NFV/SDN Impacts to 3GPP

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- Overview and Intel offerings
- Enabling NFV for 3GPP systems
  - Control and User plane
  - Management plane
- Potential SDN impacts to 3GPP
- Next steps and Proposal

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Overview and Intel offerings

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Infrastructure Needs by Segment

Enterprise

Deliver business value as fast as possible with lowest total cost of ownership

Cloud Service Providers

Scale and maintain SLAs in face of shifting customer demands while optimizing cost of service delivery

Telco

Reduce OPEX and enable business innovation to drive incremental revenue

Pressing need for Flexible, Responsive and Efficient Infrastructure

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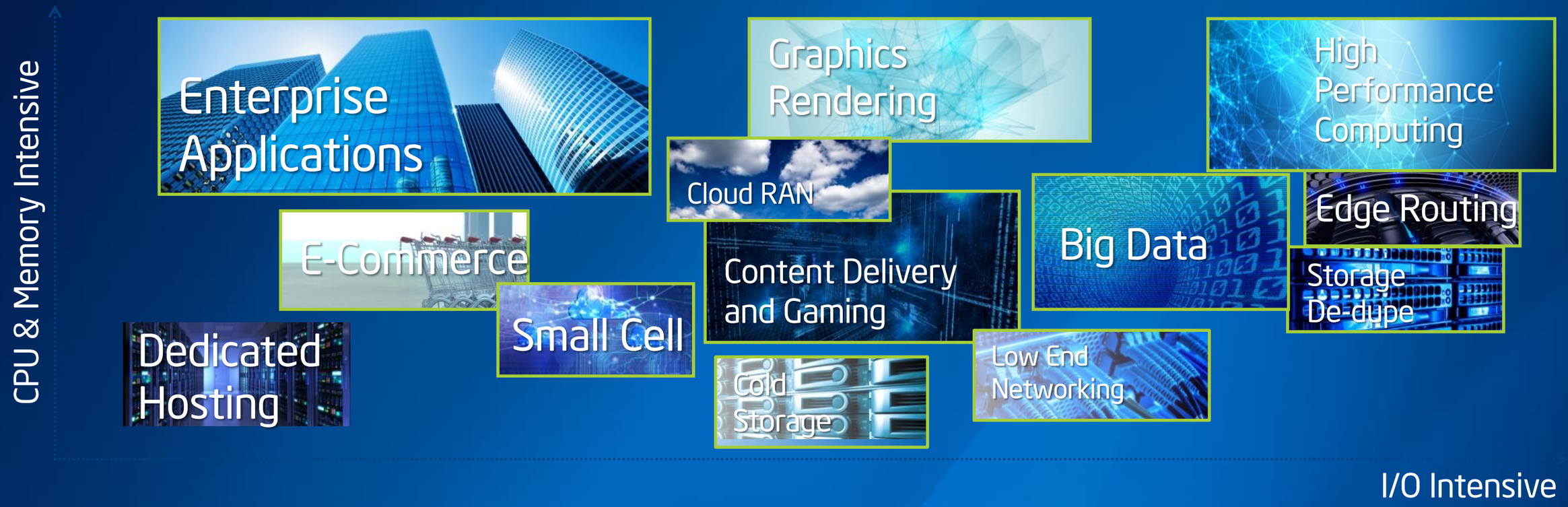
Diversity of Workloads



Challenge: efficiency without added complexity

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Intel – Building Blocks to Address the Challenges

Hardware building blocks

- Processors (intel inside ATOM, intel inside XEON)
- Accelerators
- Ethernet

Software building blocks

- Intel Software
  - Intel® LTE Baseband Reference Stack
  - Cache Acceleration Software
  - Intel® DPDK (Intel Data Plane Development Kit)
- Ecosystem Software
  - openstack
  - Open vSwitch (An Open Virtual Switch)
  - OpenFlow
  - Wind River

Systems

Customer reference boards, Reference architectures, System testing,
Intel ®System Studio Tools

End Customers

Proof of concepts, Pilots, Industry forums

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Wireless Communications Propelling NFV

Telco: Transitioning to General Purpose Computing	SDN: Transforming Networks Across All Segments	NFV: Virtualizing Fixed Functions Onto Servers
Across All Workloads *Application, Control, Data, Management*	*Intel IT: SDN cuts Provisioning tier from* **Weeks to Minutes**[1]	*Imitative Formed Oct 2012* **Now > 25 carriers** *1st requirements released within one year*
Several Cloud based networking and CRAN Initiatives	Open Standards Rapidly Emerging OPEN vSWITCH An Open Virtual Switch OpenFlow OPEN DAYLIGHT	ETSI World Class Standards

Intel: Major Carrier Qualifications Of SDN/NFV In All Key Regions With Top System Vendors

1: Source: Intel IT internal estimate
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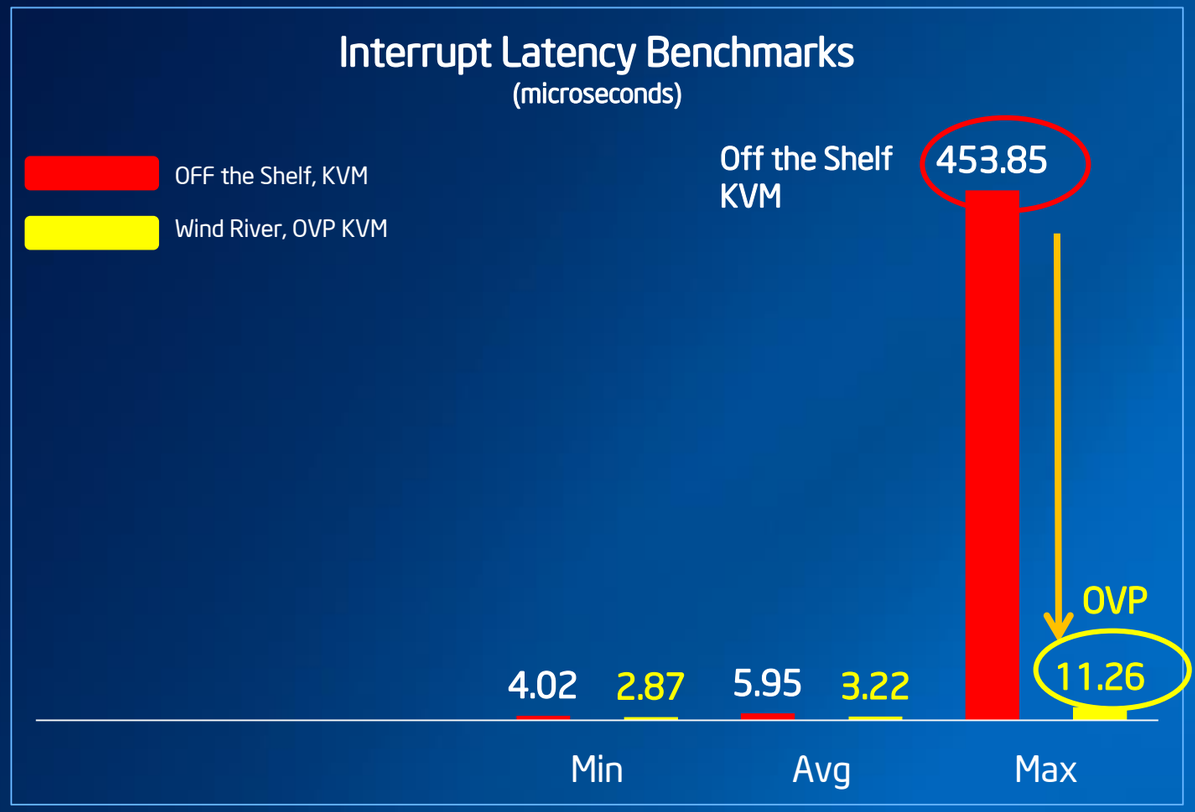
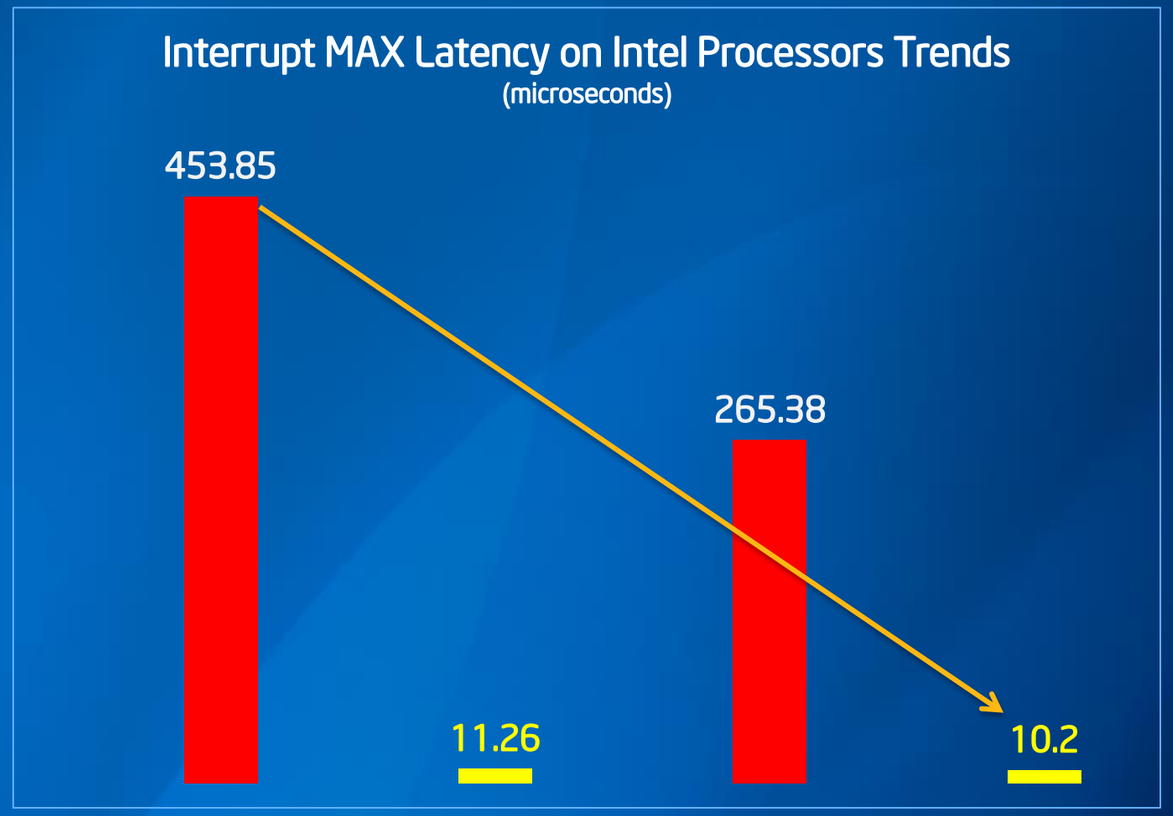
Performance to meet use case requirements: Latency Example with Open Virt. Platform (OVP)





24 hour test

- Reducing interrupt latency (a major contributor to jitter), improves hypervisor performance across all workloads
- Wind River OVP Enabling All Virtualized Workloads To Run Like Native Intel®VT

General Performance disclaimer: For more complete information about performance and benchmark results, visit Performance Test Disclosure

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Enabling NFV for 3GPP systems

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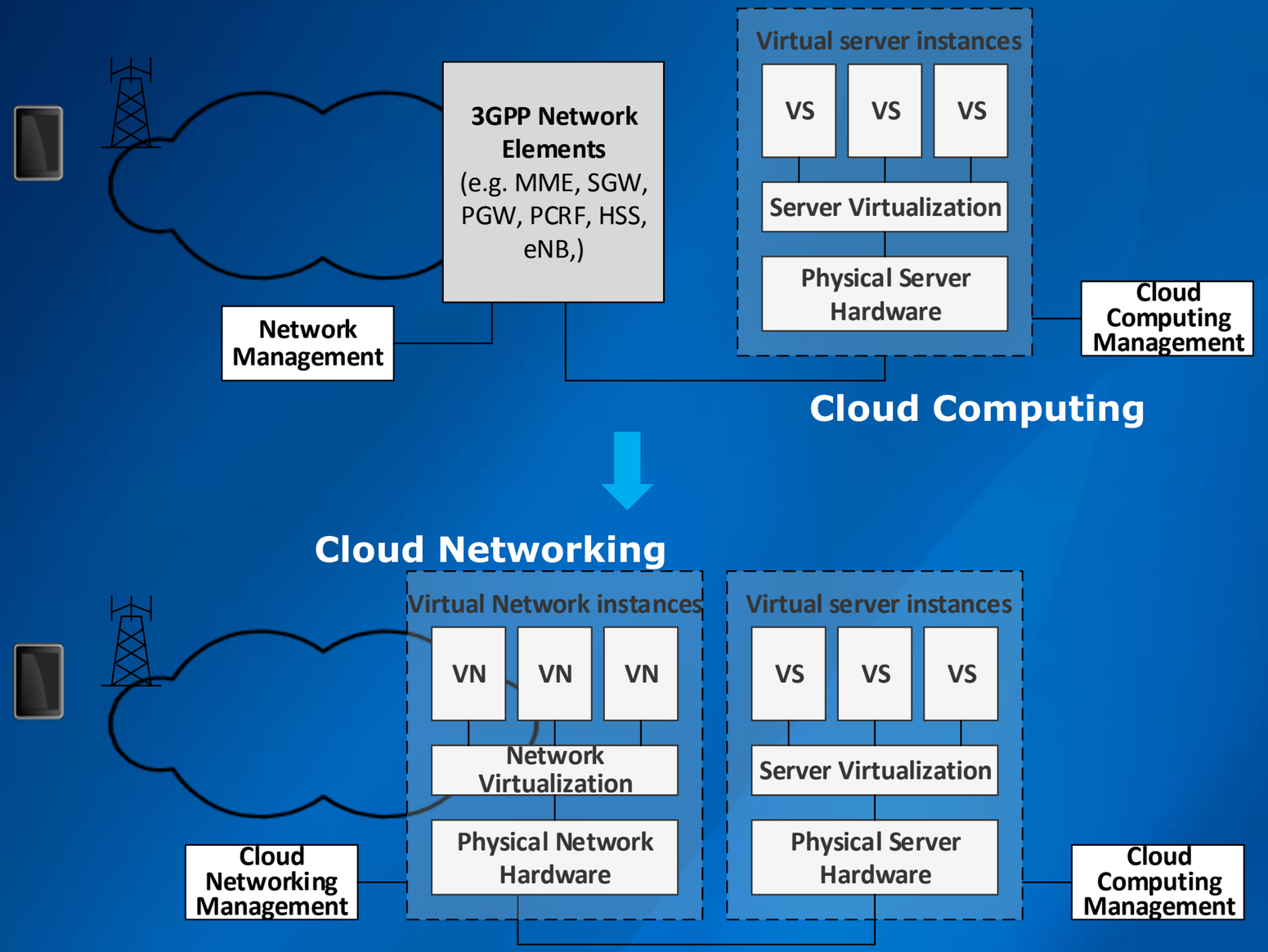
Cloud Computing to Cloud Networking Evolution



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Enabling NFV for 3GPP systems

- All existing EPC functionality can be implemented as VNFs
  - No changes to existing interfaces is anticipated.
- This can enable new use cases due to advanced programmability and intelligence of networks

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Traditional IT management vs. Cloud management

- **Traditional IT** – Services and assets are tied together in complex vertical stacks that are hard to change and manage. The business agility suffers.
- **Cloud services** – Service components are abstracted and sourced from dynamic resource pools with horizontal layers loosely bounded into services which enables IT to keep up with the speed of business.

Cloud management - typically involves resource management, configuration and automatic provisioning, performance monitoring, providing a self service portal across the cloud infrastructure.

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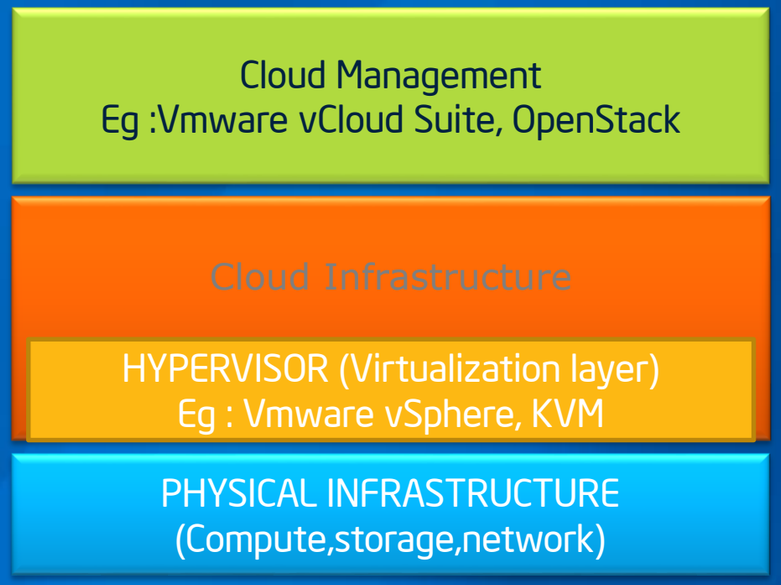

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ETSI NFV Management/Orchestration and 3GPP Management Reference Points

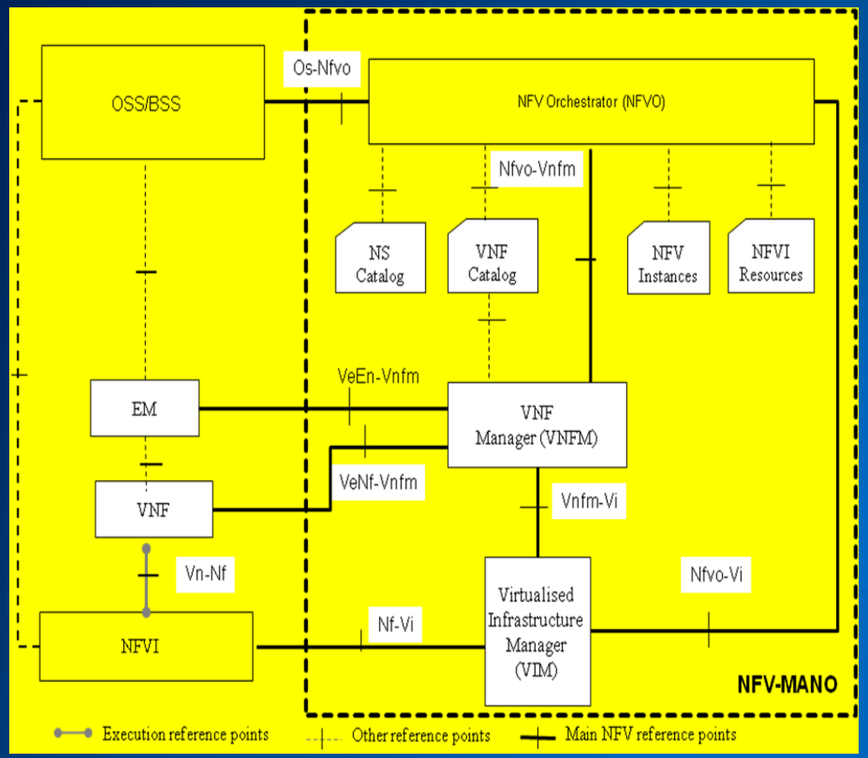

Figure 5.2: The NFV management and orchestration architecture with reference points of GS NFV-MAN 001 V0.2.3 (2014-02)

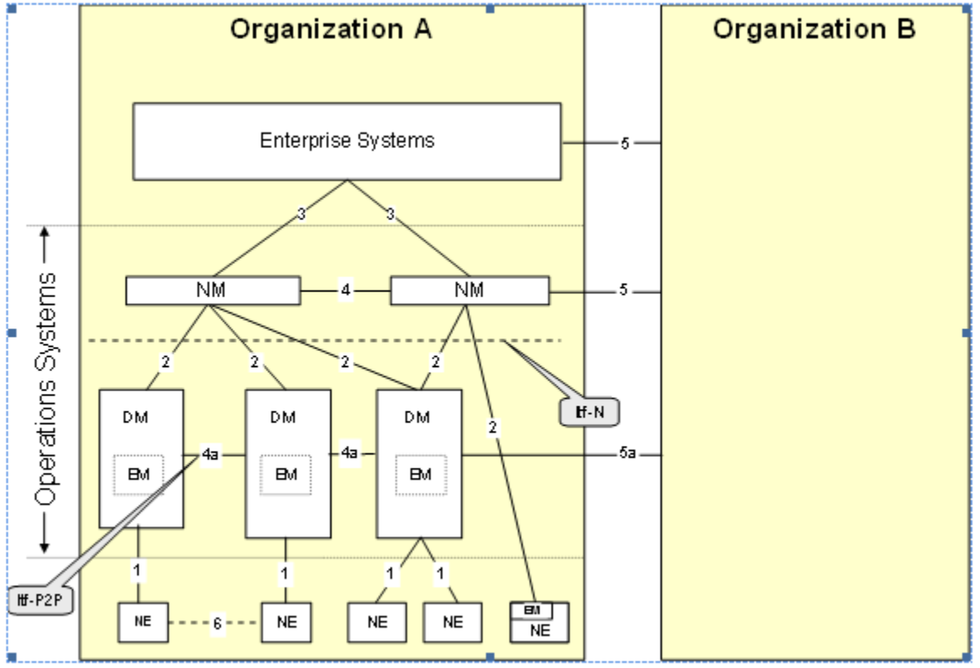

Figure 1: Management reference model **3GPP TS 32.101**

Sources: ETSI NFV and 3GPP
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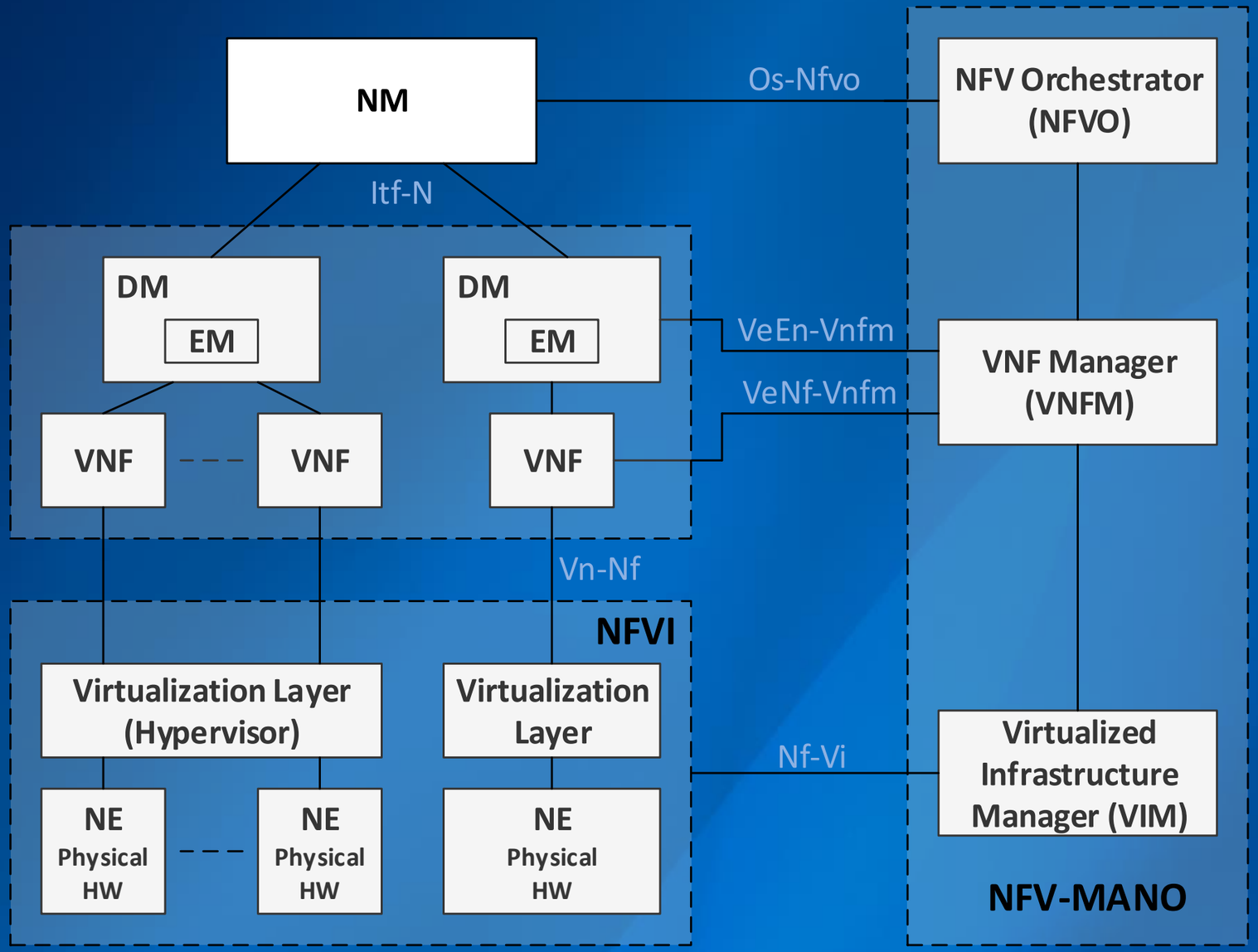
Potential mapping between ETSI NFV & 3GPP SA5 Management Architecture



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Potential SDN impacts to 3GPP

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NFV and SDN

- NFV
  - Leveraging standard IT virtualization technology to consolidate many network equipment types onto industry standard high volume servers, switches and storage.
  - Equipment can be located in Datacenters, Network Nodes and in the end user premises.
  - Applicable to any data plane and control plane function in fixed and mobile network infrastructures.

- SDN
  - Separation of control and data plane
  - A logically centralized controller and view of the network
  - Programmability of the network by external applications

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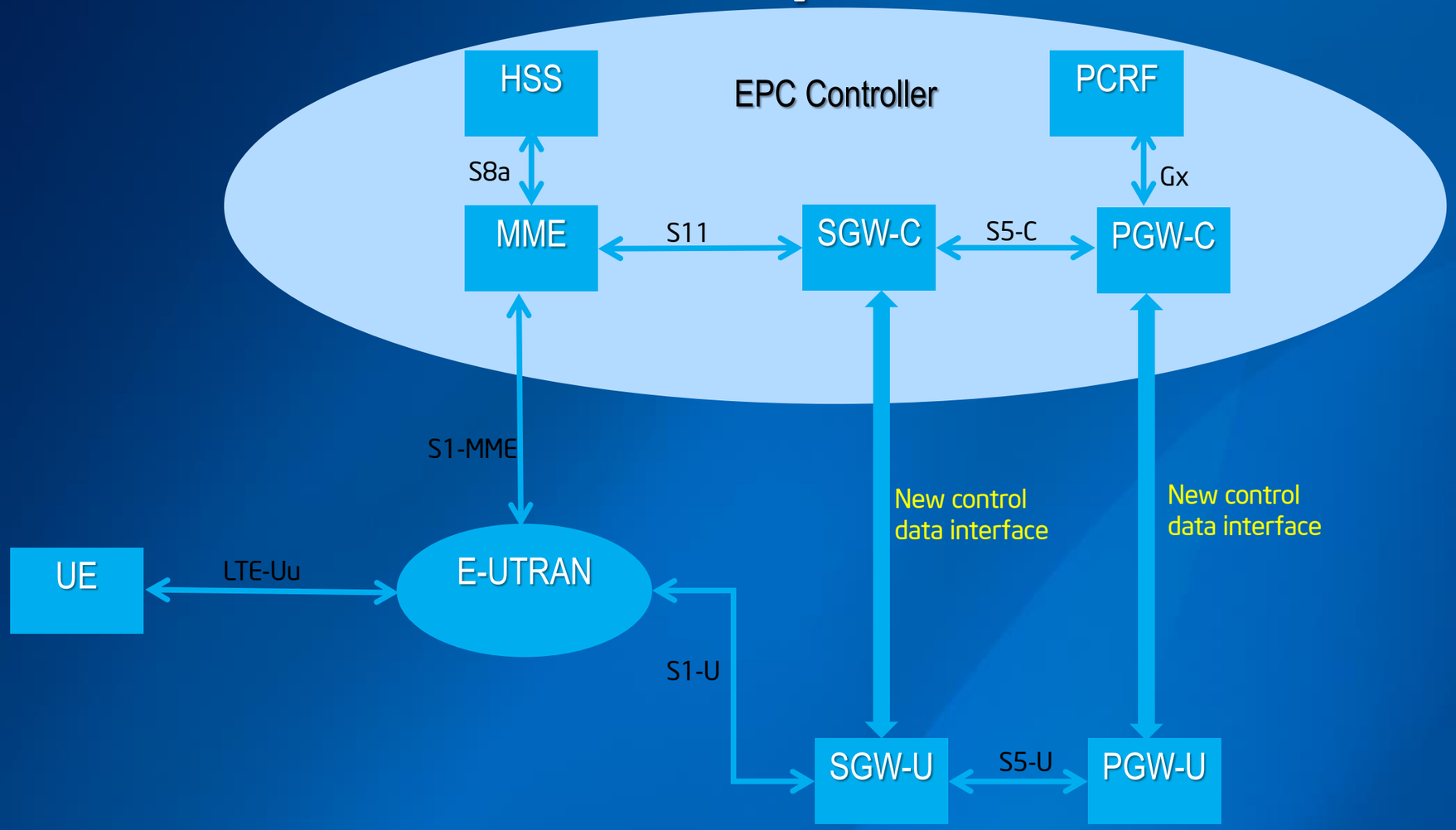
SDN impacts



- Collocation of all EPC control in the cloud.
- New control-data separation interfaces for SGW and PGW

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Our view on SDN

- SDN as an architectural trend deals with control-data separation.
  - Followed by “logically centralizing” the control plane.
- SDN has broad applicability with some early adoption in the data center/enterprise
- Telecom architecture largely has control-data separated and can be easily centralized by implementation of the control plane as VNF(s).

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Next steps and Proposal

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Proposal

- 3GPP and NFV should cooperate to identify gaps between 3GPP standards and NFV requirements and resolve the gaps in a timely manner.
- 3GPP should actively embrace this new paradigm to drive
  - significant OPEX benefits to MNOs and
  - additional MNO revenue streams resulting from the network agility and programmability.
- 3GPP should start studying the following items
  - Impacts of NFV on 3GPP system at large
  - Mapping of ETSI NFV MANO framework to the 3GPP management framework and resulting gaps

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