A Container Stack for OpenStack

Scott McCarty (@fatherlinux)
Senior Principal Product Marketing Manager, Red Hat

Stephen Gordon (@xsgordon)
Principal Product Manager, Red Hat

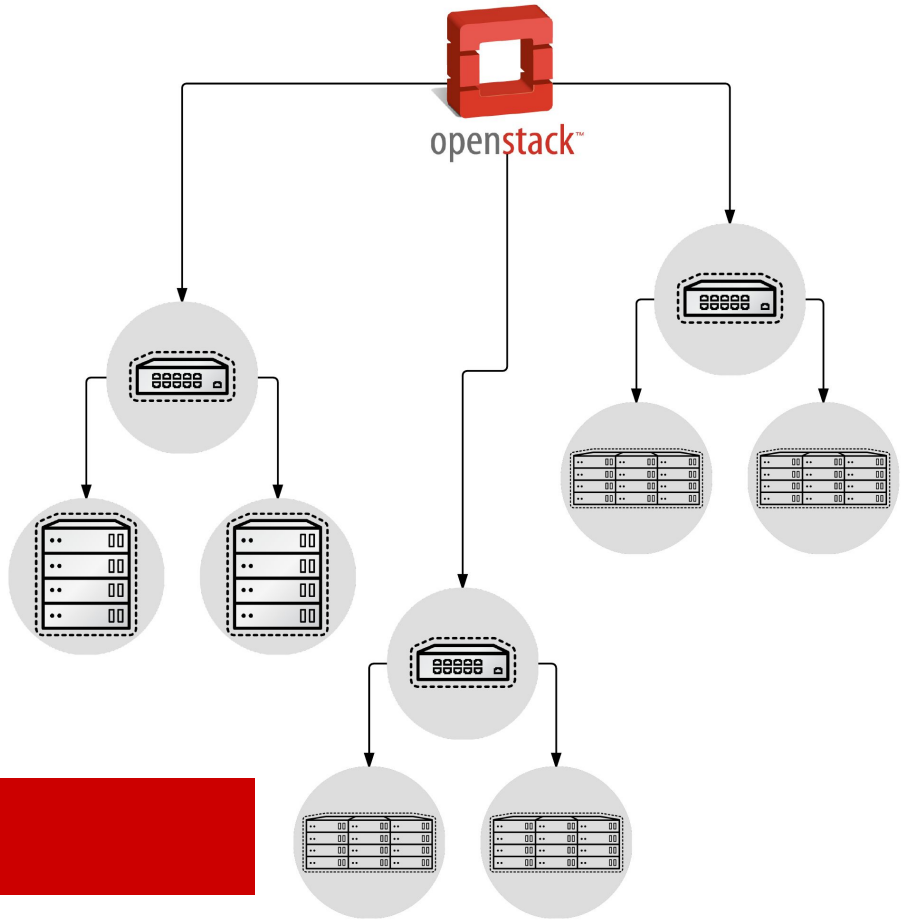
Sebastien Han (@sebastien_han)
Principal Storage Architect, Red Hat

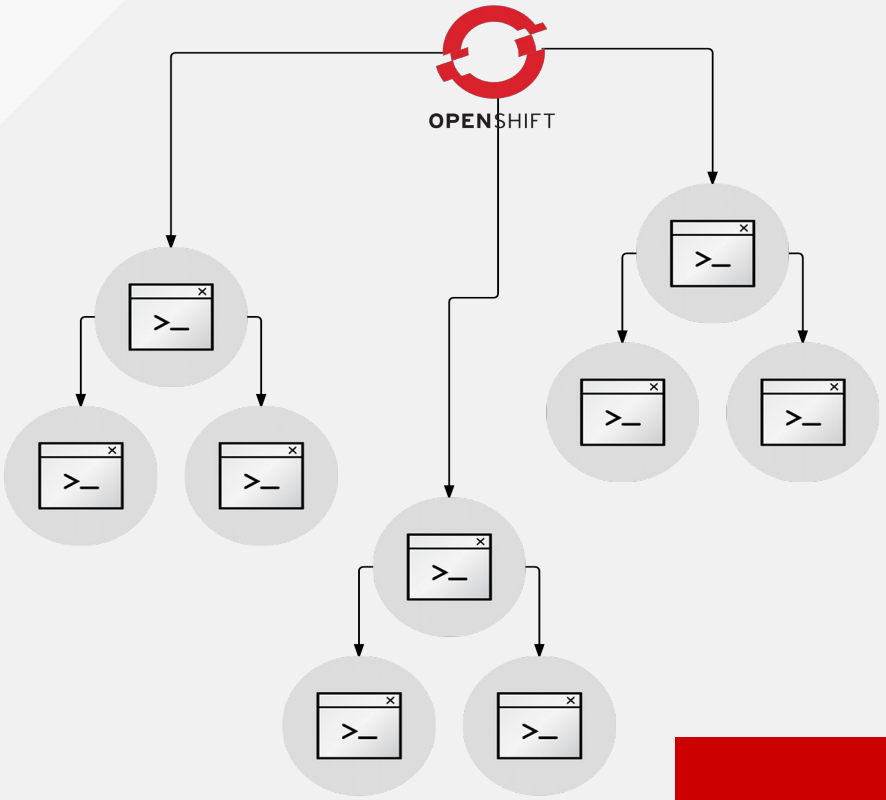
Why not just use OpenShift?

Why not just use OpenStack?

EXPOSITION & CONSUMPTION OF RESOURCES

Exposition of Resource





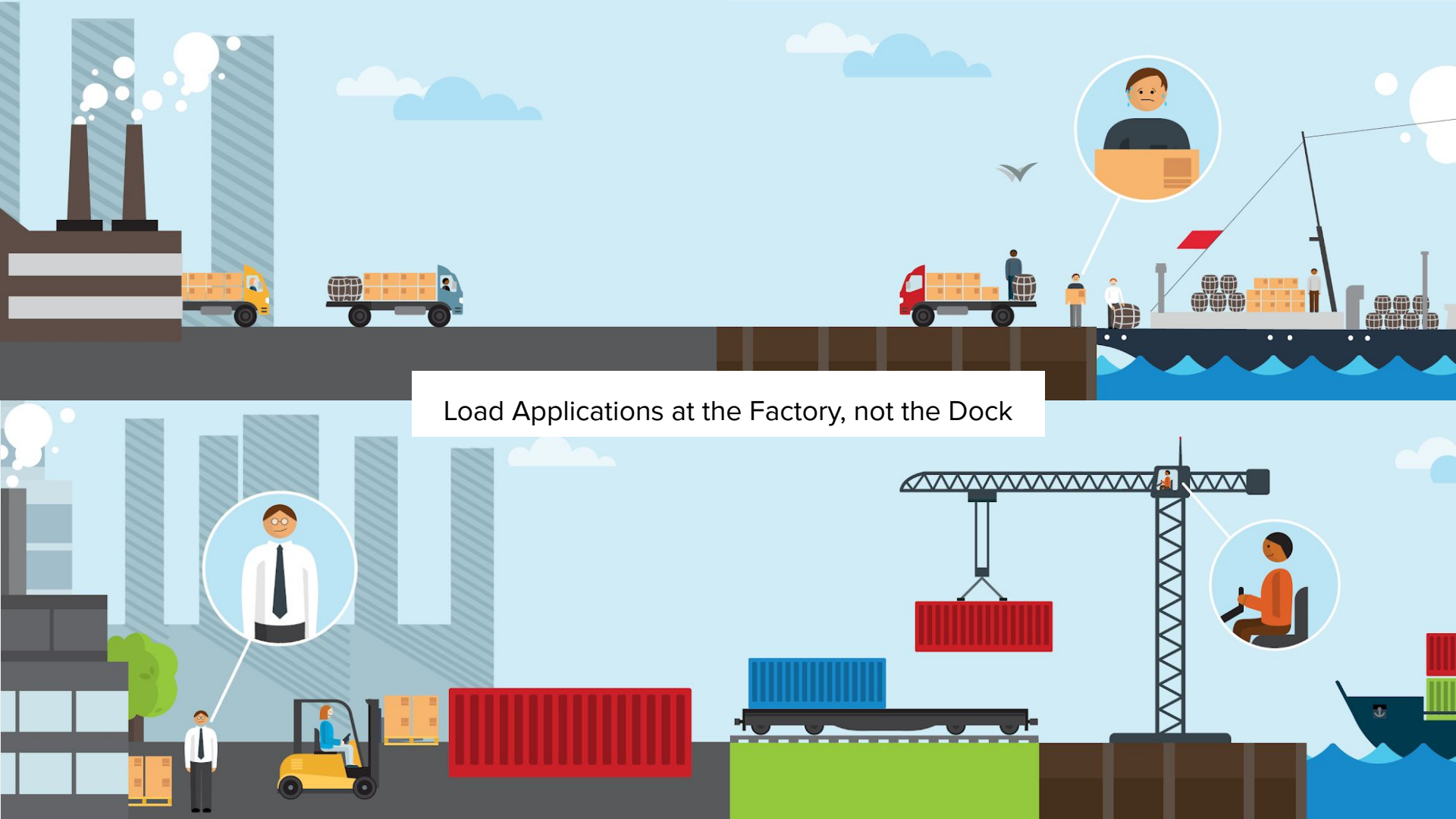

```
                └─hald-addon-stor
        └─{hald}
├─im-settings-dae
├─irqbalance
├─libvirtd───10*[{libvirtd}]
├─lldpad
├─mcelog
├─5*[mingetty]
├─modem-manager
├─notification-ar
├─ntpd
├─openvpn
├─pcscd───{pcscd}
├─polkitd
├─pulseaudio─┬─gconf-helper
│            └─4*[{pulseaudio}]
├─python───python───2*[{python}]
├─python───2*[{python}]
├─python───2*[ssh]
├─rhsmcertd
├─rpc.statd
├─rpcbind
├─rsyslogd───3*[{rsyslogd}]
├─rtkit-daemon───2*[{rtkit-daemon}]
├─seahorse-daemon
├─snmpd
├─2*[ssh-agent]
├─sshd───sshd───rsync
├─syndaemon
├─thunderbird───51*[{thunderbird}]
├─wpa_supplicant
└─xinetd
```

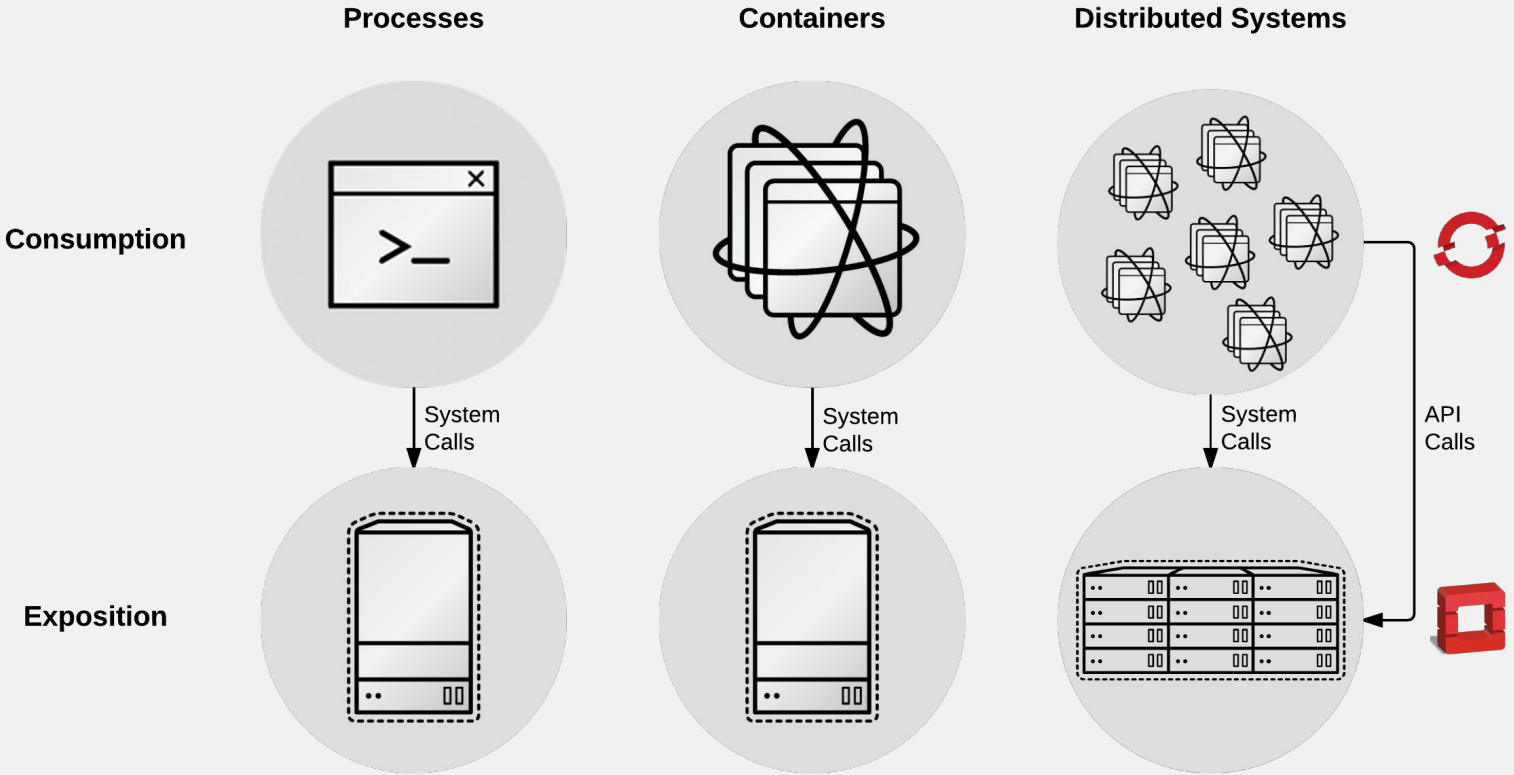
Consumption of Resource

Fancy Files

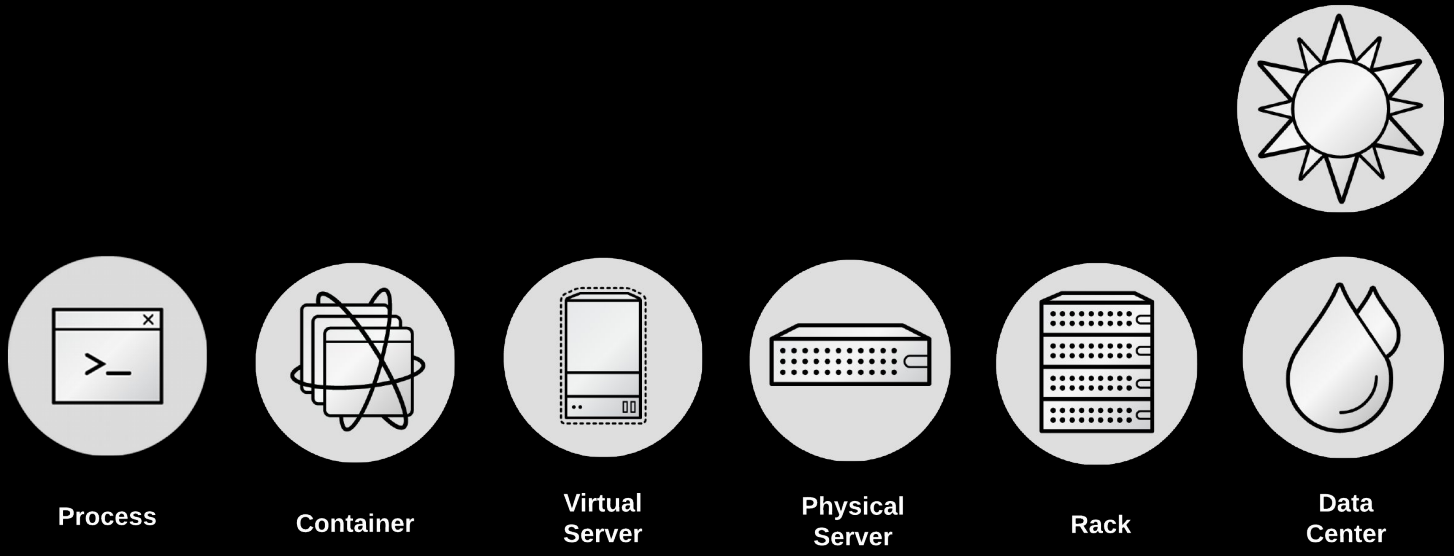
Also Fancy File Servers

Fancy Processes


Load Applications at the Factory, not the Dock

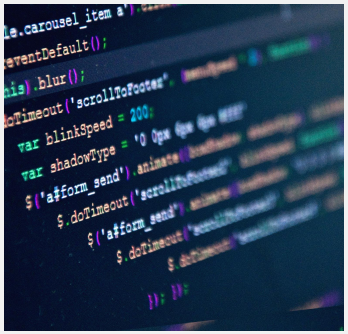

Processes
Containers
Distributed Systems
Consumption
Exposition
System Calls
System Calls
System Calls
API Calls

The Tenancy Scale

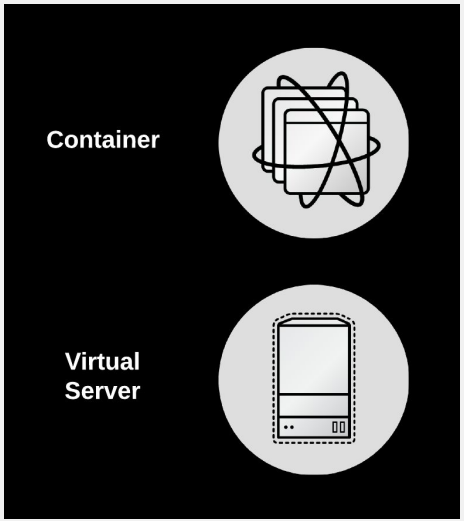


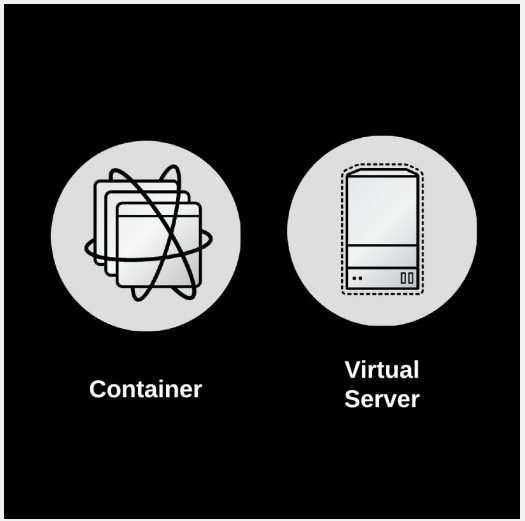
Application Containers

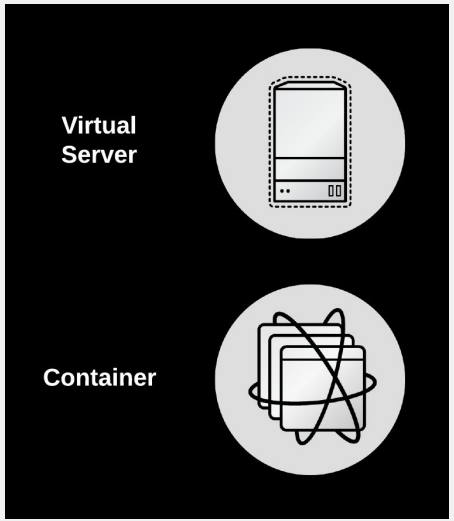
1. Code: mysqld
2. Configuration: /etc/my.cnf
3. Data: /var/lib/mysql
4. Other stuff :-)



Container Patterns

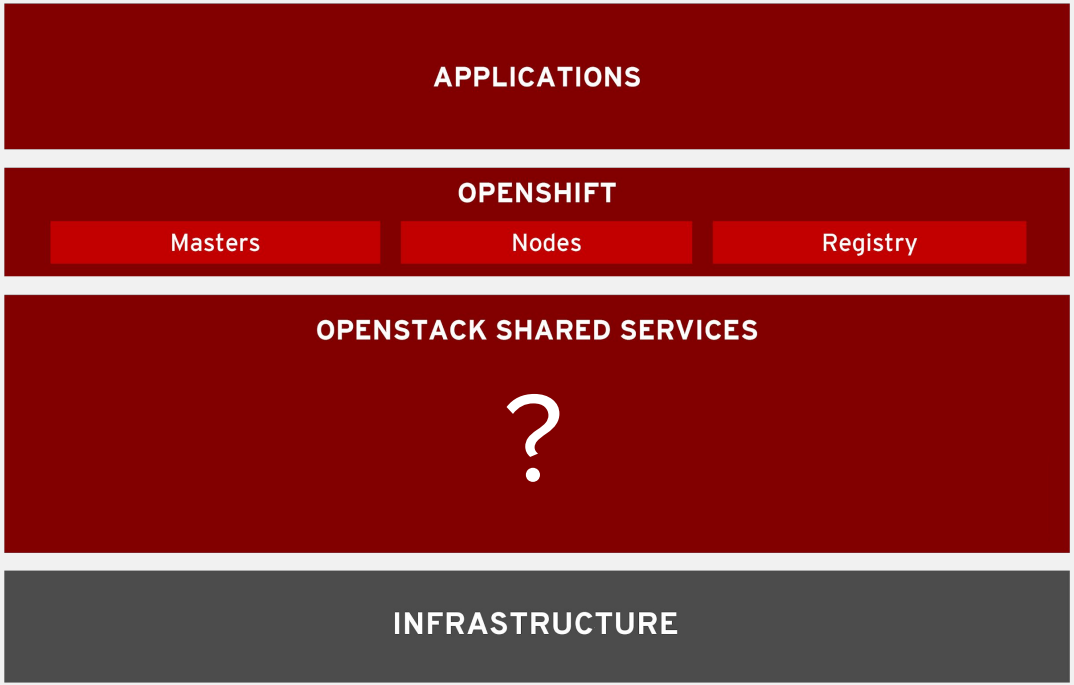






BETTER TOGETHER

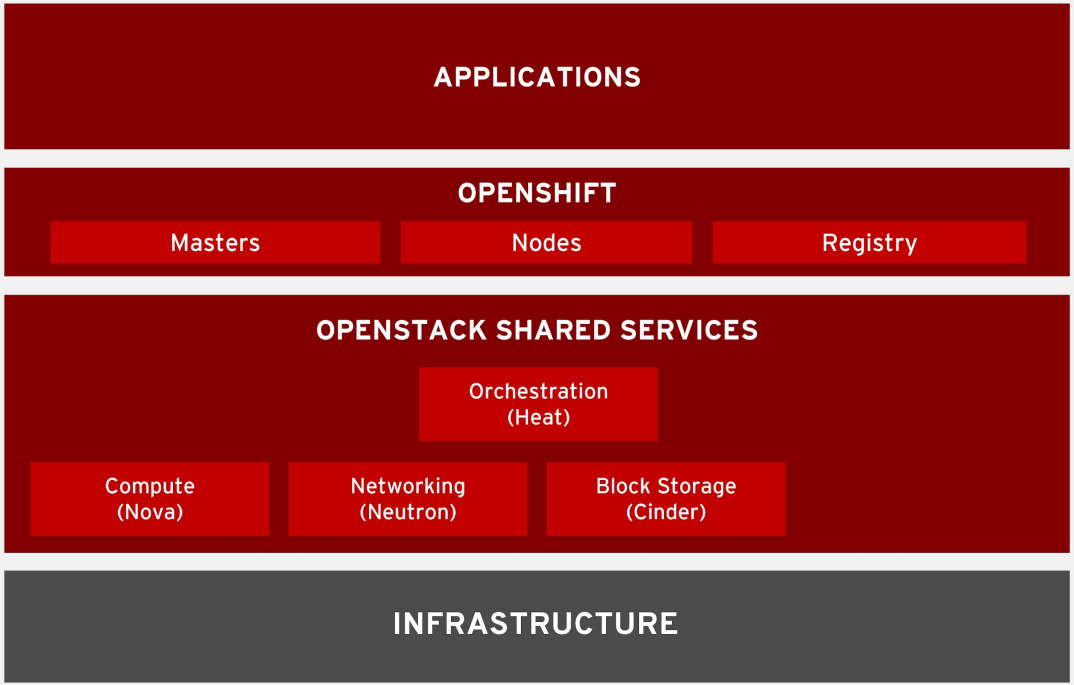
OpenShift on OpenStack



Architectural tenets:

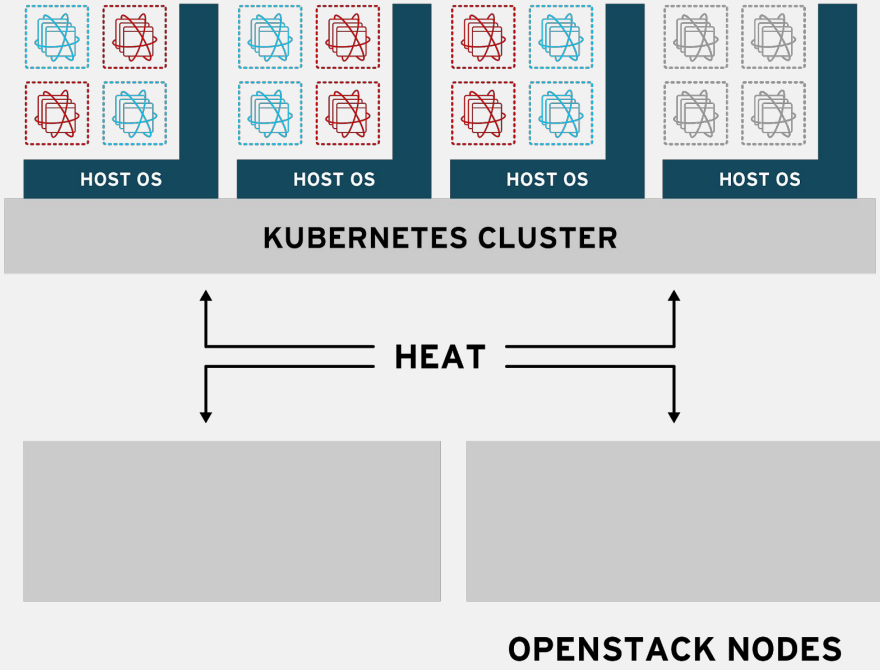
- Technical independence
- Avoiding redundancy
- Contextual awareness
- Simplified management

OpenShift on OpenStack - Current



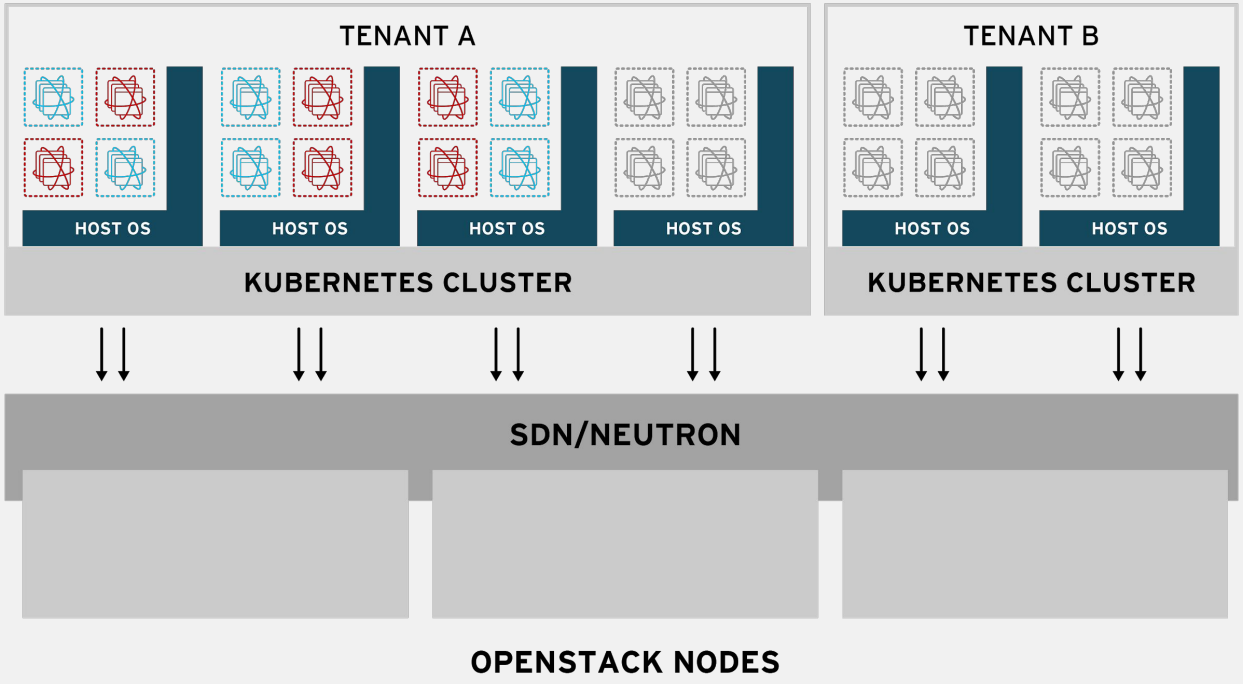
- Networking via **Neutron** networks.
- Load Balancing via **Neutron** LBaaS V1
- Block Storage via **Cinder** volumes.
- Compute via **Nova** virtual machines.
- Orchestration via **Heat** templates.
- Reference architecture to be published “real soon now”

Use Case: Provisioning



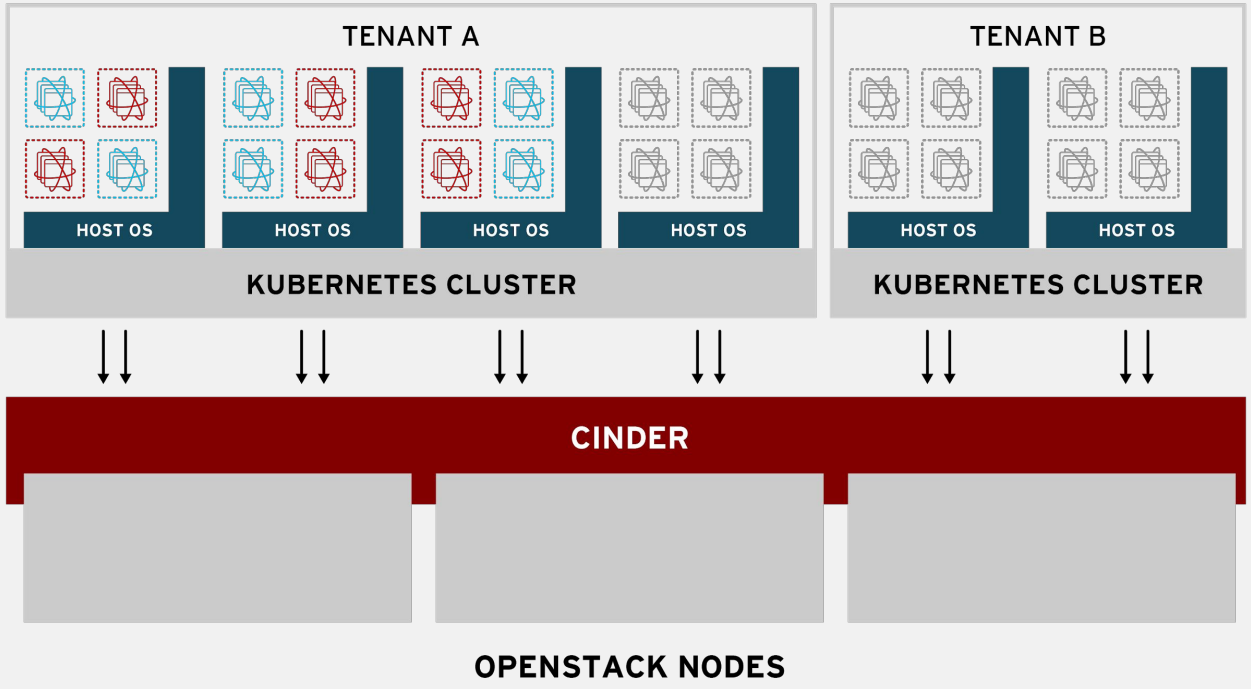
- Heat provides orchestration services for OpenStack clouds
- Pre-provision OpenStack resources for tenant (networks, nodes, etc.).
- Also used directly or via e.g. Magnum
- Configure for access to network and storage
- Register into Kubernetes cluster

Use Case: Networking



- Tenant isolation via OpenStack SDN
- Application isolation via container SDN
- Environment separation and isolation

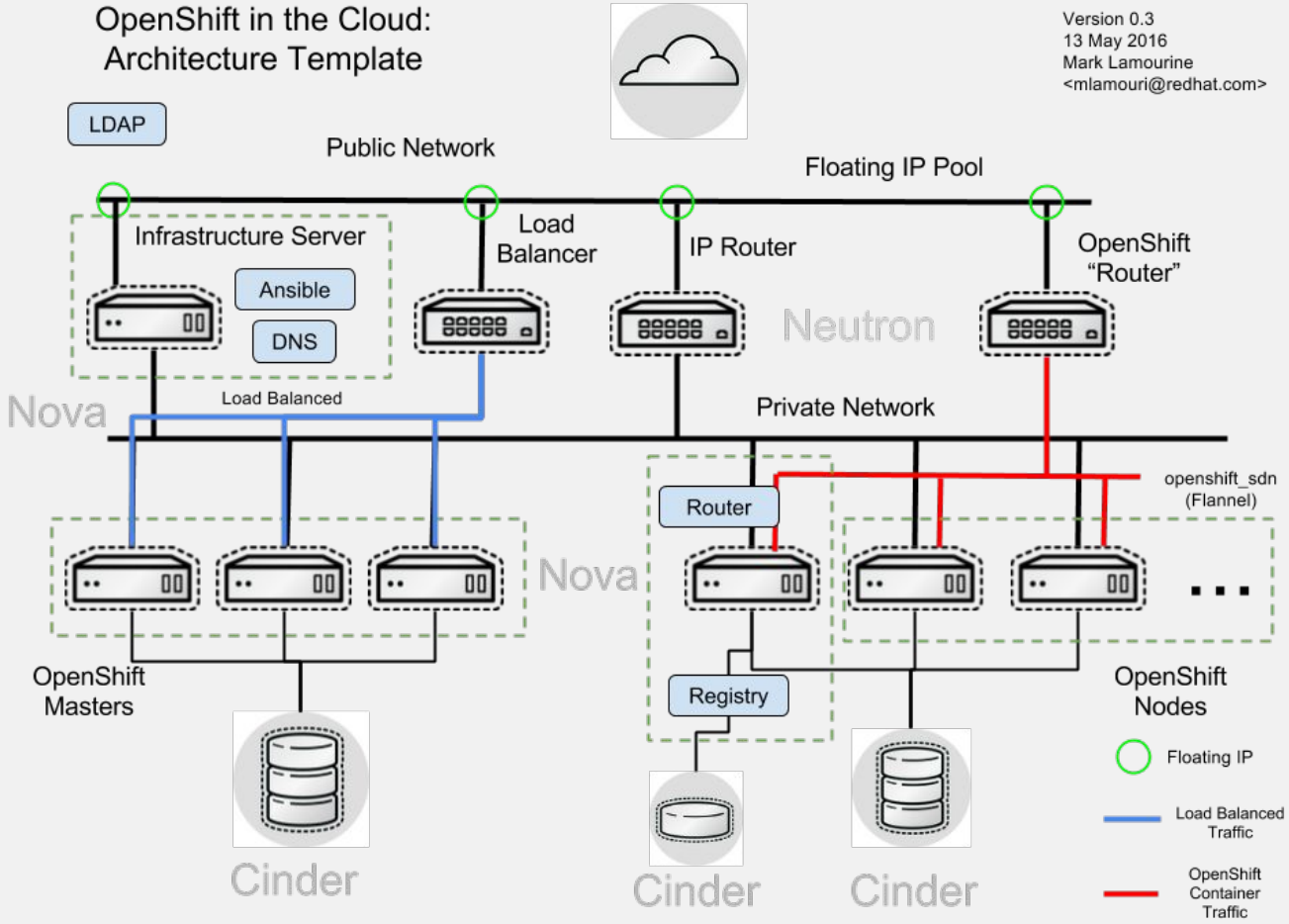
Use Case: Storage



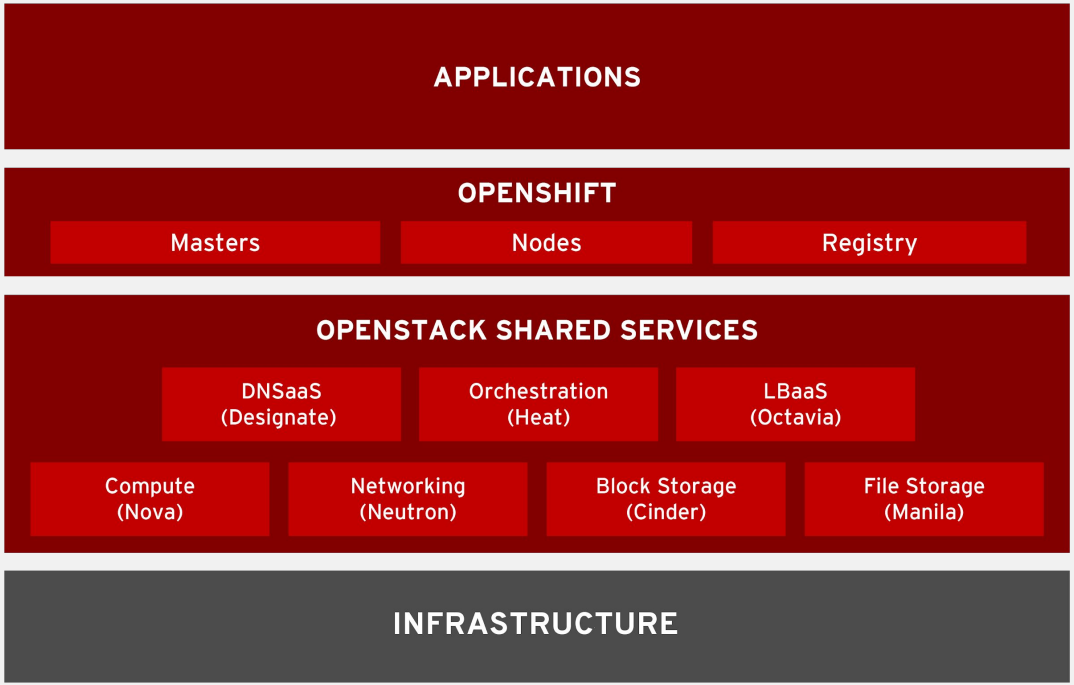
- Container hosts consume OpenStack storage
- Tenant isolation
- Application storage managed by Kubernetes
- Stateful applications
- Containerized distributed storage services

OpenShift in the Cloud: Architecture Template

Version 0.3
13 May 2016
Mark Lamourine
<mlamouri@redhat.com>



OpenShift on OpenStack - Future



- Load Balancing via **Octavia** (LBaaS V2)
- DNS via **Designate**
- File Storage via **Manila**
- Re-validate architecture on bare-metal using **Ironic**

CONTAINERIZING THE INFRASTRUCTURE

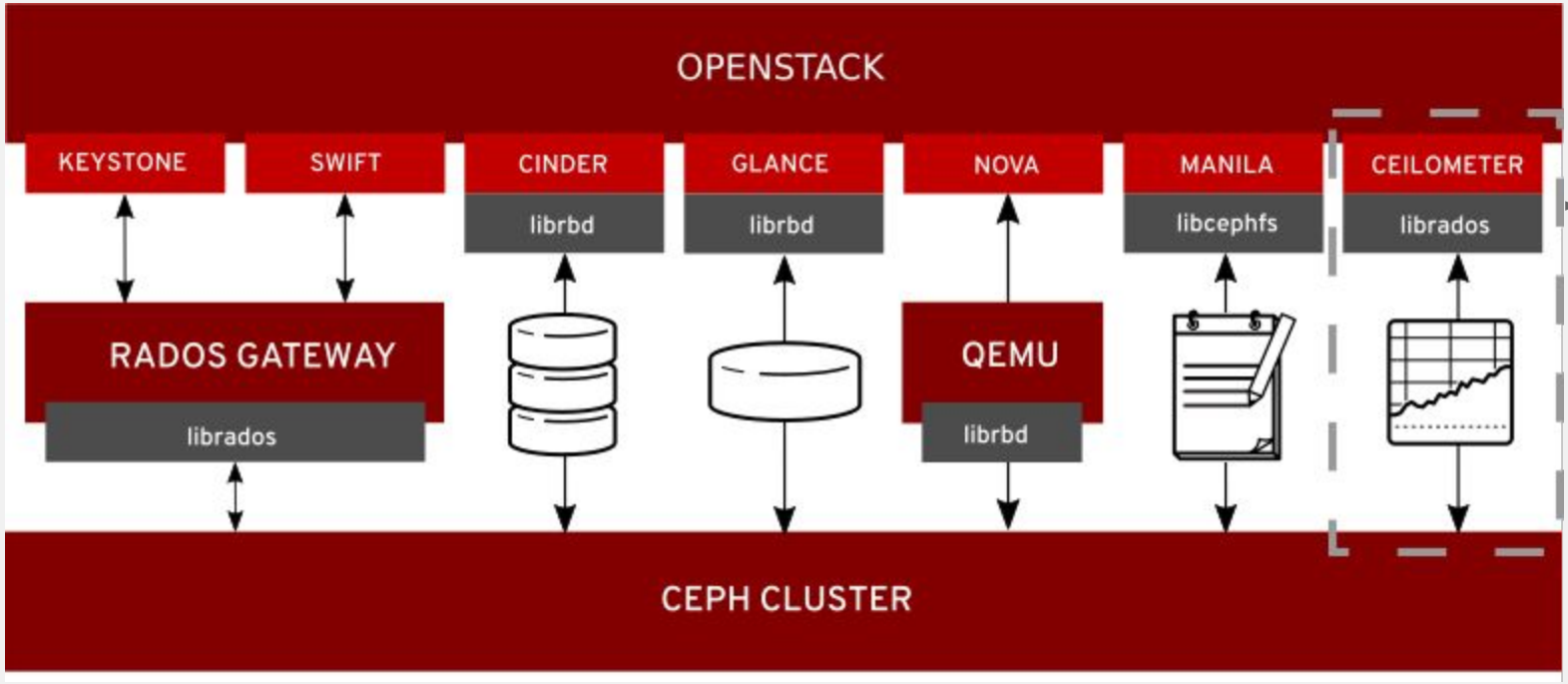
Why should you care?

Toward an **unified and common tool** for managing your platform, **Kubernetes**.

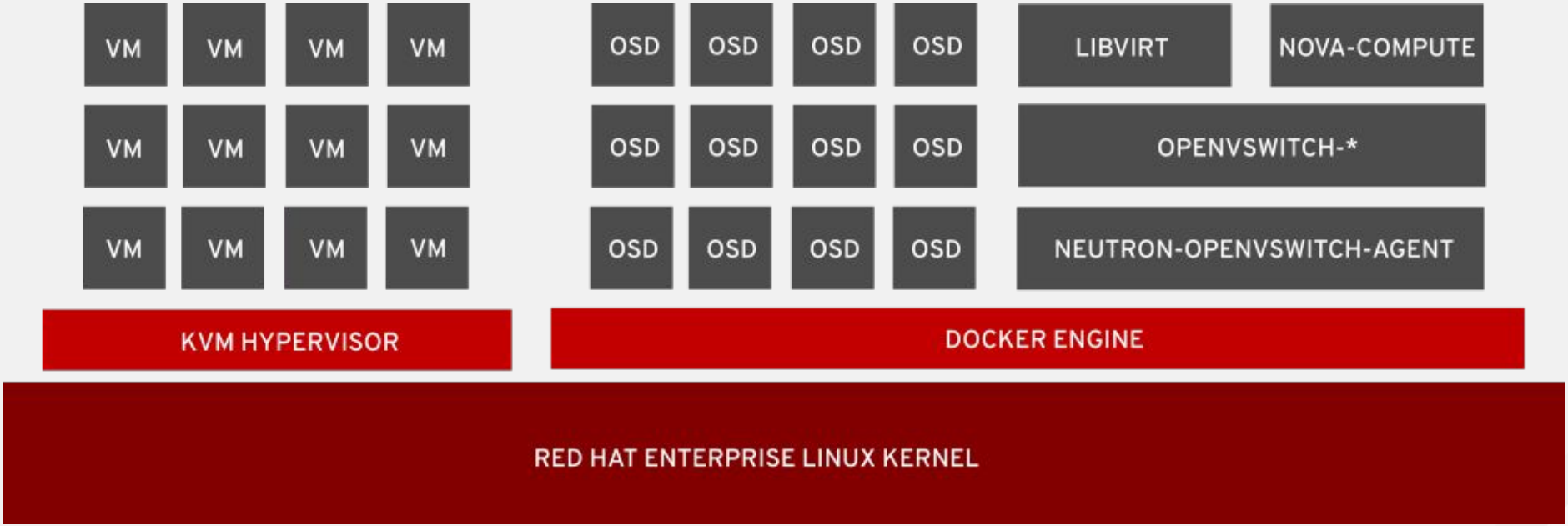
- OpenStack is just another application on your container stack
- Hypercon… what? Why was it difficult prior to containers?
  - **Collocate compute** and **storage** resources on the same machine
  - Fine control of resources using cgroups, NUMA and CPU pinning
  - Guest can potentially benefit from a local hit when performing IOs
  - Component upgrades made easy with containers

What is Ceph?

- Open, massively-scalable, **software-defined storage**
- Flexible, **scale-out architecture** on clustered commodity hardware
- **Unified** storage platform
- **CRUSH** algorithm to distribute data
- Integrated, easy-to-use management console
- **Designed for cloud** infrastructure and emerging workloads
- Used by the majority of OpenStack deployments


OPENSTACK
KEYSTONE
SWIFT
CINDER
GLANCE
NOVA
MANILA
CEILOMETER
librbd
librbd
libcephfs
librados
RADOS GATEWAY
librados
QEMU
librbd
CEPH CLUSTER
Not supported yet

Hyperconverged Node In-depth



VM qemu-kvm

Introducing containerized work

OpenStack Kolla:

- Runs OpenStack components in containers
- Orchestration using Ansible
- Prototype on Kubernetes (kolla-kubernetes project)

Ceph Docker:

- Containerizes all Ceph daemons
- Orchestration using Ansible
- Prototype on Kubernetes

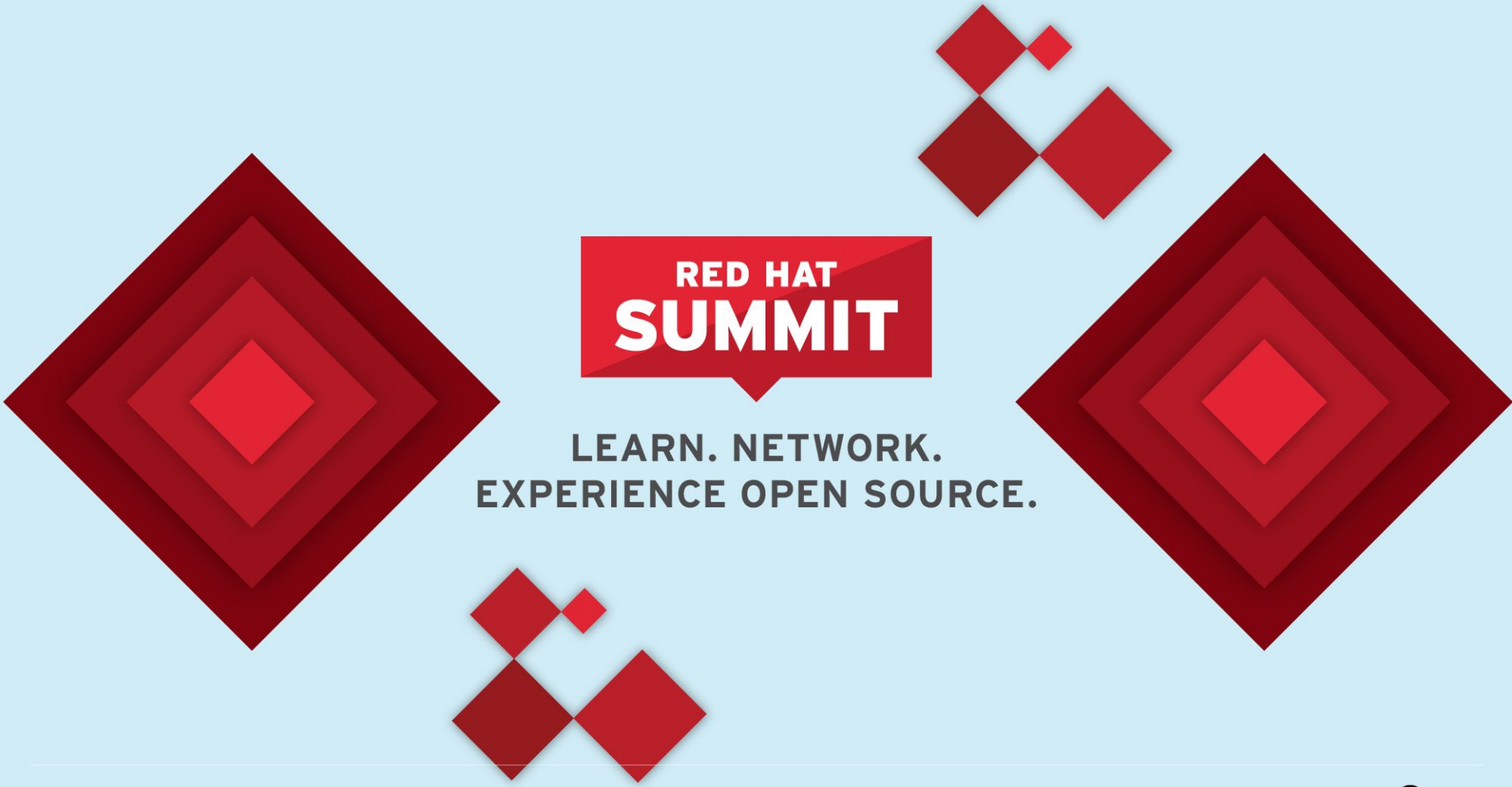
Tech previews

- OpenStack Compute nodes tech preview since Red Hat OpenStack Platform 8
- Red Hat Ceph Storage in containers since 1.3.2 and the new 2.0 release

KEY TAKE AWAYS

Free takeaways!

- OpenShift enables developers to consume resources
- OpenStack enables operations to expose resources
- Containers simplify deployment of OpenStack, Ceph, OVS, etc.
- OpenShift + OpenStack = Distributed Systems Operating System



Citations

- OpenShift on OpenStack Heat Template Work: http://bit.ly/23Zh6l1
- Dynamic Cinder Provisioning: red.ht/1qPRqFA
- OpenShift Commons Briefing (Mark Lamourine): http://bit.ly/1NwLEDh
- Workload and Containerization Characteristics: http://red.ht/1SBw9ql
- Containerizing Ceph: https://github.com/ceph/ceph-docker
- Kolla Kubernetes: https://github.com/openstack/kolla-kubernetes
- Deploy Kolla images with Kubernetes spec: https://review.openstack.org/#/c/255450/