



THE FOUL SIDE OF OPEN SOURCE NETWORKING

Thomas D. Nadeau
Technical Director, NFV

tnadeau@redhat.com
[@tdnjunisco](#)

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Agenda

- Fundamental Thesis
- Transforming The Network
- Networking Strategy

*An Authoritative Review of Network
Programmability Technologies*



SDN

Software Defined Networks

O'REILLY®

Thomas D. Nadeau & Ken Gray





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TRANSFORMING THE NETWORK

**WE ARE
TRANSFORMING
THE NETWORK**

TODAY'S NETWORK

hardware-centric
provisioned for peak capacity
relatively static configuration

TOMORROW'S NETWORK

software-centric

elastic provisioning

highly dynamic configuration

Context-specific hardware

OPEN SOURCE SOFTWARE IS CHANGING THE CONVERSATION



COMMODITIZATION



INNOVATION

OPEN SOURCE NFV TRANSFORMING THE NETWORK

not just a license
not just code development
community and collaboration

UPSTREAM FIRST

WHAT?

design, dev, test
all upstream

VALUE

influence
maintenance
quality and
security
interoperability

RISKS OF FORKING

quality
user
expectations
technical debt
interoperability

UPSTREAM DYNAMICS

OPENSTACK

PROJECT INFLUENCE

13.4M

Lines of code

2,600

Committers

CONSUMPTION CONSIDERATIONS

467

Changes per day

3,400+

Number current
issues / bugs

Over 3 years and 6 major releases, 97% of the code has changed.

Key Areas of Focus for The Telco/SP Market

- Edge
- Mobile Edge for 5G
 - vEPC, vRAN, vCDN, SD-WAN, vPE/vCPE, vIMS
- Continued support of RHOSP and expansion
- Supporting evolution towards containers and OpenShift
- RHEL as the underpinning for these platforms and containers

UPSTREAM DYNAMICS

KUBERNETES

PROJECT INFLUENCE

1.8M

Lines of code

877

Committers

CONSUMPTION CONSIDERATIONS

47

Changes a day

2,167

Number current
issues / bugs

Over 3 years and 11 minor releases, 95% of the code has changed.

MAKING OPEN SOURCE PRODUCTION GRADE

257

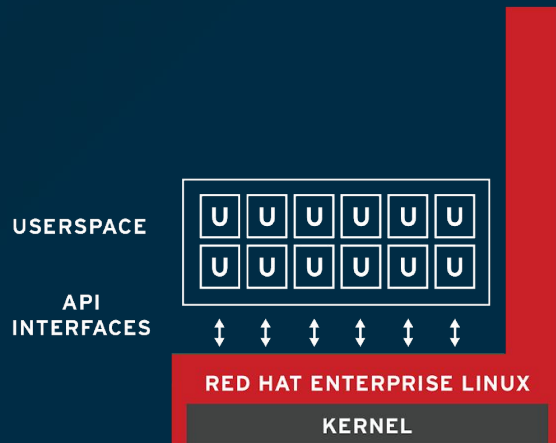
BUGS FIXED between
Kube 1.9 and
OpenShift 3.9

194

BUGS FIXED between
OpenShift 3.9
and 3.9.33

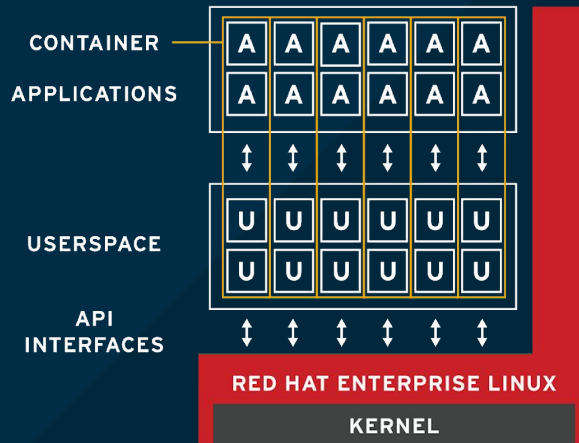
**EVEN AFTER THAT, A
KERNEL ISSUE...**

WHY THIS HAPPENED



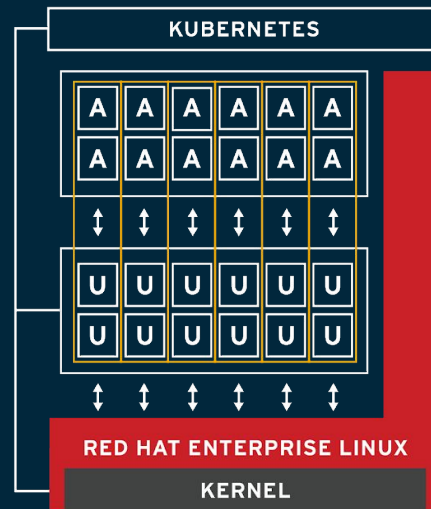
~300 SYSTEM CALLS

And associated data structures creating
direct dependency on the kernel



**~2,400 SYMBOL
DEPENDENCIES**

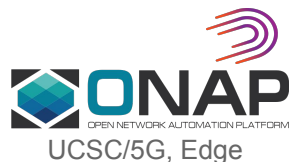
On core system libraries and in Linux



~7,700 SYSTEM CALLS

Called by kubernetes to create
and start a single container

SDO, SW & HW Ref. Implementations, PoCs



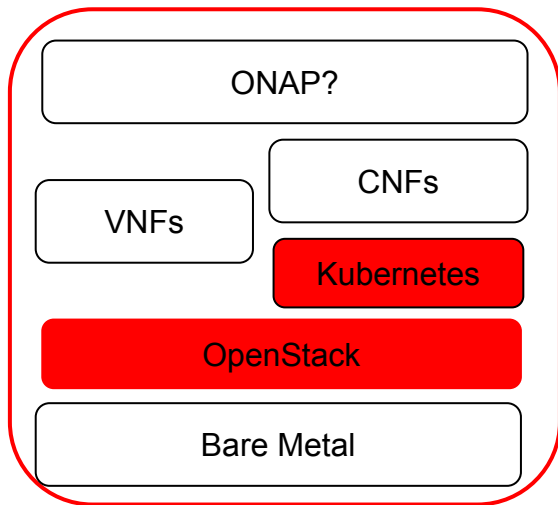


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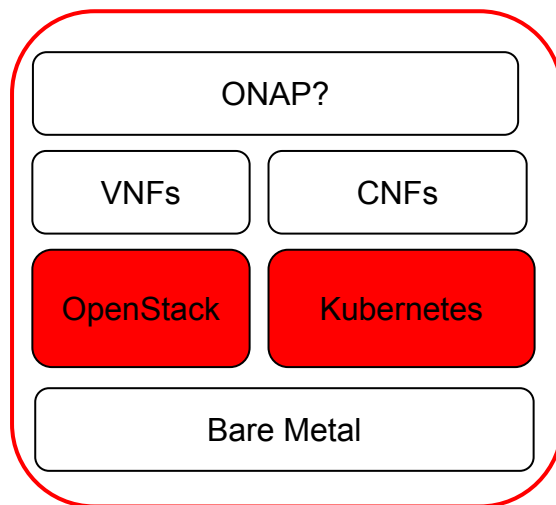
NETWORKING TECHNOLOGY STRATEGY

Networking Differentiation in the Hybrid VNF & CNF Telco Cloud Platform

Short Term



Medium Term

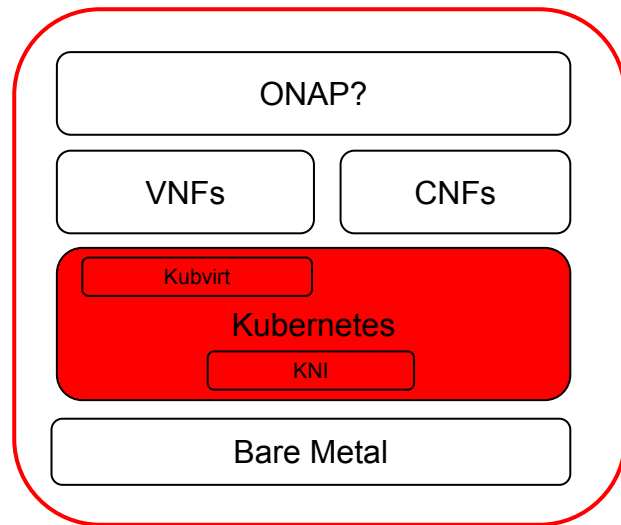


Source: Modification of Linux Foundation

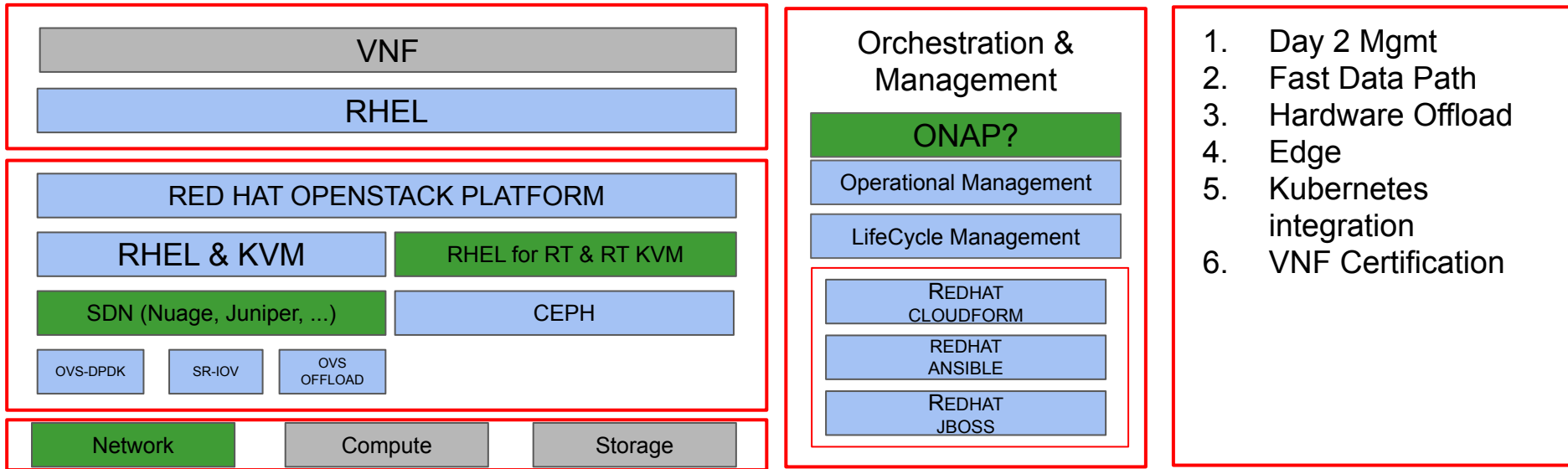
Target Architecture of Telco Cloud Platform and Why The Network Matters

Longer Term

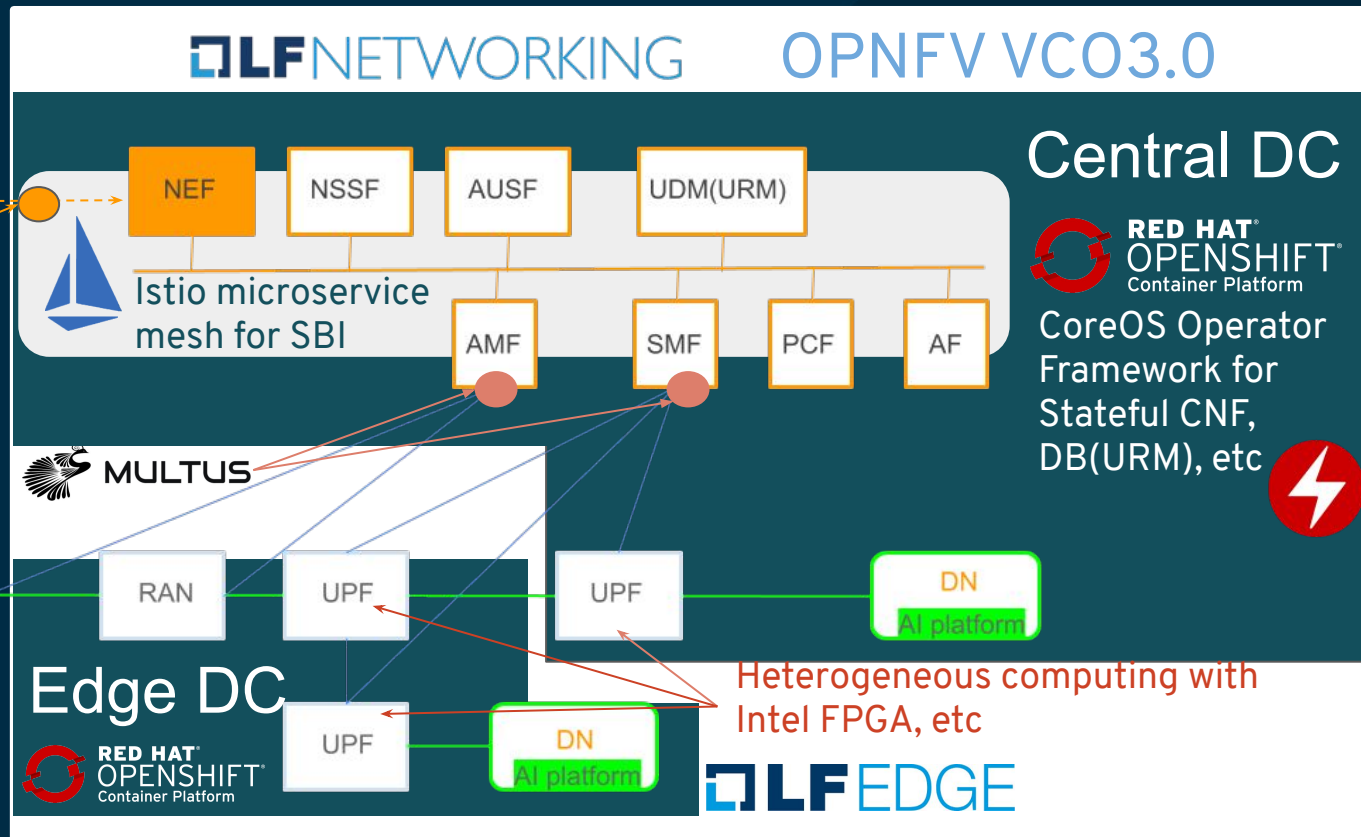
1. Single, Converged Platform
2. Challenge: Develop new workloads as CNFs
 - a. CNFs may not perform as VNFs do
3. Migration:
 - a. When HW deprecated
 - b. No tooling required for Migration
VNF->CNF => traffic redirection by Mgmt Orchestration



Networking Priorities (green)



5G/TELCO CLOUD VCO POSSIBILITY



AKRAINO KNI-EDGE FAMILY



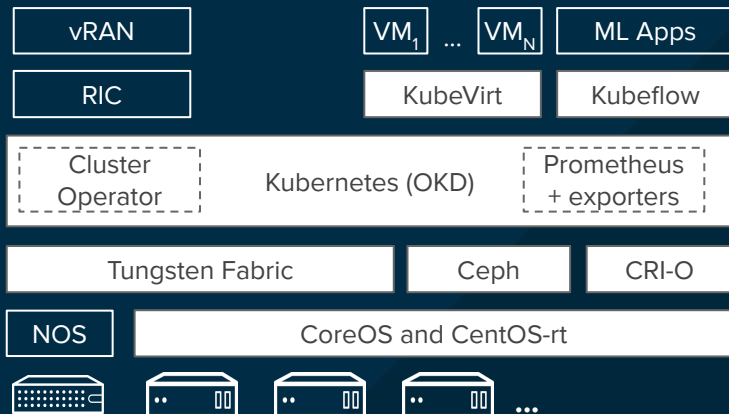
Provider Access Edge (PAE) Blueprint

Project contributors: Red Hat, Juniper, Intel

Footprint: 3-7 servers (Unicycle)

Supports various types of edge apps via its middlewares:

- VM-based (KubeVirt)
- AI/ML (Kubeflow)



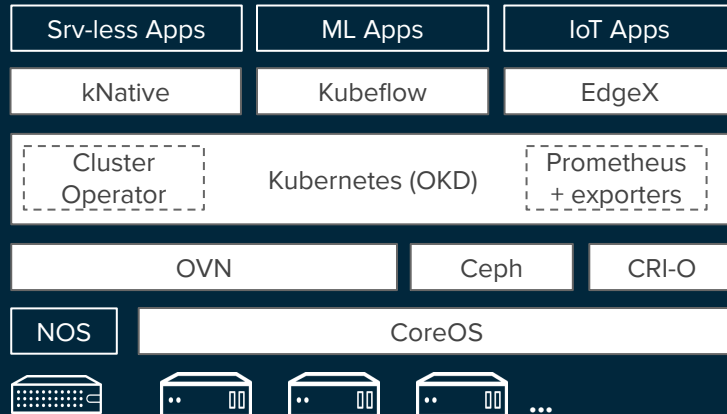
KNI for Industrial Edge (IE) Blueprint

Project contributors: Red Hat, Nokia, Intel

Footprint: 3-7 servers (Unicycle)

Supports various types of edge apps via its middlewares:

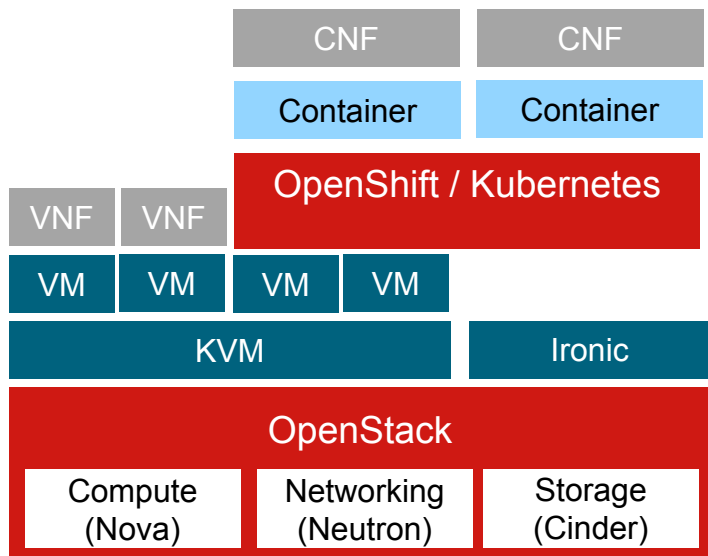
- AI/ML (Kubeflow)
- kNative (Serverless / FaaS)
- EdgeX (IoT)



OpenStack Networking Highlights

OpenShift on OpenStack

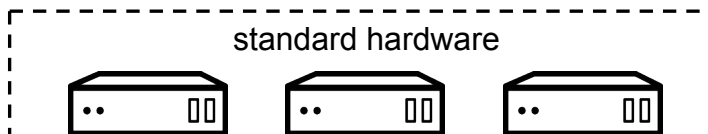
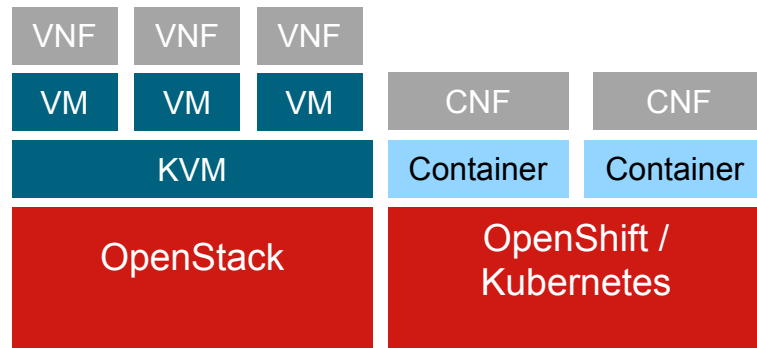
(OpenStack Undercloud)



OR

OpenShift & OpenStack

(OpenStack Undercloud)

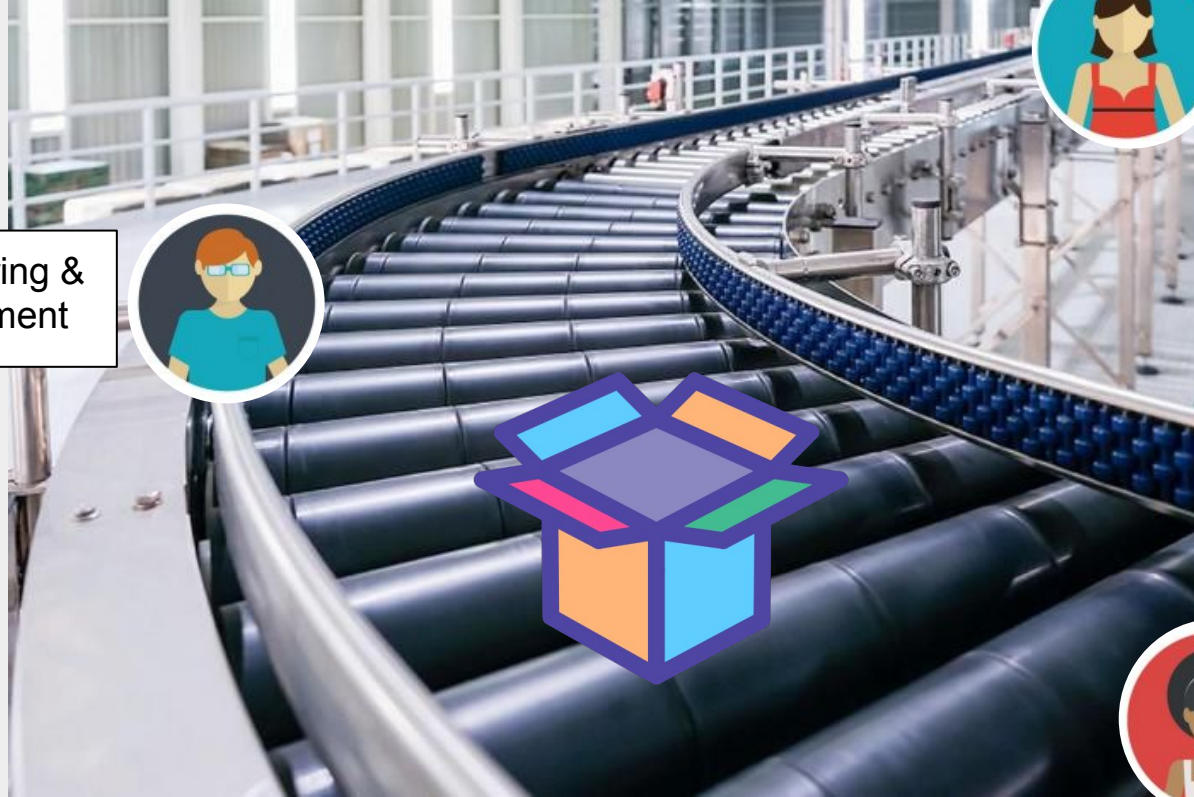




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EMERGING TECHNOLOGY TRENDS ON THE HORIZON

The OCTO Innovation Conveyor Belt: How We Work



Product Engineering &
Product Management

0-18
months

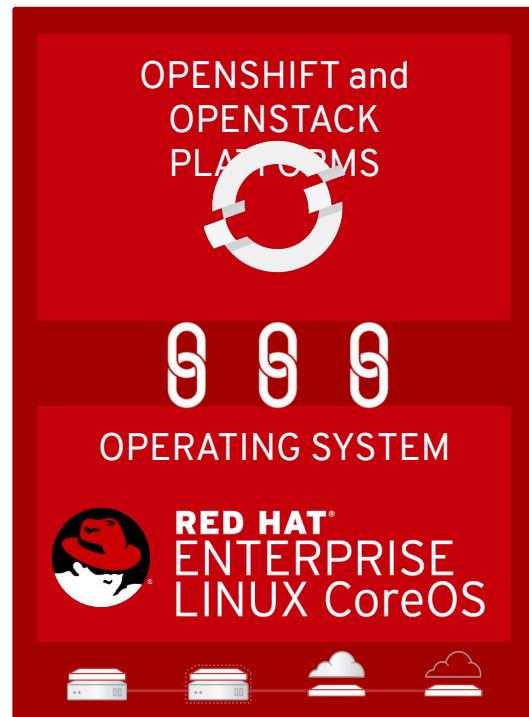
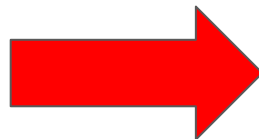
OCTO

18-36
months

Customer

TECHNOLOGY EVOLUTION AND VISION REALIZED

CNF
Operators
Multi Cluster Mgmt and
interconnection
Microservices Networking (istio)
Bare metal support (IPMI)
Trusted Boot (Keylime)
Edge PoCs
(Akraino/Airship/ORAN)
Vodafone/Intel PoC (eBPF/XDP)
Platform NFV Enhancements:
(SR-IOV, Hardware Offload,
Multus, Multicast support, FPGA
NIC support)
ONAP PoCs



Thank You

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