

Multi-MANO interworking for the management of multi-domains networks and network slicing - Functionality & Demos

Acknowledgement & Open Source Solutions

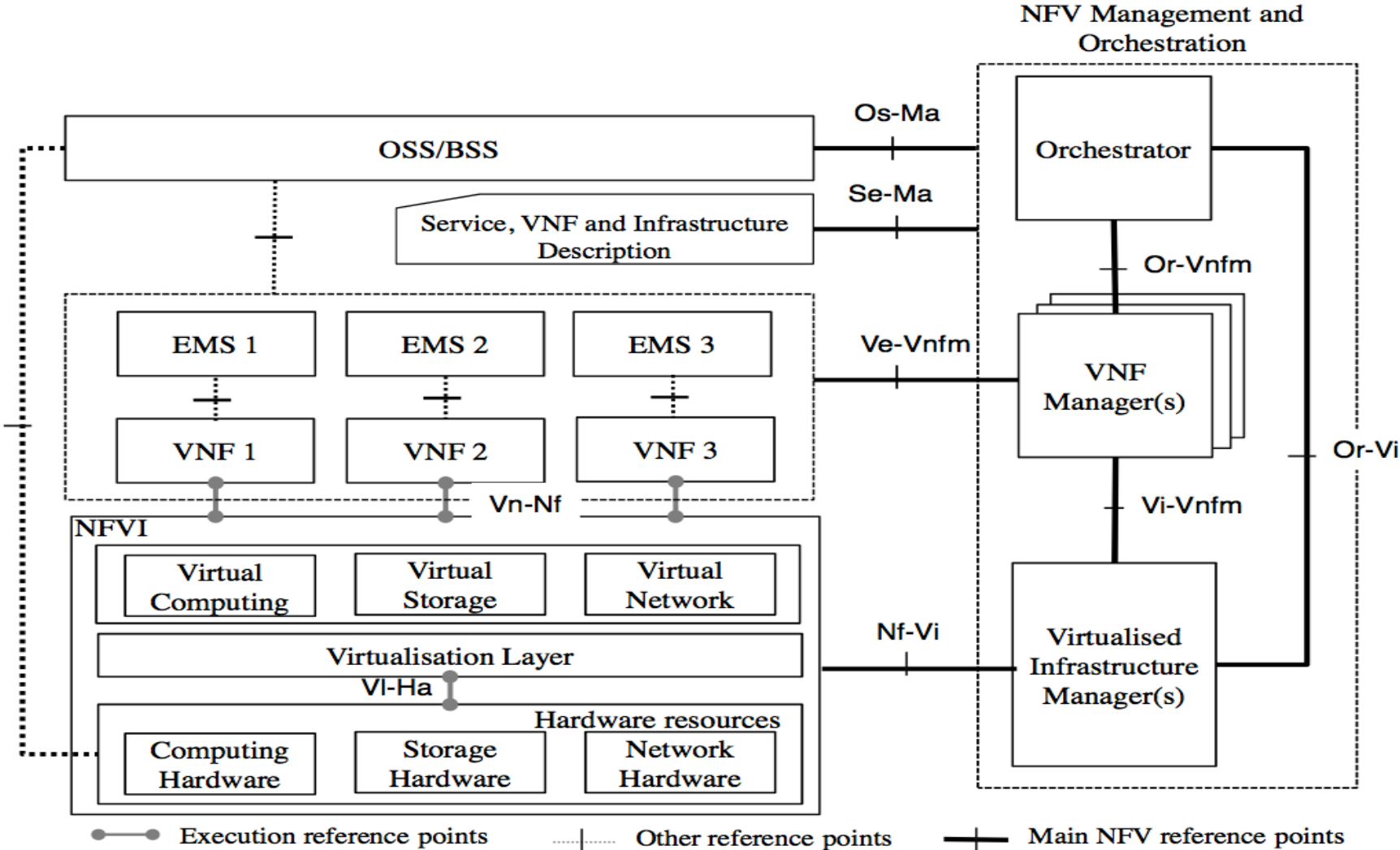
- NECOS project: NFVi Slicing <http://laurabaella.com/necos/>
- SONATA project: MANO Framework <https://sonata-project.org>
- 5GEx project: Multi-domain Orchestration: <http://www.5gex.eu>



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NFV Reference Framework



NFV reference architectural framework

Contents

- NFVi Slicing
- Multi-MANO Interworkings
- Concluding Remarks

- *Demos: Multi-MANAO Interworkings*

NFVi Slicing (NECOS project)

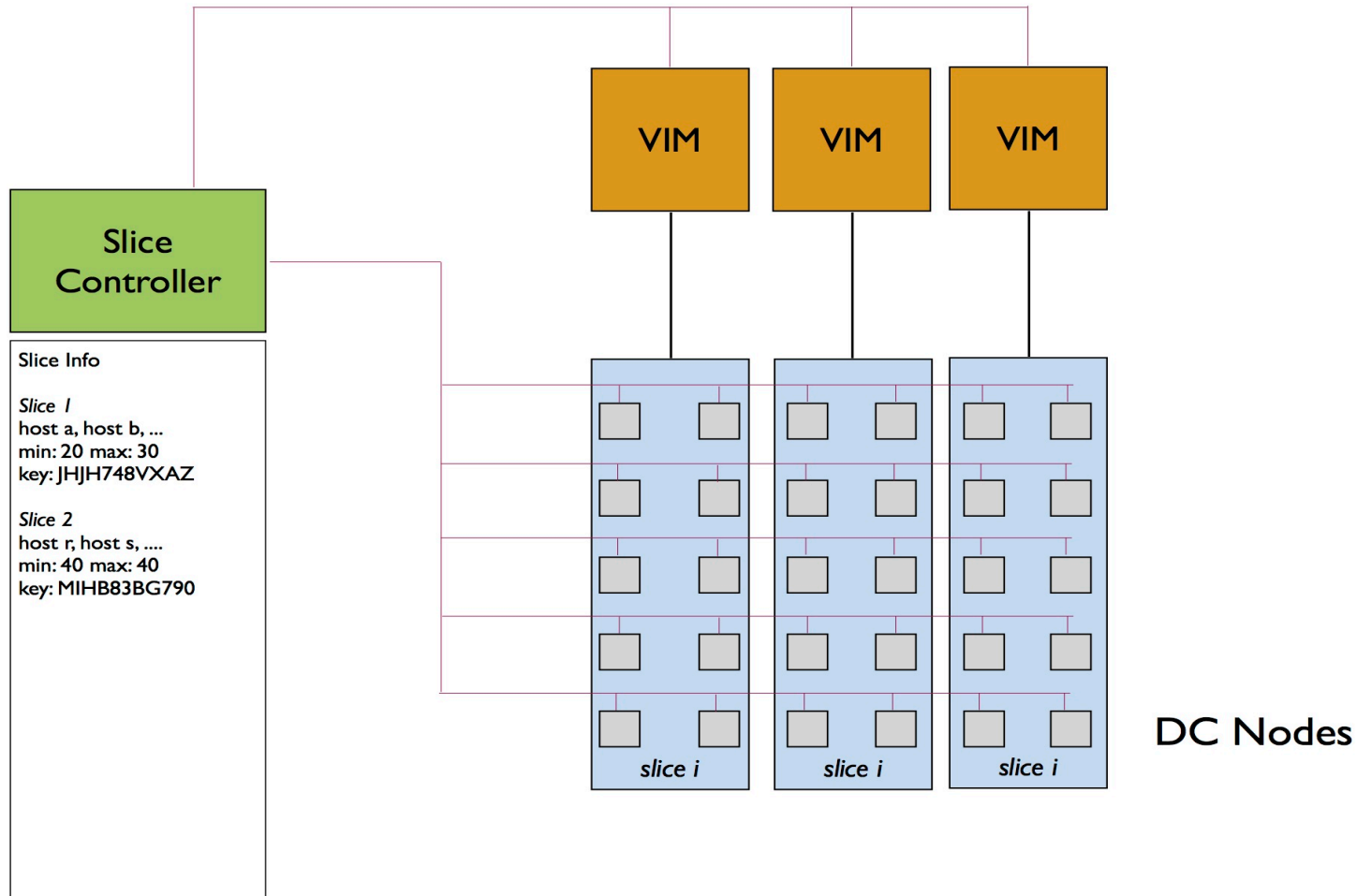
- A Slice is an aggregated set of resources that can be used in the context of an end-to-end networked service comprised of virtual network functions.
- Slices are composed of multiple resources which are isolated from other slices and allows logically isolated network partitions, with a slice being considered as the basic unit of programmability using network, computation and storage.
- If we have slicing everywhere, including networks and DCs, we observe the following attributes:
 - there is a separation of physical/logical resources
 - there is isolation of services as no customers share physical/logical resources
 - it is secure as only specified customer can access host, no sharing or cross VM issues

NFVi Slicing (NECOS Project)

- For this slice approach, we have designed and built a DC Slice Controller which is able to allocate a slice of a DC and create an on-demand per-slice VIM.
- The DC slice and the VIM are provisioned solely for use with the service. Each slice and its associated VIM are independent of the other slices and VIMs.
- Each of these slices will be allocated and de-allocated in an on-demand fashion.
- A customer interacts with a Slice Controller, and requests a new slice. The resulting slice will be isolated from the other slices. In this instance, the SONATA Orchestrator is the customer.
- The following slide presents how the resources of a DC are isolated from each other, and how a Slice Controller is involved in such a process.

NFVi Slicing (NECOS)- open source solution

<http://clayfour.ee.ucl.ac.uk/slice/index.html>



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Multi-MANO interworking

Concept

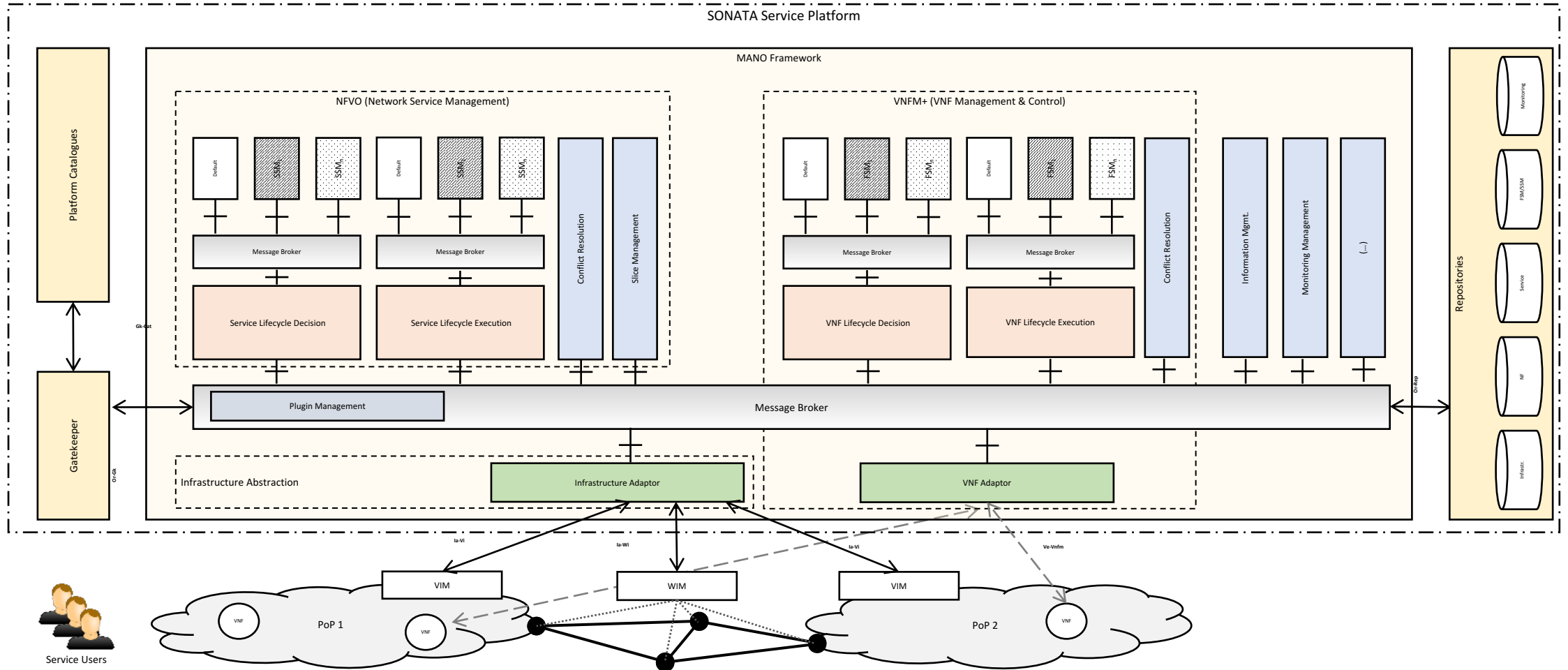
- Two (or more) Service Platforms (SPs) cooperate for rapid and dynamic service provisioning in an NFV MANO environment.

Motivation

- A SP/orchestrator can leverage on a segment of NFVi or on other SP to instantiate functions, services and network slices
- The operator has segmented its infrastructure in order to meet the demands of separate organisation/departments. It deploys a hierarchy of service platforms that need to collaborate in order to deploy NFV end-to-end services and/or network slices across the network.

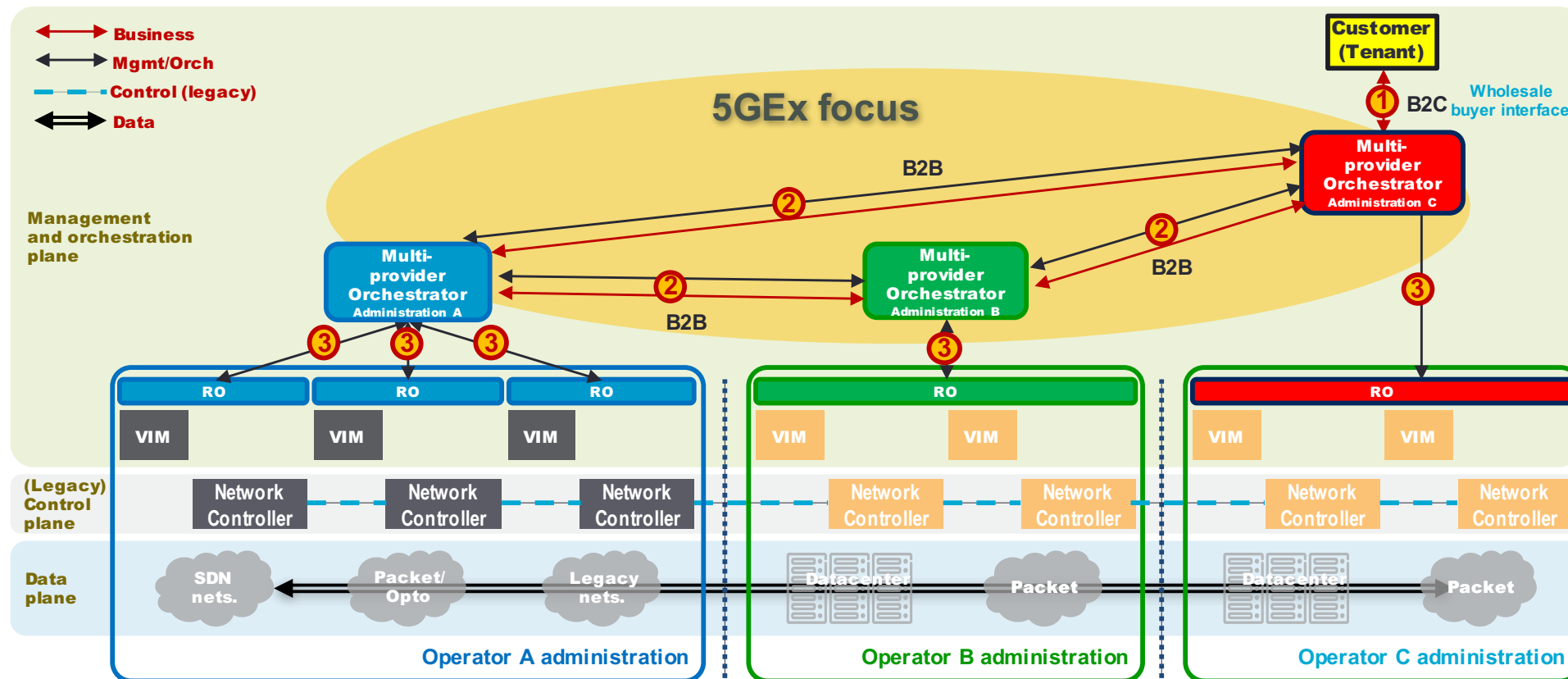
Multi-MANO interworking - SONATA (II)

SONATA MANO Framework & Open Source Solution : <https://sonata-project.org>



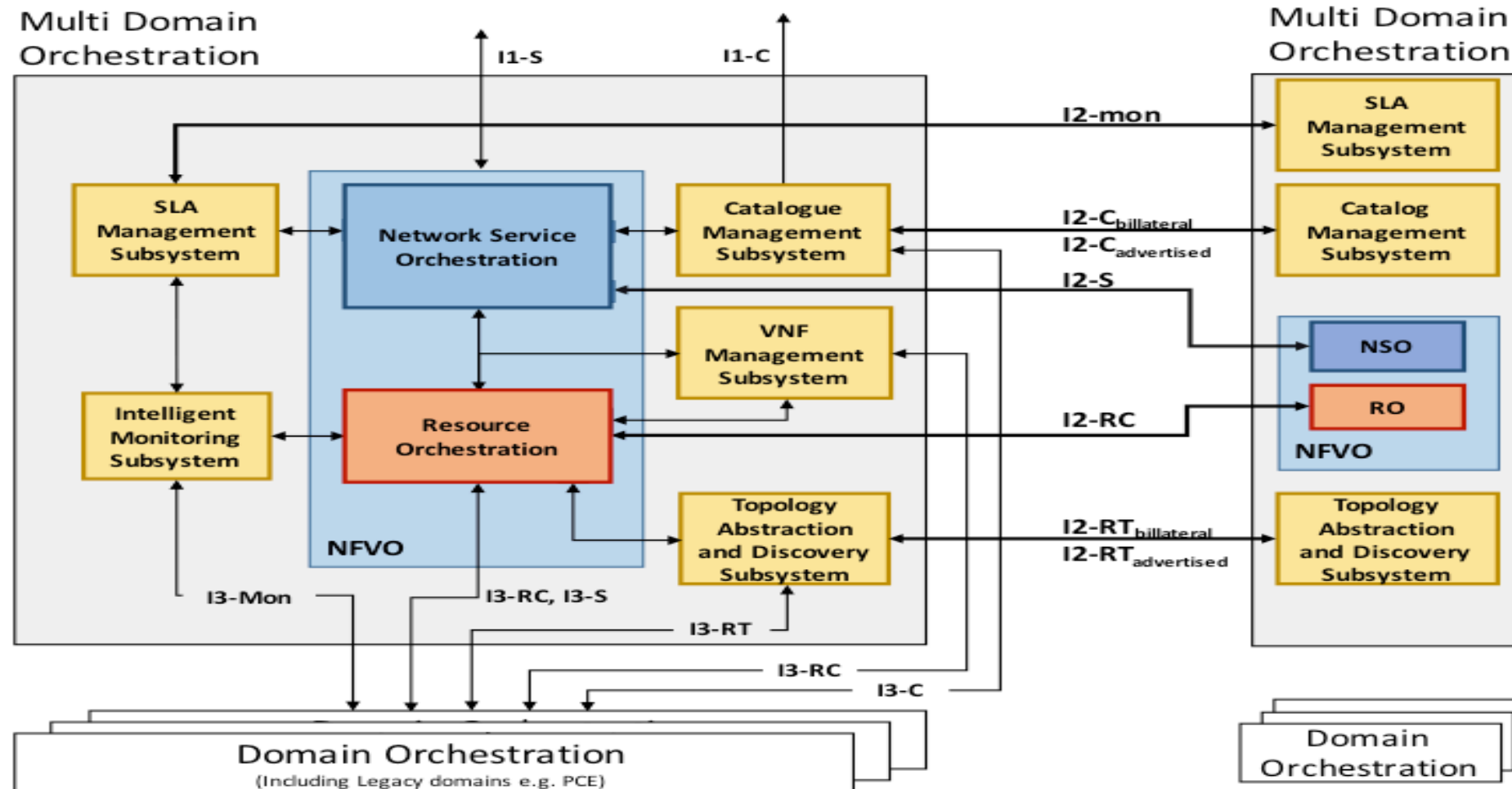
Multi-MANO interworking – 5GEx (III)

5GEx: Multi-domain orchestration MANO Framework & Open Source Solution : <http://www.5gex.eu>

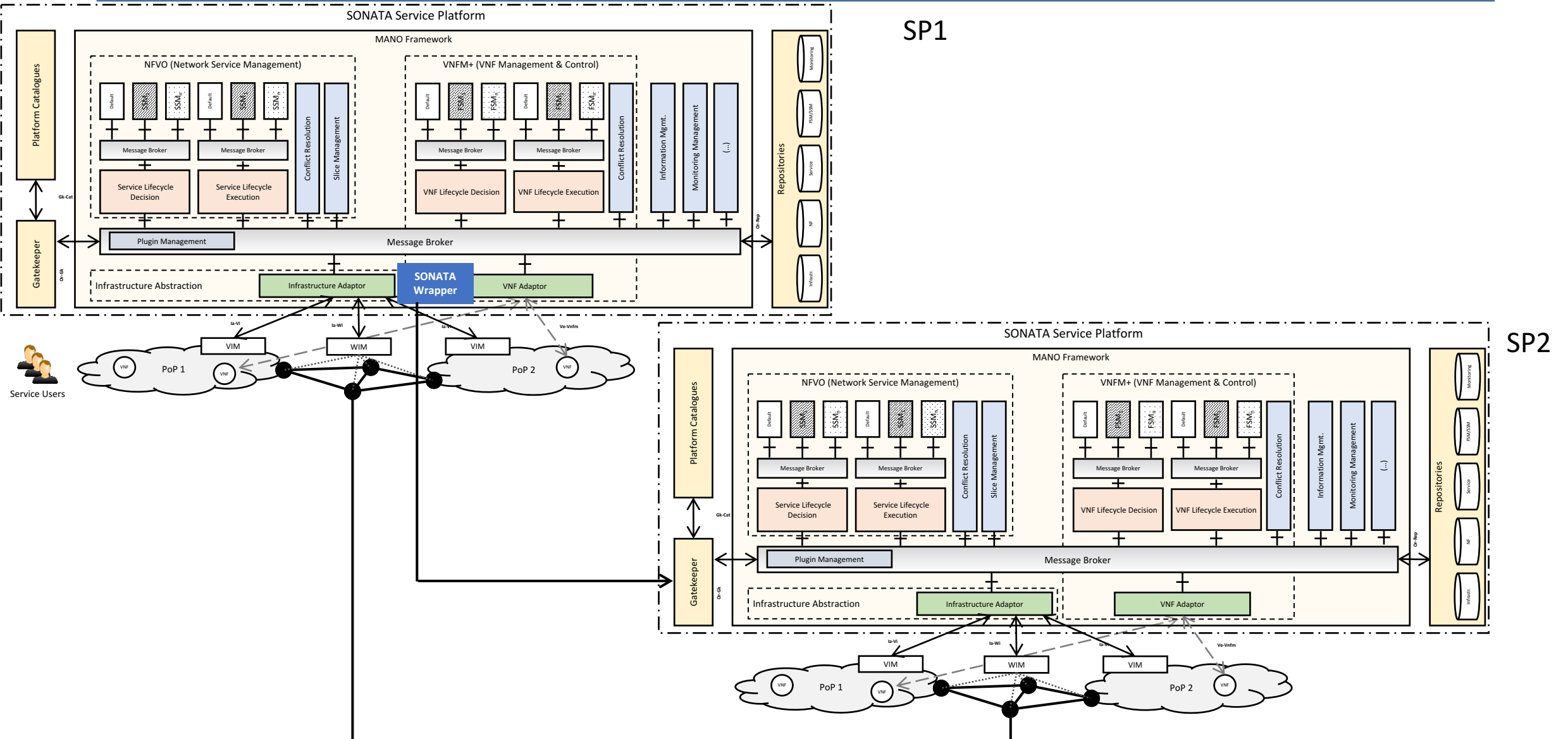


Multi-MANO interworking – 5GEx (IV)

5GEx: Multi-domain orchestration & MANO Framework & Open Source Solution : <http://www.5gex.eu>



Multi-MANO Interworking: SONATA to SONATA



SONATA-to-SONATA Summary

- One SONATA platform utilizes another SONATA platform to orchestrate a subsection of the NFVI.
- Supports either **complete outsourcing** of a network service for deployment in a lower SP or **split service deployment across two SONATA SPs**.
- **Extended SONATA Infrastructure Abstraction** facilitates the communication between the higher level SP and the lower level one
 - **/vims** and **/wims** API used by higher level SP in order to gather information on available NFVI-PoPs, available resources and WAN connectivity in the NFVI orchestrated by lower level SP

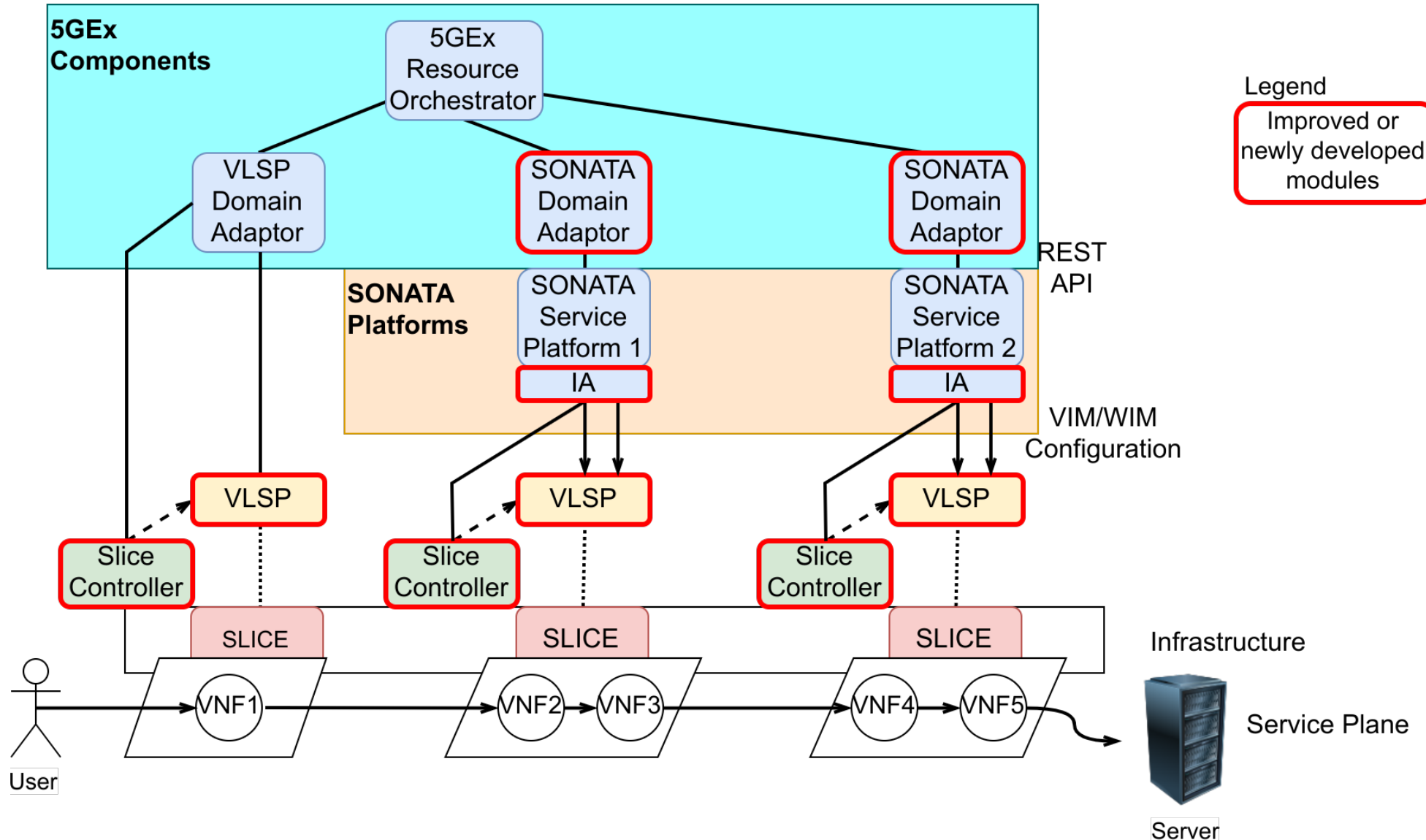
Multi-MANO interworking: 5GEX to SONATA

- MANOs / SPs might be of different implementation or technology to meet varying objectives.
- In this scenario, we look at higher level MANOs / orchestrators leveraging lower level MANOs to orchestrate virtual resources on the “far” segment of the NFVi .
- Implementation
 - a 5GEx MANO interaction with multiple SONATA SP instances
 - dynamic software controlled NFVi Slicing + on-demand VIM

5GEx-SONATA interaction scenario

- A remote orchestrator (5GEx MANO) at higher level over a lightweight VIM domain (**UCL VLSP implementation**) and two SONATA SP instances
- A REST interface between **5GEx domain adapters** and each SONATA Gatekeeper
- Each SONATA SP operates on top of a slice/partition of the NFVI, **using a VLSP VIM**
- An **Upgraded Infrastructure Adapter** drives creation of VIM slices by interacting with the **Slice Manager**
- Each **End-to-end service** composed of **multiple VNFs**, on-boarded as services in each SONATA Service Platform and exposed as *Domain Capabilities* to the 5GEx orchestrator.

5GEx-SONATA interaction scenario & sliceable NFVi



Contents

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-
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Concluding Remarks

- This work marks the 1st demonstrated interaction between two MANO Platforms showing how one can map different service and infrastructure models, relying on MANO's flexible architecture and rich APIs
- This work also shows how MANO has been adapted to a *sliceable* NFV Infrastructure.
- A full slicing mechanism with Slice Controller, and a new VIM and WIM wrapper for VLSP VIM have been developed
- This work highlights the importance of multi-MANO operation, which is an emerging and essential part of Multi-Domain Management
- MANO recursivity promises great value for Telecom industry who wants to manage their distributed deployments, in an NFV environment.

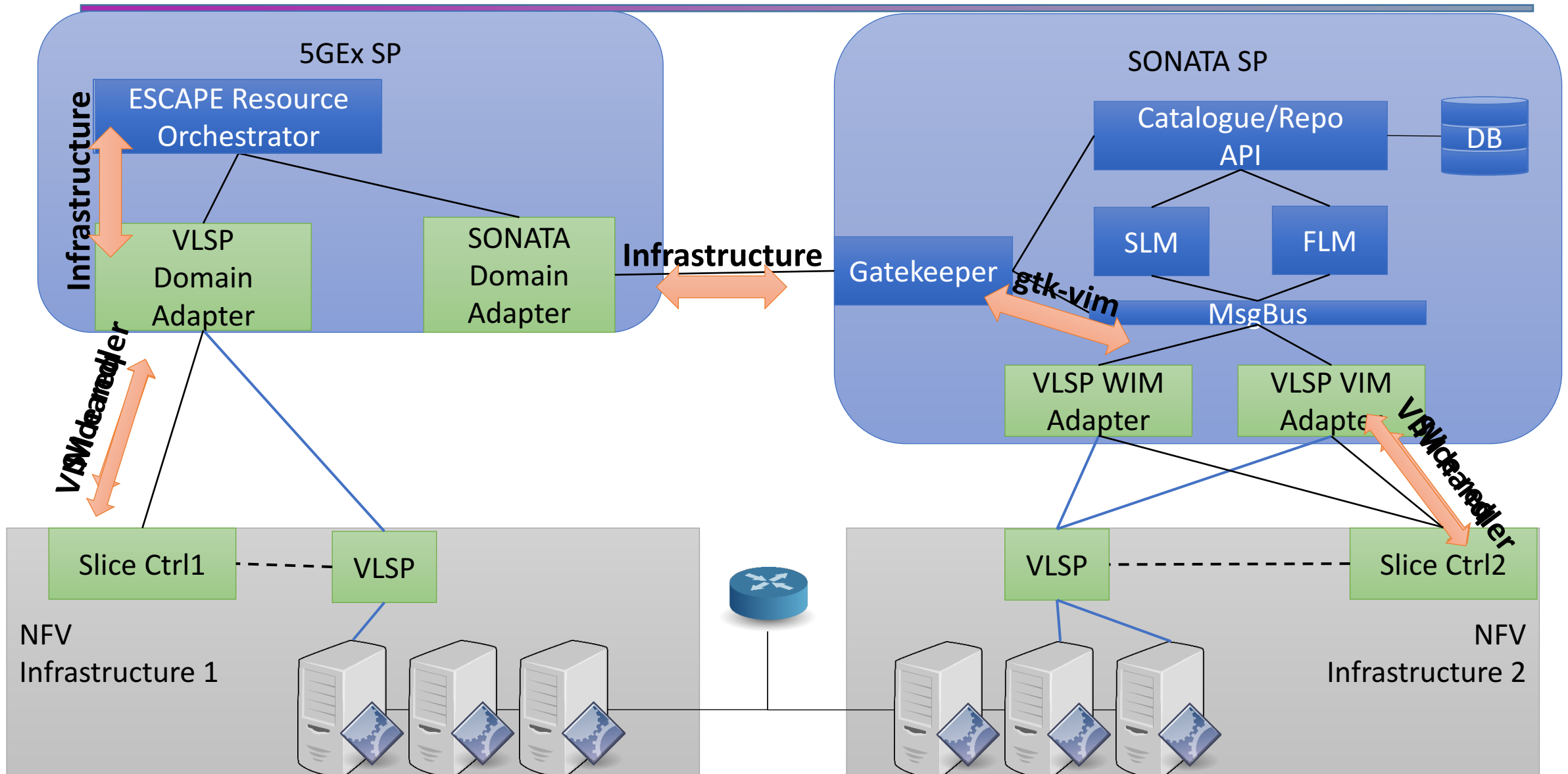
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-
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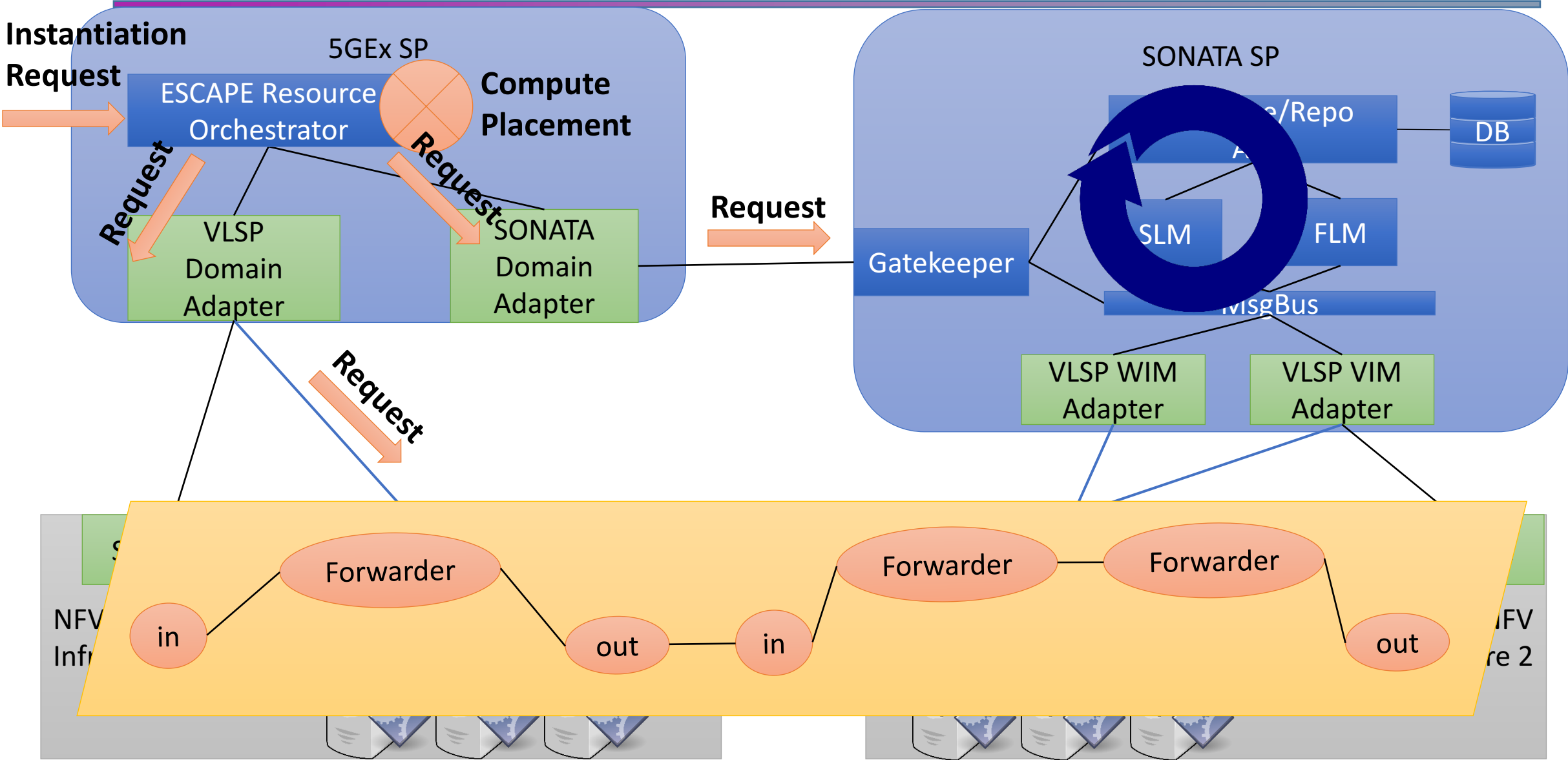
Demo Flow - Overview

1. Different service elements are already on-boarded by department/business-unit developer on each SONATA SP
2. VLSP and SONATA domain adaptors in the 5GEx MANO are turned on.
3. SONATA Domain Orchestrators gather information on topology and capabilities and pass it back to the domain adaptors
4. Each SONATA SP interacts with the Slice Controller of the PoP that creates a new slice and configure a VIM at runtime for the service
5. The end-to-end service instantiation and operation via the higher level MANO

Demo Flow – Slice Setup



Demo Flow – Service Instantiation



Demo Flow – Step 4 - Operation

