SDN and NFV
Stepping Stones to the Telco Cloud

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The Evolution of SDN and NFV
The technology journey: convergence of the SDN & NFV stages

- **NFV phase 0**: Decouple
- **NFV phase 1**: Virtualize
- **NFV & SDN phase 2**: Cloudify
- **NFV & SDN phase 3**: Decompose
- **SDN phase 0**: Decouple
- **SDN phase 1**: Interconnect

**Need to accelerate the convergence**

- We are starting to cloudify in NFV
- We are starting to interconnect in SDN
Realizing the full business benefits of NFV using SDN

- Proprietary hardware network function
- Dumb physical pipes

- Solutions based on virtualized network functions
- Dumb virtual pipes

- Distributed solution based on flexible VNF deployments
  - Programmable Network Infrastructure
  - Smart virtual network infrastructure

VNF A1 + VNF A2 + VNF B1 + VNF B2 + VNF C1 + VNF D1
SDN for NFV

Flexibility
- Apps
- Programmability of the network

Agility
- SDN Controller
- Dynamicity

Manageability
- Analytics

Scalability
- Controller federation

Loose coupling between the overlay and underlay
Fat vs. fit VNFs

**Thick/fat VNFs**
Virtual implementations of physical functions
- Complex multiservice configurations
- Integrated load balancing, high availability, AAA IF
- Scale in and out internal to VNF

**Drawbacks**
- Complex to implement, integrate, and test
- Elasticity is difficult to implement
- Slow rollouts, long time to revenue

**Thin/fit VNFs (apps)**
Single-service atomic network functions
- In-network load balancing, high availability
- Single interface to AAA
- Scaling by adding network function instances

**Advantages**
- Simple integration and testing
- Elasticity by simple integration with orchestration
- Fast rollouts, short time to revenue
The Business Value of SDN enabled NFV
**SDN enabled vGi-LAN solution**

**Challenges**
- All functions sized for peak
- Slow new service deployment
- Separate load balancers needed per function

**Advantages**
- No need to send all traffic through all devices – no overprovisioning
- Agility – add new services without affecting other services
Service agility with HPE ContexNet

Total: **139 days** for a New Service Launch with PMO

- **PMO**
  - About 1 month
  - About 1 month per service
  - About 15 days
  - About 15 days
  - About 20 days
  - About 45 days – could be complex and usually manual

- **ContexNet**
  - About 1 day per service (fewer decision makers needed)
  - About 5 days
  - About 15 days
  - About 2 days
  - About 20 days
  - About 1 day

New Service Launch

Total: **44 days** for a New Service Launch with ContexNet
SDN-enabled virtualized Gi LAN

What challenges does it address

- The need to optimize Gi LAN capacity utilization
- The need to be able to launch and try new services with minimal risks
- The need to offer highly personalized services

And how …

- NFV implementation enables matching capacity expansion to revenue growth
- SDN enables easy plug and play of new service functions into the Gi LAN and service path
- SDN enables policy integration to create scalable per user/per application traffic flows

HPE Carrier SDN solutions to optimize NFV implementations

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SDN-enabled mobile packet core

Challenges
Traffic growth pattern putting pressure on the gateway
- Increasing active/idle signaling load
- Increasing peak throughput load
Traffic composition changing
- Video upload & download increasing
- Emerging applications need lower latency and/or local only connectivity
  - “Private LTE” networks, IoT apps

Advantages
Independent scaling of user and control planes
Capability to break out traffic
vEPC split solutions

1. Simple split

- Core
  - Control Plane
  - User Plane
- Backhaul
- Edge
  - User Plane
- RAN

2. Distributed user plane APN-based local breakout

- Control Plane
- User Plane
- Gi-LAN

3. Per-flow selection between central and distributed Gi-LAN

- Control Plane
- User Plane
- Gi-LAN

- Specific APNs are broken locally to Mobile Edge
- Requires preconfiguration
- Dynamic handling of same APN traffic based on application context
SDN-enabled mobile packet core

Exploding EPC capacity
Unpredicted quality of experience
Latency-sensitive applications
Desire to develop two-sided business models

SGW/PGW control/user plane separation
Per-flow apportioning of user-plane instances
Distributed mobility management, processing, and service continuity
Policy integration, SFC, and capability exposure

What challenges does it address
And how …

HPE Carrier SDN solutions to optimize NFV implementations
The Evolution of SDN, NFV and Open Innovation
The evolution of SDN, NFV, & open innovation

How important is SDN to NFV?

Very important: 69%
Somewhat important: 30%
Not at all important: 1%

(Customer Survey 2015)
Open source and ecosystems – pathways to the Telco Cloud

**OPNFV Release Brahmaputra Overview**

- **Orchestration and Management**
  - Compute
  - Storage
  - Network
- **Virtual Network Functions**
  - Compute
  - Storage
  - Network
- **Data Plane Acceleration**
  - DPDK
  - ODP
- **Infrastructure**
  - Pharos Community Labs
  - OPNFV Bare Metal Labs

**HPE OpenNFV Ecosystem**

**Customer Engagements**

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**Partner Engagements**

- **Partners**
  - 70+ Application partners
  - 10 Technology partners
- **NEPs**
  - NEC
  - Samsung