NFV and Openstack

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ETSI NFV member: Steering Committee and Software Architecture co-chair
ATIS SDN-NFV member
Agenda

1- Definition de NFV ?

2- Specifications ETSI NFV & Use Cases

3- ETSI NFV, Openstack et OPNFV

4- HP Helion & Openstack
1- What is NFV: Network Function Virtualization

virtually network functions: from Home or Enterprise Gateway to Access/Core telecom network & Data centers

**Leverage IT virtualization techniques for telco functions**

- Use standard servers and storage
- Applicable to telco network functions
- Initiative from Tier 1 Operators & Vendors launched as a new Industry Specification Group (ISG) in ETSI

**Key Benefits**

- Reduced equipment costs
- Faster time to market
- Resource sharing
- Targeted service introduction
- More flexible, programmatic operations
ETSI NFV architecture & interfaces

http://www.etsi.org/technologies-clusters/technologies/nfv (open area)
http://portal.etsi.org/home.aspx (restricted area)
ETSI NFV – E2E Network Service with NFV

=> Compose VNF and PNF to create Network Services

End-to-end Network Service

VNF-FG Corresponding to Network Function Forwarding Graph

Virtualisation Layer

Compute/storage Infrastructure network

Physical link Logical link Virtualisation

End Point

NFVS

Hardware resources

VNF-FG-2

VNF-1

VNF-2A

VNF-2B

VNF-2C

VNF-3

=> Compose VNF and PNF to create Network Services
ETSI NFV Use Cases

- Large Telecom Networks
- Regulated
- Roaming Services

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- Growing data/video traffic
- Unpredictible peaks
- Enterprise SLAs
- Government security
- Emergency services
- etc
Use Case: 3GPP IMS MRF
Telco Grade Media Server Environment

The AS interfaces
- ISC **SIP** to invoke & control interactive multimedia apps
- Sh **Diameter** interface to HSS for subscriber profile
- Ro **Diameter** towards Online charging system
- Rf **Diameter** towards Offline charging system

The MRF interfaces
- Mr **SIP** for Media server control (Netann, etc.)
- Mb **RTP/RTCP** for media processing and interaction
- Cr **HTTP, HTTPS, VoiceXML, REST** for app interaction

Supports applications like IVR, Voice Mail, Voice-Video conference, ...
Includes multiple codecs support, real time transcoding ...
Ex#: IMS MSE/MRF modeling into VNF

The Multimedia Services Environment is decomposed into “VNF” or “VNFC”:

- The IMS MRF VNF that groups the MRB and the MRF (composite VNF) composed of MRF-C, MRF-P and MRF Storage VNFC
- The OCSEE Application server that includes a SIP AS function, a J2EE container, an internal WEB LB and a Reporting and Monitoring function, is it considered as VNFC (VNF Components)
- The SIP Load Balancer is aimed to load balance the incoming SIP Session towards several SIP AS instances. It’s a signalling function that supports the ISC IMS interface
- AS storage is an external storage for the AS data (SIP & WEB)
Ex#: IMS MRF VNF Descriptors (VNFD)

The IMS MRF VNFD includes the description of the MRF cluster:
- MRB network & application configuration
- MRF instances number
- MRF storage instances number
- Affinity rules
- Anti-affinity rules
- IP QoS network constraints for each vLAN (Bandwidth, Jitter, Delay, Packet Loss Tolerance)
- etc
**Ex#: Architecture & Lifecycle simplified**

**3GPP IMS MSE/MRF**

- **OSS**
  - 1- deploy new MRF
  - 2- read MRF Descriptor (XML file) & SW image

- **NFV Orchestrator**
  - 2- allocate resources
  - 3- deploy vMRF software
  - 4- manage lifecycle (scaling etc)

- **VIM (ex Openstack)**

- **Virtualization (ex KVM)**

- **HW (Compute, Storage, Networking)**

**Legend**

- HW (Compute, Storage, Networking)
- Virtualization (ex KVM)
- OSS (Operator Support System)
- NFV Management and Orchestration
- NFV Orchestrator
- NFV Service Catalog
- VNF Catalog
- VNF Instances
- NFV Resources
- NFV Orchestrator
- vMRF EM
- vMRF VNF Manager
- Virtualized Infrastructure Manager(s)
- OSS/BSS
- NFV VNF Manager
- NFVI
- VeEn-Vnfm
- VeNF-Vnfm
- Vn-Nf
- Nf-Vi
- Nfvo-Vi
- Nfvo-Vnfm
- Vnfm-Vi
- VN

**Steps**

1. **deploy new MRF**
2. **read MRF Descriptor (XML file) & SW image**
3. **allocate resources**
4. **deploy vMRF software**
5. **manage lifecycle (scaling etc)**

**Legend**

- HW (Compute, Storage, Networking)
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- Vnfm-Vi
- VN

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ETSI NFV SWA - VNF architecture

Virtual container
- 1 VNFC = 1 container
- virtualization container (not just hypervisor)

Scalability
- Scale in/out
- Scale up/down
- Autoscale, etc

VNF w/ single component

VNF w/ multiple components

non-parallelizable VNFC

parallelizable VNFC (min. and max. # of instances)

stateless VNFC

stateful VNFC

VNFC w/ externalized state
ETSI SWA - VNFC to VNFC Communications

An example of requirements

Scenario #1

- VNFC
- Hypervisor
- Host
- HW Switch
- CPU
- RAM

Scenario #2

- VNFC
- Hypervisor
- Host
- CPU
- RAM

Scenario #3

- VNFC
- vSwitch
- Hypervisor
- Host
- CPU
- RAM

Scenario #4

- VNFC
- eSwitch (SR-IOV)
- NIC
- Hypervisor
- CPU
- RAM

Scenario #5

- VNFC (DPDK)
- eSwitch (SR-IOV, DPDK)
- NIC
- Hypervisor
- CPU
- RAM

Scenario #6

- VNFC
- Hypervisor
- Host
- CPU
- RAM

Affinity

Affinity

SRIOV support

DPDK support

SRIOV support

Affinity

DPDK support

SRIOV support

Affinity
ETSI NFV Management & Orchestration

MANO

Execution reference points
Other reference points
Main NFV reference points
Multiple VIM & NW Controller

Key Highlights:

- VNFM & NFVO could be across multiple NFVI Domains, ie multiple VIM
- VIM could interface multiple Network Controllers
- NFVO could request a “WAN manager” to bridge 2 PoP, PoP1 & PoP2 via a WAN. Meaning NFVO not only interface with VIM but also with WAN manager
- VNFM does not interact with WAN manager, only to NFVO and VIM
- WAN can support PNF

Source: MANO GS
ETSI NFV INF – NFVI architecture & Interfaces
POC#6: Virtualized Mobile Network with Integrated DPI

Telefonica
Intel
Tieto
Qosmos
Wind River Systems
HP

vEPC and vDPI
Openstack
SDN
DPDK

=> Accelerated ETSI NFV in a multi-vendor environment

Demo
MWC’14
POC#15: Subscriber Aware Sgi/Gi-LAN Virtualization

Telenor
ConteXtream
SkyFire Networks
Guavus
Redhat
HP

SDN based service chaining
Across multi-Openstack domains

Demo
SDN world Congress
Oct’14
POC #23 - E2E Orchestration of Virtualized LTE Core-Network Functions
& SDN-based Dynamic Service Chaining of VNFs using VNF-FG

SKT
HP
Samsung
Telcoware

Multi-vendor Fully orchestrated & automated vEPC – vIMS on Openstack & SDN based infrastructure

Demo
SKT R&D Lab
SDN World Congress

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3- NFV and Openstack

example of requirements Nf-Vi, Vi-Vnfm, Nfvo-Vi

- Multi-hypervisor support
- Different virtualization model (ie docker, Linux)
- Support legacy, bare metal
- Support DPDK CPU, SRIOV NIC
- Expose NW load balancer and other functions
- Support HA , 5 9s
- Support Secure Boot , certification
- Support resource reservation (prior to instantiation)
- Map pCPU with vCPU (dedicated CPU – pinning)
- Support NUMA placement (memory access perf)
- Expose localization of resources
- Expose resource catalog
- Expose resource metrics
- Release backward compatible
- Rollback
- etc
NFV & OpenStack ?? Ex Security

Many blocks interact with Keystone
Keystone is not the only entity that deals with security
Keystone deals with security & policies, but NFV will need end to end security & policies across end to end network, at ?NFVO level : how to synchronize? etc

? How can I ensure there is no security breach in 1.7M lines ?
? How does Openstack prevent back doors ?
? How does Openstack support secure boot, certified VM?
? How can I define security rules for an SDN application to change a flow table on an SDN switch that is provided by a IaaS Provider that may change along the life of the service ?
? How can I ensure that the memory I am sharing will not be accessed by somebody else ?
? Can I present the system admin to access my personal data etc
ETSI NFV and Openstack

ETSI NFV

Telecom Large WW community
Specs ETSI NFV
Scope: Telco Cloud (ie Openstack) + VNF + VNF & NS Orchestration
POCs
⇒ Gap Analysis with SDO and Opensource “Liaison”

Cloud Large WW community
Opensource Code
Scope: Enterprise Cloud

⇒ Many “Liaison”
OPNFV
Open Platform For NFV – www.opnfv.org
Launched Sept 30th, 2014
Chairman: Prodip Sen, HP

Work with upstream SDO (ETSI NFV) and Opensource (Openstack, OpenDaylight, KVM, Xen etc)
HP OpenNFV PR in Feb’14: a new BU, new Products and OpenNFV Labs

OSS Layer
- Full OSS Suite from basic fault to service level management based on IMC & SiteScope

VNF Layer
- HP vHSS, vMRF, vSR and other key Network related Services Software available for virtualized environment deployment
- An ecosystem of partners

NFVI Layer
- Broader Hardware Support for high performance packet processing
- Hardware/Software features integrated for high speed packet processing (SR-IOV support in OneView/CS8)
- Native SDN Support with all HP Networking portfolio
- Common Networking Environment for Networking using Comware7 stack

MANO Layer
- HP NFV Director: ETSI Based NFV Orchestrator for full life-cycle management
- HP Helion OpenStack provides necessary OpenStack API support for NFV, and a carrier grade cloud management functionality
- HP SDN Controller
- Converged Infrastructure Management using a single tool – OneView

OSS Layer
[Diagram showing layers and components]
HP NFV Director

ETSI NFV Orchestrator with embedded VNF Manager

Model Driven vs Script Driven
A common point to ensure consistent management and behavior of VNFs and NSs
- Automatically manages the end-to-end service across VNF, VNF-FGs, and NSs
- Supports multiple VNF across multiple sites
- Handles provisioning and monitoring functions

Designed to meet the evolving ETSI specifications
- Full NFV orchestrator functionality, interfaces, and interaction models
- Includes VNF manager functionality and works with external (VNF-supplied) VNF managers

Supporting the journey to NFV
- Handles virtual and physical network functions and hybrid services
- Supports networks consisting of traditional and SDN domains

Open and multivendor
- Supports integration with any VNF, VIM, and OSS using open APIs

Modular and extensible
- Start small and grow
- Flexible integration with OSS, EMS, VNF, and infrastructure
HP contributions to OpenStack®

- Board member: Eileen Evans, VP Opensource
- 3 technical committee member: Monty Taylor, Sean Dague and Devananda van der Veen
- Number #1 contributor by number of employees to Havana release, and second to Icehouse
- Number #2 in number of commits for Havana & Icehouse
- Incl Continuous integration, testing, and deployment lead of OpenStack commits
- & Openstack developer infrastructure, dashboard, bare metal provisioning, open integration suite, quality assurance, database as a service, etc

Some other Examples ...
HP NFV Management Software Stack

NS Orchestrator (fulfillment & assurance)  VIM Adaptor  VNF Manager (embedded)  Global Resource Orchestrator  WIM adapter  VNF adapter

Horizon-based (Self-service portal)

Horizon-based (Self-service portal)

REST APIs

HP Helion OpenStack

REST APIs

http://api.openstack.org/api-ref.html

HP OneView

REST APIs & Message Bus

Oss-Ma

Virtualized Platform Admin

NFV Tenant

Infrastructure Management

Workload Specific Management

Physical Infrastructure Provider

NS Orchestrator

VIM

VNF Manager

Global Resource Orchestrator

WIM adapter

VNF adapter

Cinder (Storage)

Image

Flavors

Networks

HP OneView driver

Image

Ironic

Neutron (Network)

HP OneView driver

Volume Types

Glance

Nova

OS

HW

Networks

Conn.

Pools

Volumes

Connections

Pools

Pools

Pools

Net Svcs

Resource Manager

Resource Manager

Resource Manager

Resource Manager

Resource Manager

RESTful APIs to Foundation Services

Power, Cooling

Storage Arrays

Image Storage

Servers, Enclosures

Edge Switches LAN, SAN

HPN Network Devices
Summary

Network Function Virtualization (NFV) is driving CSP requirements towards Openstack Via ETSI NFV specifications and OPNFV open source project

HP is heavily involved and leading governance and contributions in ETSI NFV and other SDO, as well as Opensource community incl Openstack, OpenDaylight and OPNFV

HP is committed to NFV and Openstack, with HP OpenNFV and HP Helion Openstack for public, private, hybrid and NFV cloud
Thank You

More on www.hp.com/go/nfv