Accelerate OpenStack*
Together

*OpenStack is a registered trademark of the OpenStack Foundation
Software Defined Infrastructure – A Gateway to Faster Innovation & Lower Costs

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Agenda

• Architectural Transformation
• Software Defined Infrastructure (SDI) Vision
• Overview of the ETSI-NFV reference architecture
• Challenges & Opportunities presented by SDI & NFV use cases
• Share thoughts on how you can get involved in this exciting new space.
Software Defined Infrastructure (SDI) Vision

SDI benefits the User / Infrastructure owner by enabling faster innovation and lower cost

Efficient SDI requires Application ⇔ Infrastructure interaction

Abstractions allow finer granularity in pooling Network, Storage and Compute elements

Orchestration optimally allocates resources matching App requirements to Infrastructure capabilities

Policy based provisioning
Dynamic Automation
App/SLA mapping to underlying Infrastructure
Architectural Transformation

Single Application on Dedicated Hardware

- Firewall
- BRAS
- Intrusion Detection System

TEM/OEM Proprietary OS
ASIC, DSP, FPGA, ASSP

SDN/NFV

- Firewall App
- BRAS App
- CPE App
- DPI App
- PDG App

SDN/NFV Infrastructure

- x86 CPU
- NIC Silicon
- Chipset Acceleration
- Switch Silicon
- Linux

OpenStack Summit, Paris, Nov. 3-7, 2014
European Telecommunications Standards Institute
Network Functions Virtualisation (NFV)

OSS: Operations Support Systems
BSS: Business Support Systems
VNF: Virtual Network Function
EMS: Element Management System
VIM: Virtualised Infrastructure Manager
NFVI: Network Functions Virtualisation Infrastructure

OpenStack™ ≈ VIM

Figure from ETSI-NFV GS NFV 002 v1.1.1
http://www.etsi.org/deliver/etsi_gs/nfv/001_099/002/01.01.01_60/gs_nfv002v010101p.pdf
SDI & NFV: A Powerful Force for Network Transformation

- SDI is a holistic view of the VIM, the network controller and the NVFI (Compute, Network and Storage Infrastructure)
- SDI underpins applications such as NFV.
Multiple Related SDI Open Source & Standards Development Activities

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<td>OpenDaylight Open Source Controller Consortium</td>
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<td>Network Function Virtualisation</td>
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<td>Open Networking Foundation</td>
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Communities will need to collaborate openly to move the market forward

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Open Source Reference Architecture for SDN/NFV

Common VIM and Control layers

OpenStack

Enhancements

Open Daylight

OVSDB

Open Flow

Other

Cloud/Data Centre

App

App

App

DPDK based vSwitches

Linux*/KVM

Intel® ONP Server

New use cases bring new requirements for collaborate with the community

Telco + ETSI/NFV mapping

OSS/BSS

Service Orcheduler

VNF Manager

EMS

Telco Data Centre

vRouter

vFW

vIPS

DPDK based vSwitches

Linux*/KVM

Intel® ONP Server

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Challenges & Opportunities Ahead
SDI Reference Stack: Capabilities and Challenges

OpenStack*, OpenDaylight, Open vSwitch and the Intel® Architecture Server

Many existing / emerging mechanisms

- Network Virtualization
- Overlays
- L4-L7 vAppliances
- Service Function Chaining (SFC)

Additional network mechanisms

- Deployment of Network Appliances as Infrastructure Services
- Unified Scheduling for Network, Storage and Compute
- User/Application awareness
- SLA and Policy support

OpenStack

Network Policy/SLA Definition

Policy/SLA Definition

Open Daylight

Policy/SLA Enforcement

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vSwitch Challenges... and Opportunities

Growing Demands
- Increased East/West traffic
- Higher core density enables more VM co-location & Inter-VM traffic
- Network Security, Isolation, SLA
- Monitoring, visibility

Many implementations
- Varying features, performance and API

Performance
- Low, controlled latency
- Sufficient throughput
- Low CPU utilization

Vanilla Open vSwitch small packet performance may fall behind NFV applications needs
Data Plane Development Kit (www.dpdk.org)

Optimized software libraries and drivers for accelerating packet processing

1: Intel internal estimate
2: Intel Internal measurement of packet processing performance using Intel Xeon processors. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to intel.com/performance
DPDK Enabling Requires Enhance Platform Awareness

- NUMA Awareness
- CPU Pinning
- Huge Pages
- SR-IOV

Server

Processor
Socket 0

Processor
Socket 1

Application Process

Application Process

Application Process

Application Process

Optimising placement for platform resources enables greater performance & efficiency
DPDK Enabling Requires Enhance Platform Awareness

- NUMA Awareness
- CPU Pinning
- Huge Pages
- SR-IOV

Co-location helps with cache efficiency for faster inter-process data sharing & communication.
Data Plane Development Kit (DPDK) Based vSwitches

OpenStack needs to be able to configure high performance I/O paths to the VM
One cloud – all workloads – all industries

Cloud Transformation Partner

- Path to NFV
- OSS/BSS Modernization
- New cloud revenues

NFV Full Application Stacks

- Media & OSS/BSS Differentiation
- Cloud for Enterprise

Cloud Infrastructure Governance & Security

Cloud Infrastructure Automation

Software Defined Networking

End to End Infrastructure
[ Storage + Compute + Network ]

Data Center
AN NFV Transformation has started

Yesterday
- Optimized VNF configuration Build
  - APP
  - H/W
- Firewall
- BRAS

Today
- OpenStack
  - APP
  - Virtualization Layer
  - H/W

NFV | Openstack | ODL Transformation

- OSS/BSS
- PaaS
- Cloud IaaS Mgmt
  - Compute
  - Network
  - Storage
  - Virtualisation Layer
  - Physical Infrastructure
- Access Virtual Gateways
- Aggregation
- Transport SDN/NFV
- Virtual Edge Services
Provision & Configuration of VNF’s

VNF

APP
APP
APP

Network
Compute
Storage

PaaS
Policy/Security/Governance

Openstack NBI API’s

Neutron
Nova
Cinder
Glance
Swift

Service Catalog

VNF
OVF
NSD

Attributes for NFV config and expose via API

VNF Additional Requirements

VLAN Trunk
PCI Device Capability
Firmware validation
Local storage
QoS

Security
CPU Pinning
NUMA Topology
Network Anti-Affinity

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Scheduling is ....

Information Exposed to make “Intelligent fine grain placement decisions”

- Onboard Storage
- PCI_Device_Type
- Network Based Anti-Affinity
- High Performance vSwitch
- Link_Type
- CPU Pinning
- NUMA Awareness
- Feature .......

...placing an application in the Cloud based on the constraints to handle my app to meet my SLA

Host 1
- Chipset Acceleration
- CPU IvyBridge
- PCI_Type X

Host 2
- SSD
- CPU Haswell
- PCI_Type E

Host - N
- Host Red Hat
- Atom
- PCI_Type Z

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NFV Made Easy...

Policy Governance → PaaS → SLA

OpenStack API's

Scheduler

Host 1 → Host 2 (DPDK vSwitch SR-IOV) → Host 3 → Host -N

API Exposure

Cloud abstraction of requirements

Unified scheduling

Customer or Operator

OVF Package

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OPNFV Certification program

OPNFV certification program will not be for certain vendors only, but for the industry.

OPNFV certification program will certify vendors for compliance to ETSI/NFV standards and OPNFV reference architecture, validate multi-vendor compliance, full-stack interoperability, and assess and benchmark performance.
to disrupt markets by accelerating the SPEED of business without losing control
Policy Governed Platform-As-A-Service
How you can get involved in this exciting new space?
Collaborate in Open Source and SDOs to enable the SDI vision by supporting/contributing to:

- APIs and Information Models extended to support use cases
- Automated configuration for enhanced Server and vSwitch performance
- Unified scheduler enhancements for optimal placement across Compute, Network & Storage domains
- Policy driven infrastructure with SLA enforcement at the server
Future OvS Directions...
Policy controlled SR-IOV + Open Daylight + OpenStack*

Optimize the Server Data Plane for Network and Storage workloads
Software and Hardware combination for optimized flexibility and performance

*Intel® DPDK
OpenStack Summit, Paris, Nov. 3-7, 2014

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For more information, visit http://www.intel.com/go/virtualization