Challenges and Best practices for Deploying NFV & SDN

Presenting at Juniper's NXTWORK 2017

Dec 12, 2017

Ali Kafel

Director of Business Development

@akafel

akafel@redhat.com

Guil Barros

Senior Principal Product Manager

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

85
OFFICES

35
COUNTRIES

S&P
500
COMPANY

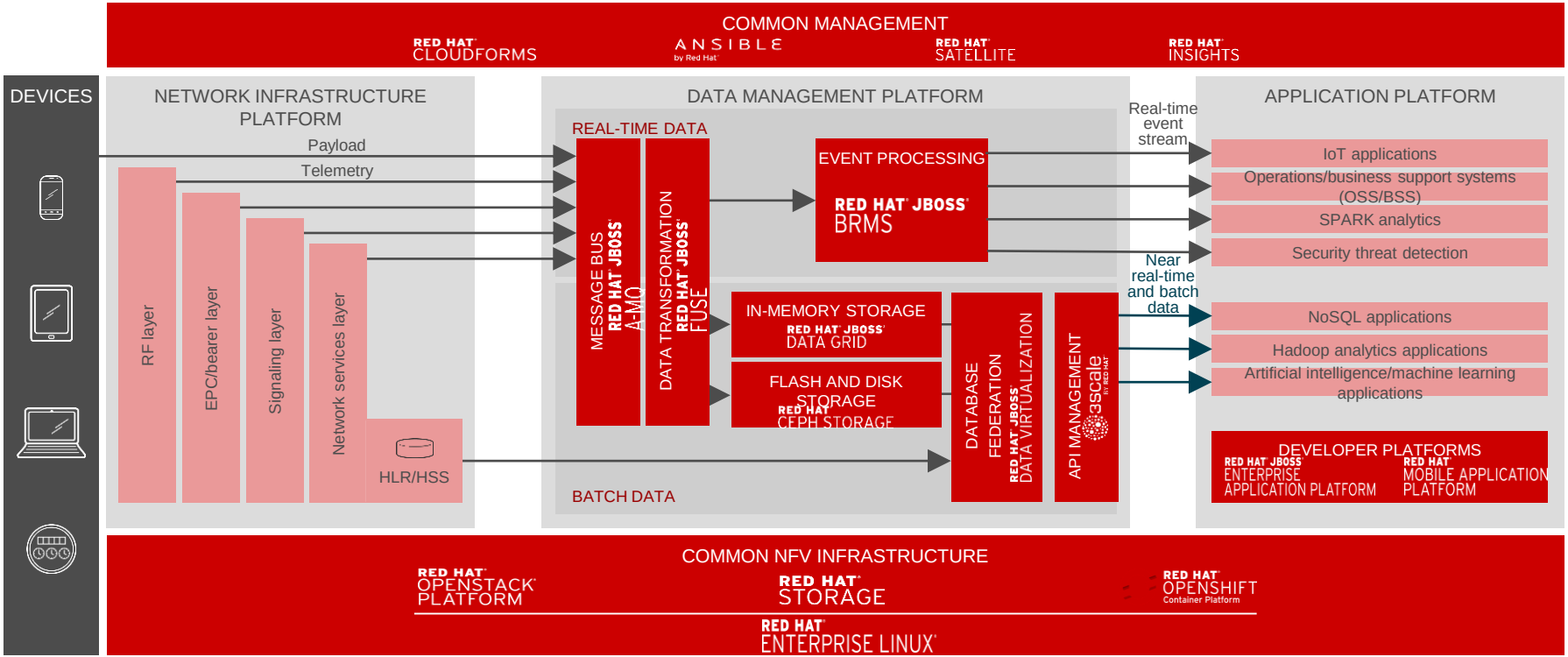
NYSE
RHT

THE FIRST
$2 BILLION
OPEN SOURCE COMPANY
IN THE WORLD

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!

redhat.

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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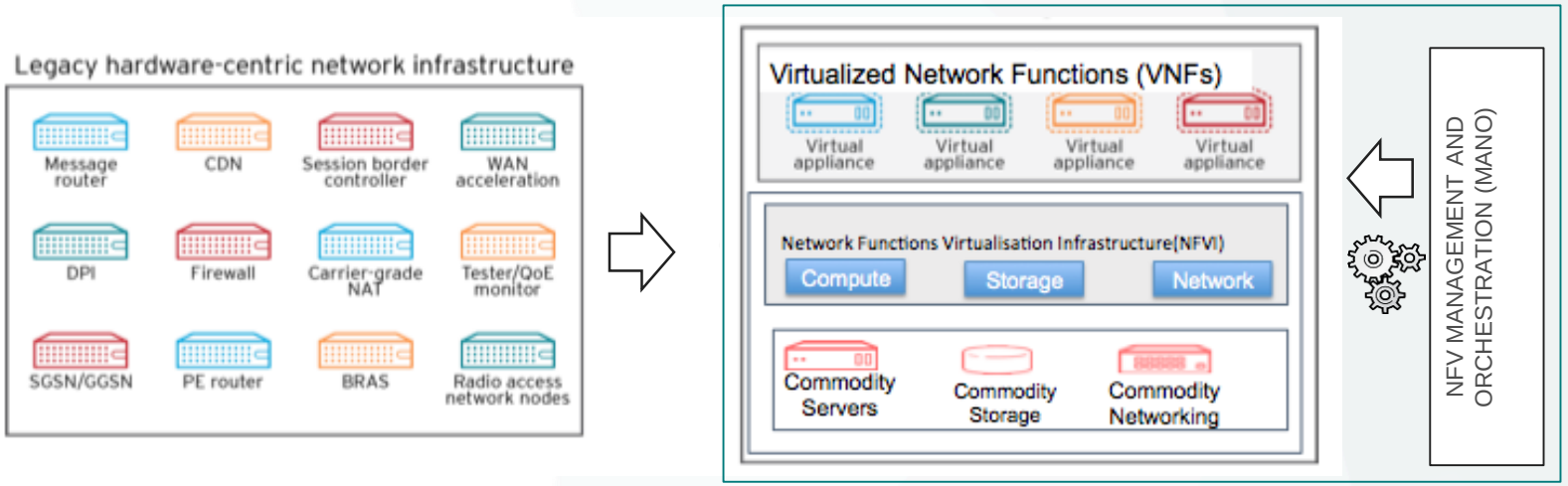
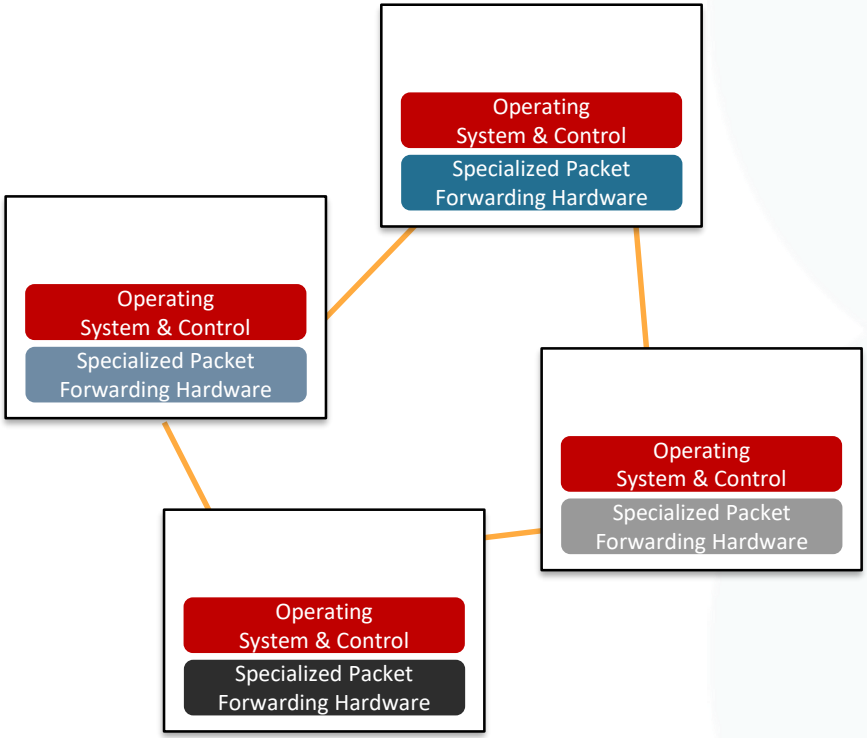
NFV or Network Functions Virtualization:

- 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



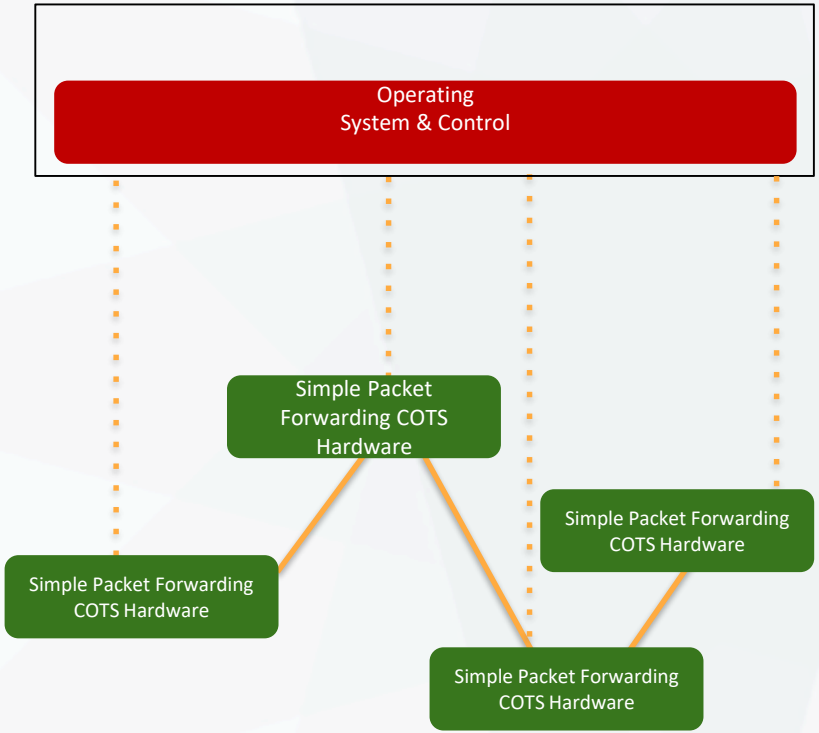
SDN

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

NaaS: GoLive in months, activate new customer in minutes

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

Agility & Faster Time to Service

Code to production launch

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"

Efficiency & Lower Expenses

Servers managed per admin

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

Reduce Operational Complexity

# of SKUs to manage

Google: 10 Configs

Google: ~10 shared hardware system bundles

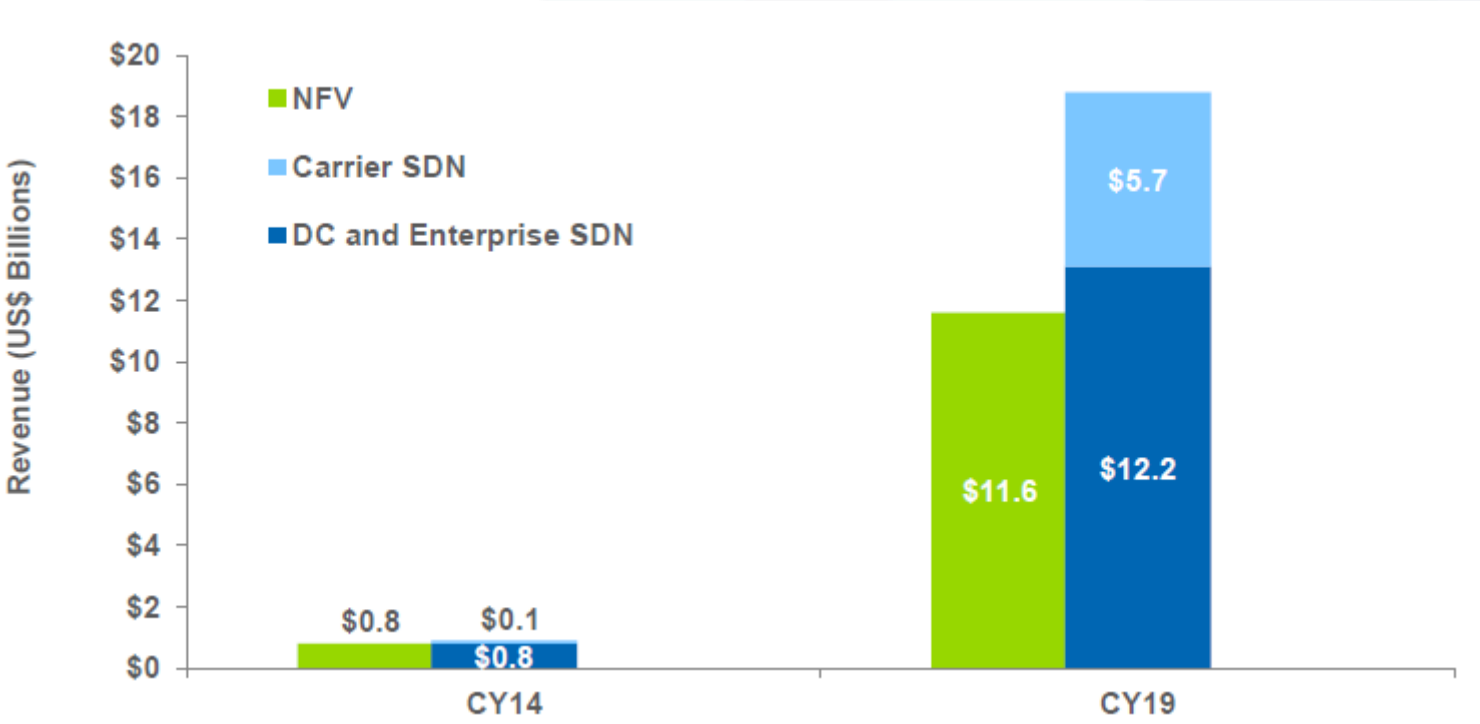
Traditional Telco or Enterprise: : 1,000's

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

redhat.

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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

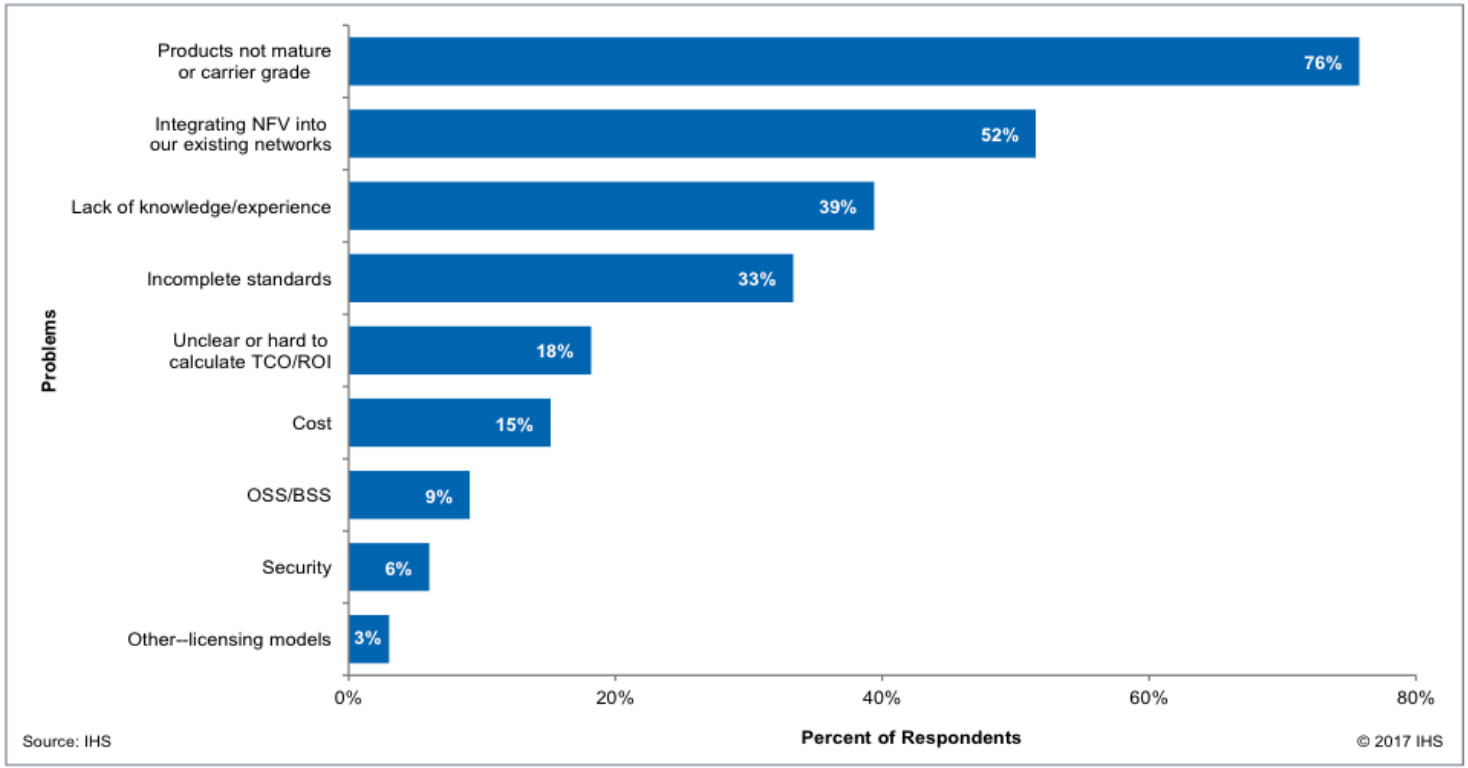
- Are you bought into Digital Transformation?
- Can you prove Cost Savings, new services with faster TTM?

Product, Operational and SLA challenges

- Lifecycle management, Onboarding, Standards

Problems and issues holding back commercial NFV deployment

Custom work and “hand holding” required



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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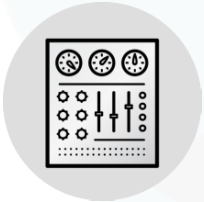
Red Hat NFV Strategy

Community

Upstream first innovation

Product

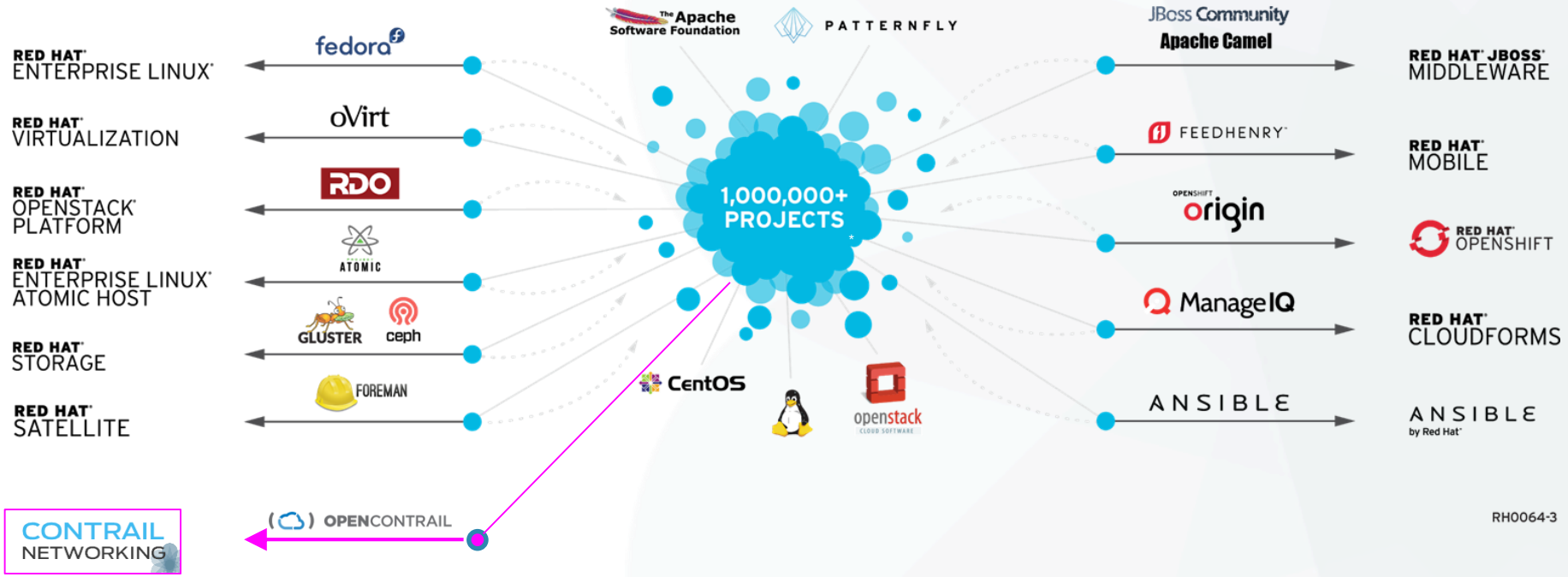


Unified fabric for NFV and IT

Partners

Choice via certified ecosystem

Upstream First, From Communities To Enterprise

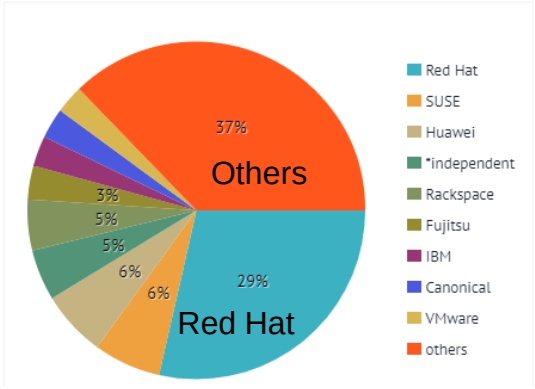


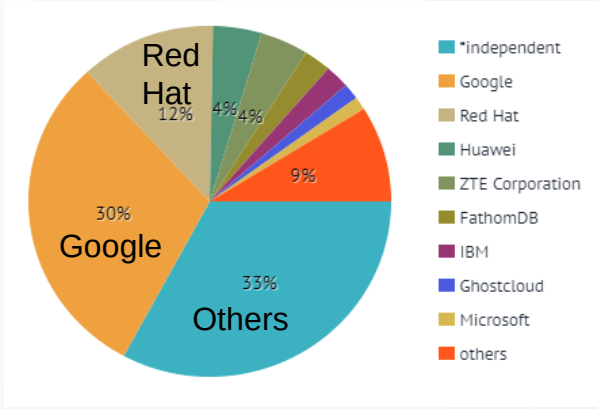
Contrail is provided by Juniper, all other products are from Red Hat

Community Strategy

Leadership through upstream contribution

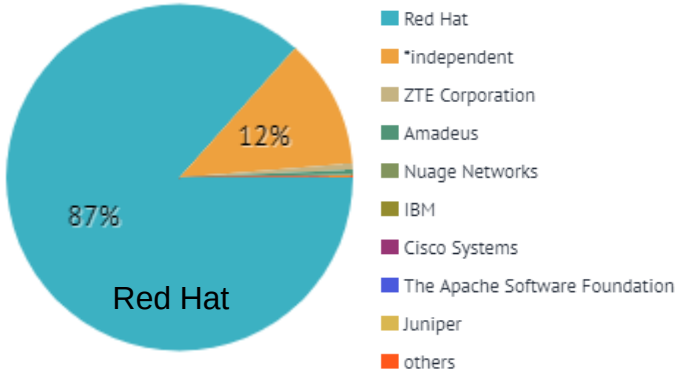
Red Hat is the largest contributor to **OpenStack** by far (Queens)

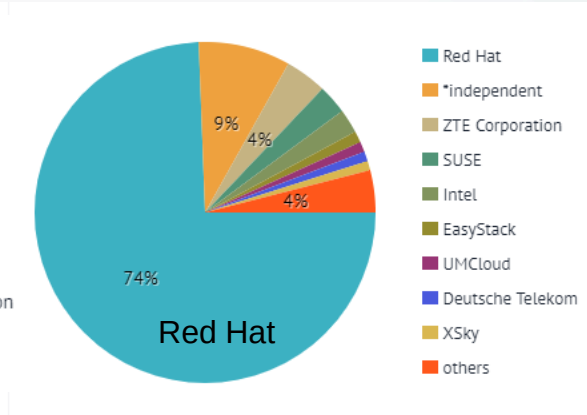




Red Hat is the 2nd largest contributor to **Kubernetes**

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

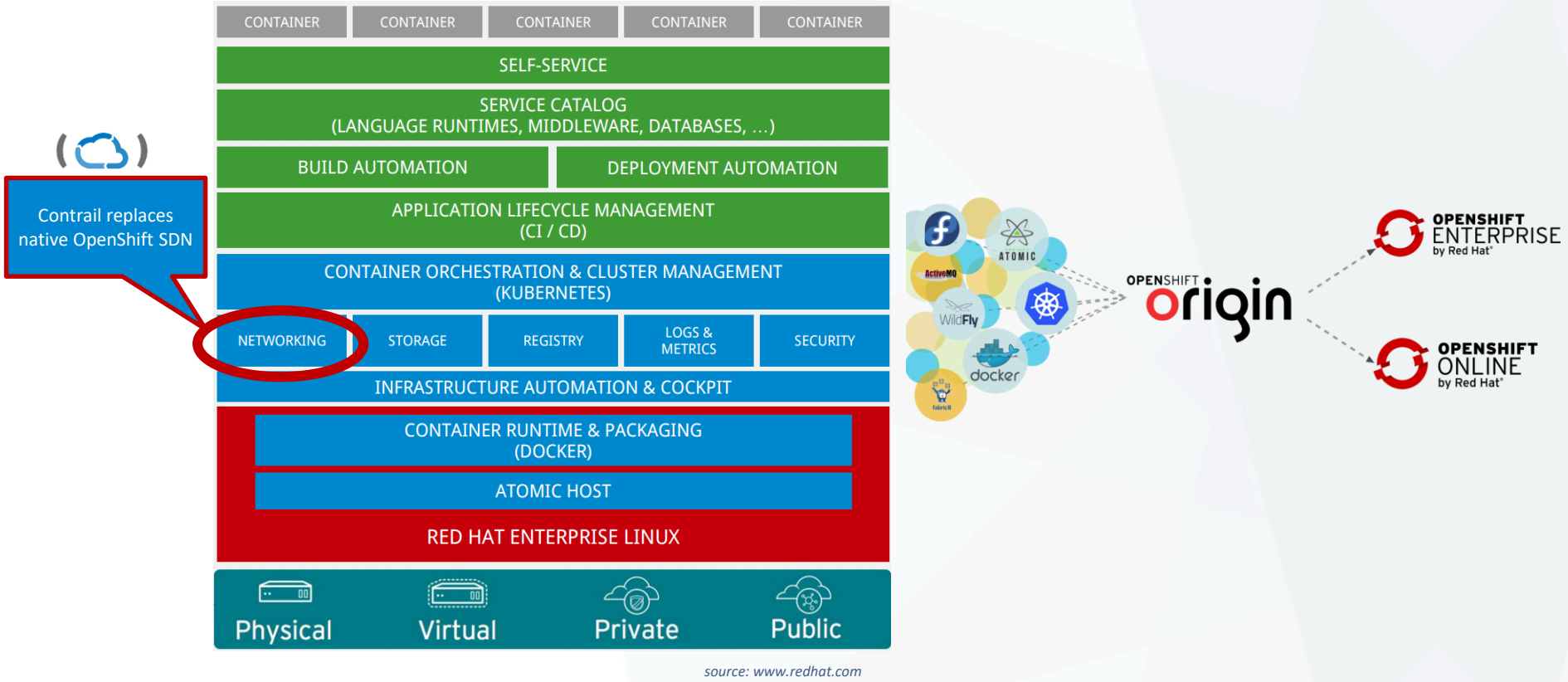
Integrated product for Cloud/SDN & NFV

- **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

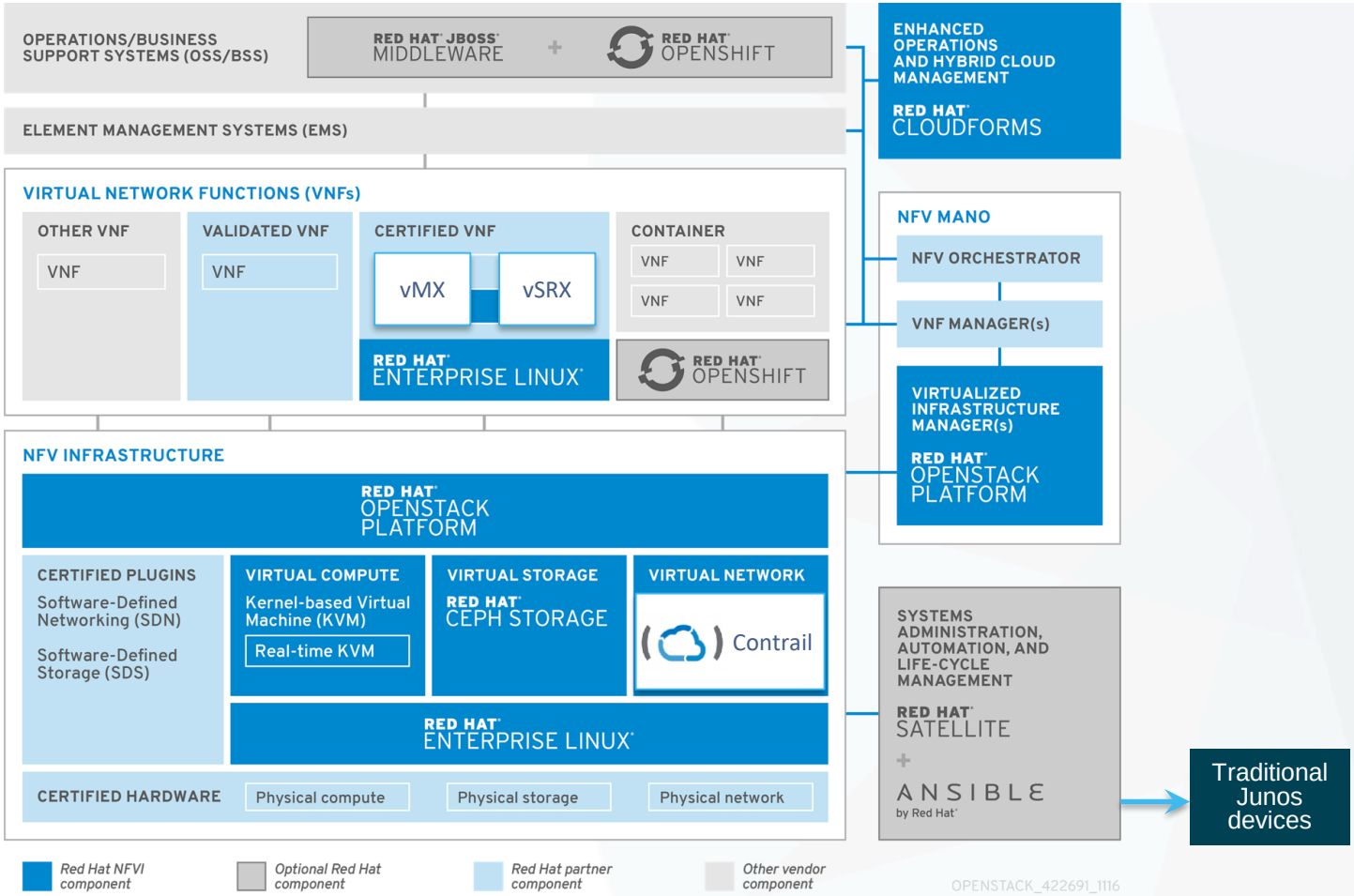
- **Vast Hardware support and partner ecosystem** - inherits Red Hat Enterprise Linux certified HW catalog + OpenStack partners

OpenShift + 3rd party SDN such as Juniper Contrail



source: www.redhat.com

OpenStack/VM + 3rd party SDN such as Juniper Contrail



Evolving RHOSP to meet the needs of carrier-grade workload requirements

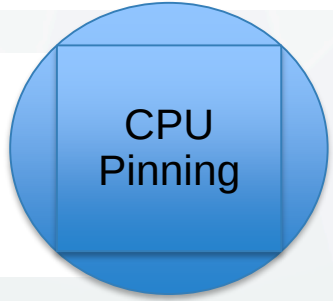
ADDRESSING THE NEED FOR NETWORK FUNCTIONS VIRTUALIZATION

RHOSP support for Network Functions Virtualization (NFV) is evolving to meet the carrier-grade workload requirements of service providers

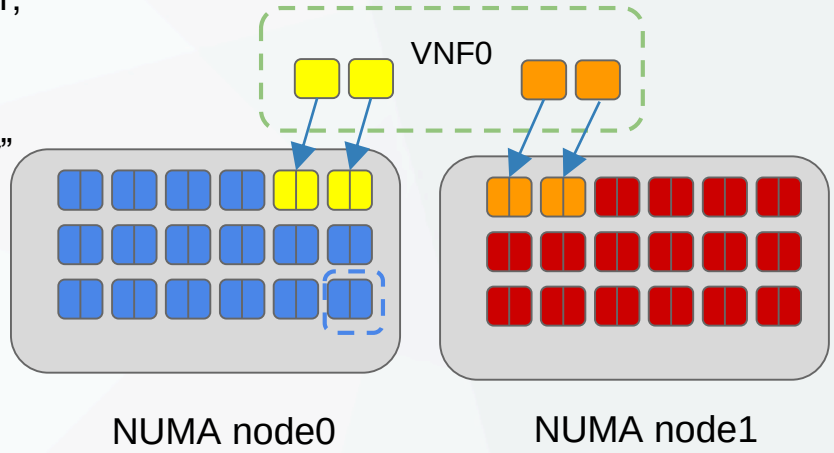
Key OpenStack NFV Features

- 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

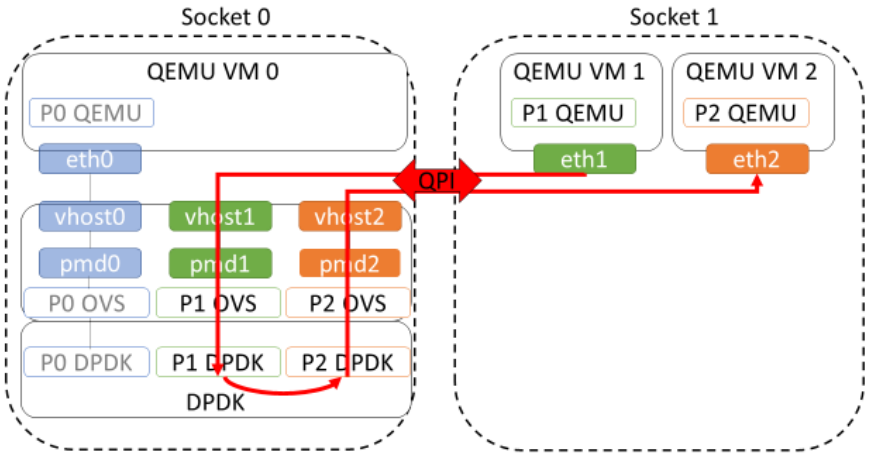
CPU Pinning

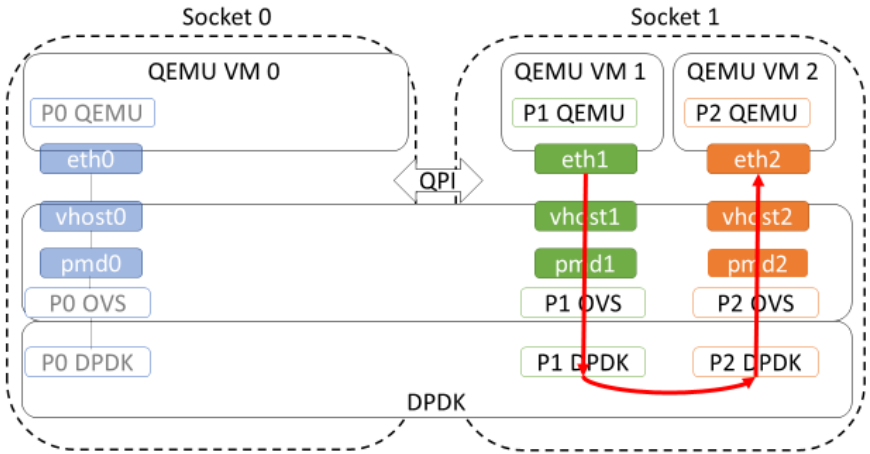


- vcpu_pin_set = 0,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19
- reserved_host_memory_mb = 1024
- NovaSchedulerDefaultFilters= “RamFilter, ComputeFilter, AvailabilityZoneFilter, ComputeCapabilitiesFilter, ImagePropertiesFilter, PciPassthroughFilter, NUMATopologyFilter, AggregateInstanceExtraSpecsFilter”
- 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/ for excellent documentation, and of course, code!

== ACTIVE LOOP ==

```
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

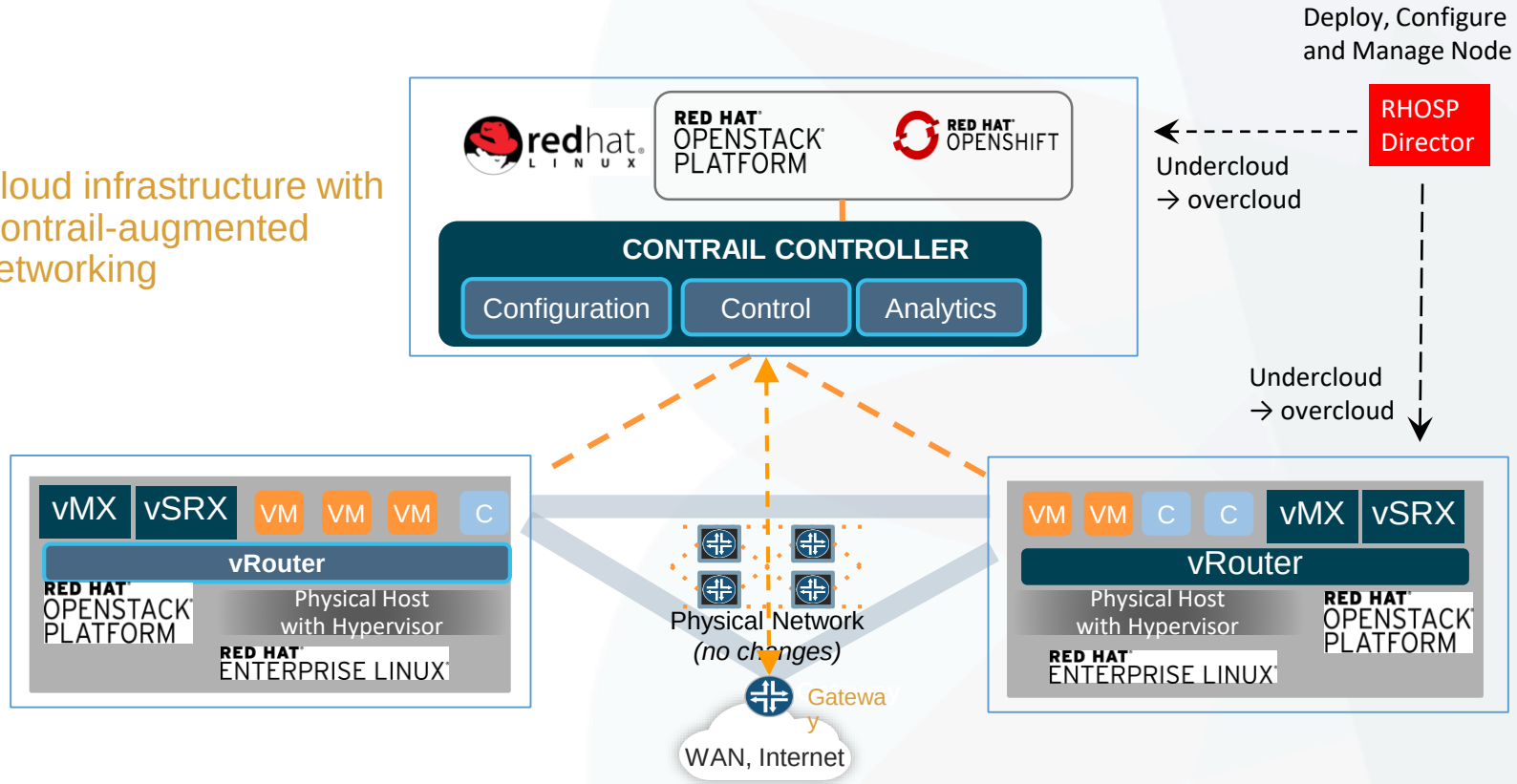
- Deployment orchestration
- Service configuration
- Sanity checks

OPERATIONS

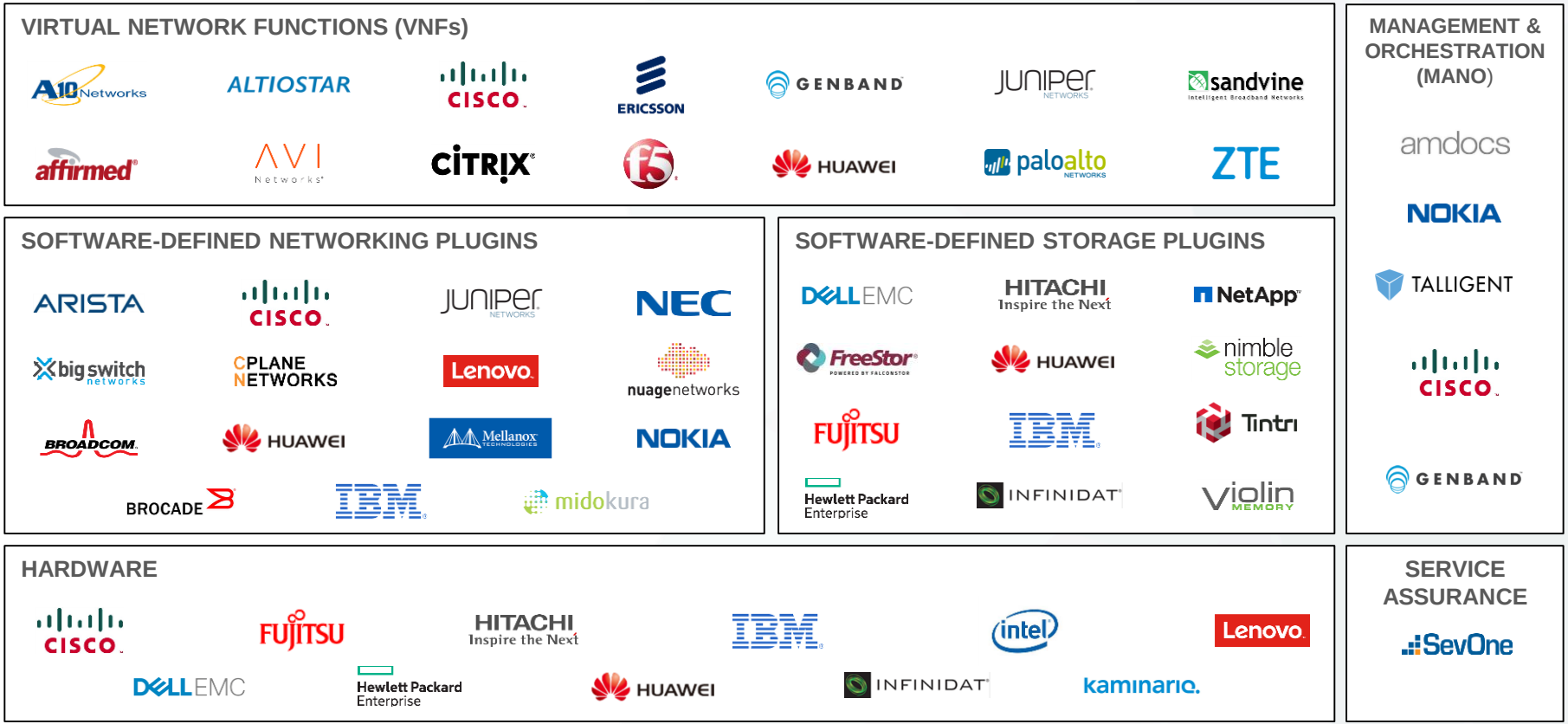
- Updates and upgrades
- Scaling up and down
- Change management

Juniper and Red Hat – Distributed Architecture for better performance

Cloud infrastructure with Contrail-augmented networking

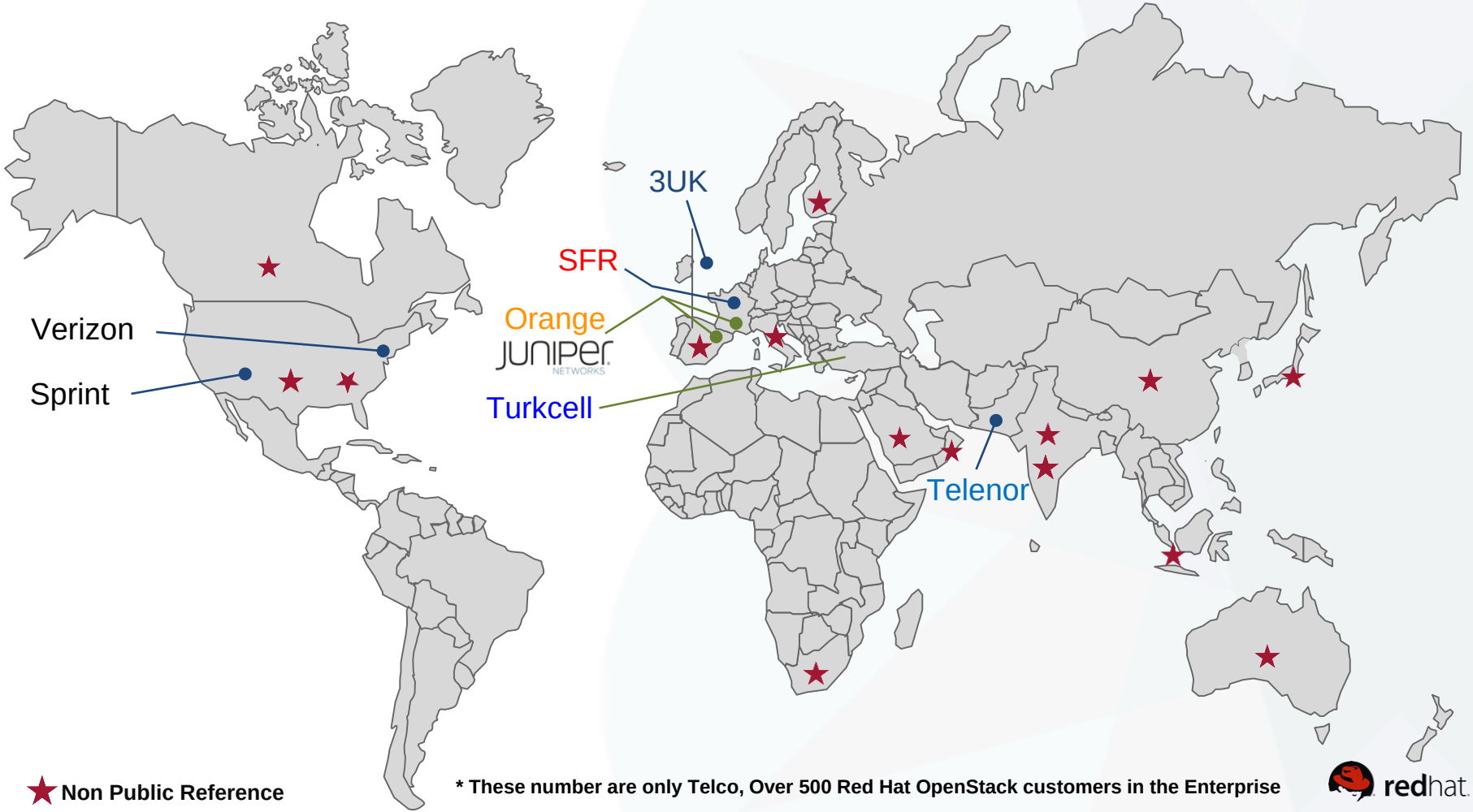


Red Hat's NFV and SDN Partner Ecosystem



We are the "Switzerland of NFV & SDN "

Red Hat's Telco OpenStack Production Reference Map*



★ Non Public Reference

* 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

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

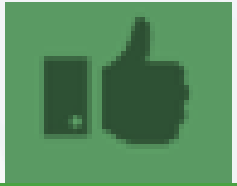
Customers want instant access to new customized services

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

35

"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

Closing

- 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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End