
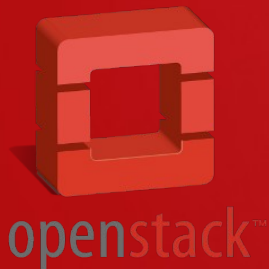




# Introduction to OpenStack

**Michael Lessard, RHCA**  
Senior Solutions Architect  
mlessard@redhat.com  
 michaellessard



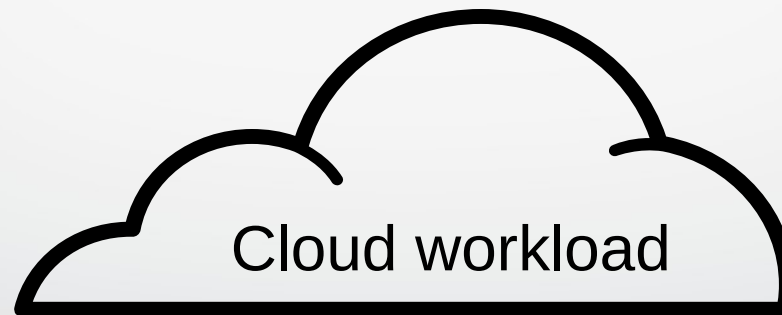
# Agenda

- What is Openstack ?
- What is a cloud workload ?
- OpenStack upstream
- OpenStack Architecture
- OpenStack incubating projects
- OpenStack Red Hat distributions

# What is Openstack ?

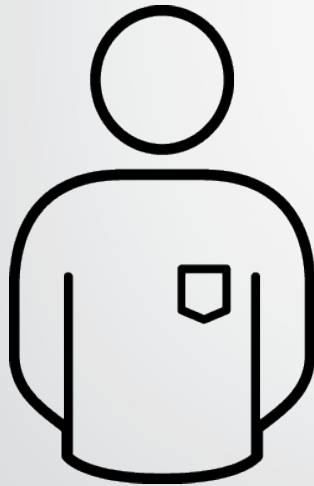
# OpenStack is ...

## Public or Private Cloud



# OpenStack is ...

Self Service



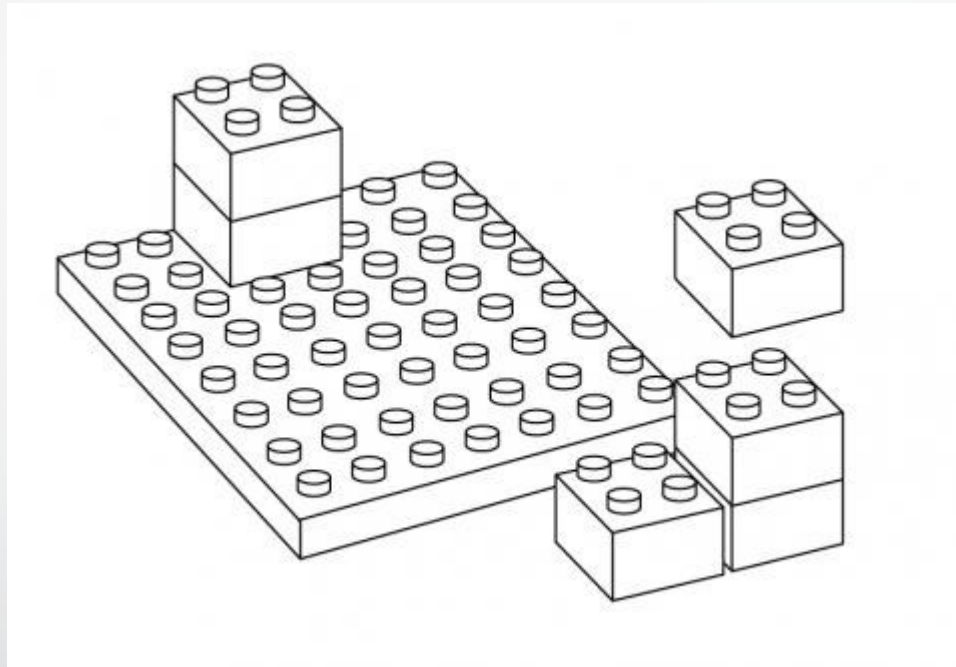
APIs



Web  
Dashboard

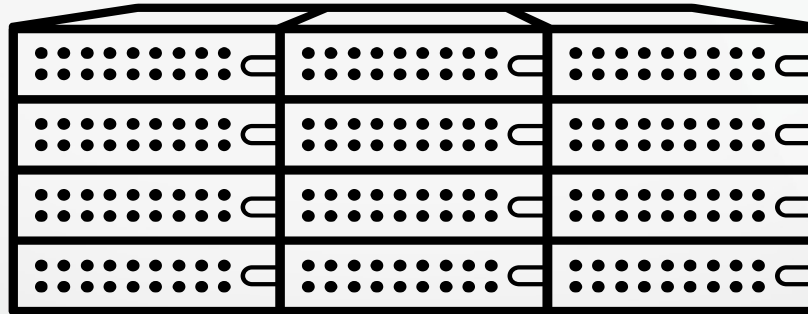
# OpenStack is ...

Building blocks



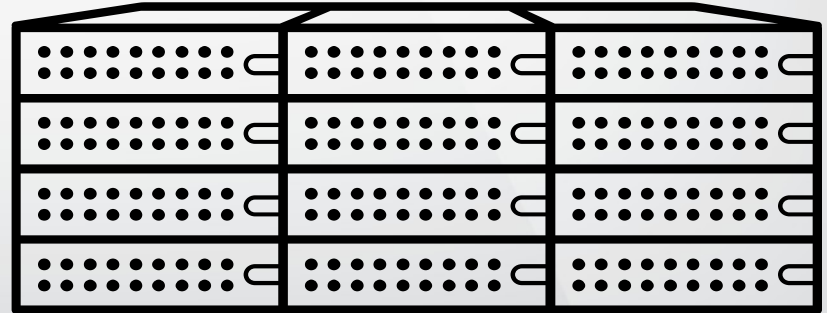
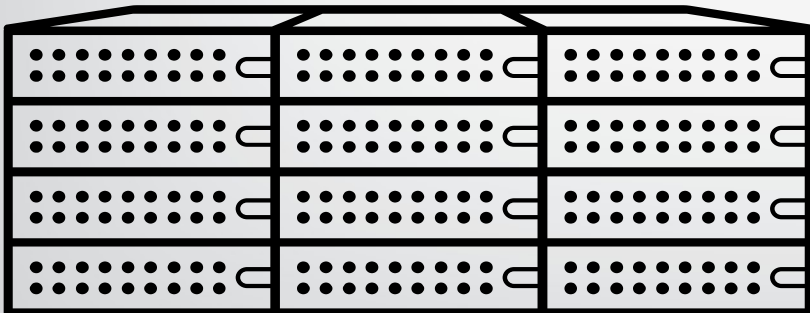
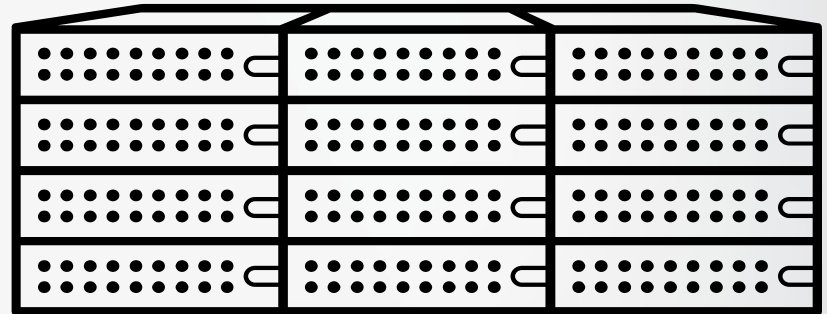
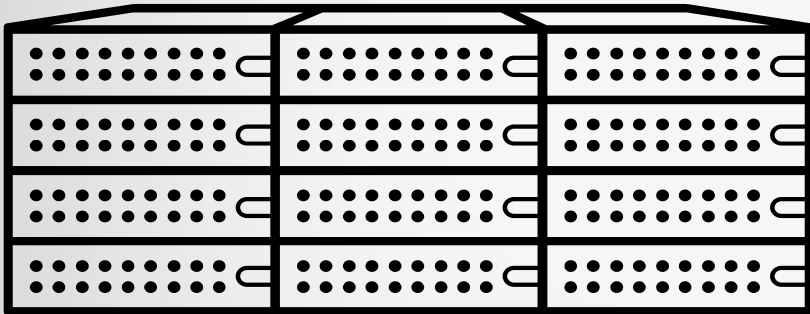
# OpenStack is ...

Illusion of Infinite Capacity



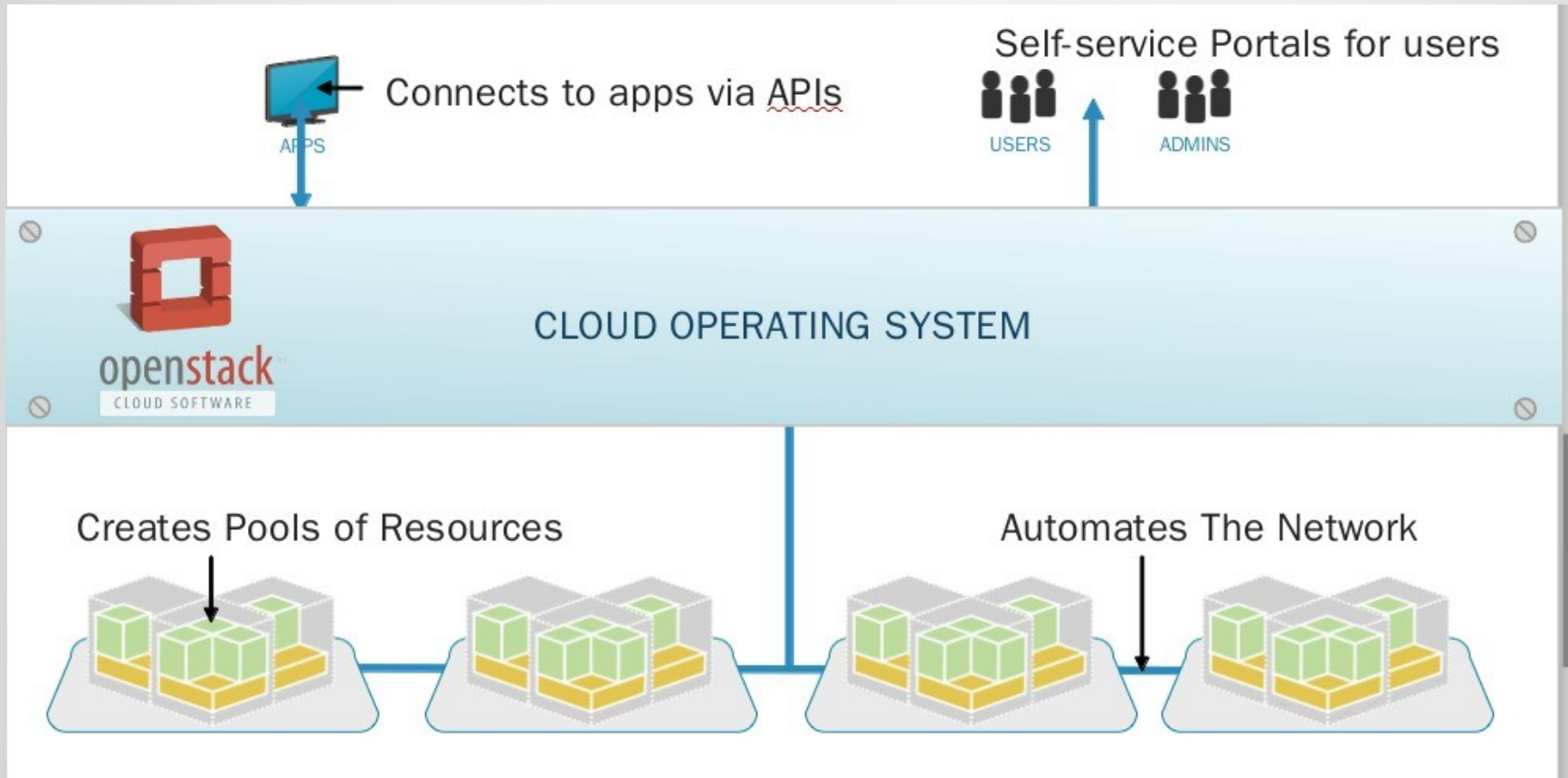
# OpenStack is ...

Massive Scale





# OPENSTACK

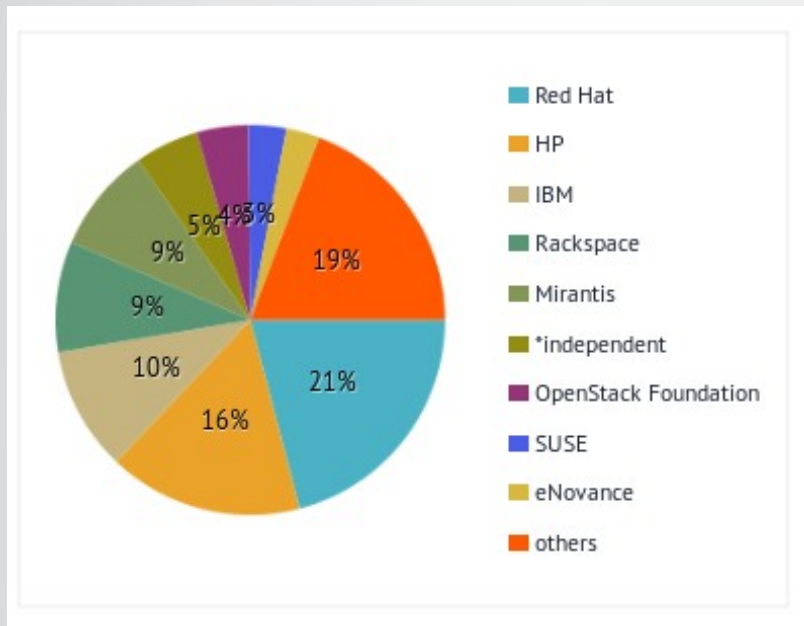


# OPENSTACK COMMUNITY

In 4 years

The second largest after Linux

# Contribution by companies



\*Havana

| #  | Company              | Commits |
|----|----------------------|---------|
| 1  | Red Hat              | 3151    |
| 2  | HP                   | 2433    |
| 3  | IBM                  | 1553    |
| 4  | Rackspace            | 1381    |
| 5  | Mirantis             | 1315    |
|    | *independent         | 802     |
| 6  | OpenStack Foundation | 644     |
| 7  | SUSE                 | 473     |
| 8  | eNovance             | 419     |
| 9  | VMware               | 310     |
| 10 | Intel                | 197     |
| 11 | NEC                  | 182     |
| 12 | Canonical            | 175     |
| 13 | UnitedStack          | 167     |
| 14 | DreamHost            | 148     |
| 15 | Nebula               | 128     |
| 16 | Yahoo!               | 111     |
| 17 | SolidFire            | 101     |
| 18 | Bitergia             | 97      |
| 19 | Cisco Systems        | 88      |

# What is a cloud workload ?

# SERVICE MODELS / WORKLOADS

---

## TRADITIONAL WORKLOADS

- Stateful VMs, application defined in VM
- Big VMs: vCPU, vRAM, local storage inside VM
- Application SLA = SLA of VM
- SLA requires enterprise virtualization features to keep VMs highly available
- Lifecycle measured in years
- VMs scale up: add vCPU, vRAM, etc.
- Applications not designed to tolerate failure of VMs

## CLOUD WORKLOADS

- Stateless VMs, application distributed
- Small VMs: vCPU, vRAM, storage separate
- Application SLA not dependent on any one VM
- SLA requires ability to create and destroy VMs where needed
- Lifecycle measured in hours to months
- Applications scale out: add more VMs
- Applications designed to tolerate failure of VMs

# SERVICE MODELS / WORKLOADS



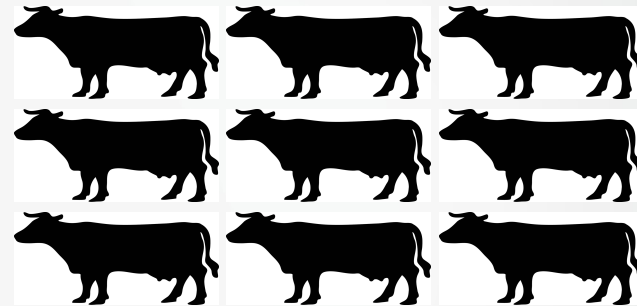
## TRADITIONAL WORKLOADS



- Pets are unique, lovingly hand raised and cared for
- They are given names
- When they get ill you nurse them back to health



## CLOUD WORKLOADS



- Cattle are almost identical to each other
- They are given numbers
- When they get ill you get another one

# OpenStack upstream

# UPSTREAM

- Releases every 6 months
  - April & October: Named Alphabetically
- Upstream focus
  - Distribution neutral
- Does not provide :
  - Installer (devstack?) or centralized management



**Austin** – October 2010

- Initial release
- Object Storage production ready
- Compute in testing

**Bexar** – February 2011

- Compute production ready
- Initial release of Image Service
- Focus on installation and deployment

**Cactus** – April 2011

- Focus on scaling enhancement
- Support for KVM/QEMU, XenServer, Xen, ESXi, LXC

**Diablo** – September 2011

- First “production ready” release

**Essex** – April 2012

- Dashboard and Identity added to core
- Quantum incubated

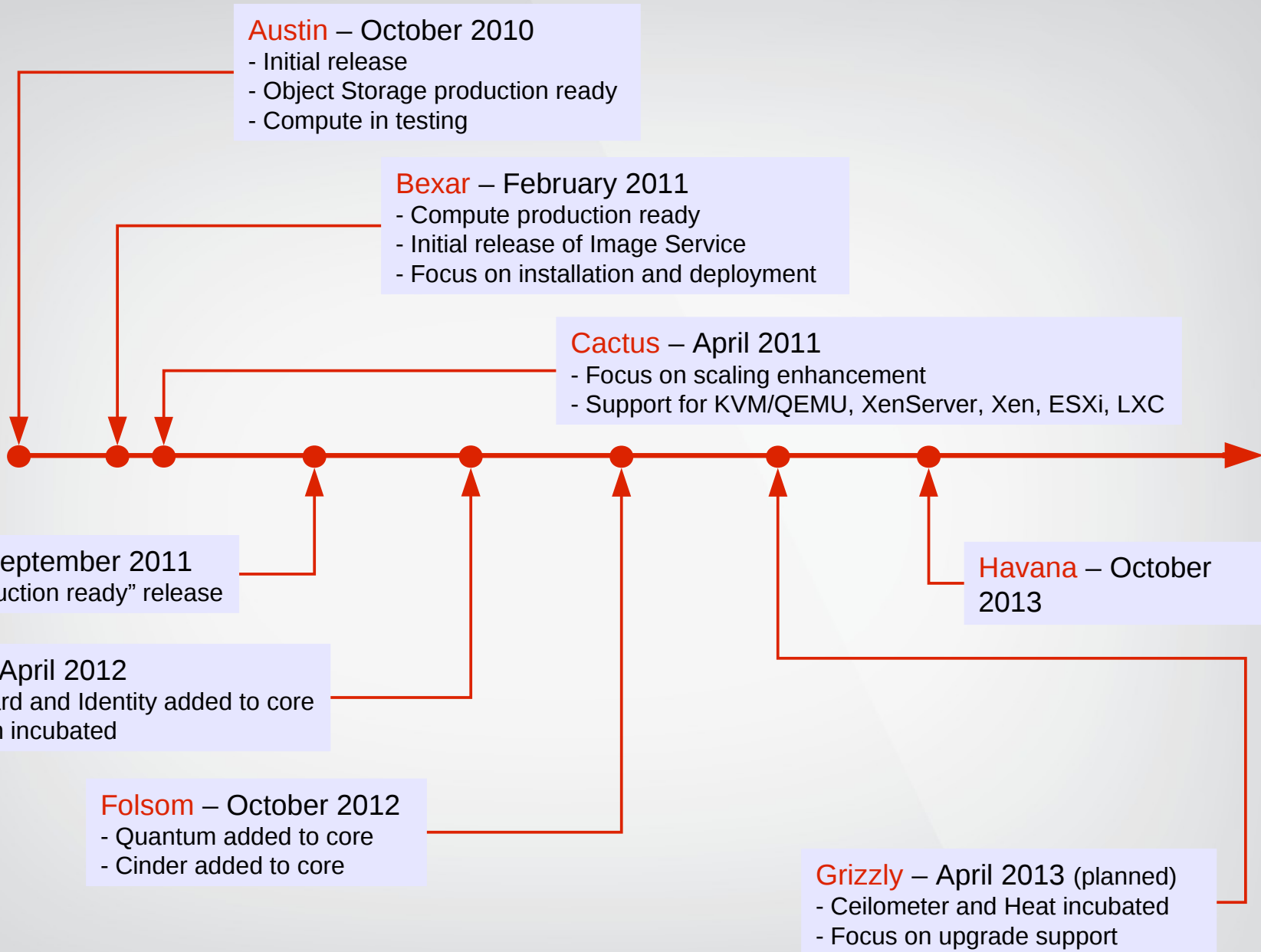
**Folsom** – October 2012

- Quantum added to core
- Cinder added to core

**Havana** – October 2013

**Grizzly** – April 2013 (planned)

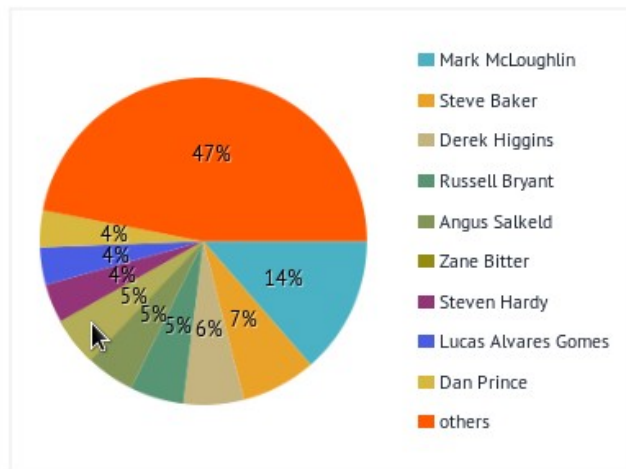
- Ceilometer and Heat incubated
- Focus on upgrade support



# RED HAT UPSTREAM FOCUS

- Heavily engaged in community since 2011
  - Established leadership position in community
  - Both in terms of governance and technology
  - Including Project Technical Leads on Nova, Keystone, Oslo, Heat and Ceilometer
  - Creating and leading stable tree
- 3rd largest contributor to Essex Release
- 2nd largest contributor to Folsom Release
- Largest contributor to Grizzly Release
  - Note: These statistics do not include external dependencies  
eg. libvirt, kvm, Linux components

## Contribution by engineers

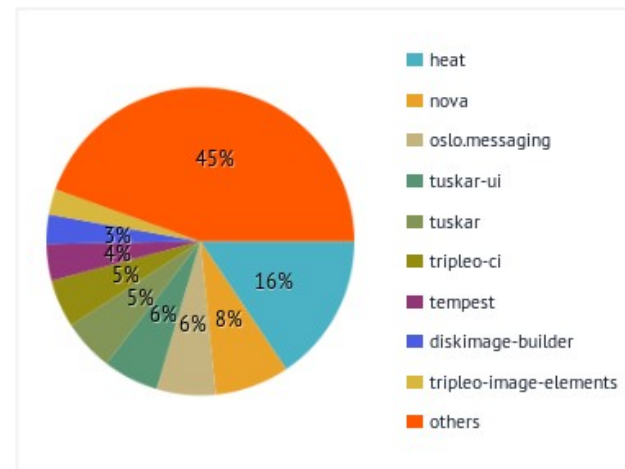


Show  entries

Search:

| #  | Engineer               | Commits |
|----|------------------------|---------|
| 1  | Mark McLoughlin        | 425     |
| 2  | Steve Baker            | 231     |
| 3  | Derek Higgins          | 187     |
| 4  | Russell Bryant         | 166     |
| 5  | Angus Salkeld          | 151     |
| 6  | Zane Bitter            | 148     |
| 7  | Steven Hardy           | 121     |
| 8  | Lucas Alvares Gomes    | 115     |
| 9  | Dan Prince             | 114     |
| 10 | Flavio Percoco Premoli | 112     |
| 11 | Attila Fazekas         | 74      |
| 12 | Tzu-Mainn Chen         | 68      |
| 13 | Matthew FarrelLee      | 59      |
| 14 | Eoghan Glynn           | 56      |
| 15 | Peter Portante         | 55      |
| 16 | Michal Fojtik          | 49      |
| 17 | Eric Harney            | 46      |
| 18 | Jamie Lennox           | 43      |
| 19 | Jiří Stránský          | 38      |
| 20 | Imre Farkas            | 36      |

## Contribution by modules



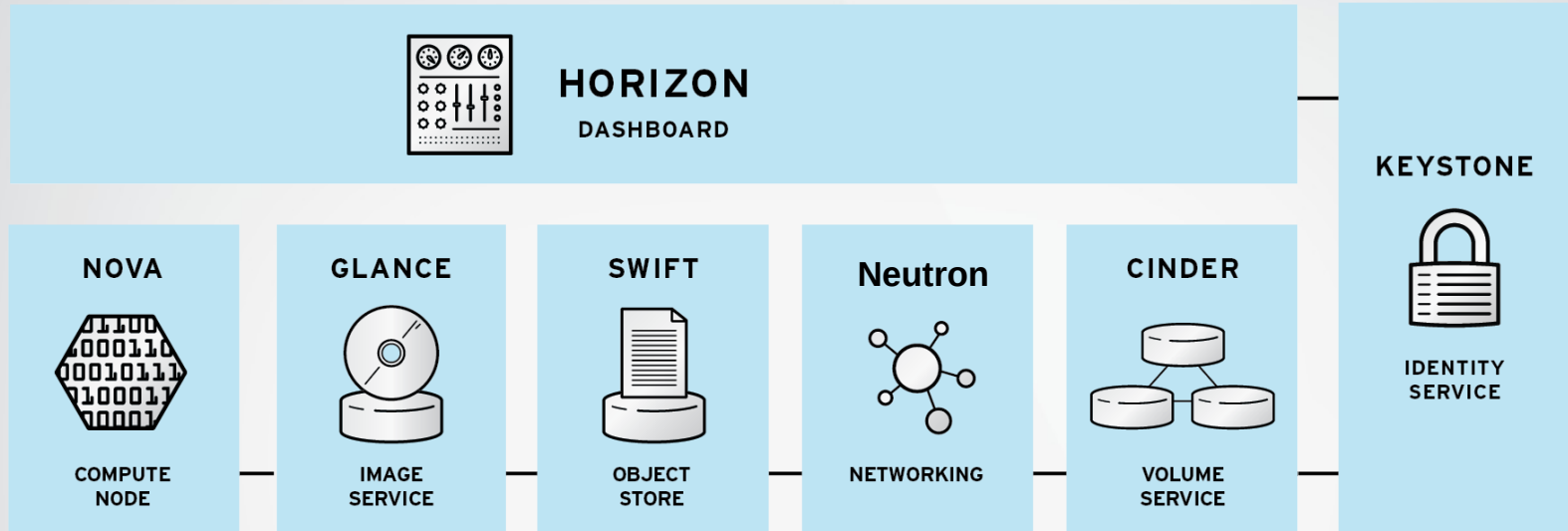
Show  entries

Search:

| #  | Module                 | Commits |
|----|------------------------|---------|
| 1  | heat                   | 487     |
| 2  | nova                   | 244     |
| 3  | oslo.messaging         | 194     |
| 4  | tuskar-ui              | 182     |
| 5  | tuskar                 | 169     |
| 6  | tripleo-ci             | 158     |
| 7  | tempest                | 120     |
| 8  | diskimage-builder      | 96      |
| 9  | tripleo-image-elements | 84      |
| 10 | reviewstats            | 83      |
| 11 | horizon                | 80      |
| 12 | devstack               | 75      |
| 13 | swift                  | 72      |
| 14 | oslo-incubator         | 68      |
| 15 | ceilometer             | 64      |
| 16 | keystone               | 61      |
| 17 | config                 | 61      |
| 18 | tripleo-incubator      | 58      |
| 19 | neutron                | 57      |
| 20 | openstack-manuals      | 56      |

# OpenStack Architecture

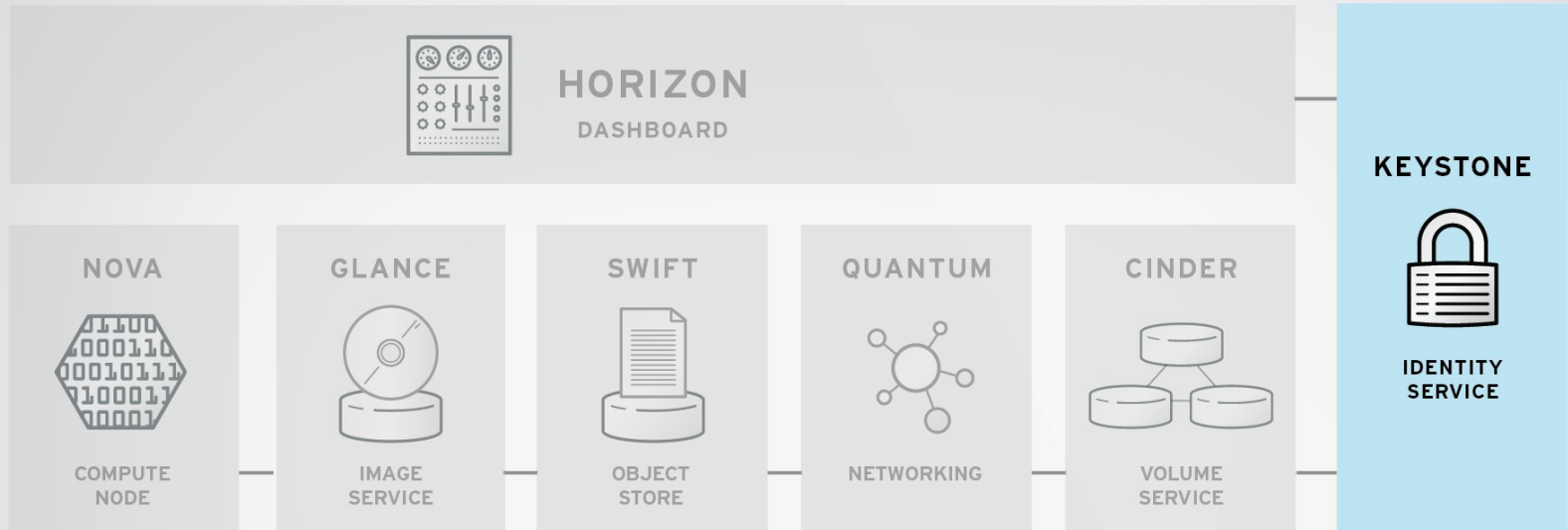
# OPENSTACK ARCHITECTURE



OST 0001

- Modular architecture
- Designed to easily scale out
- Based on (growing) set of core services

# OPENSTACK ARCHITECTURE

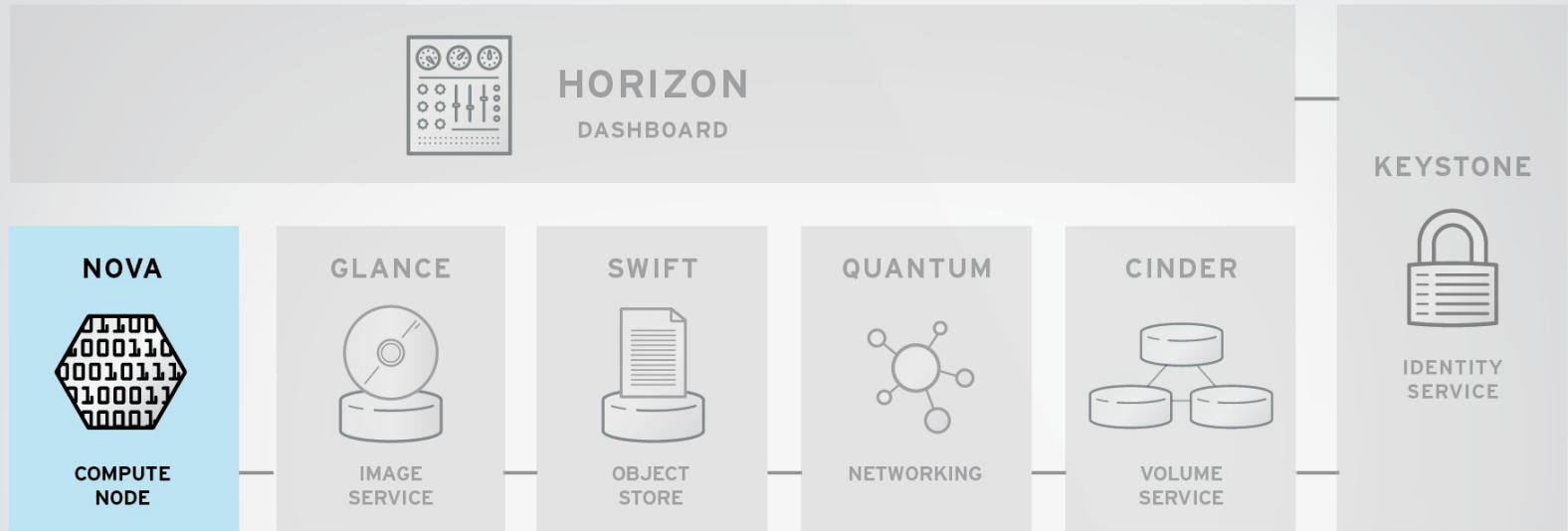


OST 0001

## Keystone

- Identity Service
- Common authorization framework
- Manages users, tenants and roles
- Pluggable backends (SQL, PAM, LDAP, IDM, etc)

# OPENSTACK ARCHITECTURE

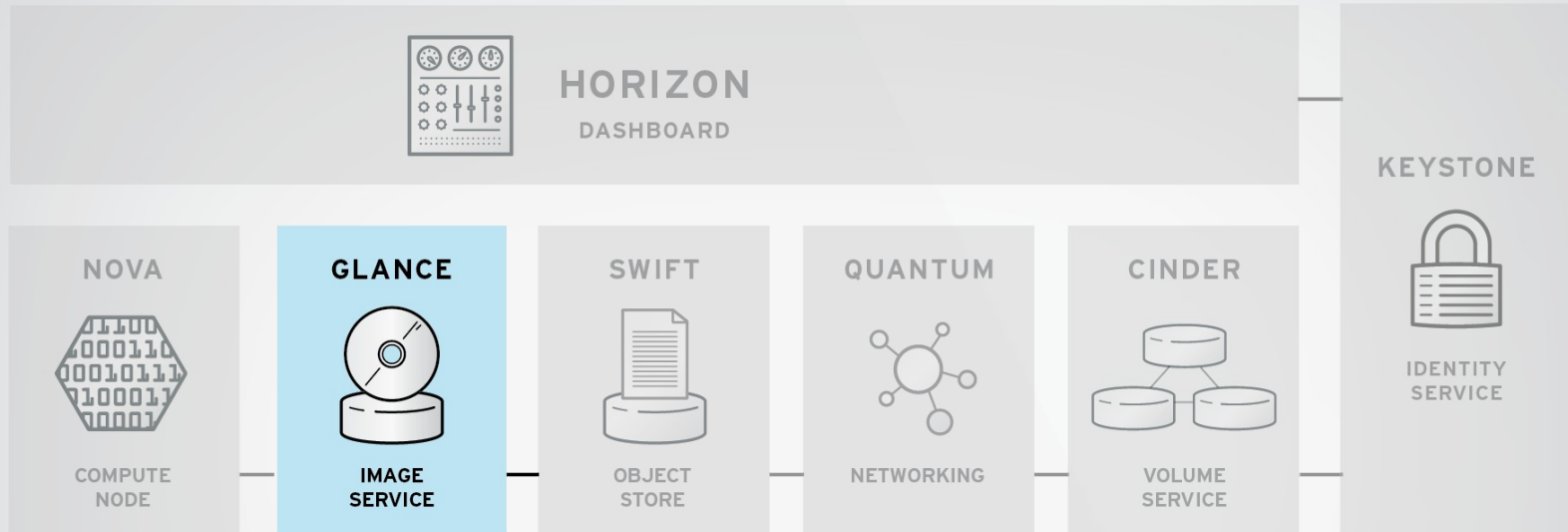


OST 0001

## NOVA

- Core compute service comprised of
  - Compute Nodes – hypervisors that run virtual machines
    - Supports multiple hypervisors KVM, Xen, LXC, Hyper-V and ESX
  - Distributed controllers that handle scheduling, API calls, etc
    - Native OpenStack API and Amazon EC2 compatible API

# OPENSTACK ARCHITECTURE



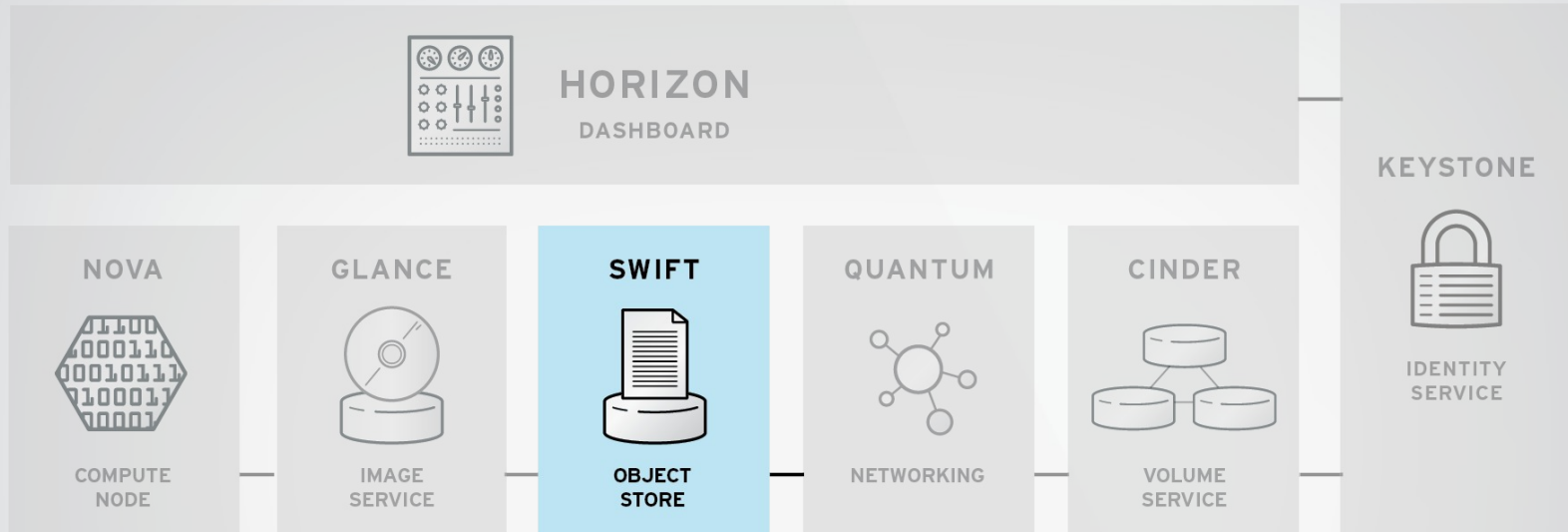
OST 0001

## Glance

- Image service
- Stores and retrieves disk images (virtual machine templates)
- Supports Raw, QCOW, VMDK, VHD, ISO, OVF & AMI/AKI
- Backend storage : Filesystem, Swift, Gluster, Amazon S3



# OPENSTACK ARCHITECTURE

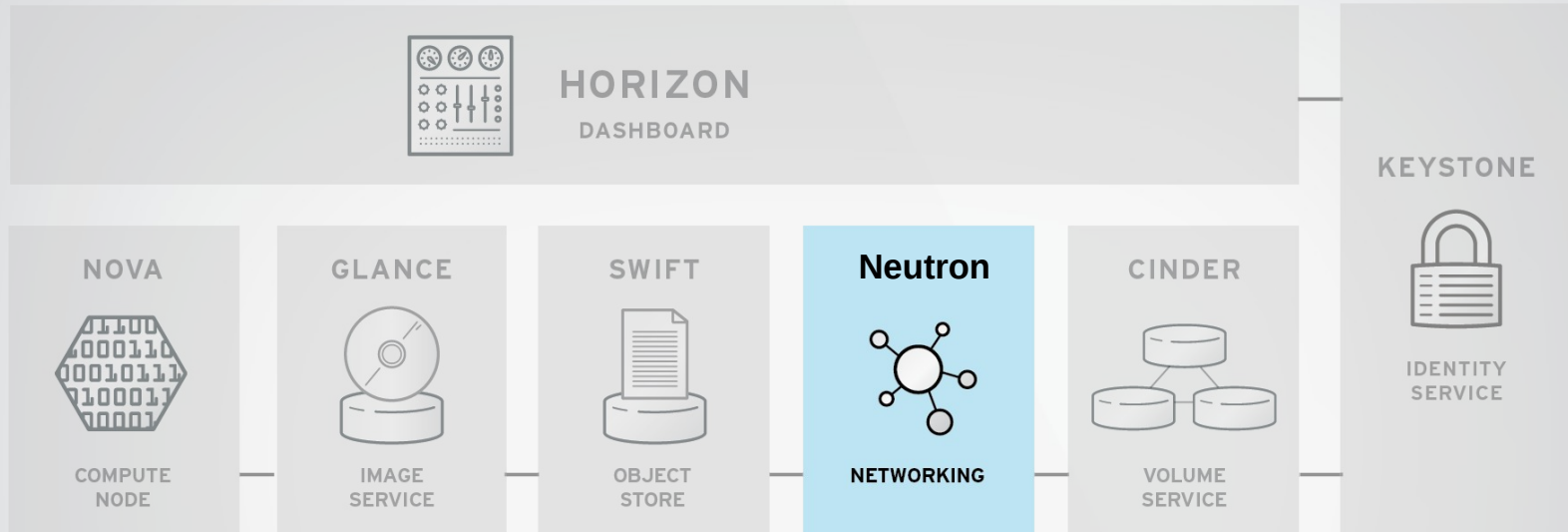


OST 0001

## Swift

- Object Storage service
- Modeled after Amazon's S3 service
- Provides simple service for storing and retrieving arbitrary data
- Native API and S3 compatible API

# OPENSTACK ARCHITECTURE

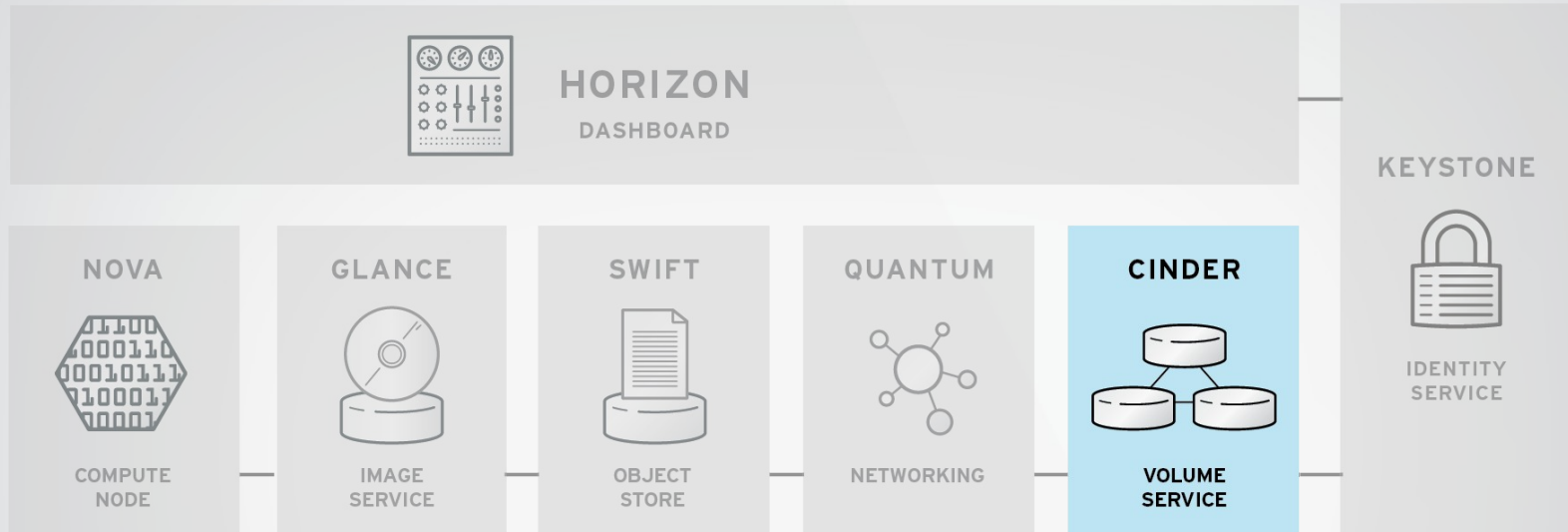


OST 0001

## Neutron

- Network Service
- Provides framework for Software Defined Network (SDN)
- Plugin architecture
  - Allows integration of hardware and software based network solutions
    - Open vSwitch, Cisco UCS, Standard Linux Bridge, Nicira NVP

# OPENSTACK ARCHITECTURE

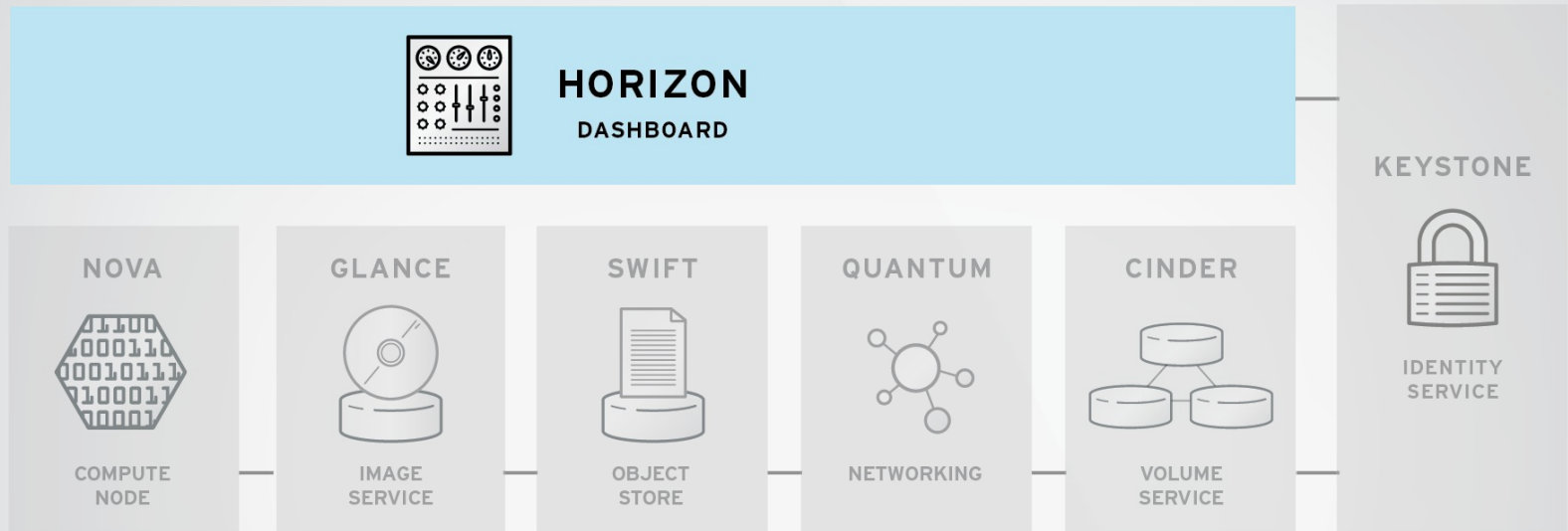


OST 0001

## Cinder

- Block Storage (Volume) Service
- Provides block storage for virtual machines (persistent disks)
- Similar to Amazon EBS service
- Plugin architecture for vendor extensions
  - eg. NetApp driver for Cinder

# OPENSTACK ARCHITECTURE

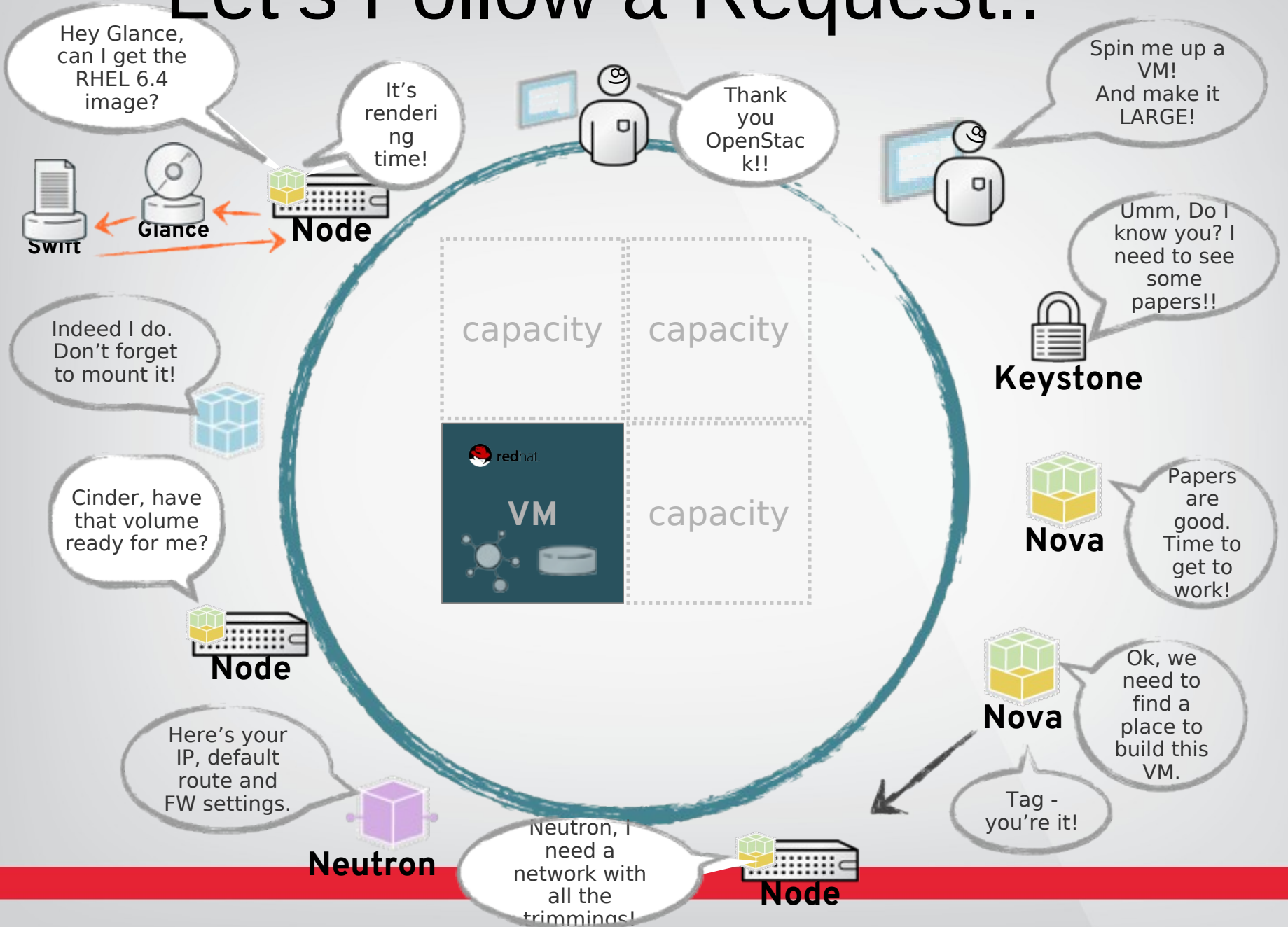


OST 0001

## Horizon

- Dashboard
- Provides simple self service UI for end-users
- Basic cloud administrator functions
  - Define users, tenants and quotas
  - No infrastructure management

# Let's Follow a Request..

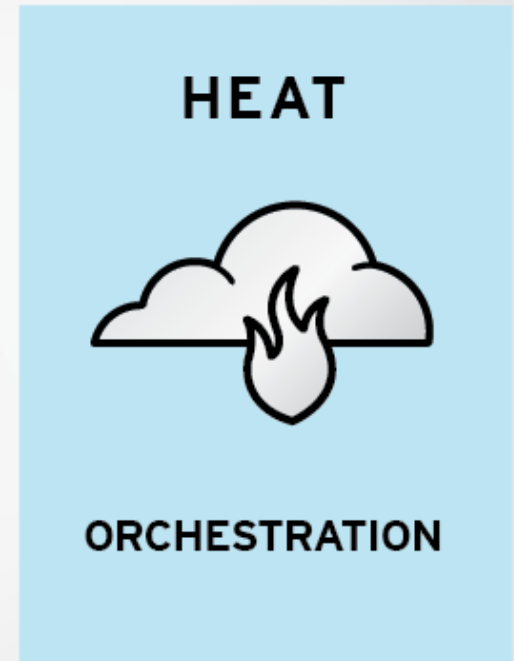


# OPENSTACK INCUBATING PROJECTS

## OpenStack Orchestration (HEAT)

- Provides template driven cloud application orchestration
- Modeled after AWS CloudFormation
- Targeted to provide advanced functionality such as high availability and autoscaling
- Introduced by  **redhat.**

Graduated from Incubation to Integrated status for the Havana release



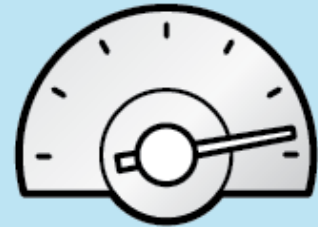
# OPENSTACK INCUBATING PROJECTS

## OpenStack Monitoring and Metering (CEILOMETER)

- Goal: To provide a single infrastructure to collect measurements from an entire OpenStack infrastructure; eliminate need for multiple agents attaching to multiple OpenStack projects
- Primary targets metering and monitoring; provides extensibility

Graduated from Incubation to Integrated status for the Havana release

**CEILOMETER**



**METERING AND  
MONITORING**

# OpenStack Incubating projects



# OTHER OPENSTACK PROJECTS

- Deployment (TripleO)
  - Installing, upgrading and operating Openstack using Openstack's own cloud facilities (nova, neutron and heat)
  - Continuous integration and deployment testing at the bare metal layer (Ironic)
- File storage (Manila)
  - Shared filesystem as a service
  - NFS, Cifs and others
- Database Service (Trove)
- Bare metal (Ironic)
- Raksha (Backup)
- Queue service (Marconi)
- Common Libraries (Oslo)

# OpenStack Red Hat distributions

# BUILDING A COMMUNITY



- RDO Project
  - Community distribution of OpenStack
  - Packaged for \*EL6 and Fedora
  - Freely available without registration
  - Packstack (puppet modules) to simplify the installation
    - < 10 minutes to install
- Vanilla distribution – closely follows upstream
  - Upstream release cadence
  - 6 month lifecycle – limited updates based on upstream

# RELEASE CADENCE

- Upstream
  - Source code Only
  - Releases every 6 month
  - 2 to 3 'snapshots' including bug fixes
  - No more fixes/snapshots after next release
- RDO
  - Follows upstream cadence
  - Delivers binaries



**HOME**

QUICK START

DOCS

FORUM

PEOPLE

Q SEARCH

The most up-to-date OpenStack on the industry's most trusted Linux platform, now easy to install and deploy.

QUICK START →

## Neutron Networking Google Hangout

On Tuesday, September 24th, we'll had a Google Hangout where we'll be covering Neutron Networking for beginners. If you missed it, you can still watch it on YouTube at <https://www.youtube.com/watch?v=afImoFeuDnY#t=275> and bring your followup questions to the [RDO Forum](#)

## Introducing RDO

RDO is a community of people using and deploying OpenStack on Red Hat and Red Hat-based platforms. We have [documentation to help get started](#), [forums](#) where you can connect with other users, and [community-](#)



## RDO documentation

This page links to general information about RDO, guides for getting your OpenStack cloud up and running, and information on using RDO with other Red Hat ecosystem technologies. Since RDO sticks closely to the upstream OpenStack project, the documentation at docs.openstack.org will also prove helpful.

If you've come across useful tips for resolving issues on OpenStack, or if you're interested in sharing details of your deployment, please consider sharing this information with the community at our [troubleshooting](#) and [case studies](#) pages.

### Install

[edit](#)

### Networking

[edit](#)

### Storage

[edit](#)

- [Quick start guide \(RDO Grizzly\)](#)
- [Quick start guide \(RDO Havana\)](#)
- [Deploying RDO Using Foreman](#)
- [Launching your first VM](#)
- [Image Resources](#)
- [Deploy Heat and launch your first Application \(RDO Grizzly\)](#)
- [Deploy Heat and launch your first Application \(RDO Havana\)](#)
- [Repository information](#)

- [Quick start guide with Neutron](#)
- [Launching your first VM with Neutron](#)
- [Configuring Neutron to use VLANs](#)
- [Using GRE Tenant Networks](#)
- [Neutron with existing external network](#)
- [Difference between Floating IP and private IP](#)
- [Setting a Floating IP Range](#)
- [Other networking resources](#)
- [Setting up a virtualized multi-node dev](#)

- [GlusterFS with Keystone Quickstart](#)
- [Using Gluster for Cinder Block Storage](#)
- [Using Ceph for Block Storage with RDO](#)

# RDO Quick Start

```
# yum install -y http://rdo.fedorapeople.org/openstack-  
havana/rdo-release-havana.rpm sudo  
# yum install -y openstack-packstack  
# packstack --allinone --os-neutron-install=n
```

[http://\\$YOURIP/dashboard](http://$YOURIP/dashboard)



DASHBOARD

Project Admin

CURRENT PROJECT  
**admin**

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Object Store

Containers

# Overview

Logged in as: admin

[Settings](#)

[Help](#)

[Sign Out](#)

## Limit Summary



**Instances**  
Used 4 of 10



**VCPUs**  
Used 4 of 20



**RAM**  
Used 8,192 MB of 51,200 MB



**Floating IPs**  
Used 0 of 10



**Security Groups**  
Used 0 of 10

## Select a period of time to query its usage:

From:

To:

The date should be in YYYY-mm-dd format.

**Active Instances: 4 Active RAM: 8GB This Period's VCPU-Hours: 52.74 This Period's GB-Hours: 1054.88**

## Usage Summary

| Instance Name               | VCPUs | Disk | RAM | Uptime          |
|-----------------------------|-------|------|-----|-----------------|
| <a href="#">fed</a>         | 1     | 20   | 2GB | 2 weeks, 5 days |
| <a href="#">RHEL64</a>      | 1     | 20   | 2GB | 2 weeks, 5 days |
| <a href="#">Ubuntu</a>      | 1     | 20   | 2GB | 2 weeks, 5 days |
| <a href="#">Windows2012</a> | 1     | 20   | 2GB | 2 weeks, 4 days |

Displaying 4 items



# TryStack.org

# OPENSTACK SANDBOX

A FREE WAY TO TRY OPENSTACK WITH YOUR APPS

**The Easiest Way To Try Out OpenStack.** We've set up large clusters of hardware running OpenStack on both x86 and ARM architectures. The best part? It's totally free for you to try & test your apps—thanks to our generous individual and corporate contributors.

For A Free Account:

Join Our Facebook  
Group



Once we approve your  
account...

Select an OpenStack Flavor:

**OpenStack Essex** on ARM

Login

**OpenStack Grizzly** on  
x86/RHEL

Login

Or Learn About [Using The API](#)

Testing only, please.

**Rule No. 1: Remember that TryStack is designed exclusively as a testing sandbox.** We wanted a fast, easy way for developers to test code against a real OpenStack environment, without having to stand up hardware themselves. It probably goes without saying that this is not the place for production code - you should host only test code and test servers here. In fact, your account on TryStack will be periodically wiped to help make sure no one account tries to rule tyrannically over our democracy. Play nice in the sandbox!

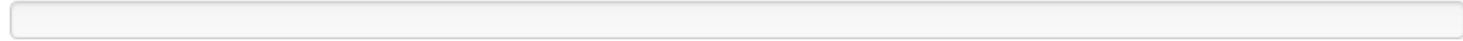


DASHBOARD

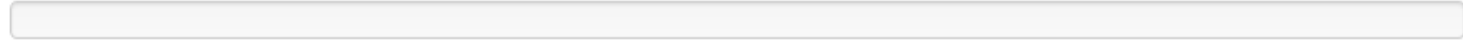
# Overview

## Quota Summary

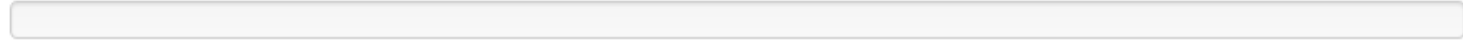
Used 0 of 10 Available Instances



Used 0 of 20 Available vCPUs



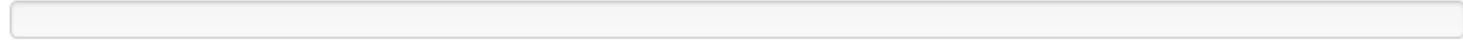
Used 0 MB of 4,096 MB Available RAM



Used 0 of 1 Available volumes



Used 0 GB of 1 GB Available volume storage



## Select a month to query its usage:

October ▼ 2013 ▼

Active Instances: - Active RAM: - This Month's VCPU-Hours: 0.00 This Month's GB-Hours: 0.00

## Usage Summary

[Download CSV Summary](#)

| Instance Name        | VCPUs | Disk | RAM | Uptime |
|----------------------|-------|------|-----|--------|
| No items to display. |       |      |     |        |
| Displaying 0 items   |       |      |     |        |

Project

CURRENT PROJECT  
**facebook688981323**

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

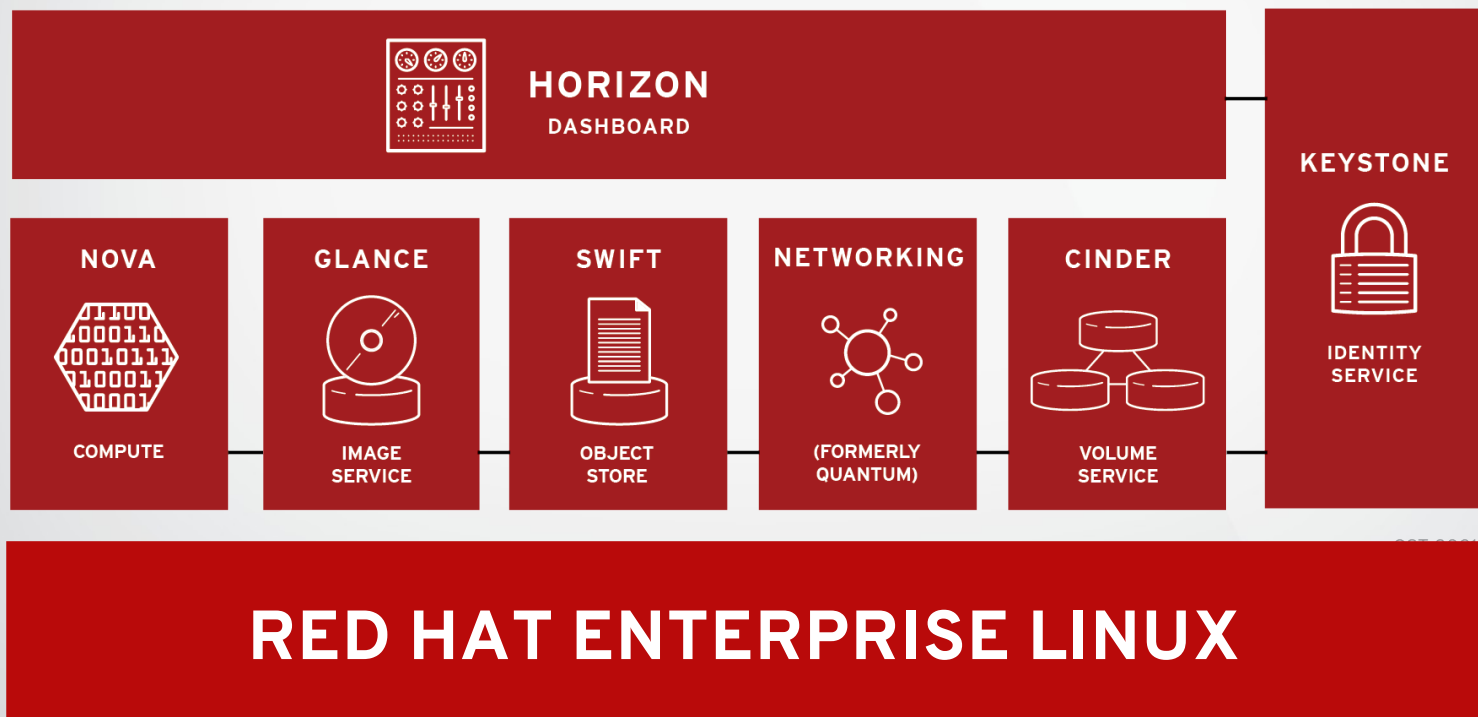
Access & Security

Object Store

Containers

# RED HAT ENTERPRISE LINUX OPENSTACK PLATFORM

- Hardened OpenStack, API identical with upstream, longer (starting with 1 year) enterprise life cycle
- Optimized for and integrated with Red Hat Enterprise Linux



# RED HAT ENTERPRISE LINUX OPENSTACK PLATFORM VALUE

- Enterprise grade OpenStack deployment with ecosystem, lifecycle, support that customers expect from Red Hat
  - Based on RHEL and includes required fixes in both OpenStack and RHEL
  - Enterprise hardened OpenStack code
  - Longer supported lifecycle
    - includes bug fixes, security errata, selected backports
  - Certified ecosystem (Red Hat Certified OpenStack Partner program and Red Hat Enterprise Linux ecosystem)
  - Full support and Certifications for RHEL and Windows workloads

# RELEASE CADENCE

- Red Hat OpenStack (RHOS)
  - 6 Month cadence
  - Roughly 2 to 3 months AFTER upstream
    - Time to stabilize, certify, backport etc.
  - Initially 1 year lifecycle
    - eg. Support for Folsom ends after Havana release
    - eg. Support for Grizzly ends after “I” release
  - Will increase lifecycle over time
    - Likely to move to 2 years after Havana
      - Based on upstream stability and resources

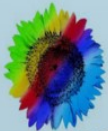
# RED HAT® OPENSTACK CLOUD INFRASTRUCTURE PARTNER NETWORK

**HITACHI**  
Inspire the Next

**JUNIPER**  
NETWORKS

**vmware**

**NEC**



**WIPRO**  
Applying Thought



**SUPERMICRO**

Seagate



**BULL**



**LOCKHEED  
MARTIN**

**EMC<sup>2</sup>**

**AMD**

**lenovo**

**FUJITSU**



nuagenetworks

SOLARFLARE®

**Symantec.**

**BROCADE**



**NetApp**



**IBM**

**intel**

**CISCO**

# OPENSTACK PROGRESSION



- Open source, community-developed (upstream) software
- Founded by Rackspace Hosting and NASA
- Managed by the OpenStack Foundation
- Vibrant group of developers collaborating on open source cloud infrastructure
- Software distributed under the Apache 2.0 license
- No certifications, no support

- Latest OpenStack software, packaged in a managed open source community
- Provide an easy way to install Openstack with Packstack (Puppet modules)
- Aimed at architects and developers who want to create, test, collaborate
- Freely available, not for sale
- Six-month release cadence mirroring community
- No certification, no support
- Installs on Red Hat and derivatives

- Enterprise-hardened OpenStack software
- Delivered with an enterprise life cycle
- Six-month release cadence offset from community releases to allow testing
- Aimed at long-term production deployments
- Certified hardware and software through the Red Hat OpenStack Cloud Infrastructure Partner Network
- Supported by Red Hat
- OpenStack certification (CL210 and EX210)

# Use cases

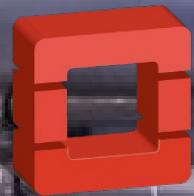


# CERN's infrastructure

~1300 compute nodes

Run ~1000 VMs simultaneously

Deployed ~250VMs in ~5min\_



openstack™

# Conclusion

# TO LEARN MORE

- Learn more about RDO
  - [openstack.redhat.com](https://openstack.redhat.com)
- Learn more about RHOS
  - [redhat.com/products/cloud-computing/openstack](https://redhat.com/products/cloud-computing/openstack)
- 90-day RHOS Eval (Includes RHEL lics for 3 RHOS nodes)
  - [redhat.com/openstack](https://redhat.com/openstack)
- Openstack summit videos

## We've been **OPEN** all along.

It's in our DNA.

It's not lip service. Or cloud washing.

Open is what we do. And how we do it.

With every step forward, Red Hat opens another layer of the technology stack.

Cloud is the next step—the next open innovation.

# THE BIRTH OF OPENSTACK

**Subject:** Significant new cloud project and competition

**From:** Rick Clark <rick.clark@rackspace.com>

**Date:** 06/07/2010 12:09 PM

**To:** Mark Collier <mark.collier@rackspace.com>, Jim Curry <jim.curry@rackspace.com>, Lew Moorman <lmoorman@rackspace.com>, Pat Matthews <pat.matthews@rackspace.com>, Paul Voccio <paul.voccio@rackspace.com>, Lee Bieber <lee.bieber@RACKSPACE.COM>

- gpg control packet  
Guys,

I have been anticipating that NASA would eventually dump a lot of code from their Nebula cloud back into Eucalyptus and fix most of it's problems, but they have taken a different path.

NASA has rewritten eucalyptus completely, in python and it looks a lot better. They are actively recruiting partners and Canonical is looking at them to replace Eucalyptus in Ubuntu.

I think this is a significant development, because of NASA's reputation.

Paul and I are looking into it technically and will report back ASAP.

<http://novacc.org/>

Rick

# Questions