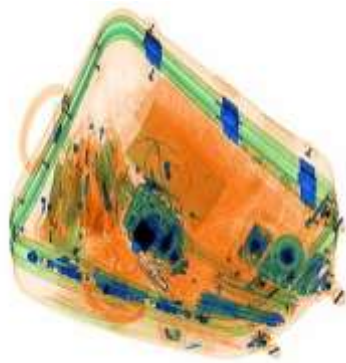


System Requirements Servers CASRA Application Version 3.8 and newer

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1. OVERVIEW

This document discusses the system requirements for server components of CASRA's software applications for version 3.8 and newer. See the separate document for detailed system requirements on the client components or the software architecture.

CASRA offers a variety of system and infrastructural solutions targeted to particular usage scenarios and that can be adapted to best fit your needs.

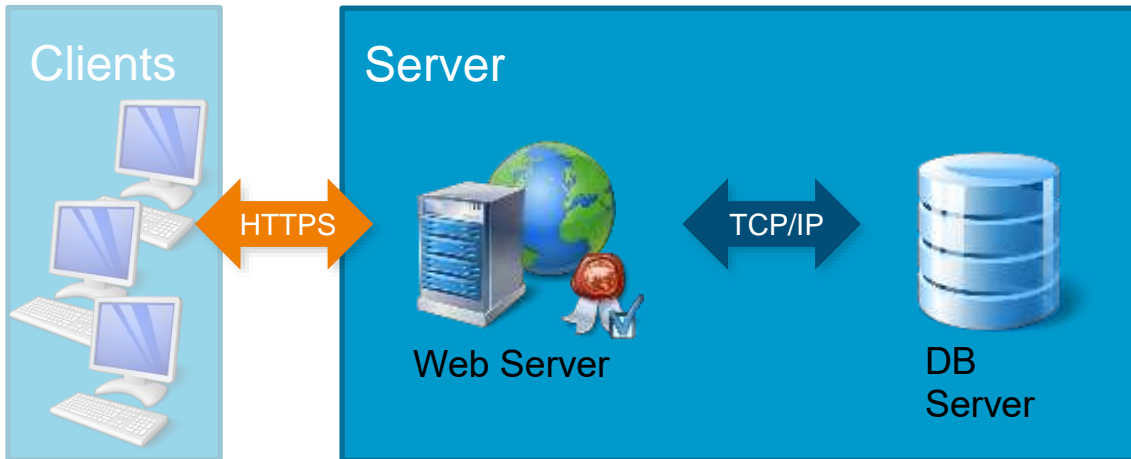


Figure 1 – server system components.

Clients



Please make sure to verify compliance with the “System Requirements Workstations” for the same software version to ensure that the client workstations meet the required specifications.

2. SOLUTIONS

2.1. STANDALONE

Standalone installations are recommended when a single workstation is used to access the platform. In a standalone set-up all components of the platform are installed and run on the same machine. An overview of the location of each the components are given in Figure 2.

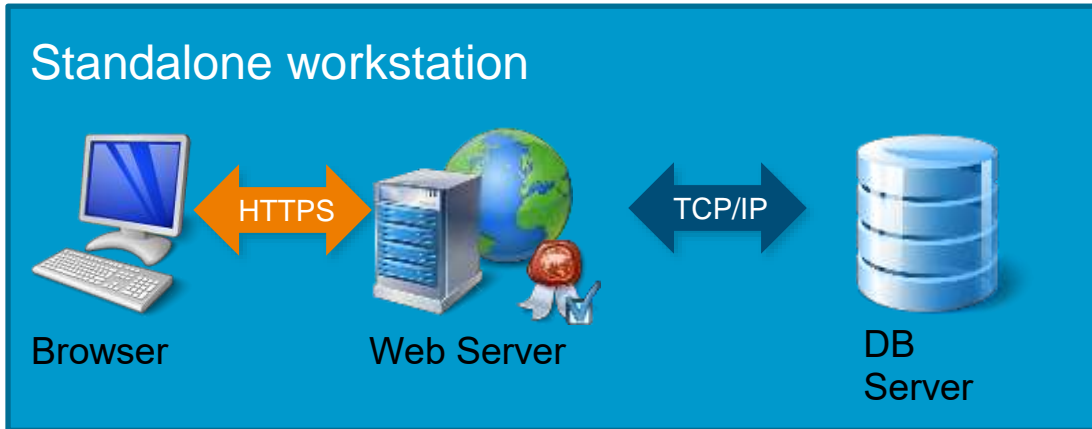


Figure 2 - Standalone installation

A standalone installation requires one machine matching the specification of each of the components.

2.2. ALL-IN-ONE SERVER

Installations with a limited number of client workstations that require a centralized solution would benefit from the all-in-one server solution. With this approach all server-side components are installed and run on one server in the network.

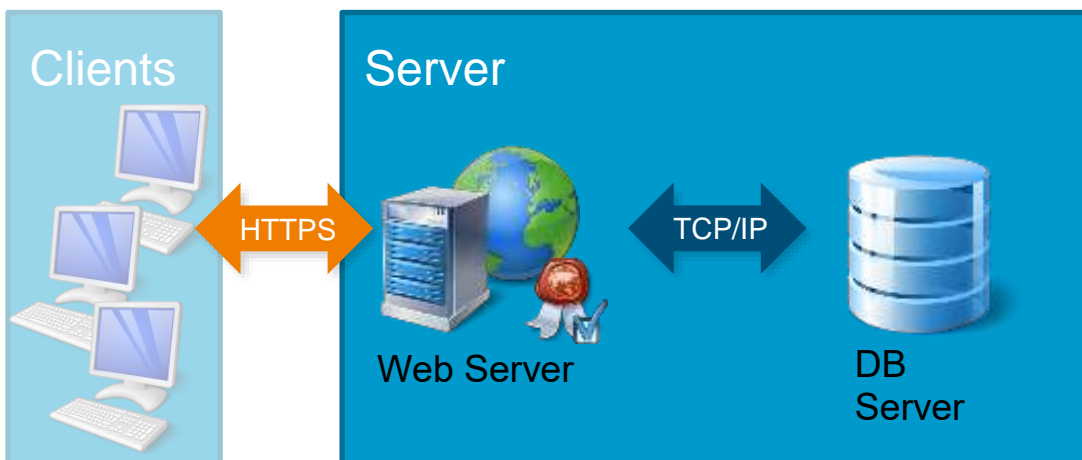


Figure 3 - All-in-on server installation

The all-in one server configuration requires a separate specification for clients and server.

2.3. WEB AND DATABASE SERVER

A solution with separate servers for web layer and database is available for installations that impose performance requirements exceeding that of the all-in-one solution. This configuration also allows the database to be hosted in your own database environment.

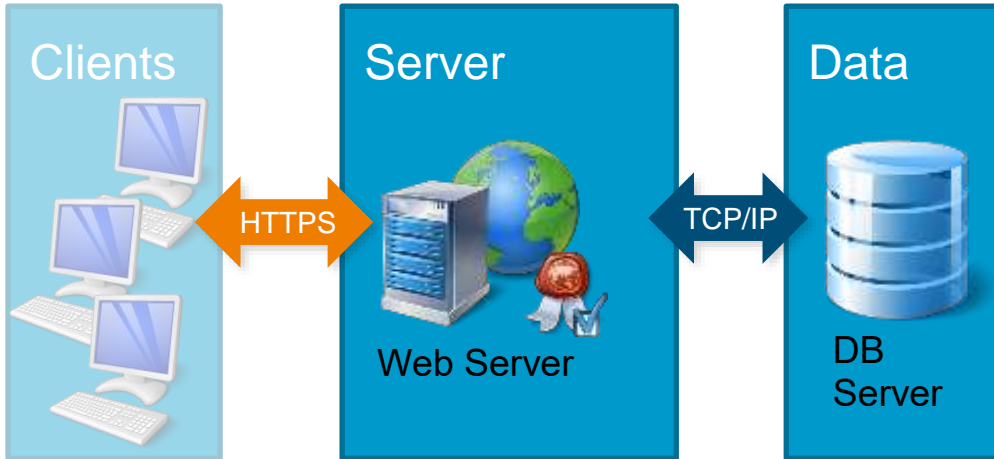


Figure 4 - Web and database server installation

This configuration requires a separate specification for clients, web server, and database server.

3. SYSTEM REQUIREMENTS

This section provides an overview of the system requirements of the components (i.e. the server tiers) for all supported scenarios. The supported tiers are web server and database server.

The relevant specifications depend on the system architecture recommended to you by our technical experts. The database tier is always singular. Some architectures recommend integrating multiple components into one tier. In such a scenario combine the specifications for each of the components.

System Architecture	Tiers
Standalone*	All layers including client are located on the same tier. Integrate the specifications from all systems including the client specification (see separate document).
All-in-one	Web server and database (server) are located on the same tier. Integrate the specifications from all systems including the client specification (see separate document).
Web and database	Web server is located on the same tier. The database (server) is located on a separate tier.

Standalone*



Microsoft SQL Server Express edition is allowed for standalone installations under certain circumstances. Please contact our technical experts for information.

Microsoft SQL Server Express edition has limited functionality, scalability and allows data storage to a maximum of 10 GB. The party responsible for hosting the database is required to upgrade the SQL Server to Standard edition or higher when the database size reaches 7 GB. The party should inform CASRA as soon as this limit is reached. Note that SQL Server Express also lacks certain tools important for database maintenance, monitoring and support.

The database component (i.e. the database hosted in SSMS) can be hosted in a dedicated environment.

Please contact our technical staff for information if you like to use a virtualized environment.



3.1. WEB SERVER

Requirement	Minimal	Recommended
Processor	See section 4 Scalability	See section 4 Scalability
RAM	See section 4 Scalability	See section 4 Scalability
Hard Disk**	20 GB available	80 GB available
Operating System (EN / DE)	Windows Server 2008 R2	Windows Server 2012 R2
Network*	100 Mbit	1Gbit
Screen Resolution	1024 x 768	1280 x 1024
Internet Information Services (IIS)	IIS 7.0	IIS 8.5
.NET Framework	.Net Framework 4.5.1	.Net Framework 4.5.1
Silverlight	Silverlight min 5.1.20125.0	Silverlight 5.1 (latest)
Internet Browser	Internet Explorer 9 or higher	Internet Explorer 11

Figure 5 – Web server specifications.

Network*



The applications require network access to the database server. Ensure that connections to the SQL instance on the database server are possible and that privileges and access rights for the user hosting the IIS website are sufficient for read and write transactions to access. Refrain from granting more rights than necessary whenever possible.

Available hard disk space**



The specification for disk size is dependent on the number of licensed libraries delivered with the installation.

Active virus scanning of application folders should be disabled. Folders path include the website root and subordinate folders (e.g. C:\inetpub\casra\) and library root and subordinate folders.

Communication between clients and web server is secured by SSL certificates leveraging 2048bit encryption technology.

3.2. DATABASE SERVER



Requirement	Minimal	Recommended
Processor	See section 4 Scalability	See section 4 Scalability
RAM	See section 4 Scalability	See section 4 Scalability
Available Hard Disk Space	See section 4.1 Data growth metric	See section 4.1 Data growth metric
Operating System	Windows Server 2008 R2 (EN,DE)	Windows Server 2012 R2 (EN,DE)
Network	100 Mbit	1Gbit
Screen Resolution	1024 x 768	1280 x 1024
.NET Framework	.Net Framework 4.5.1	.Net Framework 4.5.1
SQL Server*	Microsoft SQL Server 2008 R2 SP2	Microsoft SQL Server 2012 SP3

Figure 6 – Database server specifications.

SQL Server*



The application database utilizes indexing to leverage fast response times for complex read transactions. The index hashes should be rebuilt on a regular basis to maintain its effectiveness. We recommend a nightly reorganization of the index hash tables and a rebuild of the indexes once a week. Contact our technical experts to identify how to schedule automatic index reorganization and rebuild, and which indexes are affected. For general information, see <http://msdn.microsoft.com/en-us/library/ms189858.aspx>.

A database backup policy is recommended to mitigate data corruption, e.g. due to a network or power failure. We recommend weekly full backups and daily differential backups. Contact our technical experts for recommended backup & recovery policies and practices.



Microsoft SQL Server Standard Edition should be installed at a minimum, and Web or Enterprise editions are recommended for deployment scenarios with many concurrent users and connections, requiring a more powerful server solution.

Microsoft SQL Server Express editions are not supported. CASRA cannot guarantee and is not liable for the availability of its software and services on systems leveraging SQL Server Express editions. Any Express server versions used in production environments should be upgraded to the specified editions at the latest when the physical database size and logs reach 7 GB.

4. SCALABILITY

Our software solution infrastructure scales horizontally to support large operational environments and increase in demand. The architecture of the software supports up-scaling (and downscaling) at any time during its productive lifespan.

Considering scalability is particularly relevant for the ‘web and database server’ described in sections 2.3. For less advanced solutions the server specifications should be integrated.

Scalability impacts the number of servers and the number of cores and RAM for each of these servers. The specifications are differentiated between the three server types (web server and database server).

Server		Concurrent users			
Type	Component	10	20	40	More than 40***
Web server + Business server**	CPU cores	2 core	4 cores	8 cores	<i>Request specification</i>
	RAM	3.0 GB	4.0 GB	4.0 GB	
Database server	CPU cores	2 cores	4 core	8 cores	<i>Request specification</i>
	RAM	4.0 GB	8.0 GB	16.0 GB	

Figure 7 – Specification for the recommended number of processor cores and RAM for all server types.

Business server**



The business server exists as a single instance and, contrary to web servers, does not support horizontal scalability. The server run only one windows service.

More than 40 concurrent users***



We recommend considering load balancing across multiple web servers when user concurrency exceed 40. Please contact our technical staff for installations that should support a large number of concurrent users. We shall work with you to provide recommendations for the required infrastructure that best fits your IT environment.

Processor

The recommended number of cores is based in reference to each server being equipped with the Intel Xeon Processor E5640.

Processor specification	
Processor Number	E5640
Launch Date	2010 Q1
# of Cores	4
Clock Speed	2.66 GHz
L2 Cache	12.0 MB

Figure 8 – Specification for the recommended processor type for each server type. Detailed specification is available at http://ark.intel.com/products/47923/Intel-Xeon-Processor-E5640-12M-Cache-2_66-GHz-5_86-GTs-Intel-QPI

A similar or better processor model may be used. Please consult with our technical staff for recommendations and confirmation of the processor of intended use.

For example, the recommended E5640 processor model is equipped with four cores and supports 40 concurrent users when used in a web server. However, the Intel Xeon Processor E3-1240 v3, although also equipped with four cores, would support more users in the same server.

Processor specification	
Processor Number	E3-1240 v3
Launch Date	2013 Q2
# of Cores	4
# of Threads	8
Cache	8.0 MB
Clock Speed	3.40 GHz
Max Turbo Frequency	3.80 GHz

Figure 9 – Specification for the recommended processor type for each server type. Detailed specification is available at http://ark.intel.com/products/75055/Intel-Xeon-Processor-E3-1240-v3-8M-Cache-3_40-GHz

4.1. DATA GROWTH METRIC

Solutions that are deployed with the XRT product may experience significant growth in database size depending on the user population. To assess the impact on database size a metric has been established that estimates the prospective growth for a given user population.

The metric determines the average monthly growth rate of the database based on the size of the screener population, the average number of courses available to those users, and the training time in hours each screener is expected to spend training per course (this may be based on regulatory requirements).

The data growth is estimated to increase **per month by 0.2 MB per user for each hour of training**. The scenarios in the table below indicate monthly growth for a few common scenarios and population sizes.

Component	Application lifetime	Overall training hours per month						
		10	20	50	100	200	500	1000
SQL disk size	1 year	24 MB	48 MB	120 MB	240 MB	480 MB	1.2 GB	2.4 GB
	5 years	120 MB	240 MB	600 MB	1.2 GB	2.4 GB	6 GB	12 GB

Figure 10 – Data growth scenarios based on application lifetime and training regulation scenarios. The “Overall training hours per month” are calculated as: #users x #training hours per month. For example, a population of 100 screeners with a regulatory 30 minutes per month each for CBS and HBS training yields: 100 screeners x (30 / 60) hours x 2 courses = 100 hours.

Data growth for the other products, e.g. CTP, Infoboard, User Management, OCT and CES, is not significant and has not been included in this metric.

5. INSTALLATION

The following requirement is crucial to speed up the installation or to execute an update of an installation:

- Domain user, which has the "login as a service" right, is local administrator on all servers and is DB owner.

<https://technet.microsoft.com/en-us/library/cc794944%28v=ws.10%29.aspx>

- A valid SSL certificate is deployed to all clients.
- The SSL certificate is installed on the webserver and the thumbprint of the certificate is known.

Please contact our technical staff for more information.