described in this technical guidance.

* + - 1. *Web Service Technology*

The Schema Transformation Network Service should be implemented as a SOAP web service with WSDL definitions and be compliant with WS-I Basic Profile [[28](#_bookmark408)]. The use of these standard web service technologies ensures that we meet the key architectural goal of using open interfaces and reduces the difficulties involved in meeting the key architectural goal of supporting business processes. These standards are supported by most development toolkits (including Java and .net) and most modern orchestration frameworks.

SOAP/WSDL is the leading industry standard for web service communication. The only alternative in common usage is a RESTful interface. RESTful interfaces have proven successful where there are a small number of services and a very large client base (see for example Google’s AJAX Search API interfaces [[66]](#_bookmark439)). SOAP/WSDL based interfaces have proven to be very successful when integrating services with a small to medium client base. REST does not mandate any particular format for how clients should handle messages and errors, which makes it more difficult to integrate clients than for SOAP.

**Recommendation: The interface should be specified formally using SOAP/WSDL.**

* + - 1. *Parameter Passing*

Both feature datasets and configuration data used by the Schema Transformation Network Service can be very large. In order to enable efficient resource usage, these will all be passed by reference to the service. This will:

* + - * + Reduce the overheads of control messages that are sent to the service (which will frequently be persisted when the service is used in an orchestrated manner).
        + Enable the service to access data in the most appropriate manner for the underlying transformation engine. This may include delaying the load of the source data; querying the source data in a manner that optimises access patterns; outputting transformed data before all source data has been read.
        + Enable greater control over the versioning of configuration data. This will ensure that the configuration can be well maintained and will also enable the transformation engine to perform pre-process optimisations for specific transformation definitions in advance of performing the transformation.
      1. *Feature Data Access*

Source data may be accessed through a download service (see [[1](#_bookmark393)2]) or any service with one of the interfaces listed below:

* + - * + Pre-defined dataset access, by HTTP GET or FTP from a simple URL.
        + Direct data access using a WFS interface, with a query specified using filter encoding. Since this is a parameter to the Schema Transformation Network Service (see Input Spatial Data Set parameter to the Transform operation in Section 4.1.3 above), it is up to the client to define the filter required. Where there is insufficient source attribution for queries to differentiate the dataset, multiple WFS endpoints can be used to separate the data in datasets.

The Schema Transformation Network Service will use the related download service standards for these types. If a particular implementation of INSPIRE network services cannot use HTTP, FTP or WFS directly, it can still use the proposed interface by performing the following steps:

1. Using the available resources to download the dataset to local environment,
2. Convert the dataset into a GML 3.1.1 or 3.2.1 document with application schema.
3. Upload GML to a available HTTP or FTP site
4. Invoke Schema Transformation Network Service, passing the URL of the GML document.
   * + 1. *Configuration Data Access*

Configuration data will be stored in an XML repository and be referenced by direct download URL. This should ideally be stored in a managed system, such as an enterprise metadata repository (see also comments at the top of this section regarding the INSPIRE Registry [[27]).](#_bookmark407) There are no commonly adopted standards for such systems, although ebXML Registry and Repository [[14]](#_bookmark395) and UDDI [[15]](#_bookmark396) are often quoted. Most Service-Oriented Architecture (SOA [[29])](#_bookmark409) frameworks appear to write their own systems with only cursory compliance with standards. Services currently available tend to provide direct HTTP access to resources, therefore a simple URL will be used within this interface to avoid tying the system to any specific integration platform.

For details of how the use of the XML Repository was verified during the prototype, please refer to Prototype Report [[62]](#_bookmark435) Section 2.2.1.

* + - 1. *Synchronicity*

The main ‘transform’ operation may take a long time to complete, particularly with large data sets or complex mappings. In order to avoid transport layer timeouts in both the server and client implementations, this operation will return asynchronously. WS-Addressing provides the means by with the requester will be informed when the transformation is complete.

All other operations are expected to complete quickly and will therefore be synchronous.

* 1. **(External Component) Schema Mapping Designer**

This section describes the realization of the Schema Mapping Designer component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **Schema Mapping Designer** |
| **Responsibilities** | * Enabling the user to define a mapping from a source schema to the target schema. Persisting this mapping in RIF format. * Validating that the mapping covers all requested elements of the source and target schema. |
| **Collaborations** | * The *Transformation Service* will perform transformations based on mappings created by the schema mapping designer. * The *XML Repository* may provide schema definitions to be used by the schema mapping designer (although these can also be provided directly by the Source Datastore if it is implemented using a WFS). |
| **Rationale** | * In order to perform transformations, a definition of the required mapping from source to target schema must be provided by the user in RIF format. * While the RIF format is extremely flexible, in enabling all possible transformations, it is structured in a rigorous logical manner which does not map directly onto specific types of transformation. A user interface is required to ensure that the user can use their data modelling expertise to construct conformant mapping definitions. |

*Table 12 Schema Mapping Designer Component*

This needs to provide an interface that is easily accessible by the target users, who will be performing the role of Data Expert, as described in the Use Case Model (Section [4,](#_bookmark316) Use Case View), whilst also permitting access to the full power of the Schema Transformation Network Service. The Schema Mapping Designer could be implemented either as a dedicated RIF mapping definition authoring tool, or as an export functionality in an existing tool. The responsibility for implementing the RIF mapping definition rests, in principle with clients.

However, the benefits to tool vendors from undertaking an extension of their software are not difficult to see: a mapping design tool that provides RIF export functionality will be an essential component in the INSPIRE toolkit used by LMOs.

For further details of common transformations that the schema mapping designer should be able to handle, see Appendix E.

* 1. **(External Component) XML Repository**

This section describes the realization of the XML Repository component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **XML Repository** |
| **Responsibilities** | * Provides mechanism for managing schema descriptions and schema mapping descriptions. * Provides access to these by *Transformation Service* component. |
| **Collaborations** | * Used by the *Schema Mapping Designer* and *Transformation Service* components*.* |
| **Rationale** | The use of a standard XML Repository (implementing, typically, the OASIS ebXML standard, see [[33]](#_bookmark411)) specification for managing the configuration documents relating to transformation services is an alternative to always passing the configuration items directly to the services. It has several advantages:   * Configuration is passed by reference, resulting in lower traffic and in many cases better performance. * Enables the *Transformation Service* component to cache the results of transformation specific optimisations, to improve performance of repeated transformations. This is possible due to the unique identifiers for each version of a configuration item. * Enabled efficient version control for registered objects. * Promotes unified understanding of registered objects, since they are accessible from a single location. * Enables and encourages collaborative development. * XML Repository technology offers enhanced storage, classification, querying and data quality tools above and beyond other document storage formats. * Implementations of the XML Repository standard are available under open source licences (for example, freebXML [[61]).](#_bookmark434) |

*Table 13 XML Repository Component*

It is currently anticipated that the Schema Transformation Network Service should work with any xml repository that is capable of providing access to registered documents through HTTP GET operations.

**Note:** Compatibility with XML repository standards (such as ebXML [[33])](#_bookmark411) was investigated during prototyping. For more details, see the Prototype Report [[62]](#_bookmark435) Section 2.2.1 and Section

[5.3.1.4](#_bookmark332) of this document.

* 1. **(External Component) Source Datastore**

This section describes the realization of the Source Datastore component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **<<External>> Source Datastore** |
| **Responsibilities** | * Provides access to data that is to be transformed in a standard format. |
| **Collaborations** | * Used by the *Transformation Service* component to access data. |
| **Rationale** | * Source data needs to be made accessible in a web compatible manner (this is recommended to be GML 3.1.1 or 3.2.1). * The source data is likely to be very large, so it is best handled like this rather than directly in the SOAP message. * The scope of the Schema Transformation Network Service is to transform the logical schema, rather than other aspects of transformation such as coordinate reference system or data format. By providing all input data in a standard format, the service is simplified significantly and this ensures that all source data is web accessible. * There are a number of open source and commercial WFS [[34]](#_bookmark412) implementations that could be used as source datastores. Many of these support automatic file format transformation, for example presenting shape files in GML format. The tool used for the Schema Transformation Network Service prototype is Geoserver [[59].](#_bookmark432) * As an alternative, the source datastore could be implemented using a FTP or HTTP site. In this case no query functionality would be supported. * Where WFS is used, queries can be used to divide the data into discrete datasets for transformation. Where there is insufficient source attribution for queries to differentiate the dataset(s), multiple WFS endpoints or layers can be used to separate the data appropriately. |

*Table 14 Source Datastore Component*

* 1. **(External Component) Target Datastore**

This section describes the realization of the Target Datastore component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **<<External>> Target Datastore** |
| **Responsibilities** | * Providing an interface that can be used store the transformed spatial dataset. |
| **Collaborations** | * The *Transformation Service* component will write data to this component. |
| **Rationale** | * The transformed data could be quite large, so is not generally suitable to be returned directly from the service, particularly when it is used in an orchestrated environment. * WFS-T [[35]](#_bookmark413) provides a standard mechanism for creating GML features in a database. It is currently the only open standards’ based technology that supports transactional creation of features and exchange of GML over the network. This is likely to be compatible with many download services which are likely to be the next step in the use of the data. * As an bulk-oriented alternative, in conformity with INSPIRE requirements for the mandatory availability of bulk downloads, the target datastore can be implemented using an FTP site. In this case, the transformed dataset will be written to the supplied URL as a single GML document. * The output format will always be one of the INSPIRE schemas, so the Schema Transformation Network Service only needs to support the generation of the range of geometry types used by these schemas. It is a requirement of a Schema Transformation Network Service to document any geometry encodings that it does not support. If there is a difference between those geometry encodings that are supported for reading and writing, separate lists of these may be provided. |

*Table 15 Target Datastore Component*

* 1. **(External Component) Service Registry**

This section describes the realization of the Service Registry component: its responsibilities, collaborations with other components and rationale for its existence.

|  |  |
| --- | --- |
| **Component** | **<<External>> Service Registry** |
| **Responsibilities** | * Provides a mapping to physical implementations of each service. |
| **Collaborations** | * The *Transformation Service* component uses this to find specific machines hosting the source and target datastores and XML Repository. |
| **Rationale** | * This is required in order to meet the non-functional requirements of the service. * The Schema Transformation Network Service needs accurate and up to date information about specific endpoints for services with which it interacts. * Note, it is possible to deploy the Service without this component, provided that all Uniform Resource Locators (URL) supplied resolve directly to the required resource for the transformation such that no additional discovery steps are required. |

*Table 16 Service Registry Component*

The availability of the Service Registry component will depend upon wider technical decisions taken in the context of INSPIRE, as it is a resource the use of which should not be limited just to the Schema Transformation Network Service. As mentioned in the above rationale, it is essentially possible to deploy and utilise the Service without this component, but its absence means that no discovery facilities exist to resolve indirect references to resources contained within the source and target datastores and XML Repository.

* 1. **(External Component) Client Application**

The Schema Transformation Network Service is exposed as a web service and, as such, for clients to engage with the Service there will be a need for some form of client application.

However, this is out of scope of this Technical Guidance (note Section [2.2](#_bookmark304) above) and hence will not be discussed further, except insofar as it is included in the use case realizations shown in Section [5.13](#_bookmark342). It is sufficient to say that this is standard web service technology and it is not proposed to restrict the options available to implementers, which are many and varied.

* 1. **(External Component) Supporting Systems**

The Schema Transformation Network Service will depend on supporting systems which may be exclusively used by the Service or shared with other services, depending on factors that are out of scope of this Technical Guidance. For example, these could be relational databases, application servers or other state persistence or runtime environments. In order to fulfil the Gather Technical Information use case (see the use case realization in

Section [5.13.](#_bookmark345)3), reference to these systems is required as it helps to explain the use case, which is not fulfilled by an automated process but by administrative intervention by the Service Integrator.

* 1. **(External Component) Backoffice Tools**

In order to query the supporting systems (see Section [5.10),](#_bookmark339) the Service Integrator needs to use certain back-office tools, the details of which are out of scope of this Technical Guidance. These could be, for example, generic relational database querying tools or web service monitoring tools. Their mention helps to explain the Gather Technical Information use case (see the use case realization in Section [5.13.3).](#_bookmark345)

* 1. **Web Service Operations**

The following sections detail the operations of the Schema Transformation Network Service web service definition. Each section gives an overview of the operation, technical details of its invocation, input and output parameters and also exception conditions.

* + 1. WSDL Operation

The WSDL for the Schema Transformation Network Service will provide the implementation of the Get Transformation Service Metadata operation, as defined in the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4].](#_bookmark387) This is part of the Gather Technical Information use case.

This provides all necessary information about the service and describes the service capabilities, including the supported transformation category, supported transformations, accepted input data types, supported logical schema definition and mapping languages.

*This operation is required by the INSPIRE Regulation (EC) No. 976/2009* [*[3]*](#_bookmark386) *as amended by*

[*[4]*](#_bookmark387) *.*

* + - 1. *Technical Detail*

|  |  |
| --- | --- |
| **Protocol** | HTTP GET (WSDL request) |
| **Synchronisation** | Synchronous |

*Table 17 WSDL Operation Protocol and Synchronisation*

* + - 1. *Parameters*

The full WSDL will be returned as detailed in Appendix A. This includes full WSDL documentation, covering the following aspects of the service as required by the Regulation [[3]](#_bookmark386) as amended by [[4].](#_bookmark387)

|  |  |
| --- | --- |
| ***Name*** | ***Role*** |
| ServiceMetadata | The Transformation Service Metadata parameter shall at least contain the INSPIRE metadata elements of the Schema Transformation Network Service. |
| OperationsMetadata | The Operations Metadata parameter provides metadata about the operations implemented by the Schema Transformation Network Service.  It shall describe each operation, including as a minimum a description of the data exchanged and the network address, and shall list the following:  The transformation categories accepted by the Transform operation;  The encoding for the input Spatial Data Set accepted by the Transform operation;  The Logical Schema languages accepted by the Transform operation; this is expressed as a list one or more URLs, each pointing to a GML profile.  The Schema Mapping languages accepted by the Transform operation (Fixed value, RIF).  The encoding for the output Spatial Data Set generated by the Transform operation; this is expressed as a list of one or more of URLs, each pointing to a GML profile.  It is the responsibility of the caller to ensure that the source and target logical schemas provided to the service use a subset of one of the nominated source and target GML profiles. |
| ResponseLanguage | the natural language used in the Get Transformation Service Metadata response |
| SupportedLanguages | A list of the natural languages supported by the Schema Transformation Network Service. |

*Table 18 WSDL Operation Parameters*

* + 1. Transform Operation

This will asynchronously perform the transformation of the source data into the INSPIRE logical schema, based on the supplied transformation specification. Internally, this may include the following steps:

* Obtain logical schema descriptions and mapping descriptions.
* Validate these configuration items.
* Translate and optimise transformation definition for internal engine.
* Obtain source data, transform data and write back data.
* Respond to the client asynchronously.

In addition to the functional aspects of this operation, it must also conform to a number of non- functional aspects, such as scalability and performance. See Section [7](#_bookmark353) System Qualitiesfor further details of these.

*This operation is required by the INSPIRE Regulation (EC) No. 976/2009* [*[3]*](#_bookmark386) *as amended by* [*[4].*](#_bookmark387)

* + - 1. *Technical Detail*

|  |  |
| --- | --- |
| **Protocol** | SOAP |
| **Synchronisation** | Asynchronous |

*Table 19 Transform Operation Protocol and Synchronisation*

* + - 1. *Parameters*

All parameters are mandatory. For full details of the valid range of parameters, see the WSDL document in Appendix A.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Mode*** | ***Name*** | ***Role*** | ***Regulation Equivalent*** | ***Valid Range*** |
| In | dataset | Indicates one or more source datasets which are to be transformed. | *Input Spatial Data Set*. This has been implemented as a pass-by-reference, rather than a pass by value. See Section [4.5](#_bookmark323) for justification. | Either a URL, or a download service and filter specification, both of which are defined in the download service technical guidance. |
| Mapping | The Schema Mapping parameter shall specify the mapping from the Source Schema to the Target Schema.  This is by reference to an XML repository. The logical schema must be contained in the repository in the RIF-PRD [[18]](#_bookmark398) format. It will import the GML application schema of the source and target schemas. | *Model Mapping*, *Source Model* and *Target Model*. The model mapping contain references to the source and target models | xsd:anyURI  This must be a reference to a logical schema definition stored in an XML repository. |
| TargetDataSet | A location in which the transformed data should be stored. The caller is responsible for creating, configuring (and deleting) this dataset. | *Transformation Response.* Using pass by reference allows the client to maintain responsibility for the generated data. See Sections [4.4](#_bookmark321)  and [4.5](#_bookmark323) for justification. | A reference to a transactional WFS or FTP URL. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Out | TransformedSo urceObjects | The number of source objects (features) that were investigated and potentially transformed. | These parameters have no equivalent in the Regulation   1. as amended by 2. although experience with rule-based systems suggests they will be valuable. | xsd:integer |
| TransformedTa rgetObjects | The number of target objects (features) that were created. | xsd:integer |
| ObjectErrors | Details of any errors that occurred during processing specific objects, or non- conformances of the object with the data specifications. Each object error will be reported separately. |  |
| SystemErrors | Details of any system errors, such as failure to connect to the target datastore. |  |

*Table 20 Transform Operation Parameters*

Since the communication is asynchronous, WS-Addressing [[25]](#_bookmark405) parameters are used to facilitate asynchronous response. Several of these parameters may also require credentials to be passed in order to access external services. Further information about this is provided in Section [7.6.](#_bookmark359)

* + - 1. *Exception conditions*

|  |  |
| --- | --- |
| ***Exception Message*** | ***Condition(s)*** |
| UnsupportedTransformation | The transformation definition is not supported by this Schema Transformation Network Service. |
| The transformation requires a built-in operation that is not available in this Schema Transformation Network Service. |
| ConfigurationError | Unable to access the XML repository. |
| Unsupported data format in the XML repository. |
| DataReadError | Unable to access the source repository, or the source repository does not contain the requested data. |
| DataWriteError | Unable to write data to the target repository. |

*Table 21 Transform Operation Exception Conditions*

* + 1. Link Transformation Service Operation

Enables the declaration of availability of a Schema Transformation Network Service for transforming spatial datasets through the member state's Transformation Services while maintaining the transformation capability at the public authority or the third-party location.

See Section [4.1.4](#_bookmark318) for further information about this operation.

* + - 1. *Technical Detail*

|  |  |
| --- | --- |
| **Protocol** | SOAP |
| **Synchronisation** | Synchronous |

*Table 22 Link Transformation Service Protocol and Synchronisation*

* + - 1. *Parameters*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Mode*** | ***Name*** | ***Role*** | ***Valid Range*** |
| In | request | The Link Transformation Service request parameter shall provide all information about the Public Authority’s or Third Party’s Transformation Service in conformity with this Regulation, enabling the use of the Public Authority’s or Third Party’s Transformation Service by the Member State's Transformation Service. | xsd:string |

*Table 23 Link Transformation Service Parameters*

* + - 1. *Exception conditions*

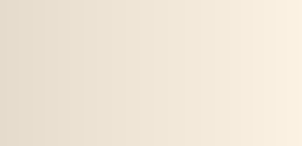
There are no special exception conditions prescribed for the Linked Transformation Service operation.

* 1. **Use-Case Realizations**

This section illustrates how the components work together. Text Formatting is used to highlight the **actors** and ***components*** referenced in each section.

* + 1. **Store Configuration**

The following UML communication diagram summarises the key steps required to realize the Store Configuration use case.



**sd Store Configuration**

**«External» Service**

**Registry**

1: storeMappingDefinition(RIF)

2: storeSourceSchema(XSD)

**«External» ClientApplication**

**«External» XML Repository**

3: storeTargetSchema(XSD)

Calls to the XML Repository

and/or the Source and Target Datastores may require a

disovery process which would use the Service Registry

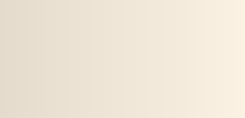
component, hence it is shown in this diagram but messages are not shown for reasons of clarity

*Figure 8 Store Configuration Communication Diagram*

In [Figure 8,](#_bookmark343) the ***Client Application*** is responsible for sending RIF Mapping Definition and source and target logical schema updates to the ***XML Repository***, which may or may not require use of the ***Service Registry***, depending on the system architecture (see rationale in Section [5.8)](#_bookmark337). Section [4.4](#_bookmark321) includes a data flow diagram to help explain this process.

* + 1. **Transform Data**

The following UML communication diagram summarises the key steps required to realize the Transform Data use case.



**sd Transform Data**

Calls to the XML Repository

and/or the Source and Target Datastores may require a

disovery process which would use the Service Registry

component, hence it is shown in this diagram but messages are not shown for reasons of clarity

**«External» Service Registry**

2.1: getMappingDefinition(TransformRef) :RIF 2.2: getSourceSchema(TransformRef) :XSD 2.3: getTargetSchema(TransformRef) :XSD

2: transformData()

**«External» ClientApplication**

**:Schema Transformation Network Service**

2.4: getSourceDataset() :GML

**«External» Source**

**Datastore**

1: prepareDatastore()

2.5: writeOutputGml(GML)

**«External» Target Datastore**

**«External» XML Repository**

*Figure 9 Transform Data Communication Diagram*

In [Figure 9,](#_bookmark344) in order to perform a transformation, the ***Client Application*** first prepares a ***Target Datastore*** to accept the transformed data. This should be pre-configured with the INSPIRE GML application schema.

The ***Schema Transformation Network Service*** is then called to perform the transformation. It loads the source and target logical schemas and schema transformation definitions from ***the XML Repository***. Source data is loaded from the ***Source Datastore***, transformed and written out to the ***Target Datastore***.

The transformation process involves interpretation of the schema transformation definition document from the neutral interchange format into a format consumable by the chosen transformation engine.

The target data is output to the location corresponding to the abstract Spatial Data Set input parameter to the Transform operation.

Section [4.5](#_bookmark323) includes a data flow diagram to help explain this process.

* + 1. **Gather Technical Information**

The following UML communication diagram summarises the key steps required to realize the Gather Technical Information use case.

**sd Gather Technical Information**

1: wsdl()

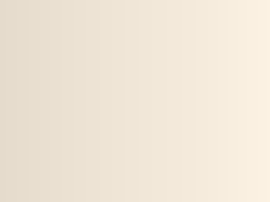
2: queryConfiguration() :CurrentConfiguration

**«External» Supporting Systems**

**«External» Backoffice Tools**

**:Schema Transformation Network Service**

*Figure 10 Gather Technical Information Communication Diagram*



In [Figure 10,](#_bookmark346) the ***Service Integrator*** actor is responsible, with the help of the external ***Backoffice Tools*** component, for querying the state of the Schema Transformation Network Service, and its supporting systems, in order to establish its capabilities. In order to do this, the ***Service Integrator*** will make use of the Service’s wsdl() operation as well as other features in the supporting systems which are out of scope of this Technical Guidance, but are referred to abstractly as the queryConfiguration() operation. Section [4.6](#_bookmark325) includes a data flow diagram to help explain this process.

1. **Data View**

This section contains further detail regarding the data involved in the system, specifically the schema description and schema mapping configuration items that are used by the Schema Transformation Network Service.

* 1. **Rationale for Choice of Schema Description Language**

The Schema Transformation Network Service requires a description of the source logical schema in order to aid the user in the construction of a schema mapping, validate the mapping and optimise the transformation process. This only needs to contain the basic structural aspects of the schema, for example:

* + - Class definitions
    - Datatype property definitions
    - Association property definitions
    - Property cardinalities
    - Identification of feature classes
    - Class inheritance hierarchy.

For a full description of the levels of transformation which may be encountered by the Schema Transformation Network Service, see the State of the Art Analysis [[9],](#_bookmark391) Appendix B.

A key requirement for a schema description language identified by the State Of The Art Analysis [[9]](#_bookmark391) is interoperability with the mapping interchange format. Given that this document recommends use of RIF [[18]](#_bookmark398) for expressing mapping definitions, this essentially means that the schema description language must be either RDF Schema [[36],](#_bookmark414) OWL [[37]](#_bookmark415) or XML Schema [[38].](#_bookmark416) As the schema description language is an interchange format, it is important that it is both sufficient for the service and practically usable by service clients, typically by conversion from an existing schema description. An example transformation document is given in Appendix D to this document to demonstrate the compatibility of GML [[26]](#_bookmark406) with RIF.

XML Schema is most closely aligned to the needs of the Schema Transformation Network Service, since it is designed for the strict definition of concrete datatypes. It has good support for common data modelling techniques such as structured types containing inner-typed properties and cardinalities, which are not naturally part of RDF Schema or OWL (although can be emulated).

Although UML can be used to express a range of modelling abstractions (including physical models) it cannot be used to express the actual data content. This means that if UML where used as the schema description language, the service would have to perform an internal translation of the UML into an appropriate concrete physical model of the datasets (like XSD). Although this process is tractable, and there are open sources tools that can perform it, this extra level of conversion places unnecessary processing overheads on the service and introduces significant extra development complexity with no substantial benefit. It is also worth noting that even though UML is well standardised, the UML interchange format XMI is used in incompatible ways by tool vendors.

Since the requirement is to support spatial systems and have a method of identifying feature types from complex property types, GML provides useful semantics and common types on top of XML Schema. Therefore, GML should be used as the schema interchange format for the Schema Transformation Network Service.

Where source datasets are initially only available in SHAPE or MAPinfo TAB files, these need to been converted into GML (with appropriate application schema). There are a range of commercial and open source tools that can perform this mapping automatically. As a vendor neutral format, GML is well positioned as an interchange format, and it is likely that tool support will improve with time. Once converted to GML, the datasets can either be provided to the system using a WFS service, or directly using the URL upload. Where data is stored in a live database, access can be provided using a WFS server (again there are several open source and commercial implementations of the WFS interface).

There are some potential issues with GML that need to be considered in the context of the Schema Transformation Network Service:

* GML does not currently support multiple inheritance. This is used in some complex data models, but the majority of source data models investigated so far do not support multiple inheritance. In cases where multiple inheritance is needed with GML serialisation, standard tools will ‘copy down’ attributes from one parent class to base classes. This system could easily be extended to add further application-specific information regarding the logical schema that is being implemented (in a similar way to the additional information that is supplied with xlinks, see [[64]](#_bookmark437)). Future versions of XML Schema will add native support for multiple inheritance.
* The structure of the current XSD encoding of GML is quite verbose for complex properties (requiring separate XML elements for property names and property values). This will impact the RIF mapping definition in terms of additional verbosity, but will not affect usability. Since most users will interact with the mapping definition through some form of user interface, this is not expected to be a problem.
  1. **Schema Mapping Interchange Format**

This section describes the format chosen to encode schema mapping definitions and how it is recommended to apply it to the task of INSPIRE schema transformation.

* + 1. **Language Features**

A detailed rationale for the selection of Rule Interchange Format (RIF) as a mapping definition language, and an outline of the main characteristics of the language, is given in Appendix C to this document. In addition, Appendix E to this document details numerous common transformation patterns and how they can be expressed using RIF. In the meantime, this section just gives a general overview of the expressive capabilities of the language as related to the INSPIRE schema transformation task.

* + 1. **RIF Normative and Presentation Syntaxes**

The W3C RIF Specification [[18]](#_bookmark398) describes two syntaxes for RIF:

* + - 1. the ***normative*** syntax is XML-based and designed for machine-readability;
      2. there is also a ***presentation*** syntax which is not intended to be machine-readable; it is used to present RIF concepts for discussion.
    1. **Spatial Extensions**

RIF provides support for flexible extension to include new features. The RIF language can be extended so that it would be possible to write a language for describing spatial rules and actions based on RIF (although this is outside the scope of INSPIRE requirements and it is difficult to see where it would be appropriate, given that RIF is design for exchange of business rules rather than for design of complex algorithms) . It is also possible to plug in components written in other languages (such as XML Schema) and to import datatypes defined using XML Schema, OWL and RDF (see [[21]](#_bookmark400)).

The most likely approach to integrating spatial functions and predicates to meet INSPIRE requirements would be by defining a library of placeholder spatial functions and predicates, that could be translated into an end-use language implementation as required. Since RIF is not envisaged itself to be used as an end-use language, there is only a need to define the operation signatures and parameter datatypes within such a spatial library. Section [6.2.4](#_bookmark351) contains a specific recommendation for this.

* + - 1. *RIF-Geometry dialect*

The RIF Overview [38] states:

*… it should be possible for motivated experts to define a new RIF dialect as a syntactic extension to an existing RIF dialect, with new elements corresponding to desired additional functionality. These new RIF dialects would be non-standard when defined, but might eventually become standards.*

It is possible, for example, to define a geometric dialect of RIF, called, naturally, RIF- Geometry. The route for definition of this new dialect has been described by RIF-FLD (Framework for Logic Dialects, see [[17])](#_bookmark397) and demonstrated by RIF-DTB (DataTypes and Built- ins, see [[19])](#_bookmark399) which was built using RIF-FLD. Such a spatial dialect could contain the signatures and datatypes required to express concepts such as those described in the OGC Simple Features Interface Standard (SFS) [[20],](#_bookmark401) including:

* + - * + Zero, one, two and three-dimensional point, line and polygon geometries.
        + Spatial attributes: isEmpty(), boundary(), isSimple, 3D(), etc.
        + Spatial queries: area, equals, touches, overlaps, disjoint, intersects, crosses, within, contains, beyond, etc.
        + Spatial analysis: union, intersection, within-distance, min-bounding-box, convex-hull, count-vertices, linear-reference, max-height, centre-point, is-closed, covers, covered- by, etc.
        + Generalisation and conflation of geometries.

RIF-FLD (see [[17])](#_bookmark397) defines several types of extension points: symbols, connectives, quantifiers, aggregate functions, and terms. These could be built on to implement new language elements that align precisely with geometric concepts.

* + - 1. *Black-box approach*

An alternative way to include spatial functions in RIF, is the “black box” approach. An XML schema is written externally and imported as a specific namespace into a RIF document. The concepts defined in the schema can be referred to in the rules, without there being any requirement for an implementation. This is a more lightweight route.

The strengths and weaknesses of each extensibility approach are as follows:

|  |  |
| --- | --- |
| ***New dialect specialising RIF-FLD*** | ***Black-box XML schema import*** |
| ***Strengths*** | ***Strengths*** |
| Precise logical syntax and semantics | Quick and easy to write the schema |
| Easier to communicate and standardise | Enables implementation in any language |
|  | Possible highly performant implementations |
| ***Weaknesses*** | ***Weaknesses*** |
| Could be intellectually challenging | Less mathematical rigour in definition |

|  |  |
| --- | --- |
| Could perform poorly in a rules engine |  |

*Table 24 Comparison of Methods of Including Spatial Functions in RIF*

A generic set of spatial functions and predicates for INSPIRE style transformations was developed during the prototyping phase to enable interoperability with common spatial operations and this forms the basis of the recommended approach for the Schema Transformation Network Service. See the following Section [6.2.4](#_bookmark351) for a key recommendation in this respect. Appendix F to this document also contains additional information about this.

* + 1. **Spatial Functions and Predicates for INSPIRE Transformations within RIF-PRD**

This section describes the approach that we recommend should be used for the encoding of references to spatial operations within normative-syntax RIF-PRD documents. This applies to the expression of transformations upon data instances such that they involve operations on geometric attributes. Since there is no existing standard for such RIF expressions, it is proposed that we take the OGC Simple Feature Access Specification version 1.2 as the basis for defining a standardised approached to use of class and method name IRIs, since this is the recommended standard for geometric data types and definitions referred to in the INSPIRE data specifications (see e.g. Requirement 7 of the INSPIRE Data Specification Hydrography, [[68]).](#_bookmark441)

The Extended Backus-Naur Form (EBNF, see [[67]](#_bookmark440)) is a well-known meta-syntax for defining context-free grammars and is used in many computing contexts. For the TNS Technical Guidance, the EBNF production for <iri> will be:

<iri> ::=ٰ<http://www.opengeospatial.org/standards/sfa>ٰ

ٰ/ٰ <interface-name> [ٰ#ٰ <method-name> ]

This definition depends on certain non-terminals defined elsewhere:

interface-name : interface name.

method-name : method name.

The interface name will be that of the interface type for any given geometry, as this ensures that conflict is avoided when multiple classes implement the same method.

The list of supported operations for the Schema Transformation Network Service prototype is given in Appendix F to this document. This provides an illustration of the approach proposed in this section.

**Recommendation: when referring to spatial functions and predicates within a RIF document, use the OGC Simple Feature Access Specification version**

**1.2 as the basis for identifying and naming function and predicate placeholders.**

* + 1. **RIF Usage Guidelines**

RIF is intended to be used by mapping designer tool authors such that the design user interface is capable of generating semantically and syntactically valid RIF documents at the conclusion of the mapping definition process. This section and Appendix E together describe ways RIF can be used to capture mapping conditions and transformation actions, and explore the expressiveness inherent in the language that makes it suitable for this purpose.

We *recommend* that RIF be used in these ways:

* To define production rules for mapping attributes from source to target feature instances.
* To create target objects based on simple classifications derived from analysis of source instance enumeration-type attributes.
* To define complex classifications of conceptual types based on analysis of source data, and iterate over those types to populate target schema.

We *do not* advise that RIF be used in the following ways:

* Implement spatial or other utility functions (beyond defining operation signatures and parameter datatypes).

Some common patterns that can be applied to facilitate RIF rule authoring are:

***If…Then…Do***

This is the basic pattern that governs imperative processing of a transformation.

|  |
| --- |
| If  ( And  ( (\* logical conditions \*)  Or (  (\* logical conditions \*)  )  )  )  Then ( Do  (  (\* actions \*)  )  ) |

The If clause contains the set of mapping conditions that must hold true in order to proceed to apply the actions in the Then clause. Note that And and Or clauses are used as part of the conditions. The Do clause contains the actions that effect the production of the target output.

***Assert / Modify / Retract***

These actions correspond to the SQL statements INSERT, UPDATE and DELETE.

|  |
| --- |
| (\* create new tn-ra:RailwayStationNode \*)  Do  ( Assert  ( ?iId New()  ?iId #  ?iId[base:localId->xsd:string(?featureId) base:namespace->"AN.LMO"^^xsd:string]  ) |

|  |
| --- |
| ) |

In this example, the transformation is producing a new InspireId object and populating its localId and namespace attributes with data; in the first case, with a variable value (via a cast), and in the second case, a string literal constant.

***Frames***

Objects and attribute assignments can be expressed using **frame** constructs, e.g.

|  |
| --- |
| ?line[src:featId->?featureId src:survey->?surveyDate src:geometry->?lineGeom] |

The frame declaration starts with the variable ?line, then left and right square brackets define the space for making statements about the contents (attribution) of the object. This example predicates that the variable ?line has (at least) featId, survey and geometry attributes which are assigned the variables ?featureId, ?surveyDate and ?lineGeom, respectively. Since this statement is evaluated and must be true to continue processing, we can thereafter use the variables as labels to refer to the attributes of the object when needing to pass those attributes into the target schema. Frame logic is very powerful in its ability to express object concepts and, for this reason, has been proposed as a formal foundation for object-oriented programming languages (see, for example, the paper available at [[22]).](#_bookmark402)

For further details, see the RIF-PRD Specification at [[18].](#_bookmark398)

Appendix E explores numerous categories of transformation and gives examples of RIF mapping conditions and transformation actions to assist mapping design tool authors to appreciate the functionality required of such a tool.

**6.3 Schema Mapping Definition Process (Supplementary)**

Please refer to the Prototype Report Section 2.3 for a description of the approach used to define schema mappings during the prototyping of the INSPIRE Schema Transformation Network Service.

1. **System Qualities**

This section details system qualities that must be considered during implementation or design of a Schema Transformation Network Service.

* 1. **Interoperability and Vendor Neutrality**

A key goal of the INSPIRE Schema Transformation Network Service interface is to provide a standardised interface to permit interoperability with clients and enable multiple vendors to implement the Schema Transformation Network Service.

To achieve this goal, any implementation specific or proprietary languages have been avoided in the definition of the data interchange formats. It is anticipated that these will need to be extended in many circumstances, for example by providing custom user defined operations.

This should always be performed using the extension points documented in this report and be fully documented.

* 1. **Extensibility**

The expressiveness of the RIF mapping definition language can be supplemented by import of externally defined spatial functions which do not need to be written in RIF itself. See

Section [6.2.3](#_bookmark350) above for details of the extension points.

* 1. **Capacity**

The Schema Transformation Network Service is required by the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4]](#_bookmark387) to support a minimum of 5 simultaneous requests.

In order to achieve this, the Schema Transformation Network Service must be based upon an appropriate implementation platform that permits multiple, parallel invocations and therefore interactions need to be coordinated on a secure and transactional foundation.

* 1. **Availability**

To meet the INSPIRE Regulation [[3]](#_bookmark386) as amended by [[4],](#_bookmark387) the probability of a network service to be available shall be 99% of the time.

The implementation of the Schema Transformation Network Service must take appropriate actions to ensure that this is possible. This must include consideration of:

* + - Failover for processing nodes that encounter systemic challenges (e.g. hardware outages)
    - Dynamic provisioning to meet increased resource demands (if system users make simultaneous, taxing demands on system resources by seeking to transform large dataset requiring lengthy and memory-hungry transformations).
  1. **Performance**

For a description of the performance analysis aspects of the the INSPIRE Schema Transformation Network Service prototype, please refer to the Prototype Report [[62]](#_bookmark435) Section 2.7.

* 1. **Handling of Credentials**

The Schema Transformation Network Service must access external download services and XML repositories. These may require some form of access control, such as passing of an authentication token or credentials.

The INSPIRE Initial Operating Capability Task Force (IOC TF) [[23]](#_bookmark403) is currently investigated related issues. Once a proposed solution to this is endorsed, it should be followed for this service.

* 1. **Error Policy**

Schema transformation definitions are complex documents. It would be relatively simple to construct an invalid transformation, for example referring to attributes or classes that do not exist, or using operations that have not been defined on the source schema.

The Schema Transformation Network Service must ensure that all inputs are validated thoroughly and all pre-requisites tested (for example, access to required data and services) before performing a large amount of transformation.

Even after validating the prerequisites, it is possible that errors will occur. This is because specific features may have combinations of attributes that are not correctly handled by the mapping definition. This may also occur because a built-in function unexpectedly returns a value that is invalid in some way. When this kind of feature related error occurs, the service should continue to process the remaining features and report these errors in the call-back message.

* 1. **Reliability, Security, Quality of Service, Rights Management, etc. (Supplementary)**

Production implementations of the Schema Transformation Network Service may need to support a number of additional INSPIRE requirements. These could include topics such as security, reliability, rights management, etc.

These issues are currently being investigated by the INSPIRE IOC TC [[23]](#_bookmark403) and therefore are not yet covered by this Technical Guidance. Many industry standards relating to these features are implemented using specific SOAP headers, so it is expected that these should fit into the Transformation Service interface defined here with relative simplicity.

Schema Transformation Network Service vendors are advised to check the latest guidance from INSPIRE regarding this work.

* 1. **Testing Policy (Supplementary)**

For a description of the testing policy adopted for the INSPIRE Schema Transformation Network Service prototype, please refer to the Prototype Report [[62]](#_bookmark435) Section 2.4.3.

1. **Implementation View (Supplementary)**

The Schema Transformation Network Service interface defined in this technical guidance has been designed such that it may be implemented by a variety of types of organisation whilst still being sufficiently flexible to support INSPIRE schema transformations.

This section aims to provide practical advice on how existing data manipulation engines may be used to implement the Schema Transformation Network Service. For Schema Transformation Network Service users, this will ensure that costs are reduced and reliability is increased by using tried and tested technology.

The State Of The Art Analysis [[9]](#_bookmark391) identified that most existing or prototyped data manipulation engines use a proprietary language to specify the operation of their tools. The tool vendor survey identified that most tools were capable of performing the most complex of the identified categories of schema transformation. Therefore, it should be theoretically possible to represent complex schema transformations in a number of different tools.

A basic implementation of a Schema Transformation Network Service will require:

* 1. A web service interface.
  2. A data manipulation engine, to perform the transformations.
  3. Spatial processing and support capabilities.
  4. A configuration parser, to translate between the tool’s proprietary configuration language and the generic interchange format used by the INSPIRE service.
  5. A user interface to define configuration, either directly in the RIF format or with functionality to export to RIF.

Further details of each of these will be covered in the following sections.

* 1. **Web Service Interface**

LMOs requiring to make their data available in INSPIRE format, or third-parties engaged by them to assist with implementing INSPIRE, or other intermediate bodies such as national agencies, will need to develop a simple web service, following the interface defined in this document. This will utilise the components described in Sections 5.3 to 5.8 above to perform the transformation operations.

* 1. **Data Manipulation Engine**

This should be capable of loading data, performing transformations and storing data.

The following must be considered when selecting or modifying a data manipulation engine:

* + - Ability to perform all operations (directly or indirectly) equivalent to those required by the rule interchange language and extensions defined within this document
    - Ability to meet the extensibility, capacity, availability and performance requirements based on the guidance given in Section [7.](#_bookmark353)
  1. **Spatial Process and Support**

The system should be capable of processing spatial data in complex and richly expressive structures, using standards-based technology, and executing sophisticated spatial analytical operations, in a scalable and performant manner.

* 1. **Configuration Parser**

The configuration parser is responsible for transforming a transformation definition in the RIF format into the internal configuration format required by the data manipulation engine.

The details of configuration parser depend on the selected data manipulation engine, but it may be as simple as a stylesheet application.

The configuration parser may additionally perform optimisations of the transformation process, to take advantage of any specific features of the data manipulation engine. It is important to note that the RIF configuration is merely an interchange format – it does not specify any particular implementation approach.

* 1. **User Interface**

This could be any tool that provides a graphical representation of source and target schemas and allows for the expression of mappings between the respective feature classes and attributes. The tool should permit export of the mapping to RIF, although RIF does not need to be its native storage format.

1. **Deployment View (Supplementary)**

Options for the deployment of the INSPIRE Schema Transformation Network Service depend on the business use cases to which the Service will be applied. Options are likely to include:

* Local deployment at the data provider’s location
* Deployment in an external service provider
* Deployment in an INSPIRE consumer location.

This Technical Guidance is unable to provide prescriptions for how to deploy the Service that will meet every possible scenario which may be encountered in production environments.

However, the Prototype Report [[62]](#_bookmark435) Section 2.6 describes the deployment of the prototype Service, the factors that were considered, and the result of their evaluation. It is hoped that the information in that document will assist implementers in resolving the challenges specific to their environment and business needs.

**Appendix A: Interface Specifications**

The full Schema Transformation Network Service web service description is included below. This document is encoded in Web Service Description Language (WSDL) (see [[65]).](#_bookmark438)

|  |
| --- |
| <?xml version=*"1.0"* encoding=*"UTF-8"* standalone=*"no"*?>  <wsdl:definitions xmlns:soap=[*"http://schemas.xmlsoap.org/wsdl/soap/"*](http://schemas.xmlsoap.org/wsdl/soap/)xmlns:tns=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/)xmlns:wsdl=[*"http://schemas.xmlsoap.org/wsdl/"*](http://schemas.xmlsoap.org/wsdl/) xmlns:xsd=[*"http://www.w3.org/2001/XMLSchema"*](http://www.w3.org/2001/XMLSchema)name=*"INSPIRE-Schema-TNS"* xmlns:wfs=[*"http://www.opengis.net/wfs"*](http://www.opengis.net/wfs)xmlns:filter=[*"http://www.opengis.net/ogc"*](http://www.opengis.net/ogc) xmlns:rif=[*"http://www.w3.org/2007/rif#"*](http://www.w3.org/2007/rif)xmlns:wsa=[*"http://www.w3.org/2005/08/addressing"*](http://www.w3.org/2005/08/addressing)xmlns:owl2=[*"http://www.w3.org/2002/07/owl#"*](http://www.w3.org/2002/07/owl)targetNamespace=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/)>  <wsdl:types>  <xsd:schema targetNamespace=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/)>  <xsd:import namespace=[*"http://www.w3.org/2007/rif#"*](http://www.w3.org/2007/rif)schemaLocation=*"PRDRule.xsd"* />  <xsd:import schemaLocation=*"ws-addr.xsd"* namespace=[*"http://www.w3.org/2005/08/addressing"*](http://www.w3.org/2005/08/addressing) />  <xsd:element name=*"TransformRequest"*>  <xsd:complexType>  <xsd:sequence>  <xsd:element name=*"sourceDataset"* type=*"tns:dataset"* maxOccurs=*"unbounded"*>  <xsd:annotation>  <xsd:documentation>  This is a list of one or more source datasets to be processed by the transformation service.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"mapping"* type=*"tns:mapping"*>  <xsd:annotation>  <xsd:documentation>This is a description of the transformation that is to be performed. This should be encoded in the rule  interchange format. It may either be defined inline or by reference to an external location (e.g. xml repository).  </xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"targetDataset"* type=*"tns:dataset"*>  <xsd:annotation>  <xsd:documentation>Details of where the transformed data should be placed. This should be a reference to a pre-configured WFS that supports WFS 1.1 transactional operations (Create).  </xsd:documentation>  </xsd:annotation>  </xsd:element>  </xsd:sequence>  </xsd:complexType>  </xsd:element>  <xsd:complexType name=*"dataset"*>  <xsd:choice> |

|  |
| --- |
| <xsd:element name=*"directDownload"*>  <xsd:complexType>  <xsd:sequence>  <xsd:element name=*"url"* type=*"xsd:anyURI"*>  <xsd:annotation>  <xsd:documentation>A location at which a GML file may be downloaded directly.</xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"defaultCRS"* type=*"xsd:anyURI"*>  <xsd:annotation>  <xsd:documentation>The default CRS of the given file.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"schema"* type=*"xsd:anyURI"* minOccurs=*"0"*>  <xsd:annotation>  <xsd:documentation>The location of the application schema.  This is only mandatory for the target dataset.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  </xsd:sequence>  </xsd:complexType>  </xsd:element>  <xsd:element name=*"WFSReference"*>  <xsd:complexType>  <xsd:sequence>  <xsd:element name=*"capabilitiesURL"* type=*"xsd:anyURI"* />  <xsd:element name=*"layer"* type=*"xsd:string"* maxOccurs=*"unbounded"*>  <xsd:annotation>  <xsd:documentation>A list of layers that will be loaded  </xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"maxFeatures"* type=*"xsd:long"* minOccurs=*"0"*>  <xsd:annotation>  <xsd:documentation>Optional maximum number of features that should be loaded from the WFS. A value of –1 implies no upper limit on the number of features that are loaded.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"filter"* type=*"xsd:string"* minOccurs=*"0"*>  <xsd:annotation>  <xsd:documentation>Optional filter to be passed to the WFS.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  </xsd:sequence>  </xsd:complexType>  </xsd:element> |

|  |
| --- |
| </xsd:choice>  </xsd:complexType>  <xsd:complexType name=*"mapping"*>  <xsd:choice>  <xsd:element name=*"directDownload"* type=*"xsd:anyURI"*>  <xsd:annotation>  <xsd:documentation>A location at which the document may be downloaded directly. This will typically be a location within an XML repository.</xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element ref=*"rif:Document"* />  </xsd:choice>  </xsd:complexType>  <xsd:element name=*"LinkTransformationService"*>  <xsd:complexType>  <xsd:sequence>  <xsd:element name=*"request"* type=*"xsd:string"*>  <xsd:annotation>  <xsd:documentation>If the request parameter supplied contains a non- null URL, the service will forward all future requests to the specified delegate (except for future calls to this operation).  Conversely, if the request parameter is null, the forwarding is cancelled. Note that, because this service accesses resources using pass-by-reference, to be successful the delegate service must have access to any specified resources.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  </xsd:sequence>  </xsd:complexType>  </xsd:element>  <xsd:element name=*"TransformationComplete"*>  <xsd:complexType>  <xsd:sequence>  <xsd:element name=*"transformedSourceObjects"* type=*"xsd:integer"*>  <xsd:annotation>  <xsd:documentation>The number of source objects that were investigated and potentially transformed</xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"targetObjects"* type=*"xsd:integer"*>  <xsd:annotation>  <xsd:documentation>The number of target objects that were created</xsd:documentation>  </xsd:annotation>  </xsd:element>  <xsd:element name=*"objectError"* minOccurs=*"0"* maxOccurs=*"unbounded"*>  <xsd:annotation>  <xsd:documentation>Details of any errors that occurred during processing specific objects, or non-conformances of the object with the data specifications.</xsd:documentation>  </xsd:annotation>  <xsd:complexType>  <xsd:simpleContent> |

|  |
| --- |
| <xsd:extension base=*"xsd:string"*>  <xsd:attribute name=*"objectId"* type=*"xsd:string"* />  </xsd:extension>  </xsd:simpleContent>  </xsd:complexType>  </xsd:element>  <xsd:element name=*"systemError"* minOccurs=*"0"* maxOccurs=*"unbounded"* type=*"xsd:string"*>  <xsd:annotation>  <xsd:documentation>Details of any system errors that occurred during the processing, such as failure to connect to the target datastore. These should explain the current state of the system, for example if any output features were written or not.  </xsd:documentation>  </xsd:annotation>  </xsd:element>  </xsd:sequence>  </xsd:complexType>  </xsd:element>  </xsd:schema>  </wsdl:types>  <wsdl:message name=*"TransformRequestRequest"*>  <wsdl:part element=*"tns:TransformRequest"* name=*"parameters"* />  </wsdl:message>  <wsdl:message name=*"LinkTransformationServiceRequest"*>  <wsdl:part name=*"parameters"* element=*"tns:LinkTransformationService"*></wsdl:part>  </wsdl:message>  <wsdl:message name=*"TransformationCompleteRequest"*>  <wsdl:part name=*"parameters"* element=*"tns:TransformationComplete"*></wsdl:part>  </wsdl:message>  <!-- WS-Addressing call back messages -->  <wsdl:message name=*"WSARelatesToHeader"*>  <wsdl:part name=*"RelatesTo"* element=*"wsa:RelatesTo"* />  </wsdl:message>  <wsdl:message name=*"WSAMessageIDHeader"*>  <wsdl:part name=*"MessageID"* element=*"wsa:MessageID"* />  </wsdl:message>  <wsdl:message name=*"WSAReplyToHeader"*>  <wsdl:part name=*"ReplyTo"* element=*"wsa:ReplyTo"* />  </wsdl:message>  <wsdl:portType name=*"INSPIRE-Schema-TNS"*>  <wsdl:documentation>This is the main port for INSPIRE Schema Transformation Network Services.</wsdl:documentation>  <wsdl:operation name=*"TransformRequest"*>  <wsdl:documentation>This will asynchronously perform the transformation of the source data into the inspire format, based on the supplied transformation specification.  For further details of the requirements of this operation, please see the INSPIRE Schema Transformation Services Technical Guidance document.  </wsdl:documentation>  <wsdl:input message=*"tns:TransformRequestRequest"* />  </wsdl:operation>  </wsdl:portType>  <wsdl:portType name=*"INSPIRE-Schema-TNS-Response"*>  <wsdl:documentation>This is the port for asynchronous responses to the INSPIRE transformation network services.</wsdl:documentation>  <wsdl:operation name=*"TransformationComplete"*> |

|  |
| --- |
| <wsdl:input message=*"tns:TransformationCompleteRequest"*></wsdl:input>  </wsdl:operation>  </wsdl:portType>  <wsdl:binding name=*"INSPIRE-Schema-TNSSOAP"* type=*"tns:INSPIRE-Schema-TNS"*>  <soap:binding style=*"document"* transport=[*"http://schemas.xmlsoap.org/soap/http"*](http://schemas.xmlsoap.org/soap/http) />  <wsdl:operation name=*"TransformRequest"*>  <soap:operation soapAction=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-)  *1/TransformRequest"* />  <wsdl:input>  <soap:body use=*"literal"* />  <soap:header message=*"tns:WSAReplyToHeader"* part=*"ReplyTo"* use=*"literal"* encodingStyle=*""* />  <soap:header message=*"tns:WSAMessageIDHeader"* part=*"MessageID"* use=*"literal"* encodingStyle=*""* />  </wsdl:input>  </wsdl:operation>  </wsdl:binding>  <wsdl:binding name=*"INSPIRE-Schema-TNSCallbackSOAP"* type=*"tns:INSPIRE-Schema-TNS-Response"*>  <soap:binding style=*"document"* transport=[*"http://schemas.xmlsoap.org/soap/http"*](http://schemas.xmlsoap.org/soap/http) />  <wsdl:operation name=*"TransformationComplete"*>  <soap:operation soapAction=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-)  *1/TransformationComplete"* />  <wsdl:input>  <soap:body use=*"literal"* />  <soap:header message=*"tns:WSARelatesToHeader"* part=*"RelatesTo"* use=*"literal"* encodingStyle=*""* />  </wsdl:input>  </wsdl:operation>  </wsdl:binding>  <wsdl:service name=*"INSPIRE-Schema-TNS"*>  <wsdl:port binding=*"tns:INSPIRE-Schema-TNSSOAP"* name=*"INSPIRE-Schema-TNSSOAP"*>  <soap:address location=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/) />  </wsdl:port>  </wsdl:service>  <wsdl:service name=*"INSPIRE-Schema-TNS-Callback"*>  <wsdl:port binding=*"tns:INSPIRE-Schema-TNSCallbackSOAP"* name=*"INSPIRE-Schema-TNSCallbackSOAP"*>  <soap:address  location=[*"http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/callback"*](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/callback) />  </wsdl:port>  </wsdl:service>  </wsdl:definitions> |

**Appendix B: Sample SOAP Requests**

The following sample SOAP request, schema description document and schema mapping document are based on real examples from the prototyping exercise.

**Sample Transform Operation Request Message**

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <soap:Envelope [xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">](http://schemas.xmlsoap.org/soap/envelope/)  <soap:Header>  <wsa:ReplyTo [xmlns:tns="http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/) [xmlns:rif="http://www.w3.org/2007/rif#"](http://www.w3.org/2007/rif) [xmlns:wsa="http://www.w3.org/2005/08/addressing">](http://www.w3.org/2005/08/addressing)  <wsa:Address>http://lslbvm41:44369/TNS/callbackport</wsa:Address>  </wsa:ReplyTo>  <wsa:MessageID [xmlns:tns="http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/) [xmlns:rif="http://www.w3.org/2007/rif#"](http://www.w3.org/2007/rif) [xmlns:wsa="http://www.w3.org/2005/08/addressing">a161d586-8e0e-47b2-933c-](http://www.w3.org/2005/08/addressing) 31f16f5acb34</wsa:MessageID>  </soap:Header>  <soap:Body>  <tns:TransformRequest [xmlns:tns="http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/"](http://inspire.jrc.ec.europa.eu/SchemaTransformation/v0-2/) [xmlns:rif="http://www.w3.org/2007/rif#"](http://www.w3.org/2007/rif) [xmlns:wsa="http://www.w3.org/2005/08/addressing">](http://www.w3.org/2005/08/addressing)  <sourceDataset>  <WFSReference>  <capabilitiesURL>http://geoserver:8080/tnstg- geoserver/ows?service=WFS&amp;version=1.0.0&amp;request=GetCapabilities</capabilitiesURL>  <layer>dcp:Perceelvlak</layer>  <maxFeatures>-1</maxFeatures>  </WFSReference>  </sourceDataset>  <mapping>  <directDownload> file:/home/jrc/rif/digest/dutch\_cadastral\_parcel.rif  </directDownload>  </mapping>  <targetDataset>  <directDownload>  <url>/tmp/gml/dutch.xml</url>  <schema>/XSD/CadastralParcels.xsd</schema>  </directDownload>  </targetDataset>  </tns:TransformRequest>  </soap:Body>  </soap:Envelope> |

**Sample Schema Description Document**

The following is a sample source logical schema that describes Dutch Cadastral Parcel data.

|  |
| --- |
| <?xml version="1.0" encoding="UTF-8"?>  <xsd:schema [xmlns:xsd="http://www.w3.org/2001/XMLSchema"](http://www.w3.org/2001/XMLSchema) [xmlns:bcp="http://jrc.onespatial.com/cp/belgium"](http://jrc.onespatial.com/cp/belgium) [xmlns:dcp="http://jrc.onespatial.com/cp/dutch"](http://jrc.onespatial.com/cp/dutch) [xmlns:gml="http://www.opengis.net/gml"](http://www.opengis.net/gml) [xmlns:nhy="http://jrc.onespatial.com/hy/norwegian"](http://jrc.onespatial.com/hy/norwegian) [xmlns:nitn="http://jrc.onespatial.com/tn/lpsni"](http://jrc.onespatial.com/tn/lpsni) [xmlns:outline="http://jrc.onespatial.com/outline"](http://jrc.onespatial.com/outline) [xmlns:shy="http://jrc.onespatial.com/hy/swedish"](http://jrc.onespatial.com/hy/swedish) [xmlns:sitn="http://jrc.onespatial.com/tn/osi"](http://jrc.onespatial.com/tn/osi) elementFormDefault="qualified" [targetNamespace="http://jrc.onespatial.com/cp/dutch">](http://jrc.onespatial.com/cp/dutch)  <xsd:import [namespace="http://www.opengis.net/gml"](http://www.opengis.net/gml) schemaLocation="http://geoserver:8080/tnstg-geoserver/schemas/gml/3.1.1/base/gml.xsd"/>  <xsd:complexType name="PerceelvlakType">  <xsd:complexContent>  <xsd:extension base="gml:AbstractFeatureType">  <xsd:sequence>  <xsd:element maxOccurs="1" minOccurs="0" name="the\_geom" nillable="true" type="gml:MultiSurfacePropertyType"/>  <xsd:element maxOccurs="1" minOccurs="0" name="MI\_PRINX" nillable="true" type="xsd:double"/>  <xsd:element maxOccurs="1" minOccurs="0" name="PCVL\_VESTI" nillable="true" type="xsd:string"/>  <xsd:element maxOccurs="1" minOccurs="0" name="PCVL\_PRCL\_" nillable="true" type="xsd:string"/>  <xsd:element maxOccurs="1" minOccurs="0" name="PCVL\_DATUM" nillable="true" type="xsd:dateTime"/>  <xsd:element maxOccurs="1" minOccurs="0" name="PCVL\_DAT00" nillable="true" type="xsd:dateTime"/>  </xsd:sequence>  </xsd:extension>  </xsd:complexContent>  </xsd:complexType>  <xsd:element name="Perceelvlak" substitutionGroup="gml:\_Feature" type="dcp:PerceelvlakType"/>  </xsd:schema> |

**Sample Mapping Document**

The following is a sample RIF mapping definition document that specifies how to transform a source dataset (containing Dutch Cadastral Parcel data) into the INSPIRE Cadastral Parcels format.

|  |
| --- |
| <?xml version=*"1.0"* encoding=*"UTF-8"* standalone=*"yes"*?>  <Document  xmlns=[*"http://www.w3.org/2007/rif#"*](http://www.w3.org/2007/rif)xmlns:xsi=[*"http://www.w3.org/2001/XMLSchema-instance"*](http://www.w3.org/2001/XMLSchema-instance)xmlns:gml=[*"http://www.opengis.net/gml/"*](http://www.opengis.net/gml/)xmlns:omwg=[*"http://www.omwg.org/TR/d7/ontology/alignment"*](http://www.omwg.org/TR/d7/ontology/alignment)xmlns:goml=[*"http://www.esdi-humboldt.eu/goml"*](http://www.esdi-humboldt.eu/goml)  xmlns:rdf=[*"http://www.w3.org/1999/02/22-rdf-syntax-ns#"*](http://www.w3.org/1999/02/22-rdf-syntax-ns)>  <payload>  <Group>  <sentence>  <Implies>  <if>  <Exists>  <declare>  <Var>dutch\_instance</Var>  </declare>  <declare>  <Var>dutch\_pcvl\_prcl</Var>  </declare>  <declare>  <Var>dutch\_pcvl\_datum</Var>  </declare>  <declare>  <Var>dutch\_pcvl\_dat00</Var>  </declare>  <declare>  <Var>dutch\_geometry</Var>  </declare>  <formula>  <And>  <formula>  <Member>  <instance>  <Var>dutch\_instance</Var>  </instance>  <class>  <Const type=*"rif:iri"*>http://jrc.onespatial.com/cp/dutch:Perceelvlak</Const>  </class>  </Member>  </formula>  <formula>  <Frame>  <object>  <Var>dutch\_instance</Var>  </object>  <slot ordered=*"yes"*>  <Const  type=*"rif:iri"*>http://jrc.onespatial.com/cp/dutch:PCVL\_PRCL\_</Const> |

|  |
| --- |
| <Var>dutch\_pcvl\_prcl</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*> http://jrc.onespatial.com/cp/dutch:PCVL\_DATUM  </Const>  <Var>dutch\_pcvl\_datum</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*> http://jrc.onespatial.com/cp/dutch:PCVL\_DAT00  </Const>  <Var>dutch\_pcvl\_dat00</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*> http://jrc.onespatial.com/cp/dutch:the\_geom  </Const>  <Var>dutch\_geometry</Var>  </slot>  </Frame>  </formula>  </And>  </formula>  </Exists>  </if>  <then>  <Do>  <actionVar>  <Var>inspire\_instance</Var>  <New/>  </actionVar>  <actionVar>  <Var>inspire\_id</Var>  <Frame>  <object>  <Var>inspire\_instance</Var>  </object>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:inspireId  </Const>  <Var>inspire\_id</Var>  </slot>  </Frame>  </actionVar>  <actions ordered=*"yes"*>  <Assert>  <target>  <Member>  <instance>  <Var>inspire\_instance</Var>  </instance>  <class>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:CadastralParcel |

|  |
| --- |
| </Const>  </class>  </Member>  </target>  </Assert>  <Assert>  <target>  <Frame>  <object>  <Var>inspire\_id</Var>  </object>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:BaseTypes:3.2:localId</Const>  <Var>dutch\_pcvl\_prcl</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:BaseTypes:3.2:namespace</Const>  <Const type=[*"http://www.w3.org/2001/XMLSchema#string"*](http://www.w3.org/2001/XMLSchema#string)> NL.KAD.CP  </Const>  </slot>  </Frame>  </target>  </Assert>  <Assert>  <target>  <Frame>  <object>  <Var>inspire\_instance</Var>  </object>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:geometry</Const>  <Var>dutch\_geometry</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>CadastralParcels:label</Const>  <Var>dutch\_pcvl\_prcl</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:nationalCadastralReference  </Const>  <Var>dutch\_pcvl\_prcl</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:validFrom  </Const>  <Var>dutch\_pcvl\_datum</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:validTo |

|  |
| --- |
| </Const>  <Var>dutch\_pcvl\_dat00</Var>  </slot>  <slot ordered=*"yes"*>  <Const type=*"rif:iri"*>  urn:x-inspire:specification:gmlas:CadastralParcels:3.0:beginLifespanVersion  </Const>  <Var>dutch\_pcvl\_datum</Var>  </slot>  </Frame>  </target>  </Assert>  </actions>  </Do>  </then>  </Implies>  </sentence>  </Group>  </payload>  </Document> |

**Appendix C: Rationale for use of Rule Interchange Format**

This section describes, in detail, the reasons why RIF was selected for the mapping definition format, and why other candidate formats were rejected for this purpose.

**Requirement for a Mapping Interchange Format**

The domain of solutions that handle schema transformation contains a large number of mapping languages. Some of these are specific to systems engineering models (such as MOF

[[40]](#_bookmark418) -based languages like ATL [[41]](#_bookmark419) and QVT [[42]](#_bookmark420)) and thus designed primarily for assisting engineers in understanding and communicating modelling concepts. Others are designed primarily for the specialised requirements of XML processing (such as XSLT [[43]).](#_bookmark421) However, no accepted standard exists for mapping interchange in the same way as UML [[31]](#_bookmark410) is a standard for defining system engineering models, or XML Schema [[37]](#_bookmark415) is for describing XML documents.

Schema mapping takes instance data from a given location in a source schema and transposes it into a corresponding location in a target schema. A number of transformation “levels” have been defined as part of the State of the Art Analysis [[9]](#_bookmark391) (see Appendix B to the document). Correspondences between source and target locations are defined using rules. Therefore, the essential requirement of a schema mapping language is that it be capable of defining rules and rulesets. It is, in addition, necessary for such a language to be able to define actions that produce target data on the basis of predicates and functions applied to the source data. It is also necessary for the language to be able to identify and make assertions about instance data (i.e. objects), and not just on the level of classes and their attributes.

**Mapping Transfer Language *versus* End-Use Language**

Even with these qualifications on the role of a schema mapping language, there are still many candidate languages that could be used. In addition to languages, many tools that are currently distributed (either commercially or under open source licences) use their own, internally-defined mapping formats. Therefore, a realistic solution to the challenge of schema transformation in a heterogeneous environment like INSPIRE must involve enlistment of a mapping transfer language. Interchange of mappings enables the concepts essential to the schema mapping to be distilled into a precise, machine-readable format that can be validated, exchanged, stored and passed freely about the INSPIRE community.

This approach facilitates inclusion of diverse solutions into a common system. The benefits of such an approach are analogous to those inherent in the design of the internet. With the internet, the key feature of the architecture is that no single network host is essential to the viability of the whole. To apply this analogy, we could say that each “host” is a language format, and that a good architecture would be one in which no single language has to be *both* used for storage and exchange of mappings *and* applied at the point of end-use. Adoption of a single mapping transfer language, whilst enabling the end-use language to be implemented in any compliant way, decouples the mapping definitions from any single implementation format, promotes interoperability and discourages vendor lock-in.

The only requirement that must apply to an end-use language is that it be possible unambiguously to translate to it from the mapping transfer language at the point of end-use,

i.e. when running a specific transformation. This translation must be semantics-preserving so that mapping definitions are able to be used across multiple, heterogeneous systems.

**Selection of Rule Interchange Format**

The Schema Transformation Network Service State of the Art Analysis identified three mapping languages which could serve as the mapping transfer format for the Schema Transformation Network Service: RIF, QVT and XSLT.

Before discussing the relative merits of the rule interchange formats, first let us establish some terminology that should help clarify the context.

The objective of the mapping language is to define a transformation between a source dataset (***sd***) in source logical schema (***LS***) into a target dataset (***td***) in a target logical schema (***LT***). In operation, the service must process a concrete physical encoding of the source and target datasets (***sp*** and ***tp*** respectively) and the source and target schema (***PS*** and ***PT*** respectively).

**Query View Transformation (QVT)**

The QVT/MOF/OMG family of languages are well suited to the conversion of logical schema expressed in one physical encoding into an alternative physical encoding. In terms outlined this would be like translating ***PS*** into ***PS\****, where both ***PS*** and ***PS\**** are equivalent expression of the same logical schema (***LS***) in different encoding formats (say UML and XSD for example). This does not help with either defining the relationship between the logical schema (***LS*** and ***LT***), the physical schemas (***PS*** and ***PT***) or the data itself. QVT has therefore been rejected as a candidate model definition language.

**Extensible Stylesheet Language Transformations (XSLT)**

XSLT is part of the XML tool stack. This stack contains two closely coupled technologies for expressing physical encodings of physical model structure (XSD) and dataset content (XML). In the terms outlined an XSLT document describes directly how a target dataset (***tp***) can be derived from a source dataset (***sp***). XSLT itself does make reference to the data models of either source or the target dataset (that is to say ***LS***, ***LT***, ***PS*** or ***PT***). The XML stack has very good tools support and a very high degree of developer adoption. It should be noted that the physical model encoding language currently does not support multiple inheritance. This has been address in a recent version of the standard (XSD 1.1), however this standard is only just beginning to be adopted by industry and full adoption may be a long way away. Developer expertise with XSLT is more limited; its strictly declarative nature (no bad thing in a transformation language) can present a steep learning curve to developers from an object- oriented or procedural background. There are two limitations of XSLT which make unsuitable for use as the mapping definition language for the Schema Transformation Network Service. Firstly, XSLT is focused at transforming XML at a syntactic level, rather than a feature/object level. This is not a problem for it typical use in the presentation layer of applications, however for spatial transformation it forces the developer to focus on the structure of the XML encoding, rather than of the structure of the logical schema. This in turn leads to verbose expressions that are hard to read and to debug. A second limitation of XSLT is more to do with the available implementation technologies, rather than the standard itself. XSLT engines load the entire source document into memory, before processing. Spatial datasets, when expressed in GML, may grow to many hundreds of megabytes. Documents of this size do require specialist handling (streaming/disk-backed-storage) and are not well suited to direct in memory transformation. For these two reasons XSLT has been rejected as a candidate model definition language.

**Rules Interface Format (RIF)**

RIF, combined with GML application schema for source and target schemas, presents a strong candidate. Like XSLT, it directly defines how a target dataset (***tp***) can be derived from a source dataset (***sp***). Unlike XSLT it is less tightly bound to XML syntax, making it easier to translate into other transformation languages.

It supports frame logic: i.e. this is the formal underpinning of object-oriented programming (see, for example, [[22],](#_bookmark402) which discusses the close similarity between the concepts of *frame* and *object*). Therefore, RIF can deal with object instances. It also has a strong intellectual and practical background, see below for more information.

RIF has been designed primarily to be a rule/action interchange language (rather than an implementation language). It is mathematically rigorous, and has been disseminated by a well-respected international standards body (W3C [[44]](#_bookmark422)). RIF has been designed by a group of experts representing the distilled experience of the Business Rules Management Systems industry. It is appropriate to the challenge of schema transformation, and indeed it is one of the use cases for which the format was designed, see [[45].](#_bookmark423)

Documentation on RIF is available at the W3C RIF Working Group website (see [[46]).](#_bookmark424) This website contains the full specification of RIF dialects, test cases, papers and information on current implementations of RIF.

RIF has several dialects, which the following table summarizes:

|  |  |
| --- | --- |
| **Dialect** | **Description** |
| Core | Subset of basic rules common to all dialects. |
| Basic Logic Dialect (BLD) | First-order logic-based language focussing on the expression of relations between source and target models. It was written as an application of RIF-FLD to demonstrate the extensibility of RIF. |
| Production Rules Dialect (PRD) | Provides support for rules and actions. It has not been written as an application of RIF-FLD as the framework is only currently able to support first-order logic-based languages and not rules/actions type languages, but is instead specified separately. |
| Framework for Logic Dialect (FLD) | A framework that enables the definition of new logical languages without having necessarily to state explicitly every aspect of the new language, since the principle is that it re-uses default settings stated in the framework, while enabling the extending implementation to change only those aspects it is designed to target. |

*Table 25 RIF Dialects*

The only RIF dialect capable of expressing the creation of new target instances (a requirement for a schema mapping language) is RIF-PRD.

**Recommendation: The Schema Transformation Network Service should use RIF-PRD as the mapping definition language.**

As well as supporting a range of basic functions, RIF has support for the inclusion of user defined functions. To support the spatial nature of mappings, the Schema Transformation Network Service should support all the operations identified in the OGC Simple Feature Specification (see [[52]).](#_bookmark429) Appendix F to this document describes how the operations defined in the OGC Simple Feature Specification can be referenced from RIF mappings.

**Recommendation: The Schema Transformation Network Service should support all the basic RIF functions.**

**Recommendation: The Schema Transformation Network Service should support all the operations identified in the OGC Simple Feature Specification.**

**Appendix D: Compatibility of Rule Interchange Format and GML**

It is possible to import GML application schema directly into RIF documents and make reference to the datatypes defined in them, in order to construct data transformations. Here is an example of this.

Given a GML document in which multiple features are defined such as this railway line:

|  |
| --- |
| <gml:featureMember>  <src:TransportFeature gml:id="ida6c50110-dcac-4560-90b6-22dfdabaf948">  <src:fema>CL\_RAIL</src:fema>  <src:survey>20040906</src:survey>  <gml:curveProperty>  <gml:LineString srsName="EPSG:29902" srsDimension="3">  <gml:posList>305152.443986936 316670.370978073 0 305169.344009866 316442.815006442 0  305196.160952081 316259.726042089 0 305276.066960803 316072.356043934  249999999968949000000000000000000000000</gml:posList>  </gml:LineString>  </gml:curveProperty>  </src:TransportFeature>  </gml:featureMember> |

A RIF document to express the transformation could be written like this (this example is abbreviated to focus on the essentials of the mapping):

|  |
| --- |
| Document  ( Prefix(xsd [<http://www.w3.org/2001/XMLSchema#>)](http://www.w3.org/2001/XMLSchema)  Prefix(gml-311 [<http://schemas.opengis.net/gml/3.1.1/gml.xsd#>)](http://schemas.opengis.net/gml/3.1.1/gml.xsd) Prefix(gml-321 [<http://schemas.opengis.net/gml/3.2.1/gml.xsd#>)](http://schemas.opengis.net/gml/3.2.1/gml.xsd) Prefix(net <urn:x-inspire:specification:gmlas:Network:3.2#>)  Prefix(tn <urn:x-inspire:specification:gmlas:CommonTransportElements:3.0#>) Prefix(tn-ra <urn:x-inspire:specification:gmlas:RailwayTransportNetwork:3.0#>) Prefix(src [<http://www.somedataprovider.org/gml/transport#>)](http://www.somedataprovider.org/gml/transport)  Group  ( Forall ?feat ?trans ?type ?date ?geom ?id ?lstr ( If  ( And  ( ?feat # gml-311:featureMember  ?feat[src:TransportFeature->?trans]  ?trans[src:fema->?type  src:survey->?date  gml-311:curveProperty->?geom gml-311:id->?id]  ?geom[gml-311:LineString->?lstr]  )  )  Then Do  ( Assert  ( ?iId New()  ?iId # net:inspireId  ?iId[base:localId->xsd:string(?id) base:namespace->"AN.LMO"^^xsd:string]  ?rllink New() |

|  |
| --- |
| ?rllink # tn-ra:RailwayLink  ?rllink[net:beginLifespanVersion->xsd:dateTime(?date) net:inspireId->?iId  net:endLifespanVersion[@nilReason]-> "missing"^^xsd:string net:inNetwork->"LMO"^^xsd:string  net:fictitious->"false"^^xsd:boolean net:centerlineGeometry->?geom tn:validFrom->?xsd:dateTime(?date)  tn:validTo[@nilReason]->"missing"^^xsd:string]  ?clg New()  ?clg # net:centerlineGeometry  ?curv New()  ?curv # gml-321:LineString  ?rllink[net:centerlineGeometry->?curv)  ?rllink[gml-321:id->?id]  ?curv[gml-321:LineString->?lstr]  ?featMemb New()  ?featMemb # gml-321:featureMember  ?featMemb[net:NetworkElement->?rllink]  )  )  )  )  ) |

When combined with other rules, as part of a transformation, this helps to build the following INSPIRE GML:

|  |
| --- |
| <TransportFeatures aggregationType="set">  <gml:boundedBy>  <gml:Envelope srsName="urn:x-ogc:def:crs:EPSG:29902">  <gml:lowerCorner>305152.443986936 316072.356043934</gml:lowerCorner>  <gml:upperCorner>305276.066960803 316670.370978073</gml:upperCorner>  </gml:Envelope>  </gml:boundedBy>  <featureMember>  <tn-ra:RailwayLink gml:id="ida6c50110-dcac-4560-90b6-22dfdabaf948">  <net:beginLifespanVersion>2004-09-06T00:00:00.000</net:beginLifespanVersion>  <net:inspireId>  <base:localId>ida6c50110-dcac-4560-90b6-22dfdabaf948</base:localId>  <base:namespace>AN.LMO</base:namespace>  </net:inspireId>  <net:endLifespanVersion nilReason="missing"/>  <net:inNetwork>LMO</net:inNetwork>  <net:fictitious>false</net:fictitious>  <net:centerlineGeometry>  <gml:curveProperty>  <gml:LineString srsName="EPSG:29902" srsDimension="3">  <gml:posList>305152.443986936 316670.370978073 0  305169.344009866 316442.815006442 0  305196.160952081 316259.726042089 0  305276.066960803 316072.356043934  249999999968949000000000000000000000000  </gml:posList>  </gml:LineString>  </gml:curveProperty> |

|  |
| --- |
| </net:centerlineGeometry>  <tn:validFrom>2004-09-06T00:00:00.000</tn:validFrom>  <tn:validTo nilReason="missing"/>  </tn-ra:RailwayLink>  </featureMember>  <featureMember xlink:href="#f3"/>  </TransportFeatures> |

**Appendix E: Common Transformations Expressed Using Rule Interchange Format**

Transformations, as encoded using rule languages, are composed of **patterns**. These patterns provide a way to modularise the construction of a rule document. Here follow details of patterns identified based on third-party research and our experience of INSPIRE testing.

For each pattern, an example is given using RIF to perform a transformation from a nominal source schema (which is not explicitly identified but is based on an actual example LMO dataset) to conform to the INSPIRE logical schema.

***Please note, this appendix does not constitute a primer in the use of RIF, but a demonstration of its ability to express the mappings required for INSPIRE schema transformation. However, an attempt has been made to show only the essential features of the mappings in order to make them useful for instruction in the basic constructs of RIF.***

**Patterns Drawn From Third-Party Research**

Work has already been done to analyse the kinds of transformations that are commonly required to achieve schema transformations (see [[47]).](#_bookmark425) This study identified various categories of schema transformation activity. The key concept is that the process of mapping from a source to a target schema requires the identification of **correspondences** between source and target data in the form of classes and attributes (which themselves could be classes). The broad categories of correspondences are in the following table. Within these categories, further sub-divisions can often be identified, depending on the context.

|  |  |  |
| --- | --- | --- |
| ***Case*** | ***Type of correspondence*** | ***Description*** |
| 1 | Single correspondences [1:1] | A datum that is required by the target schema is available in the source schema in the same format |
| 2 | Single correspondences [n:1] | Several data in source schema map to one datum in target schema |
| 3 | Single correspondences [1:n] | One datum in source schema maps to several data in target schema |
| 4 | Single correspondences [m:n] | Several data in source schema map to several data in target schema. |
| 5 | Missing correspondences [source] | A datum that is available in the source schema is not available in the target schema |
| 6 | Missing correspondences [target] | A datum that is required in the target schema is not available in the source schema |
| 7 | Multiple correspondences [choice] | Special situations with choice (i.e. co-occurrence) constraints |
| 8 | Multiple correspondences [structural] | Differences between source and target schema structures |
| 9 | Duplicate correspondences | Two or more items in source schema that map to the same item in target schema (or possibly to as many duplicates, depending on the mapping policy) |

*Table 26 Categories of Correspondences*

The approach used in the following subsections is to present the relevant parts of the source and target schema, both from the viewpoint of the logical schema and of the actual data. The examples are based on actual INSPIRE requirements, although presented in simplified format to make the rulesets easier to understand. The INSPIRE network, hydrography and cadastral parcel application schema are referred to in many of these examples to fulfil the role of the target schema (see [[8]).](#_bookmark390) Some of the examples are based on hypothetical scenarios.

Case 1: Single Correspondences (One-To-One)

Here is an example where an attribute in a source schema class maps directly to an attribute in a target schema class. In this case, the line instance’s geometry attribute maps to the RailwayLink’s centerlineGeometry attribute. A new instance of the target class is created in order to receive the data.

The following RIF ruleset expresses the required transformation.

|  |
| --- |
| Forall ?line  ( If ( ?line # src:line ) )  Then Do  ( Assert (  (?lineGeom ?line[gml:geometry->?lineGeom])  ?rllink New()  ?rllink # tn-ra:RailwayLink  ?rllink[net:centerlineGeometry->?lineGeom]  )  )  ) |

Case 2: Single Correspondences (Many-To-One)

Here is an example where multiple instances in the source schema map to a single instance in the target schema. In this case, a series of lines stored as distinct objects in the source schema map to a RailwayLinkSequence in the target schema (as well as mapping to other elements in the schema, N.B. the extra attribute mapping is not shown here).

The following RIF ruleset expresses the required transformation.

|  |
| --- |
| (\* rule1 – first pass to create RailwayLinks and DirectedLinks and associate them \*)  Group  ( Forall ?line  ( If( ?line # src:line )  Then Do  ( Assert  ( ?rllink New()  ?rllink # tn-ra:RailwayLink  (?lineGeom ?line[gml:geometry->?lineGeom])  ?rllink[net:centerlineGeometry->?lineGeom]  ?dirlink New()  ?dirlink # net:DirectedLink  (\* create 1-to-1 relationship between rllink and dirlink \*)  ?dirlink[net:link->?rllink]  ) |

|  |
| --- |
| )  )  )  (\* rule2 – create a new RailwayLinkSequence object if none exists \*)  Group  ( Forall ?rlseq ( If  ( And  ( ?rlseq # tn-ra:RailwayLinkSequence Not  ( Exists  ( ?rlseq # tn-ra:RailwayLinkSequence )  )  )  )  ( Then ( Do  ( Assert  ( ?rlseq New()  ?rlseq # tn-ra:RailwayLinkSequence  )  )  )  )  )  )  (\* rule3 - assign DirectedLinks to the new RailwayLinkSequence list \*)  Group  ( Forall ?dirlink ( If  ( And  ( ?dirlink # net:DirectedLink Not  ( Exists  ( ?rlseq ( And  ( ?rlseq # tn-ra:RailwayLinkSequence  (?dirlink External(pred:list-contains(?rlseq[link] ?dirlink)))  )  )  )  )  )  )  Then ( Do  ( Modify  ( (?list ?rlseq[net:link->?list]) External(func:append(?list ?dirlink))  )  )  )  )  ) |

Case 3: Single Correspondences (One-To-Many)

Here is an example where a single source instance maps to multiple target instances. In this case, a single source object line is transformed into multiple target objects: the inspireId identifier plus the RailwayLink and RailwayType feature types (this is only one kind of multi-cardinality transformation: it is equally possible to transform instances of the same type, whereby for example one has an object with a list attribute in the source schema and individual top-level instances in the target schema).

In addition to the excerpt given at the start of this section, this example also refers to the following part of the INSPIRE transport networks logical schema.

|  |
| --- |
| Forall ?line, ?featureId ?surveyDate ?lineGeom ( If  ( And  ( ?line # src:line  ?line[src:featId->?featureId src:survey->?surveyDate gml-311:geometry->?lineGeom]  )  )  Assert ( And  ( ?iId New()  ?iId # net:inspireId  ?iId[localId->xsd:string(?featureId) namespace->"NI.LPSNI"^^xsd:string]  ?rllink New()  ?rllink # tn-ra:RailwayLink  ?rllink [  net:inspireId->?iId  net:beginLifespanVersion->xsd:dateTime(?surveyDate) net:centrelineGeometry->?lineGeom  ]  ?rltype New()  ?rltype # tn-ra:RailwayType  ?rltype [  net:inspireId->?iId  net:networkRef->?External(function:make-list(?rllink)) net:beginLifespanVersion->uml:DateTime(?surveyDate)  tn-ra:type->"train"^^xsd:string  ]  )  ) |

Case 4: Single Correspondences (Many-To-Many)

Here is an example where multiple source instances map to multiple target instances.

Consider a source schema which has its transport network logical schema expressed using sets of road lines named Road, each of which contains a multi-cardinality leadsTo attribute which is a list of object references of all other road lines that touch the given line, and thus expresses an association between road lines. In the INSPIRE network application schema, however, links are associated with nodes, rather than directly with each other. Therefore, in order to map this data into the INSPIRE logical schema it is necessary to infer the presence of network nodes from the fact of lines touching each other. This is different from Case 8 below (where leaf and inner nodes are cross-mapped) because, in this case, the nodes required in the target schema do not exist in the source schema, although they are logically inferrable.

This example shows the required transformation expressed using RIF. The example is simplified to show only the essential elements of the transformation. It shows a spatial library being included in the document to enable the source geometry to be analysed. Note that this example has the potential to create redundant, duplicate nodes, and needs more work to address those limitations.

|  |
| --- |
| Document  ( Prefix(gml-311 [<http://schemas.opengis.net/gml/3.1.1/gml.xsd#>)](http://schemas.opengis.net/gml/3.1.1/gml.xsd) Prefix(net <urn:x-inspire:specification:gmlas:Network:3.2#>)  Prefix(tn-ro <urn:x-inspire:specification:gmlas:RoadTransportNetwork:3.0#>) Prefix(src [<http://www.somedataprovider.org/gml/transport#>)](http://www.somedataprovider.org/gml/transport)  Prefix(spatial <http://1spatial.com/inspire/spatialfunctions#)>  (\* rule1 – create RoadLinks and associated RoadNodes \*)  Group (  Forall ?line ?geom ( If  ( And (  ?line # src:RoadLine  ?line[gml-311:geometry->?geom]  )  )  Then Do  ( Assert (  ?rdlink New()  ?rdlink # tn-ro:RoadLink  ?rdlink[net:centrelineGeometry->?geom]  ?rdnode New()  ?rdnode # tn-ro:RoadNode  (\* assign the last set of coordinates in the line to be the coordinates of the node \*)  (?coordlist External(spatial:getCoords(?geom)))  ?rdnode[net:geometry->External(func:get(?coordlist  External(func:count(?coordlist))))]  ?rdnode[net:spokeEnd->External(function:append(?rdlink)]  )  )  )  )  ) |

Case 5: Missing Correspondences (Source Lacks Data)

When data required by the target schema is lacking in the source schema, there are many strategies for handling the lack.

* 1. Assign a default value to a target instance. e.g.

|  |
| --- |
| ?iId New()  ?iId # net:inspireId  ?iId[net:namespace->"AN.LMO"^^xsd:string] |

In this case, the namespace attribute of the inspireId is assigned a constant string value identifying the source data provider.

* 1. Assign a random value to a target instance (provided this is optional data: in the case of mandatory data, it is unwise to assume a random value would meet business requirements). This strategy is primarily of interest to transformation mapping designers as a way of facilitating trial-and-error development of mappings (e.g., see below section 8.3, under the Mapping Designer user interface discussion, the proposed random value assignment feature of the Mapping Definition’s target tab). However, it will not be expanded upon in this section because it is clearly outside the scope of the INSPIRE Schema Transformation Network Service solution.
  2. Leave a target instance null (transformation ok, only applies where target value is nullable). In this snippet, the validFrom and validTo attributes of the RailwayType NetworkProperty have not been assigned. Since they are specified as voidable in the logical schema this is acceptable. If suitable, a ReasonForVoidValue may be provided to explain why the value has not been populated.

|  |
| --- |
| ?rltype New()  ?rltype # tn-ra:RailwayType  ?rltype [  net:inspireId->?iId  net:networkRef->?External(function:make-list(?rllink)) net:beginLifespanVersion->uml:DateTime(?surveyDate)  tn-ra:type->"train"^^xsd:string  ] |

* 1. Transformation fails, where it is not possible to follow one of the above strategies.

Case 6: Missing Correspondences (Target Lacks Data)

Here is an example where data present in the source schema has no corresponding location in the target schema i.e. information would be lost if the mapping were reversed.

Take for example the RoadSurfaceCategory feature type in INSPIRE transport networks logical schema. INSPIRE schema says: paved, unpaved. A national dataset with a feature classifier Road could conceivably have an enumerated attribute called surface with permitted values being: asphalt, concrete, brick, cobblestone, permeable, wood, gravel, cinder, earth. The first two values map more or less well to the target value paved. The last three values map to the target value unpaved. But can we say that a wooden road surface is paved? Hence, the target schema, in this case, lacks the expressiveness required. It is noted that this is seldom the case with the INSPIRE schema, and the example is an artificial one; furthermore, it is not challenging to express a transformation in RIF, the problem is more that one would have to make a business decision as to whether to void the target attribute or to apply the more likely of the two permitted target values. Therefore, this case will not be discussed any further.

Case 7: Multiple Correspondences (Choice)

The INSPIRE GML application schema use substitution groups heavily. Many of the substitution groups values are domain-restricted to various codelists (e.g. FormOfWay in the Transport Networks data theme in expressed as a substitutable element for the tn:TransportProperty head element). For example:

In the INSPIRE schema we have

|  |
| --- |
| <element name="FormOfWay" substitutionGroup="tn:TransportProperty" type="tn-ro:FormOfWayType">  <annotation>  <documentation>-- Definition --&#13;  A classification based on the physical properties of the Road Link. [TWG TN, based on EuroRoadS]</documentation>  </annotation>  </element> |

A RIF ruleset to manage this is shown under “domain mapping” below. Alternatively, A multi- choice type of construct could be expressed in RIF by testing for the presence of certain values in source attributes. An example of this is

|  |
| --- |
| Group  ( Forall ?line ?featureId ?surveyDatye ?theme ?lineGeom ( If  ( And  ( ?line # src:line  ?line[src:featId->?featureId src:survey->?surveyDate src:fema->?theme gml:geometry->?lineGeom]  ?line[src:tema->?category]  Or  ( External(pred:boolean-equal(?category "MOTORWAY"^^xsd:string)) External(pred:boolean-equal(?category "A\_CLASS"^^xsd:string)) External(pred:boolean-equal(?category "DUAL\_CARR"^^xsd:string)) External(pred:boolean-equal(?category "B\_CLASS"^^xsd:string)) External(pred:boolean-equal(?category "<4M\_TARRED"^^xsd:string)) External(pred:boolean-equal(?category "<4M\_T\_OVER"^^xsd:string)) External(pred:boolean-equal(?category "CL\_MINOR"^^xsd:string)) External(pred:boolean-equal(?category "CL\_M\_OVER"^^xsd:string))  )  )  )  Then ( Do  (\* create new tn-ro:RoadLink and associated properties (not shown here) \*) |

In this rule condition block, the fema attribute is tested against a set of values and, if it meets at least one of the conditions in the Or block, a new instance of the tn:roadLink class is created. The selection of which type of target object to create is controlled by assertions on source attributes.

Case 8: Multiple Correspondences (Structural)

Here is an example where there are structural differences between source and target models such that leaf (attribute) and inner (class) nodes change their relationships and it is necessary to navigate these differences to transform meaning from one to the other.

|  |
| --- |
| If  ( Or  ( External(pred:boolean-equal(?category "RL\_TUNNEL"^^xsd:string)) External(pred:boolean-equal(?category "CL\_RAIL"^^xsd:string)) External(pred:boolean-equal(?category "UNSHOWN\_RL"^^xsd:string))  )  )  Then  ( Do  ( ?rllink New()  ?rllink # tn-ra:RailwayLink  )  ) |

In this case, a check is made on the value of the variable ?category which has previous been assigned the category of the transport object defined in the source schema. Based on this value being within one of the constant value in the Or clause, a new object instance is created in the target schema. Thus, a source leaf node maps to a target inner node.

Case 9: Duplicate Correspondences

This refers to the same data appearing twice in the source schema (i.e. identical elements part of the same parent element or collection). The fact of their duplication does not automatically mean there is redundancy, as their cardinality can in itself be useful information. Therefore, it is necessary to enable the user to specify whether to filter them out, or to copy them across intact.

It is a tenet of RIF-Core [[49]](#_bookmark427) that duplicate elements in a source schema, when matched by a predicate in a rule condition, do not cause the outcome of the evaluation of the condition to produce a different result from the result in the absence of such duplicates. However, the challenge in the case of production rules and creation of target schema objects, is that the cardinality of such objects may not be respected in cases where it should be. In a Forall condition combined with a Do… Assert construct, every instance in the fact base that satisfies the rule condition will be transformed into a new instance. So the default behaviour of RIF is to respect the cardinality of objects during transformation. In order to filter out duplicates, it would be necessary to change the approach slightly, to re-test the condition of the fact base after each rule condition is evaluated. This could be done as follows:

|  |
| --- |
| Group  ( Forall ?X ?C ( If  ( And ( ?X[ex:count -> ?C] pred:numeric-greater-than(?C 0) )  //other rule conditions  )  Then ( Do  ( Modify (?X[ex:count-> func:numeric-subtract(?C 1)]) ) Assert ( ... )  )  )  ex:foo[ex:count -> 1]  )  ) |

This example is based on the RIF-PRD test case located at [[48].](#_bookmark426) In this case, alongside the rule conditions which would be evaluated by default, a counter value is also evaluated. It is initialised with the value 1 and decremented by one each time the rule conditions are tested. This means the Assert action will be performed exactly once. The contents of the Assert block are left empty.

**Pattern Drawn From INSPIRE Testing Activities**

The following patterns are drawn from our experience of INSPIRE testing.

|  |  |  |
| --- | --- | --- |
| ***Case No.*** | ***Type of correspondence*** | ***Description*** |
| 10 | Straight mapping including sub-attribute level | Mapping source feature attributes to target instances, including where attributes are nested within source objects |
| 11 | Default value setting | Supplying default values for certain attributes |
| 12 | Functional value setting | Calling external functions to transform attribute values |
| 13 | Domain mapping | Aligning of source and target codelists and enumerations |
| 14 | Classifying | Identifying correct target instance taxonomy based on source attributes |
| 15 | Class Inheritance | Defining rules against parent classes that can apply to all child classes |
| 16 | Assignment of unique identifier values | Assigning guaranteed unique identifier values to target instances on creation |
| 17 | Complex operations | Sophisticated target schema enrichment operations |
| 18 | Intermediate objects | Use of intermediate objects to decompose mapping into multiple steps. |

*Table 27 Further Patterns Drawn From INSPIRE Testing*

Case 10 Straight Mapping Including Sub-Attribute Level

This is a scenario where you have a source feature classifier with certain attributes. It maps fairly straightforwardly to a target feature class, with perhaps some direct attribute mappings and possibly sub-attribute mappings. It is equivalent to the scenario shown above under *Case 1: Single Correspondences (One-To-One)* and the example given under that heading serves to illustrate this category as well.

Case 11: Default Value Setting

See Missing correspondences (Source Lacks Data), point (a).

Case 12: Functional Value Setting

Consider this snippet:

|  |
| --- |
| ?obj[gml:id->func:concat("LPSNI"^^xsd:string "\_"^^xsd:string xsd:string(?featureId))] |

Here, an externally-defined function (in fact, part of the RIF-DTB dialect [[19])](#_bookmark399) named concat is called and returns the concatenation of its three string arguments, which is assigned to the gmlid attribute of the containing object.

Another example shown here, based on the Cadastral Parcels data theme, has the RIF-DTB function substring() which returns a truncated string being the first six characters of the

?parcelId variable’s contents, and the function getPoint() which is defined in a third- party spatial library and derives the value required to be assigned to the cp:referencePoint attribute as a side node (we assume the function guarantees that the returned point lies within the source geometry).

|  |
| --- |
| ?parcel # src:PropertyRegistrationParcel  ?geometry # gml:geometry  ?cparcel # cp:CadastralParcel  ?iId # net:inspireId  ?iId[localId->xsd:string(?parcelId) namespace->"TDK.CP"^^xsd:string]  ?parcelId ?parcel[cp:inspireId->?iId]  ?cparcel[cp:label->External(func:substring(?parcelId, 0, 6))  cp:referencePoint->External(func:getPoint(?geometry))) |

Case 13: Domain Mapping

A typical INSPIRE transformation problem is the mapping of domains of values (e.g. codeLists and Enumerations) from one schema to another. The definition of the mapping requires domain expertise. However, the separate question of how to express the mapping using a rules language can be tackled in RIF using the following constructs.

Firstly, a set of lists are created to hold the source and target enumerations. Note that the index position of each element provides the required information to map from source to target values, e.g. DUAL\_CARR in the source schema maps to motorway in the target schema.

|  |
| --- |
| ["http://1spatial.com/inspire/fema\_list"^^rif:iri](http://1spatial.com/inspire/fema_list) [func:make-list("MOTORWAY"^^xsd:string  "A\_CLASS"^^xsd:string |

|  |
| --- |
| "DUAL\_CARR"^^xsd:string "B\_CLASS"^^xsd:string "CL\_MINOR"^^xsd:string "CL\_M\_OVER"^^xsd:string "<4M\_TARRED"^^xsd:string "<4M\_T\_OVER"^^xsd:string )]  ["http://1spatial.com/inspire/fow\_list"^^rif:iri](http://1spatial.com/inspire/fow_list) [func:make-list("motorway"^^xsd:string  "singleCarriageway"^^xsd:string "motorway"^^xsd:string "singleCarriageway"^^xsd:string "singleCarriageway"^^xsd:string "singleCarriageway"^^xsd:string "singleCarriageway"^^xsd:string  "singleCarriageway"^^xsd:string )] |

Secondly, the lists are used to perform the mapping. The index-of() and get() functions defined in RIF-DTB enable retrieval of the index of the source value and, from that, the target value.

|  |
| --- |
| (?theme ?line[src:fema->?theme])  ?fway New()  ?fway # tn-ro:FormOfWay  ?fway[tn-ro:formOfWay->External(func:get(fow\_list External(func:index-of(fema\_list  ?theme))))] |

Case 14: Classifying

This is the scenario where we map a source object to a target object, and make the selection of the target object’s type (i.e. class) dependent on a logical formula which is a series of tests applied to one or more source attributes. In this example drawn from the Transport Networks data theme, the source feature class is CO\_BUILDING, a generic building class, with a feature type attribute BUILDINGUS, which specifies the type of building. Suppose that we want to make the instantiation of a RailwayStationArea in the target schema happen only in cases where the BUILDINGUS value is 7.0 and the DATE is greater than 2009.1.1.

We could express that meaning using the following RIF constructs.

|  |
| --- |
| Forall ?building such that ?building # src:CO\_BUILDING ( If  ( ?building[src:BUILDINGUS->"7.0"^^xsd:double src:DATE->"2009.1.1"^^xsd:string]) ( Then  ( Do  ( Assert  ( ?rsa New()  ?rsa # tn-ra:RailwayStationArea (?geom ?building[src:GEOMETRY->?geom])  ?rsa[net:geometry->?geom]  )  )  )  ) |

|  |
| --- |
| ) |

This exemplifies application of a target object classification based on source attributes.

Case 15: Class Inheritance

In many cases, source schema features can be identified as occupying a place within an ontological inheritance hierarchy, as a child class of another, perhaps abstract, class. For example, in the INSPIRE application schema, the Hydrography application schema contains the hydro-base application schema which defines the HydroObject class. This class is a parent for every other hydrographic feature class and provides a central place for defining certain identifier type information. The creation of subclass instances of the HydroObject during a transformation could involve use of rules that take advantage of the fact that everything being created in the target schema (as far as hydrography is concerned) “is a” HydroObject element. A rule such as the following can be defined once for the entire transformation, rather than repeatedly for each concrete class instance. This approach simplifies the rules base. N.B. these rules operate on target instances created in a previous pass or action. In cases where there is already an inheritance hierarchy in the source schema, rules of this sort can also operate during a first pass. Note that this approach could also apply to setting of the gmlid on target features being subclasses of AbstractFeature.

|  |
| --- |
| (\* Rule 1 – process a concrete class. \*)  Forall ?riversegment ( If  ( ?riversegment # src:RiverSegment )  Do  ( Assert  ( ?wcls New()  ?wcls # hy-n:WatercourseLinkSequence  (\* etc for other straight attribute mappings \*)  )  )  )  (\* Rule 2 - process its abstract class. \*)  (\* assuming rule condition variables ?id and ?dp have already been declared and assigned \*)  Forall ?ho ( If  ( ?ho # hy:HydroObject )  Do  ( Modify  ( ?gname New()  ?gname # gn:GeographicalName  ?hi New()  ?hi # hy:hydroIdentifier  ?hi[hy:localId->?id hy:namespace->?dp]  ?ho[gn:GeographicalName->External(function:append(?gname)) hy:hydroId->External(function:append(?hi))]  )  ) |

|  |
| --- |
| ) |

Case 16: Assignment Of Unique Identifier Values

The Schema Transformation Network Service is responsible for deriving INSPIRE features from source features. Each INSPIRE feature needs a unique and persistent identifier. To be unique and persistent it is recommended that all INSPIRE identifiers be derived, using a deterministic process, from information contain in the attributes of the source features. In this way, if the transformation process is repeated, an identical set of inspire features will generated. The derivation process should be insensitive to the order in which features are transformed. Specifically, it is not recommended that any external state (like database sequences) be used in the derivation of INSPIRE identifiers.

In a simple example, where one INSPIRE feature is derived from one source feature, all that is required is to copy the source attribute, and set the namespace to a unique string managed by the owner of the source dataset. If the structure of the INSPIRE identifier changes over time, different approaches could be applied to derive a unique and persistent identifier.

|  |
| --- |
| Group  ( Forall ?X ( If  (  (\* rule conditions here, bind ?id variable to a source id attribute.  And CO.DP is a unique namespace managed by the owner of the source data. \*)  )  Then Do  ( Assert  ( ?inspireId New()  ?inspireId # net:InspireId  ?inspireId[base:localId-> ?id)]  ?inspireId[base:namespace->”CO.DP.”^^xsd:string)]  )  )  ex:foo[ex:count -> 5]  )  ) |

Where more than one INSPIRE feature is derived from a single source feature, the process can be adapted by

1. Using the outlined process to generate a unique INSPIRE identifier for the source feature (whether or not it will actually be outputted)
2. Generated a set of identifiers for the generated INSPIRE features that use the INSPIRE id of the source feature as a ‘namespace’. This namespace need not be placed in nominated namespace attribute; it may merely be an appropriately delimited prefix to the localId.

It is not clear that it would be possible to generate meaningful persistent INSPIRE identifiers if the source datasets do not contain enough information to derive them in a deterministic manner. In such circumstances, it would still be possible to using a randomly generated UUID to assign a unique identifier. However, running the transformation process twice would generate a different set of identifiers.

Case 17: Complex Operations

The following is a complex operation defined using natural language. It comprises a ruleset following by a sequence of actions which are performed if the rule is satisfied. The action states:

*“For cadastral boundaries that touch cadastral parcels, if it is either a left or right boundary, then assign the cadastral boundary’s reference as the cadastral parcel instance’s cp:boundary attribute and, likewise, assign the cadastral parcel’s reference as the cadastral boundary instance’s cp:parcel attribute.”*

This would be cumbersome to implement using RIF, therefore it is recommended that operations be defined as external functions and imported into the RIF document. See the “black-box” approach described in Section [6.2.3](#_bookmark350) Spatial Extensions.

Case 18: Intermediate Objects

Mapping definitions can sometimes be simplified through the use of intermediate objects. These allow the mapping process to be broken into a series of transformations, rather than tackled in one go. Although use of intermediate objects introduces the complexity of an extra schema, it results in a more modular mapping definition, which may be easier to design and maintain.

Intermediate objects may be used to merge logically similar classes in the source dataset (such as RIVER\_POLYGON and RIVER\_LINE) before translation to an INSPIRE class (e.g. Watercourse).

Equally, intermediate objects could be used to separate logically dissimilar objects in the source data (for example, split TRANSPORT\_LINES into ROAD\_LINKS and RAIL\_LINKS) before translation to different INSPIRE classes.

The Schema Transformation Network Service should only output data in the nominated target schema. This means that intermediate objects can be created in an alternative schema without them appearing in the generated dataset. It is not recommended that intermediate objects are generated in the source schema as this may lead to race conditions and/or infinite loops.

**Appendix F: Supported Simple Features Functions and Predicates**

The following is a listing of the spatial functions and predicates supported by the Schema Transformation Network Service prototype. It illustrates the approach to naming functions and predicates proposed in the main body of the document (see Section [6.2.4).](#_bookmark351) Note that it is up to the implementers of a given transformation engine to implement these functions and predicates and document clearly any that they do not support.

|  |
| --- |
| IRI of Function or Predicate |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#GetDimension> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#GetSpatialReference> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#SetSpatialReference> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#IsEmpty> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#IsSimple> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#Envelope> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#Project> |
| <http://www.opengeospatial.org/standards/sfa/IGeometry#Extent2D> |
| <http://www.opengeospatial.org/standards/sfa/IWks#ExportToWKB> |
| <http://www.opengeospatial.org/standards/sfa/IWks#ExportToWKT> |
| <http://www.opengeospatial.org/standards/sfa/IWks#ImportFromWKB> |
| <http://www.opengeospatial.org/standards/sfa/IWks#ImportFromWKT> |
| <http://www.opengeospatial.org/standards/sfa/IGeometryFactory#CreateFromWKB> |
| <http://www.opengeospatial.org/standards/sfa/IGeometryFactory#CreateFromWKT> |
| <http://www.opengeospatial.org/standards/sfa/IPoint#Coords> |
| <http://www.opengeospatial.org/standards/sfa/IPoint#GetX> |
| <http://www.opengeospatial.org/standards/sfa/IPoint#GetY> |
| <http://www.opengeospatial.org/standards/sfa/ICurve#GetLength> |
| <http://www.opengeospatial.org/standards/sfa/ICurve#StartPoint> |
| <http://www.opengeospatial.org/standards/sfa/ICurve#EndPoint> |
| <http://www.opengeospatial.org/standards/sfa/ICurve#IsClosed> |
| <http://www.opengeospatial.org/standards/sfa/ICurve#Value> |
| <http://www.opengeospatial.org/standards/sfa/ILineString#GetNumPoints> |
| <http://www.opengeospatial.org/standards/sfa/ILineString#Point> |
| <http://www.opengeospatial.org/standards/sfa/ISurface#GetArea> |
| <http://www.opengeospatial.org/standards/sfa/ISurface#Centroid> |
| <http://www.opengeospatial.org/standards/sfa/ISurface#PointOnSurface> |
| <http://www.opengeospatial.org/standards/sfa/IGeometryCollection#GetNumGeometries> |
| <http://www.opengeospatial.org/standards/sfa/IGeometryCollection#Geometry> |
| <http://www.opengeospatial.org/standards/sfa/IPolygon#ExteriorRing> |
| <http://www.opengeospatial.org/standards/sfa/IPolygon#GetNumInteriorRings> |
| <http://www.opengeospatial.org/standards/sfa/IPolygon#InteriorRing> |
| <http://www.opengeospatial.org/standards/sfa/IMultiCurve#GetLength> |
| <http://www.opengeospatial.org/standards/sfa/IMultiCurve#IsClosed> |
| <http://www.opengeospatial.org/standards/sfa/IMultiSurface#GetArea> |
| <http://www.opengeospatial.org/standards/sfa/IMultiSurface#Centroid> |
| <http://www.opengeospatial.org/standards/sfa/IMultiSurface#PointOnSurface> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Equals> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Touches> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Intersects> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Contains> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Within> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Disjoint> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Crosses> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation#Overlaps> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialRelation2#Relate> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialOperator#Distance> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialOperator#Boundary> |
| <http://www.opengeospatial.org/standards/sfa/ISpatialOperator#Buffer> |
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*Table 28 Supported and Unsupported Simple Features Functions and Predicates*

**Appendix G: Definitions, Acronyms, Abbreviations and Initials**

Definitions, acronyms, abbreviations and initials are available in the INSPIRE Glossary [[2].](#_bookmark385) The following are also introduced in this document.

|  |  |
| --- | --- |
| ***Acronyms, Abbreviations and Initials*** | ***Expansions and Definitions*** |
| ATL | *ATLAS Transformation Language*, a model transformation language and toolkit to produce a set of target models from a set of source models. |
| CRS | *Coordinate Reference System*, a system that defines how georeferenced spatial data relates to real locations on the Earth’s surface. |
| DQ | *Data Quality*: the processes and technologies involved in ensuring the conformance of data values to business requirements and acceptance criteria (see [[50]).](#_bookmark428) |
| ebXML | *Electronic Business using eXtensible markup Language*, a family of XML based standards whose mission is to provide an open, XML-based infrastructure for exchanging business information. |
| EC | *European Commission*, the executive body of the European Union. |
| ETL | *Extract, Transform and Load*, a database and data warehousing term referring to the process of migrating data from one storage format to another. |
| FME | A widely-used spatial ETL solution that enables GIS Professionals to translate, transform, integrate and distribute spatial data. |
| GIS | *Geographic Information System*, a system that captures, stores, analyses, manages, and presents data that are linked to location. |
| GML | *Geography Markup Language*, the XML grammar defined by the OGC to express geographical features |
| gOML | *Geographic Profile of the OML*, a subdialect of OML written by the Humboldt Community for use in its Alignment Editor and Conceptual Schema Transformer applications. |
| HTTP | *Hypertext Transfer Protocol*, a protocol for distributed, collaborative, hypermedia information systems |
| INSPIRE | *Infrastructure for Spatial Information in the European Community*, a European Union wide initiative to harmonise spatial data infrastructures in order to support policy and decision making in Europe. |
| IOC | *INSPIRE Initial Operating Capacity Task Force*, a group commissioned to help and support the implementation of INSPIRE in the Member States of the European Union. |
| IR | *Implementing Rules*, a set of rules to ensure that the spatial data infrastructures of the Member States of the European Union are compatible and usable in a Community and transboundary context. |
| ISO | *International Organisation for Standardization*, the world's largest developer and publisher of international standards. |
| JRC | *Joint Research Centre*, the European Union's scientific and technical research laboratory and an integral part of the European Commission. |
| LMO | *Legally Mandated Organisation*, an organisation that has or will have a legal |

|  |  |
| --- | --- |
| ***Acronyms, Abbreviations and Initials*** | ***Expansions and Definitions*** |
|  | mandate for one or more aspects of INSPIRE. |
| MOF | *Meta-Object Facility*, an OMG standard for model-driven engineering. |
| OGC | *Open Geospatial Consortium*, an international, non-profit organization engaged in development of standards for geospatial and location based services. |
| OMG | *Object Management Group*, an international, open membership, not-for-profit computer industry consortium involved in developing enterprise integration standards for a variety of technologies. |
| OML | *Ontology Mapping Language*, a modelling language enabling the user to specify correspondences between two ontologies. |
| QVT | *Query/View/Transform*, a standard for model transformation defined by the OMG. |
| RDF | *Resource Description Framework*, a general method for conceptual description or modelling of information that is implemented in Web resources. |
| RIF | *Rule Interchange Format*, a W3C standard for exchanging rules among rule systems, in particular among Web rule engines. |
| RIF-BLD | *RIF Basic Logic Dialect*, a RIF dialect that enables logic rules to be exchanged between rule systems. |
| RIF-Core | *RIF Core Dialect*, a common subset of the RIF-BLD and RIF-PRD dialects, based on RIF-DTB 1.0. |
| RIF-DTB | *RIF Datatypes and Built-Ins*, a RIF dialect containing datatypes, built-in functions and built-in predicates expected to be supported by RIF dialects such as RIF- PRD, RIF-BLD and RIF-Core. |
| RIF-FLD | *RIF Framework for Logic Dialects*, a framework for specifying the syntax and semantics of RIF logic dialects. |
| RIF-PRD | *RIF Production Rules Dialect*, a standard XML serialization format for production rule languages. |
| SDIC | *Spatial Data Interest Community*, an organisation with an interest in improving use of resources for spatial data management and the development and operation of spatial information services. |
| SOA | *Service-Oriented Architecture*, a system design approach that views components as online services which produce or consume data in relation to one another. |
| SOAP | A protocol specification for exchanging structured information in the implementation of Web Services in computer networks (original meaning was Simple Object Access Protocol) |
| SQL | *Structured Query Language*, a database computer language designed for managing data in relational database management systems. |
| TNS | *Transformation Network Service*, a Web service providing query or data instance transformation services. |
| UDDI | *Universal Description, Discovery and Integration*, a platform-independent, XML- based registry for publishing business services online. |
| UML | *Unified Modeling Language*, a standardised general-purpose modelling |

|  |  |
| --- | --- |
| ***Acronyms, Abbreviations and Initials*** | ***Expansions and Definitions*** |
|  | language in the field of software engineering. |
| URL | *Uniform Resource Locator*, an identifier that specifies where a network resource is available and the mechanism for retrieving it. |
| UUID | *Universally Unique Identifier*, an identifier standard used in software construction, that enables distributed systems to uniquely identify information without significant central coordination. |
| W3C | The *World-Wide Web Consortium*, an international community of member organisations working to develop Web standards. |
| WFS | *Web Feature Service*, a specification providing an interface enabling requests for geographical features across the Web using platform-independent calls. |
| WFS-T | *Web Feature Service (Transactional),* a WFS with additional support for transactions, which are atomic, consistent, isolated and durable pieces of information processing activity. |
| WS-Addressing | *Web Services Addressing*, a specification providing transport-neutral mechanisms to address Web services and messages. |
| WSDL | *Web Services Description Language*, an XML format for describing network services. |
| WS-I | *Web Services Interoperability Organization*, an open industry organization chartered to establish best practices for Web services interoperability. |
| XMI | *XML Metadata Interchange*, an OMG standard for exchanging metadata information via XML, which is a serialization format for MOF-compliant models. |
| XML | *eXtensible Markup Language*, a set of rules for encoding documents electronically. |
| XSLT | *eXtensible Stylesheet Language Transformations*, a language for transforming XML documents into other XML documents. |

*Table 29 Explanation of Acronyms*

**Appendix H: References**

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INSPIRE

Infrastructure for Spatial Information in Europe

**Technical Guidance for the implementation of INSPIRE Discovery Services**

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**Foreword**

Directive 2007/2/EC of the European Parliament and of the Council [**Directive 2007/2/EC**], adopted on

14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE will make available relevant, harmonised and quality geographic information to support the formulation, implementation, monitoring and evaluation of policies and activities, which have a direct or indirect impact on the environment.

INSPIRE is based on the infrastructures for spatial information established and operated by the 27 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in the following areas.

* Metadata;
* The interoperability and harmonisation of spatial data and services for selected themes (as described in Annexes I, II, III of the Directive);
* Network Services;
* Measures on sharing spatial data and services;
* Co-ordination and monitoring measures.

The Implementing Rules are adopted as Commission Decisions or Regulations, and are binding in their entirety.

In particular with respect the Network Services, Implementing Rules are required for the following services (Article 11(1) of the Directive):

1. *“discovery services search for spatial data sets and spatial data services on the basis of the content of corresponding metadata, and display the metadata content;*
2. *view services as a minimum, display, navigate, zoom in/out, pan, or overlay spatial data sets and display legend information and any relevant content of metadata;*
3. *download services enabling copies of complete spatial data sets, or of parts of such sets, to be downloaded;*
4. *transformation services enabling spatial data sets to be transformed with a view to achieving interoperability;*
5. *invoke spatial data services" enabling data services to be invoked.”*

In addition to the Implementing Rules, non-binding Technical Guidance documents describe detailed implementation aspects and relations with existing standards, technologies, and practices. They may need to be revised during the course of implementing the infrastructure to take into account the evolution of technology, new requirements, and cost benefit considerations. Figure 1 illustrates the relationship between the INSPIRE Regulations containing Implementing Rules and their corresponding Technical Guidance documents.

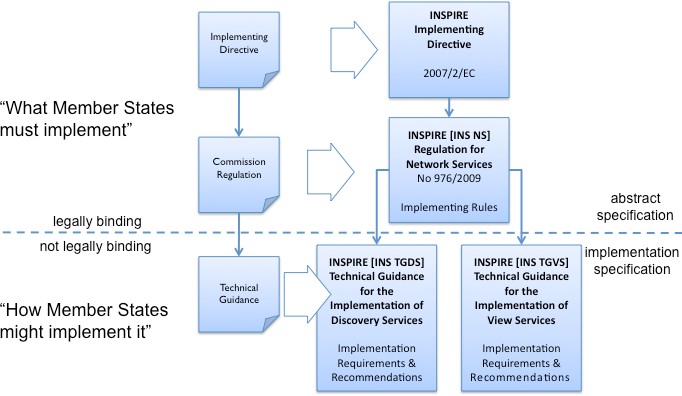


Figure 1: Relationship between INSPIRE Implementing Rules and Technical Guidance

Technical Guidance documents define how Member States might implement the Implementing Rules described in a Commission Regulation. Technical Guidance documents may include non-binding technical requirements that must be satisfied if a Member State chooses to conform to the Technical Guidance. Implementing this technical guidance will maximise the interoperability of INSPIRE services.

This Technical Guidance concerns the INSPIRE Discovery Services. The Technical Guidance contains detailed technical documentation highlighting the mandatory and the recommended elements related to the implementation of INSPIRE Discovery Services. The technical provisions and the underlying concepts are often illustrated by use case diagrams and accompanied by examples.

|  |
| --- |
| This document will be publicly available as a ‘non-paper’, as it does not represent an official position of the Commission, and as such cannot be invoked in the context of legal procedures. |

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Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use, which might be made of this publication.

**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Release** | **Editor** | **Description** |
| 28Jul2009 | 2.0 | Network Services Drafting Team | Two approaches to include INSPIRE metadata as  part of the *Get Discovery Service Metadata response* have been incorporated |
| 17Jun2010 | 2.12 | Initial Operating Capability Task Force | The INSPIRE extended Capabilities XML schema has been included in Annex B  Links with other technical components in INSPIRE have been described based on the INSPIRE domain model  A new interpretation and recommended implementation of the Link Discovery Service operation has been described  An approach to implement the required Language parameter has been recommended  General editorial changes |
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| 07Nov2011 | 3.1 | IOC TF | IOC TF Approved |

1. **Introduction**

INSPIRE Discovery Services allow users and computer programs to search for spatial datasets and services based on their metadata records. This document specifies Technical Guidance for Member States to implement INSPIRE Discovery Services as mandated by the Regulation on INSPIRE Network Services [**INS NS,** Annex II].

Following this Technical Guidance will ensure that INSPIRE Discovery Services are implemented in a consistent and compatible way across Europe. It is based on European and International standards, current practices in related stakeholder communities and relevant European initiatives such as e-Government, and the EU Interoperability Framework.

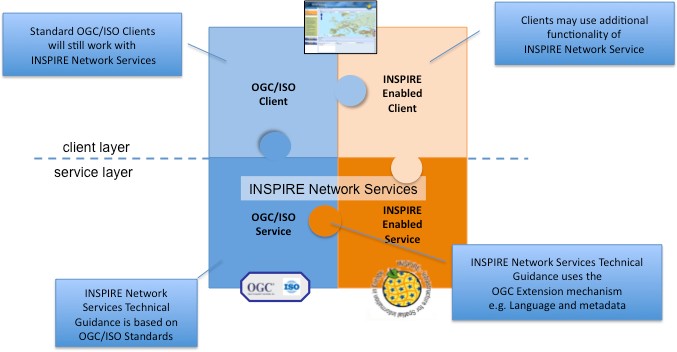


Figure 2: Extending ISO and OGC Standards for INSPIRE Requirements

This document specifics requirements and recommendations based on the OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0 [**CSW ISO AP**]. It defines an INSPIRE Profile of [**CSW ISO AP**] to implement the following operations:

* + **Get Discovery Service Metadata**: Provides all necessary information about the Discovery Service and describes service capabilities;
  + **Discover Metadata**: Allows requesting INSPIRE metadata elements of spatial data sets and services from a Discovery Service;
  + **Publish Metadata**: Allows editing of INSPIRE metadata elements of resources in the Discovery Service (push or pull metadata mechanisms). Editing meaning insert, update and delete;
  + **Link Discovery Service**: Allows the declaration of the availability of a Discovery Service for the discovery of resources through the Member State Discovery Service while maintaining the resource metadata at the owner’s location.

In addition, this document defines how a query for metadata should be written, and how to handle multilingual aspects of INSPIRE Discovery Services.

This is the initial version of the Technical Guidance document and it has been validated and tested in collaboration with the Initial Operating Capability Task Force. It may be used by the Member States for the initial implementation of the INSPIRE Discovery Services.

1. **Normative references**

This technical guidance incorporates, by dated or undated references, provisions from other publications. For dated references, subsequent amendments to or revisions of any of these publications apply to this guide only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

These normative references are cited at the appropriate places in the text and the publications are listed hereafter:

INSPIRE, Implementing **Directive 2007/2/EC** of the European Parliament and of the Council as regards interoperability of spatial data sets and services

INSPIRE**, INS NS** Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services

INSPIRE**, INS MD** Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata (Text with EEA relevance). See also Corrigendum to INSPIRE Metadata Regulation

INSPIRE**, INS MDTG,** INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119.

INSPIRE, **INS DSTG**, Technical Guidance for the implementation of INSPIRE Discovery Services

**ISO 19115**:**2003***, Geographic information – Metadata*

**ISO 19115/Cor.1:2006***, Geographic information – Metadata, Technical Corrigendum 1*

**ISO 19119:2005***, Geographic information – Services*

**ISO 19119:2005 PDAM 1,** *Geographic information – Services*

**ISO/TS 19139:2006***, Geographic information - Metadata - Implementation specification*

OGC 07-006, **OGC CSW**, OGC™ Catalogue Services Specification, version 2.0.2 (Corrigendum Release 2).

OGC 07-045, **CSW ISO AP**, OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0, version 1.0.0 (2007).

OGC 05-008, **OGC OWS**, OGC Web Services Common Specification, version 1.0 (May 2005)

1. **Terms and abbreviations**
   1. ***Terms***
2. **application profile**

set of one or more base standards and - where applicable - the identification of chosen clauses, classes, subsets, options and parameters of those base standards that are necessary for accomplishing a particular function [ISO 19101, ISO 19106]

1. **discovery services**

making it possible to search for spatial data sets and services on the basis of the content of the corresponding metadata and to display the content of the metadata [INSPIRE Directive]

1. **metadata**

information describing spatial data sets and spatial data services and making it possible to discover, inventory and use them [INSPIRE Directive]

1. **metadata element**

a discrete unit of metadata, in accordance with [ISO 19115]

1. **network services**

network services should make it possible to discover, transform, view and download spatial data and to invoke spatial data and e-commerce services [INSPIRE Directive]

1. **queryable**

a metadata element that can be queried upon

1. **spatial data**

data with a direct or indirect reference to a specific location or geographic area [INSPIRE Directive]

1. **spatial data set**

identifiable collection of spatial data [INSPIRE Directive]

* 1. ***Abbreviations***

AP Application Profile

ARC Architecture

CSW Catalogue Services for the Web

CSWT Catalogue Services for the Web Transactional GET HTTP Get Method

HTTP Hypertext Transfer Protocol

INSPIRE Infrastructure for Spatial Information in Europe IOC Initial Operations Capability

ISO International Organisation for Standardisation KVP Key Value Pair

MD Metadata

NS Network Services

OWS OGC Web Services Common Specification TF Task Force

XML eXtended Markup Language

* 1. ***Verbal forms for the expression of provisions***

In accordance with the ISO rules for drafting, the following verbal forms shall be interpreted in the given way:

* “shall” / “shall not”: a requirement, mandatory to comply with the technical guidance
* “should” / “should not”: a recommendation, but an alternative approach may be chosen for a specific case if there are reasons to do so
* “may” / “need not”: a permission

**Implementation Requirements and Recommendations notation**

To make it easier to identify the requirements and the recommendations for INSPIRE Discovery Services within this technical guidance, they are highlighted and numbered as shown below:

**Implementation Requirements #** are shown using this style

**Implementation Recommendations #** are shown using this style.

**Note**: It is worth noting that requirements as specified in the INSPIRE Regulations and Implementing Rules are legally binding, and that requirements and recommendations as specified in INSPIRE Technical Guidance are **not** legally binding. Therefore, within this technical guidance we have used the terms ‘implementation requirement’ and ‘implementation recommendation’ to indicate what is technically required or recommended to conform to the Technical Guidance.

**XML Example notation**

XML Examples are shown using Courier New on a grey background as below:

</inspire:example>

<inspire:highlight>

Highlighted Text for emphasis

</inspire:highlight>

<inspire:example>

**Note**: XML Examples are informative and are provided for information only and are expressly not normative. A reference implementation of the example XML is available on the following link:

<http://inspire.ec.europa.eu/schemas/>

* 1. ***References***

To aid readability for a non-technical audience, references within this document are denoted using “Section” or “Annex”. For example, Section 4.3.1 or Annex A.

References to other documents refer to the list of normative references in Section 3 and use the abbreviated title as indicated in **Bold** text. For example, [**CSW ISO AP**] uses the abbreviated title for the document as shown below:

OGC 07-045, **CSW ISO AP**, OGC™ Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile for CSW 2.0, version 1.0.0 (2007).

References within other documents are shown as above using the abbreviated title, together with the appropriate section within the document. For example, [**CSW ISO AP,** Section 8.2.3.1], refers to Section 8.2.3.1 within the document as listed above.

1. **INSPIRE Profile of CSW ISO AP**
   1. ***General background***

The base specification of an INSPIRE Discovery Service is [**CSW ISO AP**].

|  |
| --- |
| **Implementation Requirement 1** An INSPIRE Discovery Service shall implement the mandatory behaviour of a [**CSW ISO AP**] compliant service and the extensions as required by the INSPIRE  Directive and its associated Regulations. |

|  |
| --- |
| **Implementation Requirement 2** The extended behaviour for an INSPIRE Discovery Service with respect to the requirements of the INSPIRE Directive and the Regulation on INSPIRE Network Services [**INS NS**] consists of: Discovery Service Operations, Discovery Service Queryables, and  Discovery Service Multilingual aspects |

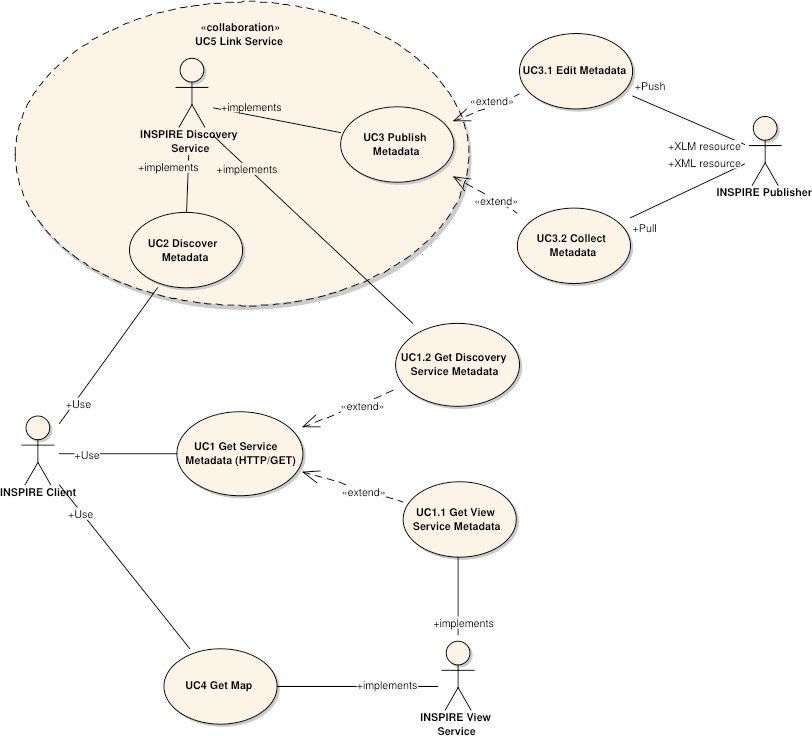


Figure 3: INSPIRE Generic Use Case

Figure 3: INSPIRE Generic Use Case illustrating use cases for the creation and publication of metadata, their discovery through a discovery service and viewing of spatial data sets via an INSPIRE View service.

**Rationale behind the choice of an INSPIRE Schema for implementing the extended capabilities of INSPIRE Network Services**

The INSPIRE Network Service Regulation [**INS NS**] requires a Network Service to respond to a “Get Network Service Metadata” request with a response that contains as one of its parameters the Network Service INSPIRE metadata.

At the time of writing this Technical Guidance the OGC GetCapabilities response document does not include all required INSPIRE metadata for the Network Service and in order to do so the Extended Capabilities mechanism is used. Through this mechanism it is possible to link INSPIRE metadata with the GetCapabilities response, either by including the missing INSPIRE metadata elements of the Network Service, or by including a reference to the INSPIRE Network Service metadata record.

The initial approach was to re-use, for extended capabilities elements, the ISO 19139 data types. The Advantages of using the ISO 19139 data types are:

* New data types do not need to be defined
* Existing client applications already have the necessary bindings to read and write the information. Type redefinition was however necessary for the following elements:
  + INSPIRE Service Type (implemented as gco:GenericName\_PropertyType)
  + Languages
  + CurrentLanguage
  + TemporalReference

Which however breaks compatibility with existing clients. The disadvantages of this approach on the other hand are:

* ISO 19139 data types currently have a double implementation;
  + The schemas from ISO 19139 version 2005-DIS (Draft International Standard) dated 2006 May 4 (20060504/) depend on the unofficial GML 3.2.0 version, but on the other hand is used in ISO AP 1.0 for CSW;
  + The ISO/TS 19139 Schemas dated 2007 April 17 (20070417/) depend on the official GML version 3.2.1 which relies on a different namespace but does not make available the implementation for the “srv” namespace for service metadata;
* CSW schema version 2.0.2 includes OGC filter version 1.1.0 which in turn includes GML version 3.1.1;
* An INSPIRE view service may also be implemented using WMS 1.1.1. The WMS 1.1.1 schema however is officially implemented only through DTD technology. There is no official DTD implementation for ISO 19139.

As a result for the discovery service capabilities document this approach would require reference to three different versions of GML in the same document.

**It has therefore been decided to use a custom INSPIRE schema for the missing INSPIRE metadata elements in the Extended Capabilities section. This allows for an easy integration with all OGC services and full validation of INSPIRE compliance using standard XML validation.** Table 3 **shows the mapping between the INSPIRE metadata elements and the OGC Capabilities metadata elements.**

**Note: the schema will be aligned to the relevant standards once these support the INSPIRE requirements. Alignment between OWS and ISO 19119 should also help addressing some of the issues.**

The custom INSPIRE schemas are available at <http://inspire.ec.europa.eu/schemas/>

This Technical Guidance uses the following namespace definitions:

xmlns:inspire\_ds="<http://inspire.ec.europa.eu/schemas/inspire_ds/1.0>" xmlns:inspire\_common="<http://inspire.ec.europa.eu/schemas/common/1.0>"

The following sections specify the required extensions to the given specifications.

* 1. ***INSPIRE Profile Implementation Requirements***

The INSPIRE specific constraints applicable to an [**CSW ISO AP**] base Discovery Service are:

|  |
| --- |
| **Implementation Requirement 3** The list of federated catalogues, if any, shall be advertised as the result of a Service metadata response to a Discover Metadata request. |

|  |
| --- |
| **Implementation Requirement 4** The additional search attributes listed in Section 4.4 are mandatory and shall be supported. |

|  |
| --- |
| **Implementation Requirement 5** The additional search attributes listed in Section 4.4 shall be advertised as the result of a Service metadata response to a discover metadata request. |

* + 1. **Discovery service exceptions**

Internationalisation of service exceptions is optional.

**Implementation Recommendation 1** If service exceptions are internationalised then the error messages (exceptions) are either expressed in the service’s default language (suppose that the request is incorrect and the LANGUAGE parameter has not been interpreted before issuing the error/exception text) or in the preferred (requested) language in other cases.

See also Section 4.5.3 Common concept for other operations.

* 1. ***Discovery service operations***

The base functionality of an INSPIRE Discovery Service is derived from [**CSW ISO AP**]. The following sections specify the extensions to this base specification that are derived from the INSPIRE requirements as defined by [**INS NS**].

[**CSW ISO AP**] distinguishes between two types of catalogue services: A 'read-only' catalogue service that has to provide operations labelled 'CSW' and a transactional catalogue service that has to provide operations labelled 'CSWT'. This distinction is derived from the OGC catalogue base specification [**OGC CSW**].

Table 1 shows the relationship between operations of an INSPIRE Discovery Service and the corresponding catalogue service operation as defined by [**OGC CSW**]. Figure 4 illustrates the Get Discovery Service metadata use case.

Table 1: INSPIRE Discovery Services Operations

|  |  |  |
| --- | --- | --- |
| **INSPIRE Discovery Services Operations** | **INSPIRE**  **Cardinality** | **OGC CSW ISO AP operations** |
| Get Discovery Service Metadata | Mandatory | OGC\_Service.GetCapabilities |
| Discover Metadata | Mandatory | CSW Discovery.GetRecords |
| Publish Metadata | Conditional | CSWT Manager.Transaction or CSWT Manager.Harvest |
| Link Discovery service | Mandatory | Combination of OGC\_Service.GetCapabilities and CSW Discovery.GetRecords  OR using Publish Metadata operation:  CSWT Manager.Transaction or CSWT Manager.Harvest |

* + 1. **Get Discovery Service Metadata**

The Get Discovery Service Metadata use case is illustrated in Figure 4.

|  |  |  |
| --- | --- | --- |
| INSPIRE  Implementing Rule | Reference [**INS NS,** Annex II] | Section 2 |
| Operation name | Get Discovery Service Metadata |
| Obligation / condition | Mandatory |
| CSW ISO AP | Operation name | OGC\_Service.GetCapabilities |
| Definition | The GetCapabilities operation allows clients to retrieve service metadata from a server. |

* + - 1. ***Request Parameters***

|  |
| --- |
| **Implementation Requirement 6** See [**CSW ISO AP**]. INSPIRE extends this operation with an additional parameter that indicates the client’s preferred language. The recommended approach to  implement this extension is described in Section 4.5.1. |

* + - 1. ***Response Parameters***

According to [**INS NS**, Annex II, Section 2.2] the Get Discovery Service Metadata shall contain the following sets of parameters:

* + - * + Discovery Service Metadata, containing at least the INSPIRE metadata elements of the Discovery Service;
        + Operations Metadata to provide metadata about the operations implemented by the Discovery Service; and
        + Languages, including the Supported languages and Response language.

The GetCapabilities response of the [**CSW ISO AP**] does not fully satisfy the requirements of the INSPIRE Network Services Regulation [**INS NS**] and in particular with respect the Discovery Service INSPIRE metadata and Language parameters (see Table 2: GetCapabilities Response [CSW ISO AP]). Two scenarios have been identified to comply with this requirement. It is up to the Member State to choose which scenario best fits its needs. As these scenarios are not mutually exclusive, a Member State may choose to implement both.

|  |
| --- |
| **Implementation Requirement 7** The response shall include discovery service metadata parameters [**INS NS**] by implementing either scenario below:   1. Scenario 1: Referencing a URL mapped to the GetCapabilities response by the MetadataURL element in the ExtendedCapabilities of the [**CSW ISO AP**]; Mandatory [OGC CSW ISO AP] capabilities parameters (see Table 2) shall be mapped to INSPIRE metadata elements to implement a consistent interface.   OR   1. Scenario 2: Including all required metadata explicitly in the GetCapabilities response [**CSW ISO AP**]. INSPIRE metadata elements that can't be mapped to [**CSW ISO AP**] elements are implemented as Extended Capabilities.   To fulfil the specific language requirements of the INSPIRE Network Services Regulation [**INS NS**], a language section shall be added in the extended capability of the service. |

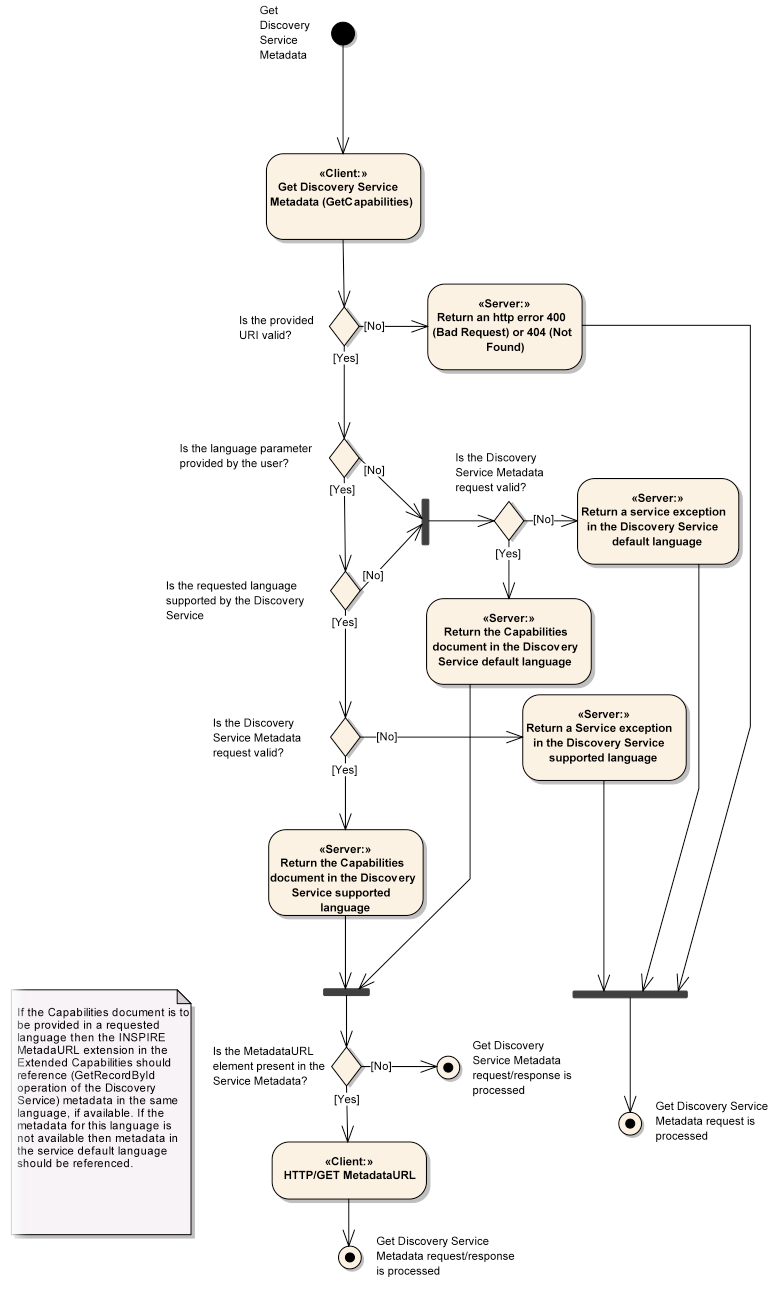


Figure 4: Get Discovery Service Metadata Use Case (UC1)

Table 2 shows the parameters that are part of a GetCapabilities response of [**CSW ISO AP**].

Table 2: GetCapabilities Response [CSW ISO AP]

|  |  |
| --- | --- |
| CSW metadata | |
| Service identification | |
| ServiceType | The ServiceType for a CSW ISO AP is fixed to “CSW”. The Spatial Data Service Type as defined by INSPIRE MD (‘discovery’) will be mapped to the INSPIRE SpatialDataServiceType element in the GetCapabilities response. |
| ServiceTypeVersion | Version of this service type implemented by this service. This value is fixed for the INSPIRE profile of CSW ISO AP to ‘2.0.2’. |
| Title | Title of this service, normally used for display to a human |
| Abstract | Brief narrative description of this service, normally available for display to a human |
| Keywords | Unordered list of one or more commonly used or formalized word(s) or phrase(s) used to describe this service. |
| Fees | Fees and terms for retrieving data from or otherwise using this service, including the monetary units as specified in ISO 4217 |
| AccessConstraints | Access constraints that should be observed to assure the protection of privacy or intellectual property, and any other restrictions on retrieving or using data from or otherwise using this service. |
| Service provider | |
| ProviderName | Unique identifier for service provider organization |
| Providersite | Reference to the most relevant web site of the service provider |
| ServiceContact | Information for contacting service provider |
| Operations metadata | |
| Operation | Metadata for one operation that this service interface implements |
| Parameter | Parameter valid domain that applies to one or more operations which this service implements |
| Constraint | Constraint on valid domain of a non-parameter quantity that applies to this service |
| ExtendedCapabilities | Metadata about this service and software additional abilities |
| Filter capabilities | |
| Filter\_Capabilities | The following elements are examples of valid filter operators: And, Or, Not, PropertyIsEqualTo, PropertyIsNotEqualTo, PropertyIsLessThan, PropertyIsGreaterThan, PropertyIsLike, PropertyIsNull, PropertyIsLessThanOrEqualTo, PropertyIsGreaterThanOrEqualTo, BBOX, Intersects, Disjoint. |

Example 1: Reporting the MetadataURL in the extended capabilities

<xs:complexType name="ExtendedCapabilitiesType">

<xs:annotation>

<xs:documentation>Extended capabilities for ISO 19128 , OGC CSW, OGC OWS services</xs:documentation>

</xs:annotation>

<xs:choice>

<xs:sequence>

<xs:annotation>

<xs:documentation>Scenario 1: Mandatory MetadataUrl element pointing to an INSPIRE Compliant ISO metadata document plus language parameters </xs:documentation>

</xs:annotation>

<xs:element name="MetadataUrl" type="resourceLocatorType"/>

<xs:element name="SupportedLanguages" type="supportedLanguagesType"/>

<xs:element name="ResponseLanguage" type="languageElementISO6392B"/>

</xs:sequence>

<xs:sequence>

<xs:annotation>

<xs:documentation>Scenario 2: Mandatory (where appropriate) metadata elements not mapped to standard capabilities, plus mandatory language parameters, plus OPTIONAL MetadataUrl pointing to an INSPIRE Compliant ISO metadata document</xs:documentation>

</xs:annotation>

<xs:element name="ResourceLocator" type="resourceLocatorType" maxOccurs="unbounded">

<xs:annotation>

<xs:documentation xml:lang="en">Mandatory linkage to the network service</xs:documentation>

</xs:annotation>

</xs:element>

<xs:element name="ResourceType" type="serviceSpatialDataResourceType"/>

<xs:element name="TemporalReference" type="temporalReference" maxOccurs="unbounded"/>

<xs:element name="Conformity" type="conformity" maxOccurs="unbounded"/>

<xs:element name="MetadataPointOfContact" type="metadataPointOfContact" maxOccurs="unbounded"/>

<xs:element name="MetadataDate" type="iso8601Date"/>

<xs:element name="SpatialDataServiceType" type="spatialDataServiceType"/>

<xs:element name="MandatoryKeyword" type="classificationOfSpatialDataService" maxOccurs="unbounded"/>

<xs:element name="Keyword" type="keyword" minOccurs="0" maxOccurs="unbounded">

<xs:annotation>

<xs:documentation xml:lang="en">If the resource is a spatial data service, at least one keyword from Part D.4 shall be provided.</xs:documentation>

</xs:annotation>

</xs:element>

<xs:element name="SupportedLanguages" type="supportedLanguagesType"/>

<xs:element name="ResponseLanguage" type="languageElementISO6392B"/>

<xs:element name="MetadataUrl" type="resourceLocatorType" minOccurs="0"/>

</xs:sequence>

</xs:choice>

</xs:complexType>

<xs:complexType name="supportedLanguagesType">

<xs:sequence>

<xs:element name="DefaultLanguage" type="languageElementISO6392B"/>

<xs:element name="SupportedLanguage" type="languageElementISO6392B" minOccurs="0" maxOccurs="unbounded">

<xs:annotation>

<xs:documentation>It is not necessary to repeat the default language</xs:documentation>

</xs:annotation>

</xs:element>

</xs:sequence>

</xs:complexType>

* + - 1. ***Discovery Service Metadata***

**Implementation Requirement 8** [**CSW ISO AP**] specifies a GetCapabilities operation with several service metadata sections. The service metadata in the capabilities documents shall be in conformance with the requirements of INSPIRE service metadata [**INS NS**].

Table 3 shows the mapping from the INSPIRE metadata elements to the capabilities as used for the implementation of the Discovery service by [**CSW ISO AP**].

The first two columns are from the INSPIRE Metadata Regulation [**INS MD**]. In the “Capabilities CSW ISO AP” column the capabilities mapping is defined. In the last column the mappings as defined in the mapping ISO 19115/ISO 19119 of the Metadata Technical Guidance [**INS MDTG**] are shown.

Table 3: INSPIRE metadata elements to CSW ISO AP capabilities metadata

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| INSPIRE  Metadata element | M/ C/ O | Capabilities CSW ISO AP | Type Field | ISO 19139 / CSW ISO AP |
| Resource title  (B1.1) | M | /csw:Capabilities/Serviceidentification/Title | String | identificationInfo[1]/\*/citation/\*/title  [ISO 19139] |
| Resource abstract (B1.2) | M | /csw:Capabilities/ Serviceidentification/Abstract | String | identificationInfo[1]/\*/abstract [ISO 19139] |
| Resource Type (B1.3) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:ResourceType |  | identificationInfo[1]/hierarchyLevel [ISO 19139] |
| Resource Locator (B1.4) | C | /csw:Capabilities/  OperationsMetadata/Operation/GetCapabili ties/DCP/HTTP/@xlink:href | URL | distributionInfo/\*/transferOptions/\*/ onLine/\*/linkage  [ISO 19139] |
| Coupled Resource (B1.6) | C | Not applicable to discovery service | - | identificationInfo[1]/\*/operatesOn |
| Spatial data service type (B2.2) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:SpatialDataServiceType | GenericN ame | identificationInfo[1]/\*/serviceType [CSW ISO Metadata AP] |
| Keyword value (B3.1)  For the mandatory category or subcategory of the  service | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:MandatoryKeyword | String | identificationInfo[1]/\*/descriptiveKe ywords/\*/keyword  [ISO 19139] |
| Keyword value (B3.1)  For any other  keyword | O | /inspire\_ds:ExtendedCapabilities/ inspire\_common:Keyword | String | identificationInfo[1]/\*/descriptiveKe ywords/\*/keyword  [ISO 19139] |
| Originating controlled vocabulary (B3.2) | C | /inspire\_ds:ExtendedCapabilities/ inspire\_common:Keyword/ inspire\_common:OriginatingControlledVoca bulary/ inspire\_common:Title |  | identificationInfo[1]/\*/descriptiveKe ywords/\*/thesaurusName  [ISO 19139] |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| INSPIRE  Metadata element | M/  C/ O | Capabilities CSW ISO AP | Type Field | ISO 19139 / CSW ISO AP |
| Temporal extent (B5.1) | C | /inspire\_ds:ExtendedCapabilities/ inspire\_common:TemporalExtent | Date | identificationInfo[1]/\*/extent/\*/temp oralElement/\*/extent  [ISO 19139] |
| Date of publication (B5.2) | C | /inspire\_ds:ExtendedCapabilities/ inspire\_common:TemporalReference/ inspire\_common:DateOfPublication | Date | identificationInfo[1]/\*/citation/\*/date [./\*/dateType/\*/text()=' publication']/\*/date  [ISO 19139] |
| Date of last revision (B5.3) | C | /inspire\_ds:ExtendedCapabilities/ inspire\_common:TemporalReference/ inspire\_common:DateOfLastRevision | Date | identificationInfo[1]/\*/citation/\*/date [./\*/dateType/\*/text()='r evision']/\*/date  [ISO 19139] |
| Date of creation (B5.4) | C | /inspire\_ds:ExtendedCapabilities/ inspire\_common:TemporalReference/ inspire\_common:DateOfCreation | Date | identificationInfo[1]/\*/citation/\*/date [./\*/dateType/\*/text()=' creation']/\*/date  [ISO 19139] |
| Specification (B7.1) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:Conformity/ inspire\_common:Specification | string | dataQualityInfo/\*/report/\*/result/\*/s pecification  [ISO 19139] |
| Degree (B7.2) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:Conformity/ inspire\_common:Degree | boolean | dataQualityInfo/\*/report/\*/result/\*/p ass  [ISO 19139] |
| Conditions applying to access and use (B8.1) | M | /csw:Capabilities/ Serviceidentification/Fees | string | identificationInfo[1]/\*/resourceCon straints/\*/useLimitation  [ISO 19139] |
| Limitations on  public access (B8.2) | M | /csw:Capabilities/ Serviceidentification/AccessConstraints | string | identificationInfo[1]/\*/resourceCon straints/\*/accessConstraints  [ISO 19139] |
| Responsible party (B9.1) | M | csw:Capabilities/ Serviceprovider/ProviderName  and csw:Capabilities/  Serviceprovider/ServiceContact/ContactInf  o/Address/ElectronicMailAddress | string | identificationInfo[1]/\*/pointOfConta c/t\*/ organisationName  and  identificationInfo[1]/\*/pointOfConta ct/address/electronicMailAddress [ISO 19139] |
| Responsible party role (B9.2) | M | csw:Capabilities/Serviceprovider/role | string | identificationInfo[1]/\*/pointOfConta ct/\*/role  [ISO 19139] |
| Metadata point of contact (B10.1) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:MetadataPointOfContact | string | contact |
| Metadata Date (B10.2) | M | /inspire\_ds:ExtendedCapabilities/ inspire\_common:MetadataDate | Date | dateStamp |
| Metadata Language (B10.3) | M | /inspire\_ds:ExtendedCapabilities/inspire\_co mmon:ResponseLanguage/ inspire\_common:Language | string | language |

* + 1. **Discover Metadata**

|  |  |  |
| --- | --- | --- |
| INSPIRE  Implementing Rule | Reference [**INS NS,** Annex II] | Section 3 |
| Operation name | Discover Metadata |
| Obligation / condition | Mandatory |
| CSW ISO AP | Operation name | CSW Discovery.GetRecords |
| Definition | The primary means of a GetRecords operation is to search and to present metadata records. |

* + - 1. ***Request Parameters***

**Implementation Requirement 9** According to [**INS NS**, Annex II, Section 3.1] two parameters shall be supported by the service: Language, and Query.

|  |
| --- |
| **Implementation Requirement 10** The language parameter shall be implemented by using the Language queryable in a filter statement as defined by [**CSW ISO AP**]. With that a client can request  metadata records in a specific metadata language. |

|  |
| --- |
| **Implementation Requirement 11** The query parameter shall be implemented by the filter statement of the GetRecords-Request itself. The query has to support all search attributes defined in Section 4.4. |

**Implementation Recommendation 2** To ensure a common response structure for a Discover Metadata request, the value of the following request parameters shall be set as follows:

* resultType = "results"
* outputFormat = "application/xml"
* outputSchema = <http://www.isotc211.org/2005/gmd>
* ElementSetName = “full”

Example 2: Discover Metadata Request

<csw:GetRecords [xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"](http://www.opengis.net/cat/csw/2.0.2) xmlns:apiso=<http://www.opengis.net/cat/csw/apiso/1.0> [xmlns:ogc="http://www.opengis.net/ogc"](http://www.opengis.net/ogc) [xmlns:gmd="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd)

service="CSW" resultType="results" outputFormat="application/xml" [outputSchema="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) startPosition="1" maxRecords="10">

<csw:Query typeNames="gmd:MD\_Metadata">

<csw:ElementSetName typeNames="gmd:MD\_Metadata">full</csw:ElementSetName>

<csw:Constraint version="1.1.0">

<ogc:Filter [xmlns:ogc="http://www.opengis.net/ogc">](http://www.opengis.net/ogc)

<ogc:And>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:Language</ogc:PropertyName>

<ogc:Literal>eng</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:ServiceType</ogc:PropertyName>

<ogc:Literal>wms</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:And>

</ogc:Filter>

</csw:Constraint>

</csw:Query>

</csw:GetRecords>

* + - 1. ***Response Parameters***

|  |
| --- |
| **Implementation Requirement 12** The Discover Metadata response shall contain at least the INSPIRE metadata elements of each resource matching the query. [**INS NS**, Annex II, Section 3.2.1] |

Discover Metadata



**«Client:»**

**Get Service or Data Metadata (Discovery.DiscoverMetadata)**

Is the provided request valid against the protocol that is used?

[Yes]

[No]

**«Server:»**

**Return a fault message in the server default machine language.**

Is the Discovery.DiscoverMetadata request valid?

[Yes]

[No]

**«Server:»**

**Return a Discovery Service exception in the Discovery Service default language.**

Are all filters in the Discovery.DiscoverMetadata request valid?

[Yes]

[No]

Does the

[No]

[No]

[Yes] [Yes]

Is the language in

**«Server:» Return a Discovery**

**Service exception in the requested language.**

Discovery.DiscoverMetadata request contains a language filter?

the language filter supported?

Does the Discovery.DiscoverMetadata request contains a language filter?

[Yes]

[No]

**«Server:»**

**Return all metadata records that comply to the**

**request in all available languages.**

Is the language in the language filter supported?

[Yes]

[No]

**«Server:»**

**Return an empty result set.**

Are there metadata records that match the request?

[Yes]

[No]

**«Server:»**

**Return an empty result set.**

**«Server:»**

**Return all metadata records that comply to the request in the requested language.**

Discovery.DiscoverMetadata request is processed.

Figure 5: Discover Metadata Activity Diagram (UC2)

* + 1. **Publish (Push / Pull)**
       1. ***Push***

|  |  |  |
| --- | --- | --- |
| INSPIRE  Implementing Rule | Reference [**INS NS,** Annex II] | Section 4.1 |
| Operation name | Publish Metadata (push) |
| Obligation / condition | Conditional: one of Transaction or Harvest has to be supported |
| CSW ISO AP | Operation name | CSWT Manager.Transaction |
| Definition | The Transaction operation defines an interface for creating, modifying and deleting catalogue records. |

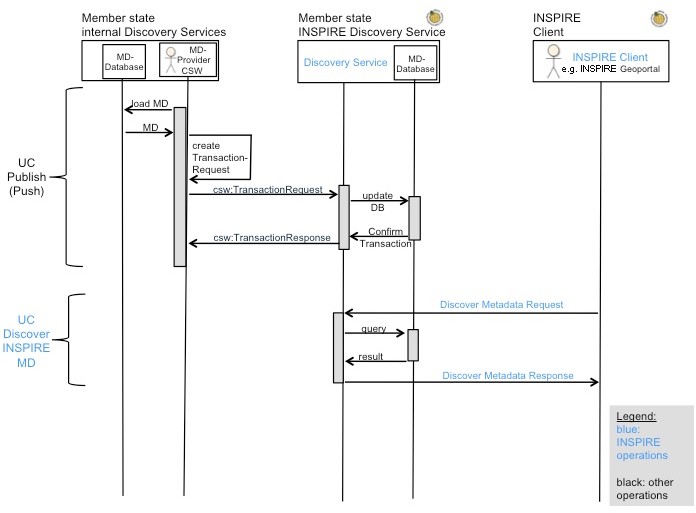


Figure 6: Publish metadata using PUSH (Transaction)

***Request Parameters***

No additional INSPIRE request parameters are required.

***Response Parameters***

No additional INSPIRE response parameters are required.

* + - 1. ***Pull***

|  |  |  |
| --- | --- | --- |
| INSPIRE  Implementing Rule | Reference [**INS NS,** Annex II] | Section 4.2 |
| Operation name | Publish Metadata (pull) |
| Obligation / condition | Conditional: one of Transaction or Harvest has to be supported |
| CSW ISO AP | Operation name | CSWT Manager.Harvest |
| Definition | The Harvest operation "pulls" data into the catalogue. |

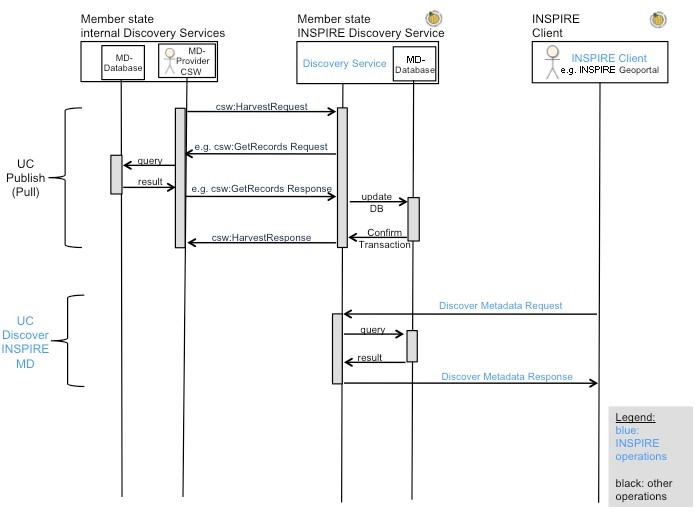


Figure 7: Publish metadata using Pull (Harvest)

***Request Parameters***

**Implementation Recommendation 3** Within the context of INSPIRE an INSPIRE Discovery Service should at least be able to harvest single metadata documents that are accessible through some online location.

[**CSW ISO AP**] specifies a harvest operation that is based on the related operation of the underlying base specification [**OGC CSW**].

**Implementation Requirement 13** If an INSPIRE Discovery Service harvests a resource, the RESOURCETYPE of the resource being harvested shall be <http://schemas.opengis.net/iso/19139/20060504/gmd>and the RESOURCEFORMAT application/xml.

***Response Parameters***

No additional response parameters are required.

* + 1. **Link Discovery Service**

|  |  |  |
| --- | --- | --- |
| INSPIRE  Implementing Rule | Reference [**INS NS**, Annex II] | Section 5 |
| Operation name | Link Discovery Service |
| Obligation / condition | Mandatory |
| CSW ISO AP | Operation name | **Centralised approach:**  A combination of the Publish Metadata operation (CSWT Manager.Transaction or CSWT Manager.Harvest) for publishing metadata, CSW.GetCapabilities (“FederatedCatalogues”) for retrieving the centralised Discovery Service endpoint and the CSW.GetRecords (CSW service metadata + dataset metadata) operation.  OR  **Discovery client approach:**  A combination of: the Publish Metadata operation (CSWT Manager.Transaction or CSWT Manager.Harvest) for publishing metadata; CSW.GetCapabilities (“FederatedCatalogues”) for retrieving federated Discovery Service endpoints and/or CSW.GetRecords for discovering Discovery Service metadata; and CSW.GetRecords to discover dataset or dataset series metadata from remote locations in a further step following the use of the here described link discovery service  OR  **Discovery Service approach:**  A combination of CSW.GetCapabilities (“FederatedCatalogues”) and CSW.GetRecords (“DistributedSearch”) |
| Definition | If federated search is supported then federated metadata catalogue services (CSW) are advertised in the Federated Catalogue section of the Member State’s CSW service Capabilities. If federated search is not supported then CSW service metadata from remote third parties has to be published in the Member States central CSW.  The GetRecords operation is able to search and to present metadata records from federated and non- federated CSW’s. |

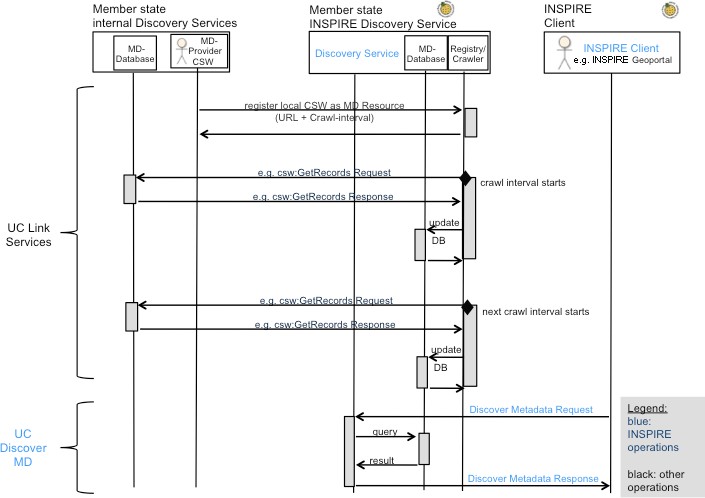


Figure 8: LINK Services using Registry/Crawler (Example DE)

**Implementation Requirement 14** The Link Discovery Service operation allows the declaration of the availability of a Discovery Service compliant with this Regulation, for the discovery of resources through the Member State Discovery Service while maintaining the resource metadata at the owner location [**INS NS]**. Furthermore the Link Discovery Service Request parameter shall provide all information about the Public Authority’s or Third Party’s Discovery Service compliant with this Regulation, enabling the Member State Discovery Service to get resources metadata based on a combination of search criteria from the Public Authority’s or Third Party’s Discovery Service and to collate it with other resources metadata.

The above INSPIRE requirement defines a mechanism that allows third parties to publish their Discovery Services to the INSPIRE network through a Member State Discovery Service. If a third party publishes its Discovery Service through a Member State Discovery Service, it shall be possible to retrieve resource metadata from the owner’s Discovery Service. The retrieval of this resource metadata can be handled by the client through iterative searches on available Discovery Services published in a Member State’s Discovery Service (Discovery client approach), or by the Discovery Service via distributed search (Discovery Service approach). In general there are three possible scenarios: the centralised, the discovery client and the Discovery Service scenario.

* + - 1. ***Centralised scenario***

If the Member State centralises all spatial data and services metadata via publishing operations at a national Discovery Service then the Link Discovery Service operation as required by the INSPIRE Network Services Regulation [**INS NS**] is implicitly fulfilled.

***Request Parameters***

No additional request parameters are required.

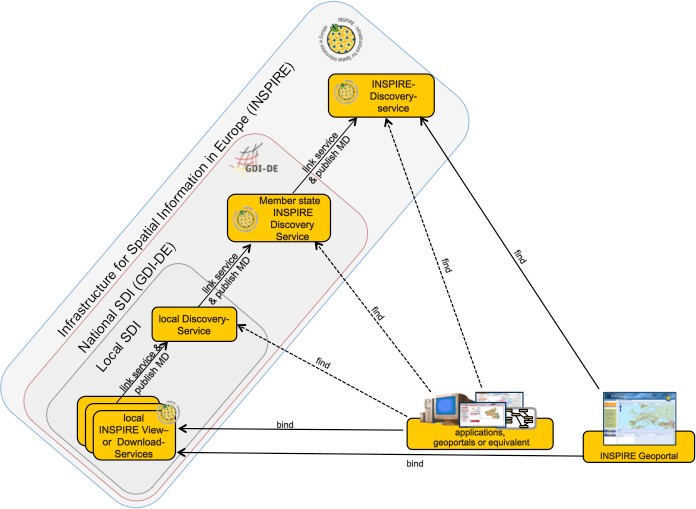


Figure 9: Example DE Network of Discovery Services

Example 3: GetRecords request

<csw:GetRecords [xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"](http://www.opengis.net/cat/csw/2.0.2) xmlns:apiso=<http://www.opengis.net/cat/csw/apiso/1.0> [xmlns:ogc="http://www.opengis.net/ogc"](http://www.opengis.net/ogc) [xmlns:gmd="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) service="CSW" resultType="results"

outputFormat="application/xml" [outputSchema="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) startPosition="1" maxRecords="10">

<csw:Query typeNames="gmd:MD\_Metadata">

<csw:ElementSetName typeNames="gmd:MD\_Metadata">full</csw:ElementSetName>

<csw:Constraint version="1.1.0">

<ogc:Filter [xmlns:ogc="http://www.opengis.net/o](http://www.opengis.net/ogc)gc">

<ogc:And>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:Language</ogc:PropertyName>

<ogc:Literal>eng</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:ServiceType</ogc:PropertyName>

<ogc:Literal>view</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:And>

</ogc::Filter>

</csw:Constraint>

</csw:Query>

</csw:GetRecords>

***Response Parameters***

GetRecords Response:

No additional parameters are required.

GetCapabilities Response:

No additional parameters are required.

* + - 1. ***Discovery client approach***

The discovery client scenario is based on the availability of information on available Discovery Service endpoints in a Member State’s Discovery Service.

**Implementation Requirement 15** Third Party Discovery Services shall be published in the Member State’s Discovery Service using the Publish Metadata operation.

Third Party Discovery Services can additionally be published in the “FederatedCatalogues” section of the Discovery Service’s capability document if they are part of a federated search infrastructure.

The Regulation on INSPIRE Network Services imposes two alternatives for implementing the Publish Metadata operation: the *push* mechanism or the *pull* mechanism. For the implementation of the link Discovery Service operation, either or both mechanisms may be used.

For further description of the implementation of the push mechanism we refer to the CSW Transaction operation [**CSW ISO AP,** Section 8.2.3.1]. For further description of the implementation of the pull mechanism we refer to the CSW Harvest operation of the [**CSW ISO AP,** Section 8.2.3.2].

The discovery client can derive the Discovery Service topology (the federation) behind a Discovery Service by retrieving the “FederatedCatalogues” section of its capability document and collecting all the Discovery Services within the federation. For INSPIRE, the possible depth of this federation is limited to one level (hopCount = 2). Therefore all federated catalogues can be retrieved from the Member State’s Discovery Service “FederatedCatalogues” section in the capabilities document.

If no federated catalogues are defined in the capability document or if the client favours the use of the CSW.GetRecords operation to find Discovery Service metadata then the client can search for Discovery Service endpoints via a CSW.GetRecords query. This also allows for discovering all published Discovery Services. In this case the client controls the searches on the Discovery Services on its own and can discover resource metadata from all discovered Discovery Services in the network by using the CSW.GetRecords operation.

Disadvantages:

* Every client has to determine the Discovery Service topology from time to time.
* The searches must be processed by every client (it is not transparent to the client).
* Discovery Services which are not directly accessible (e.g. running behind a firewall in an intranet) cannot be accessed.

Advantages:

* Searches can be processed by the client: so the client can decide by its own how the search is operated.
* The response time of a single search request may be more predictable as no hidden requests to third party catalogues are involved.

***Request Parameters***

No additional request parameters are required.



OGC CSW

CSW request

CSW response

CSW request

OGC CSW

CSW response

CSW request

CSW response

OGC CSW

**Catalogue A3**

**Catalogue A2**

**Client**

**Catalogue A1**

Figure 10: Discovery Client approach

Example 4: GetRecords request

<csw:GetRecords [xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"](http://www.opengis.net/cat/csw/2.0.2) xmlns:apiso=<http://www.opengis.net/cat/csw/apiso/1.0> [xmlns:ogc="http://www.opengis.net/ogc"](http://www.opengis.net/ogc) [xmlns:gmd="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) service="CSW" resultType="results"

outputFormat="application/xml" [outputSchema="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) startPosition="1" maxRecords="10">

<csw:Query typeNames="gmd:MD\_Metadata">

<csw:ElementSetName typeNames="gmd:MD\_Metadata">full</csw:ElementSetName>

<csw:Constraint version="1.1.0">

<ogc:Filter [xmlns:ogc="http://www.opengis.net/ogc">](http://www.opengis.net/ogc)

<ogc:And>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:Language</ogc:PropertyName>

<ogc:Literal>eng</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:ServiceType</ogc:PropertyName>

<ogc:Literal>view</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:And>

</ogc::Filter>

</csw:Constraint>

</csw:Query>

</csw:GetRecords>

***Response Parameters***

GetRecords Response:

No additional parameters are required.

GetCapabilities Response:

The FederatedCatalogues section of the capabilities document can contain 0, 1 or N entries.

* + - 1. ***Discovery Service approach (federated search)***

The Discovery Service approach implements a distributed search that allows a Discovery Service to accept a request from a client and distribute the request to other Discovery Services within a federation. In this case a Discovery Service acts as both a server and as a client (for another Discovery Service).

A Discovery Service can propagate a search request to 0, 1 or N other Discovery Services within the federation. Data returned from a Discovery Service query is processed by the requesting Discovery Service to return the data appropriate to the original Discovery Service request (collation of result sets). With that, a client may start a search from only one known location and to search all federated Discovery Services with the same filter statement. In this case, the metadata entries managed by the other Discovery Services become available to their own clients.



OGC CSW

CSW request

CSW request

CSW response

**Catalogue A1**

CSW response

CSW request

CSW response

OGC CSW

**Catalogue A3**

**Client**

**Catalogue A2**

Figure 11: Discovery Service approach

Disadvantages:

* + - * + More enhanced query request and response structures are needed.
        + Every Discovery Service that provides access to federated catalogues must process searches.
        + The response time for a single request may be less predictable as possibly hidden requests to (potentially slow) third party catalogues are involved and may infringe the QoS requirements defined in [**INS NS**]. To speed-up very slow responding remote Discovery Services a Discovery Service may harvest their content from time to time (creating an entire local cache of the metadata) and perform searches locally by filtering on all cached results of such a catalogue.

Advantages:

* + - * + The Discovery Service must only know its direct “child-catalogues”.
        + Discovery Services behind a firewall can be accessed.
        + Searches don’t have to be processed by every client.

**Implementation Recommendation 4** If a Member State chooses to implement the Link Discovery Service Operation by enabling federated search at the Discovery Service, the IOC TF recommends that it is implemented using two operations of [**CSW ISO AP**]: GetRecords and GetCapabilities.

[**CSW ISO AP**] defines a mechanism to advertise remote or federated Discovery Services for remote search through the GetRecords request of the Discovery Service [**OGC CSW**, Section 10.8.4.13 and Annex B]. Discovery Services may advertise, in the capabilities document, to which other Discovery Service a query is distributed using an operation constraint called “FederatedCatalogues”. Operation constraints are described [**OGC OWS,** Section 7.4.5].

|  |
| --- |
| **Implementation Requirement 16** A federated Discovery Service shall be published in the Member State’s Discovery Service’s capabilities document as the URL of its HTTP/KVP/GET  GetCapabilities request. |

***Request Parameters***

|  |
| --- |
| **Implementation Requirement 17** No additional request parameters are required. However, to indicate that the query should be distributed the “DistributedSearch” parameter of a GetRecords  request shall be used with the “hopCount” attribute set always equal to “2” to avoid circular searches. |

Example 5: Link Discovery Service – GetRecords request

<csw:GetRecords [xmlns:csw="http://www.opengis.net/cat/csw/2.0.2"](http://www.opengis.net/cat/csw/2.0.2) xmlns:apiso=<http://www.opengis.net/cat/csw/apiso/1.0> [xmlns:ogc="http://www.opengis.net/ogc"](http://www.opengis.net/ogc) xmlns:gmd=<http://www.isotc211.org/2005/gmd>service="CSW" resultType="results"

outputFormat="application/xml" [outputSchema="http://www.isotc211.org/2005/gmd"](http://www.isotc211.org/2005/gmd) startPosition="1" maxRecords="10">

<csw:DistributedSearch hopCount="2"/>

<csw:Query typeNames="gmd:MD\_Metadata">

<csw:ElementSetName typeNames="gmd:MD\_Metadata">full</csw:ElementSetName>

<csw:Constraint version="1.1.0">

<ogc:Filter [xmlns:ogc="http://www.opengis.net/ogc">](http://www.opengis.net/ogc)

<ogc:And>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:Language</ogc:PropertyName>

<ogc:Literal>eng</ogc:Literal>

</ogc:PropertyIsEqualTo>

<ogc:PropertyIsEqualTo>

<ogc:PropertyName>apiso:ServiceType</ogc:PropertyName>

<ogc:Literal>view</ogc:Literal>

</ogc:PropertyIsEqualTo>

</ogc:And>

</ogc::Filter>

</csw:Constraint>

</csw:Query>

</csw:GetRecords>

***Response Parameters***

GetRecords Response:

No additional parameters are required.

GetCapabilities Response:

The FederatedCatalogues section of the capabilities document can contain 1 or N entries.

Example 6: <OperationsMetadata> excerpt of a capabilities document

<ows:OperationsMetadata>

<ows:Constraint name=”FederatedCatalogues”>

<ows:Value>[http://www.MyCatalogue.eu/?](http://www.MyCatalogue.eu/)

REQUEST=GetCapabilities&SERVICE=CSW

</ows:Value>

<ows:Value>[http://www.ASecondCatalogue.eu/?](http://www.ASecondCatalogue.eu/)

REQUEST=GetCapabilities&SERVICE=CSW

</ows:Value>

<ows:Value>[http://www.AThirdCatalogue.eu/?](http://www.AThirdCatalogue.eu/)

REQUEST=GetCapabilities&SERVICE=CSW

</ows:Value>

</ows:Constraint>

</ows:OperationsMetadata>

* 1. ***Discovery Service Queryables***
     1. **Introduction**

|  |
| --- |
| **Implementation Requirement 18** [**CSW ISO AP**] as the base specification for the INSPIRE Discovery Service is based on the ISO 19115/19119 information model. As such, the INSPIRE metadata elements (see [**INS MD**]) shall be requested through the INSPIRE Discovery Service interface within a  query. |

The relation between ISO 19115 and ISO 19119 and the elements of the INSPIRE Metadata Regulation [INS MD] is described in the Metadata Technical Guidance [**INS MDTG**].

In what follows section 4.4.2 defines the required mappings to common queryables specified by [**CSW ISO AP**] and [**OGC CSW**]; section 4.4.3 defines additional queryables required by [**INS NS**] and [**INS MD**].

* + 1. **Mapping common queryables**

Table 4 identifies these INSPIRE elements from [**INS NS**] and connects them to appropriate queryables defined by OGC [**CSW ISO AP**]. Annotations are given wherever necessary.

|  |
| --- |
| **Implementation Requirement 19** An INSPIRE discovery service shall support the queryables as indicated in Table 4: INSPIRE search criteria (queryables) |

Table 4: INSPIRE search criteria (queryables)

|  |  |  |
| --- | --- | --- |
| **INSPIRE queryable metadata elements [INS NS, Table 1]** | **INSPIRE Discovery Service (CSW ISO AP) queryable properties** | **Is mandatory for INSPIRE Discovery Service?2** |
| Keyword | Subject | Yes |
| Topic category | TopicCategory | Yes, if resources of type ‘dataset’ or ‘series’ are supported by the catalogue service instance |
| Spatial data service type | ServiceType | Yes, if resources of type ‘service’ are supported by the catalogue service instance. |
| Lineage | -(not supported) | Yes |
| Spatial resolution | SpatialResolution | Yes, if resources of type ‘dataset’ or ‘series’ are supported by the discovery service instance |
| Specification | -(not supported) | Yes |
| Degree | -(not supported) | Yes |
| Geographic bounding box | BoundingBox | Yes, if resources of type ‘dataset’ or ‘series’ are supported by the catalogue service instance |
| Conditions applying to access and use | -(not supported) | Yes |
| Limitations on public access | -(not supported) | Yes |
| Responsible party | OrganisationName | Yes |
| Responsible party role |  | Yes |
| Resource Title | Title | Yes |
| Resource Abstract | Abstract | Yes |
| Resource Type | Type | Yes |
| Unique resource identifier | ResourceIdentifier | Yes |
| Temporal Reference | TemporalExtent PublicationDate RevisionDate CreationDate | Yes |

|  |
| --- |
| **Implementation Requirement 20** The only queryable that is not defined above, but is required to comply with [**INS MDTG**] is “Metadata language”. This is a mandatory queryable for INSPIRE Discovery Service to support the “Language” query parameter as defined in [**INS NS,** Annex II, Part B,  Section 3.1]. |

|  |
| --- |
| **Implementation Requirement 21** Table 5 identifies the additional queryables that are not supported by [**CSW ISO AP**], but required by [**INS NS**]. X-Path expression and data types are taken from [**INS**  **MDTG**]. |

2 See Article 11 (2) of the INSPIRE directive and Annex II Part A of the Network services IR.

Table 5: INSPIRE additional search criteria (queryables)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Definition** | **Data type** | **Property Mapping to Information Model** |
| Degree | This is the degree of conformity of the resource to the related specification. | Boolean | dataQualityInfo/\*/repo rt/\*/result/\*/pass |
| Specification | This is a citation of the specification to which the resource is expected to conform. | Specification, see Table 6 |  |
| LimitationsOnPublicAccess | This metadata element shall provide information on the limitations (if they exist) and the reasons for such  limitations (Article 5-2(e)) | LimitationsOnP ublicAccess, see Table 7 |  |
| ConditionApplyingToAccess AndUse | This metadata element defines the conditions for access and use of spatial datasets and services, and where applicable, corresponding fees as required by Articles 5-2 (b) and 11-2 (f). | CharacterString | identificationInfo[1]/\*/r esourceConstraints/\*/ useLimitation |
| Lineage | This is a statement on process history and/or overall quality of the spatial dataset. | CharacterString | dataQualityInfo/\*/linea ge/\*/statement |
| ResponsiblePartyRole | The function performed by the responsible party. | Codelist (CI\_RoleCode codelist), one of : resourceProvid er, custodian, owner, user, distributor, originator, pointOfContact, principalInvesti gator, processor, publisher, author | identificationInfo[1]/\*/p ointOfContact/\*/role |

Table 6: Composition of union specification

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Definition** | **Data type** | **Property Mapping to Information Model** |
| SpecificationTitle | Title of the specification | CharacterString | dataQualityInfo/\*/report/\*/ result/\*/specification/\*/title |
| SpecificationDate | Reference date of specification | Date-8601 | dataQualityInfo/\*/report/\*/ result/\*/specification/\*/dat  e/\*/date |
| SpecificationDateType | Type reference date of specification | Codelist (CI\_DateTypeCode), one of: creation, revision or publication | dataQualityInfo/\*/report/\*/ result/\*/specification/\*/dat e/\*/dateType |

Table 7: Composition of union LimitationsOnPublicAccess

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Definition** | **Data type** | **Property Mapping to Information Model** |
| AccessConstraints | Access constraints | Codelist | identificationInfo[1]/\*/reso |
|  | applied to assure the | (MD\_RestrictionCode), | urceConstraints/\*/access |
|  | protection of | one of: copyright, | Constraints |
|  | privacy or intellectual | patent, patentPending, |  |
|  | property, and any special | trademark, license, |  |
|  | restrictions | intellectualPropertyRigh |  |
|  | or limitations on | ts, restricted, |  |
|  | obtaining the resource. | otherRestrictions |  |
| OtherConstraints | other restrictions and legal prerequisites for accessing and  using the resource. | CharacterString | identificationInfo[1]/\*/reso urceConstraints/\*/otherC onstraints |
| Classification | name of the handling restrictions on the resource. | CodeList (MD\_ClassificationCod e), one of: unclassified, restricted, confidential, secret, topSecret | identificationInfo[1]/\*/reso urceConstraints/\*/classific ation |

* + 1. **Additional advertised queryables**

[**CSW ISO AP**] defines a mechanism to advertise additional queryables through the capabilities document of the Discovery service instance [**CSW ISO AP,** Section 7.5, Table 23].

**Implementation Requirement 22** All supported ISO queryables shall be advertised to be supported by an INSPIRE Discover Metadata operation; in addition, all INSPIRE search criteria (queryables) shall be listed in the section “AdditionalQueryables”.

Example 7: Excerpt of a capabilities document advertising INSPIRE search criteria

<ows:OperationsMetadata>

<ows:Operation name="GetRecords">

*[…] (List of DCPs, parameters here)*

<ows:Constraint name="SupportedISOQueryables">

<ows:Value>Language</ows:Value>

<ows:Value>CreationDate</ows:Value>

<ows:Value>PublicationDate</ows:Value>

<ows:Value>OrganisationName</ows:Value>

<ows:Value>ResourceIdentifier</ows:Value>

<ows:Value>TopicCategory</ows:Value>

<ows:Value>DistanceValue</ows:Value>

<ows:Value>DistanceUOM</ows:Value>

<ows:Value>TempExtent\_begin</ows:Value>

<ows:Value>TempExtent\_end</ows:Value>

<ows:Value>ServiceType</ows:Value>

<ows:Value>Denominator</ows:Value>

</ows:Constraint>

<ows:Constraint name="AdditionalQueryables">

<ows:Value>Degree</ows:Value>

<ows:Value>AccessConstraints</ows:Value>

<ows:Value>OtherConstraints</ows:Value>

<ows:Value>Classification</ows:Value>

<ows:Value>ConditionApplyingToAccessAndUse</ows:Value>

<ows:Value>Lineage</ows:Value>

<ows:Value>ResponsiblePartyRole</ows:Value>

<ows:Value>SpecificationTitle</ows:Value>

<ows:Value>SpecificationDate</ows:Value>

<ows:Value>SpecificationDateType</ows:Value>

</ows:Constraint>

</ows:Operation>

</ows:OperationsMetadata>

* 1. ***Language Requirements***

The Network Services Regulation requires that multilingual aspects for network services are supported [**INS NS**]. As there is no standard way to deal with multilingualism within the current ISO or OGC specifications, the following basic principle shall be used for INSPIRE Network Services:

|  |
| --- |
| **Implementation Requirement 23** A network service metadata response shall contain a list of the natural languages supported by the service. This list shall contain one or more languages that are  supported. |

|  |
| --- |
| **Implementation Requirement 24** A client may specify a specific language in a request. If the requested language is contained in the list of supported languages, the natural language fields of the service response shall be in the requested language. It the requested language is not supported by  the service, then this parameter shall be ignored. |

* + 1. **GetCapabilities-Operation**

***GetCapabilities-Request:***

The HTTP/GET binding of the GetCapabilities-Operation is extended by an additional parameter that indicates the client’s preferred language.

|  |
| --- |
| **Implementation Requirement 25** The name of this parameter shall be “LANGUAGE”. The parameter values are based on ISO 639-2/B alpha 3 codes as used in [**INS MDTG**]. |

Table 8: Language parameter and list of codes

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter Name** | **Parameter Value** | **Is mandatory for a Client Request?** | **Is mandatory to support for the Service?** |
| LANGUAGE | Codelist (See ISO/TS 19139) based on alpha-3 codes of ISO 639-2. | No, it is optional. | Yes, it is mandatory to be supported and shall be processed if the parameter is present in a client’s request with a supported language code. If the parameter is absent in a clients request or it requested an unsupported language the service shall response in the service default language. |
|  | Use only three-letter codes from in ISO 639-2/B (bibliographic codes), |  |
|  | The list of codes for the 23 official EU languages and EFTA Countries is: |  |
|  | Bulgarian – **bul** Italian – **ita** |  |
|  | Czech – **cze** Latvian – **lav** |  |
|  | Danish – **dan** Liechenstein – **ger** |  |
|  | Dutch – **dut** Lithuanian – **lit** |  |
|  | English – **eng** Maltese – **mlt** |  |
|  | Polish – **pol** Norwegian – **nor**  Estonian – **est** Portuguese – **por** |  |
|  | Finnish – **fin** Romanian – **rum** |  |
|  | French – **fre** Romansh - **roh** |  |
|  | German – **ger** Slovak – **slo** |  |
|  | Greek – **gre** Slovenian – **slv** |  |
|  | Hungarian – **hun** Spanish – **spa** |  |
|  | Irish – **gle** Swedish – **swe** |  |
|  | Icelandic – **ice** |  |
|  | The list of all the codes is defined at <http://www.loc.gov/standards/iso639-2/> Regional languages also are included in this list. |  |

|  |
| --- |
| Schema:  [OCG-GetCapabilities-Request]&LANGUAGE=<ISO 639-2/B alpha 3 code>  Example: [http://inspire.network.service.example/service?SERVICE=](http://inspire.network.service.example/service?SERVICE)[...]&VERSION=[...]&LANGUAGE=eng |

***GetCapabilities-Response:***

If a client request specifies a supported language the following fields of the GetCapabilties-Response are affected:

* Titles
* Abstracts

**Implementation Requirement 26** If a client request specifies an unsupported language, or the parameter is absent in the request, the above fields shall be provided in the service default language.

This behaviour ensures backward compatibility so that any existing clients may interact with the service using the default OGC standard.

***Extended Capabilities***

To advertise the supported languages the service shall respond with Extended Capabilities:

|  |
| --- |
| **Implementation Requirement 27** The Extended Capabilities shall indicate the **response language**  used for the GetCapabilities-Response: Depending on the **requested language** the value of the  <inspire\_common:ResponseLanguage>/<inspire\_common:Language> corresponds to the language used in the response. If a supported language was requested,  <inspire\_common:ResponseLanguage>/<inspire\_common:Language> shall correspond to that requested language. If an unsupported language was requested or if no specific language was requested <inspire\_common:ResponseLanguage>/<inspire\_common:Language> shall  correspond to the **service default language**. |

And;

|  |
| --- |
| **Implementation Requirement 28** The Extended Capabilities shall contain the **list of supported languages** indicated in <inspire\_common:SupportedLanguages>.  This **list of supported languages** shall consist of   1. exact one element <inspire\_common:DefaultLanguage> indicating the service default language, and 2. zero or more elements <inspire\_common:SupportedLanguage> to indicate all additional supported languages.   Regardless of the response language, the **list of supported languages** is invariant for each GetCapabilities-Response. |

|  |
| --- |
| **Implementation Requirement 29** The Extended Capabilities shall use the XML Schema as defined in Annex A. |

***Examples:***

Service supports French and English while the service default language is French: Example 8: Response to [OGC-GetCapabilities-Request]&LANGUAGE=eng

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

Example 9: Response to [OGC-GetCapabilities-Request] or [OGC-GetCapabilities-Request]&LANGUAGE=fre

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>fre</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

Service supports only German:

Example 10: Response to any GetCapabilities-Request

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

* + 1. **GetRecords-Operation**

As stated in section 4.3.2 (Implementation requirement 10) the language parameter shall be implemented using the Language queryable in a filter statement as defined by [**CSW ISO AP**], with that a client can request metadata records in a specific metadata language.

|  |
| --- |
| **Implementation Requirement 30** A client CSW Discovery.GetRecords request without a language specific filter shall be responded to including all metadata elements that comply to the request independent from any language. Depending on the discovery service contents, the response will  involve metadata records of several natural languages. |

|  |
| --- |
| **Implementation Requirement 31** A client CSW Discovery.GetRecords request containing a language specific filter requires a response of metadata records that comply to the request. If no metadata records comply to that request, the service shall respond normally with an empty result set (without  raising an exception). |

|  |
| --- |
| **Implementation Requirement 32** If a client sends an invalid CSW Discovery.GetRecords request (that is, not compliant to CSW ISO AP) containing a language specific filter and this causes an exception at the service, the exception shall be responded in the default or in a requested and supported language. The use of a valid language specific filter itself shall not raise an exception, even  if the requested language is not supported. |

It is worth noting that the language of the metadata records contained by a service may not correspond to the list of supported languages in the GetCapabilities-Response.

* + 1. **Common concept for other operations (optional)**

Although further multilingual support is not required for INSPIRE Network Services, it may be desired by a service provider to implement further multilingual support such as:

* multilingual error messages
* multilingual support for additional Operations including HTTP/POST- and HTTP/GET-Binding For that reason a further implementation concept for multilingual aspects is recommended as follows:

The recommended INSPIRE Extension described before already provides language specific capabilities for a service.

**Implementation Recommendation 5** For further language support for other operation it is recommended to replace the operation-online-resources in each language specific GetCapabilities- Response by a specific operation-online-resource for that language. To support the additional operation-online-resources the service shall listen at the language specific operation end-points to distinguish for the requested languages.

An example of this behaviour is given below, showing how to extend the CSW.GetRecord() operation to support multilingual error messages.

1. The client sends the initial Request for Capabilities: [OCG-GetCapabilities-Request]
2. The service responses with extended Capabilities including the supported Languages

Example 11: Service response including supported languages

<inspire\_common:SupportedLanguages>

<inspire\_common:DefaultLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:DefaultLanguage>

<inspire\_common:SupportedLanguage>

<inspire\_common:Language>ger</inspire\_common:Language>

</inspire\_common:SupportedLanguage>

</inspire\_common:SupportedLanguages>

<inspire\_common:ResponseLanguage>

<inspire\_common:Language>eng</inspire\_common:Language>

</inspire\_common:ResponseLanguage>

1. The Client sends a language specific request for capabilities [OCG-GetCapabilities-Request]&LANGUAGE=eng
2. The service response with language specific capabilities containing:
   1. Translated natural language fields (titles, abstracts)
   2. **Language specific entry points** for the language specific operations using this concept.

Example 12: Response to [OCG-GetCapabilities-Request]&LANGUAGE=eng or [OCG-GetCapabilities-Request]

<csw:Capabilities[…]

<ows:Operation name="GetRecords">

<ows:DCP>

<ows:HTTP>

<ows:Post [xlink:href="http://someHOST.example/](http://someHOST.example/eng/SOAPservices/GetRecords)**eng**[/SOAPservices/GetRecords"](http://someHOST.example/eng/SOAPservices/GetRecords)>

<ows:Constraint name="PostEncoding">

<ows:Value>XML</ows:Value>

<ows:Value>SOAP</ows:Value>

</ows:Constraint>

</ows:Post>

</ows:HTTP>

</ows:DCP>[…]

</ows:Operation[…]

</csw:Capabilities>

Example 13: Response to [OCG-GetCapabilities-Request]&LANGUAGE=ger

<csw:Capabilities[…]

<ows:Operation name="GetRecords">

<ows:DCP>

<ows:HTTP>

<ows:Post [xlink:href="http://someHOST.example/](http://someHOST.example/ger/SOAPservices/GetRecords)**ger**[/SOAPservices/GetRecords">](http://someHOST.example/ger/SOAPservices/GetRecords)

<ows:Constraint name="PostEncoding">

<ows:Value>XML</ows:Value>

<ows:Value>SOAP</ows:Value>

</ows:Constraint>

</ows:Post>

</ows:HTTP>

</ows:DCP>[…]

</ows:Operation[…]

</csw:Capabilities>

1. The Client sends an invalid request to either the English or the German operation endpoint.
   1. English operation end point: Request:

[http://someHOST.example/**eng**/SOAPservices/GetRecords](http://someHOST.example/eng/SOAPservices/GetRecords) (+invalid POST-Request)

Response:

The service responses with an exception including an English exception message: e.g. “The request is invalid. Reason is … ”.

* 1. German operation end point: Request:

[http://someHOST.example/**ger**/SOAPservices/GetRecords](http://someHOST.example/ger/SOAPservices/GetRecords) (+invalid

POST-Request)

Response:

The service responses with an exception including a German exception message: e.g. “Die Anfrage ist fehlerhaft aufgrund …”.

* + 1. **Further Perspectives**

With the ongoing development of OWS Common it is expected that future versions of OGC Standards will include language support. For specific technical reasons, the concepts used for OWS common are not suitable to extend the current standards. However, with the availability of future versions of the OGC base standards the recommended approach to support multilingualism may need to be revisited.

IETF RFC 4646 is supported by OGC standards relying upon OWS 1.1.0.

**Implementation Recommendation 6** The support of IETF RFC 4646 is recommended wherever the support of ISO/639 B alpha3 for languages infringes the conformity with the standard used for implementing the [**INS NS**].

Table 9: Mapping between ISO 639/B alpha 3 and the two forms of IETF RFC 4646 supported by OWS 1.1.0

|  |  |  |
| --- | --- | --- |
| ISO639/B alpha 3 | IETF RFC 4646 short | IETF RFC 4646 long |
| bul | bg | bg-BG |
| cze | cs | cs-CZ |
| dan | da | da-DK |
| dut | nl | nl-NL |
| eng | en | en-GB |
| est | et | et-EE |
| fin | fi | fi-FI |
| fre | fr | fr-CH, fr-FR |
| ger | de | de-AT, de-DE, de-CH, de-LI |
| gre | el | el-GR |
| hun | hu | hu-HU |
| gle | ga | ga-IE |
| ice | is | Is-IS |
| ita | it | It-CH, it-IT |
| lav | lv | lv-LV |
| lit | lt | lt-LT |
| mlt | mt | mt-MT |
| nor | no | no-NO |
| pol | pl | pl-PL |
| por | pt | pt-PT |
| roh | rm | rm-CH |
| rum | ro | ro-RO |
| slo | sk | sk-SK |
| slv | sl | sl-SI |
| spa | es | es-ES |
| swe | sv | sv-SE |

1. **Quality of Services**

Since quality of service (QoS) depends on the specific testing procedure for a given service, this section describes and normalizes the testing procedure that is to be applied for the assessment of QoS for a given INSPIRE discovery service.

The monitoring parameter NSi4 in the Commission decision for monitoring and reporting measures the conformity of all network services with the implementing rules. The conformity of a network service requires the compliance with the Quality of Service as defined in Annex I of the NS regulation (in particular NSi4,1 and NSi4,2 for the current monitoring period).

* 1. ***General requirements***

|  |
| --- |
| To options exist for the measurements of Quality of Services:   1. Quality of Services requirements are measured at the service side exposed to the Internet. 2. Quality of Services requirements are measured from a central network node within the   infrastructure. |

NOTE 1 If a member state uses a central network node in the testing infrastructure (option 2), it shall take into account the network transport time, such that:

Performance = Response time from network node to central node - network transport time

The network transport time is denoted X. In this case, a member state should initiate a comparison between sample measures from the central node to sample measures at the service side, to find a realistic value of X for the specific national setting.

NOTE 2 Option 2 was included for practical reasons. Based on the evaluation of experiences the IOC TF will revisit this option.

* 1. ***Implementation requirements mandated by the Implementing Rule***

*“The response time for sending the initial response to a Discovery service request shall be maximum 3 seconds in normal situation.*

*[…]*

*Normal situation represents periods out of peak load. It is set at 90% of the time.”*

* + 1. **Normalized testing procedure**

|  |
| --- |
| Performance shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime. |

|  |
| --- |
| Structure of the sample reference request:  - Performance shall be measured using the Discovery Metadata operation. |

The structure of the sample reference request is recommended to:

- Search metadata with filter PropertyName=AnyText, Literal=dataset, and with varying BBOX requests.

|  |
| --- |
| Evaluation and assessment criteria:  - The initial response time of 3 seconds refer to first byte returned by the service to the internet. |

NOTE It is assumed that the request is completely processed by the service before the first byte is delivered. At the server side the network transport time is negligible compared to the request processing time. Therefore, it is seen as equal to measure the last byte returned

|  |
| --- |
| Normal situation shall be identified by the 90% best performing sample reference requests. |

* 1. ***Capacity***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The minimum number of served simultaneous requests to a discovery service according to the performance quality of service shall be 30 per second.”*

* + 1. **Normalized testing procedure**

|  |
| --- |
| Capacity shall be measured consistently based on sample reference request packages to a given service. The amount of request per package shall be 30 per second and shall be issued every second during a measurement timeframe of 1 min. A measurement shall take place at least once before launching the service in a production environment and monitored at regular intervals thereof to ensure  that the compliance with the capacity requirement is still ensured. |

NOTE: The result of capacity measurements in a production system may be ambiguous due to the amount of user load that the service processes at the same time and therefore it is recommended capacity tests to be processed during maintenance time frames only.

The frequency of the capacity is recommended to be monthly, e.g., during systems maintenance.

The structure of the sample reference request packages is recommended to:

- Be composed of 10% Get Discovery Service Metadata requests and 90% Discovery Metadata requests.

|  |
| --- |
| The measured capacity shall fulfil the requirements of the regulation (both capacity and performance) for all operations that are provided by the service. |

* 1. ***Availability***
     1. **Implementation requirements mandated by the Implementing Rule**

*“The probability of a Network Service to be available shall be 99% of the time.”*

* + 1. **Normalized testing procedure**

|  |
| --- |
| Availability shall be measured consistently based on sample reference requests to a given service. Minimum 10 reference requests per hour shall be issued to the service continuously during its lifetime. |

The sample request issued to the service to measure performance can be used to measure availability as well, thus also fulfilling the same evaluation and assessment criteria.

The availability shall be based on a time frame of one year meaning a maximum unplanned downtime of 3.63 days per year. Periods of planned downtime e.g. because of system maintenance, shall not be included in the measure. Downtime is considered planned when notified to the community well in advance (minimum 1 week), e.g. via notifications to registered users or on portals.

NOTE: It is assumed that the availability is calculated in the following way:

100% ↔ 365 x 24 - (planned downtime)

99% ↔ [365 x 24 - (planned downtime)] \* 0.99 etc.

Planned downtime is recommended to be less than 10 hours per month (i.e., less than 120 hours per year).

The following table shows the maximum downtime according to the implementing rules:

**Table 10: Downtime per week, month, year**

|  |  |  |  |
| --- | --- | --- | --- |
| %Uptime | Max. Downtime/week | Max. Downtime/month | Max. Downtime/year |
| 98% | 3.4 hours | 14.55 hours | 7.27 days |
| 98.6% | 2.4 hours | 10.19 hours | 5.09 days |
| 99% | 1.7 hours | 7.27 hours | 3.63 days |
| 99.5% | 0.8 hours | 3.64 hours | 1.82 days |
| 99.9% | 10 minutes | 0.73 hours | 8.73 hours |
| 99.99% | 1 minute | 4 minutes | 52 minutes |
| 99.999% | 6 seconds | 26 seconds | 5 minutes |

**Annex A Extended capabilities**

The following XSD Schema defines the XSD Types that are needed to provide additional information on multilingual aspects.

This information shall be provided in a capabilities documents that is returned by an INSPIRE Discovery Service. See [**OGC CSW**].

The XML Elements that comply with the following shall be applied in the <ExtendedCapabilities>

section of the capabilities document.

Example 14: XSD Schema defines the XSD Types for multilingual aspects

<?xml version="1.0" encoding="UTF-8"?>

<xs:schema [xmlns:xs="http://www.w3.org/2001/XMLSchema"](http://www.w3.org/2001/XMLSchema) xm[lns="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) [targetNamespace="http://inspire.ec.europa.eu/schemas/common/1.0"](http://inspire.ec.europa.eu/schemas/common/1.0) elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.0.0"

…

<xs:complexType name="languageElement" abstract="true">

<xs:sequence>

<xs:element name="Language" type="xs:string"/>

</xs:sequence>

</xs:complexType>

<xs:complexType name="languageElementISO6392B">

<xs:complexContent>

<xs:restriction base="languageElement">

<xs:sequence>

<xs:element name="Language" type="euLanguageISO6392B"/>

</xs:sequence>

</xs:restriction>

</xs:complexContent>

</xs:complexType>

<xs:complexType name="supportedLanguagesType">

<xs:sequence>

<xs:element name="DefaultLanguage" type="languageElementISO6392B"/>

<xs:element name="SupportedLanguage" type="languageElementISO6392B" minOccurs="0" maxOccurs="unbounded">

<xs:annotation>

<xs:documentation>It is not necessary to repeat the default language</xs:documentation>

</xs:annotation>

</xs:element>

</xs:sequence>

</xs:complexType>

…

<xs:element name="SupportedLanguages" type="supportedLanguagesType"/>

<xs:element name="ResponseLanguage" type="languageElementISO6392B"/>

…

**Annex B INSPIRE Network Services Regulation Compliance**

This compliance matrix shows how the Discovery Service Technical Guidance within the main body of this document conforms to the INSPIRE Network Services Regulation [INS NS].

Table 11: INSPIRE Network Services Regulation Compliance

|  |  |  |  |
| --- | --- | --- | --- |
| **Item** | **INSPIRE Network Services Regulation [INS NS] - Annex II** | **Technical Guidance for Discovery Service** | |
|  | DISCOVERY SERVICES |  |  |
|  | PART A |  |  |
|  | Search criteria |  |  |
| 1 | In order to be in conformity with the minimum set of search criteria set out in Article 11(2) of Directive 2007/2/EC, the Discovery Service shall support searching with the INSPIRE metadata elements listed in Table 1 of this Annex. | Section | 4.4.2 |
| 2 | The following INSPIRE metadata elements or set of elements shall be also available as search criteria: (a) Resource Title; (b) Resource Abstract; (c) Resource type;  (d) Unique Resource Identifier; (e) Temporal Reference. | Section | 4.4.2 |
| 3 | To allow for discovering resources through a combination of search criteria, logical and comparison operators shall be supported. | Section | 4.4.1 |
| 4 | To allow for discovering resources based on the geographic location of the resource, the spatial operator listed in Table 2 shall be supported. | Section | 4.4.1 |
|  | PART B |  |  |
|  | Operations |  |  |
|  | 1. LIST OF OPERATIONS |  |  |
|  | In order to be in conformity with Article 11(1) of Directive 2007/2/EC, the Discovery Service shall provide the operations listed in Table 3 of this Annex: |  |  |
| 5 | Get Discovery Service Metadata: Provides all necessary information about the service and describes service capabilities | Section | 4.3.1 |
| 6 | Discover Metadata: The Discover Metadata operation allows requesting INSPIRE metadata elements of resources based on a query statement to be retrieved from the target Discovery Service | Section | 4.3.2 |
| 7 | Publish Metadata: The Publish Metadata operation allows editing INSPIRE metadata elements of resources in the Discovery Service (push or pull metadata mechanisms). Editing meaning insert, update and delete | Section | 4.3.3 |
| 8 | Link Discovery Service: The Link Discovery Service function allows the declaration of the availability of a Discovery Service for the discovery of resources through the Member State Discovery Service while maintaining the resource metadata at the owner location | Section | 4.3.4 |
|  | 2. GET DISCOVERY SERVICE METADATA |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2.1.Get Discovery Service Metadata Request |  |  |
| 9 | 2.1.1.Get Discovery Service Metadata Request: Get Discovery Service Metadata Request parameters: The Get Discovery Service Metadata Request parameter indicates the natural language for the content of the Get | Section | 4.3.1.1 |
| 10 | 2.2.Get Discovery Service Metadata Response The Get Discovery Service Metadata Response shall contain the following sets of parameters: — Discovery Service Metadata, — Operations Metadata, — Languages. | Section | 4.3.1.2 |
| 11 | 2.2.1.Discovery Service Metadata parameters: The Discovery Service Metadata parameters shall at least contain the INSPIRE metadata elements of the Discovery Service. | Section | 4.3.2.1 |
| 12 | 2.2.2.Operations Metadata parameters: The Operations Metadata parameter provides metadata about the operations implemented by the Discovery Service. These metadata parameters shall describe each operation. It shall at least provide the following: 1. indicate for the Publish Metadata if the Pull Mechanism, the Push Mechanism or both are available; 2. describe each operation, including as a minimum a description of the data exchanged and the network address. | Section | 4.3.1.2 |
| 13 | 2.2.3.Languages parameter: Two language parameters shall be provided: — the Response Language parameter indicating the natural language used in the Get Discovery Service Metadata Response parameters, — the Supported Languages parameter containing the list of the natural languages supported by the Discovery Service. | Section | 4.5 |
|  | 3. DISCOVER METADATA |  |  |
| 14 | 3.1 Discover Metadata Request: This Discovery Metadata Request contains the following parameters: — Language,  — Query. | Section | 4.3.2.1 |
| 15 | 3.1.1.Language parameter: The Language parameter indicates the natural language requested for the content of the Discover Metadata Response. | Section | 4.5 |
| 16 | 3.1.2.Query parameter: The Query parameter shall contain the combination of search criteria as specified in part A. | Section | 4.3.2.1 |
|  | 3.2. Discover Metadata Response |  |  |
| 17 | 3.2.1.Discover Metadata Response parameter: The Discovery Service Metadata parameters shall at least contain the INSPIRE metadata elements of the Discovery Service. | Section | 4.3.2.2 |
|  | 4. PUBLISH METADATA |  |  |
| 18 | The Publish Metadata function enables the publication of the INSPIRE metadata elements of resources at the Discovery Service. Two alternatives are:- Push Mechanism: allowing editing of the INSPIRE metadata elements of resources accessible from the Discovery Service,- Pull Mechanism: allows the Member State Discovery Service to pull INSPIRE metadata elements of resources from a remote location. At least one of the above alternatives shall be supported. | Section | 4.3.3 |
|  | 4.1. Push Mechanism |  |  |

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| --- | --- | --- | --- |
|  | 4.1.1. Edit Metadata Request |  |  |
| 19 | 4.1.1.1. Edit Metadata Request Parameter: The Edit Metadata Request parameter provides all information requested for INSPIRE metadata elements of resources to be inserted, updated or deleted at the Discovery Service | Section | 4.3.3.1 |
|  | 4.2. Pull Mechanism |  |  |
|  | 4.2.1. Collect Metadata Request |  |  |
| 20 | 4.2.1.1. Collect Metadata Request Parameter: The Collect Metadata Request parameter provides all information about the remote location required to retrieve the available metadata of resources. It shall include as a minimum the INSPIRE metadata elements of the dedicated spatial data service. | Section | 4.3.3.2 |
|  | 5. LINK DISCOVERY SERVICE |  |  |
| 21 | The Link Discovery Service operation allows the declaration of the availability of a Discovery Service compliant with this Regulation, for the discovery of resources through the Member State Discovery Service while maintaining the resource metadata at the owner location. | Section | 4.3.4 |
|  | 5.1. Link Discovery Service Request |  |  |
|  | 5.1.1. Link Discovery Service Request parameter |  |  |
| 22 | The Link Discovery Service Request parameter shall provide all information about the Public Authority's or Third Party's Discovery Service compliant with this Regulation, enabling the Member State Discovery Service to get resources metadata based on a combination of search criteria from the Public Authority's or Third Party's Discovery Service and to collate it with other resources metadata. | Section | 4.3.4.1 |

**7 Technická specifikace nabízeného plnění – „Nabízený**

**předmět plnění"**

V této kapitole je popsán technický návrh GIS systému a to dle požadavku Zadávací dokumentace.

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