SliceNet Webinar

"5G Multi-Domain Slice Control Plane"

WEBINAR HOST: CIRIACO ANGELO, ERICSSON R&D

DATE: 25 FEBRUARY 2020

TIME: 11:00 CET

slicenet.eu

Introduction: Webinar Purpose, Presenter

- Webinar Purpose:
  - Disseminations of SliceNet Technical Achievements and Innovations with focus on the Control Plane

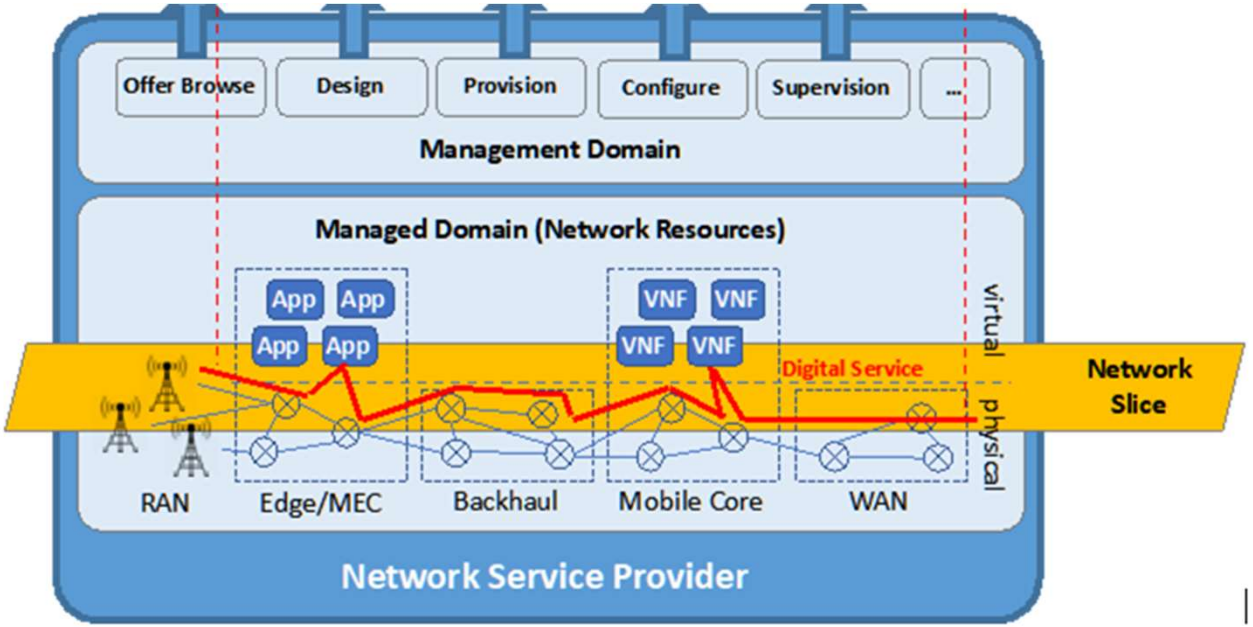
- Presenter:
  - Ciriaco Angelo, Ericsson R&D
    Ericsson representative in SliceNet

Webinar Agenda

- Agenda:
  - Introduction
  - SliceNet Architecture and Control Plane
  - Requirements and Challenges
  - Technical approaches, Control Plane Architecture
  - Technical Achievements
  - Major Innovations
  - Prototyping
  - Industry Verticals Applications
  - Q&A, References

Ciriaco Angelo
Ericsson R&D

Introduction: Network Slicing



Network Slicing, a promising solution to enable **diverse** 5G use cases with their demanding QoS/QoE

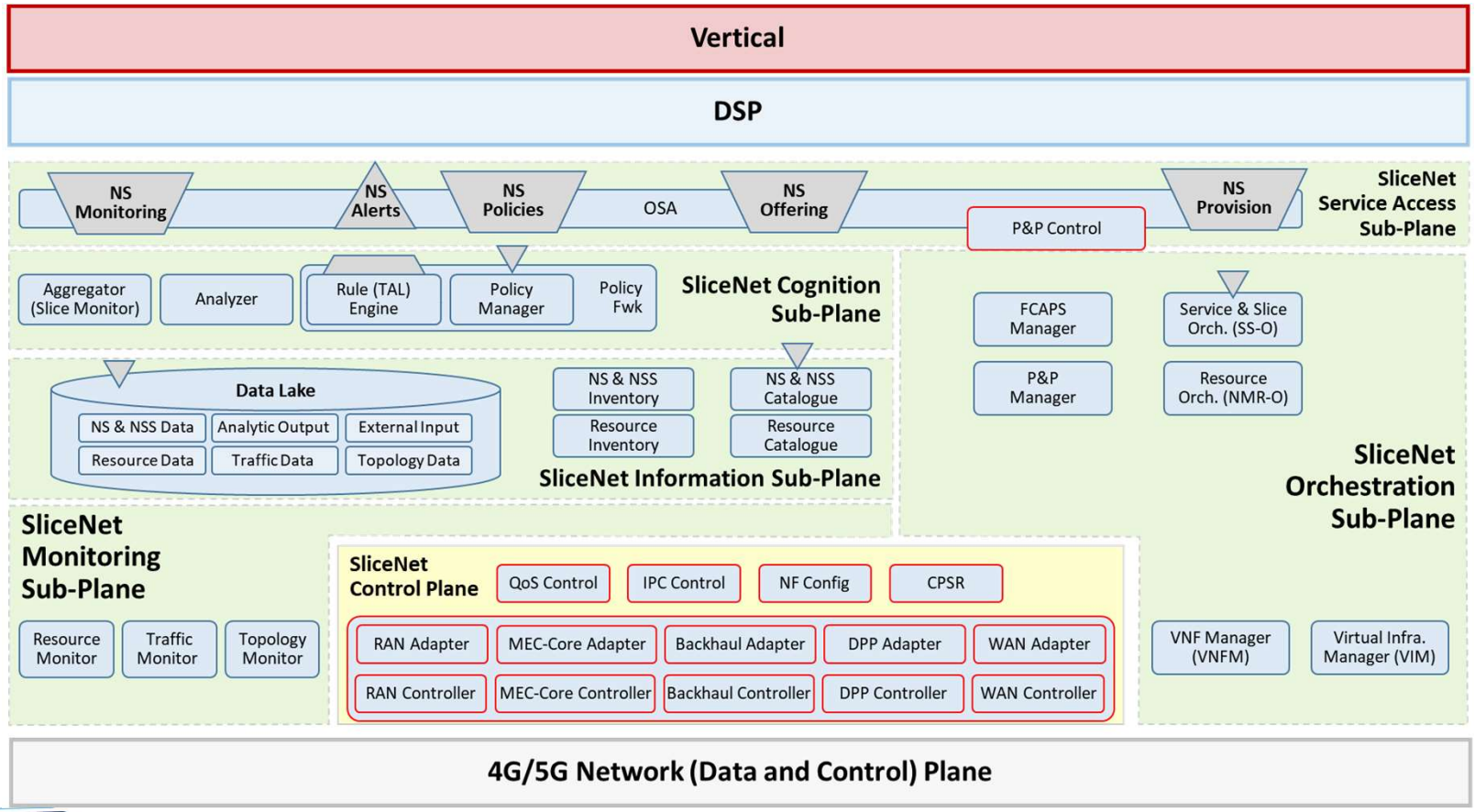
Introduction: SliceNet Project

End-to-End Cognitive
Network Slicing and Slice Management Framework in Virtualized Multi-Domain, Multi-Tenant 5G Networks

SliceNet is a second phase 5G infrastructure PPP project, which is part of the **European Horizon 2020 pro-gramme** for research and innovation.

SliceNet challenge is to design and prototype an innovative framework for management and control of **Network Slices** leveraging SDN/NFV technologies with **cognitive** techniques and **artificial intelligence**

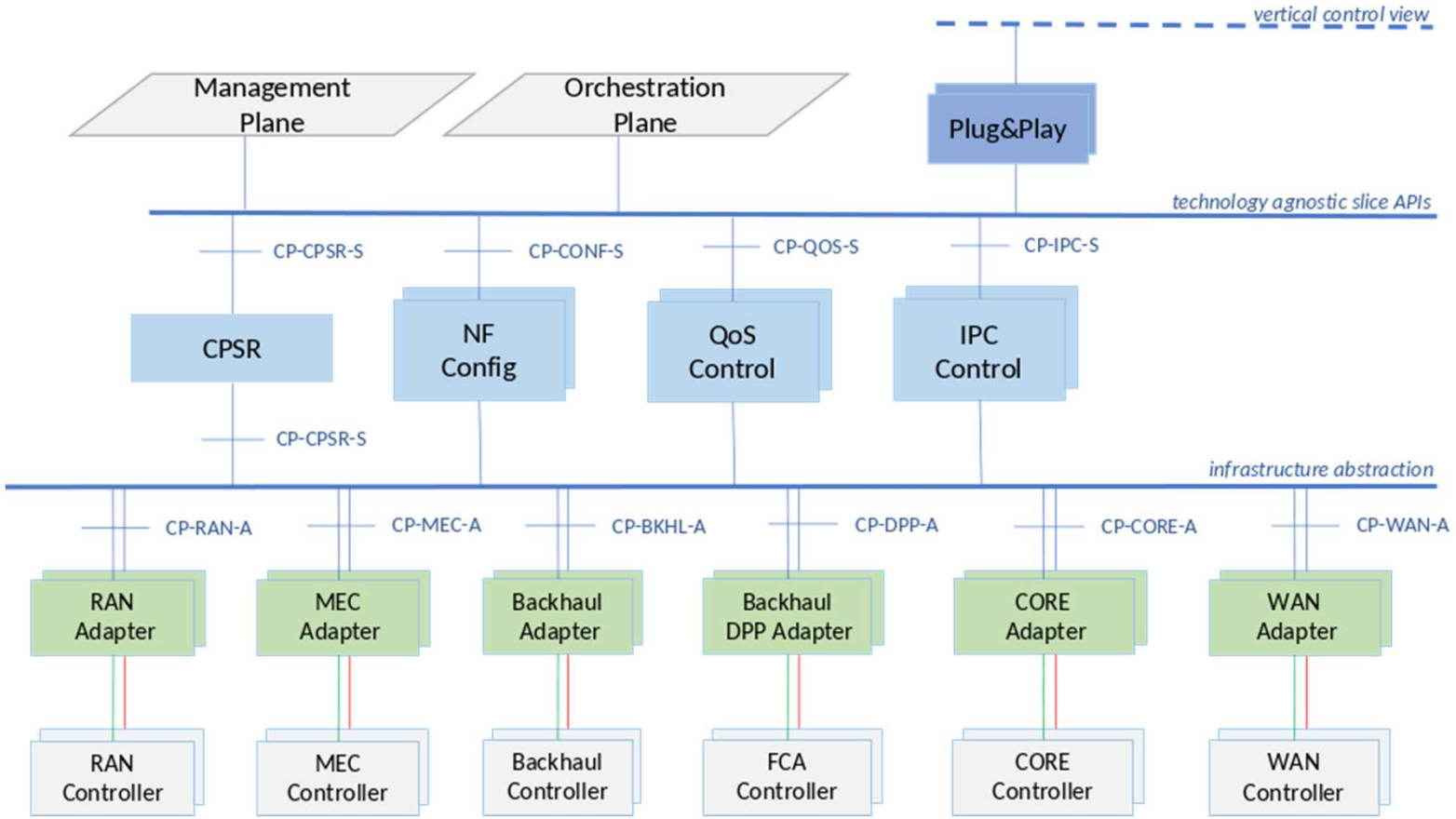
SliceNet Architecture & Control Plane



Requirements and Challenges

- **Slice dynamic configuration and customization context** for both single and multi-domain environments offering primitives for dynamic programming and control of the Data Plane
- **Control Plane architecture** allowing **slice isolation**, **scalability**, **flexibility** and **interoperability**
- **Abstraction** of underlying network technology specific details while
- SW components **loosely-coupled** with each other allowing individual **development**, **deployment** and **upgrade** with minimal related impacts.

Technical approach, Control Plane Architecture



Technical Approach, Control Plane Architecture

CP Architectural Principles

- Service Bases Architecture
  - The CP functionality is achieved by **a set of loosely-coupled components**: **Services** and **Adapters** interacting directly each other by a **Service Based Interface** (SBI)
  - **SBA framework** is implemented by the Control Plane Service Register (**CPSR**)
  - **Each Service** is instantiated **per Slice** enabling **isolation**, **scalability** and resource **optimization**
  - **Adapters** can easily be onboarded to support **newly added infrastructure pillars** so to allow **dynamic architecture expansion** and **interoperability**

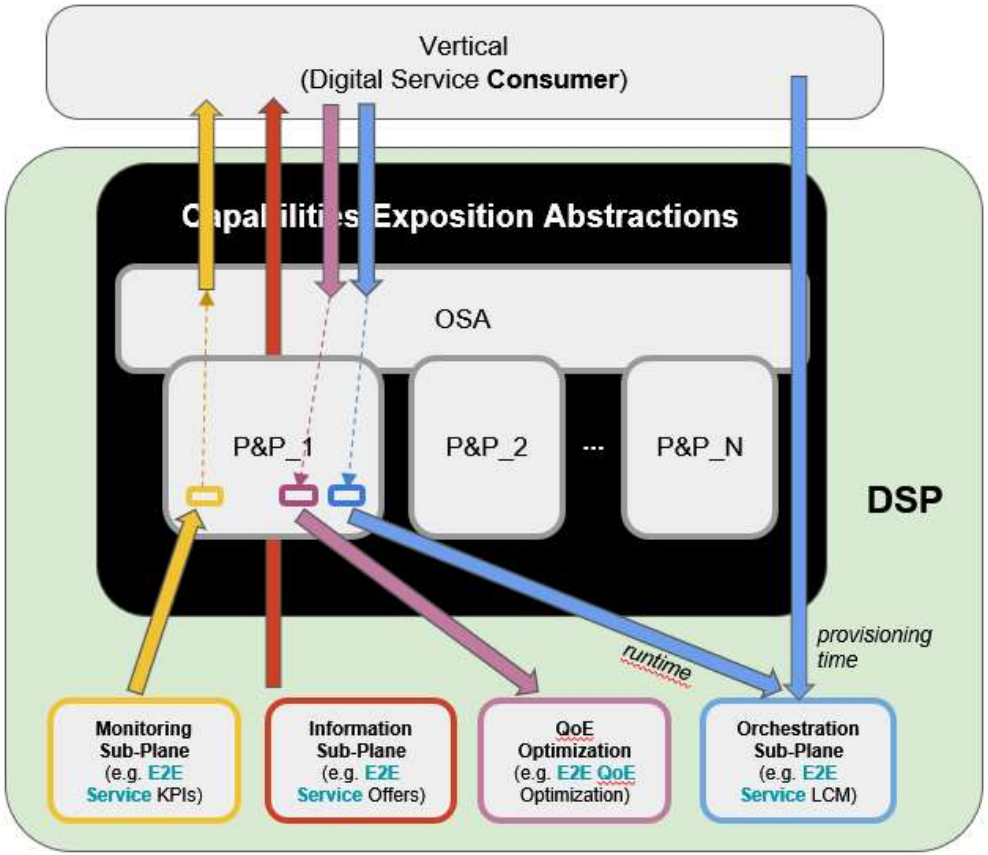
- Layered approach with a set of **abstractions** level
  - ***Infrastructure layer*** *abstraction*: **Adapters** are introduced to expose technology agnostic primitives to upper layer by **abstracting heterogeneous vendors technologies** of the NSP infrastructure pillars (RAN, MEC, Core, Backhaul, WAN)
  - ***Slice control layer*** *abstraction*: Slice **CP Services** are introduced to expose a Slice control context to upper layer by **abstracting NSP Slice composition** in terms of both technology and network pillars
  - ***Slice customization layer*** *abstraction*: **Plug & Play** is introduced to enable **customized slice view** and **control** to Verticals by further abstracting the Slice control layer

Technical Achievements

- Realization of a **Plug & Play** control framework for **customized runtime slice control** offered to verticals
- Realization of a virtualised **RAN** and **MEC- Core Controllers** supporting RAN and CN slicing
- Realization of **Adapters** enabling technology agnostic abstraction of network pillars
- Realization of a **Service Based Architecture** framework
- Realization of **CP Services** offering a **slice dynamic configuration control context** to Management Plane
- Realization of a **WAN inter-domain connection service** to enable multi-domain slices

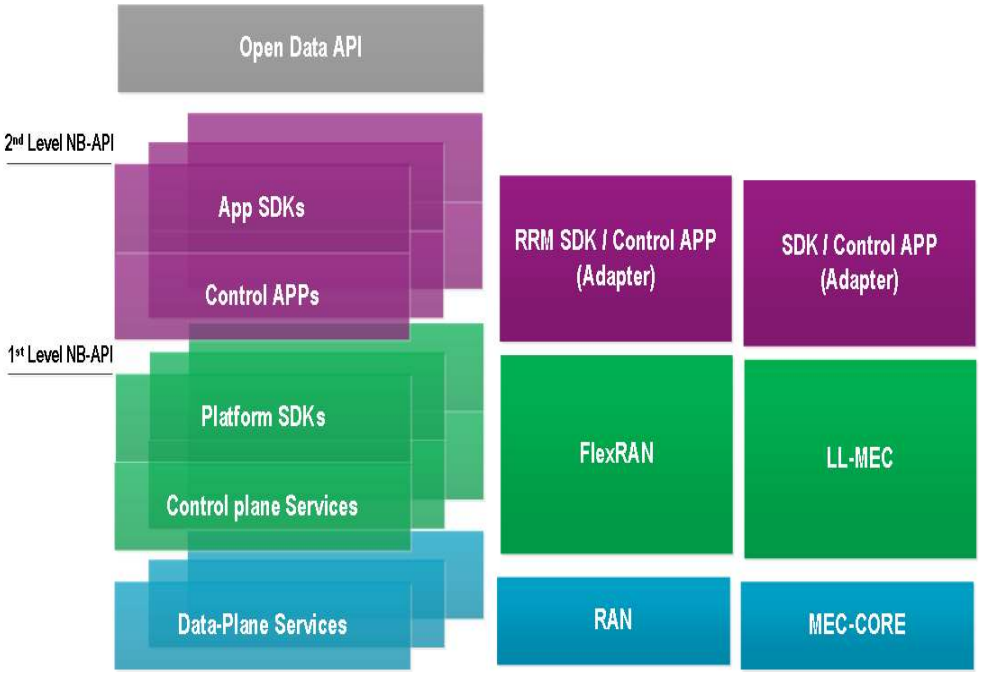
Technical Achievements, Plug & Play

- **Customized control exposure** and **slice view** activated **on-demand** when new slices are provisioned
  - how the slice is **exposed** to verticals (*which components, network and service functions, topology*)
  - how the slice and its components can be **controlled** and managed at runtime



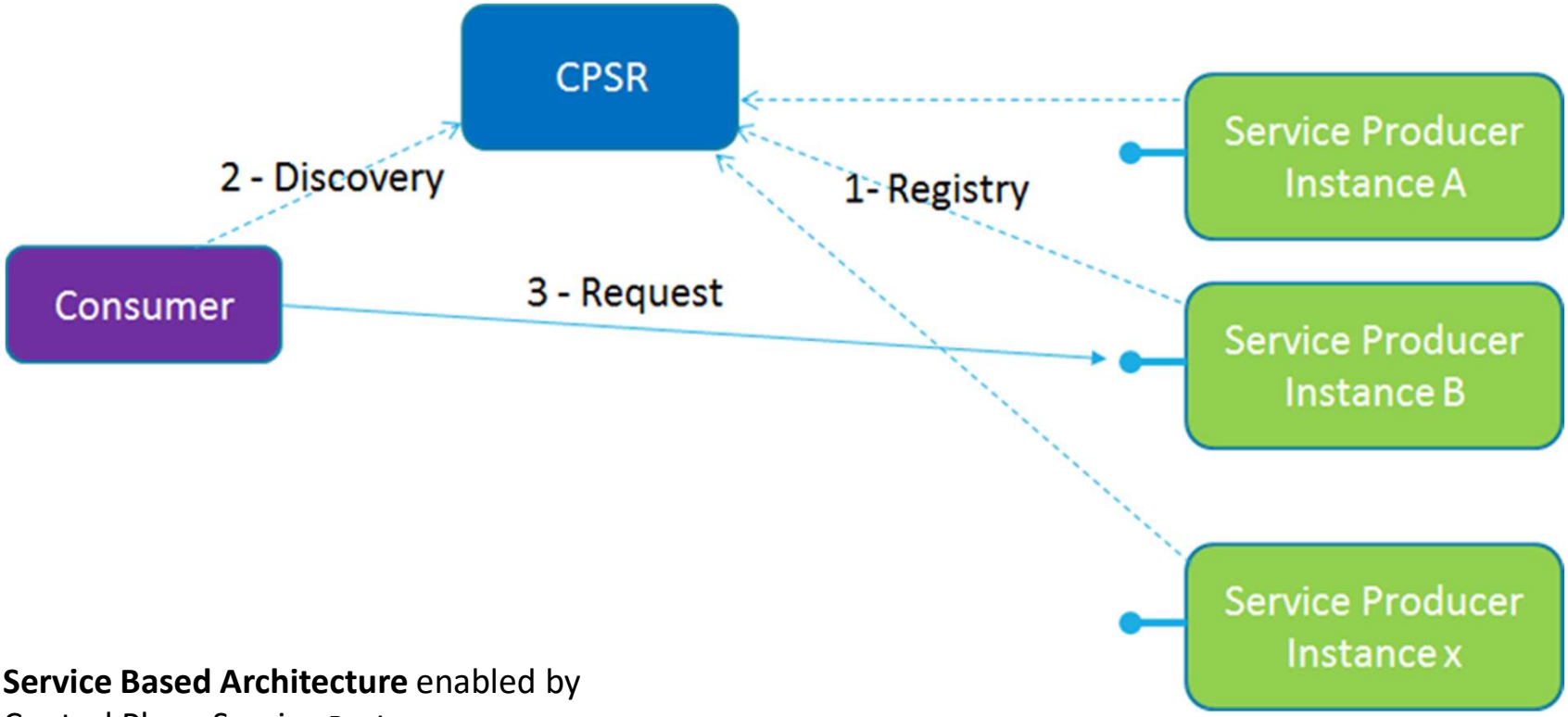
Technical Achievements, RAN and CN slicing

- **FlexRAN** and **LL-MEC** as **controllers** for Data Plane (DP) programmability on a **slice basis** in the RAN and CN segments.
- **FlexRAN, LL-MEC APIs** to facilitate eNodeB and EPC programmability: **slice configuration**, **handovers**, **UE association to slices**



FlexRAN and **LL-MEC** are Mosaic-5G platforms enabling e-2-e RAN and CN slicing.

Technical Achievements, SBA Architecture



Service Based Architecture enabled by Control Plane Service Register

Major Innovations

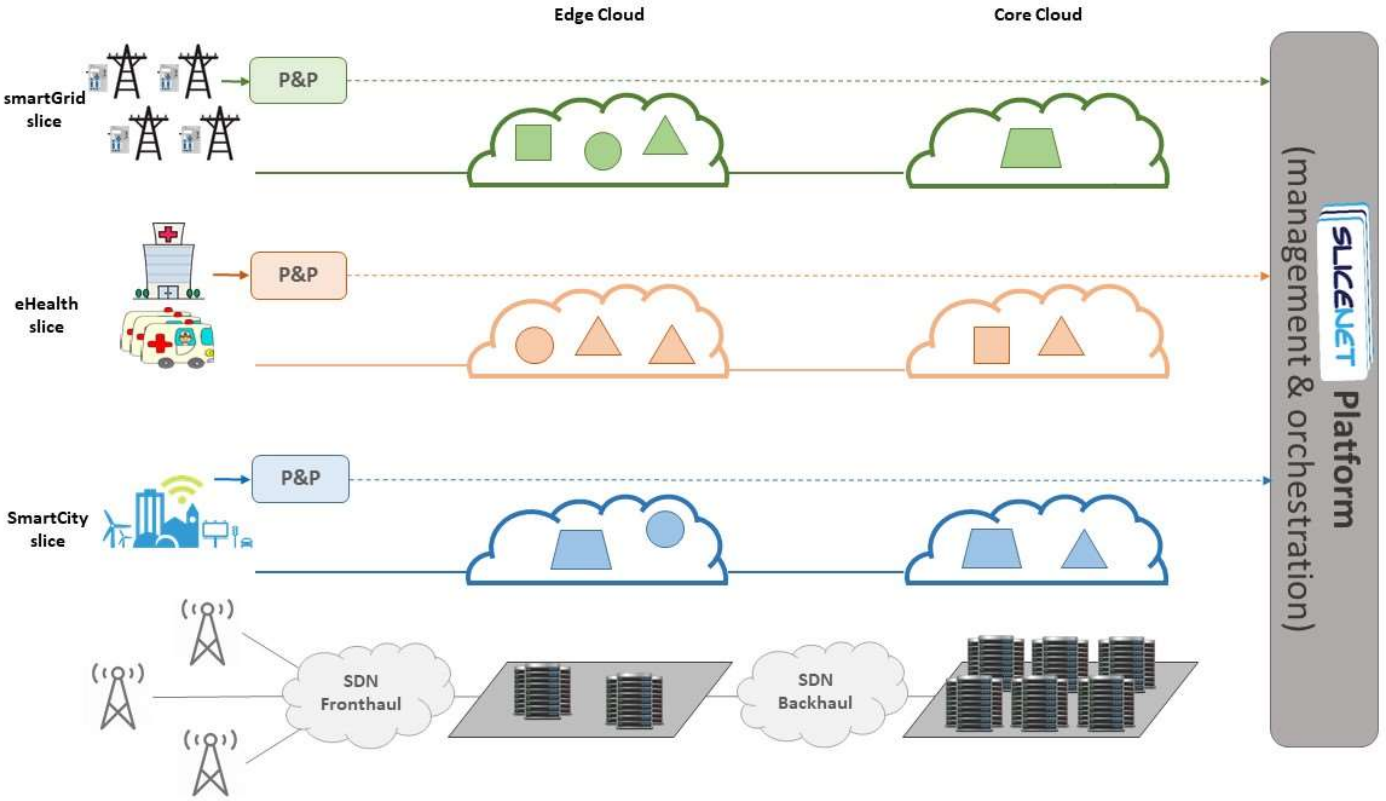
- **Plug&play** going beyond current practices of exposing run time control to verticals
- **Overlay Control Plane** coupled with **Service Based Architecture** for pluggable components and network pillars
- Architecture able to cope with **heterogeneous networks** e.g. 4G – 5G (Adapters-Controllers)
- A Control Plane **comprising multi-controllers for RAN and MEC-Core slicing** and **APIs for runtime E2E slice reconfiguration**
- **Data Path programmability** allowing QoS control on overlay networks (flow priority)
- Fully Stateless SBA **WAN adapter** for QoS on inter-domain segments

Prototyping

❖ Delivered SW components prototypes and interfaces available at SliceNet Git:

- ✓ CPSR: https://gitlab.com/slicenet/wp4/container_registry
- ✓ P&P: https://gitlab.com/slicenet/plug-and-play-control
- ✓ QoE Plugin: https://gitlab.com/slicenet/qoe-plugin
- ✓ QoS: https://gitlab.com/slicenet/wp4/container_registry
- ✓ IPC: https://gitlab.com/slicenet/wp4/container_registry
- ✓ NF-Config: https://gitlab.com/slicenet/wp4/tree/develop/NF-CONFIG
- ✓ RAN Adapter: https://gitlab.eurecom.fr/mosaic5g/store
- ✓ MEC-Core Adapter: https://gitlab.eurecom.fr/mosaic5g/store
- ✓ Backhaul Adapter: https://gitlab.com/slicenet/wp4/container_registry
- ✓ DPP Adapter: https://gitlab.slicenet.oteresearch.gr/echirivella/cp-bkhl-dpp-a
- ✓ FCA Controller: https://gitlab.slicenet.oteresearch.gr/echirivella/flowcontroller
- ✓ FCA: https://gitlab.slicenet.oteresearch.gr/echirivella/fca
- ✓ WAN Adapter: https://gitlab.com/slicenet/wp4/tree/develop/WAN/WANAdapter
- ✓ RAN Controller: http://mosaic-5g.io/flexran/
- ✓ MEC-Core Controller: http://mosaic-5g.io/ll-mec/

Industry Vertical Applications/Contributions

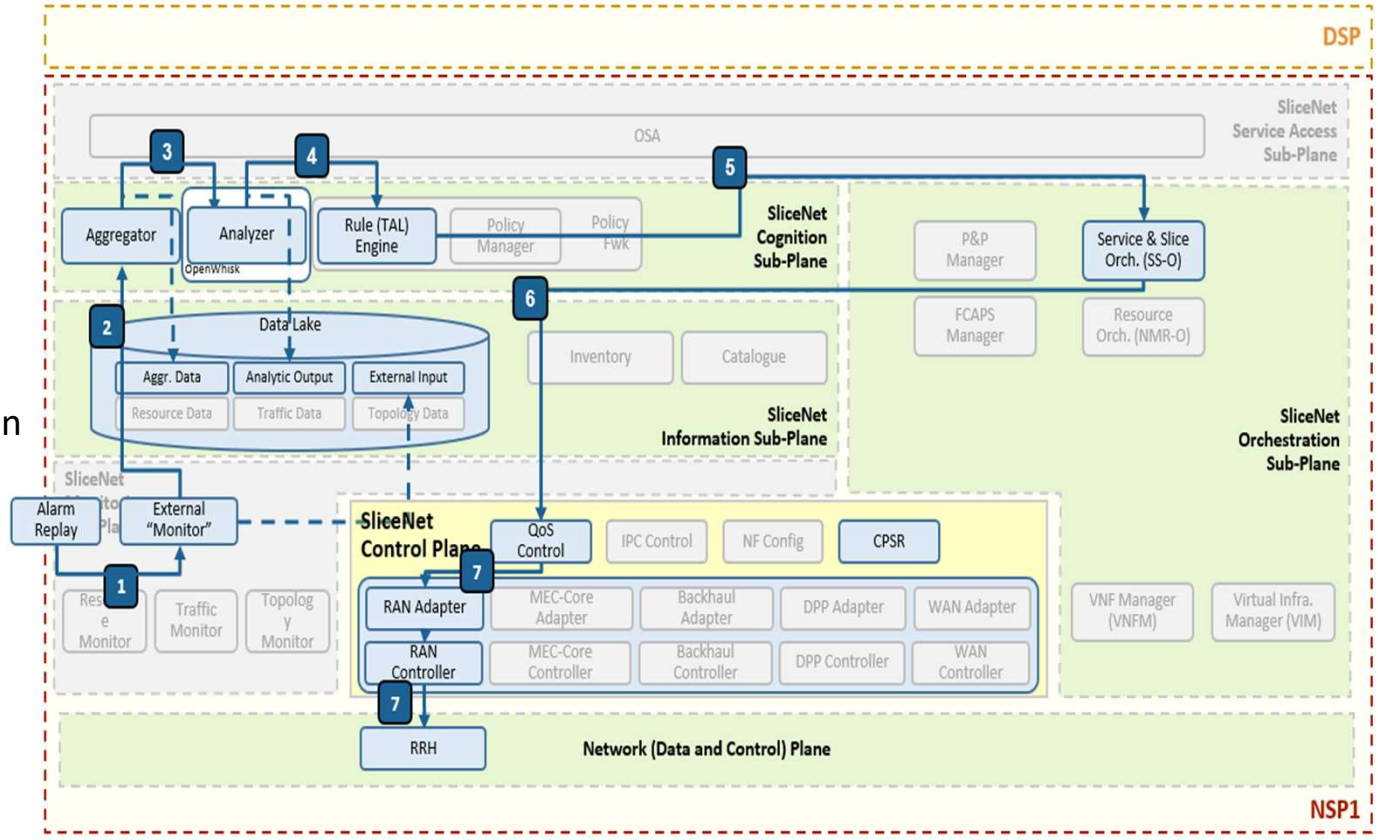


Industry Vertical Applications, Prototyping

Smart Grid

NSP

Network Slice optimization



Further Information

Website: https://slicenet.eu/

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Further information: https://slicenet.eu/publications/

SliceNet Open source contributions:
https://slicenet.eu/software-contributions/

Questions ?


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