5G NORMA

Considerations on the Implementation of Network Slicing

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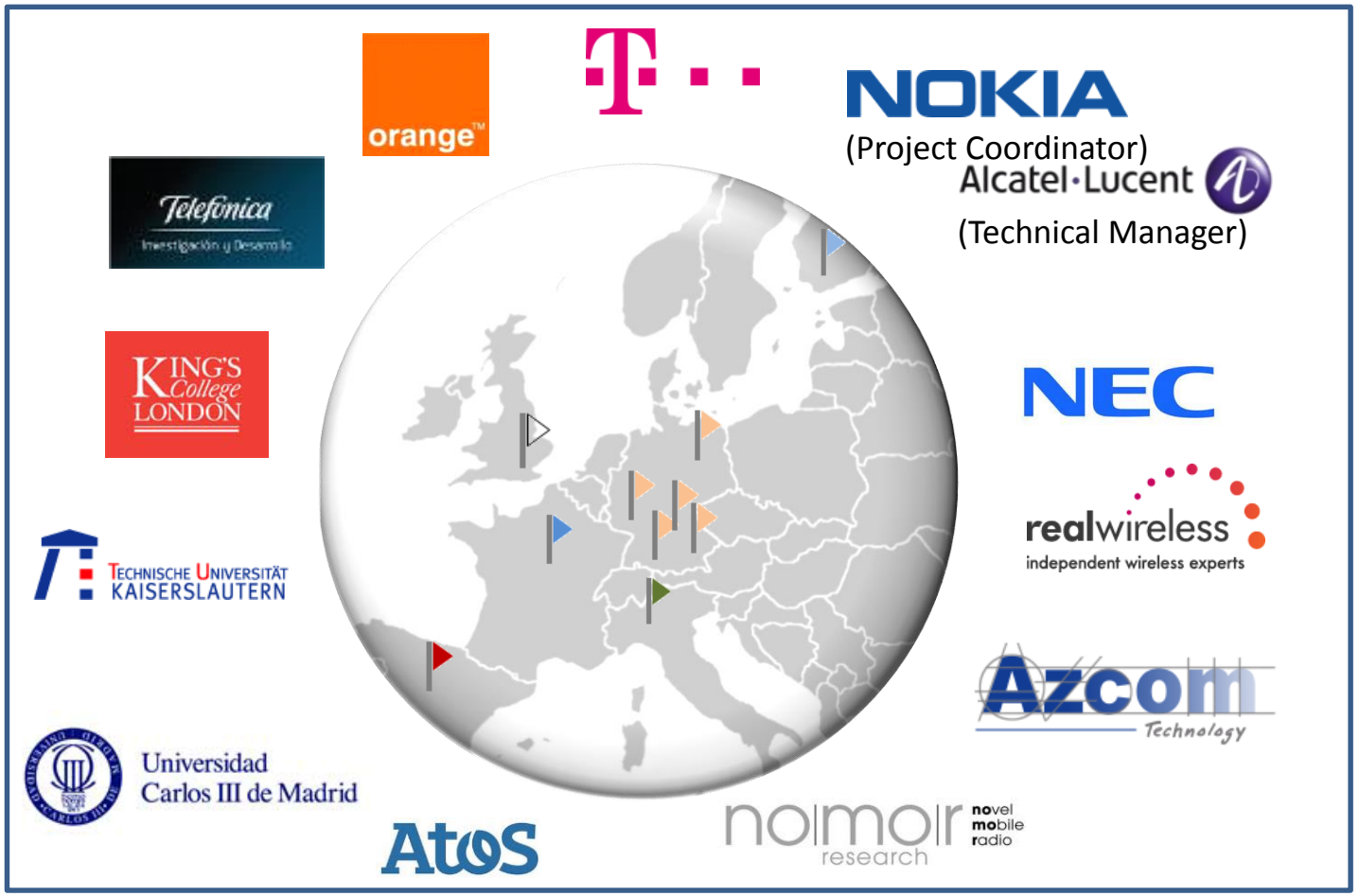
5G NORMA Consortium



5G NORMA in a nutshell

EU funded R&D project within 5GPPP Initiative, aiming on building consensus on E2E mobile network architecture and rapid implementation

Duration

July 1st, 2015 – Dec 31st, 2017 (30 months)

Project Coordinator

Peter Rost, Nokia

Connect to 5G NORMA

Webpage: https://5gnorma.5g-ppp.eu/
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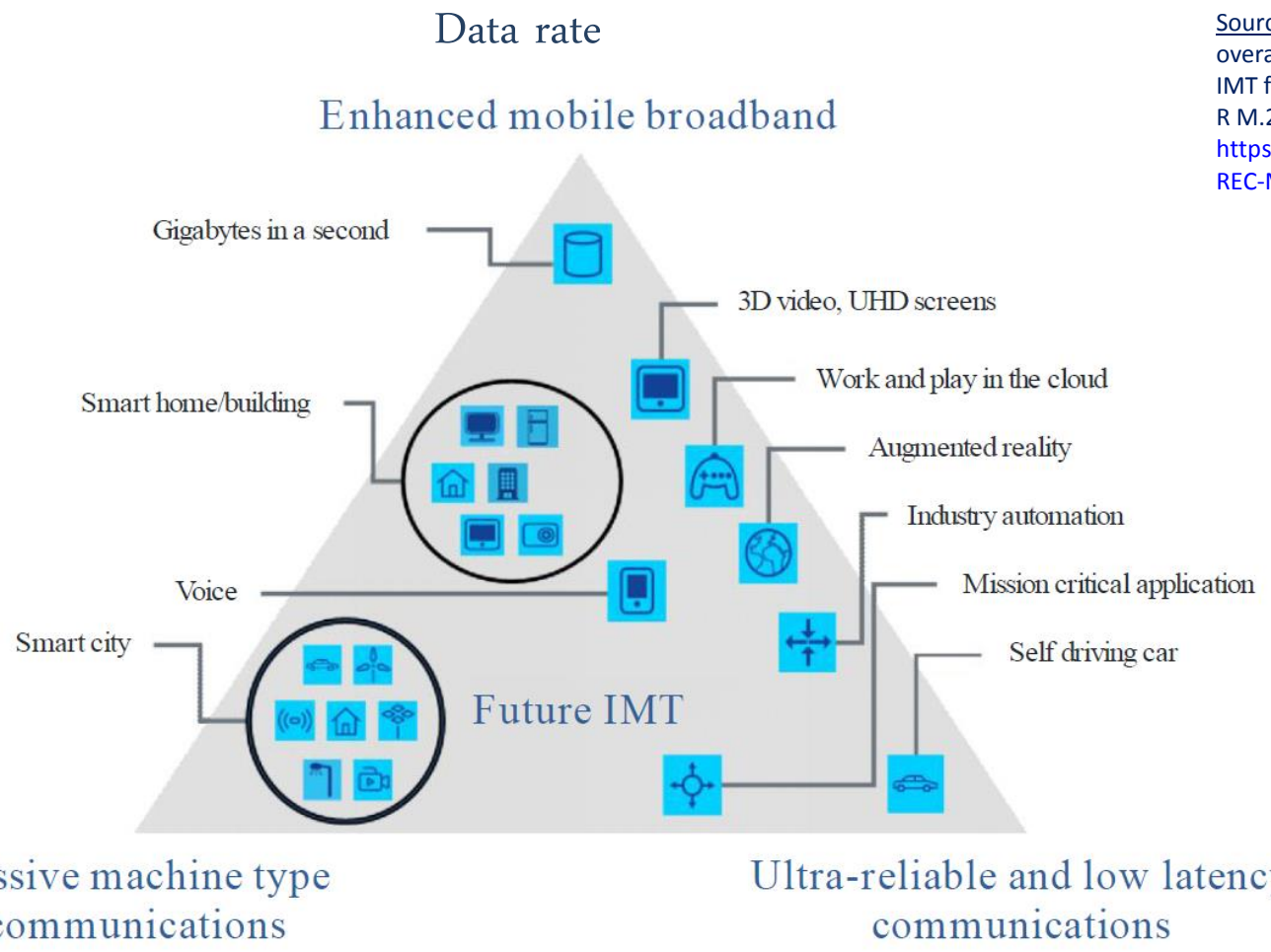
Service Demands in the Future are highly heterogeneous



Source: ITU-R: IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond. Recommendation ITU-R M.2083-0 (09/2015), https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2083-0-201509-I!!PDF-E.pdf.

Solution: Network Slicing

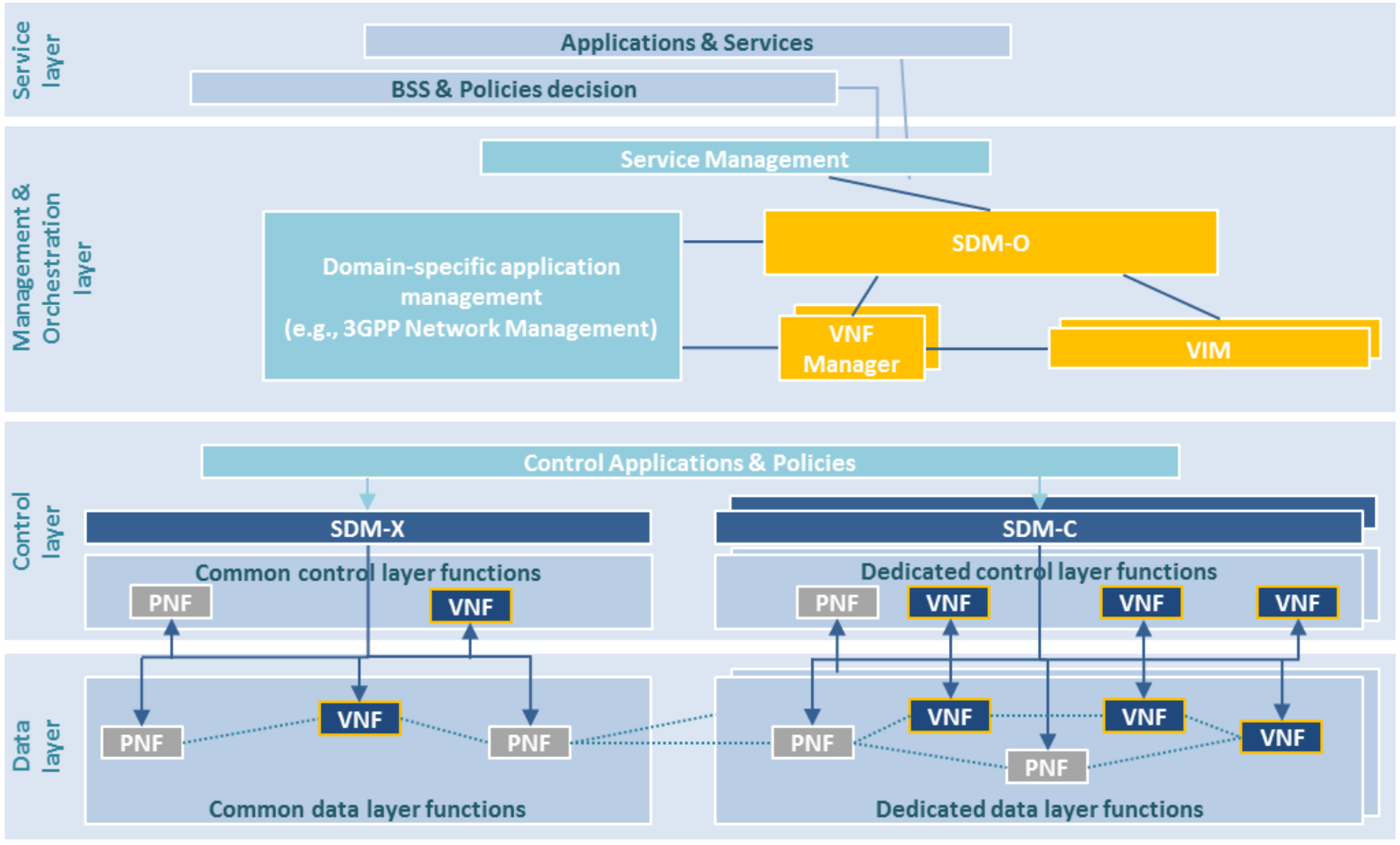
Operate multiple isolated logical network instances on a shared infrastructure

Adapted to service:

- QoS / QoE
- Functionality
- Topology
- Security

Optimized wrt. costs

Preliminary 5G NORMA Architecture (functional view)



Exposure of control

- Service management
- Mapping of customer-facing services and procedures to resource-facing services and procedures
- Access control and integrity

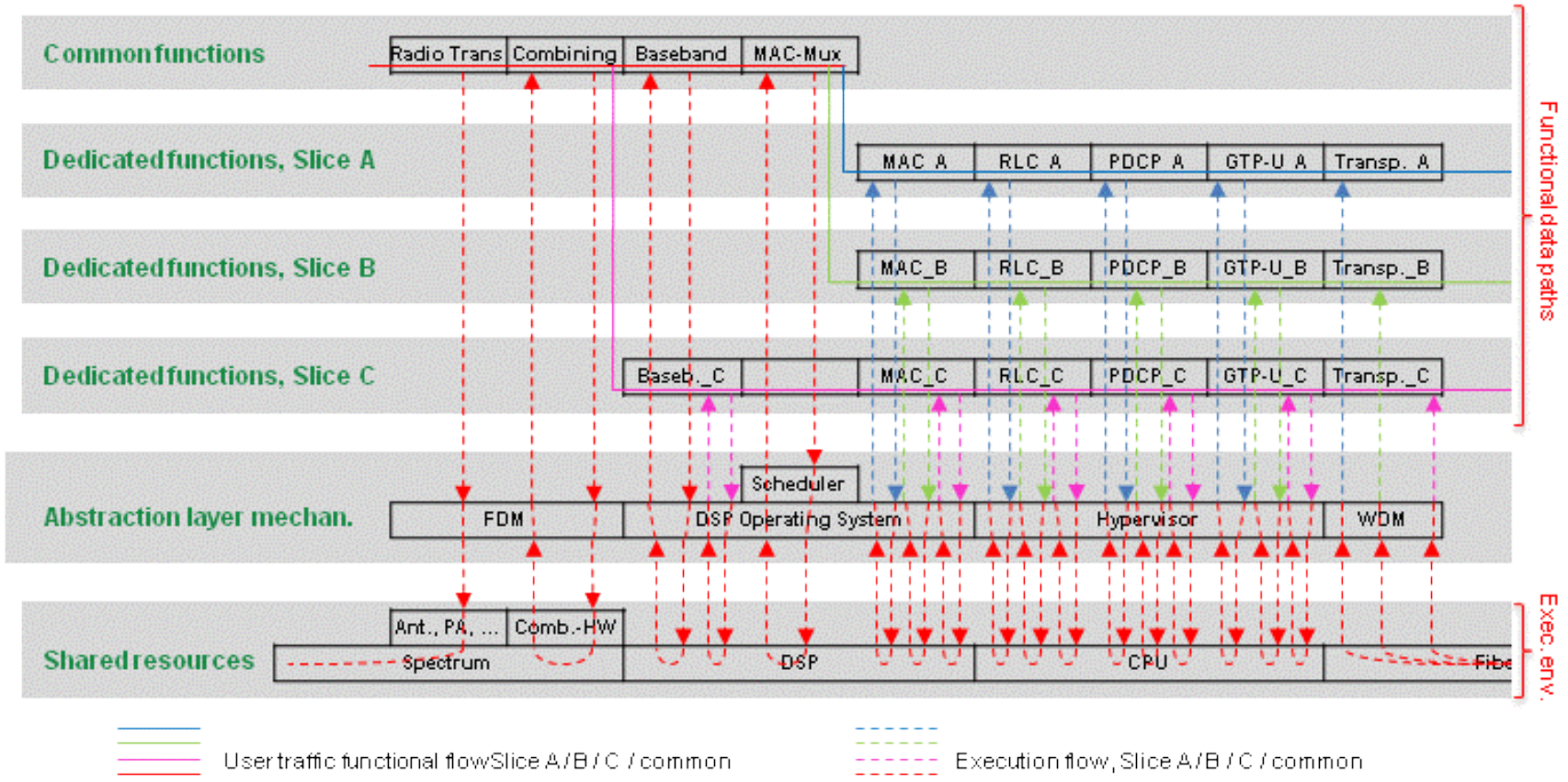
Network slicing

- SDM-O: Service and Resource Orchestration
- Inter-slice and intra-slice

Network programmability

- Differentiation into common and dedicated functions
- SDM-X and SDM-C

Separation of Functionality and Execution



Multiplexing, multitasking, virtualization

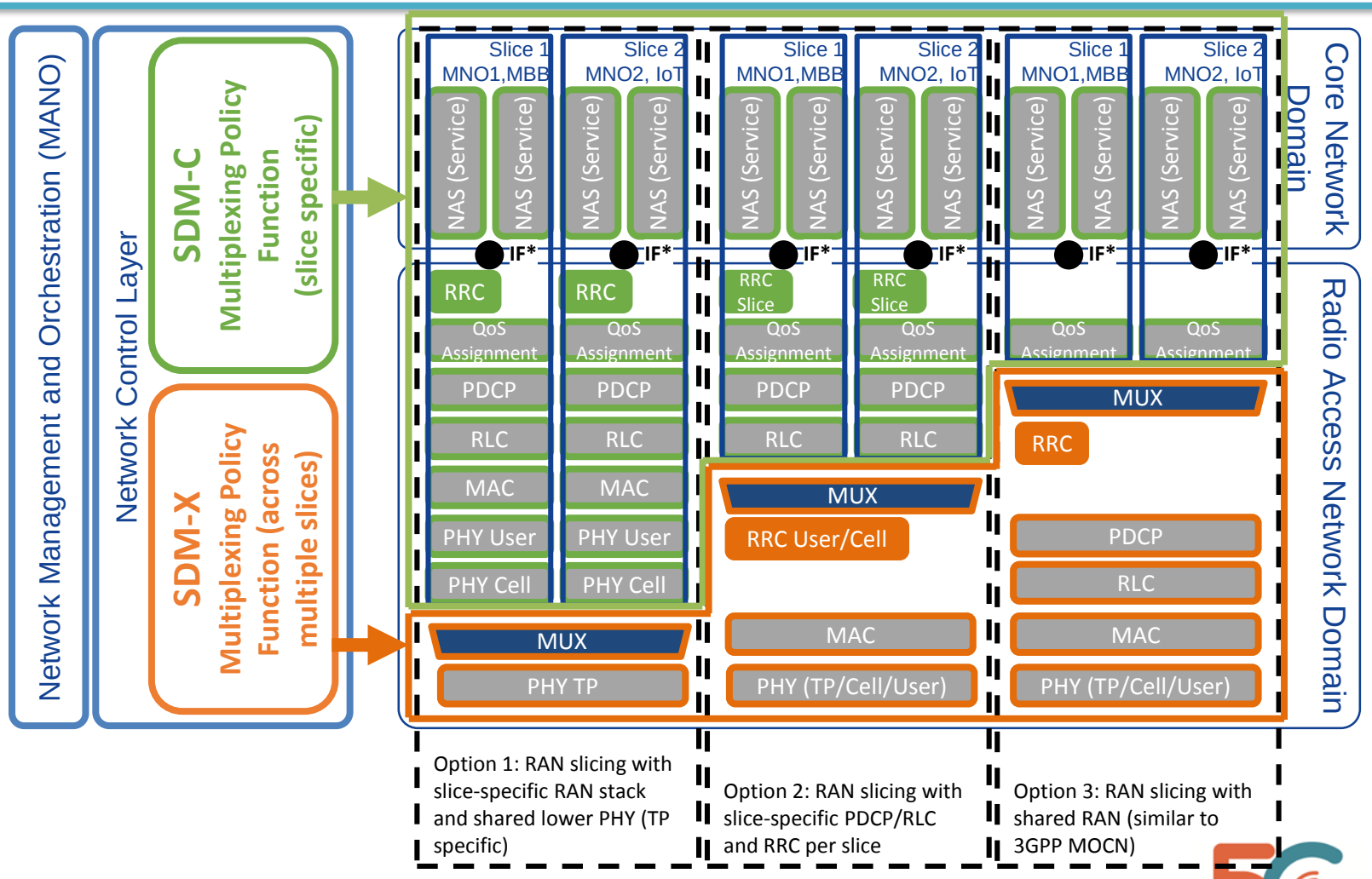
are complementary techniques:

i. Decouple functionality from its execution and the underlying hardware

ii. Partition resources into isolated execution environments

RAN Slicing Options

- Shared lower PHY
  - Option 1: RAN slicing with slice-specific RAN stack and shared lower PHY (transmission point specific)
- Shared up to MAC
  - Option 2: RAN slicing with slice-specific PDCP/RLC; RRC is split: RRC slice and RRC user/cell
- Fully shared RAN
  - Option 3: RAN slicing with shared RAN (similar to 3GPP Multi-Operator Core Network)

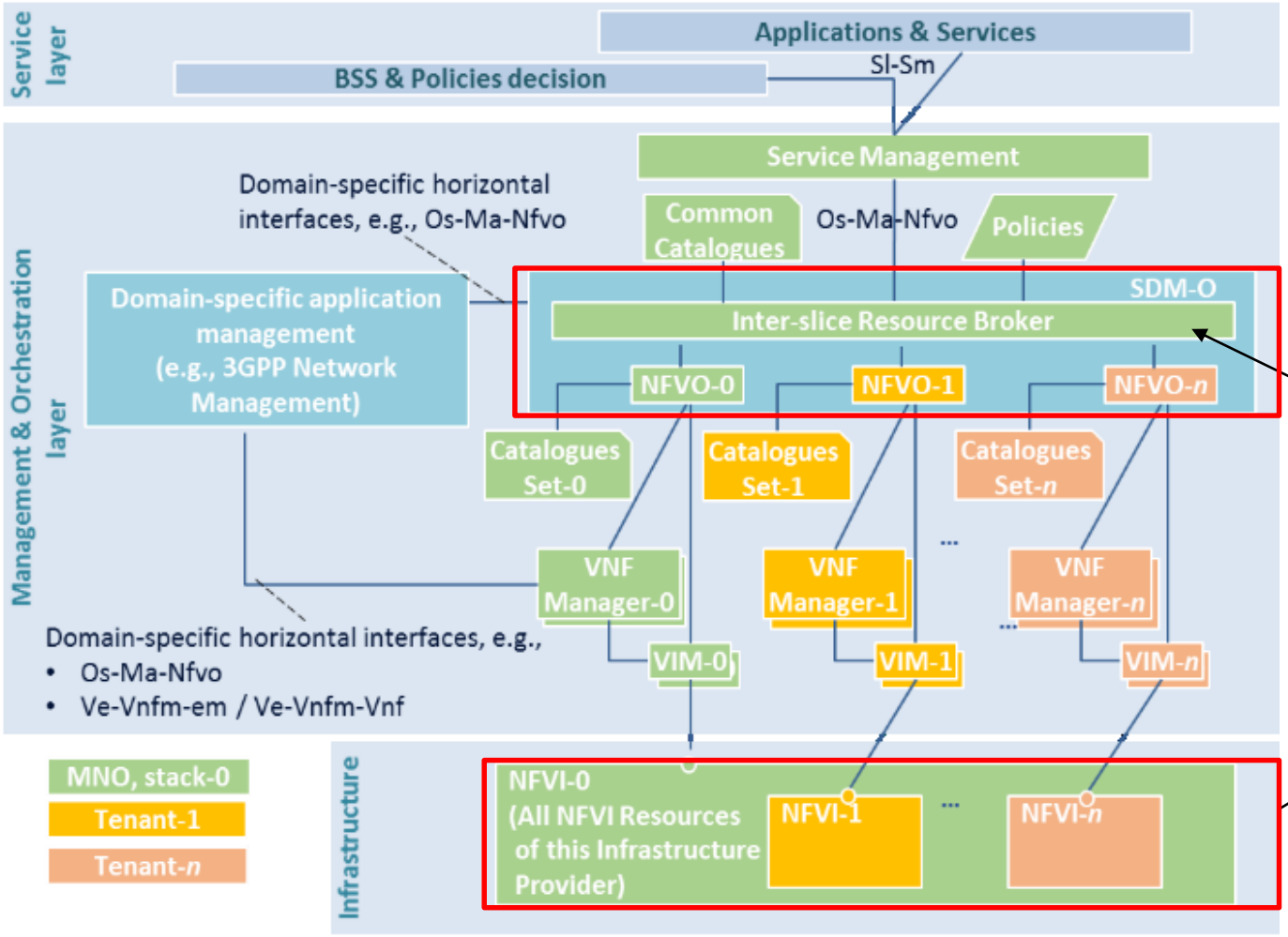


Network Slicing in 3GPP SA2

- CN part of a network slice instance comprises shared and dedicated functions

  Example:
  - Session Management Function (SMF) is slice-specific
  - Access and Mobility Management Function (AMF) is common for all slices
- Identification & selection of a slice use NSSAI (network slice selection assistance information), two components
  - “slice/service type” (SST) and “slice differentiator” (SD, similar to tenant ID)
  - NSSAI is mandatory for selecting CN part of network slice instances that shall serve a UE
  - If RAN uses NSSAI is ffs
- UEs can be (pre-)configured with a “Configured NSSAI” which can be overruled by network-provided “Allowed NSSAI”
- A single UE can simultaneously be served by one or more network slice instances

Management & Orchestration Concept for Network Slicing



Intra and inter network slice orchestration algorithms

NFV infrastructure is shared according to specific resource commitment models (e.g., reservation-based or on-demand schemes)

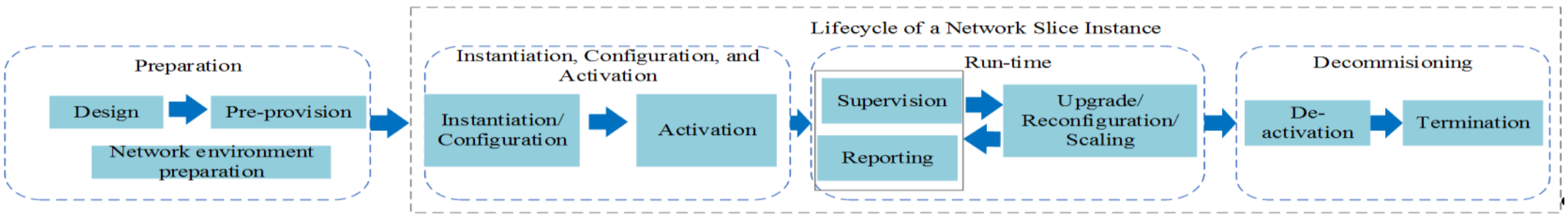
5G NORMA MANO concept

- Fully compatible with ETSI NFV
- Extensions realize required multi-tenancy and multi-domain capabilities
- Dedicated MANO functions per tenant

MANO Concept for Network Slicing

Topics currently under investigation in 5G NORMA:

- Interactions between Service Layer – Service Management – Inter-slice Resource Broker
- Comparison between MNO's and Tenant's MANO stacks:
  - Are all function blocks needed in both stacks?
  - Are the function blocks in both stacks identical?
- Analysis of multi-tenancy capabilities of legacy network management functions (NMS / EMS)
- Harmonization of MANO functions for integration of PNFs and VNFs in a common network architecture.



Source: 3GPP, TR 28.801 V0.5.0, http://www.3gpp.org/ftp//Specs/archive/28_series/28.801/28801-050.zip

Conclusion

Control Layer

3 types of control entities:

- for network functions shared between slices
- for dedicated network functions
- decentralized control functions

Data Layer

- E2E network slicing is technically feasible, including RAN
- Multiplexing, multitasking, virtualization complement each other to realize slice-specific data layer

Management and Orchestration

- Basis for 5G NORMA: ETSI NFV MANO concept
- Extensions for multi-tenancy / multi-service / multi-domain operation
- Dedicated NFV MANO functions per slice

R&D topics:

- Interaction between tenant and orchestrator
- Multi-tenancy for 3GPP network management functions
- Detailed analysis of MANO functions of operator and tenant

THANK YOU!

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