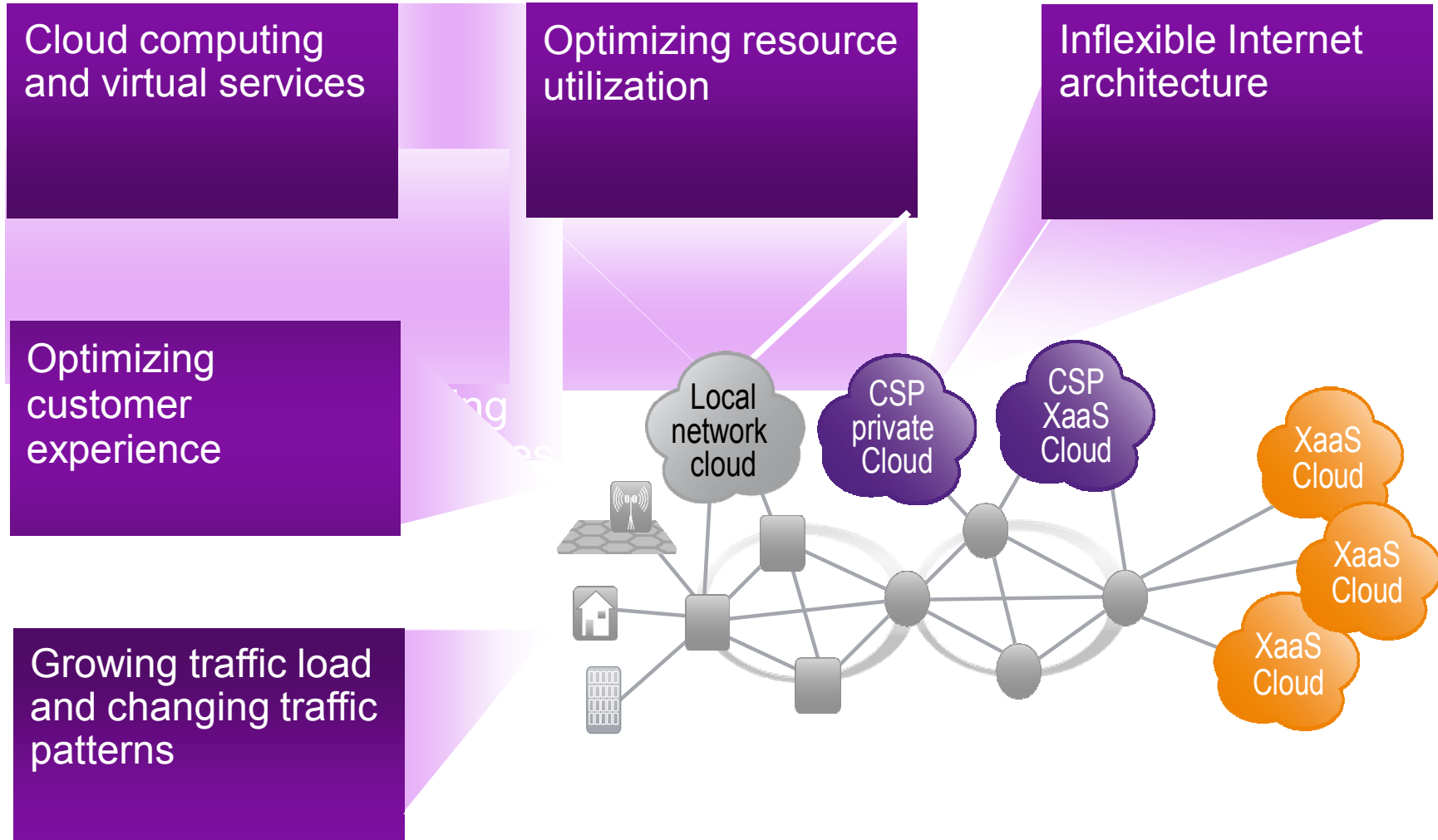# Nokia Siemens Networks
Future Network Architecture
enabled by Network Virtualization

Korean-German Workshop: Future Internet Research
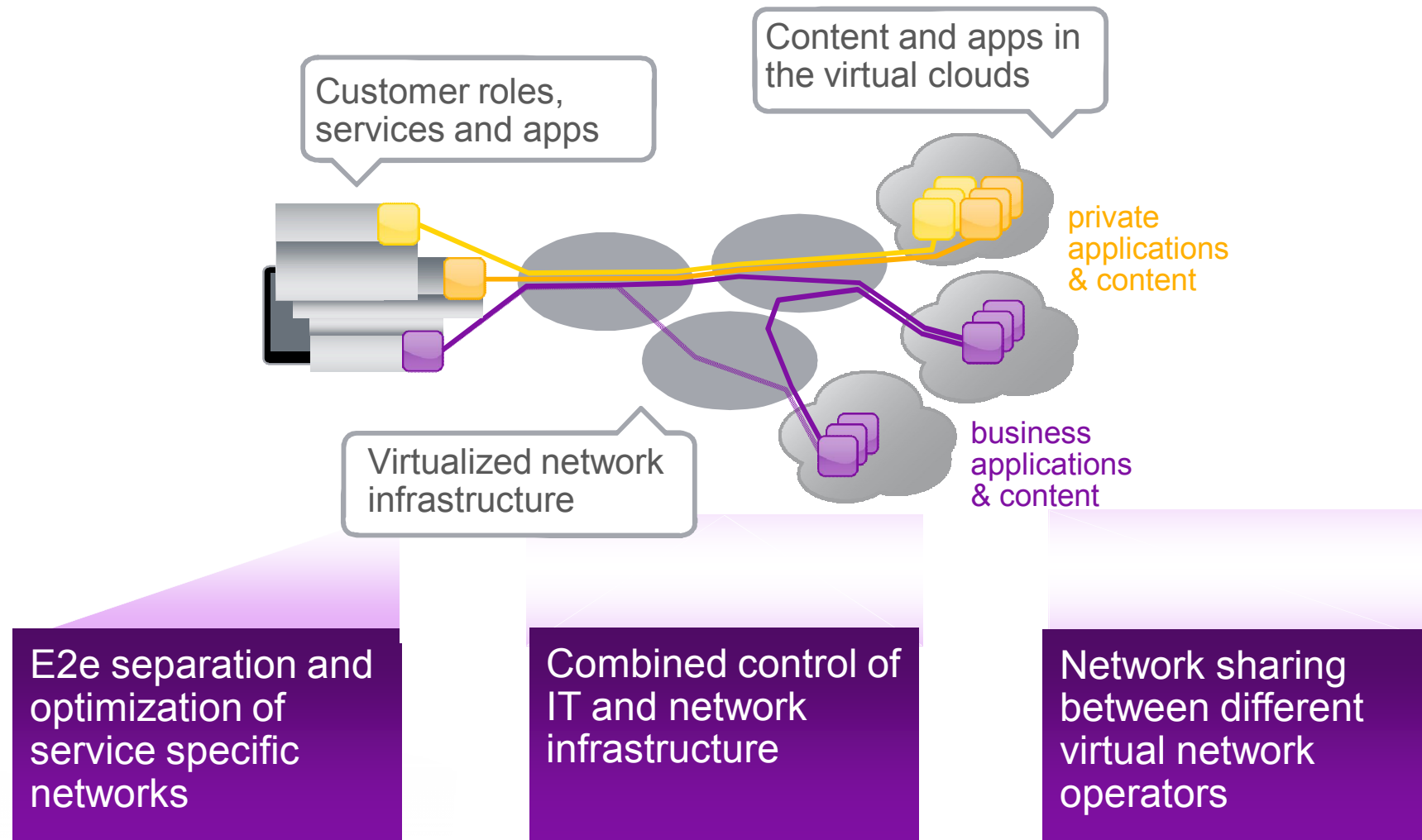08.03.- 09.03.2011, Seoul

Dr. Marco Hoffmann
NSN Research

Nokia Siemens
Networks

Trends and Challenges

Cloud computing and virtual services

Optimizing resource utilization

Inflexible Internet architecture

Optimizing customer experience

Growing traffic load and changing traffic patterns

Local network cloud

CSP private Cloud

CSP XaaS Cloud

XaaS Cloud

XaaS Cloud

XaaS Cloud

Dr. Marco Hoffmann

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Network Virtualization for building optimal networks for specific services needs

Customer roles, services and apps

Content and apps in the virtual clouds

private applications & content

business applications & content

Virtualized network infrastructure

E2e separation and optimization of service specific networks

Combined control of IT and network infrastructure

Network sharing between different virtual network operators

Dr. Marco Hoffmann

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Motivation of Network Virtualization:
integrated virtual service infrastructure

Isolated Control Planes

| Service | Service | ⋯ | Service |

Control	Control
Network	Data Center

Infrastructure

Combined Control Plane

| Service | Service | ⋯ | Service |

ITN Control
Network	Data Center

Infrastructure

End-to-End Control

Service Specific Control

Service Specific Networks

| Service | Service | ⋯ | Service |
| Control | Control | ⋯ | Control |

| Network | Control Data Center |

Infrastructure

Integrated Service Infrastructure

| Service | Service | ⋯ | Service |
| ITN Control | ITN Control | ⋯ | ITN Control |

IT and Network Resources

Infrastructure
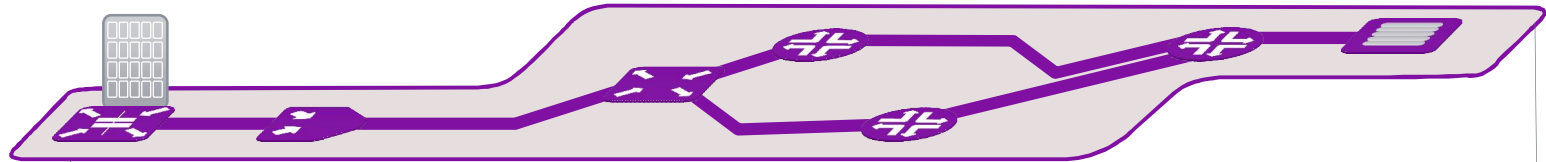
ITN: IT and Network

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Network virtualization is all about
combination and partitioning of resources
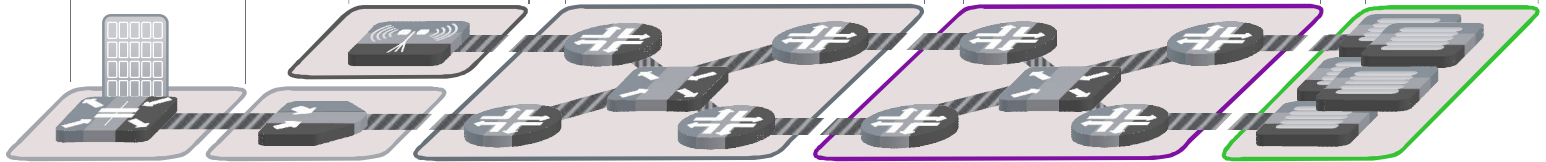

Providing optimized services
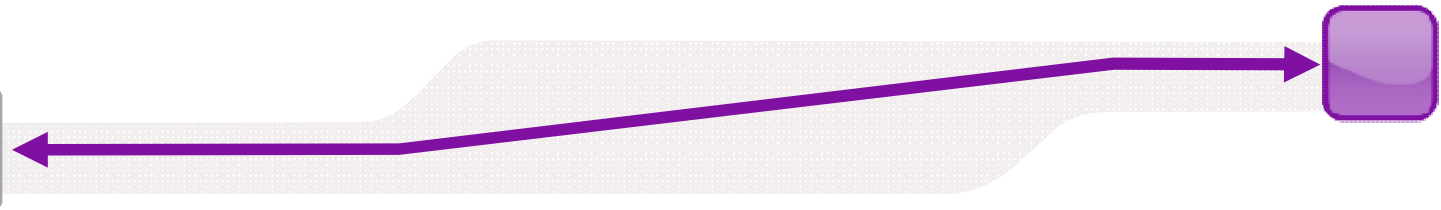
Providing optimized virtual network

Combination & partitioning of virtual resources

Link, path and node virtualization
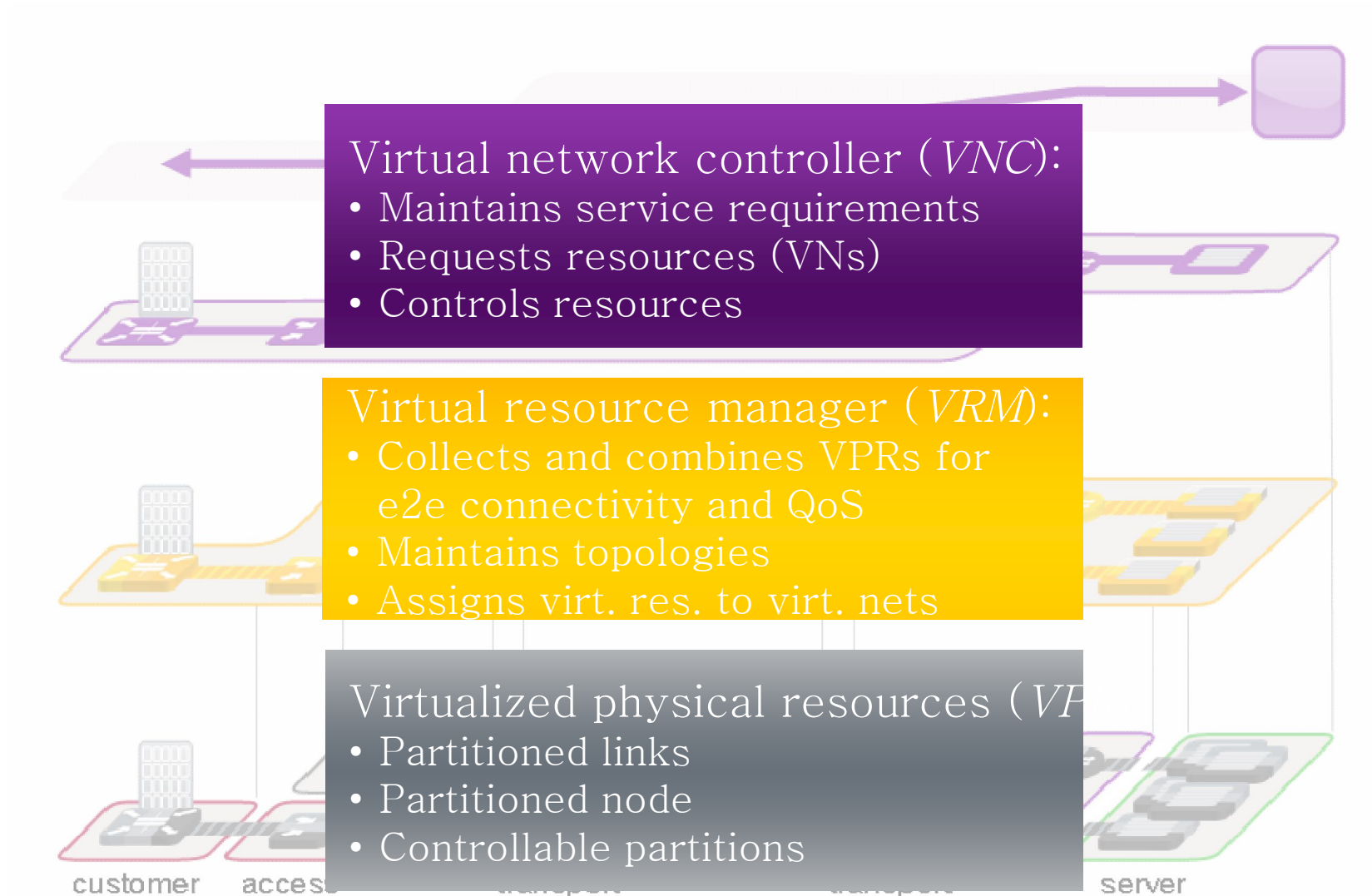
customer   access   transport   transport   server

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New basic functions evolve to enable optimized services on virtualized networks

Virtual network controller (*VNC*):
- Maintains service requirements
- Requests resources (VNs)
- Controls resources

Virtual resource manager (*VRM*):
- Collects and combines VPRs for e2e connectivity and QoS
- Maintains topologies
- Assigns virt. res. to virt. nets

Virtualized physical resources (*VP*
- Partitioned links
- Partitioned node
- Controllable partitions

customer access transport transport server

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Use Cases for Network Virtualization:
from an operator point of view – Virtual Mobile Networks

Next Mobile Network (e2e virtualization for MVNOs)

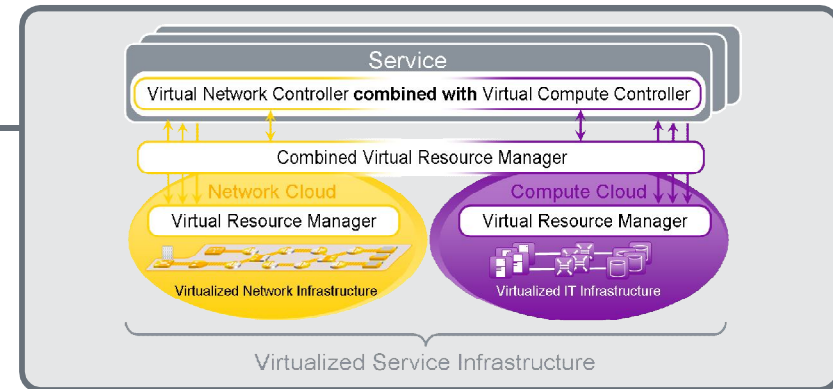**Fixed and Mobile Convergence (FMC, e.g. edge nodes)**

Inherent Mobile Services

Mobile Transport

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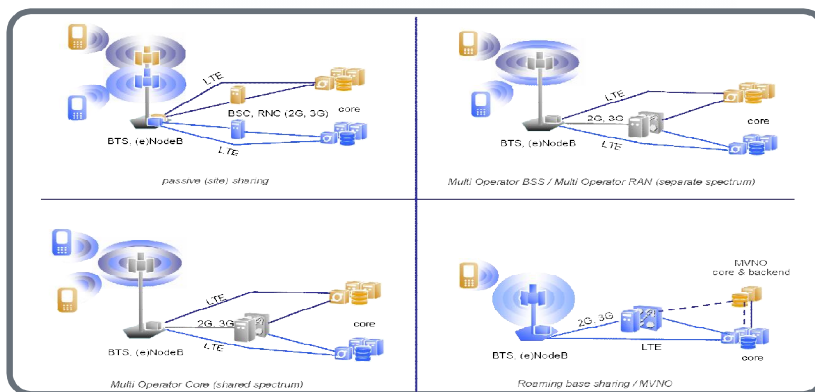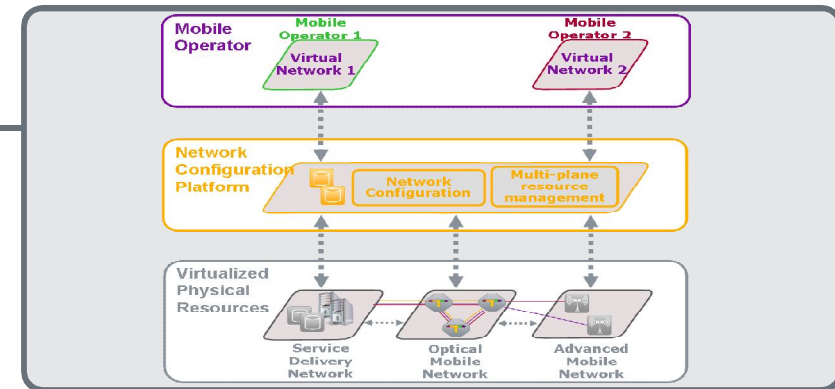
Use Cases for Network Virtualization:
from an operator point of view – combined control & service specific networks
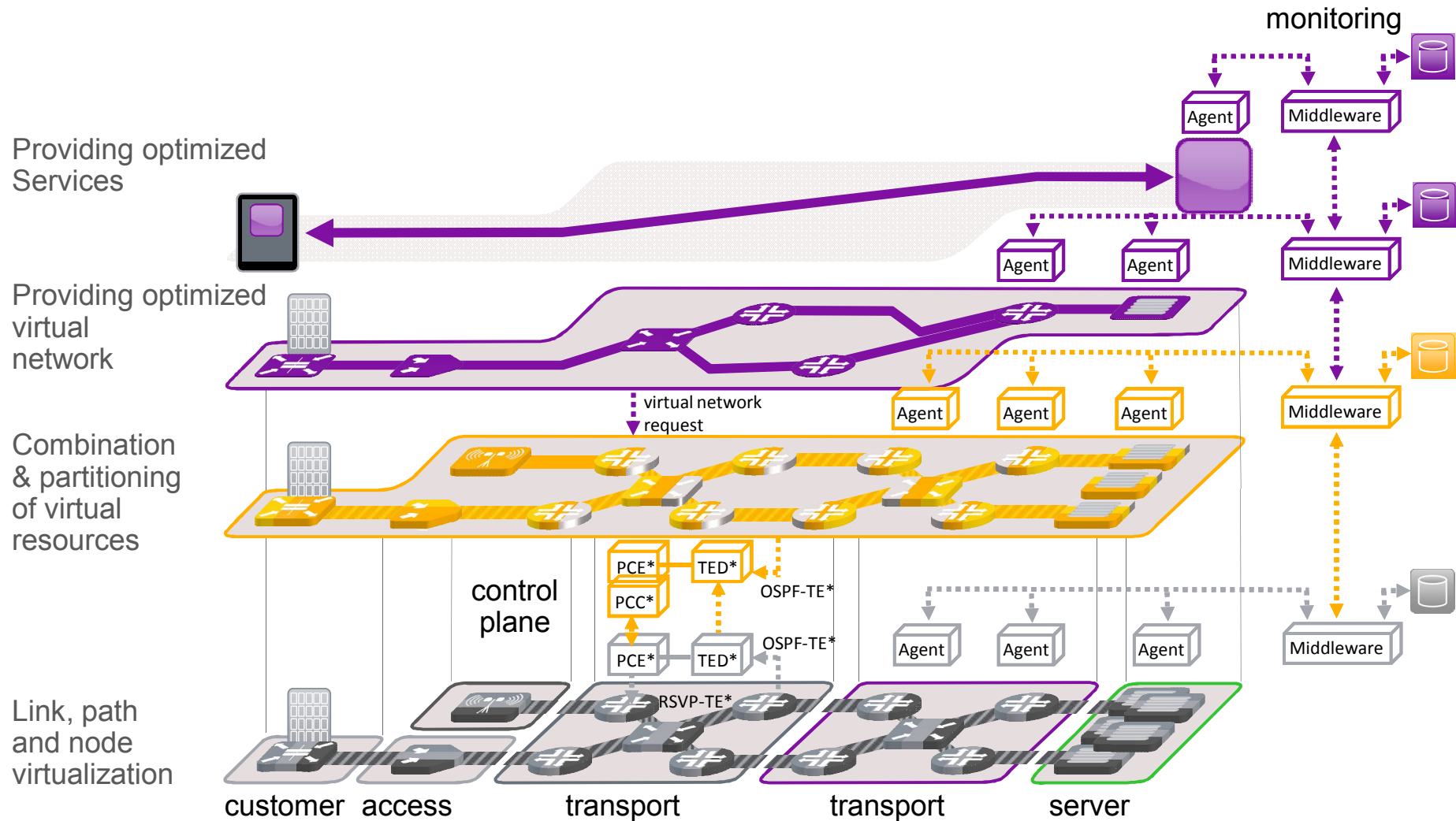
Combine Control of IT and Network Resources

Service

Virtual Network Controller **combined with** Virtual Compute Controller

Combined Virtual Resource Manager

Network Cloud
Virtual Resource Manager

Compute Cloud
Virtual Resource Manager

Virtualized Network Infrastructure

Virtualized IT Infrastructure

Virtualized Service Infrastructure

Beta Slice

(testing and faster service commercialization)

Multi-Generation Networks

Banking

VoD

Enterprise Network

Service Specific Networks

VoD: Video on Demand

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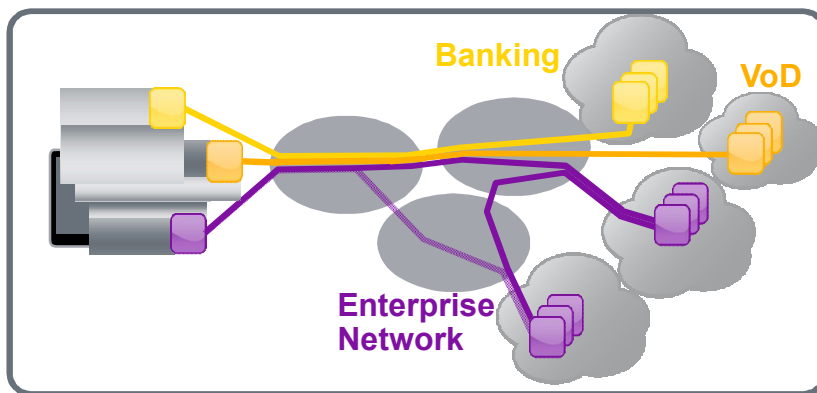
G-Lab Project Status:
control plane and monitoring of virtual networks

PCE: Path Computation Element, PCC: Path Computation Client, TED: Traffic Engineering Database
RSVP-TE: Resource Reservation Protocol – Traffic Engineering, OSPF-TE: Open Shortest Path First – TE

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Thank you