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Challenges and Solutions for Testing NFV/SDN Networks

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Agenda

CSP NW Environment	NFV/SDN Advantages	NFV/SDN Challenges
NFV NW Design and Development	NFV NW Testing	NFV Common Issues

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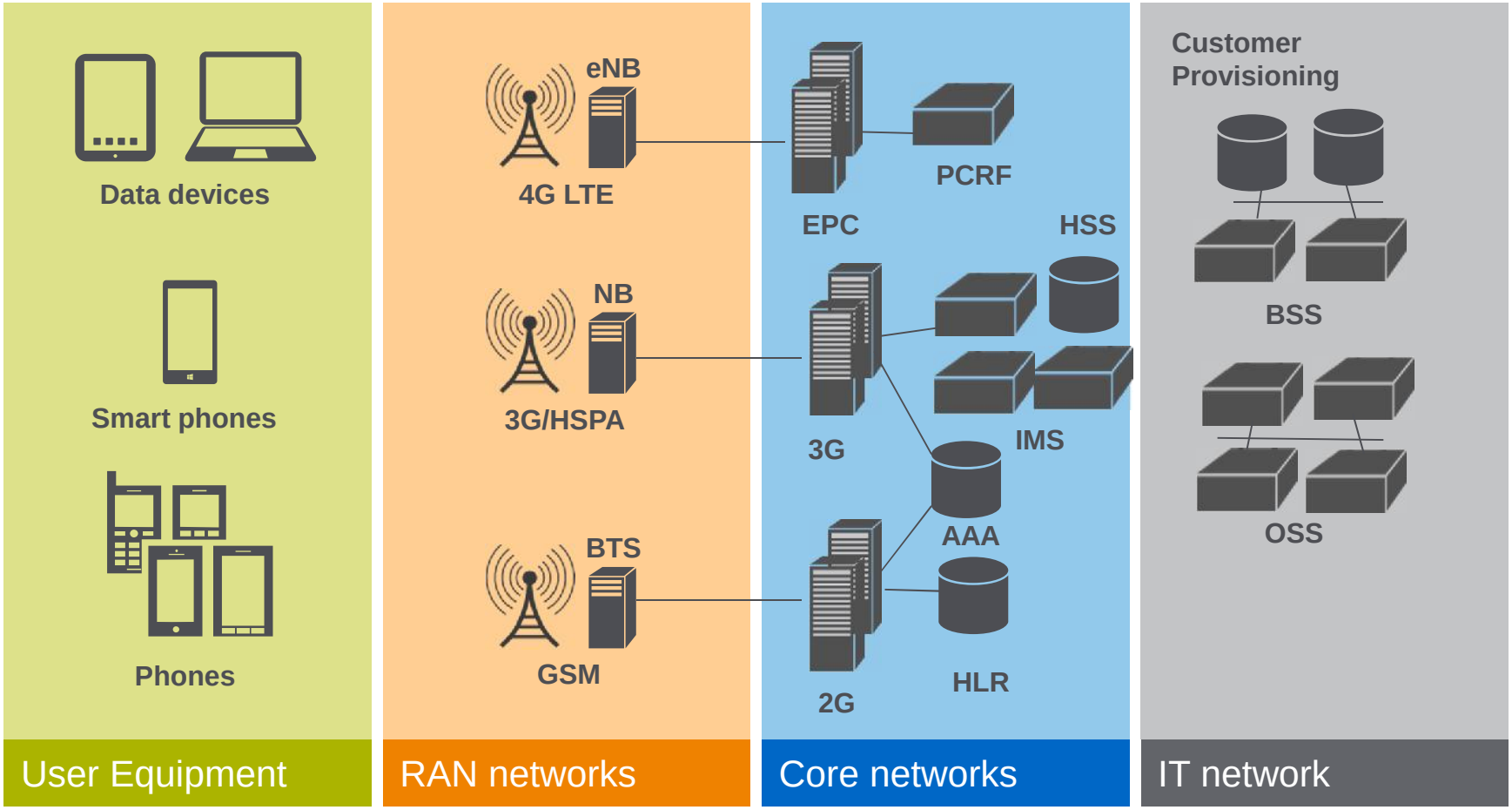
Wireless Network Domains



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CSP Network Environment

Wireless networks constantly evolving

- **Complex** multiple network topology
- **Higher data usage,** "always on" access
- **Complex LTE services** — increasing load and performance demands
- **New technology and architectures** requiring more agile network

Continuous change, new services — greater demands on network testing processes and resources

The NFV Paradigm Shift

Everything was Known is New Again…

While carriers agree on the advantages for NFV, many are struggling to quantify the development risks, understand the practical migration steps, and how to measure success

Strategic Challenges

- Change management
- What in the NW to virtualize and when?
- Where to begin?
- How to measure success

Architectural Challenges

- New NW devices, techniques, and dependencies
- Service design
- Performance
- Reliability
- Management and orchestration
- Security risks

Operational Challenges

- Managing the complex NFV deployments
- Operational complexity of a virtualized/hybrid carrier networks

Journey to NFV requires change in the way the NW is designed and tested

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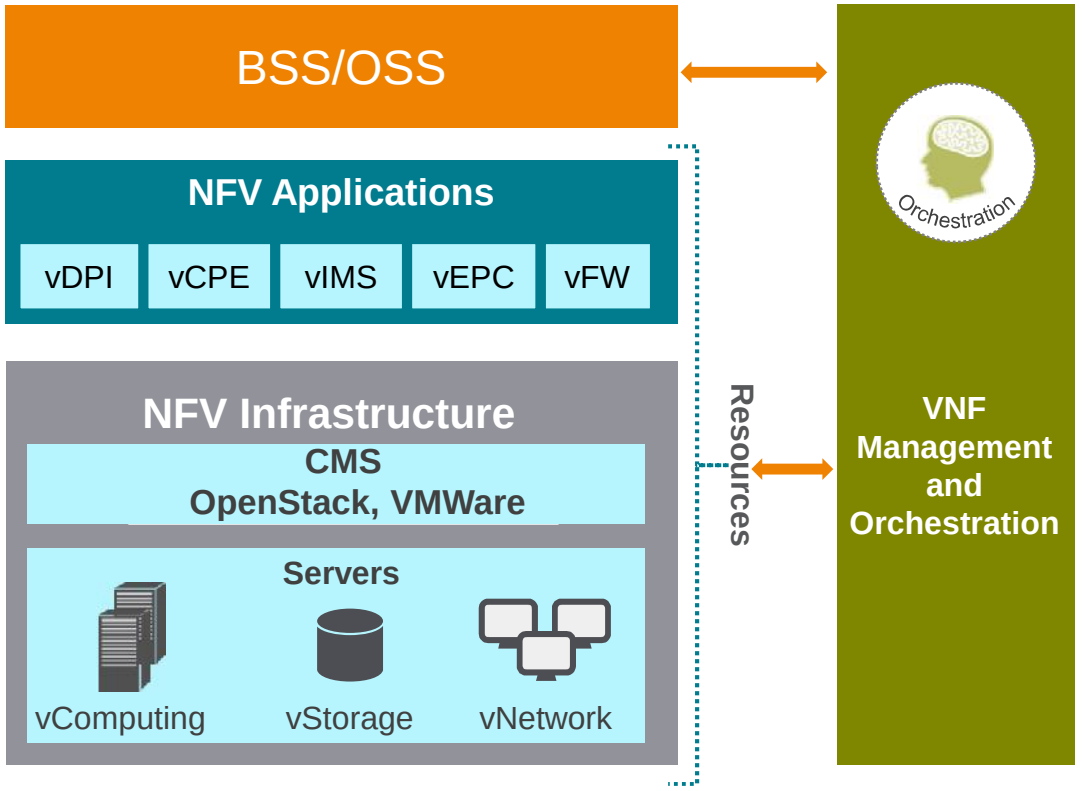
NFV/SDN Technology Advantages

- Lower equipment costs and reduced power consumption through resource sharing
- Faster time to market by shortening development and testing cycles and utilizing off the shelve HW/SW
- Increased availability of multi-version and multi-tenancy network appliances
- Highly scalability for NW capacity and functionality to meet demands



Core networks like EPC/IMS are the prime candidate for NFV development and deployment

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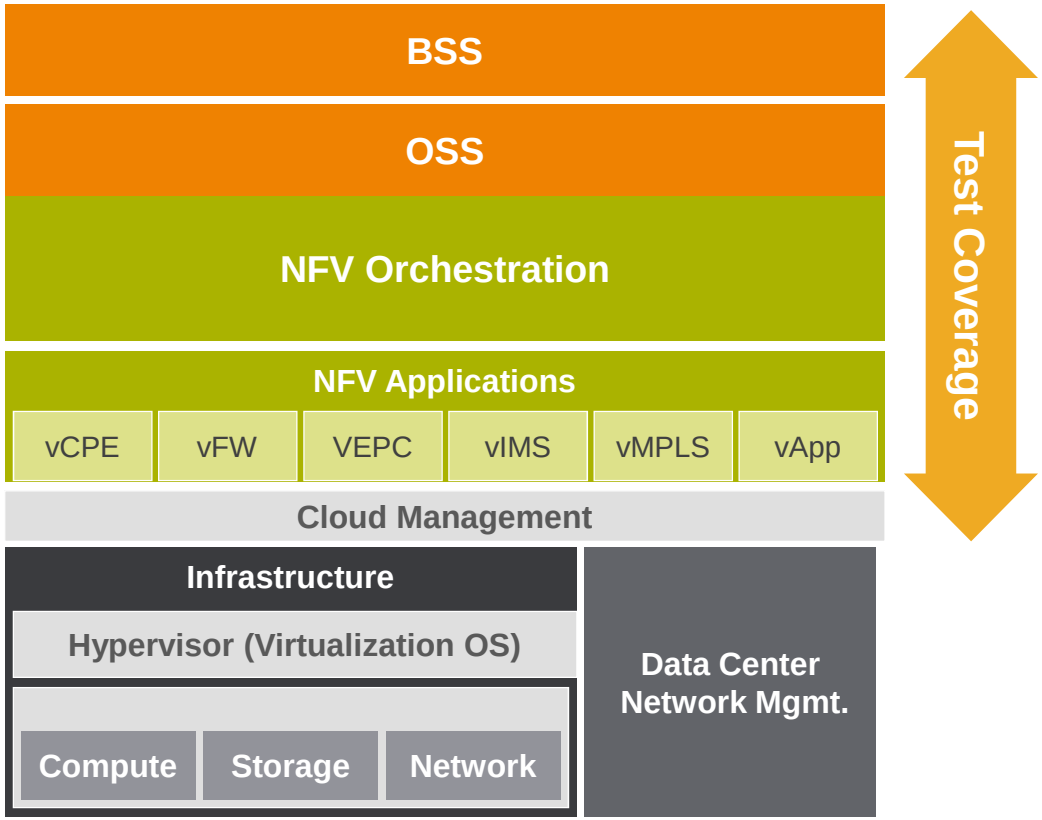
NVF/SDN Technology Challenges

- Integrating multiple virtual appliances from different vendors
- Comprehensive end-to-end testing of virtualized network functions
- Supporting hybrid networks with seamless migration paths to fully-virtualized networks
- Managing and orchestrating numerous virtual network functions, while protecting against attacks and misconfigurations
- Maintaining NW resiliency and reliability from hardware and software failures



For core networks, the seamless interoperability and network operations are critical to CSPs

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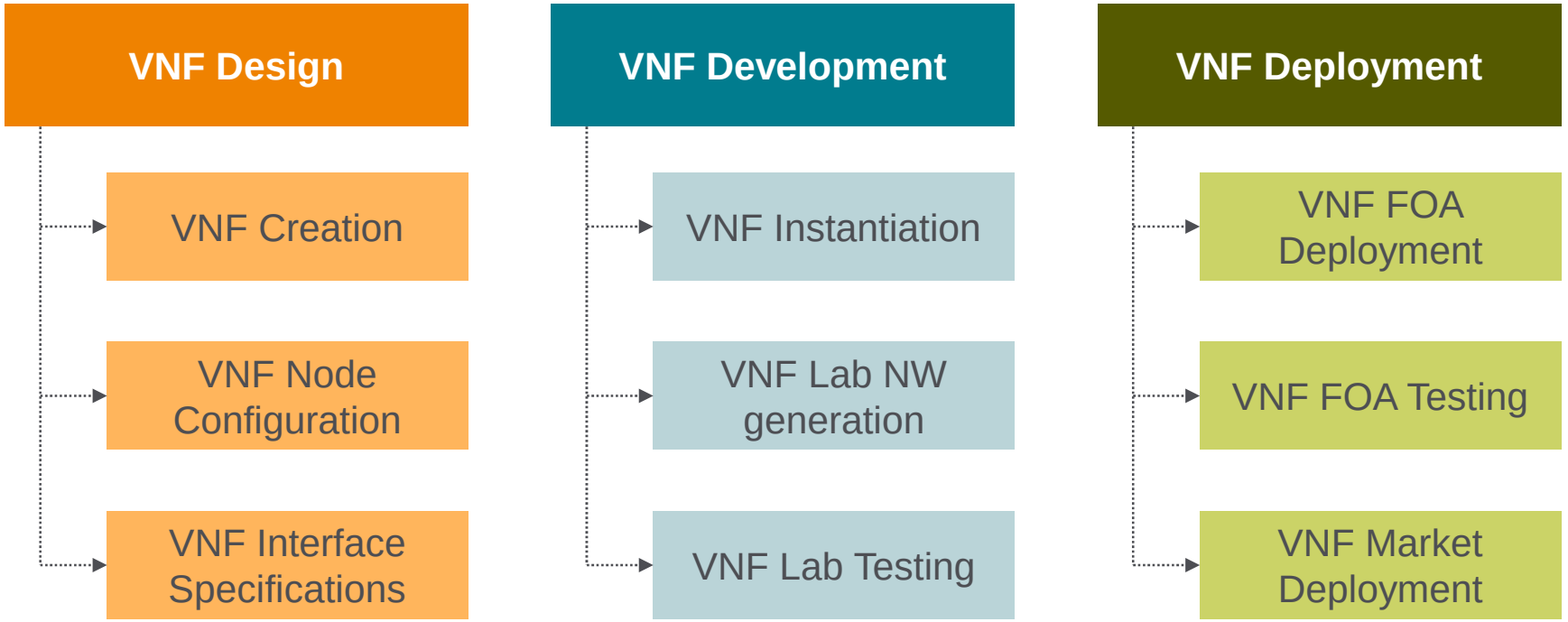
NFV Design and Development Process



The NFV NW engineering is different than traditional NW engineering methodology, more complex and iterative

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NFV Testing and Integration

- NFV lab can simulate live production design
- VNFs could be from multiple vendors (SGW, PGW, MME, PCRF)
- Service orchestration testing to validate VNF functions and configurations with OSS
- NW testing to validate interfaces and VNF functionality
- NFT testing to validate system performance and load
- E2E testing to validate E2E functionality and performance of the entire system

The NFV NW testing is different than traditional NW engineering methodology for OSS functions and NW performance: Agile or DevOps is necessary

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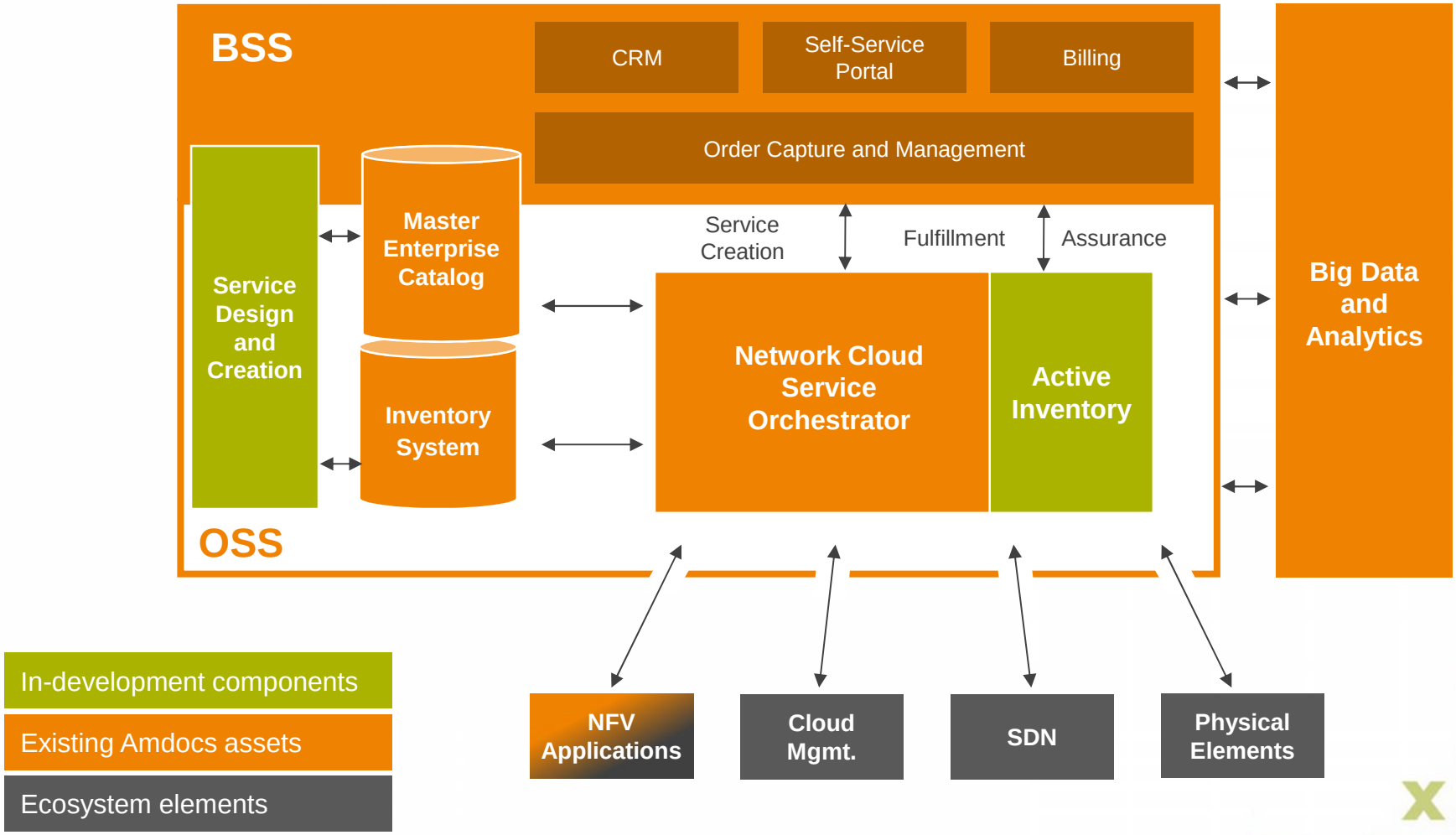
End-to-end NFV Service Offering



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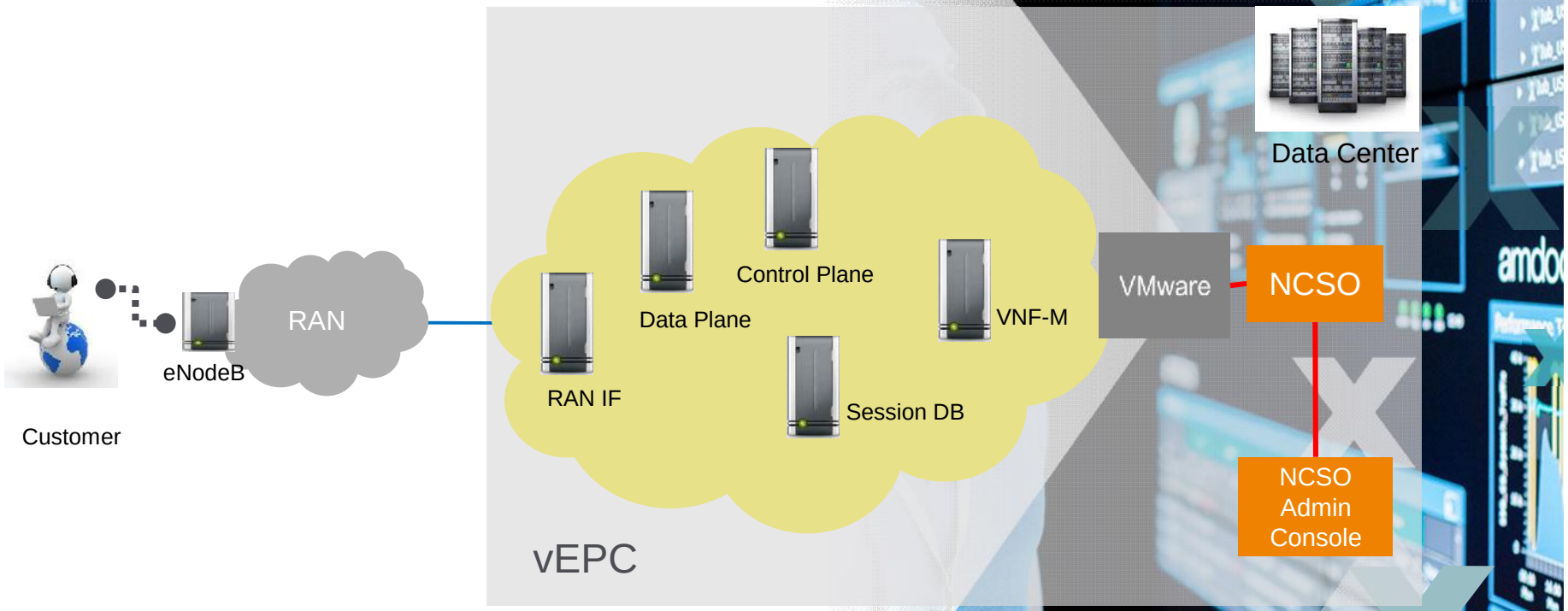
Examples of EPC design

- Simple EPC core design
- Sample of VNF configurations
- Sample of updated configurations



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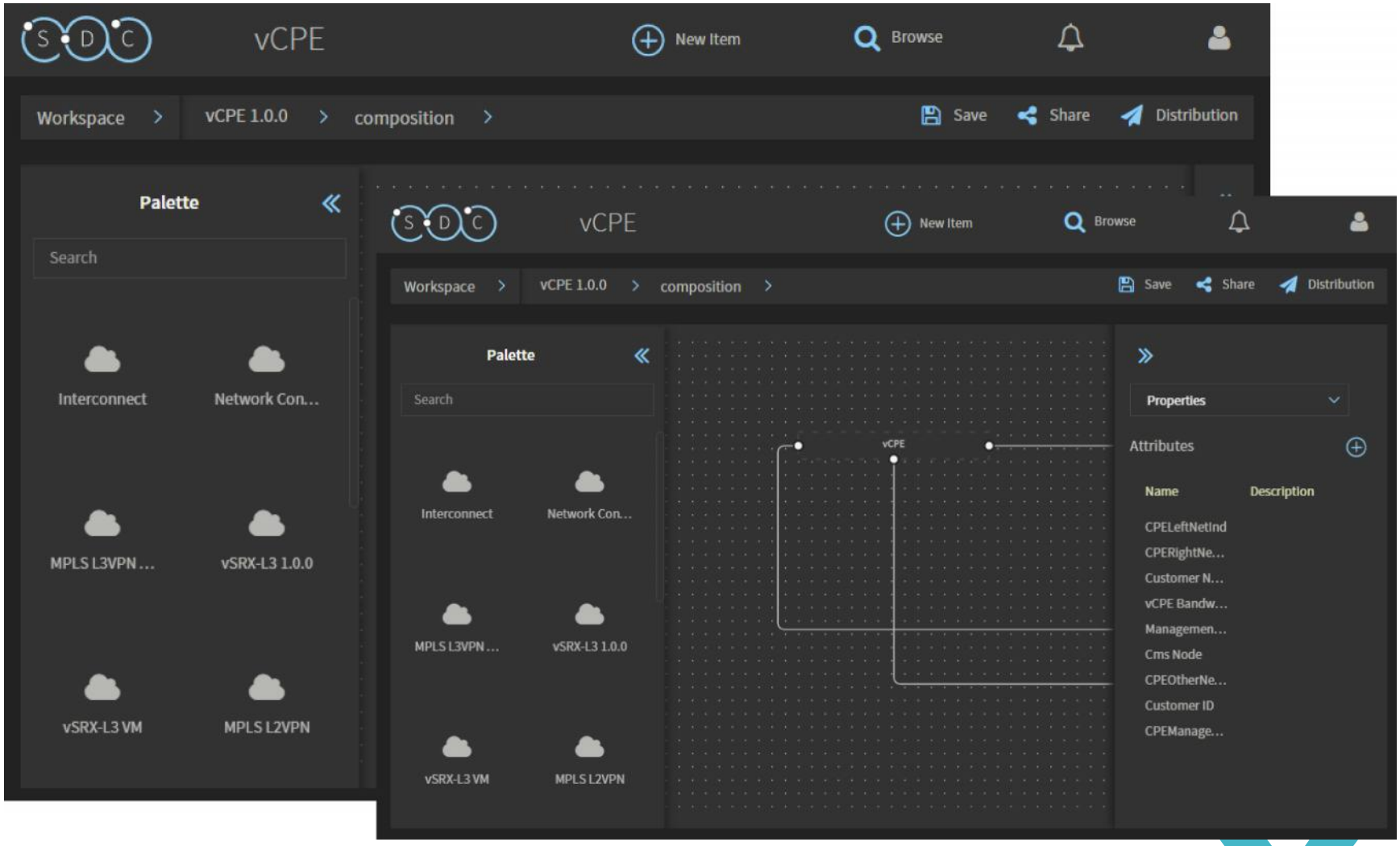
Service Design Tool



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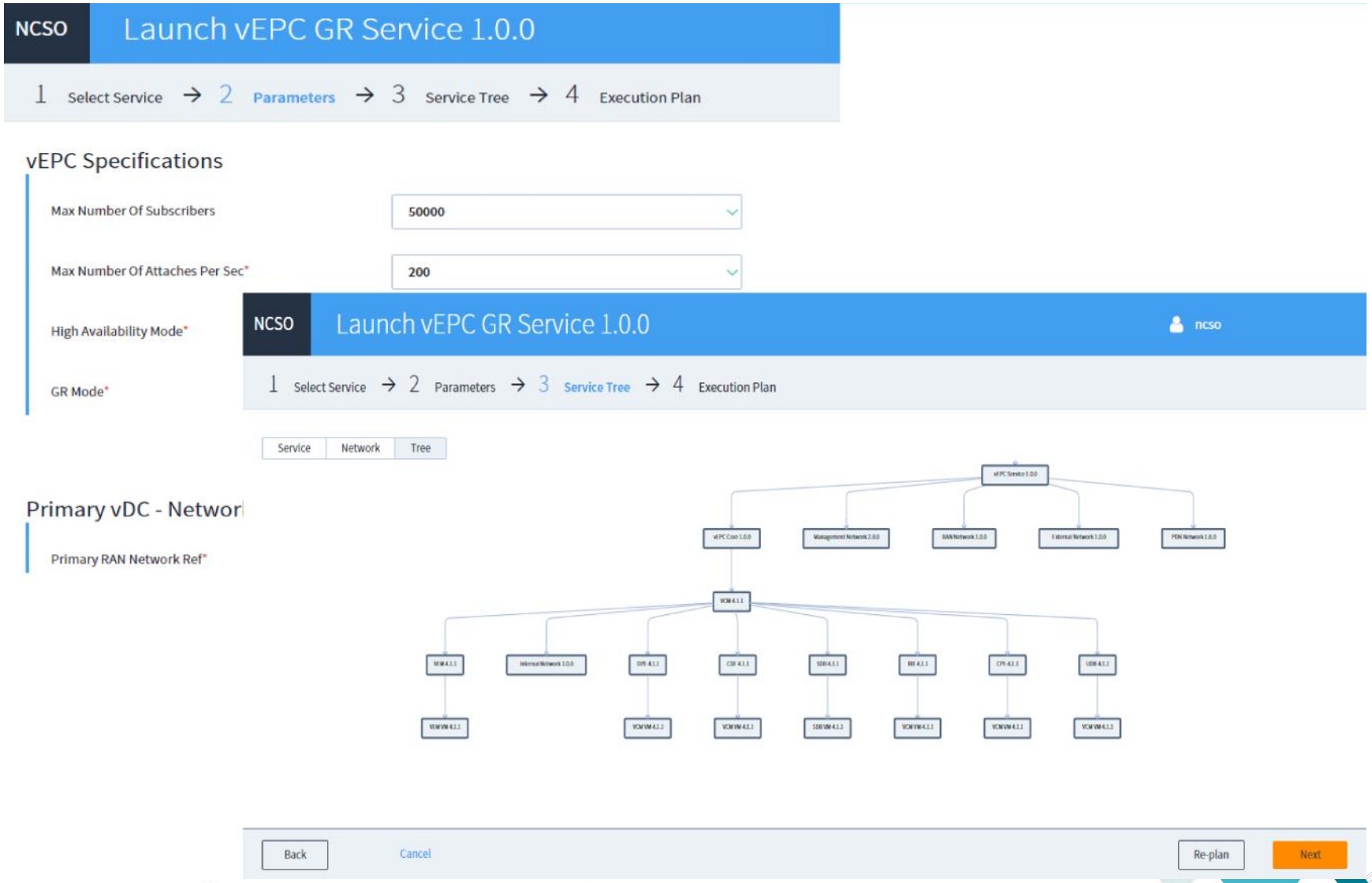
vEPC Configuration in Network Orchestrator



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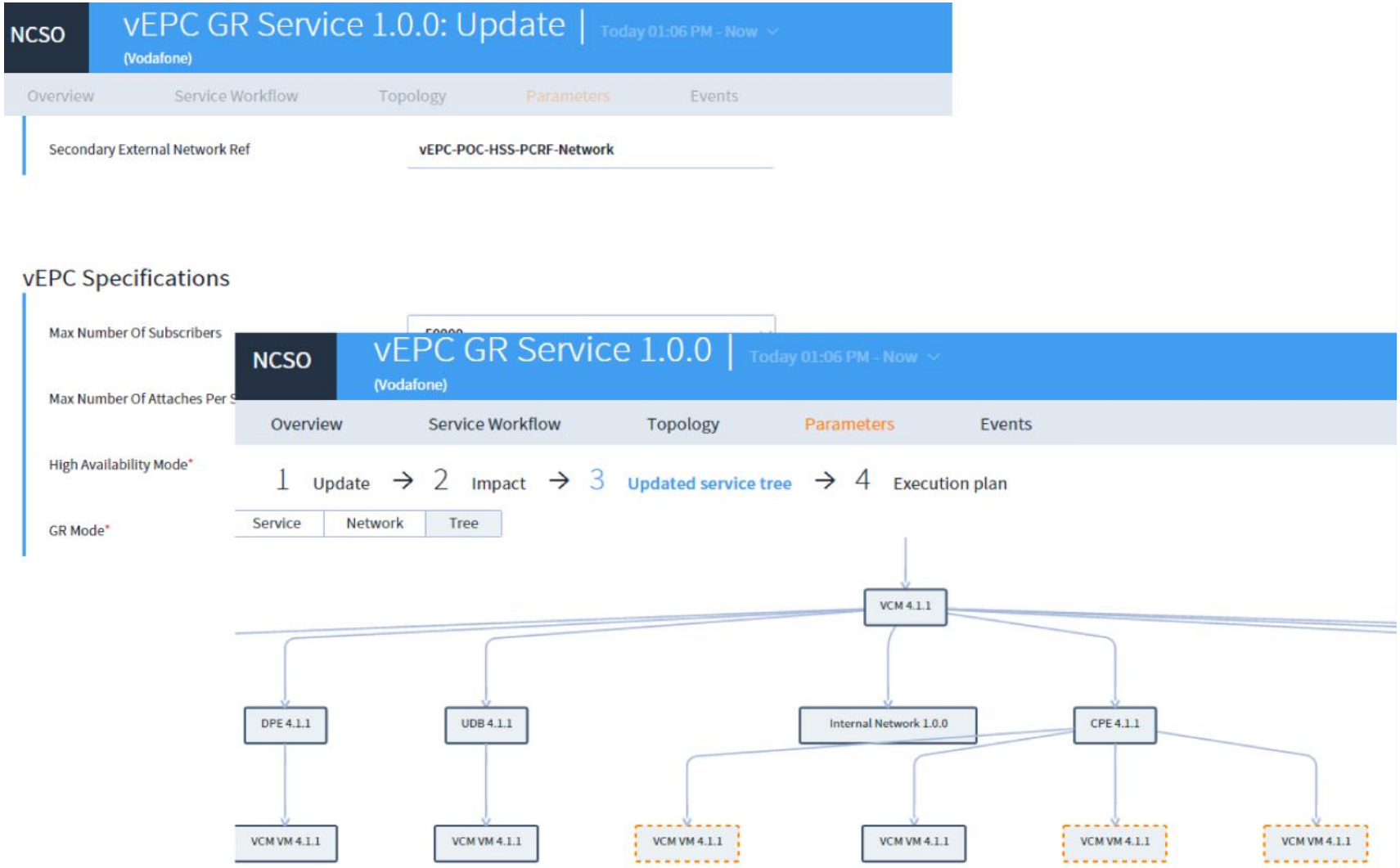
Updated vEPC in Network Orchestrator



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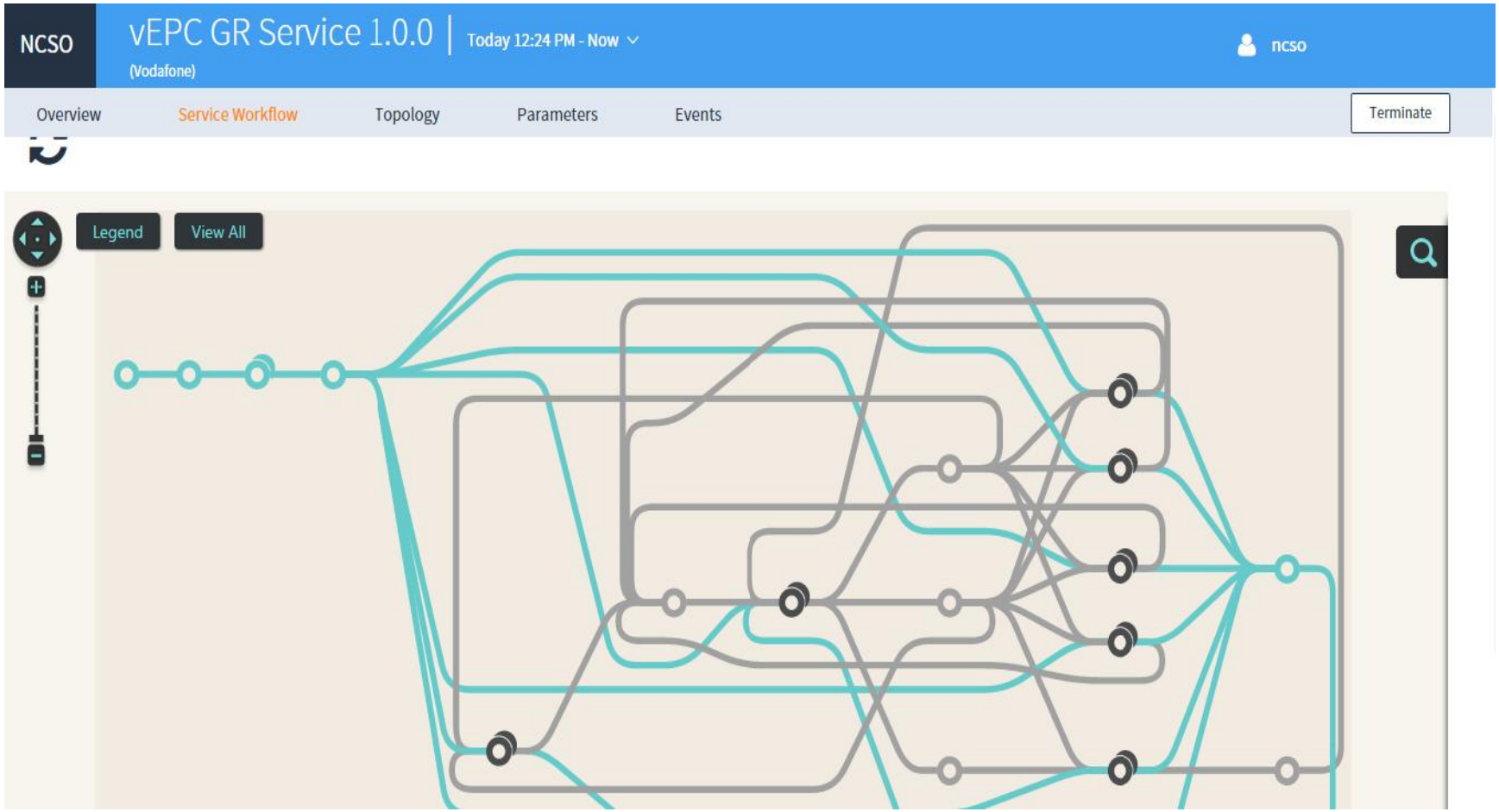
vEPC Virtual Network Graph



A virtual vEPC network and connectivity

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Common Issues with VNF Design

- VNF design phase can take longer to match the production network
- VNF orchestration and configurations are much more complex
- VNF connectivity has to be correctly designed and validated
- VNF deployment in the test lab can simulate the live network
- VNF testing can detect certain defects much sooner: connectivity, protocol, network topology
- VNF testing will require frequent retesting or regression testing after a change in configuration or topology

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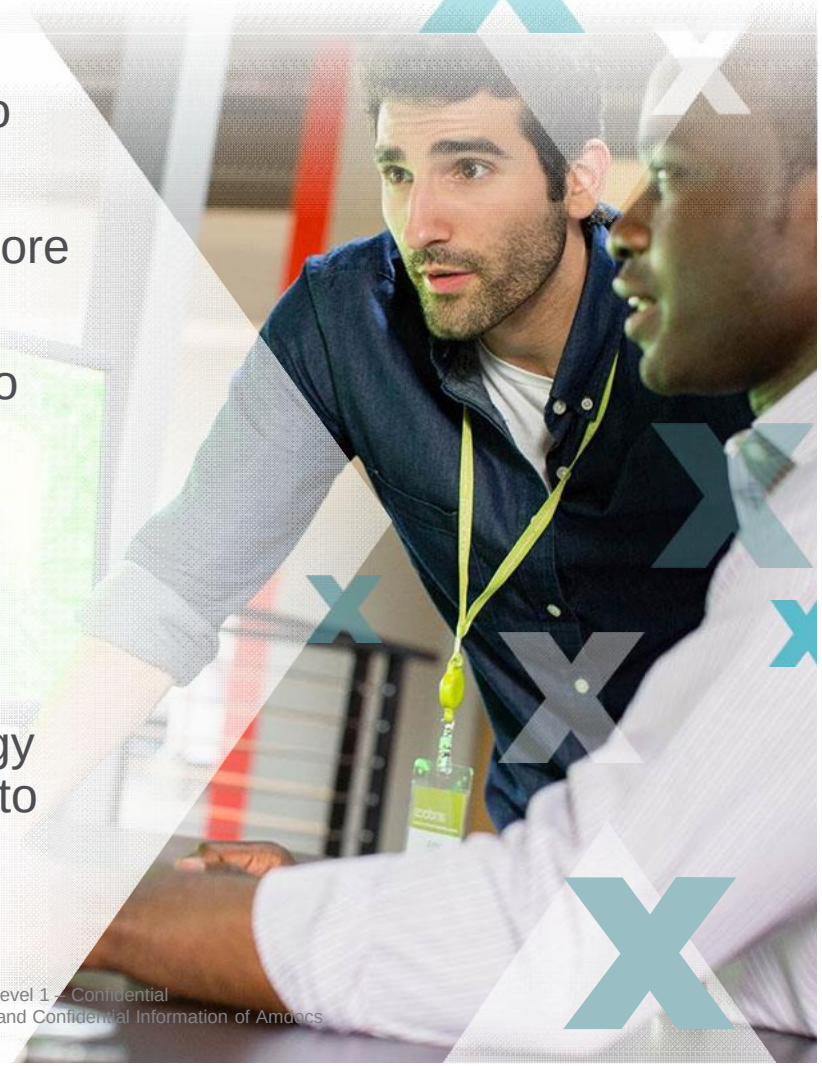
Summary

- NFV/SDN has many advantages over legacy network to CSPs, enabling faster deployment of new NW functions
- NFV/SDN poses new challenges to CSPs to design, develop and test new NW functions
- NFV technology is much more suitable for core networks such as EPC and IMS cores
- NFV testing will require different approach to test and validate:
  - NFVI layer
  - VNF layer
  - Network Orchestration
  - Network Integration with OSS
- Agile and DevOps development methodology are more suitable for testing NFV/SDN due to higher frequency of NFV deployment



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Thank you!

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