

Providing resilience within NFV infrastructures

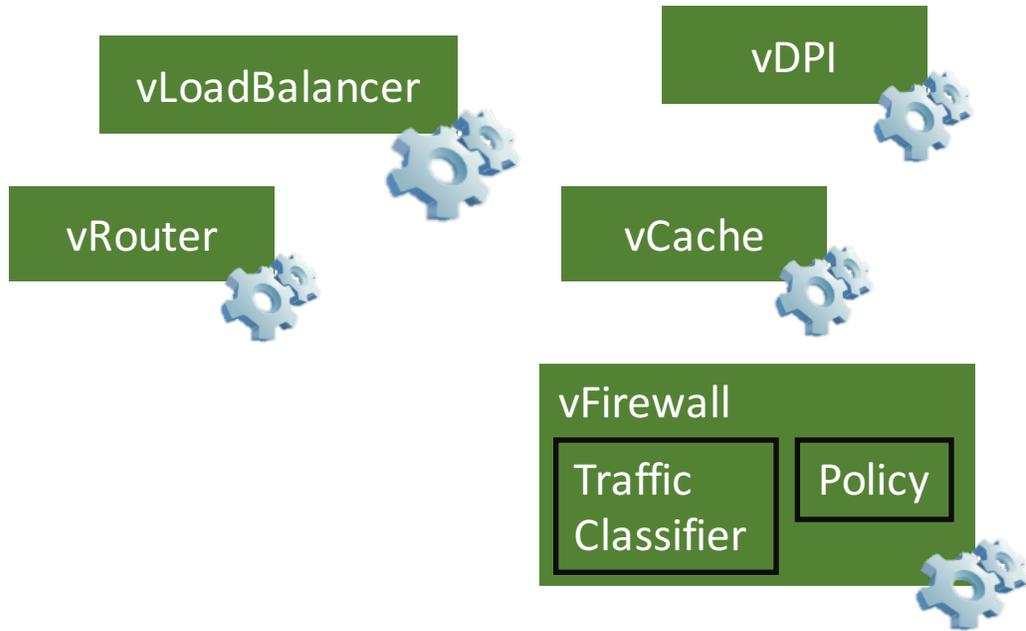
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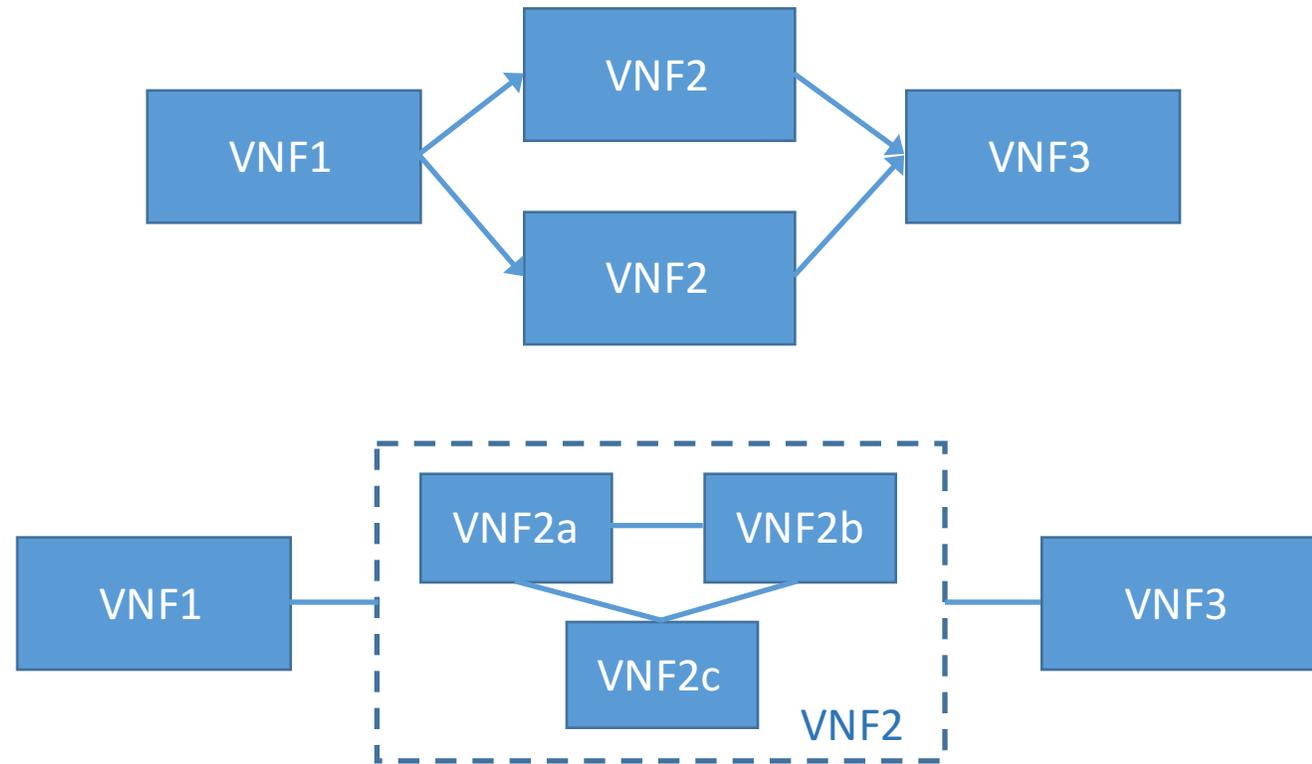
NFV and VNFs (Network Functions Virtualisation and Virtual Network Functions)

Virtual Network Function (VNFs)



Don't have to match their hardware counterparts functionality.

Service Function Chains (SFC) / Forwarding Graphs



Need for resilience in telecom networks

Required for carrier grade services.

Traditionally provided through **diversity** and **redundancy** of path and equipment .

Still required in virtualized environments but provided differently

- Naturally assists redundancy
- Avoid redundant components running on the same hardware

Goals of PhD

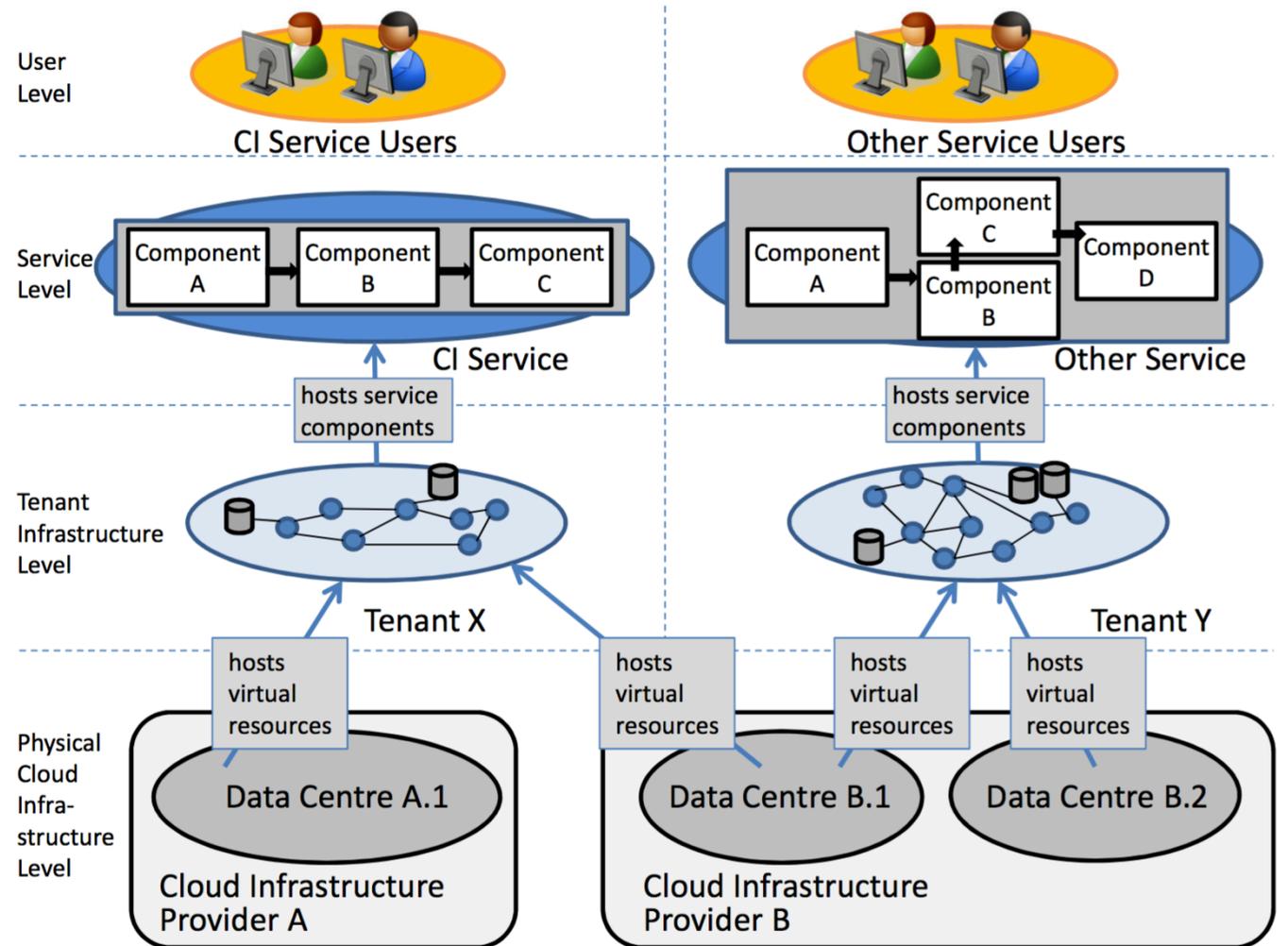
- Define resilience for individual VNFs, forwarding graphs and services
 - Understood across NFV deployments
 - Resilience metrics
 - Requirements
- Survey NFV architectures to determine how best to implement resilience when needed
- Develop and build strategies to provide multi-level resilience

VNFs and resilience

- VNF service chains need to be represented and understood in terms of resilience characteristics
- Granularity
 - VNF forwarding graphs consist of components -> sub-components -> components
 - What is the smallest sub-component?
- Classification of VNFs
 - VNF contribution to resilience depends on the service type
 - Determine its function within an overall resilience formula

Where to implement resilience?

- Service
 - Highly connected nodes – diverse links
 - Overlay networks
- Function
 - Diverse function implementations
- Virtualization
 - Redundant virtual resources
 - Migration
- Physical
 - Infrastructure monitoring
 - Hardware redundancy – e.g. NIC bonding



VNF pooling in standards IETF VNFpool BOF

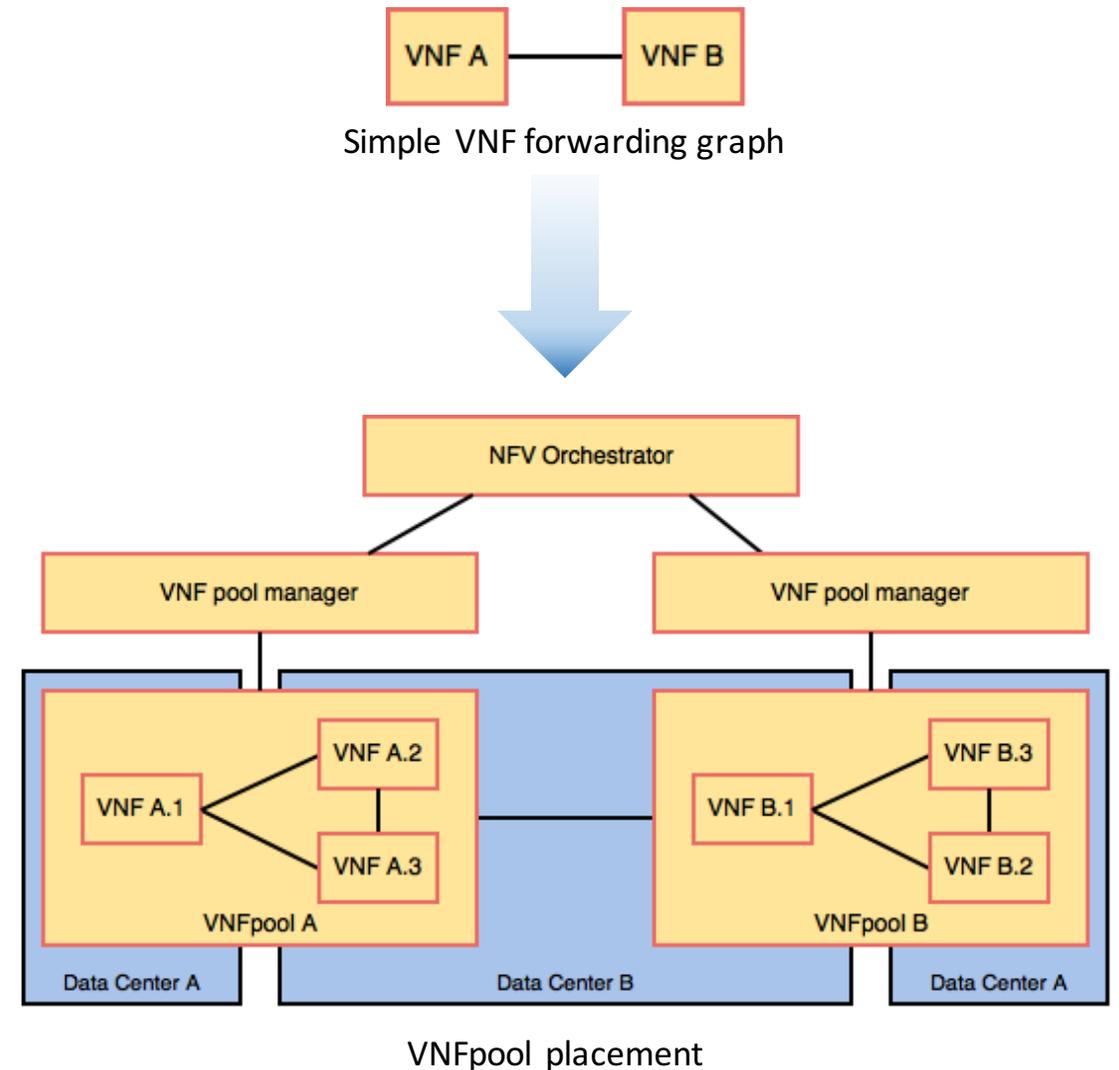
Original forwarding graph provided.

Individual VNFs are translated into VNFpools that contain a number of identical VNF instances.

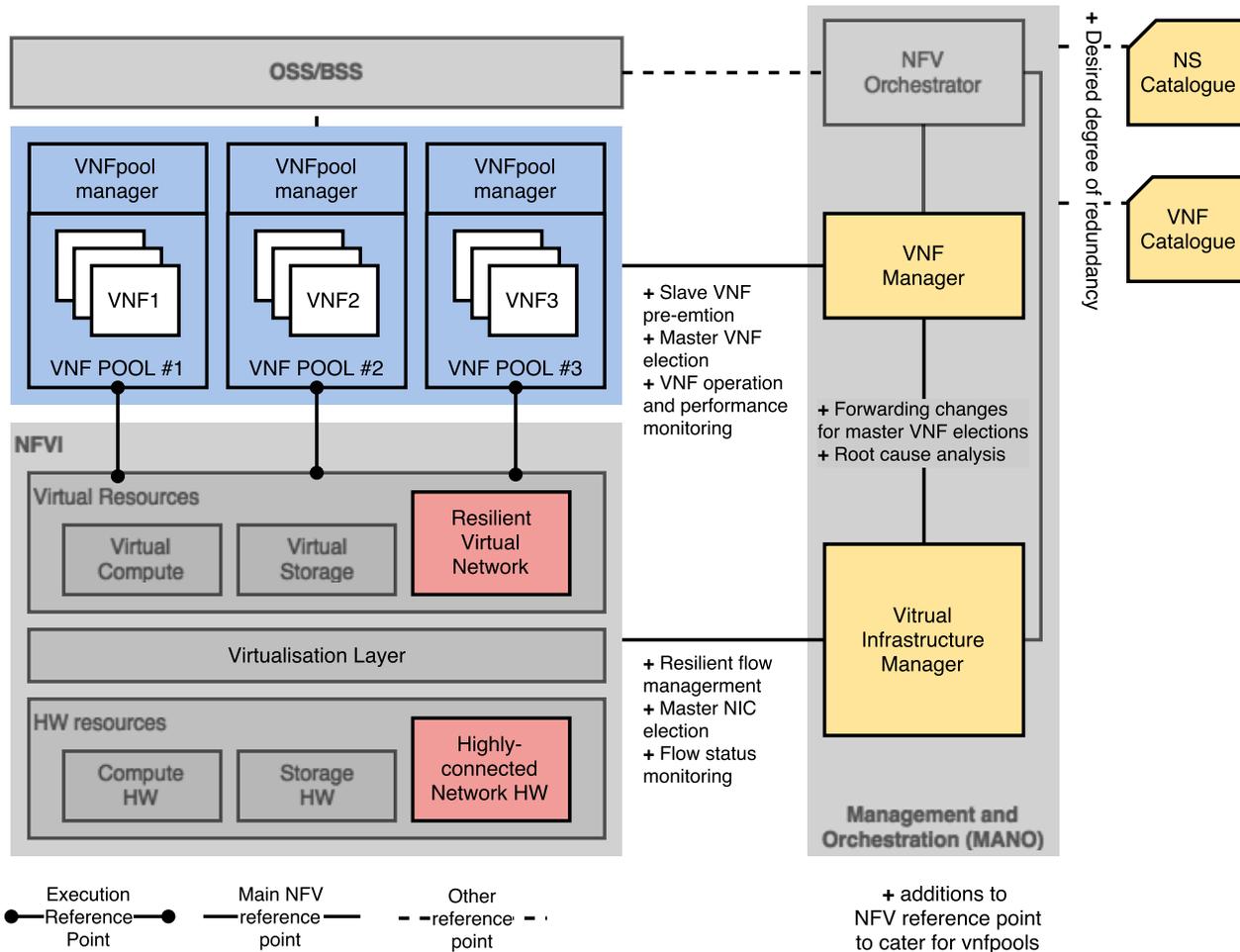
Delegate execution of tasks to instances by the VNF pool manager.

Loose coupling between the instances.

Redundant VNFs with **diverse** environments and connectivity.



VNF pooling and MANOs (Management and Orchestration)



Overall service/forwarding graph (interconnecting VNFs)

- Resilient VFNs through pooling.
- Resilient flows though the use of virtual networks and a highly connected physical network.

Intended to be an extension of existing NFV architectures and.

Highlighted modifications to the ETSI NFV architecture components and reference points

VNF pooling challenges

- Role management
- State synchronization/distribution
 - Now with high timely requirements
- Network topology transparency
- Virtualization interoperability
- Redundancy model
- Signaling overhead
- Reliable signaling

Next Steps

- Explore a set of the individual challenges with new approaches and building on existing methods.
 - Mainly the redundancy model and state distribution
 - Individual solution implementations
- Proof-of-concept integration with existing MANO
 - Cross-site test bed under development*

Thank you
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Questions