Using automated SDN/NFV infrastructure to provide security, agility and insight for dynamic cloud connectivity

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Cloud service demands are evolving
## Security and agility essential

- Infrastructure as a Service is now commoditized and enterprises are expecting more than cost-savings

- Important as more demanding business-critical services move to the cloud

- According to "2017 State of the Cloud Report" survey by Rightscale, 95% of respondents use cloud services with 67% adopting a hybrid-cloud strategy

"Increasingly, users are demanding that their CSPs deliver enterprise-ready, value-added, easily scaled services with **security** baked deeply within… the hallmarks of cloud now are **speed and agility**, but most of all, services."

Source: Cloud 2.0: New Challenges, New Opportunities For Cloud Service Providers, 451 Advisors, Dec 2015

Figure 3: The CSP Opportunity Today
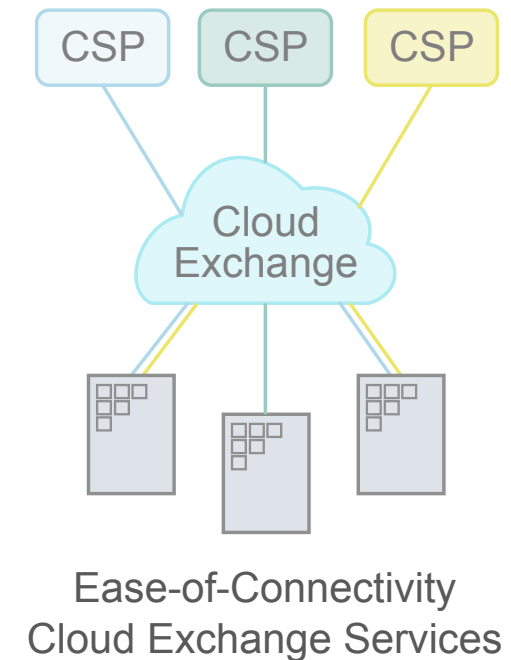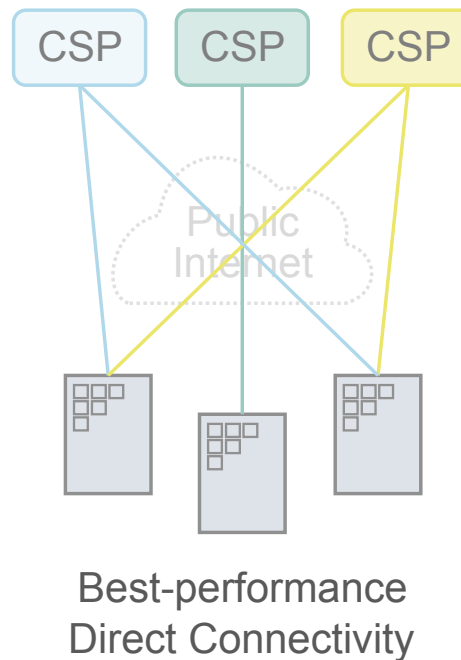*Source: 451 Research, Hosting and Cloud Study 2015*
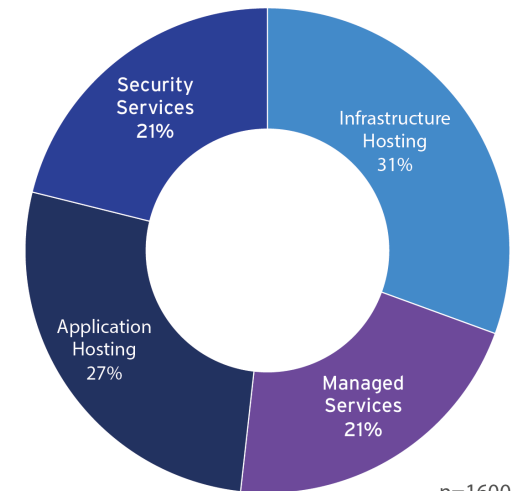
Security Services 21%
Infrastructure Hosting 31%
Application Hosting 27%
Managed Services 21%
n=1600

Source: Cloud 2.0: New Challenges, New Opportunities For Cloud Service Providers, 451 Advisors, Dec 2015

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Public Internet connectivity no longer enough
Cloud service providers responding

| CSP | CSP | CSP |

Public
Internet

| CSP | CSP | CSP |

Public
Internet

| CSP | CSP | CSP |

Cloud
Exchange

"Good-enough"
Public Internet Connectivity

Best-performance
Direct Connectivity

Ease-of-Connectivity
Cloud Exchange Services

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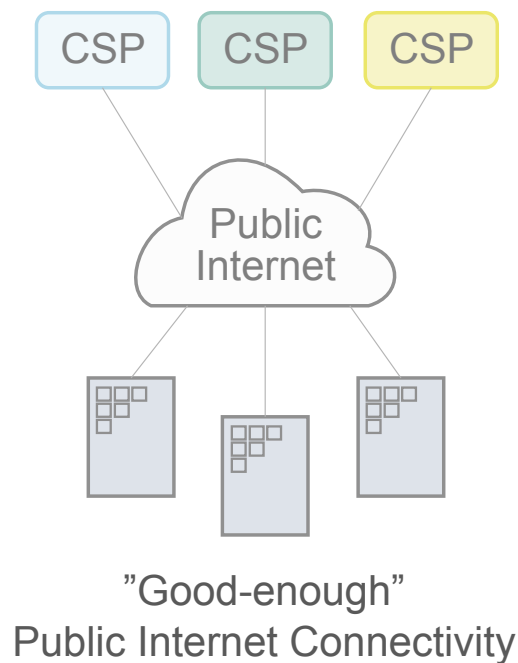
Cloud co-opetition for connectivity
Enterprises need providers to cooperate

- For hybrid cloud, enterprises need cloud service providers, data center operators and telecom service providers to cooperate

- All three busy forging alliances and partnerships to provide complete solutions

- But all three would also like to be the preferred service provider to the enterprise

- Ablity to provide service security, agility and insight could determine the outcome

Cloud Service Providers

Data Center Operators

Telecom Service Providers

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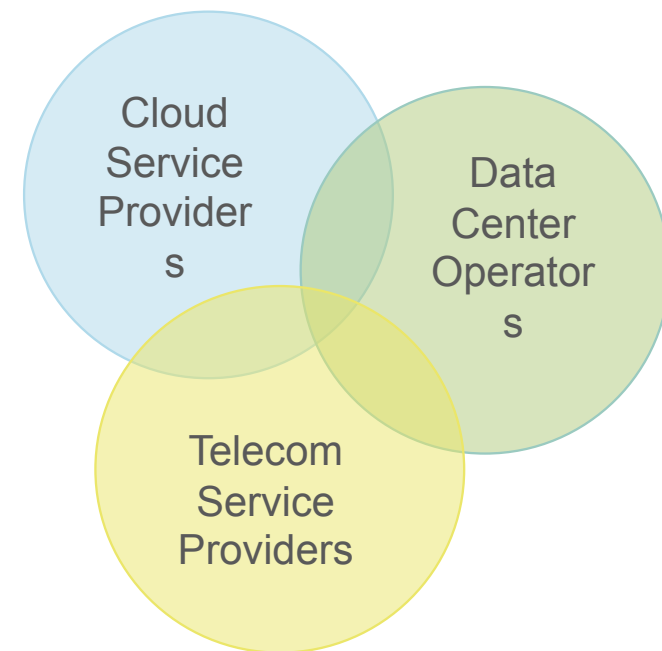
Providing security and agility
The promise of SDN and NFV

- Enterprise need is to add new locations quickly and scale services on demand

- This requires the cloud service and data center providers to respond quickly to meet new resource requirements

- This requires that connectivity can be set-up on-demand and dynamically

- Security for the service is a given

- SDN and NFV provide the conceptual framework to deliver a solution

Scale service on-demand with dynamic connectivity

CSP   CSP   CSP   CSP

Cloud Exchange

Add a new location quickly

Ease-of-Connectivity
Cloud Exchange Services

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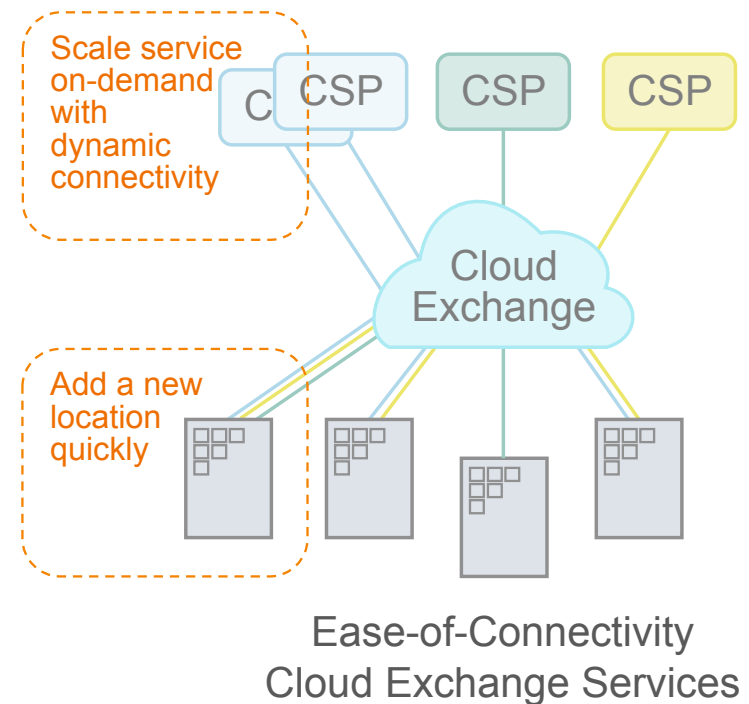
SDN and NFV MANO
Service automation solutions emerging

- MEF Lifecycle Service Orchestration (LSO) receiving broad acceptance

- Addresses challenges of automating, managing and orchestrating services

- Complemented by orchestration solutions such as OpenMANO, Open-O and AT&T ECOMP

- Coordinated with other SDN/ NFV initiatives in OpenDaylight, OpenNFV and ETSI

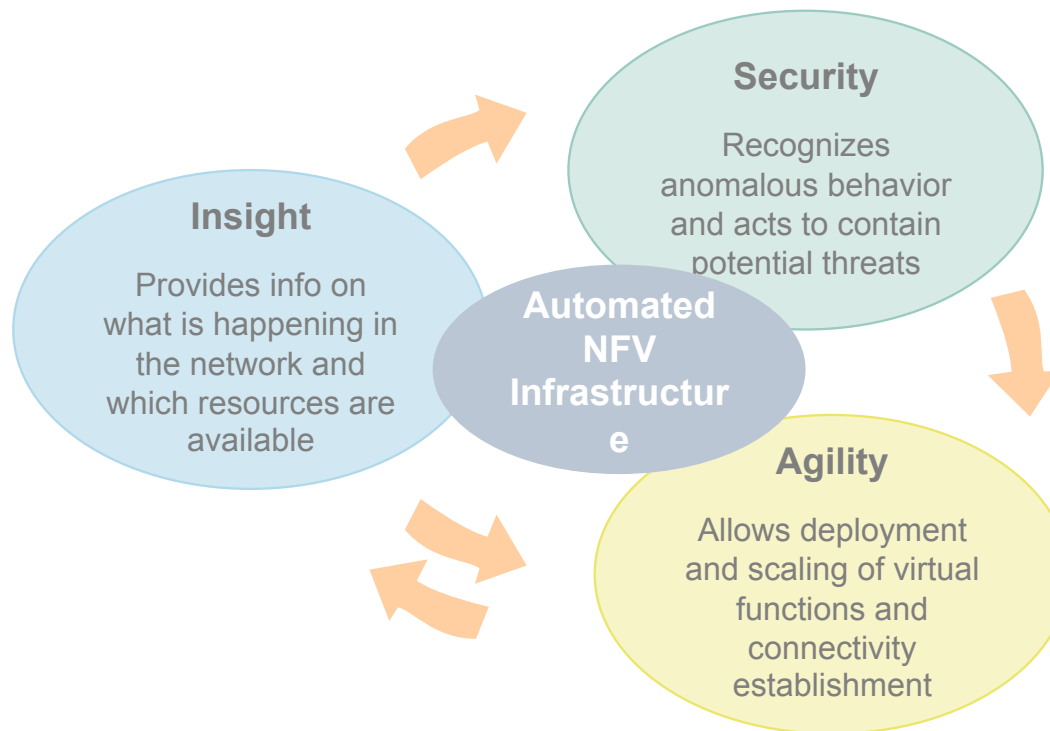| Third Network Services	Orchestrated Connectivity Services					Orchestrated Cloud Services			
	E-Line	E-LAN	E-Tree	E-Access	E-Transit	E-LAN	E-Tree	E-Access	E-Transit
	Wavelength	Internet Access		L3 VPNs	IP Transit	BIaaS	SECaaS		L4-L7 NFaaS

Intra-Domain ↕ Open APIs

Service Level Orchestration Open APIs				
Service Orchestration	Fulfilment	Performance	Policy	Security
	Control	Assurance	Usage	Analytics

Intra-Domain ↕ Open APIs

Network Level Orchestration Open APIs							
Technology Domains	Packet WAN	SD-WAN	Optical Transport	NFV	5G	Data Center	Cloud Exchange

Adapted from various MEF LSO presentations

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Service security, agility and insight
Requires NFV infrastructure built for automation

Insight

Provides info on what is happening in the network and which resources are available

Security

Recognizes anomalous behavior and acts to contain potential threats

Automated NFV Infrastructure

Agility

Allows deployment and scaling of virtual functions and connectivity establishment

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Supporting service agility
5 steps to building automated NFV infrastructure

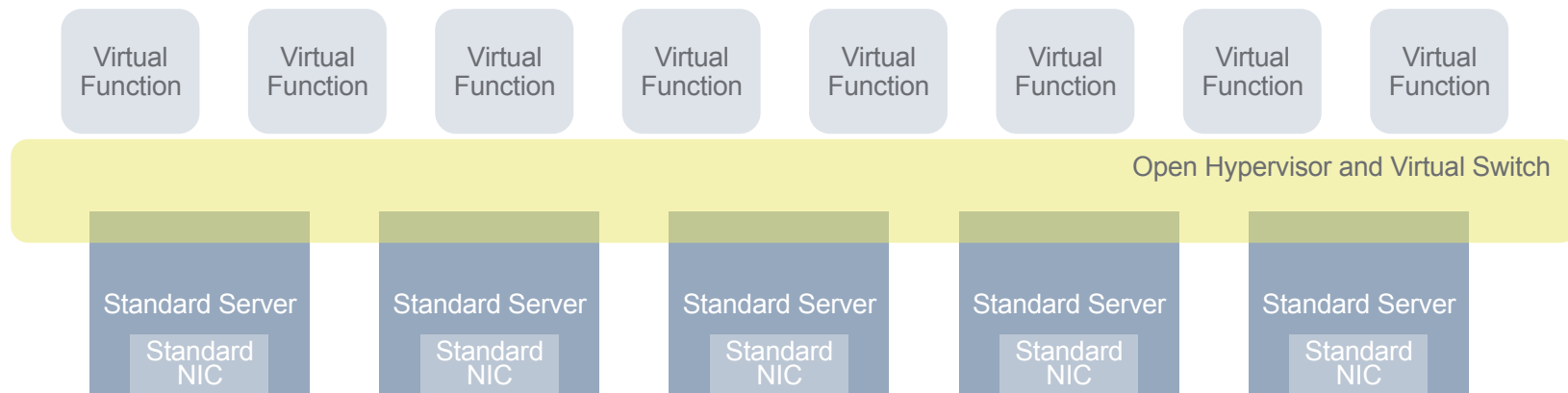| Step 1: Get data delivery to work	Step 2: Get data delivery to work with performance	Step 3: Get data delivery to work with performance, flexibility and acceptable cost	Step 4: Extend performance improvements to other data processing	Step 5: Provide insight for continuous optimizatio n
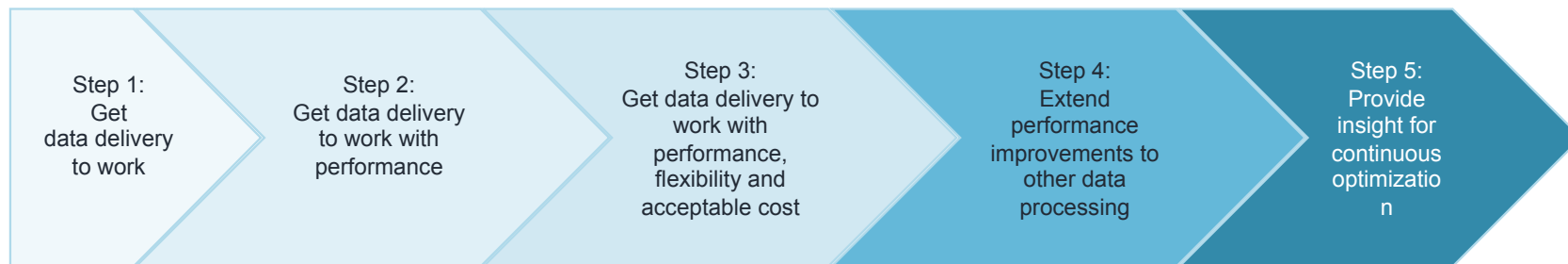
This is the challenge that needs to be addressed now to
enable automation and support service agility

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Step 1: Data delivery with flexibility
The Intel Open Network Platform

Common hardware platform with hypervisor and virtual switch
abstracts and separates hardware from software
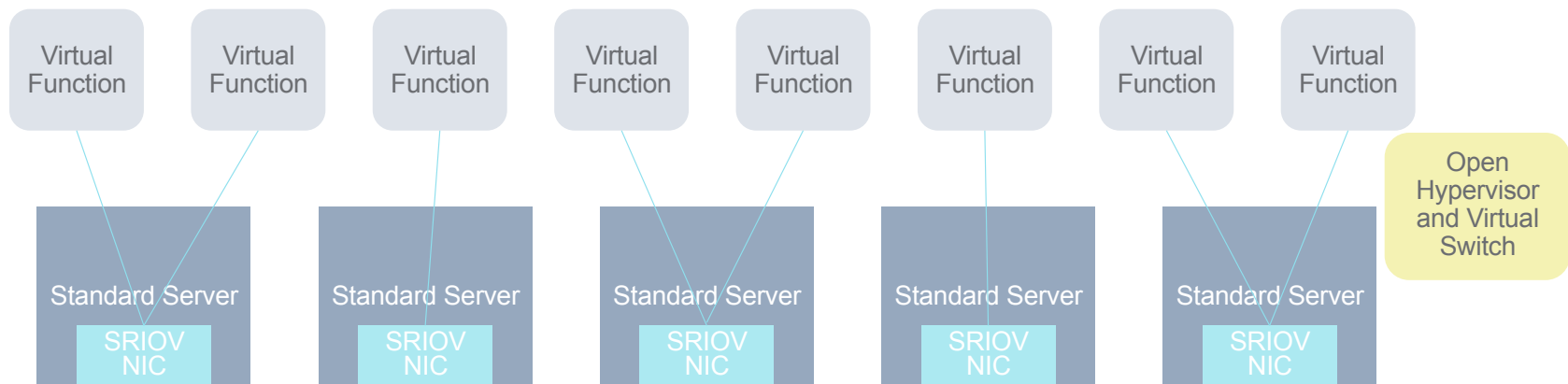allowing any function to be deployed and moved anywhere

Virtual Function	Virtual Function	Virtual Function	Virtual Function	Virtual Function	Virtual Function	Virtual Function	Virtual Function

Open Hypervisor and Virtual Switch

Standard Server	Standard Server	Standard Server	Standard Server	Standard Server
Standard NIC	Standard NIC	Standard NIC	Standard NIC	Standard NIC

But throughput performance and CPU core consumption not acceptable

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Step 2: Data delivery with performance
SR-IOV delivers but makes automation difficult

SR-IOV bypasses hypervisor, removes abstraction layer
and effectively ties software to hardware making automation difficult
Also undermines ability to achieve cost-efficiencies at data center level

| Virtual Function | Virtual Function | Virtual Function | Virtual Function | Virtual Function | Virtual Function | Virtual Function | Virtual Function |

Standard Server — SRIOV NIC

Open Hypervisor and Virtual Switch

"SR-IOV works, but it's clunky…You're bypassing the software that makes the cloud cloudy."
Martin Taylor, CTO Metaswitch, "NFV performance should be a bigger issue, SDxCentral, January 2015

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Step 3: Performance, flexibility and cost-Efficiency
Napatech virtual switch acceleration Solution

By designing a solution specifically for NFV it is possible to achieve performance, flexibility AND cost efficiency
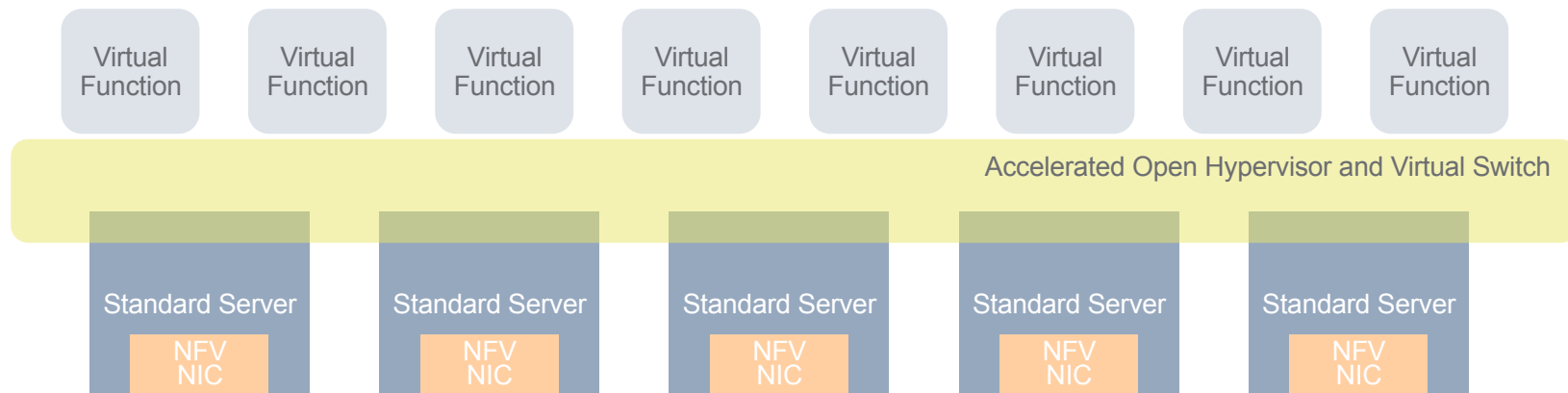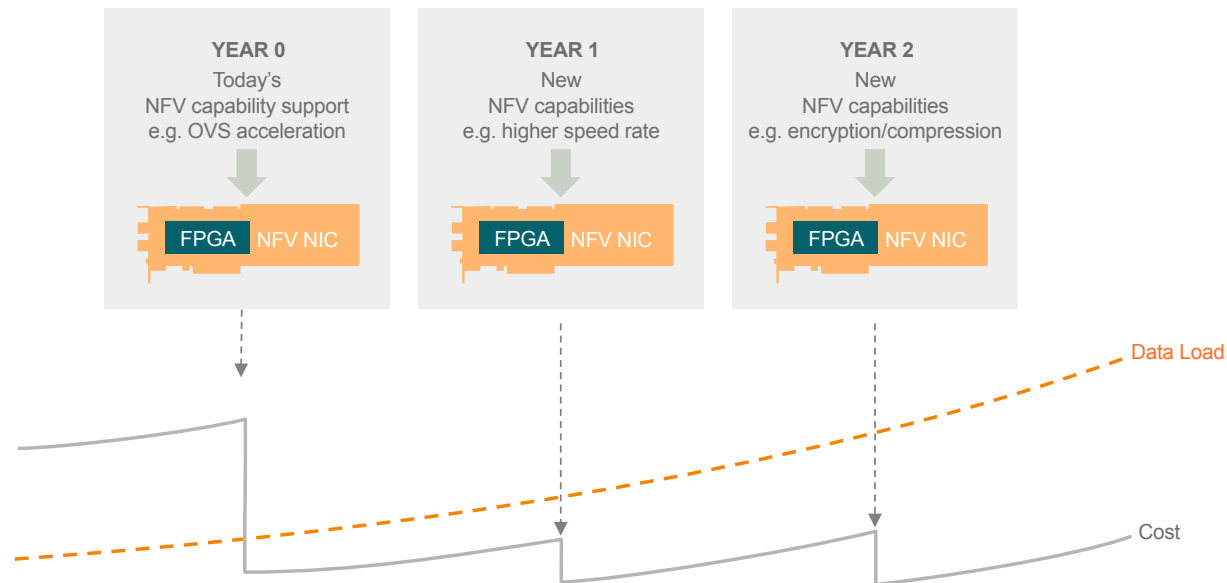

Enable automation on a common hardware platform

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Step 4: Extending performance improvement
Exploiting versatility of FPGA-based NICs

Continuously decrease cost by increasing capacity to process data using the same hardware

YEAR 0
Today's
NFV capability support
e.g. OVS acceleration

FPGA NFV NIC

YEAR 1
New
NFV capabilities
e.g. higher speed rate

FPGA NFV NIC

YEAR 2
New
NFV capabilities
e.g. encryption/compression

FPGA NFV NIC

Data Load

Cost

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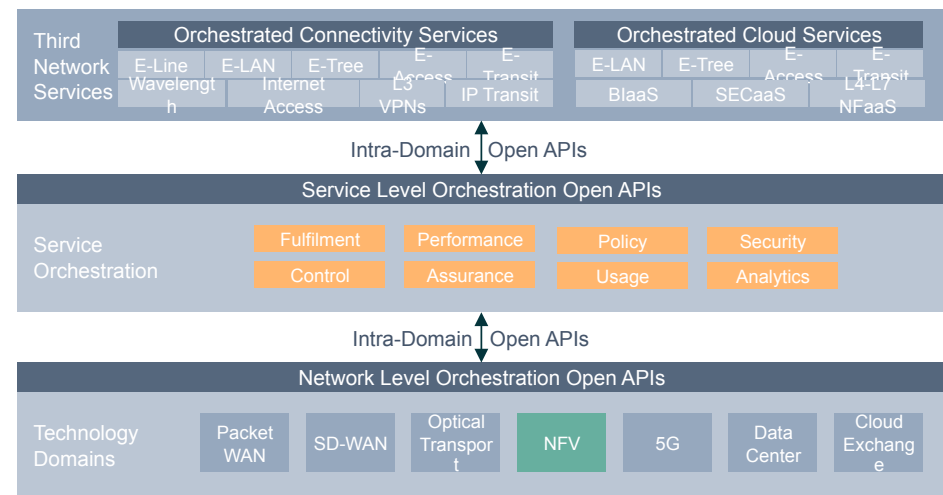
Step 5: Providing insight for optimization
Making NFV automation possible

To truly automate the NFV infrastructure and enable service agility
insight into network activity is essential

Deploy
Functions

Monitor Activity

Use Insight to Optimize and Scale
Automatically
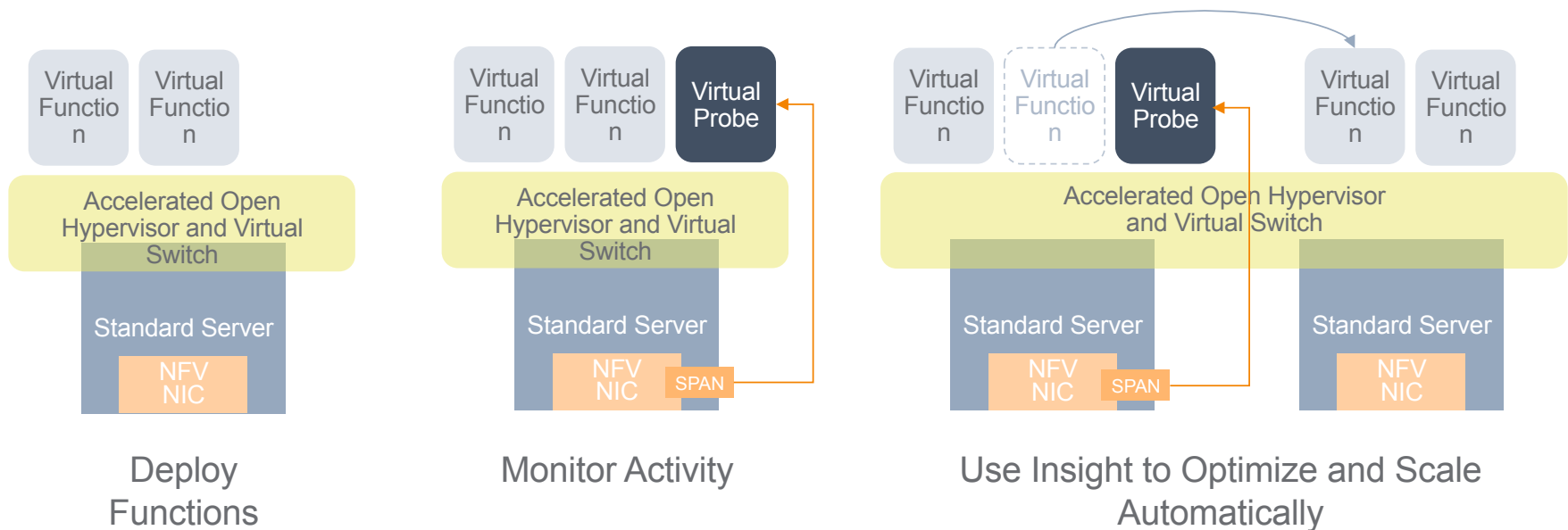
Step 5 provides insight for key functions
Makes service orchestration possible

- Key service orchestration fucntions of the LSO framework dependent on network insight

- Input from virtual probes and appliances essential for automated service orchestration including security

- This enables cloud service connectivity with agility and built-in security meeting the needs of enterprises

Third Network Services	Orchestrated Connectivity Services					Orchestrated Cloud Services			
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Napatech NFV NIC
Flexible multi-purpose acceleration

A Network Interface Card designed specifically for virtualized environments
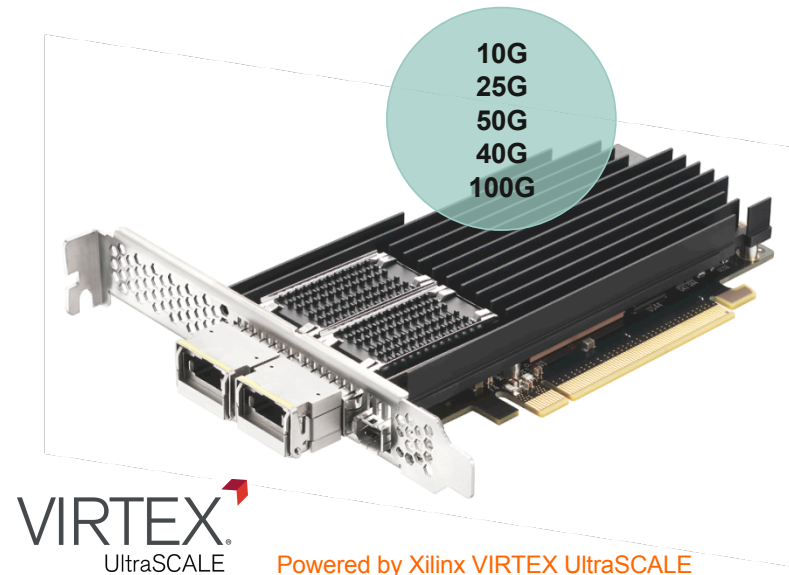
Designed for flexibility

Support multiple speed rates

Deploy multiple acceleration solutions

Designed for performance

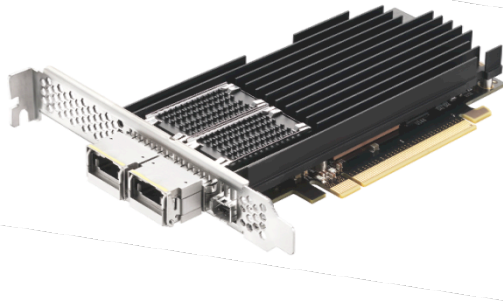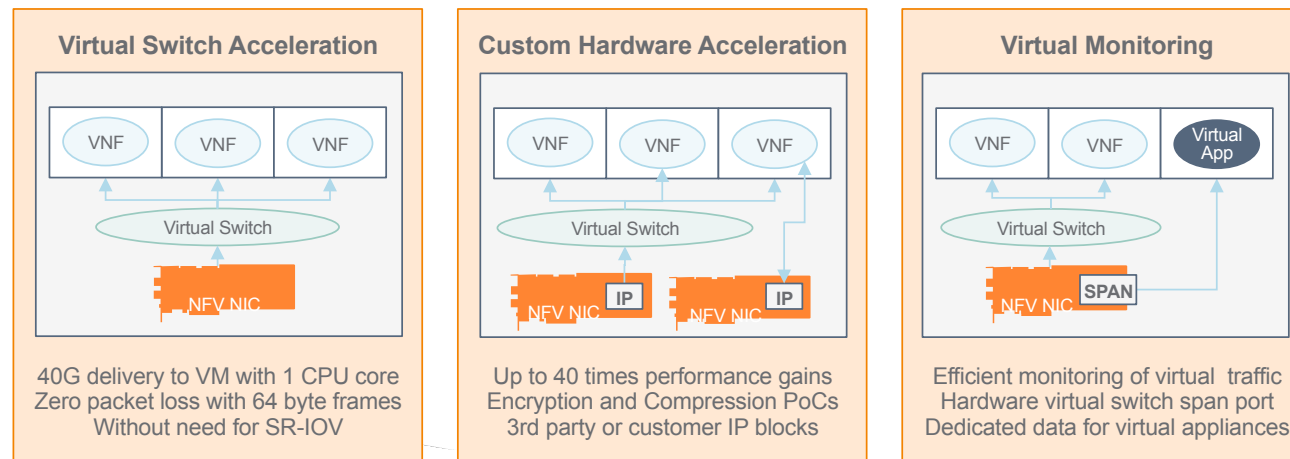200G capacity with zero packet loss

50 to 100 microsecond latency

Designed for re-configurability

Remotely update speed and capabilities

Minimal downtime with fallback assurance

10G
25G
50G
40G
100G

VIRTEX®
UltraSCALE

Powered by Xilinx VIRTEX UltraSCALE

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Napatech NFV NIC supports
Automated NFV Infrastructure solutions

Virtual Switch Acceleration

VNF   VNF   VNF

Virtual Switch

NFV NIC

40G delivery to VM with 1 CPU core
Zero packet loss with 64 byte frames
Without need for SR-IOV

Custom Hardware Acceleration

VNF   VNF   VNF

Virtual Switch

NFV NIC **IP**   NFV NIC **IP**

Up to 40 times performance gains
Encryption and Compression PoCs
3rd party or customer IP blocks

Virtual Monitoring

VNF   VNF   Virtual App

Virtual Switch

NFV NIC **SPAN**

Efficient monitoring of virtual traffic
Hardware virtual switch span port
Dedicated data for virtual appliances

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