White Paper V4.0

A European View on 5G Architecture and Beyond

Chapter 2 – Overall Architecture

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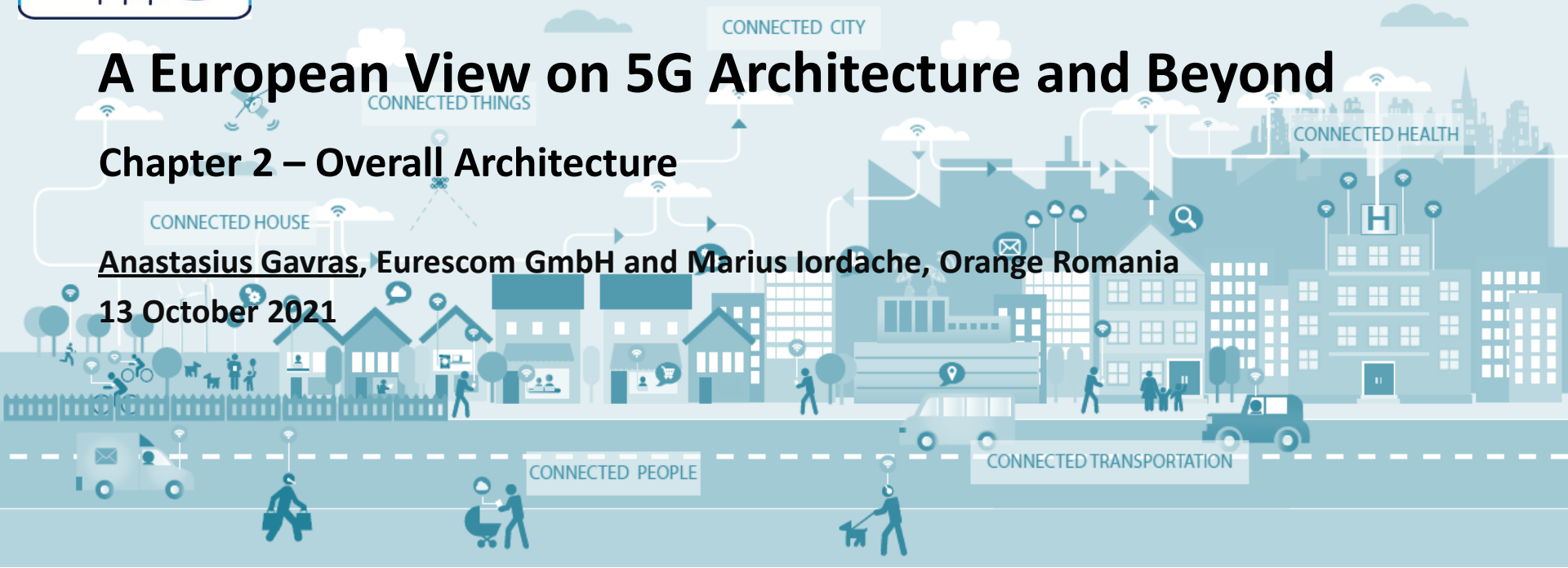


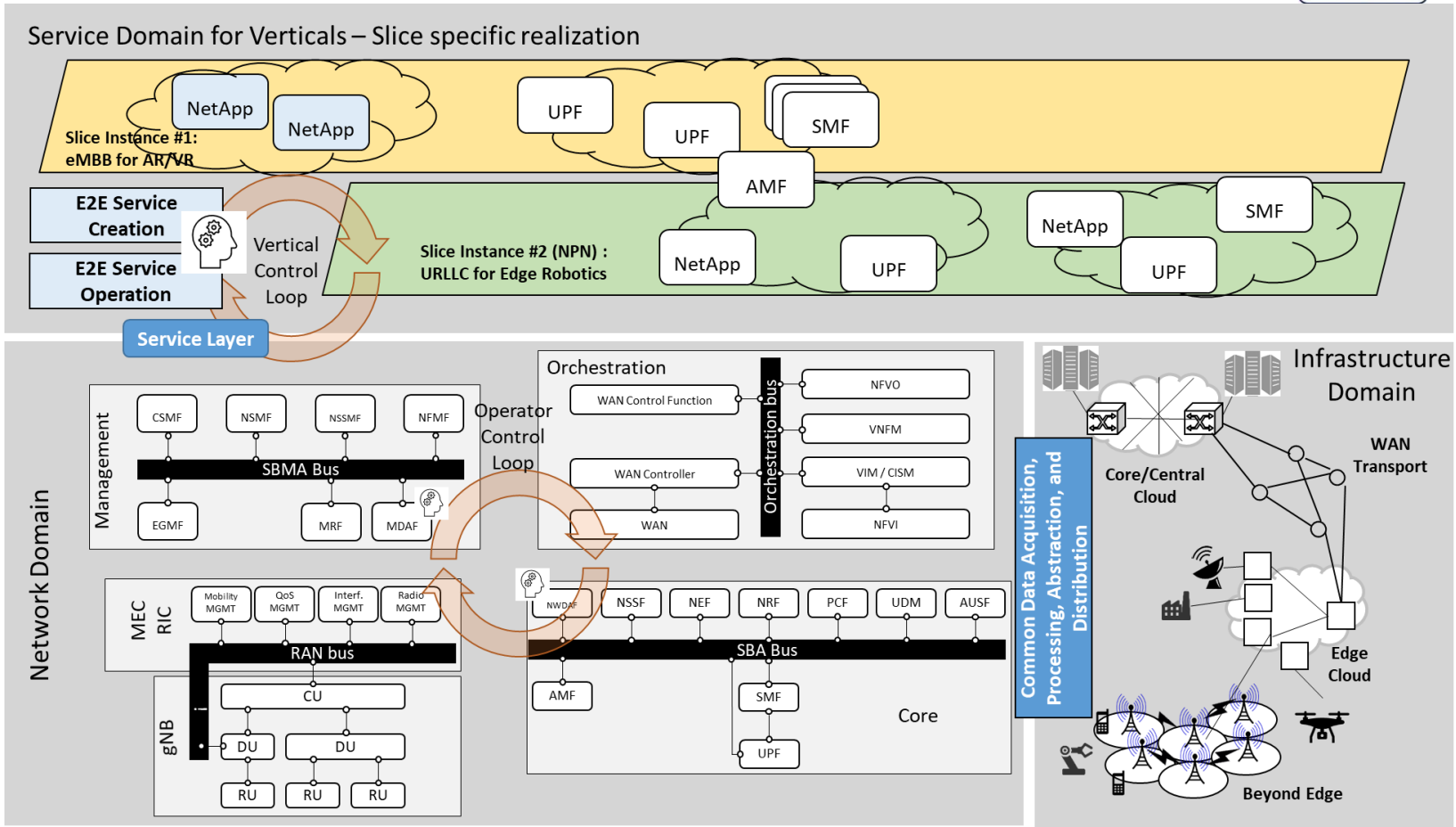
Motivation

- Phase II of the 5G PPP focused on the underlying technology including service creation → architecture white paper V3.0
- Phase III of the 5G PPP focused on test infrastructures and vertical applications → architecture white paper V4.0
  - Integrates trends towards architecture aspects for deploying vertical applications
  - Separates domains
    - Services for vertical customers
    - Network
    - Infrastructure
  - Mapping between domain and stakeholders

Outline

- Overall architecture
- Stakeholders in the 5G ecosystem
- Verticals requirements on extended architecture
- Architecture extensions
- Security architecture
- Service layer evolution
- Vertical specific architecture extensions
- Public-Privat Network Interoperation

Overall architecture (updated)



5G Infrastructure PPP
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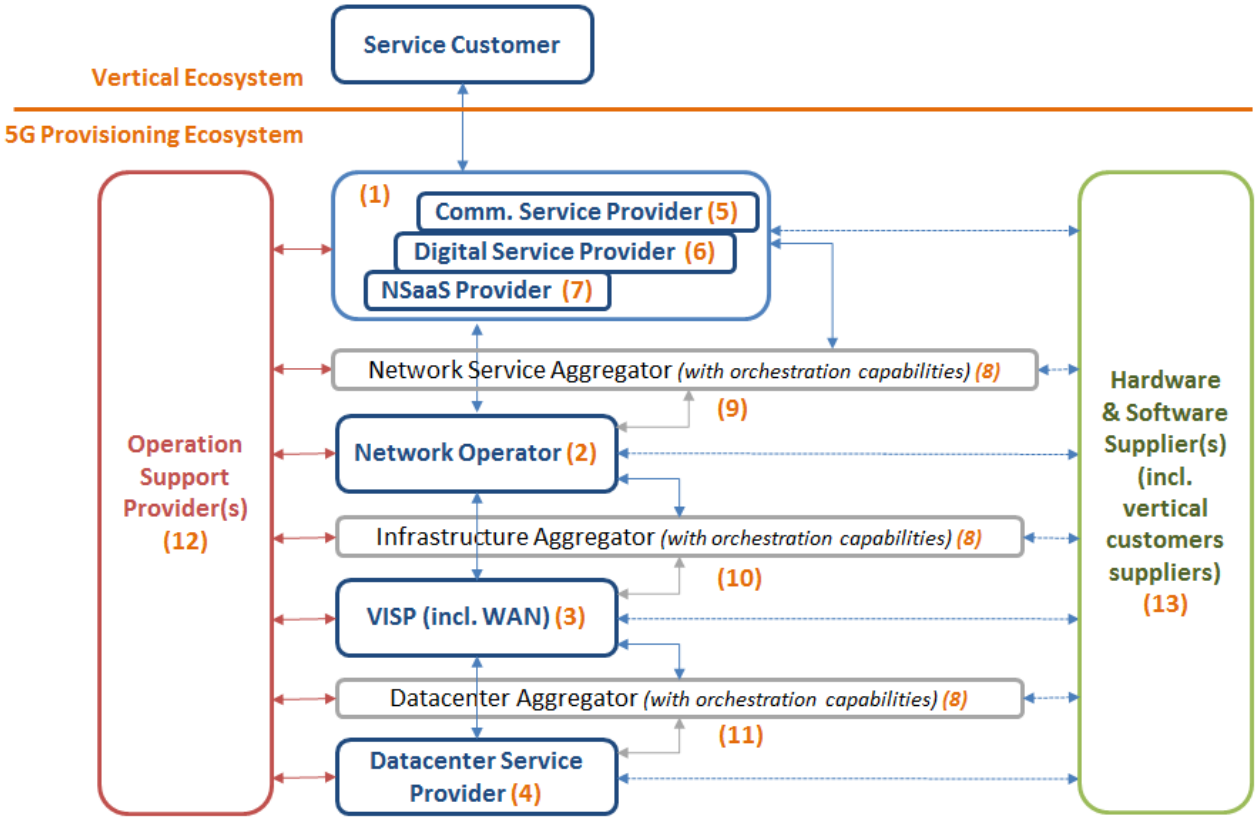
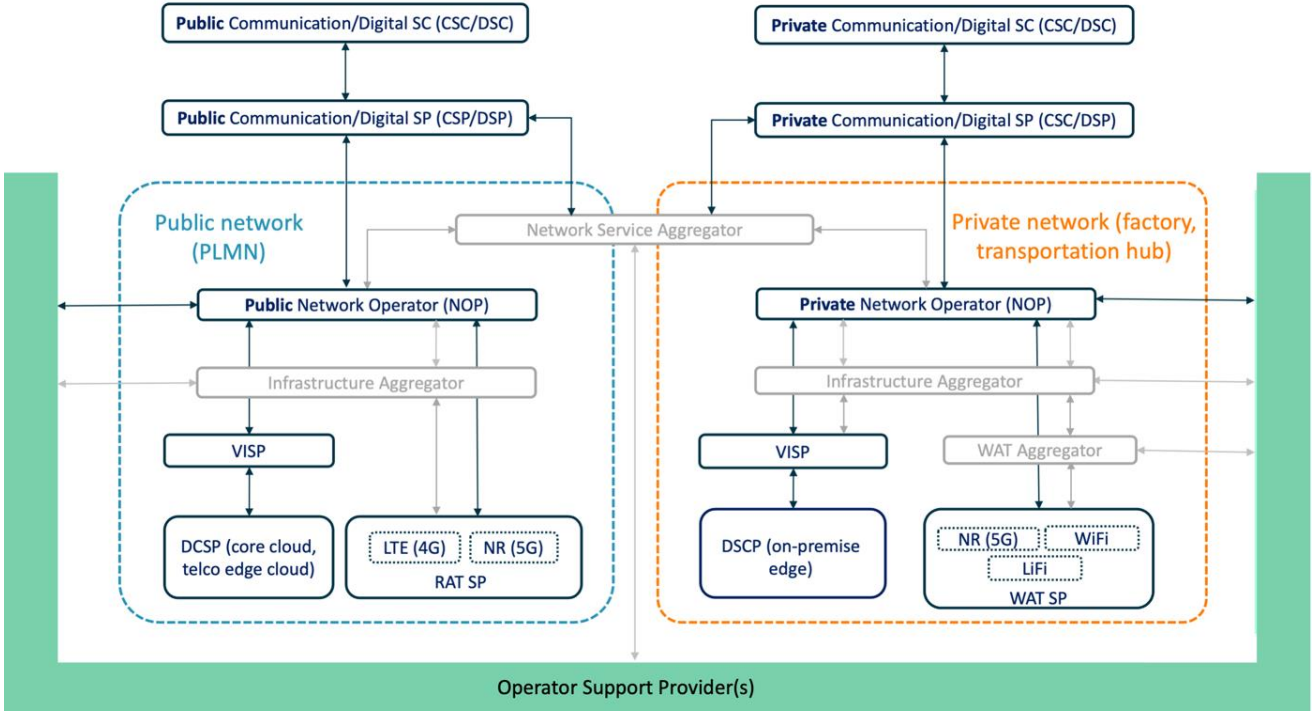
Stakeholders in the 5G ecosystem



Aligned with Hallingby, Hanne Kristine, Fletcher, Simon, Frascolla, Valerio, Gavras, Anastasius, Mesogiti, Ioanna, & Parzysz, Fanny. (2021). ***5G Ecosystems***. Zenodo. https://doi.org/10.5281/zenodo.5094340

Extension of the 5G actor role model for NPN support



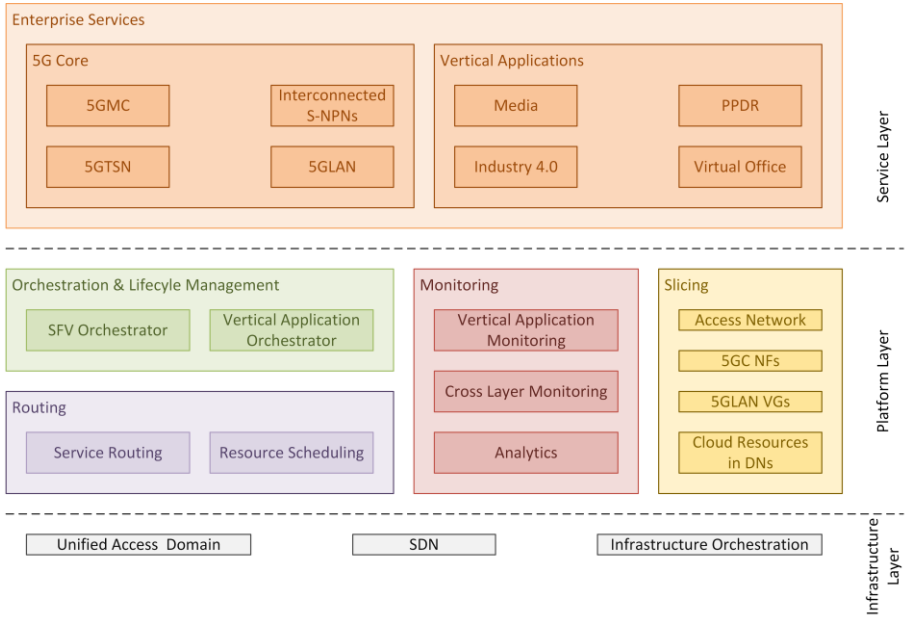
NPN support is aligned with the global 5G ecosystem model

Verticals requirements on extended architecture

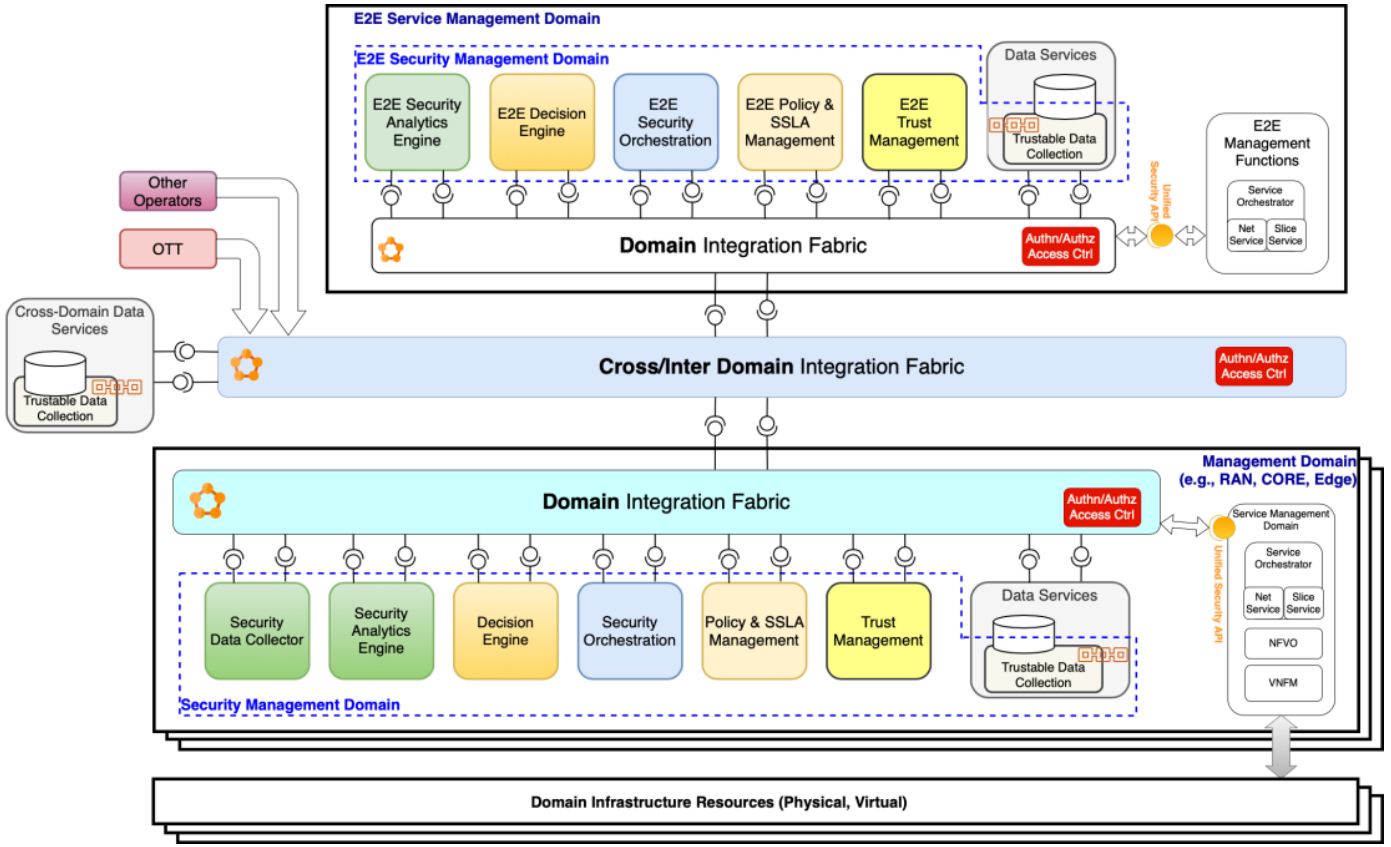
- Private networking for verticals
  - Coverage, guaranteed QoS
  - Customisation, network control
  - End user data protection
  - Integration with remote cloud, traffic steering
- Digital mobility services
- Vertical 3rd party application and network functions
  - Edge deployment and orchestration
  - Service SLAs, monitoring
  - Self-service portals
  - Testing, sandboxing, and migration to operational environment

Architecture extensions

- Telco-oriented cloud native orchestration of 5GC and vertical applications
- Deployment of and experimentation with features of Rel. 16



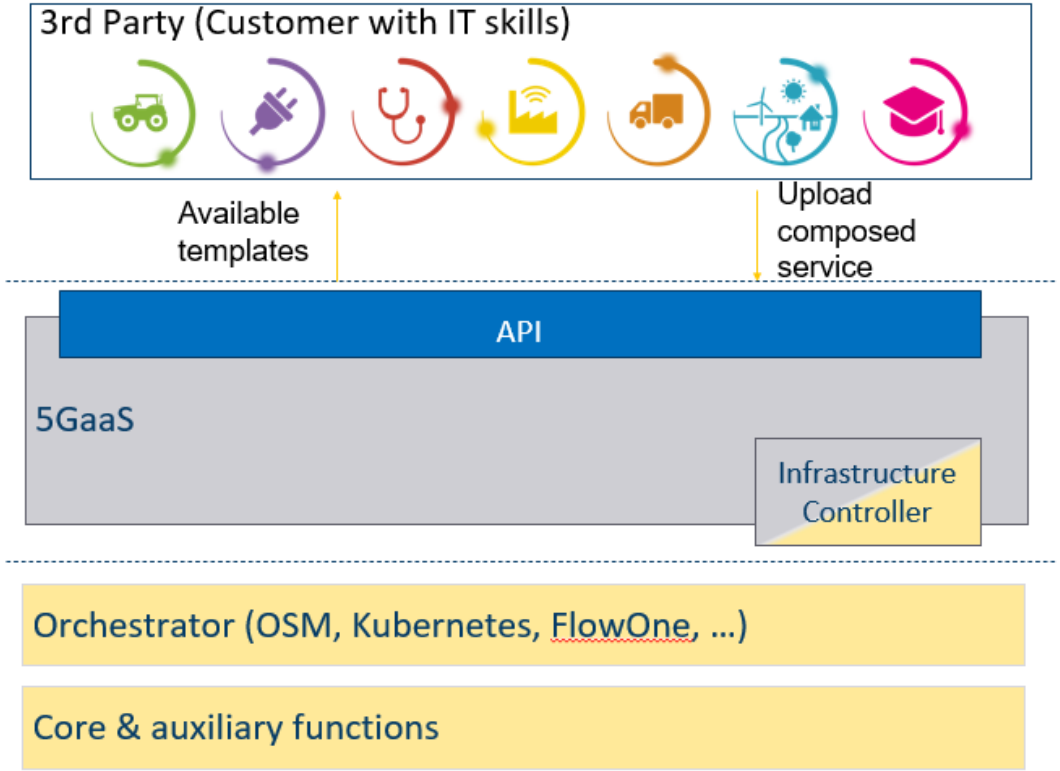
Security architecture



Service layer evolution

- Life cycle management
  - Instantiation
  - Orchestration of application-layer virtualized functions
  - Monitoring and runtime management
  - Operate the network slice
- Service migration and deployment to 5G NSA/SA edge
- Information models, data models
- Exposure mechanisms
- Unified platform hosting 5GC and vertical applications
- 5G-as-a-Service (5GaaS) API

5G as a service API



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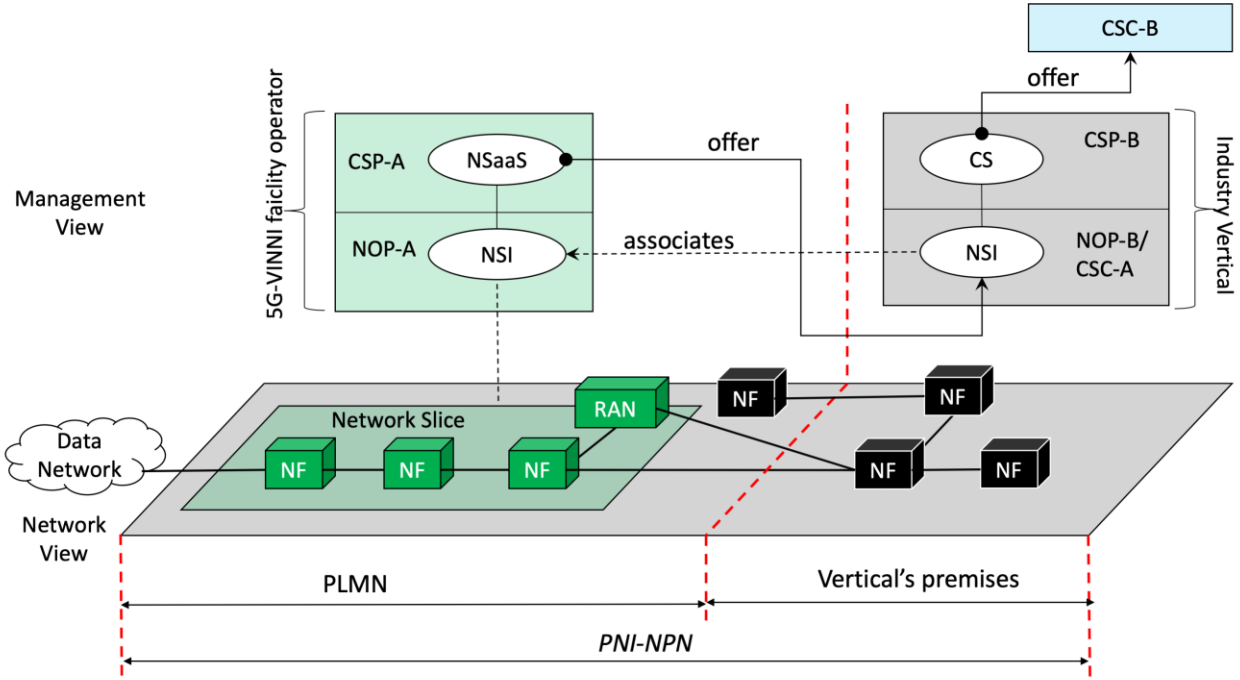
Vertical specific architecture extensions

- Extensions for private networking for verticals
- Extended layered network architecture for high-speed rail transportation facilities (FMRCS)
  - Network slices for service delivery in rail transportation environments
  - E2E network architecture extension for digital mobility services related KPIs
- Extensions for professional content production
- Intent-based E2E network slice deployment for verticals
- NetApp principles and implementation aspects
- Integration of 5G RAN with Unmanned Aerial Systems (UAS)

Public-Private Network Interoperation



Conclusion and Outlook

- Innovations in
  - Service Domain for Verticals
  - Network Domain
  - Infrastructure domain
- Native support for network automation by AI/ML (separate white paper)
  - Network data analytics function (NWDAF)
- Path to 6G
  - Key-value indicators (KVIs) to represent the dimensions of impact such as sustainability, digital inclusion and trustworthiness
  - Complementing or even replacing KPIs that represent deterministic performance measures

Kaloxylos, Alexandros, Gavras, Anastasius, Camps Mur, Daniel, Ghoraishi, Mir, & Hrasnica, Halid. (2020). ***AI and ML – Enablers for Beyond 5G Networks***. Zenodo. https://doi.org/10.5281/zenodo.4299895

The 5G Infrastructure Public-Private Partnership

https://5g-ppp.eu/white-papers/
https://5g-ppp.eu/wp-content/uploads/2021/11/Architecture-WP-V4.0-final.pdf