

Telefonica

Slicing across multiple administrative domains

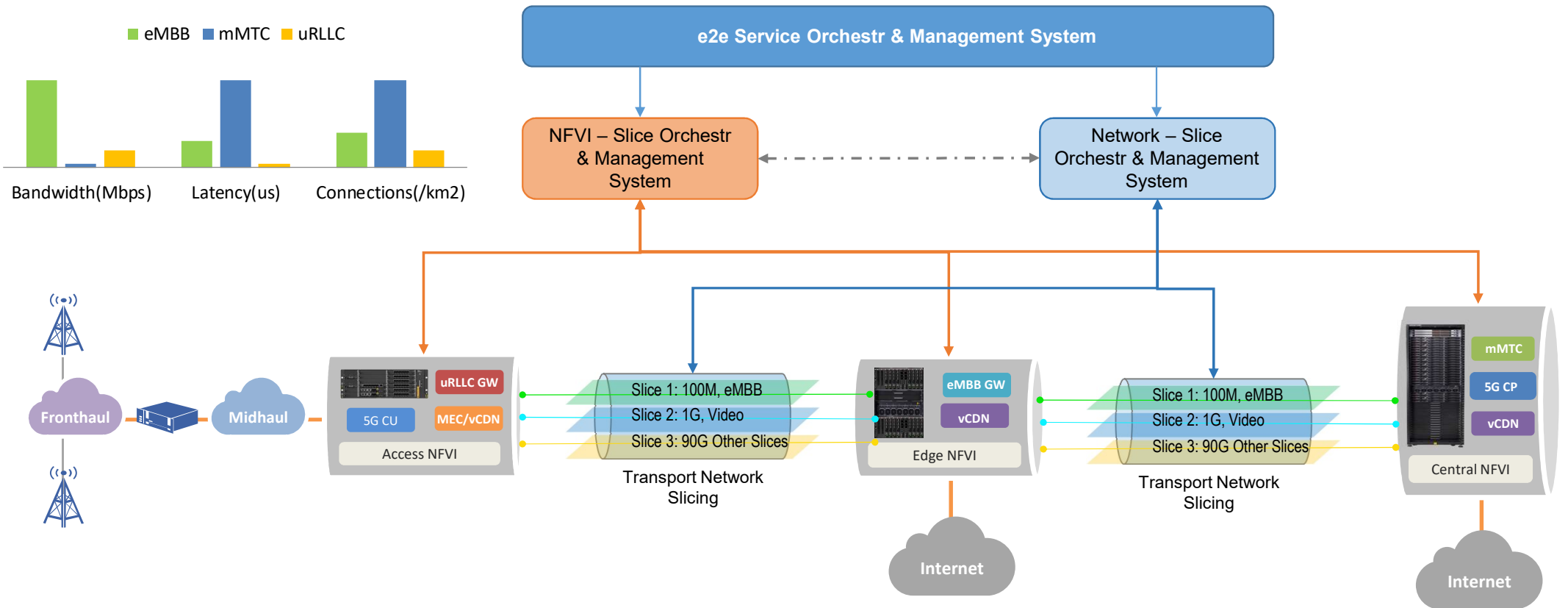
Luis M. Contreras, Telefónica GCTIO Unit
February 20th, 2019 | Leganés, Spain

#RECONNECTA



Workshop On "5G – The Next Phases"

The starting point



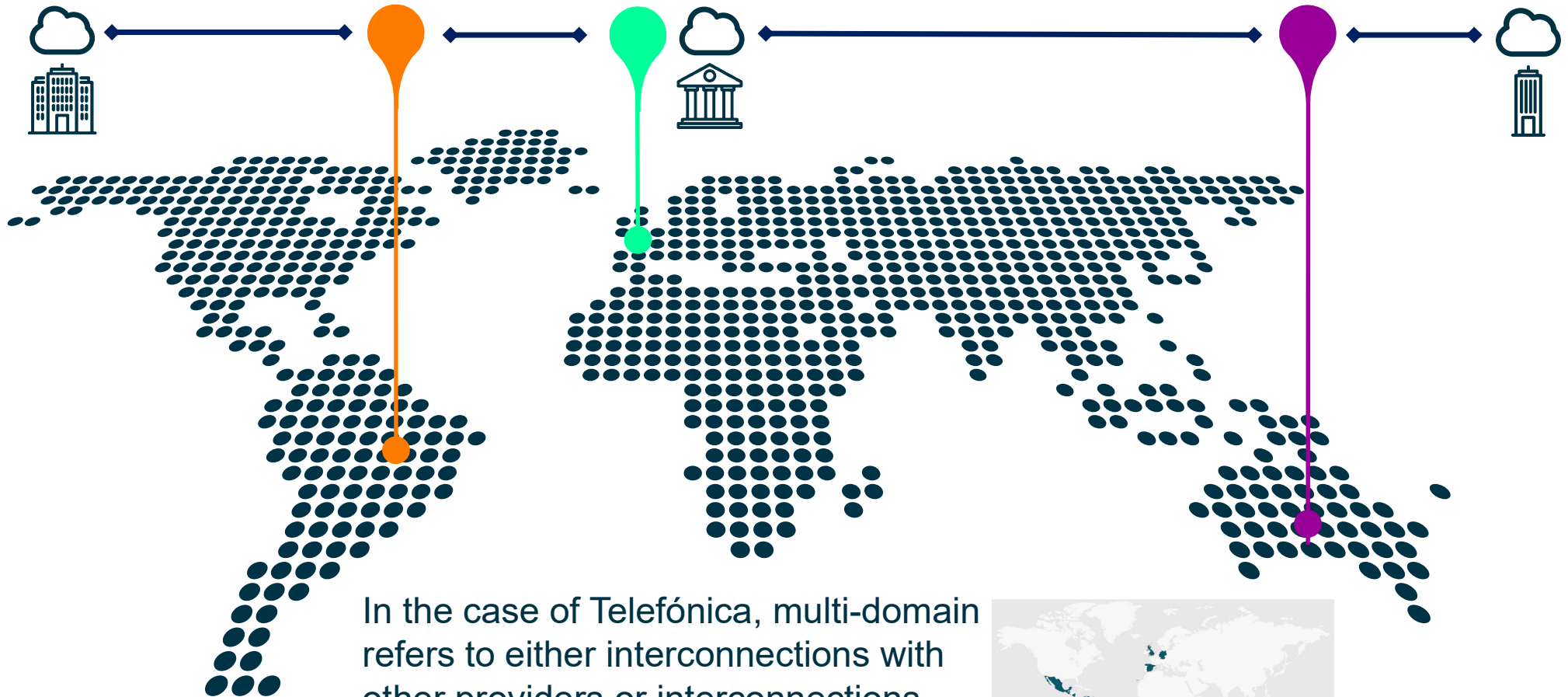
Evolution of vertical / wholesale services

- **Operators** start deploying its **own computing capabilities**
 - UNICA environment in the case of Telefónica
- Operators can leverage on these capabilities for creating **service offerings** to external (vertical / wholesale) customers
 - E.g., by deploying (or requesting) specific VNFs and service graphs
- **Adaptation to variable demands** and **changing service end-points** require more dynamic and responsive mechanisms for service delivery
- **Diverse network segments** become an integral part of the final service offering (e.g., Radio for IoT)
 - Need for a truly convergent network
- Need for efficient **deployment** of services (in the form of slices) **across multiple administrative domains**

Multi-domain slicing

- **Dynamic and automated** interaction with other providers is needed for enabling an Open Cooperative 5G Service Ecosystem but
 - How we can **know about the capabilities** of other providers? / How we can handle the **lifecycle** of such services? / How we can **ensure SLAs** among providers?
- Nowadays, interconnection and wholesale environments are **static**
 - long interactions for any inter-provider connection, requiring **manual operation**
- Leverage on **virtualization & programmability** for creating **service offerings** with
 - Proper mechanisms for **trading** these **capabilities** (at resource and VNF level)
 - **Interfaces / APIs** that could allow this to happen in an **automated** way
 - **Configure and manage** capabilities on the instantiated resources & functions from the provider or the customer perspective!!

Multi-domain perimeter



In the case of Telefónica, multi-domain refers to either interconnections with other providers or interconnections among affiliates (up to 15 Networks!)

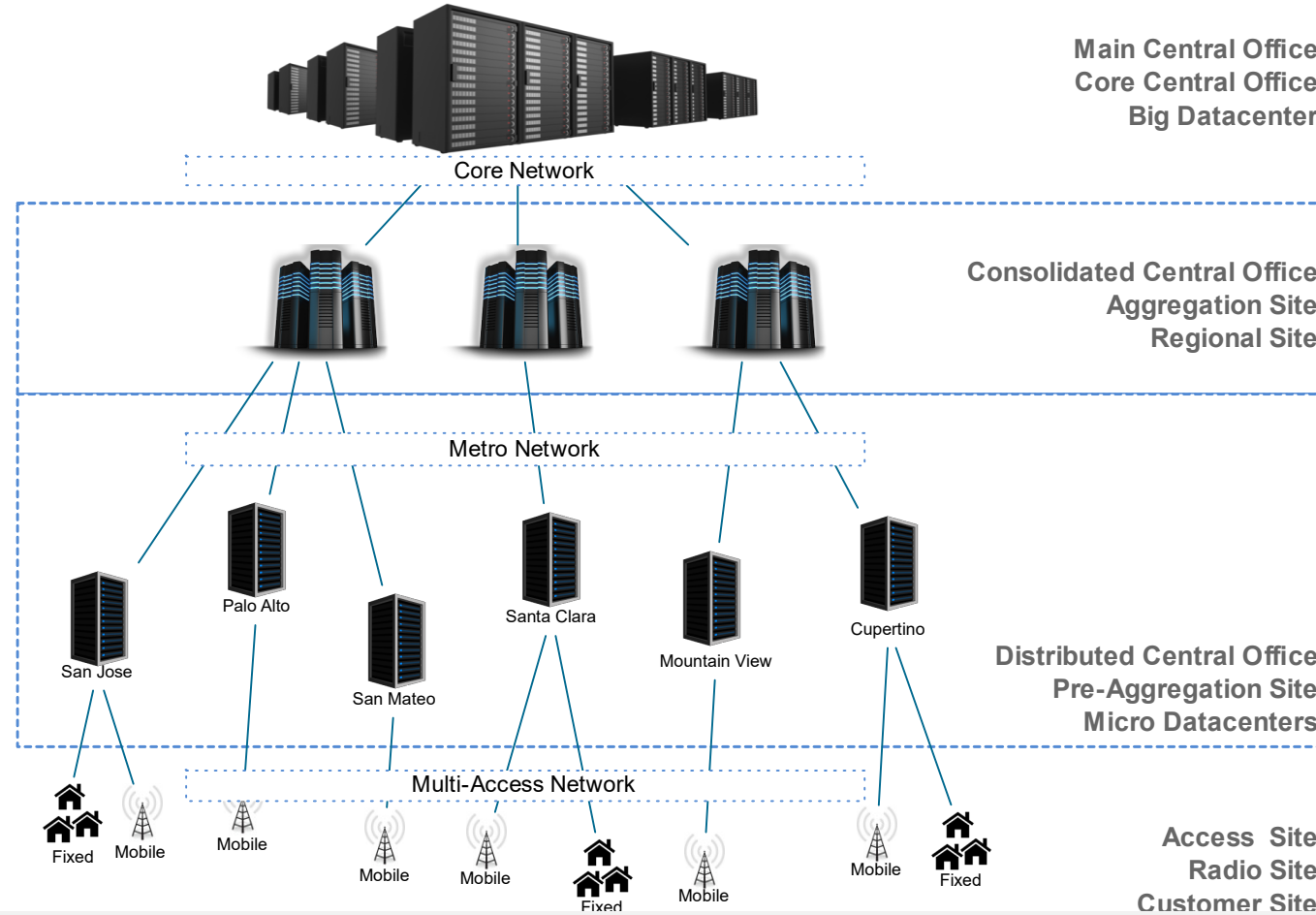


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... but also

- Telco operators
- MVNOs
- Municipalities
- Utilities
- etc



Enhanced Mobile Broadband (eMBB)

Ultra Reliable Low Latency Communication (urLLC)

Machine-Type Communication (MTC)



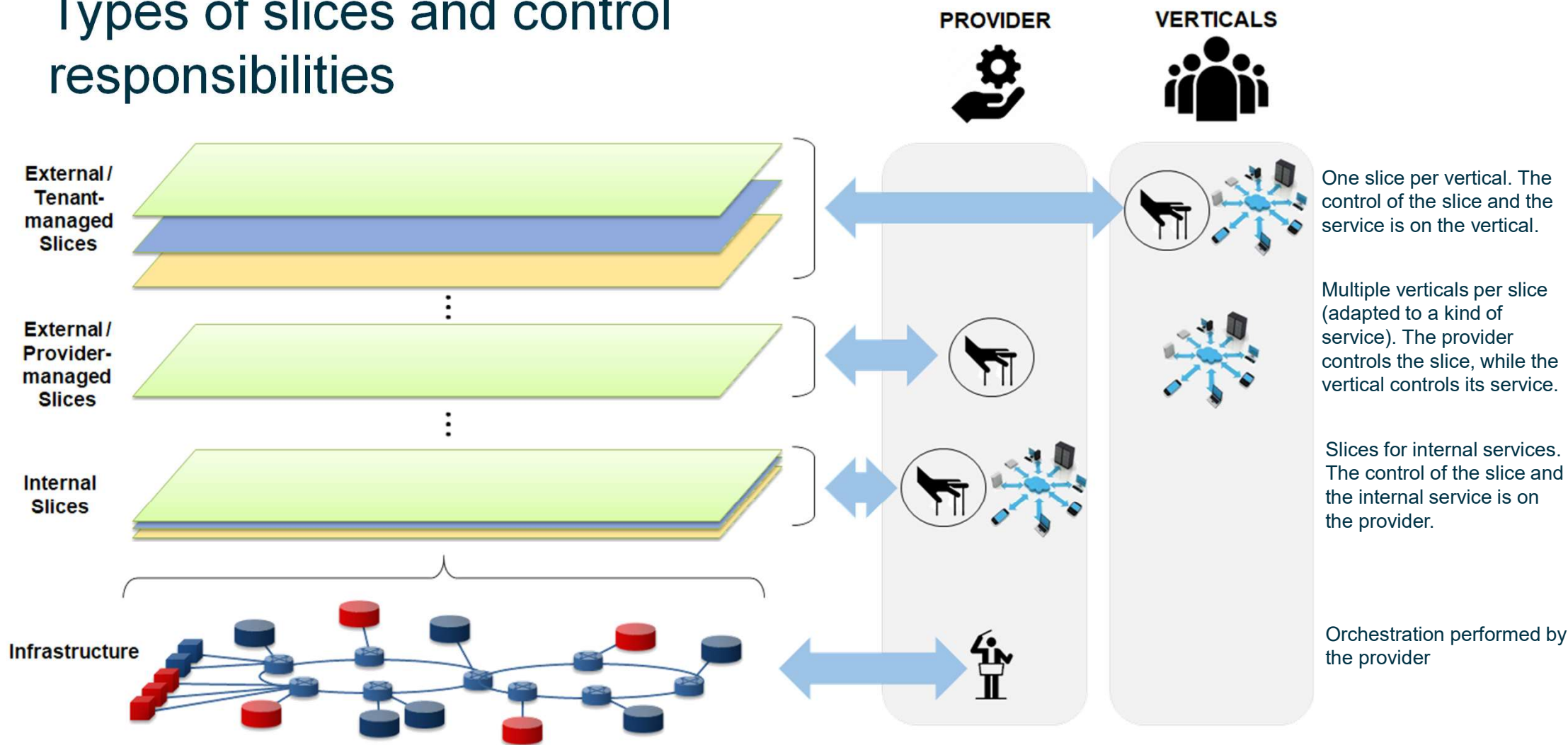
Size matters



Challenges of multi-domain slice provision (and operation)

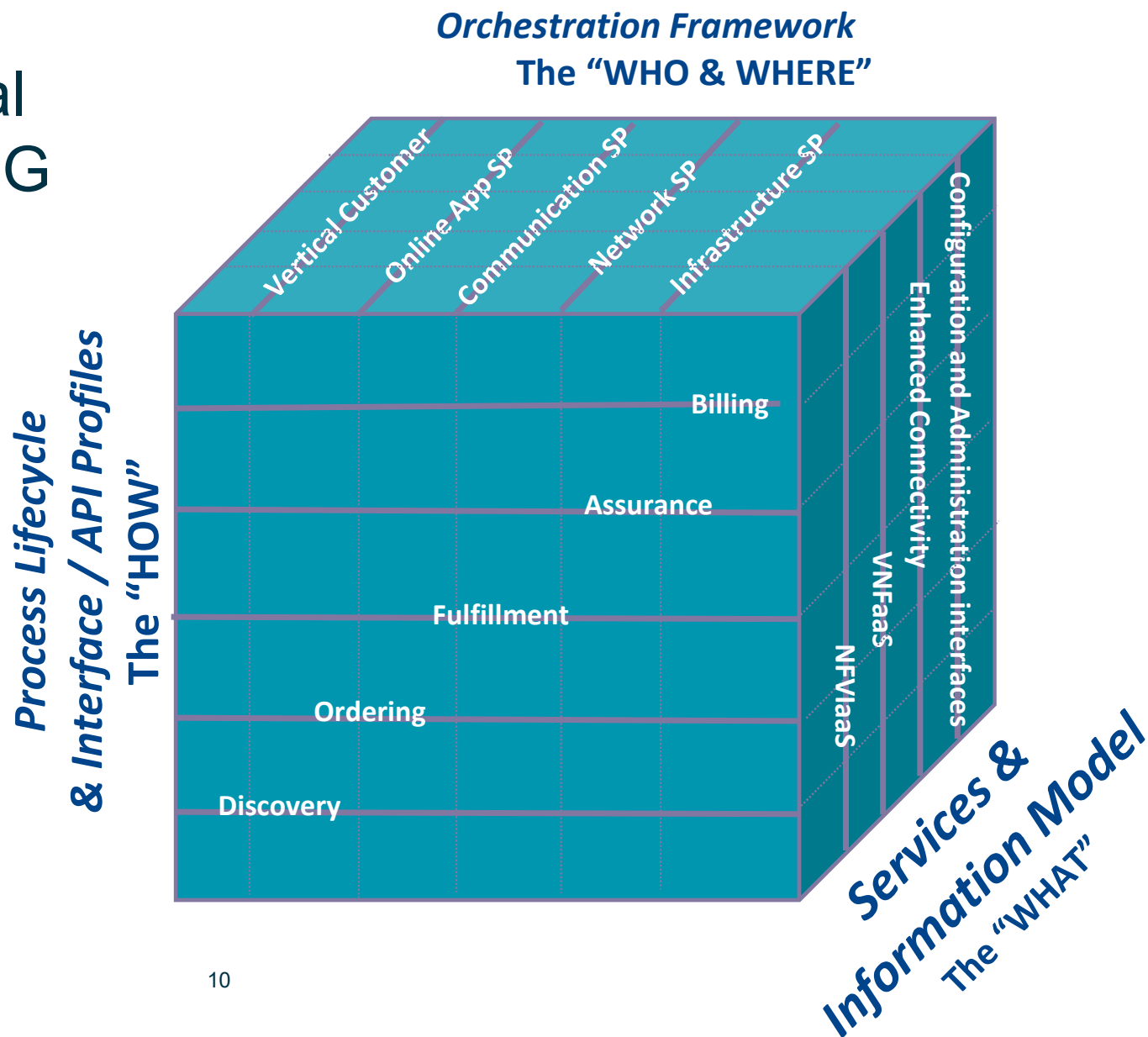
- Strict **SLAs**, associated to penalties
 - guaranteed service is a must (latency, bandwidth, availability)
- High **customization** in provisioning
 - automation as the way for simplifying the provisioning and
 - programmability to reduce time to market (\approx time to revenue)
- Need for **segregation**
 - Physical separation (e.g., dedicated backbones) → not cost efficient
 - Overlay, in the form of VPN as overlay solution → not flexible nor agile
 - Slicing, through network resource (including SF) allocation → dedicated resources per customer/service to ensure isolation on top of the same infrastructure
- Need for standardized Slice-aware Customer / Tenant **Service Interface and Service Delivery Interface**

Types of slices and control responsibilities



The Three Fundamental Vectors for integrated 5G multi-domain solution

- Shared description of **Services**
- Common **Processes**
- Interoperable **Orchestration Framework**



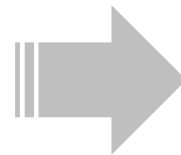
Progress on this direction

SDO Work in progress

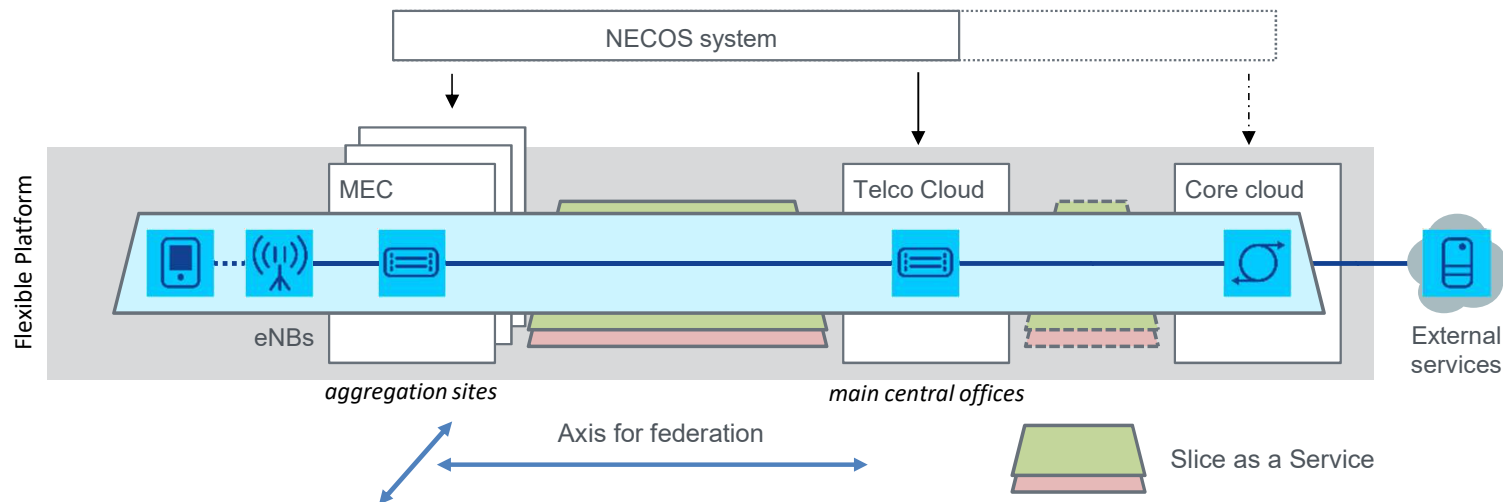
- Multi-domain NFV (ETSI NFV)
- Multi-domain management (ETSI ZSM)
- Multi-domain transport (IETF ACTN)
- Multi-provider service APIs (MEF LSO)
- ...

Yet to be developed

- Multi-site and -environment descriptors
- Intent based capabilities
- Multi-domain SLAs and policies
- Topology of resources and SFs
- ...



Taking action – NECOS Project(*)



Slice as a Service as deployment model, grouping of resources managed as a whole, that can accommodate service components, independent of other slices.

Embedded methods for an optimal allocation of resources to slices in the cloud and networking infrastructure, to respond to the dynamic changes of the various service demands.

Lightweight principle, in terms of small footprint components deployable on large number of small network and cloud devices at the edges of the network

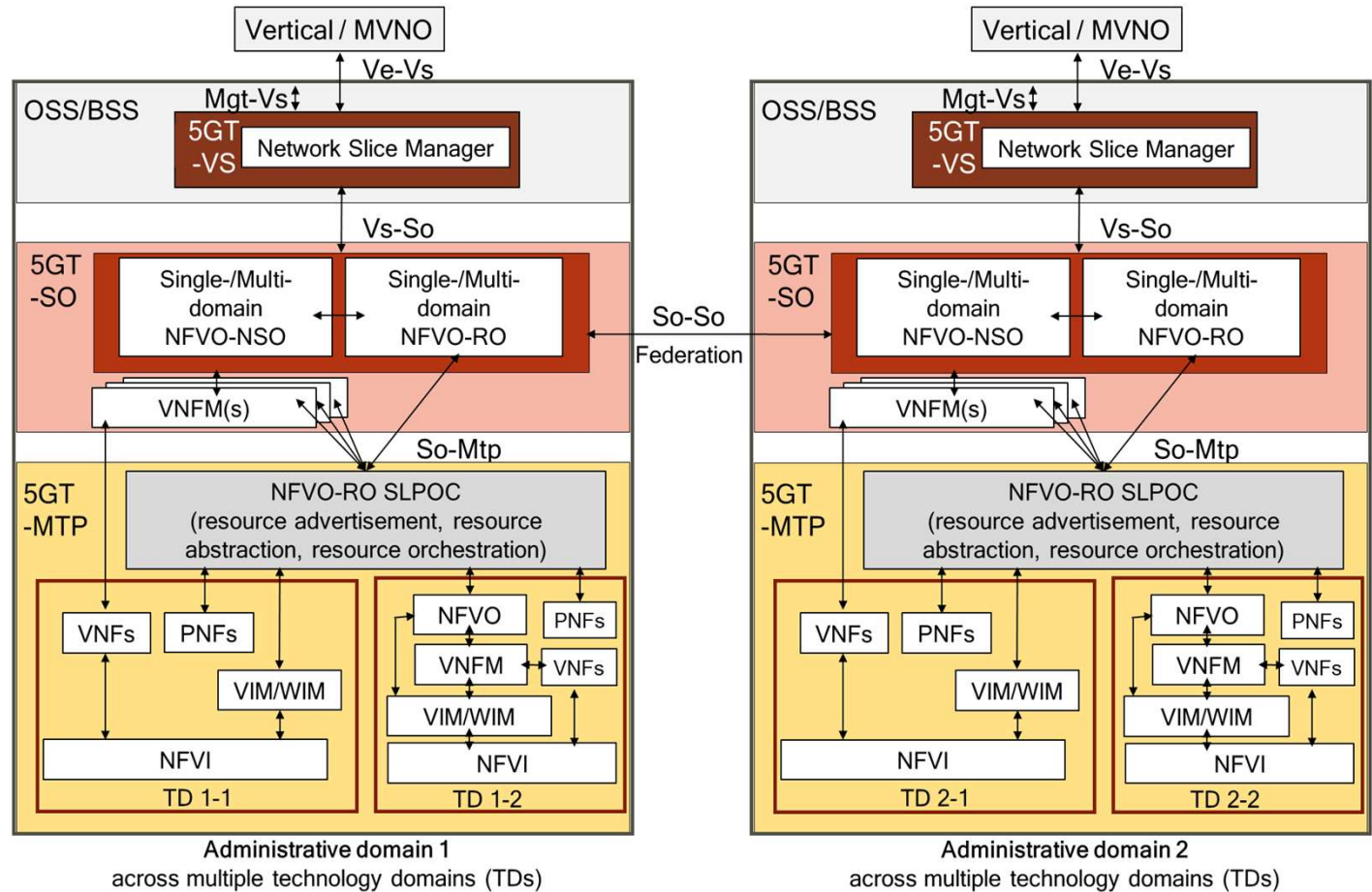
Taking action – 5G-Transformer^(*)

Defining and Managing Vertical Services:

- (1) Defining vertical services (VSB->VSD)
- (2) VSD/NSD translator: maps vertical's requirements to network slice requirements
- (3) Arbitrator: mapping vertical services to network slices, in turn to NFV Network Services

NFV Network Service Orchestration/Federation:

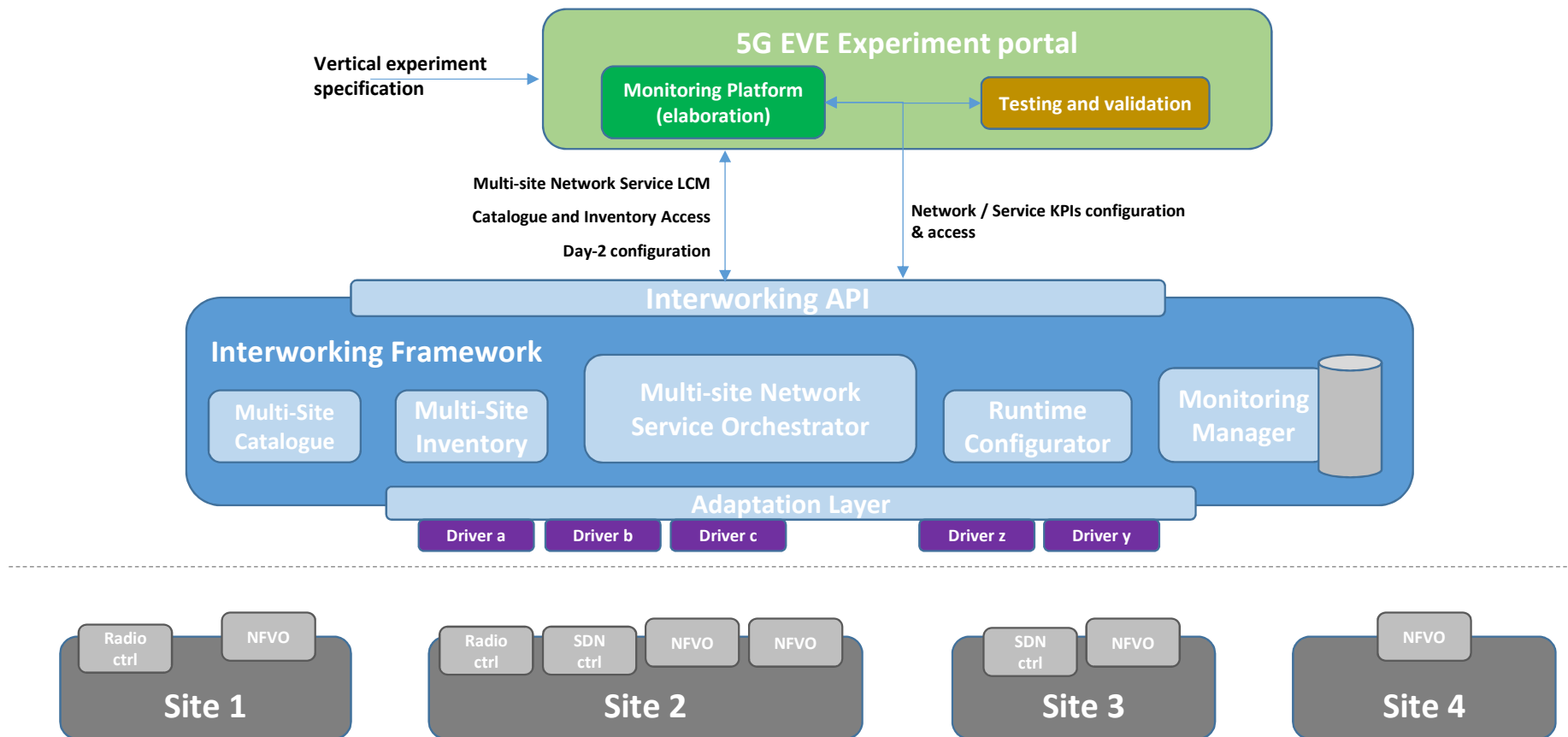
- Service Orchestration (NFVO-NSO)
 - Resource Orchestration (NFVO-RO)
-
- Allocation of resources over the infrastructure
 - Providing abstractions



Taking action – 5G-EVE(*)



5G EVE





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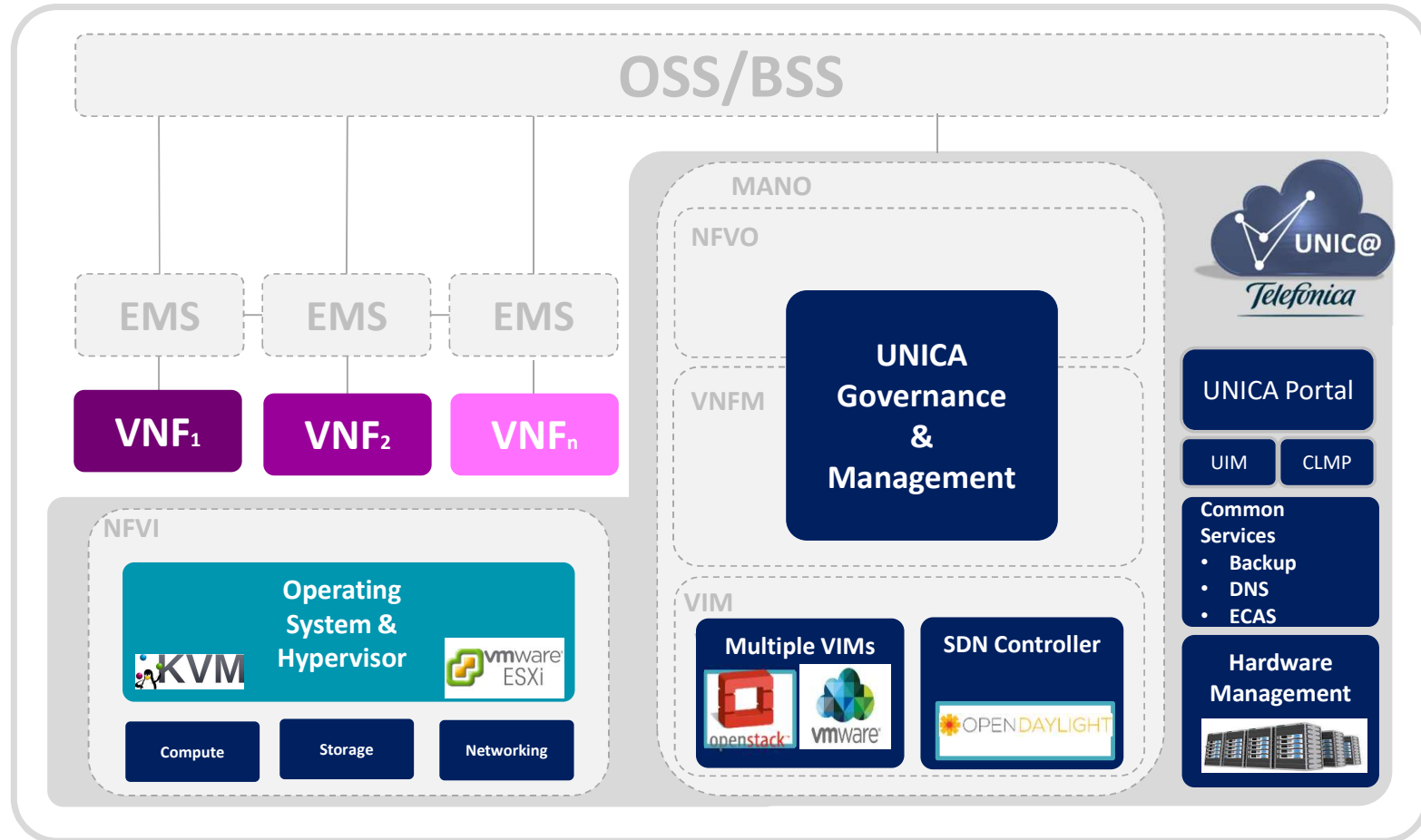
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This presentation reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

Backup



Telefónica's UNICA infrastructure



Open: modular, multi-vendor, standard, evolvable

Cloud based: Elastic, Multi site, Multi Vim, Multi Tenant

Telco Grade: Secured, High availability, High performance

Efficient: Automatized deployment and network connectivity via SDN

Interconnection models in place

- Nowadays, **interconnection** is conceived as **pure IP traffic interchange**, which limits the capability of taking advantage of new advances like network virtualization
- The current interconnection model is **not aware of peer's network resources** (i.e., load conditions, etc)
 - Not feasible an optimal delivery of traffic (/service) among peers
- All these **environments are static**, requiring long interactions for setting up any inter-provider connection
- **Manual operation** of current interconnections prevents any flexibility
 - **Automation** for both the **interconnection** sessions and the **service deployment** on top of that is needed to reach the goal of flexibility