Druid

High Level Architecture

Private 4G/5G Data - Voice - MCX

Raemis™ Private Cellular Network

Raemis™

Raemis is **Druid's** core platform for 4G and 5G.

A 3GPP compliant 4G/5G core network including voice.

Unique features designed specifically for Enterprise Critical Communications.

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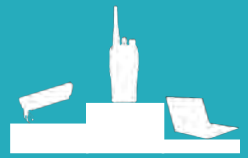
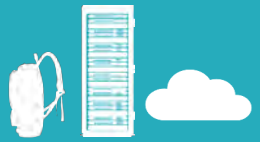


Device Priorisation

Radio Agnostic

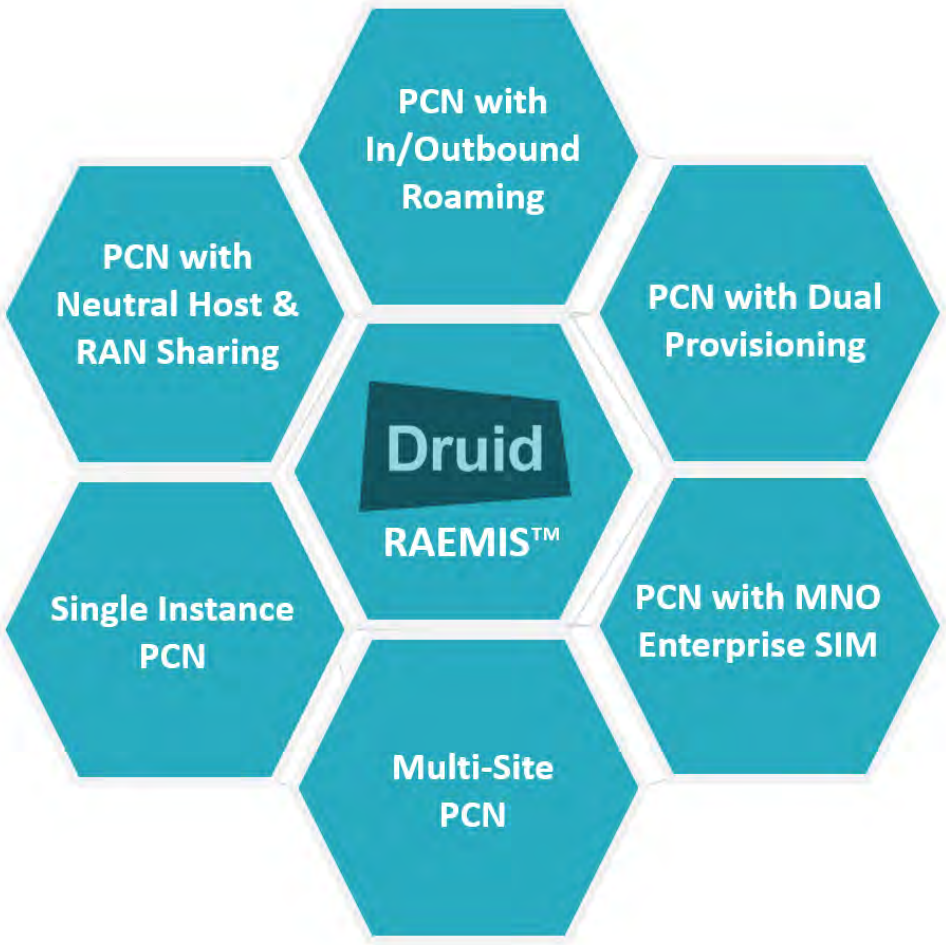
Scale up and down



Flexible Deployment

Easy to Integrate

Simple to use



Raemis Platform

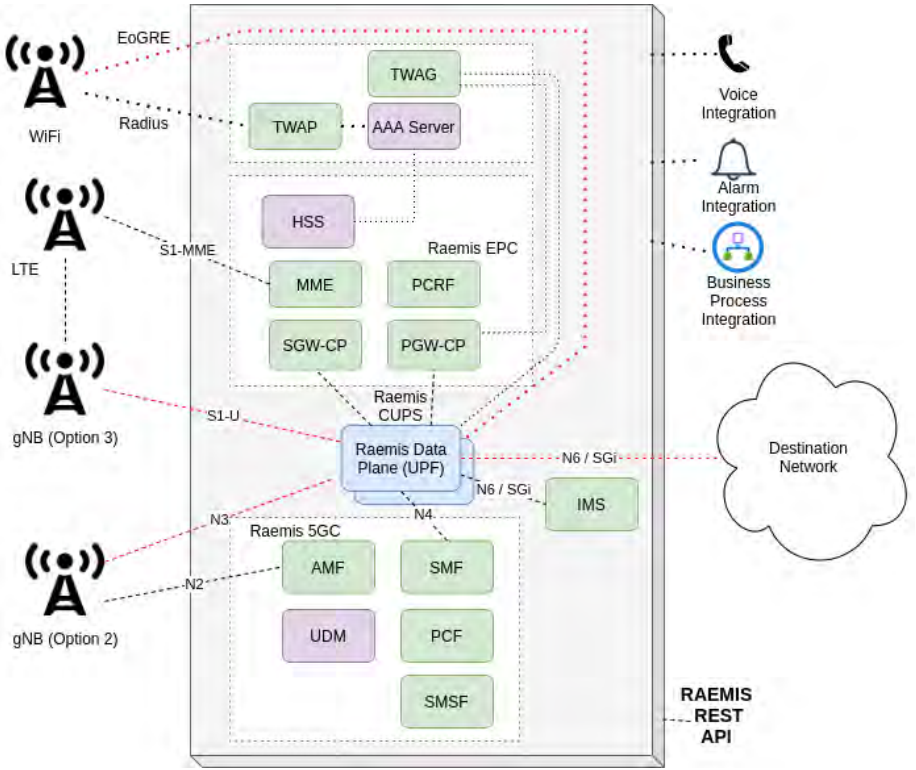
Raemis Platform delivers a multiple of solutions for private networks. In our Roadmap plans we describe the features in relation to

- Private Core (2G, 3G, 4G, 5G and Wifi)
- Roaming
- MOCN Gateway
- Innovation

Druid's Raemis platform can be deployed in different configurations to deliver unique business value for your customers.

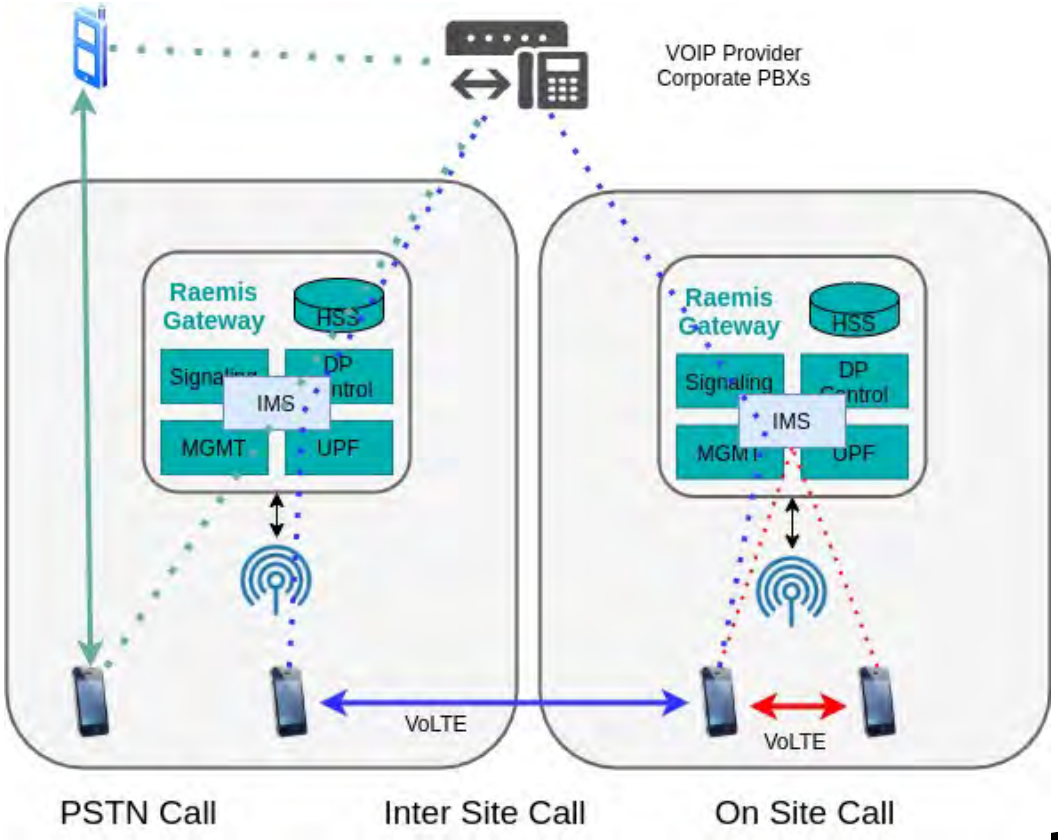
Raemis Gateway - High Level Architecture

- Full 4G/5G/WiFI Core at the edge, POP or Cloud
- Local Data Breakout
- CUPS architecture - vertical and horizontal scaling
- IMS Support
- Enterprise Integration
- Web Based Management designed for the IT Manager
- Control plane at the edge - High availability with a resilient 2nd ‘standby’ core or Active-Active (N+1) resilience



Voice Support - Raemis IMS

- Raemis IMS
  - Supports VoLTE and VoNR
  - Device Support Required
- On Site Resilience
  - On-Site Calls Local
- Voip / PBX
  - Voip/PBX Integration Possible
  - Client & Trunk Interfaces
- High Availability
  - If PBX Fails then On-Site calls OK
  - No Requirement for PBX/VOIP
  - Central IMS also Possible

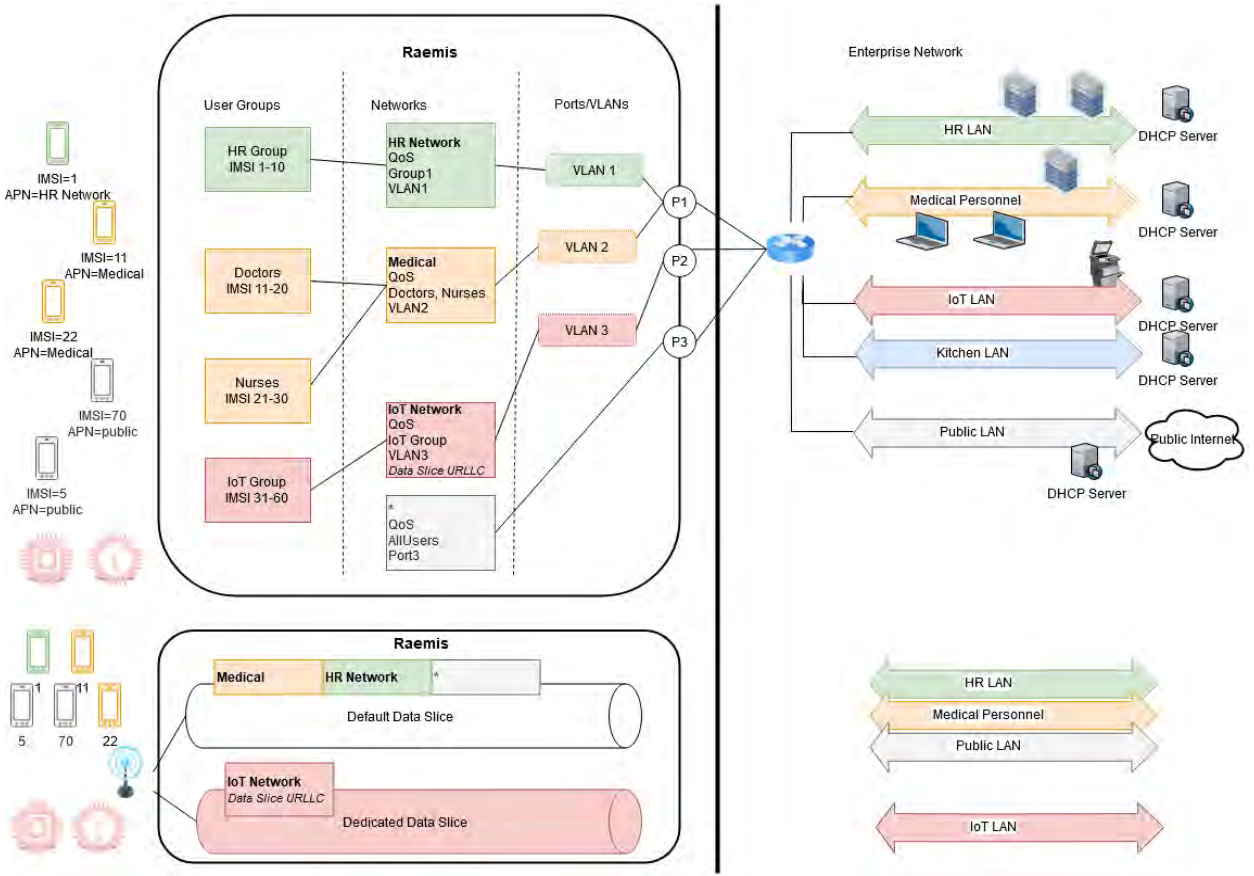


Enterprise Networking - Data Slicing Made Simple

Separating Data

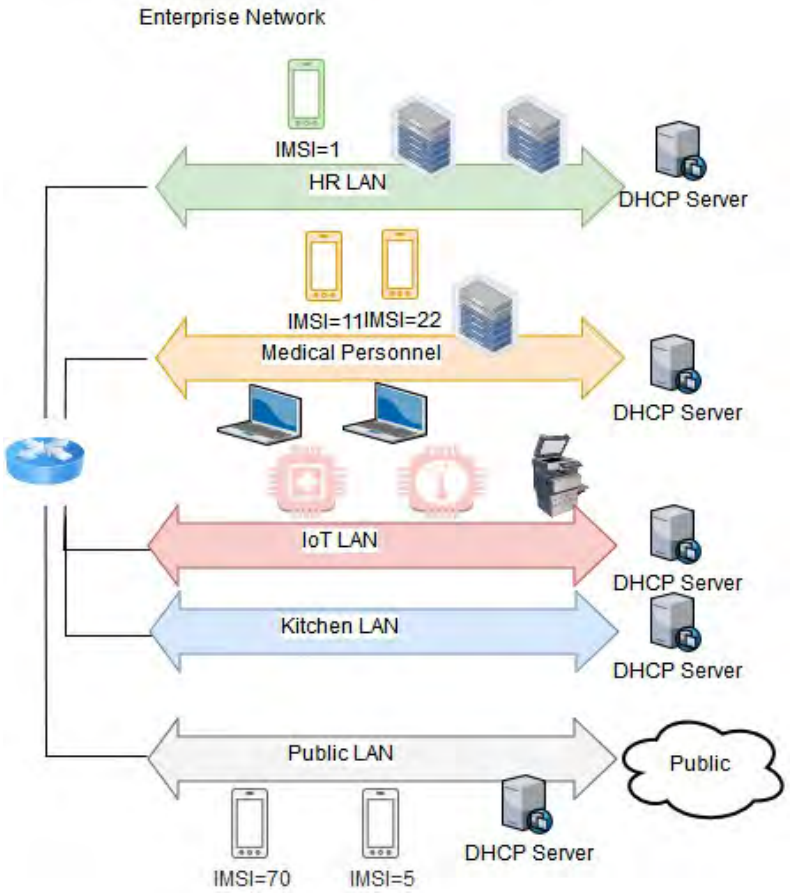
Managing QoS/5QI

Rx/N5 integration for MCX / FRMCS application servers



Enterprise Networking - IP Addressing Made Simple

- Devices must have an IP address
- Raemis supports IPv4 and IPv6
  - From an address pool:
  - Dynamically from a DHCP server
- Maintain existing layer 2 networking
  - Wifi Simplicity
  - MAC Addresses can be generated for devices
  - Raemis will answer Routing Qs (arps)
  - Network behind theDevice routing



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Enterprise Networking - QoS

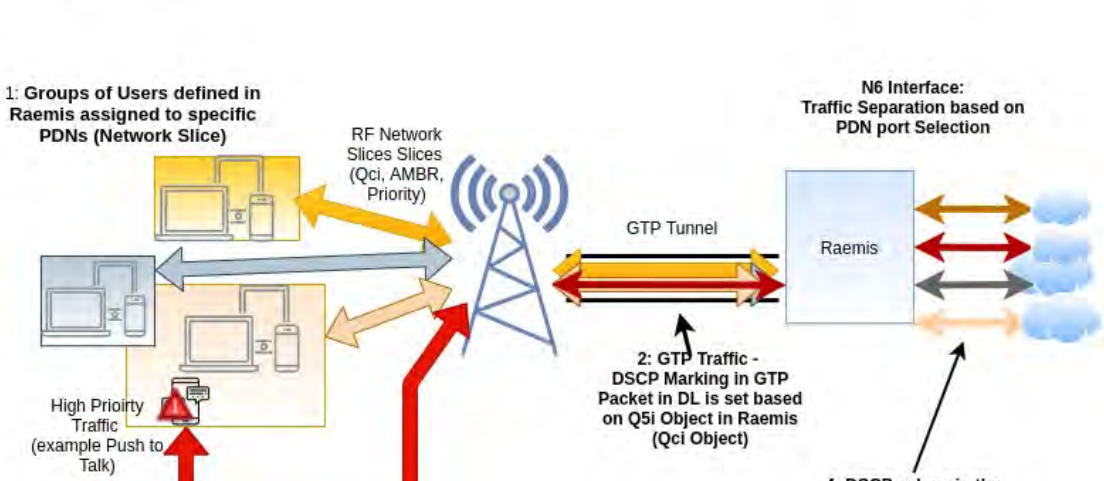
Radio is the Bottle Neck

Create Network Slices

Create PCRF Rules

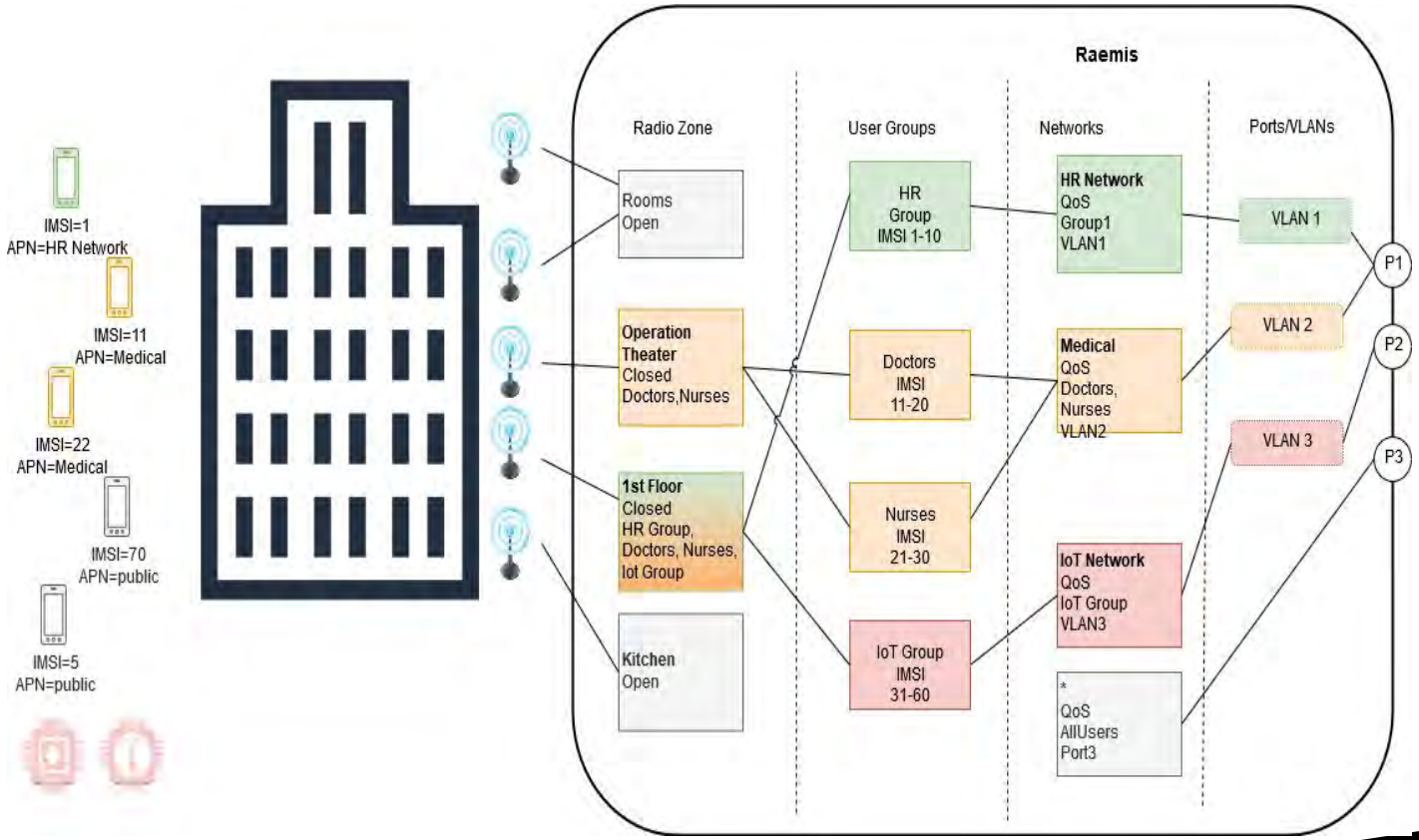
GTP Packets can be marked on Q5i

User Data can be transformed using Flow Actions

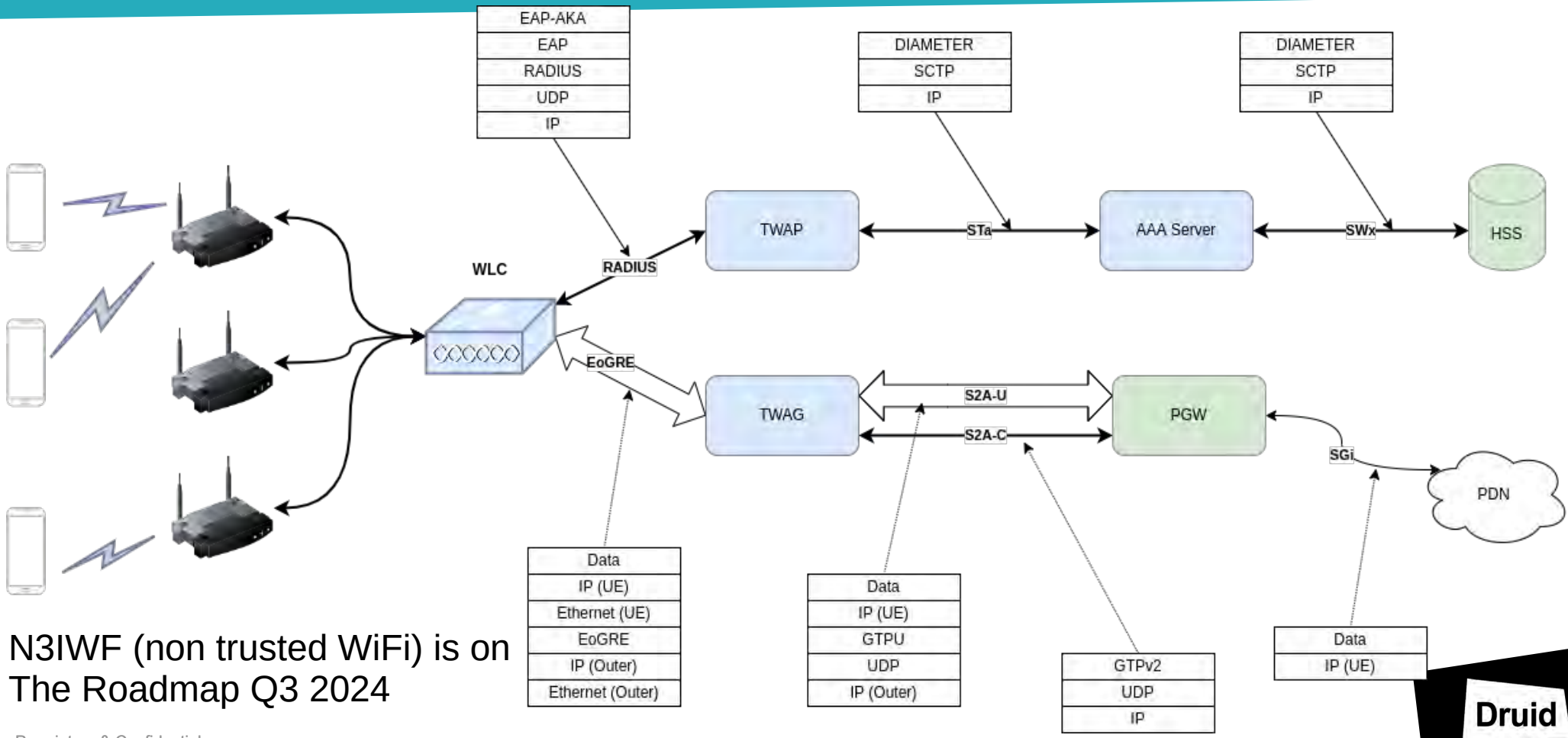


Enterprise Networking - Site and Inbuilding Radio Zoning

- Restricting Devices from Areas
- Site Management
- Timezone Support



Raemis Gateway - Wifi Integration Today



N3IWF (non trusted WiFi) is on The Roadmap Q3 2024

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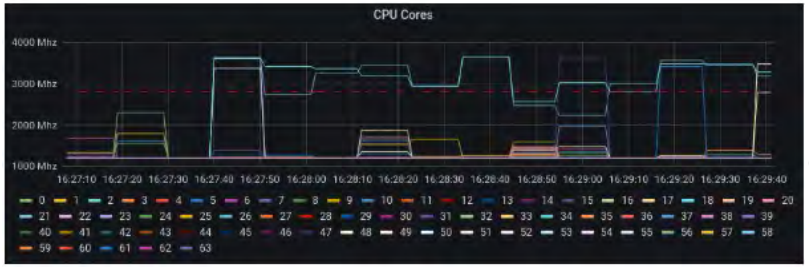
Processor Utilization

Druid are committed to ensuring that Raemis is the leading private enterprise core for Processor Utilisation

Understanding the balance between Burst Rate and sustained rate of operations

Raemis Platform Optimised to maximise 1 core for small SMBS

Goal: Start with 1 Core



Reality Processor Utilisation in normal operational state.

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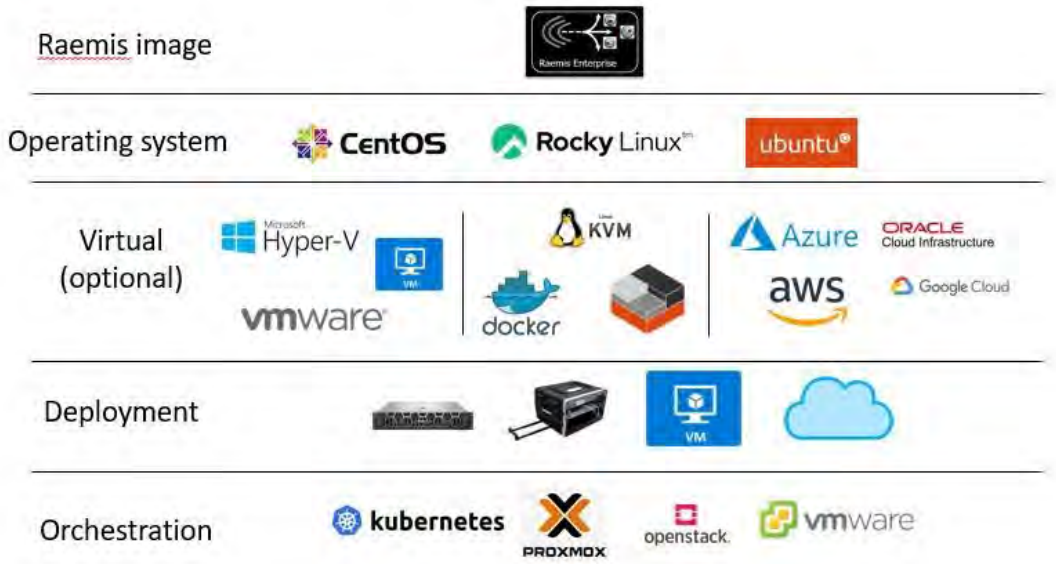
Deployment and orchestration models



System requirements	
Raemis O&M	2 CPU cores (physical cores)
Control plane	1 CPU core for each 10000 provisioned users
Data plane	1 CPU core for each 2.5 Gbps throughput
VoLTE/VoNR	1 CPU core for each 40 concurrent calls

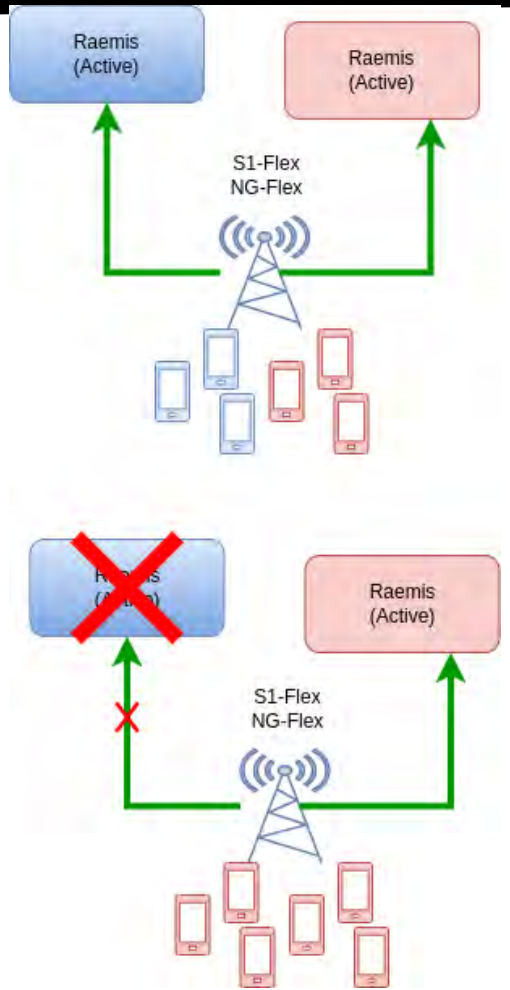
Active – Active - Deployment

In this scenario there are multiple Raemis systems (N+1) deployed and all are active. They are basically independent systems with linked license Ids (not sure if peer license is enforced).

The RAN supports the capability to distribute the Ues across all available cores.

If a core is NOT available then the UE procedures will be redirected to the other available packet cores. The packet core will then instruct the UE to detach and reattach with a new S1-U or N3 connection for user plane traffic.

Outage: In LTE we see outage to be less than 0.5 seconds (200ms)



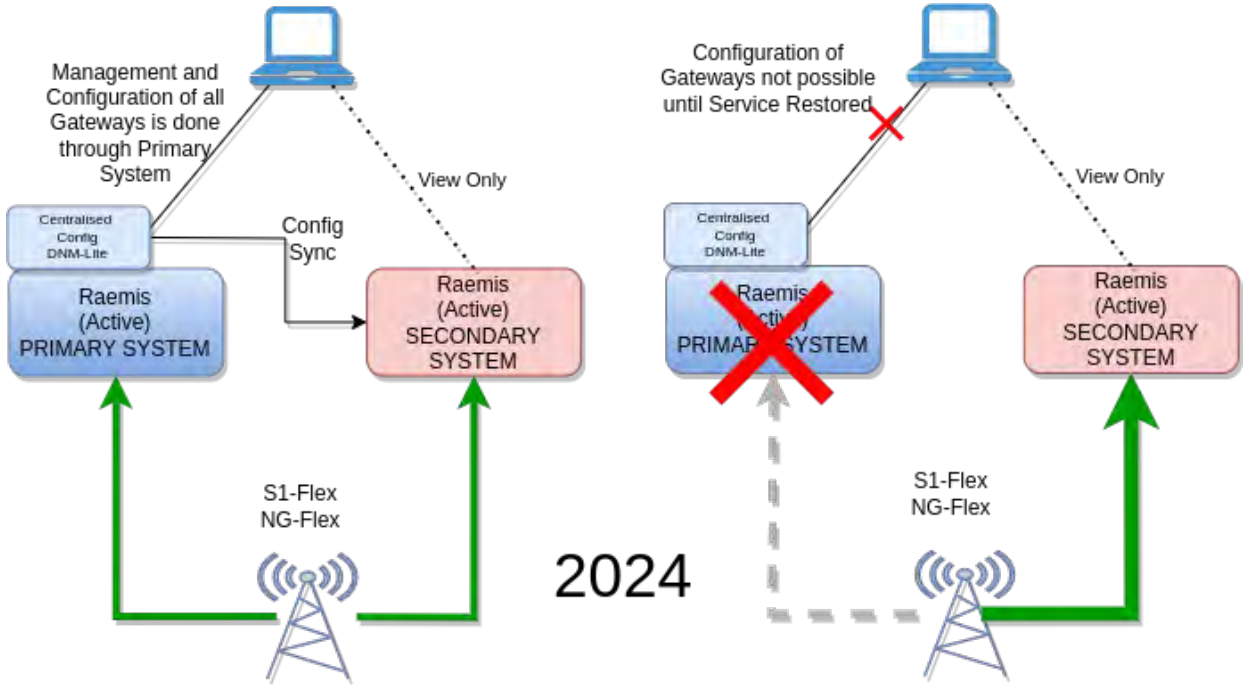
Active – Active – Standalone Systems : 2024 Solution

2024 Q1: We will make it possible to Active DNM Synchronization Feature in Primary Raemis System.

All Management and synchronization will be performed through this primary gateway.

If the Primary System is not available then updates to the configuration of the secondary system is NOT possible until the primary is restored.

If the Secondary system is not available them updates to the primary system will be possible and when the secondary reconnects the configuration will be updated.



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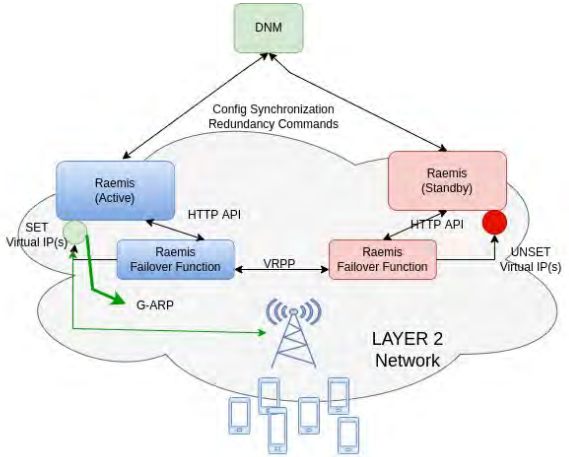
2024 – Shared IP Feature

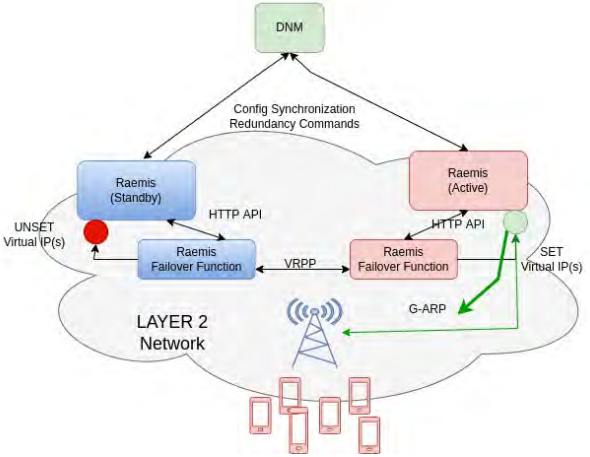
In this scenario there are multiple Raemis systems (N+1) deployed and one has the “ACTIVE” state. The ACTIVE system will activate the IP Addresses for the Radios to connect on the S1/N2 (and any other shared interfaces). If the DNM is available then the configuration for all gateways can be centrally managed and synchronized with all gateways.

The RAN is configured to connect to a single MME/AMF endpoint. A basic feature supported by all RAN vendors.

The Raemis Failover Function will determine which Network functions and infrastructure is available and will be responsible for determining which Raemis Gateway should be in the ACTIVE state. The Active Raemis Gateway will activate the necessary virtual IPs on the configured interfaces and it then broadcasts a G-ARPs on the network to announce the IP to mac mapping update that has occurred.

All Gateways and Radios are on the same Layer 2 network and after a fail-over the radio will reconnect to the Active Raemis gateway.

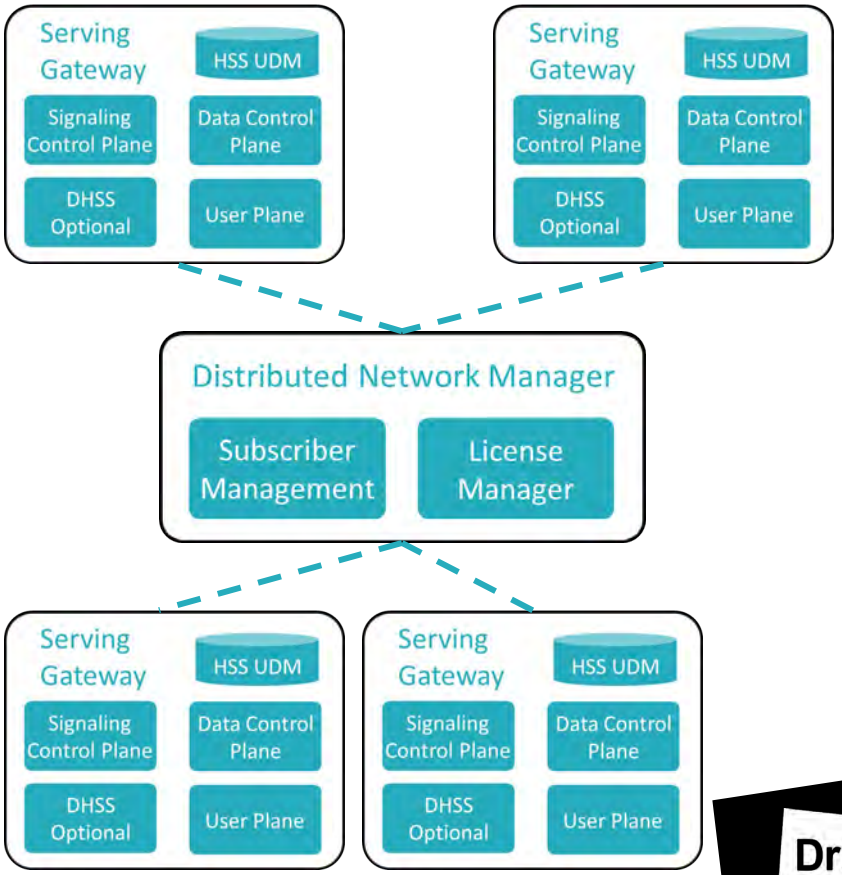




Raemis™ Distributed Network Manager

Raemis - Distributed Network Architecture

- Designed for Flexible Deployment Models
  - Short Term - Long Term Deployments
  - Centralized and Flexible Licensing
  - Centralized Device Management
  - Scale - 1 Radio to 1000 Radios
- Private Network over multiple sites
  - Multi Tenant Capability
- Central management of licenses, subscribers, Monitoring functions
- Ideal for
  - Multi-site customers - equipment from each site can work on other / all sites as determined by Administrator
  - On Site Management Possible



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Scaling & Resiliency

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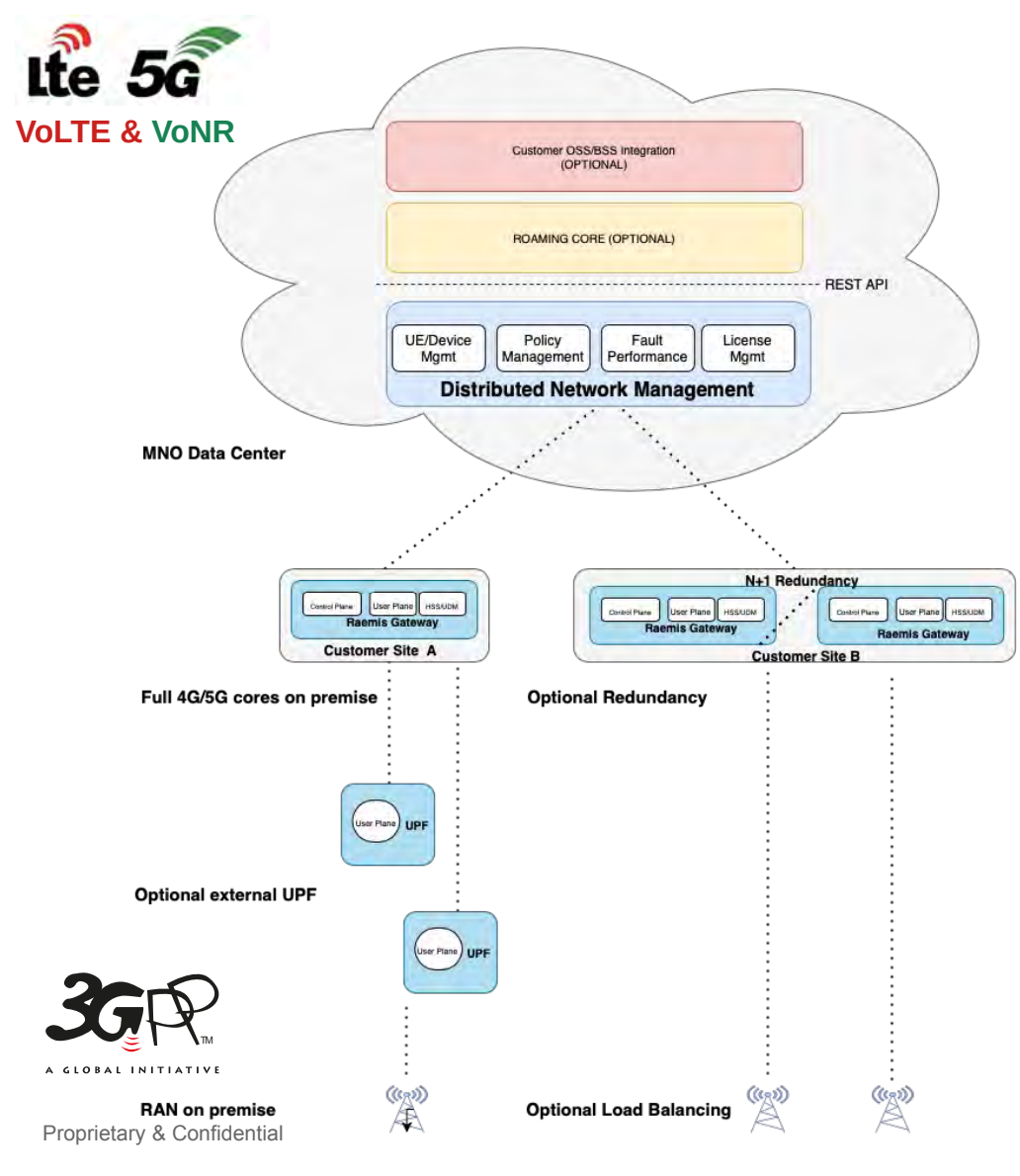
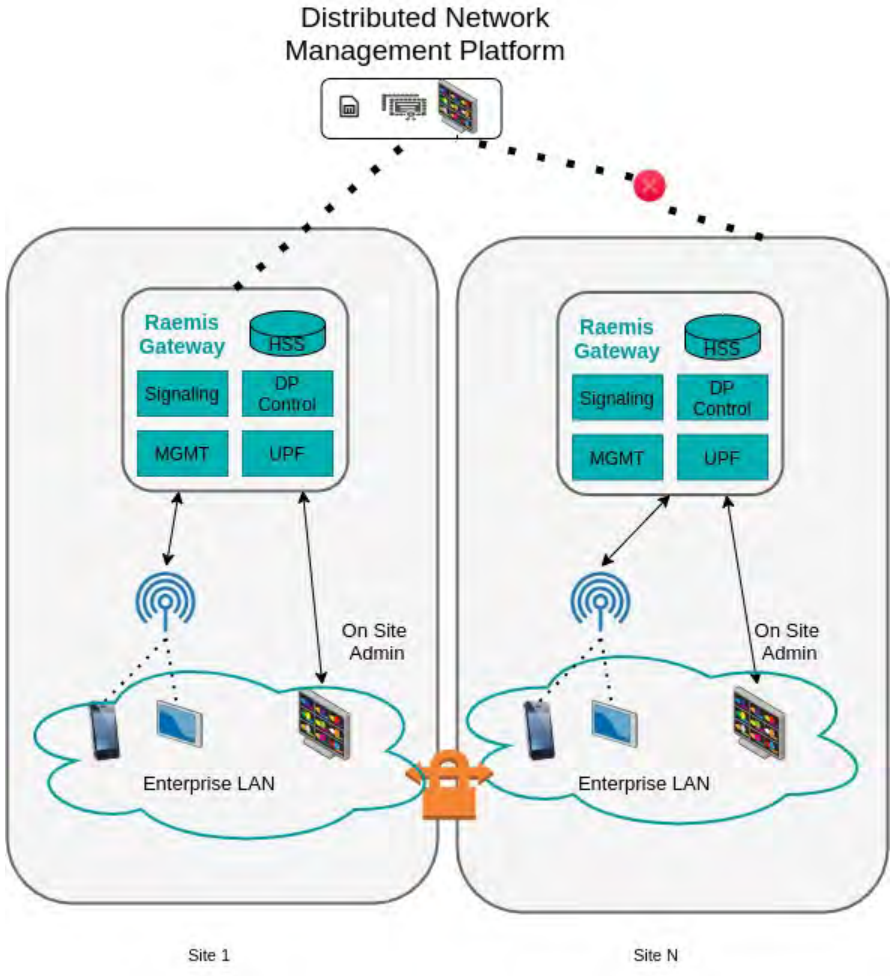
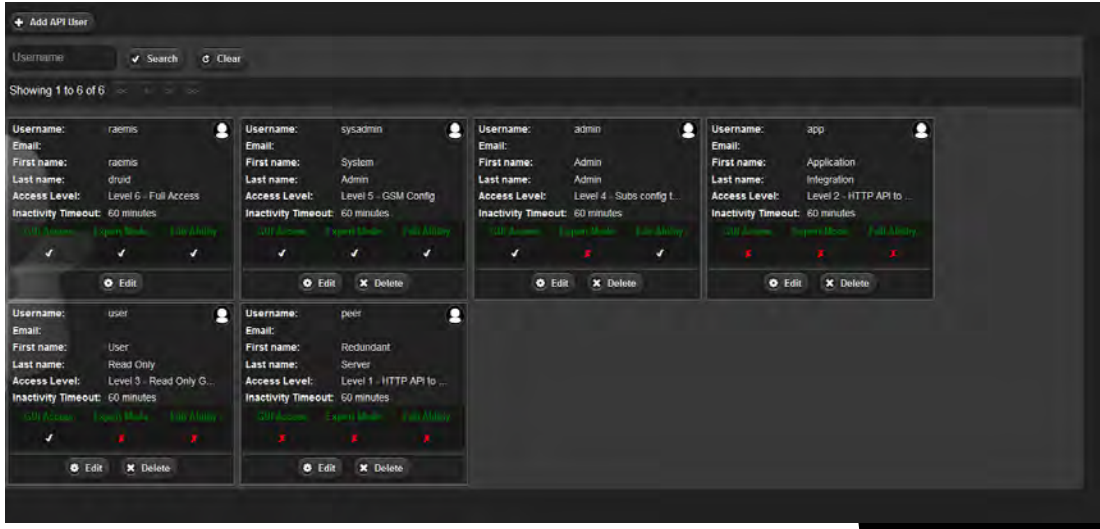


- On-Prem Serving Gateway model scales easily
- Resilience Addressed by N+1 deployments of Gateways in the data center or at the edge
  - NG-Flex is a simple mechanism to achieve this
- Scaling Vertically and Horizontally
  - For every 20,000 active devices we allocate a CPU core
  - For every 2.5 Gbps of user traffic we allocate a CPU core

Dual Management – Allow On-Site Management is possible



Define the level of Access and Control for Local Site Management



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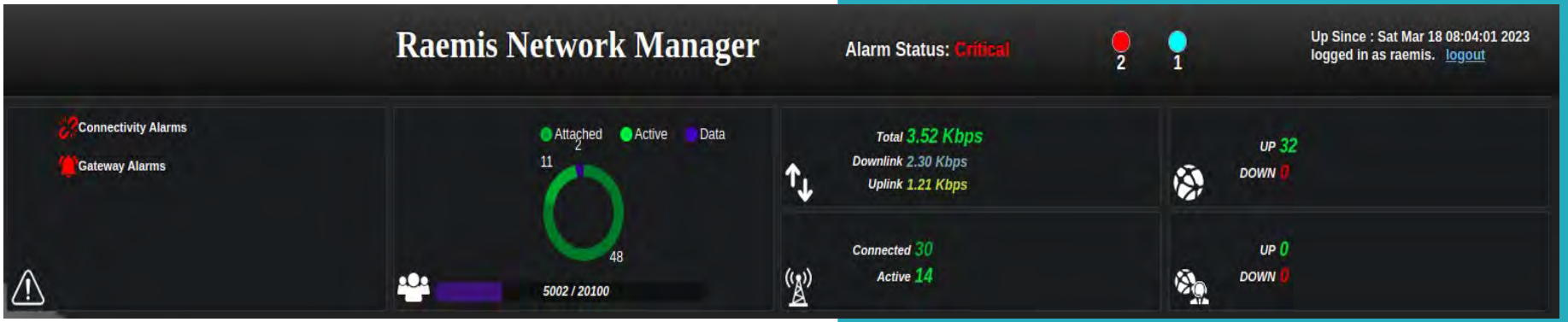
Network Overview

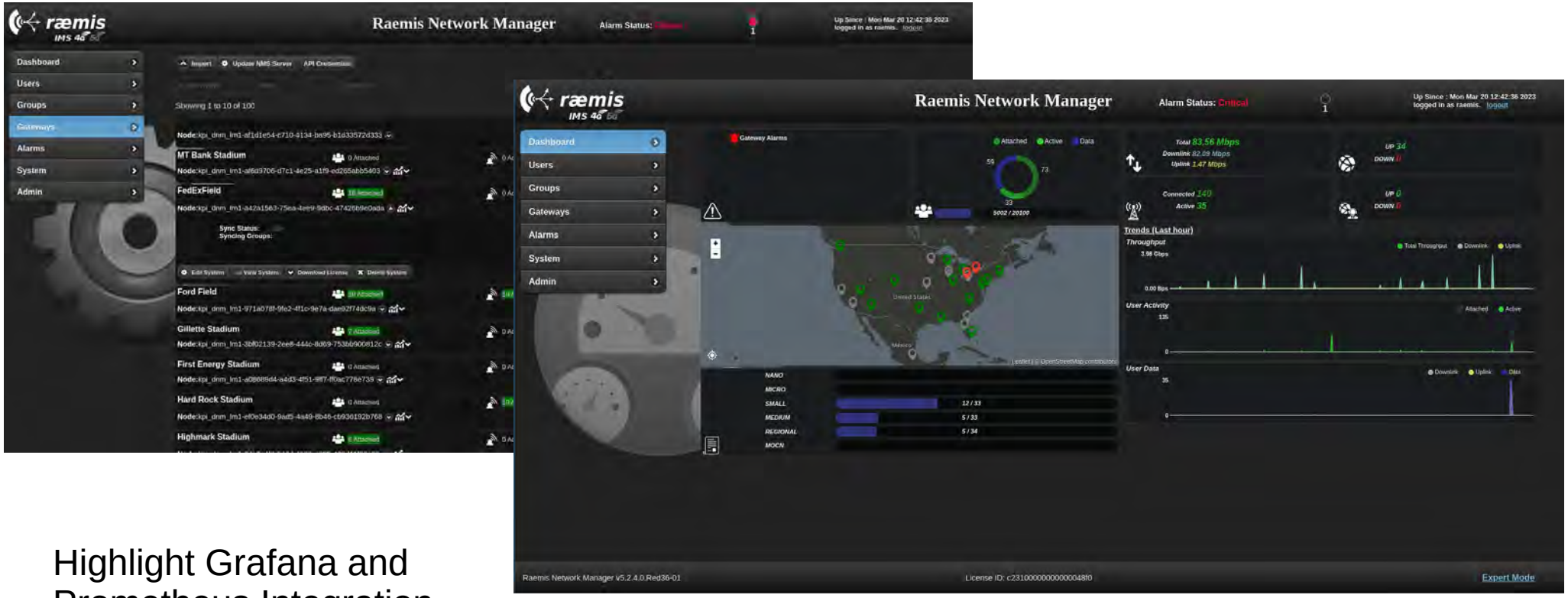
- Provide the system administrator with a general overview of the network
- Show the performance of each gateway
- Status of the network
  - User activity
  - Alarms
  - Throughput

Note : Also Possible to Use the REST API of the Raemis Gateway Manager to Integrate with OSS/BSS

Plugins for Prometheus and Grafana support also delivered



Aggregated View of KPIs



Highlight Grafana and Prometheus Integration

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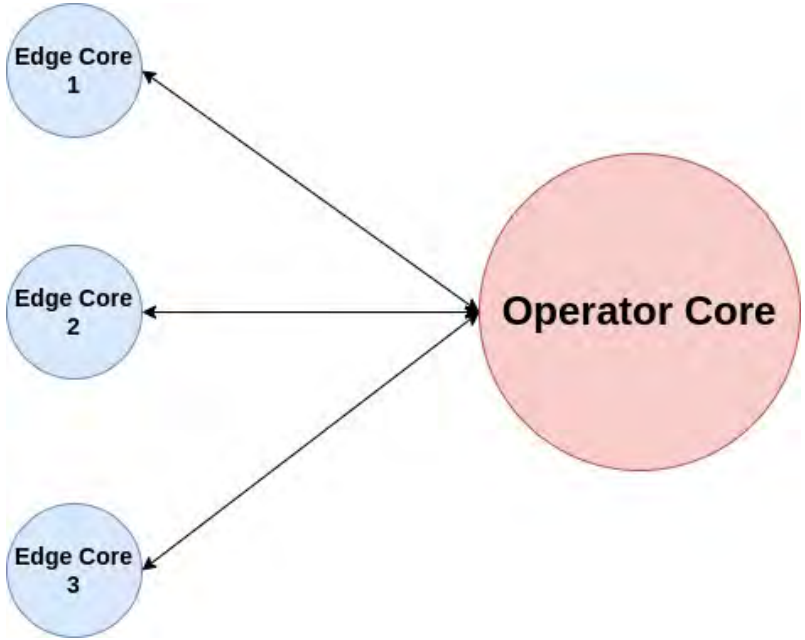
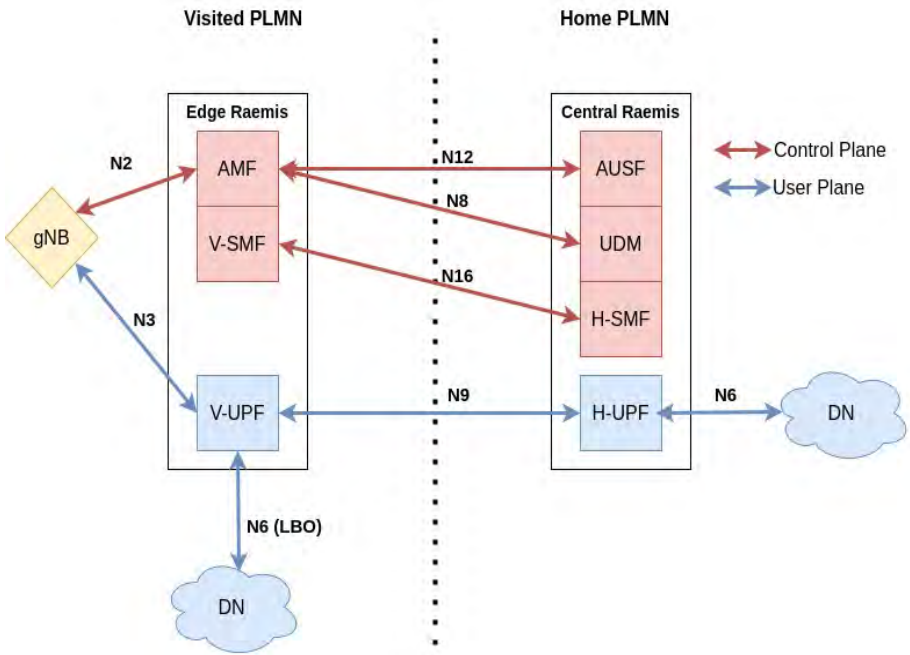
Raemis™ for MNO / MVNO

5G Enterprise Deployment for the Operator



- **Problem brief:** I am an operator. How can I easily deploy private 5G networks with the following criteria?
    a. Each edge site uses same “cookie-cutter” config.
    b. Resiliency when connection to operator goes down.
    c. Centralised location to add/update subscription related config.
    d. Local breakout of user traffic at edge.

5G Enterprise Deployment for the Operator



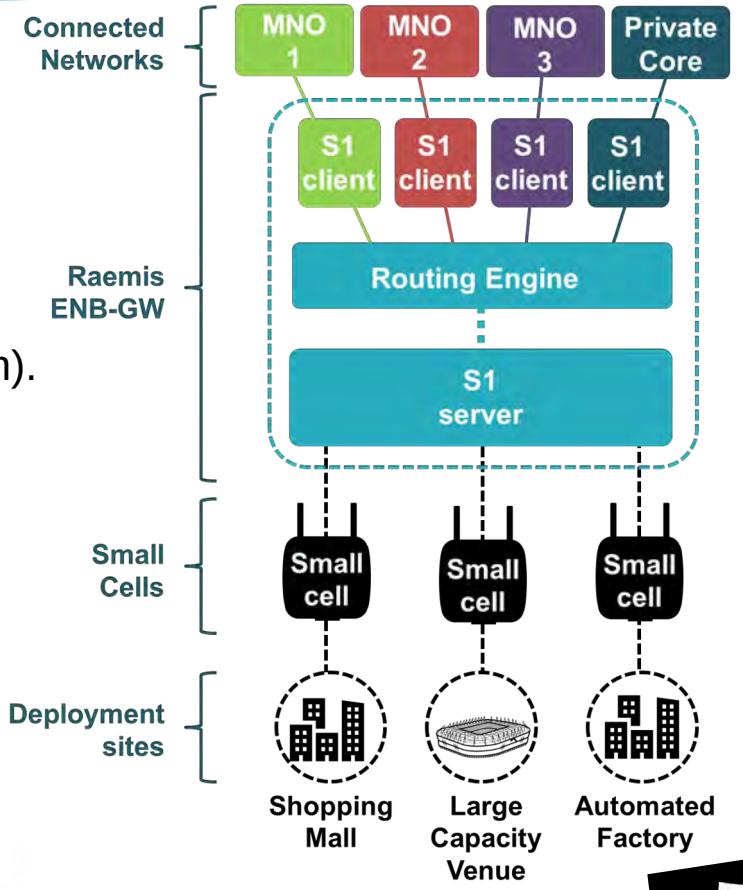
5G Roaming

- Conveniently, option 3 lines up with the architecture for a 5G roaming scenario.
  - I-SMF -> V-SMF
  - SMF -> H-SMF
  - I-UPF -> V-UPF
  - UPF -> H-UPF

Neutral Host - Raemis eNodeB/gNodeB GW

Raemis™ Neutral Host Main Features

- MOCN-GW Dashboard.
- Easy installation and integration with MNOs.
- 4G and 5G NSA support, 5G SA on the Roadmap Q2 ‘24
- Security Gateway (SeGW).
- Distributed Network Manager (DNM) integration.
- Performance and scalability (for both scale up and scale down).
- Resilience and redundancy options.
- Real-time System Monitoring.
- Admin User with GUI, Expert Mode and Edit permissions.
- Alarm Monitoring and Troubleshooting.
- Security Hardened images.
- Enterprise Integration.
- Full IPv6 support.



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Thank you

Any questions?