Challenges and Best practices for Deploying NFV & SDN
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RED HAT: THE WORLD’S LEADING PROVIDER OF OPEN SOURCE, ENTERPRISE I.T. SOLUTIONS

MORE THAN 90% of the FORTUNE 500 use RED HAT PRODUCTS & SOLUTIONS*

~11,000 EMPLOYEES

S&P 500 COMPANY

THE FIRST $2 BILLION OPEN SOURCE COMPANY IN THE WORLD

85 OFFICES

35 COUNTRIES

NYSE RHT

Leading contributor across all the key open source community projects – Linux, KVM, OpenStack, Kubernetes, etc

*Red Hat client data and Fortune 500 list, 2015
HORIZONTAL PLATFORM WITH A SINGLE, INTEGRATED INFRASTRUCTURE

From Access, to Edge to Core, Common infrastructure is an imperative!
Agenda

1. Reminder Why NFV & SDN and Current Status
2. Challenges in deploying NFV & SDN
3. Overcoming the challenges - best practices in deploying NFV & SDN
4. The Red Hat Approach and Success Stories
5. Q & A / Open Discussions
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NFV or **Network Functions Virtualization**:  
- Decoupling of network functions from underlying physical network infrastructure  
- Move of traditional network functions usually deployed in proprietary hardware to software running in virtual machines (VM) on general-purpose hardware and cloud infrastructure
SDN

**Old world** – closed, proprietary HW, monolithic switches/routers

Split the Control plane from Data Plane

- Commodity silicon
- Admin simplicity
- Hyper scalability
- Agility
Why Cloud and NFV/SDN
It’s because of Digital Transformation

- Increased efficiency and Lower Costs
  - Lower Capex and Opex
- Faster innovation and Time to market
- Less Complexity
- Agility - Automation & change faster
- No Vendor Lock-in

NFV and SDN are independent of each other but very complementary
Example of the benefits of Cloud and NFV/SDN

- **Faster time to Market**
  - Leverage trends quicker

- **Agility & Faster Time to Service**
  - Code to production launch

- **Efficiency & Lower Expenses**
  - Servers managed per admin

- **Reduce Operational Complexity**
  - # of SKUs to manage

- **NaaS: GoLive in months, activate new customer in minutes**

- **Traditional Telco Service: GoLive with new service in Years, activate new enterprise customer in months**

- **Amazon: Few seconds**
  - Every 11 seconds; Avg 10K or max 30K servers at a time using continuous integration & deployment

- **Traditional Telco or Enterprise: 6-7 Months**
  - Traditional Telco’s quote: Make a change “6-7 months per service; mostly manually”

- **Google: 1 per 15,000 srvrs**
  - Each admin can operate ~15,000 servers

- **Traditional Telco or Enterprise: < 100**
  - Operator DC: Each admin can manage up to ~100 servers → large headcount

- **Google: 10 Configs**
  - Google: ~10 shared hardware system bundles

- **Traditional Telco or Enterprise: 1,000’s**
  - NSN: 1000’s of SKUs to manage → makes it overly complex, more errors
Current status of NFV
NFV and SDN market will grow significantly over the next few years. Become part of it and don’t get left behind.

Source: IHS Infonetics SDN & NFV Intelligence Service; 1H 2016
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Challenges in deploying NFV & SDN

**Do-It-Yourself (DIY)**
- Lack of System Integration expertise
- Projects vs Products

**SkillSet**
- Linux, Cloud SW (OpenStack, Storage, SDN)
- OpenSource, DevOps

**Business Case**
- Are you bought into Digital Transformation?
- Can you prove Cost Savings, new services with faster TTM?

**Product, Operational and SLA challenges**
- Lifecycle management, Onboarding, Standards
Problems and issues holding back commercial NFV deployment

Custom work and “hand holding” required

- Products not mature or carrier grade: 76%
- Integrating NFV into our existing networks: 52%
- Lack of knowledge/experience: 39%
- Incomplete standards: 33%
- Unclear or hard to calculate TCO/ROI: 18%
- Cost: 15%
- OSS/BSS: 9%
- Security: 6%
- Other--licensing models: 3%

Source: IHS Markit 2017 Carrier NFV Strategies
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Overcoming the Challenges of deploying NFV & SDN
Best practices

Training
• On processes and technologies- x86, Linux, Virtualization & OpenStack

Open Source
• Community-based Open Source, no vendor lock-in

Hardened products
• Co-engineered, tested, validated and supported

Telco-scale Optimized
• Reliability, Availability, Manageability, Performance, Security

Integrated Cloud
• Best of breed NFVI, VNFs with common Mgmt, support, SLA
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Red Hat NFV Strategy

Community:
Upstream first innovation

Product:
Unified fabric for NFV and IT

Partners:
Choice via certified ecosystem
Upstream First, From Communities To Enterprise

Contrail is provided by Juniper, all other products are from Red Hat.
Red Hat is the largest contributor to **OpenStack** by far (Queens)

Red Hat is the 2nd largest contributor to **Kubernetes**

Red Hat is the largest contributor to **OpenShift** by far

Red Hat is the largest contributor to **Ceph** by far

These are on top of being the largest contributor to Linux and KVM
Integrated product for Cloud/SDN & NFV

• **Product Approach with upstream first**, instead of Customized solution (Introduce NFV features into existing product portfolio instead of creating a dedicated Solution)

• **Single Provider** for Linux, KVM, OpenStack, OpenShift
  – Ease of Deployment and lifecycle management (RHEL-OSP Director)
  – Linux + Virtualization + OpenStack packaging + Containers + OpenShift

• **Vast Hardware support and partner ecosystem** - inherits Red Hat Enterprise Linux certified HW catalog + OpenStack partners
OpenShift + 3rd party SDN such as Juniper Contrail

Contrail replaces native OpenShift SDN

source: www.redhat.com
OpenStack/VM + 3rd party SDN such as Juniper Contrail
RHOST support for Network Functions Virtualization (NFV) is evolving to meet the carrier-grade workload requirements of service providers.
Key OpenStack NFV Features

- Platform awareness
  - CPU Pinning
  - Huge Pages
  - NUMA-aware Scheduling
    - Memory binding
    - I/O device locality
- Enhanced packet processing
  - SR-IOV and PCI Passthrough
  - OVS-DPDK (or vRouter-DPDK w/ Contrail)
  - vhost-user and virtio performance improvements
CPU Pinning

• `vcpu_pin_set = 0,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19`
• `reserved_host_memory_mb = 1024`
• `hw:cpu_policy = shared | dedicated`
• `Host_aggregates` is used to separate hosts for CPU pinning
Numa Awareness

Without NUMA Awareness

With NUMA Awareness
10 kilo foot view

See [http://www.dpdk.org/](http://www.dpdk.org/) for excellent documentation, and of course, code!

while (1) {
    RX-packet()
    forward-packet()
}

- Implementing RX/TX-packet in userland == implement a userland driver
  - PMD driver, aka Poll Mode Driver (active loop)
  - Two first implemented drivers: Intel 82599 and Intel 82576
  - Other PMD now available: virtIO and non Intel NICs (Mellanox, Broadcom, Chelsio, ...)
- DPDK is now ported on non Intel CPUs (ARM, ...)
OSP Director

OPENSTACK ORCHESTRATION

PLANNING
- Network topology
- Service parameters
- Resource capacity

DEPLOYMENT
- Deployment orchestration
- Service configuration
- Sanity checks

OPERATION
- Updates and upgrades
- Scaling up and down
- Change management
Juniper and Red Hat – Distributed Architecture for better performance

Cloud infrastructure with Contrail-augmented networking

VNFs

Deploy, Configure and Manage Node

Undercloud → overcloud

Undercloud → overcloud
# Red Hat’s NFV and SDN Partner Ecosystem

## Virtual Network Functions (VNFs)

- A10 Networks
- Altistart
- Cisco
- Ericsson
- Genband
- Juniper Networks
- Sandvine
- Affirmed
- Avi Networks
- Citrix
- F5
- Huawei
- Palo Alto Networks
- ZTE

## Software-Defined Networking Plugins

- Arista
- Cisco
- Juniper Networks
- NEC
- Big Switch Networks
- C-Plane Networks
- Lenovo
- Nuage Networks
- Mellanox
- IBM
- Nokia
- Brocade
- Midokura

## Software-Defined Storage Plugins

- Dell EMC
- Hitachi
- NetApp
- FreeStor
- Hitachi
- HUAWEI
- Nimble Storage
- Fujitsu
- IBM
- Tintri
- Genband
- Infinidat
- Violin Memory

## Hardware

- Cisco
- Fujitsu
- Hitachi
- IBM
- Intel
- Lenovo
- HUAWEI
- Infinidat
- Kaminario
- DELL EMC
- SevOne

## Management & Orchestration (MANO)

- Amdocs
- Nokia
- Talligent

## Service Assurance

- HP
- HUAWEI
- Infinidat
- Kaminario

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*We are the “Switzerland of NFV & SDN*"
Red Hat’s Telco OpenStack Production Reference Map*

* These number are only Telco, Over 500 Red Hat OpenStack customers in the Enterprise
Juniper and Red Hat - Better Together – Why We Win As One

Shared Vision
Simplify cloud adoption and operation, Offer advanced features to scale and monetize

Market Leadership
Market Leader in IaaS and PaaS + Most Deployed Commercial SDN

Open-source Commitment
Upstream First, Committed to developing, supporting, & promoting open source

Complementary Offerings
Red Hat OpenStack; Red Hat OpenShift; CloudForms + Contrail Networking; Contrail Cloud; AppFormix; vMX, vSRX

Integrated for Simplicity
Whether customers use Contrail Networking or Contrail Cloud they get the total backing of Red Hat!
# Joint Red Hat and Juniper Joint Wins

## Telco
- Orange Business Services EasyGo vCPE service with Orange’s portal (Contrail)
- Another Tier 1 Telco in Europe (Contrail)
- Tier 1 Telco in APAC (VNF)
- Tier 1 Telco in the Middle East (Contrail)

## Enterprise
- First Joint Win in SaaS / Gaming
- First Joint Win in large Enterprise and APAC

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*Non Public Reference*
**Case study: tier 1 telco – Orange EasyGo vCPE**

**Challenge**

Appliance based services inflexible and time consuming

Do not allow agility, speed and simplicity

Customers want instant access to new customized services

**Joint SDN/NFV Solution**

Replace appliance based services with virtualized services

Customer self-care portal to control network policies

Enable Network-as-a-Service

**Benefits**

Fast deployment and provisioning of new services in weeks

New customer activation in hours

Rapid delivery by process automation

Customized service chaining

“NFV technology will enable our services to evolve even further. It will bring us the capability to offer new services to our customers in a very agile and flexible way, and the capability to bring up new functionalities on our network very quickly, coming from multiple partners.”

*Pierre-Louis Biaggi, Head of the Network Solutions Business Unit, Orange Business Services*
● SDN and NFV are driving the digital transformation
● The many challenges in deploying SDN and NFV can be easily overcome
● Work with companies with the right Community, Product and Partners
● Start today, even if just a PoC - embrace digital transformation
● Red Hat and Juniper can help
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