



Service Orchestration and Federation for Verticals

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of Vertical slicing including the Edge and Fog Systems (COMPASS)

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Outline

- Overview of 5G-TRANSFORMER
- 5G-TRANSFORMER System Architecture
- Mapping to 3GPP/ETSI NFV
- SO Functionalities and Architecture options
- Federation
- Conclusions

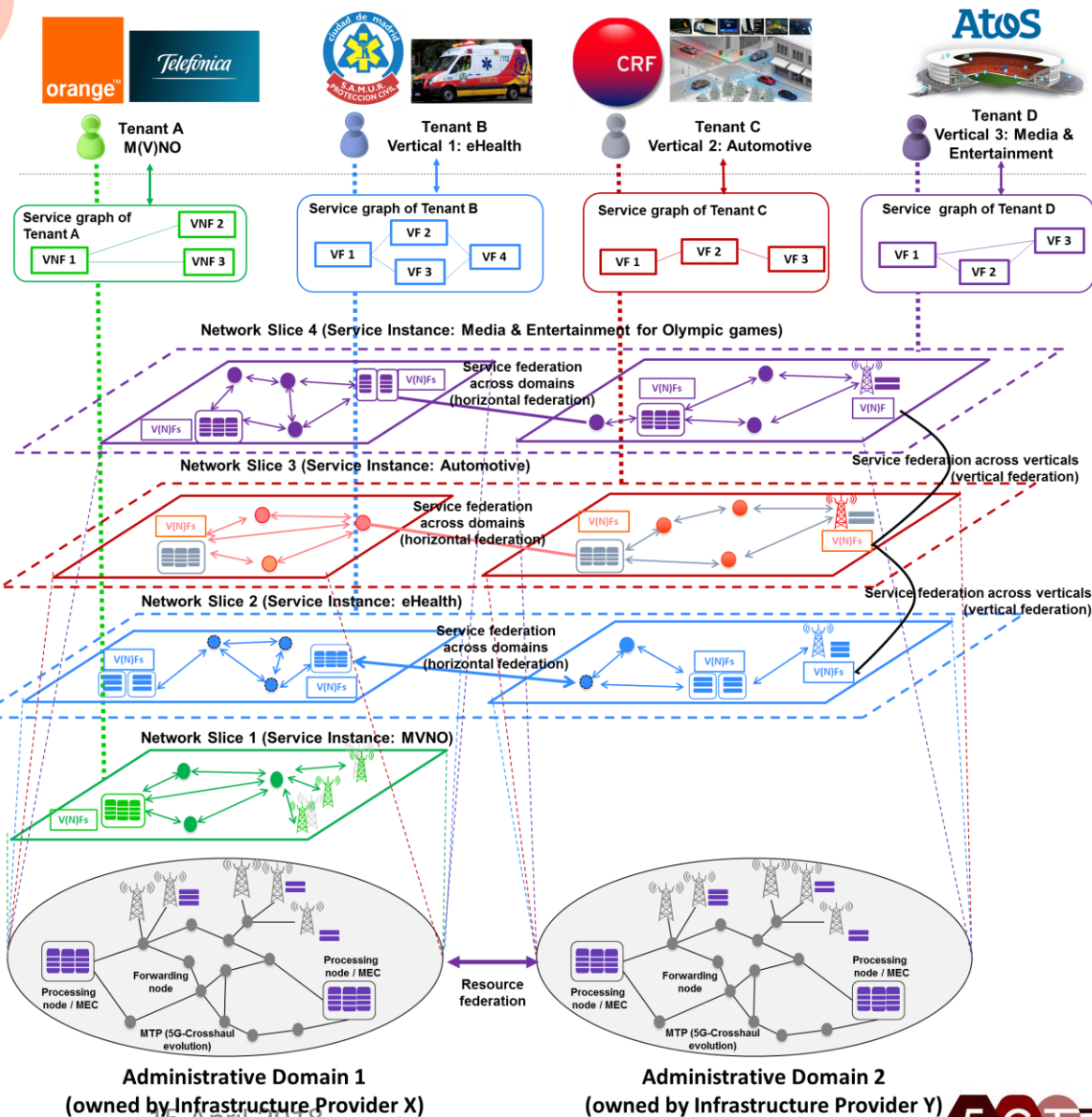
5G-TRANSFORMER Overview

5G-TRANSFORMER aims to transform rigid mobile transport networks into an SDN/NFV-based 5G Mobile Transport and Computing Platform (MTP)

Technical approach:

- Enable Vertical Industries to meet their service requirements within customized MTP slices
- Aggregate and Federate transport networking and computing fabric, from the edge up to the core and cloud, to create and manage MTP slices throughout a federated virtualized infrastructure

5G TRANSFORMER Concept



5G-Transformer users
 Mobile (Virtual) Network Operators
 Vertical Industries

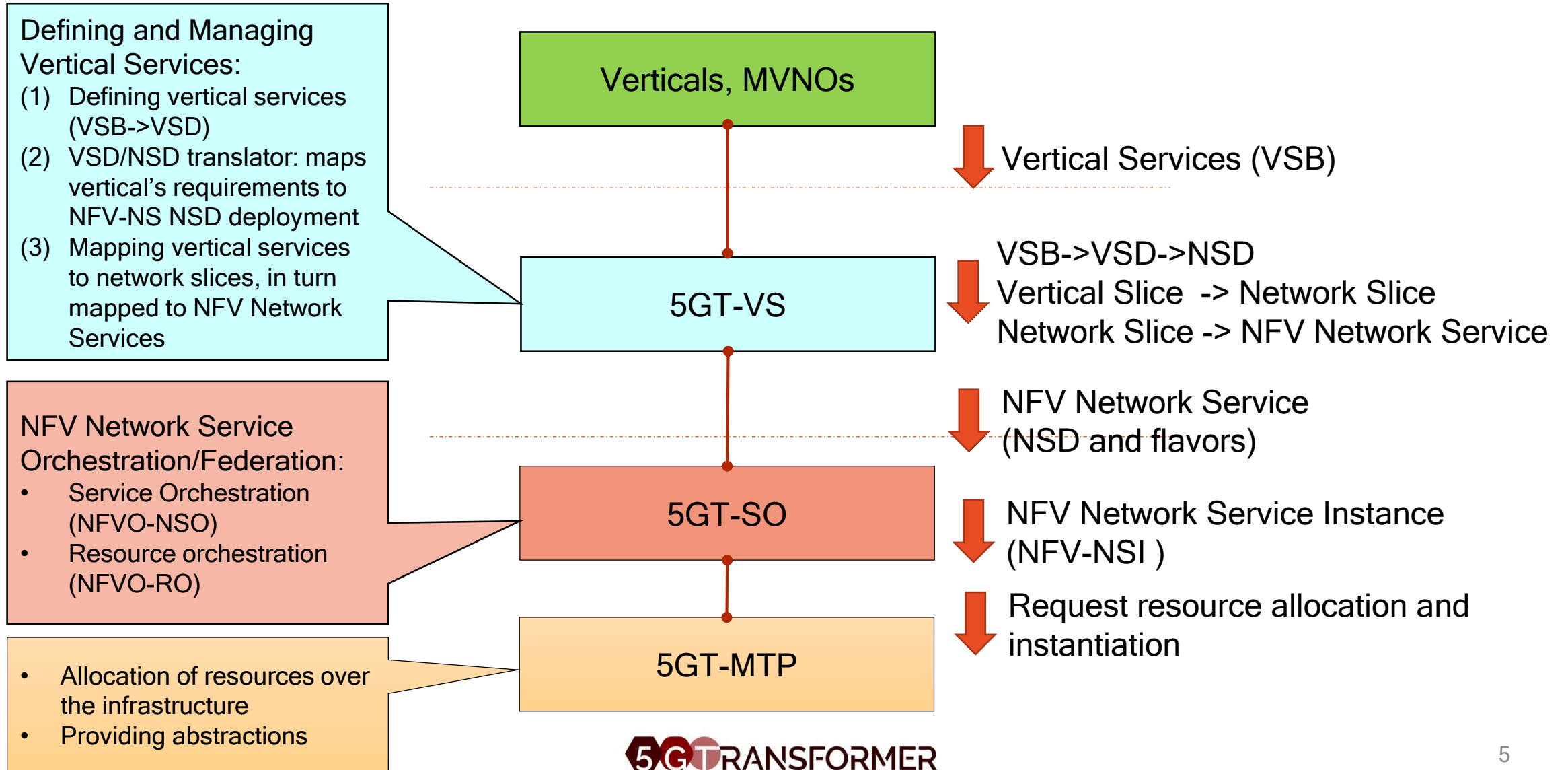
Vertical Slicer (VS)

Service Orchestrator (SO)

Mobile Transport and Computing Platform for Verticals (MTP)

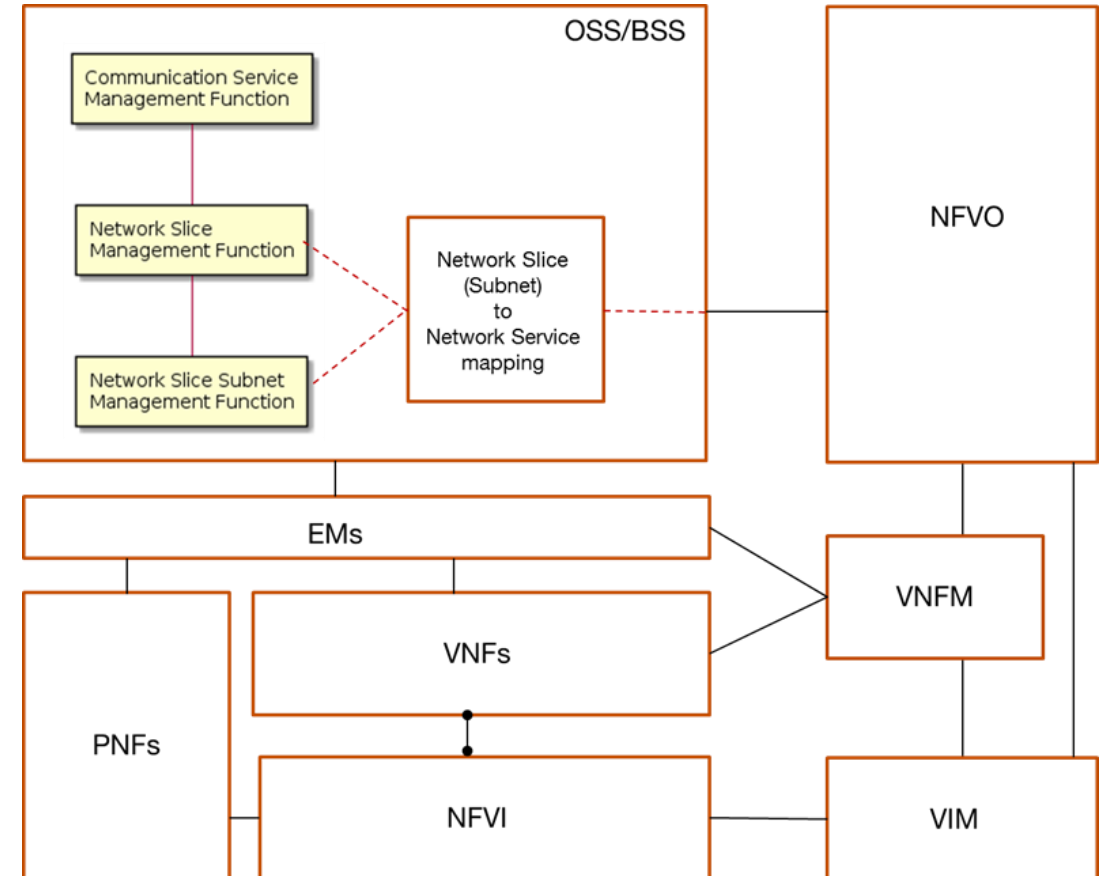
- **Vertical Slicer (5GT-VS)**
 - logical entry point for verticals to support the creation of their transport slices in a short time-scale
- **Service Orchestrator (5GT-SO)**
 - federation of transport networking and computing resources from multiple domains and allocation to slices
- **Mobile Transport and Computing Platform (5GT-MTP)**
 - underlying unified transport stratum for integrated fronthaul and backhaul networks, including compute resources

From Vertical Service to Network Slice to NFV Network Service Instantiation



Architecture in 3GPP and ETSI NFV

- 3GPP TR 28.801 - Architecture
 - **CSMF**: Translates the communication service requirements to network slice requirements
 - **NSMF**: Manages the NSIs, including their lifecycle and their mapping with the NSSIs that compose them
 - **NSSMF**: Manages the NSSIs and their lifecycle
- Map to NFV architecture
 - CSMF, NSMF and NSSMF are part of the OSS/BSS
 - An **additional «mapping function»** is required to translate between Network Slices and Network Services and interact with the NFVO



5G-T Architecture Mapping to 3GPP/ETSI NFV

- **Vertical Slicer:**

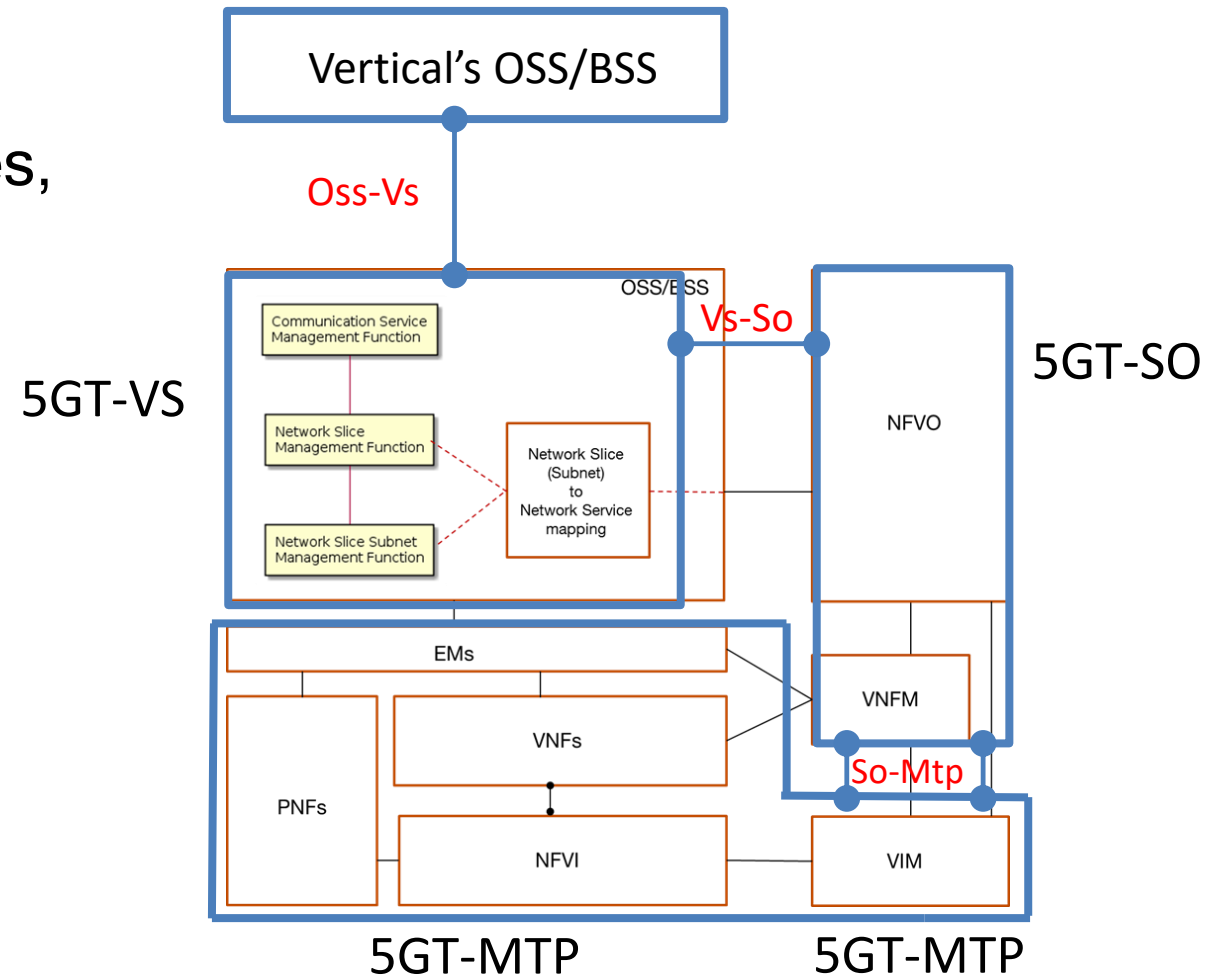
- CSMF (extended to deal with requirements of generalized services, not only communication ones)
- NSMF & NSSMF
- Mapping function

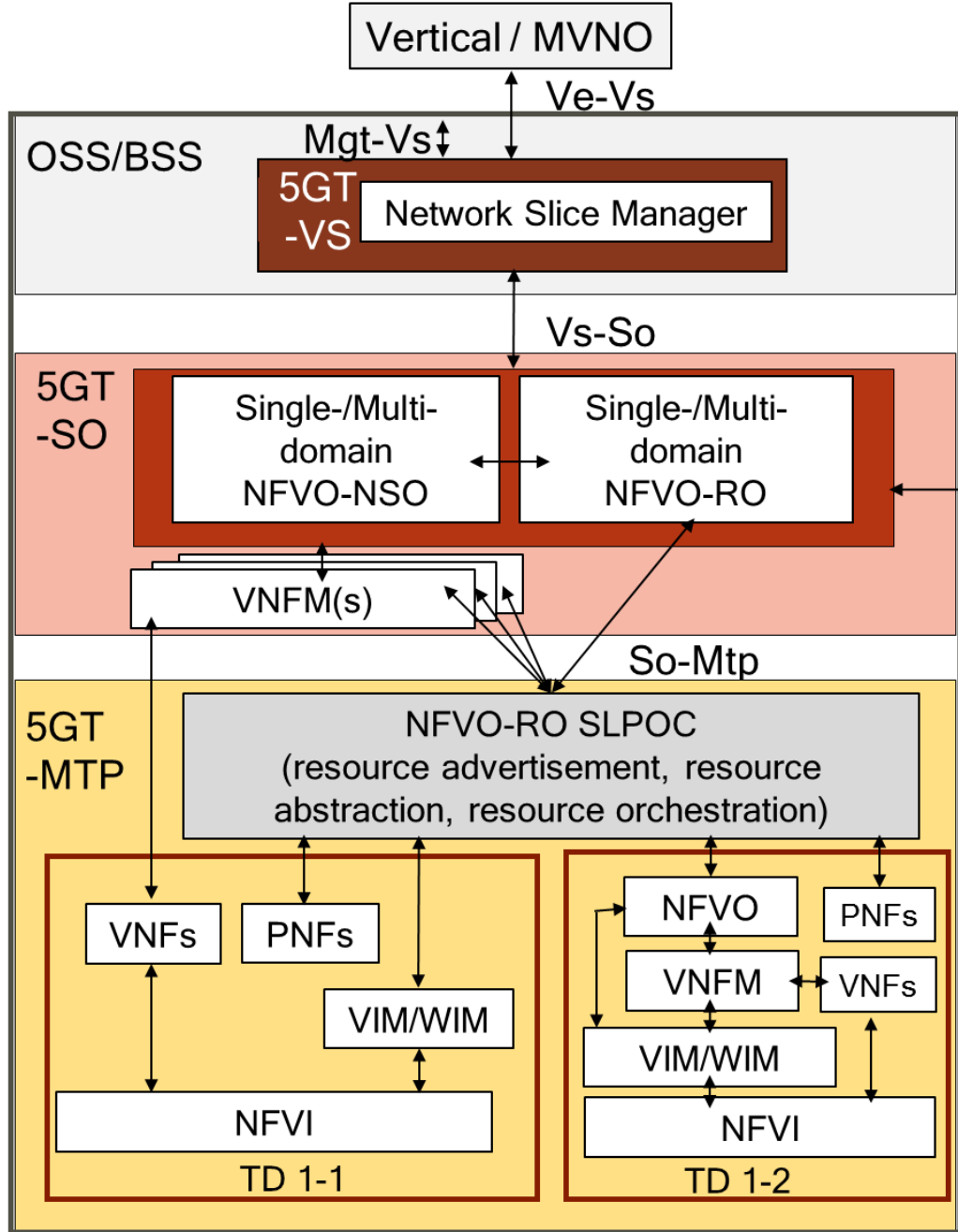
- **Service Orchestrator:**

- NFVO (NSO + RO)
- VNFM

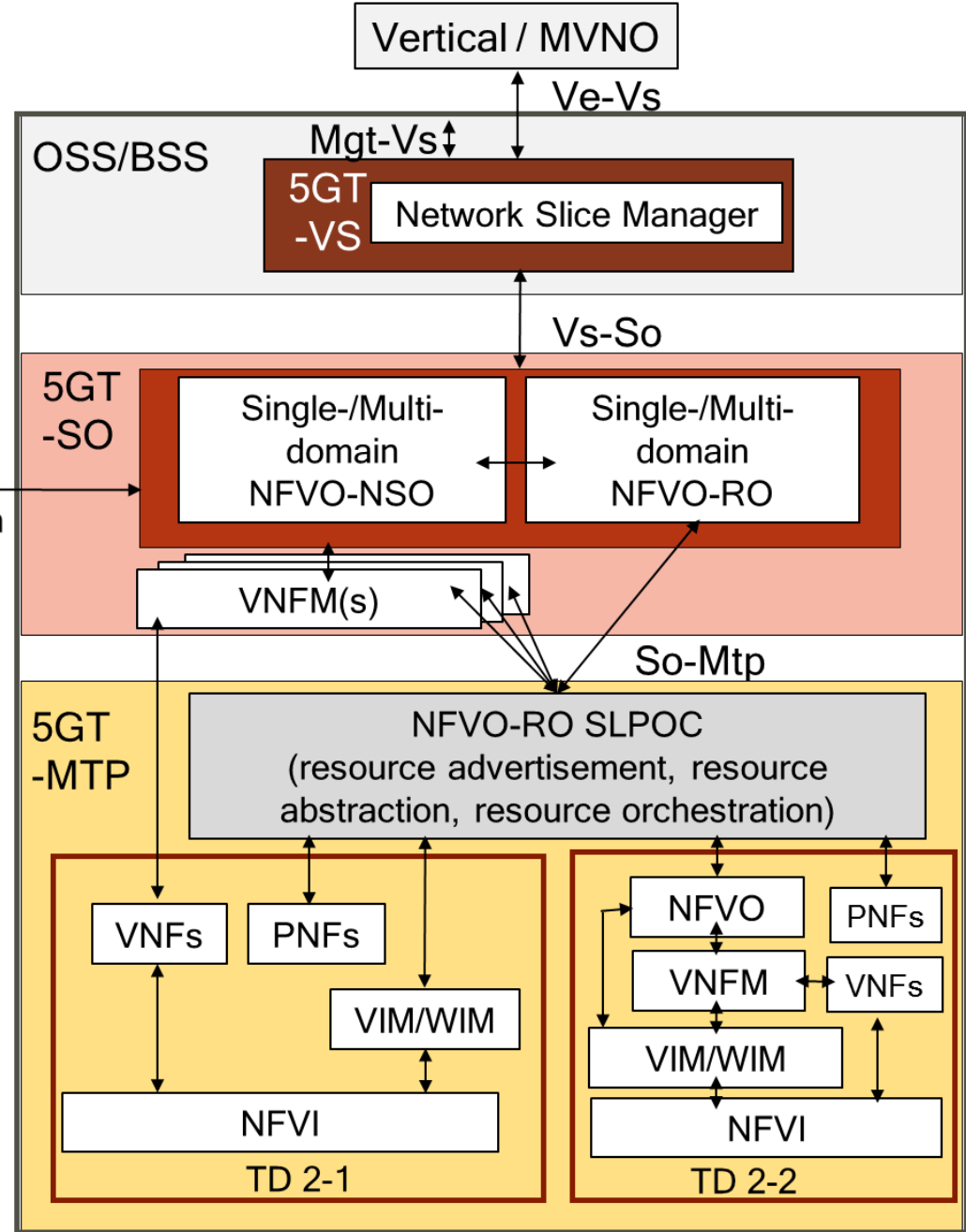
- **MTP:**

- VIM/WIM
- NFVI (extended to Mobile Edge Hosts)
- May also include its own NFVO





Administrative domain 1
across multiple technology domains (TDs)



Administrative domain 2
across multiple technology domains (TDs)

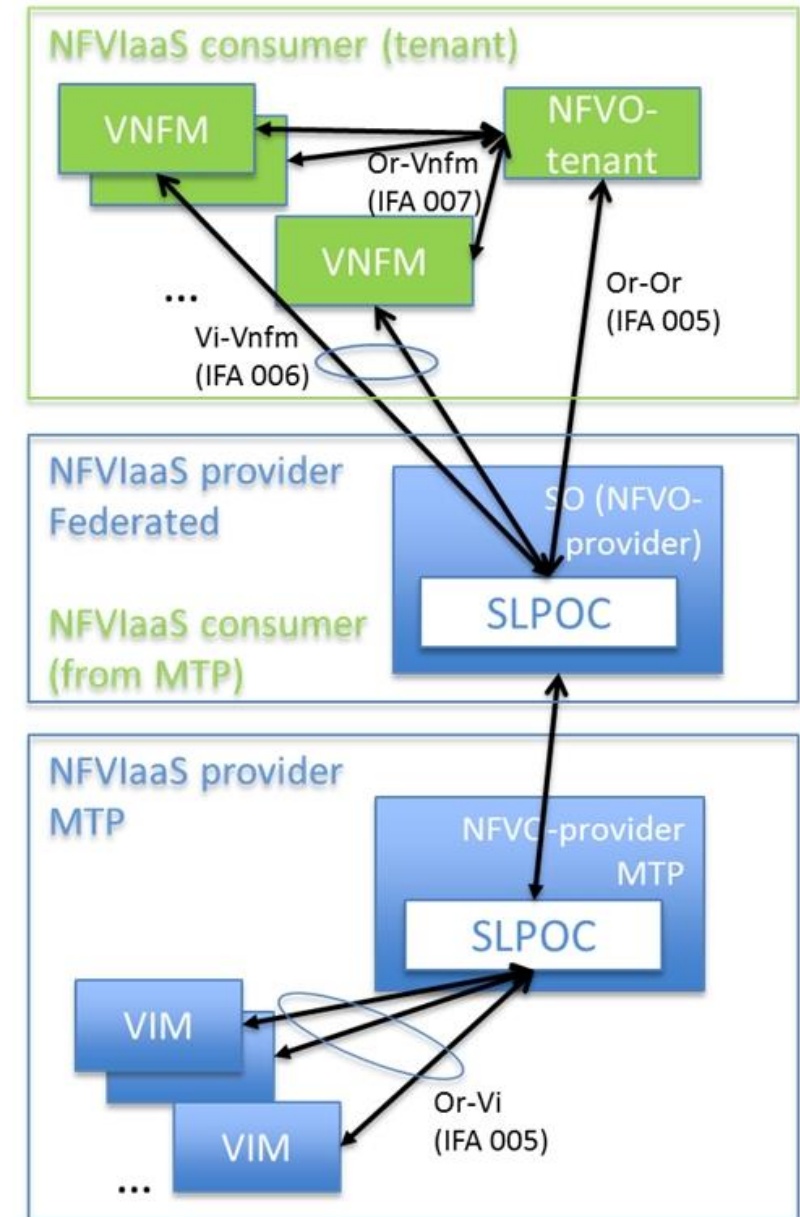
So-So
Federation

SO Key Functionalities

- **Service Orchestration**
 - Orchestration of E2E NFV Network services to fulfill the requirements of the vertical services requested through the VS
 - De-composition of NFV network services to multiple segments, deployed in different technical or administrative domains
 - Provisioning of E2E NFV networks service
- **Resource Orchestration** - optimum decisions on
 - VNF(s) Placement
 - Resource to be allocated
- **Federation** with other administrative domains through EBI/WBI
 - Resource federation (NFVIaaS)
 - Service federation (NSaaS)

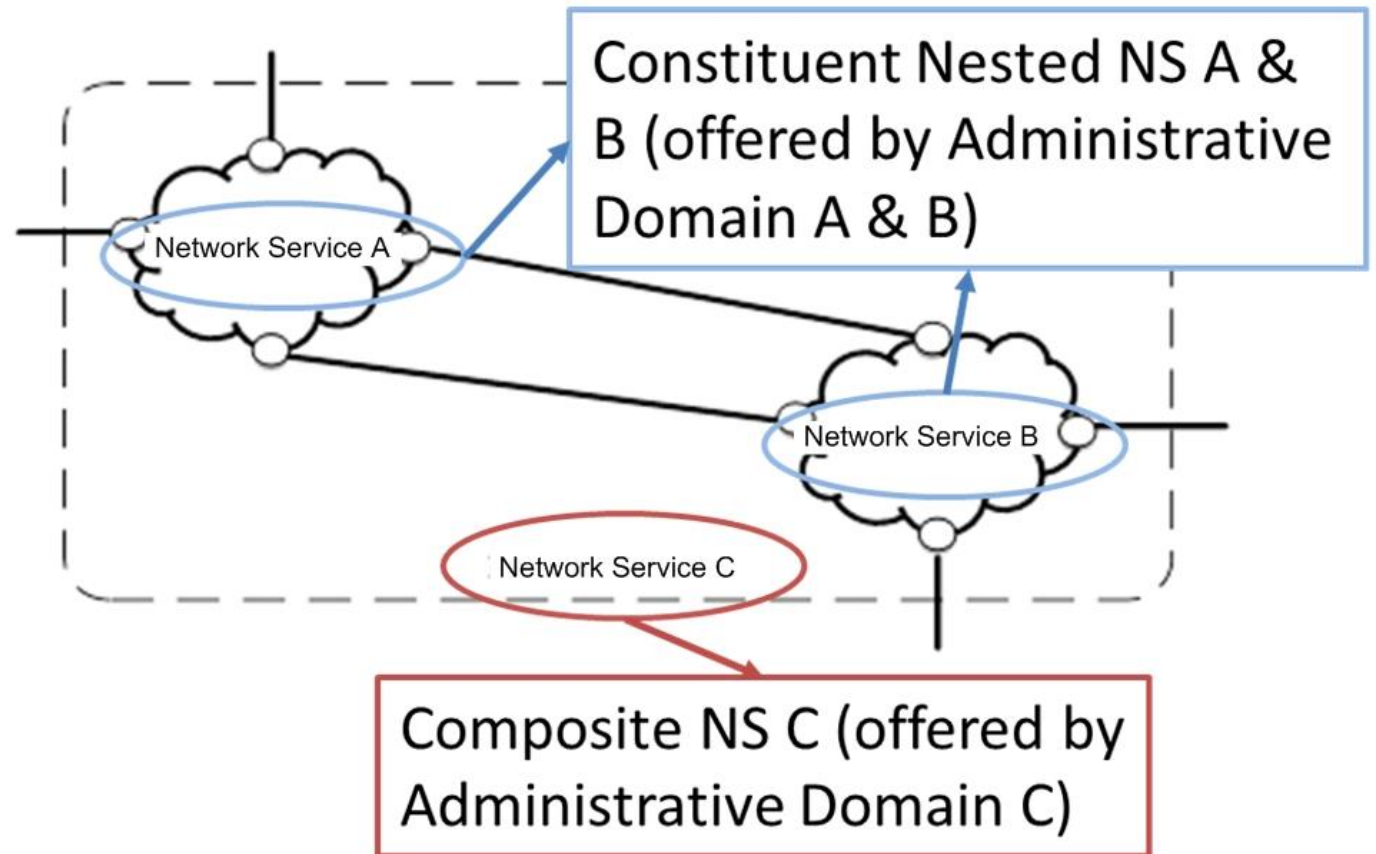
Use case 1: NFVlaaS

- The NFVlaaS consumer is a service provider that wants to run VNF instances inside an NFVI provided as a service by a different administrative entity: the NFVlaaS provider
 - The NFVlaaS consumer has the control of the VNF instances and virtual resources
- NFVlaaS consumer and NFVlaaS provider belong to different administrative domains
- The NFVI of the NFVlaaS provider is structured in several VIMs



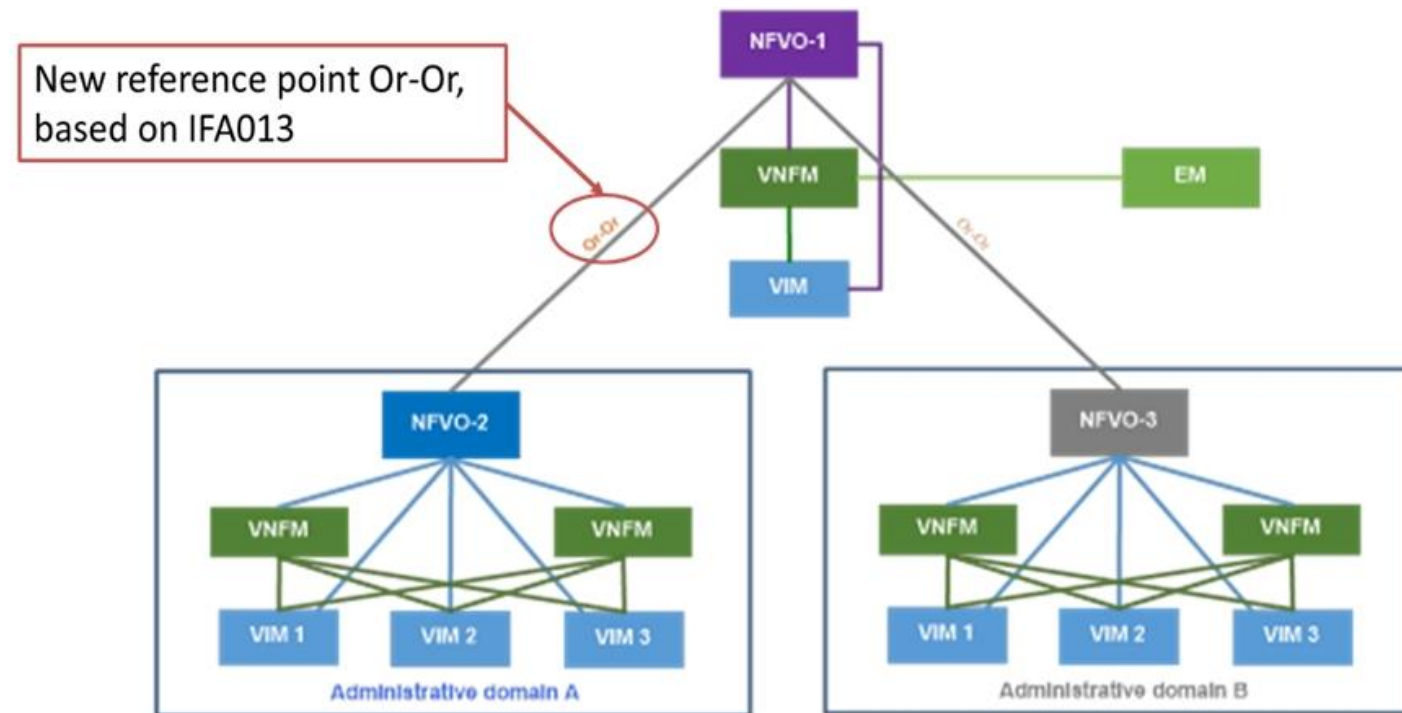
Use case 2: Network services over multiple administrative domains

- Each administrative domain includes one or more NFVI PoPs, VIMs, VNFMs and an NFVO
- Distinct specific sets of Network Services are instantiated on each administrative domain

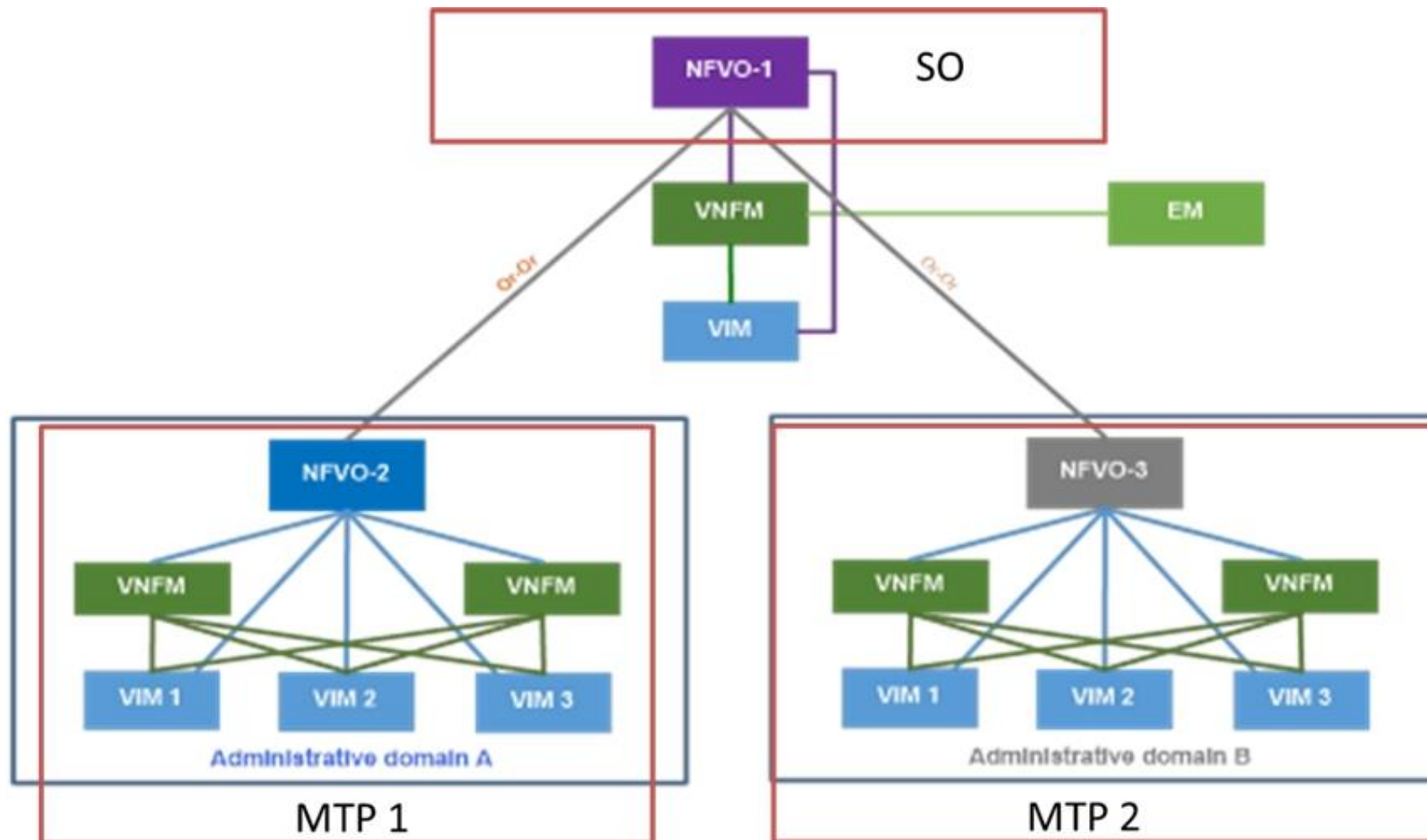


Hierarchical interaction between NFVOs

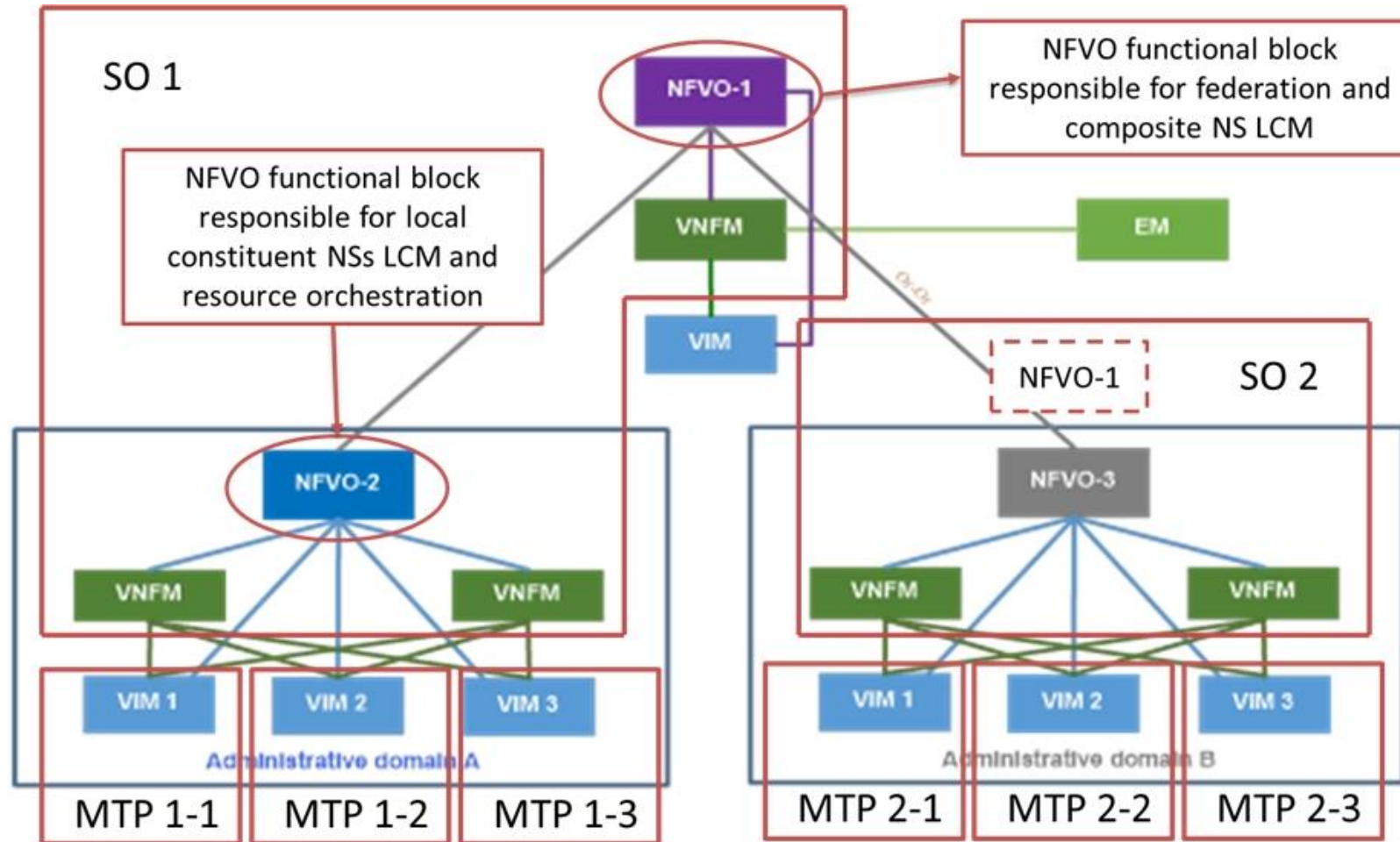
- ETSI IFA 028 proposes a hierarchical architecture:
 - The NFVO of the administrative domain offering the composite NS interacts with the NFVOs of the administrative domains offering the constituent nested NSs through a new reference point, called Or-Or, based on IFA013



5G-TRANSFORMER architecture based on hierarchical paradigm



5G-TRANSFORMER architecture based on peer-to-peer paradigm



Federation

- Defined on the SO-SO interface for sharing of resources and/or services
- Can be formed as
 - Pre-established federation
 - Relationship agreement is previously established (offline) as a business agreement
 - Open federation
 - Established between entities that advertise their resources publicly
- Key difference is level of abstraction applied to resources/services

Conclusions

- 5G-TRANSFORMER architecture is based on SDN-NFV
 - 5GT-VS:
 - Logical entry point for verticals to support the creation of vertical services
 - Creation of network slicing tailored to specific needs of vertical industries
 - 5GT-SO: Service/resource orchestration and federation
 - 5GT-MTP: Evolved Mobile Transport and Computing Platform plus MEC
- 5G-T architecture mapping to 3GPP/ETSI NFV
- SO architecture options
 - NFVlaaS
 - Network services over multiple administrative domains (hierarchical and P2P)



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