THE FOUL SIDE OF OPEN SOURCE NETWORKING

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Agenda

- Fundamental Thesis
- Transforming The Network
- Networking Strategy
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 → AGILITY → 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
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**

<table>
<thead>
<tr>
<th>Project Influence</th>
<th>Consumption Considerations</th>
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<tbody>
<tr>
<td>1.8M Lines of code</td>
<td>47 Changes a day</td>
</tr>
<tr>
<td>877 Committers</td>
<td>2,167 Number current issues / bugs</td>
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*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

Source: Matthew Barnes, OSD 3.9 upgrade summary. internal blog post, Mojo. August 2018.
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

TELECOM INFRA PROJECT
vRAN FH, OpenRAN, DCSG
NW & Telco-WGc

OPEN ALLIANCE
5TONIC
ETSI
World Class Standards
NFV
MEC
ZSM
Solving the Muletc puzzle

INTERNET ENGINEERING TASK Force

SUPERFLUIDITY

Harmonization

OPENFIRE
Linaro
DPDK
ONAP
openstack.
openstack.
Ansible
OPEN CONTAINER INITIATIVE

DPDK
ONAP
openstack.
openstack.
Ansible
OPEN CONTAINER INITIATIVE

Harmonization

CLOUD NATIVE COMPUTING FOUNDATION

Prometheus
Kubernetes
cr-0
Cri-o

kafka
OPEN DATA HUB
kafka
OPEN DATA HUB

iot
eclipse.org
iot
eclipse.org

OPENAPI INITIATIVE
OPENAPI INITIATIVE

rad
analytics
rad
analytics

Blockchain
Blockchain

TensorFlow
TensorFlow

Telecom SIG
The Origin Community Distribution of Kubernetes that powers real-time applications
Networking Differentiation in the Hybrid VNF & CNF Telco Cloud Platform

Short Term

ONAP?
VNFS
Kubernetes
OpenStack
Bare Metal

Medium Term

ONAP?
VNFS
OpenStack
Kubernetes
Bare Metal

Source: Modification of Linux Foundation
Target Architecture of Telco Cloud Platform and Why The Network Matters

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)

**Orchestration & Management**

1. Day 2 Mgmt
2. Fast Data Path
3. Hardware Offload
4. Edge
5. Kubernetes integration
6. VNF Certification

**Red Hat OpenStack Platform**

- RHEL
- RHEL & KVM
- SDN (Nuage, Juniper, ...)
- OVS-DPDK
- SR-IOV
- OVS OFFLOAD

**Network**

- Compute
- Storage

**Computing**

- RHEL for RT & RT KVM
- CEPH

**Cloud Applications**

- REDHAT
- CLOUDFORM
- REDHAT ANSIBLE
- REDHAT JBOSS

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**VNF**

**RED HAT OPENSTACK PLATFORM**
3rd party REST API from IoT, V2V, etc

3scale API GW with Istio adapter

5G/TELCO CLOUD VCO POSSIBILITY

NEF  NSSF  AUSF  UDM(URM)
Istio microservice mesh for SBI

AMF  SMF  PCF  AF

Edge DC

Central DC

Red Hat OpenShift Container Platform
CoreOS Operator Framework for Stateful CNF, DB(URM), etc

Heterogeneous computing with Intel FPGA, etc

SBA: Service Based Architecture  SBI: Service Based Interface  VCO: Virtual Central Office
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)

- **OpenShift / Kubernetes**
- **VNF**
- **VM**
- **KVM**
- **Ironic**

**OpenStack**
- **Compute** (Nova)
- **Networking** (Neutron)
- **Storage** (Cinder)

Standard hardware

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**OpenShift & OpenStack**
(OpenStack Undercloud)

- **OpenStack**
- **KVM**
- **CNF**
- **Container**

**OpenShift / Kubernetes**
- **VNF**
- **VM**

Standard hardware
EMERGING TECHNOLOGY TRENDS ON THE HORIZON
The OCTO Innovation Conveyor Belt: How We Work

0-18 months
Product Engineering & Product Management

18-36 months
OCTO

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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