



# Implantação de Arquitetura de Nuvem Privada

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BLOCO: ARQUITETURA DE INFRAESTRUTURA DE APLICAÇÕES

PROF. RODRIGO EIRAS, M.SC.

[ETAPA 1] AULA 1 – PREAMBULO E CONCEITOS GERAIS

# Apresentação

**rodrigoeiras.github.io**

PostsCategoriesTagsTeaching



**Rodrigo Eiras**

Big Data, Analytics,  
Networks.  
STEM Enthusiast!  
(Also, love beers :))

 LinkedIn

 Twitter

 GitHub

 Instagram

**Recent Posts**

**Jupyterhub**

 less than 1 minute read

Dicas para configurar um ambiente Jupyter Lab em um servidor remoto.

**Teclado Americano Linux Mint**

 less than 1 minute read

Aprenda a habilitar cedilha no Linux Mint. Apesar de parecer simples, a coisa não é bem documentada.

**E-reader LEV, da Saraiva**

 less than 1 minute read

Escrevo aqui a grata experiência que estou tendo com o e-reader Lev, da Saraiva. A princípio, eu era um pouco resistente com esses aparelhos, preferia o liv...

- Rodrigo Silva Vilela Eiras
  - Formado em Sistemas de Informação – CES/PUC-MG
  - Especialista em Redes de Computadores – UFLA
  - Mestre em Engenharia Eletrônica – UERJ
- Interesses: Redes de Computadores, Segurança da Informação, Análise de Dados, Aprendizado de Máquina, Big Data, Cloud Computing



## Disciplina Regular

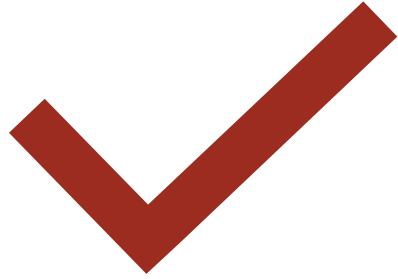
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- Aulas todas as Terças e Quintas:
  - 20:30 às 22:00
- Foco em plataforma OpenStack

# Recursos

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Roteiro no Moodle



O que é uma nuvem privada?

Vamos começar!

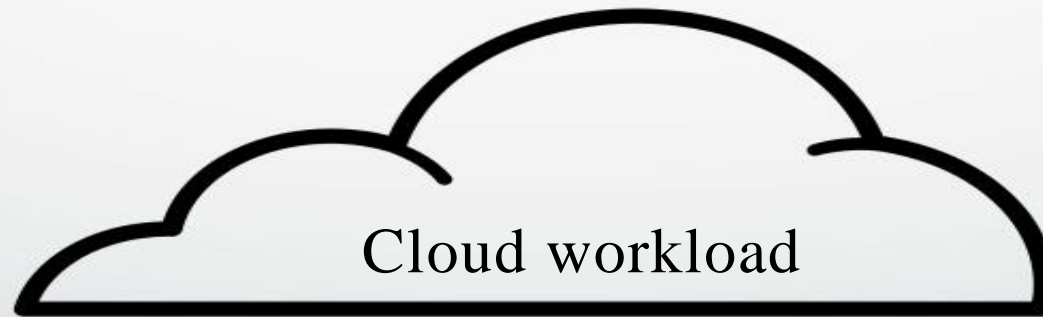
# Agenda

- 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



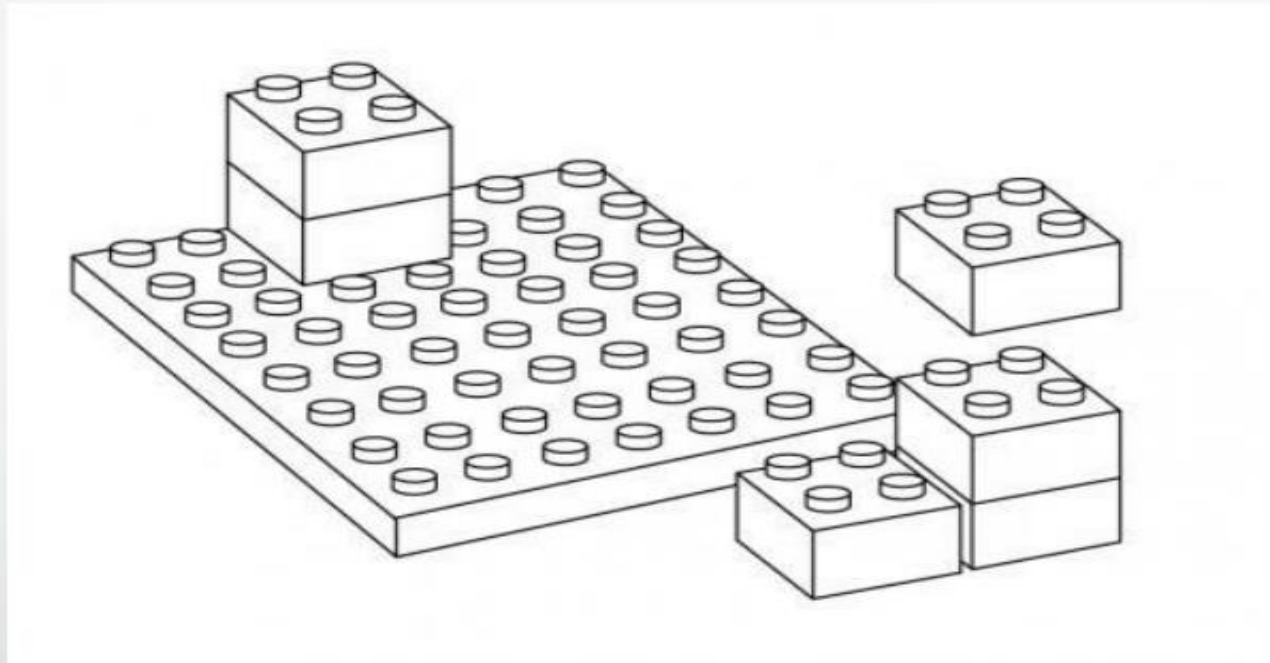
APIs



Web  
Dashboard

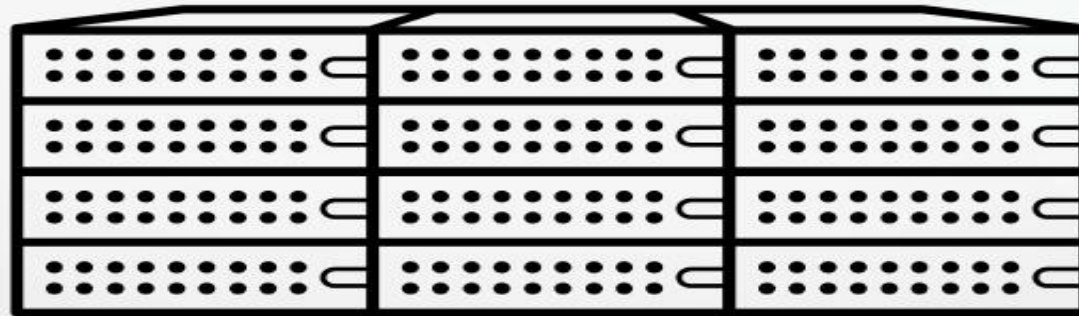
# OpenStack is ...

## Building blocks



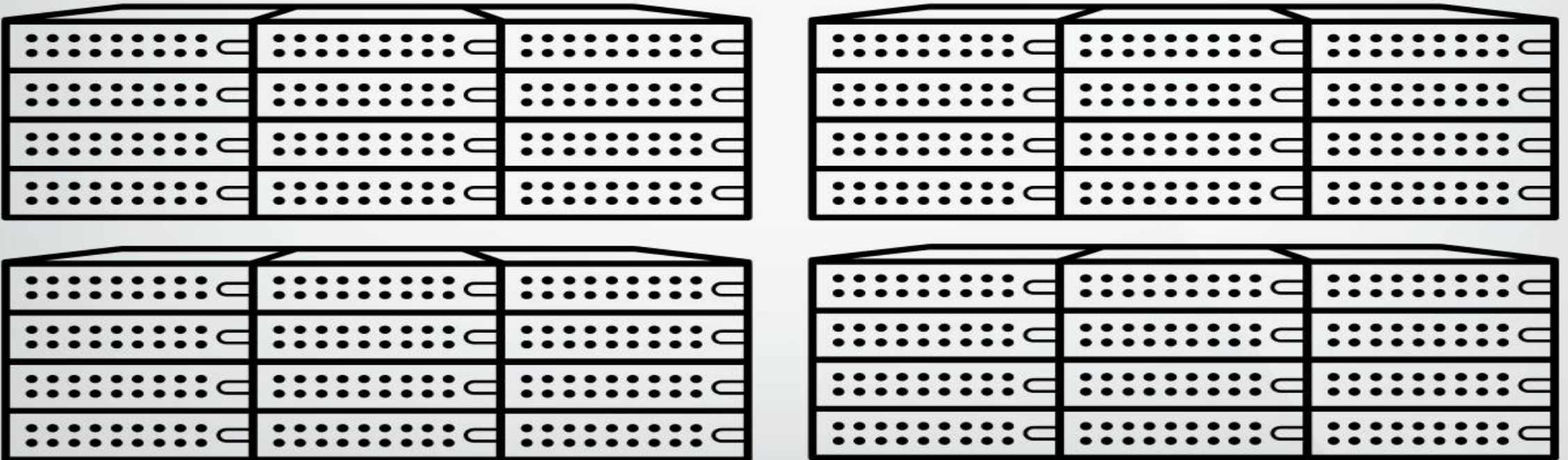
# OpenStack is ...

## Illusion of Infinite Capacity

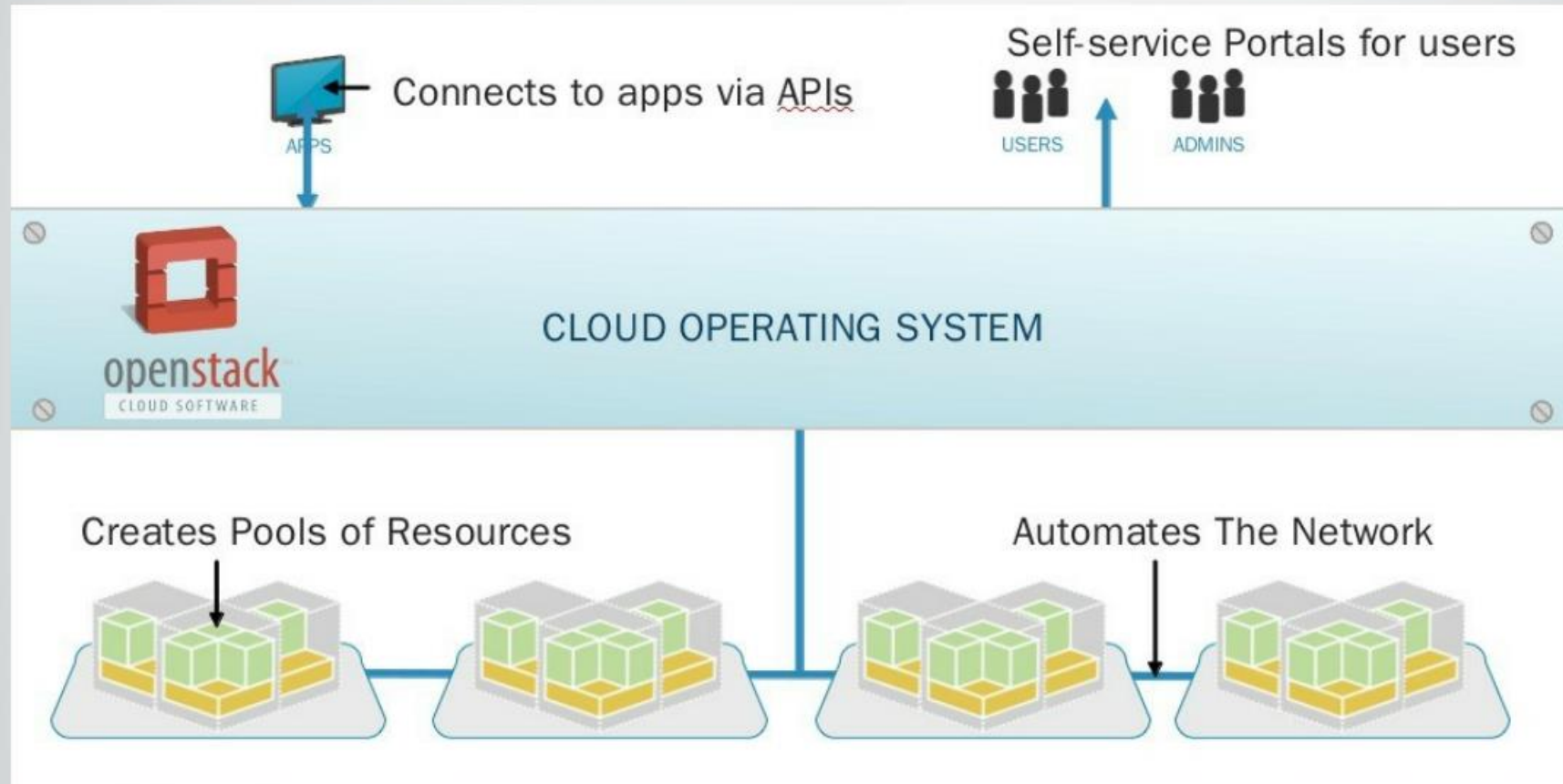


# OpenStack is ...

## Massive Scale



# OPENSTACK



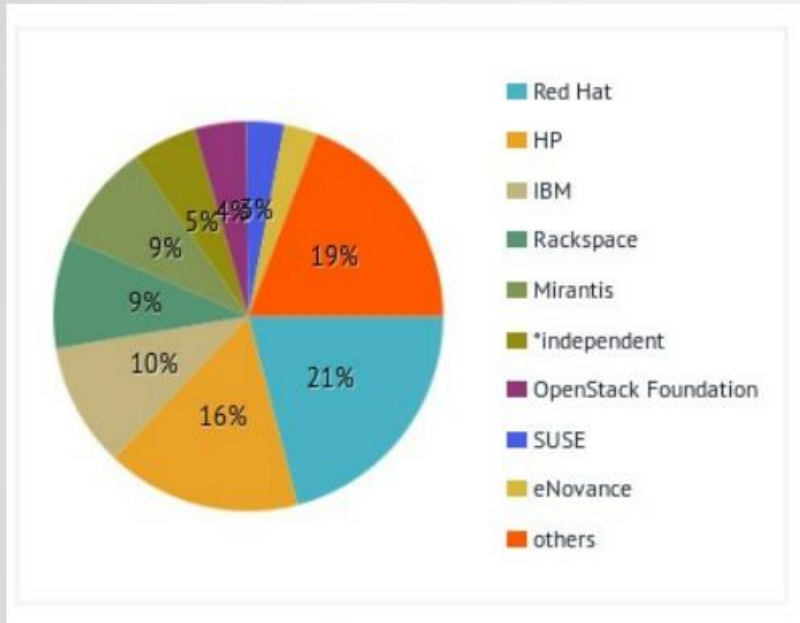
# OPENSTACK COMMUNITY

In 4 years

The second largest after Linux

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# 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



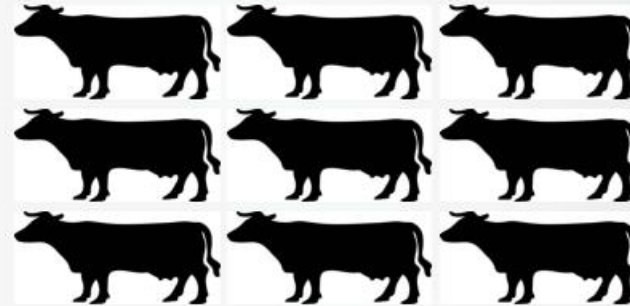
## TRADITIONAL WORKLOADS



- 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

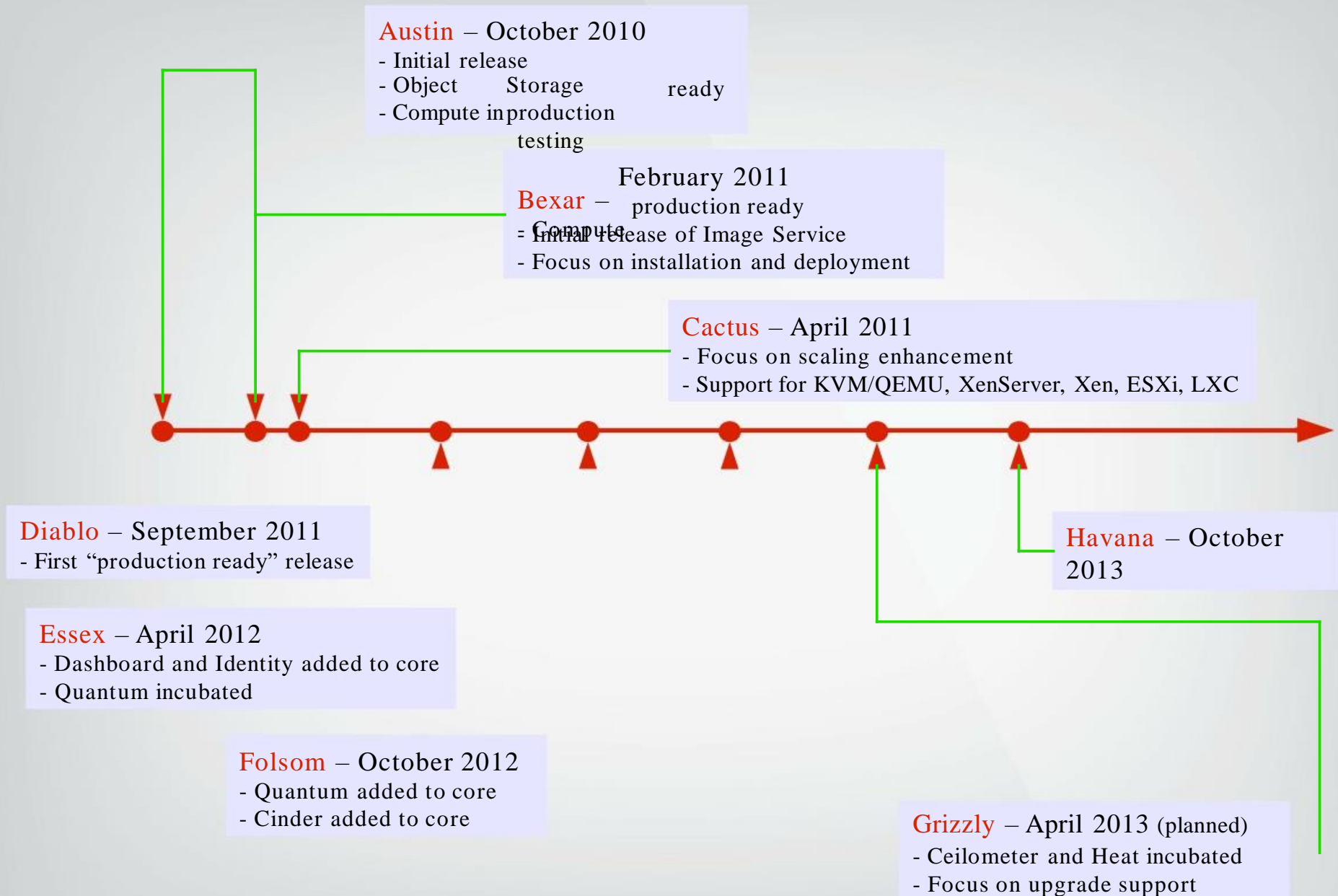


- Cattle are almost identical to each other
- They are given numbers
- When they get ill you get another one

# OpenStack upstream

# UPSTREAM

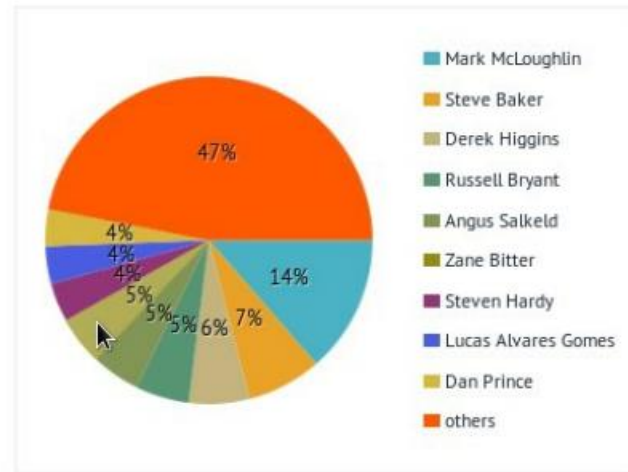
- Releases every 6 months
  - April & October: Named Alphabetically
- Upstream focus
  - Distribution neutral
- Does not provide :
  - Installer (devstack?) or centralized management



# 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

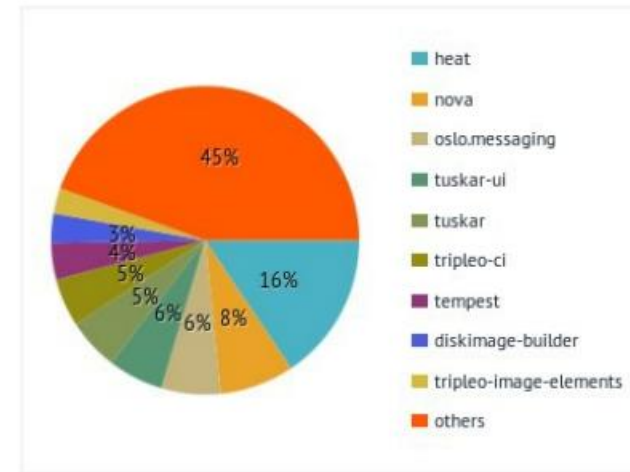


Show 25 entries

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 25 entries

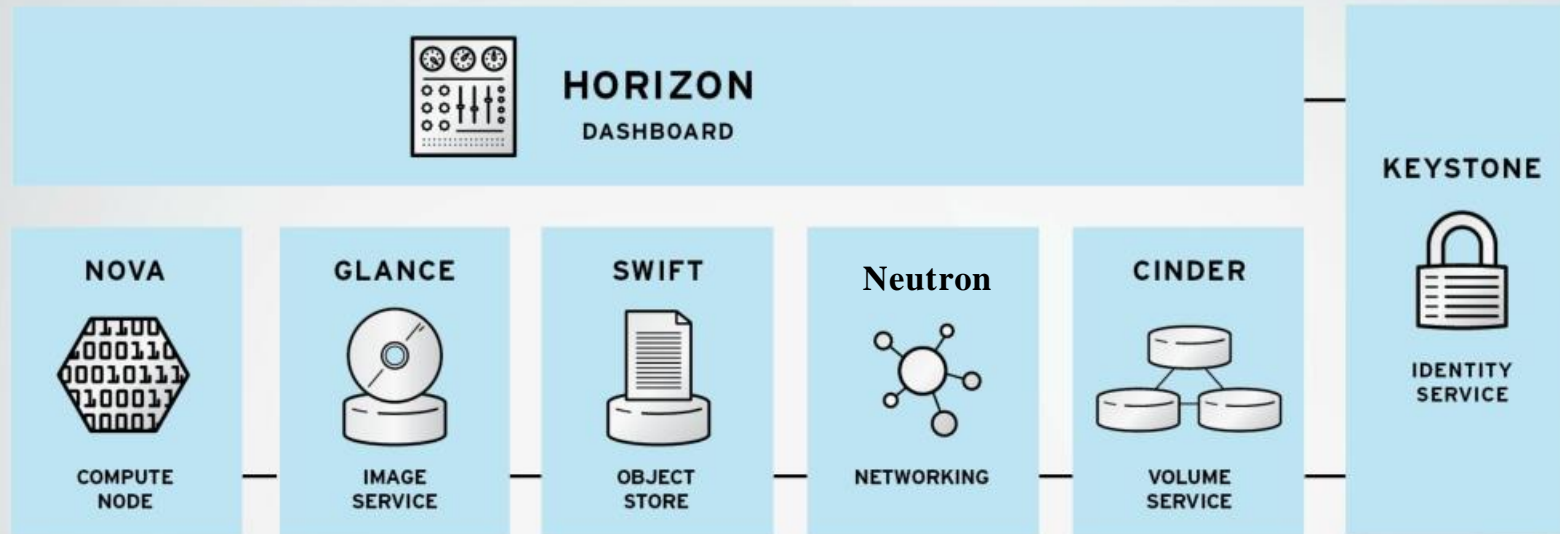
Search:

#	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



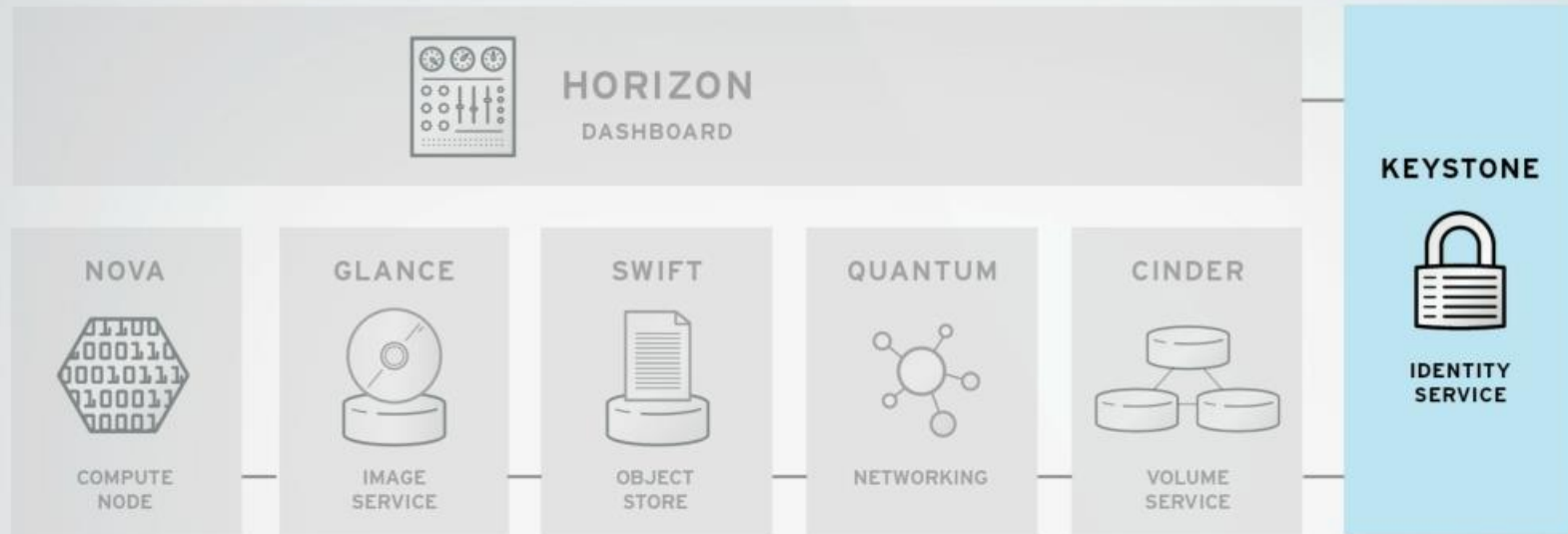
# OPENSTACK ARCHITECTURE



OST 0001

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

# OPENSTACK ARCHITECTURE

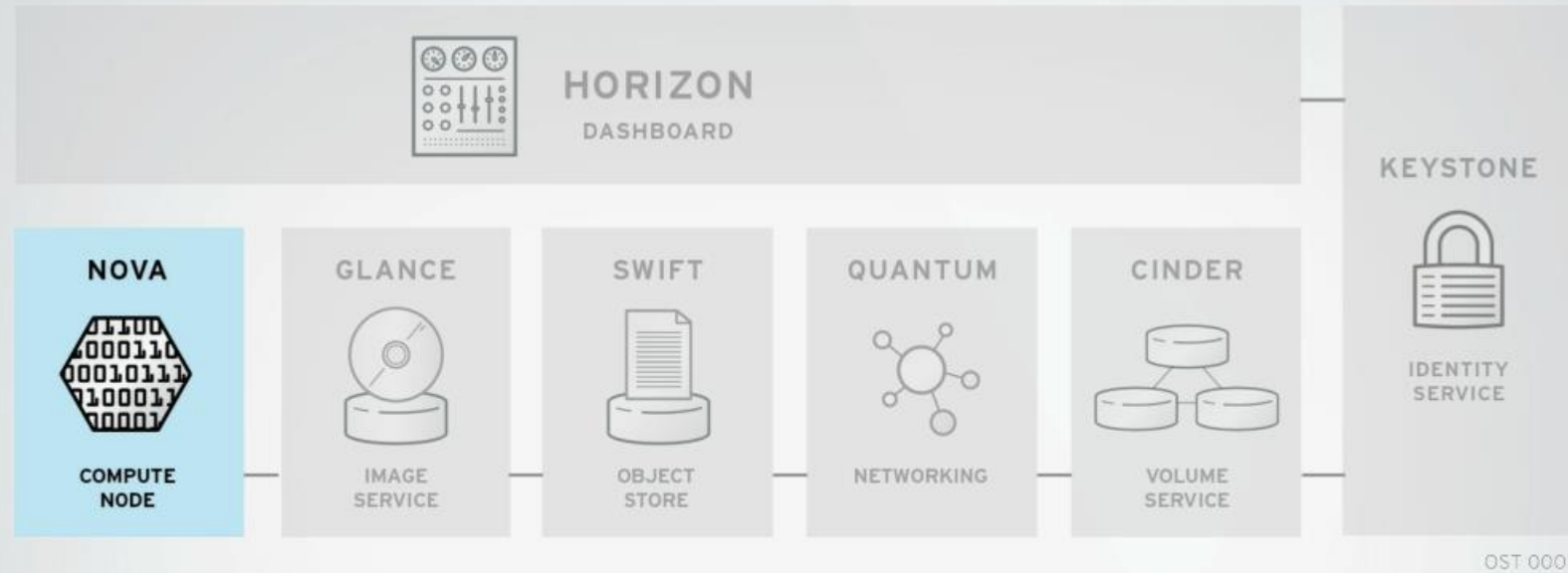


OST 0001

## Keystone

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

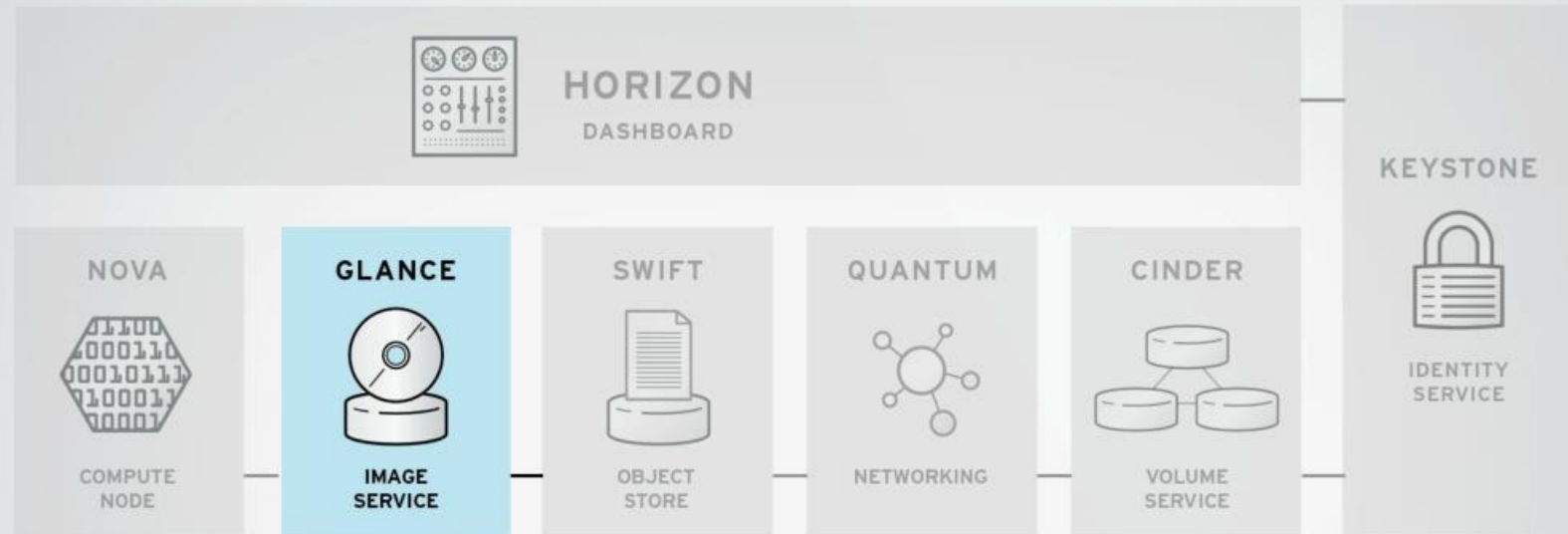
# OPENSTACK ARCHITECTURE



## 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

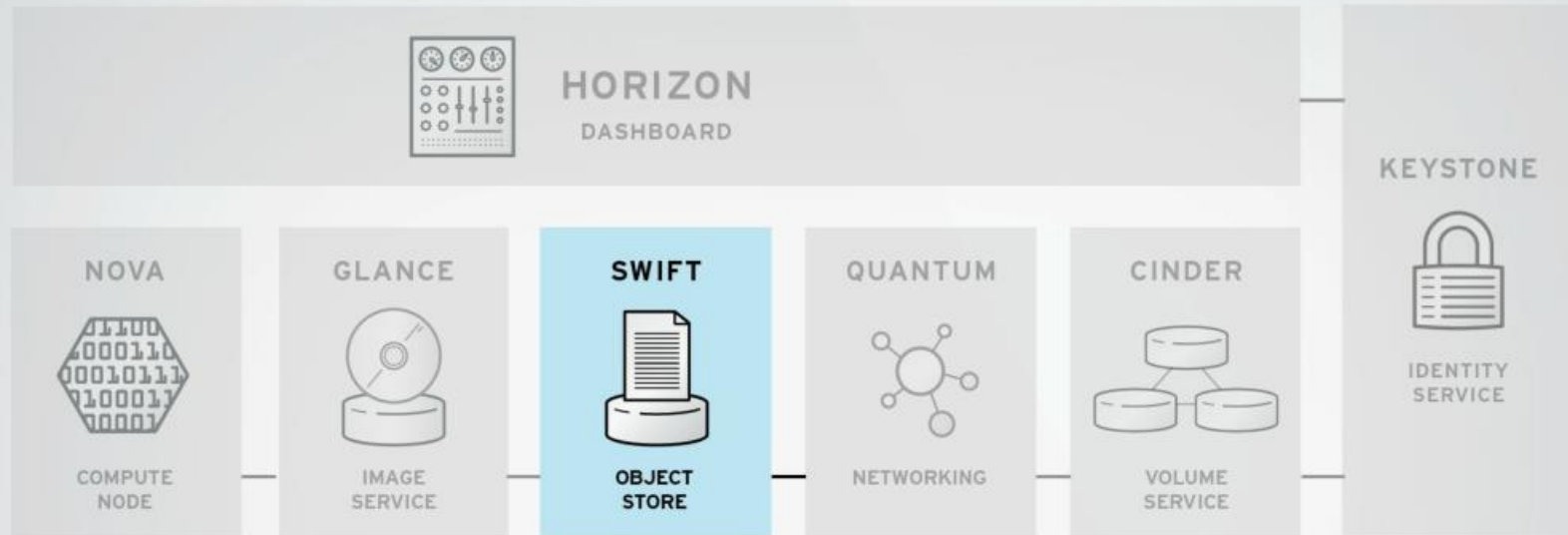
# OPENSTACK ARCHITECTURE



## 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

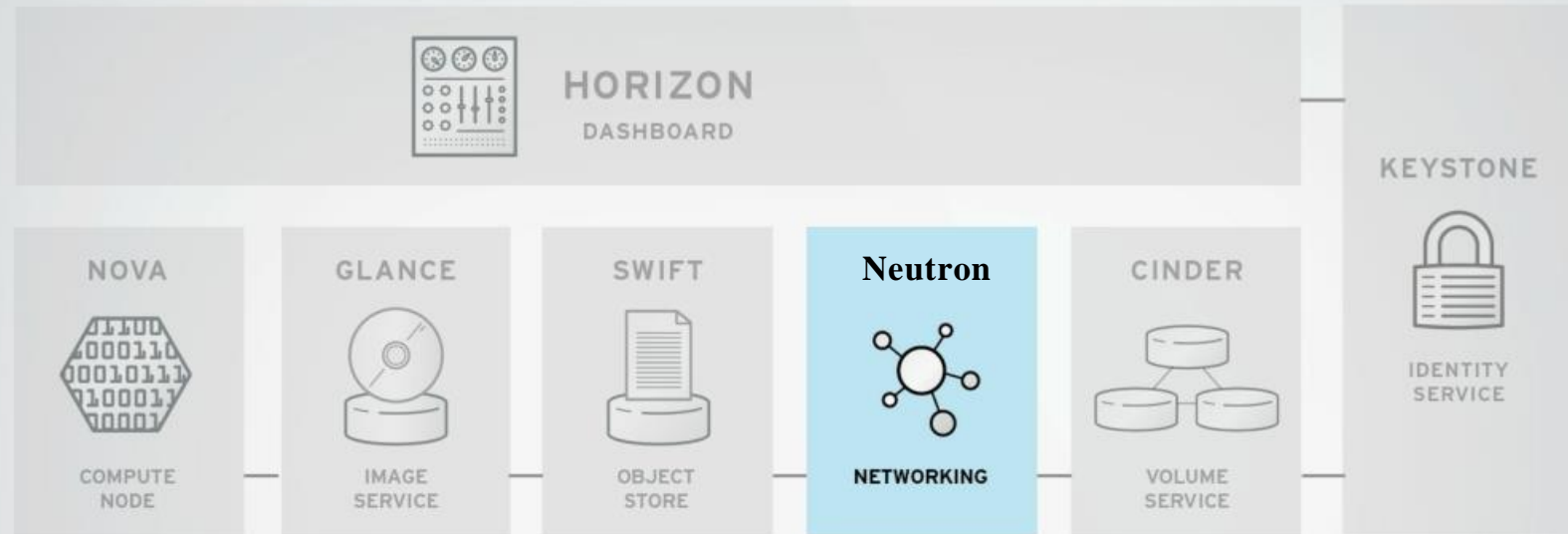


OST 0001

## 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

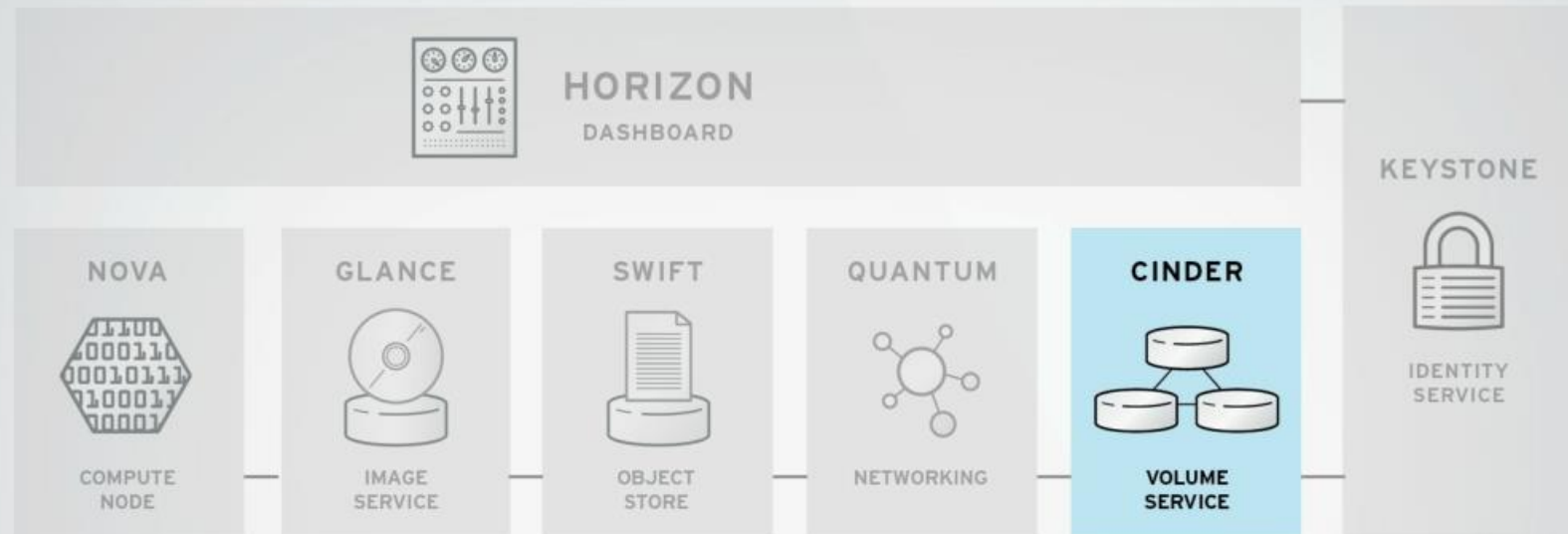


OST 0001

## 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

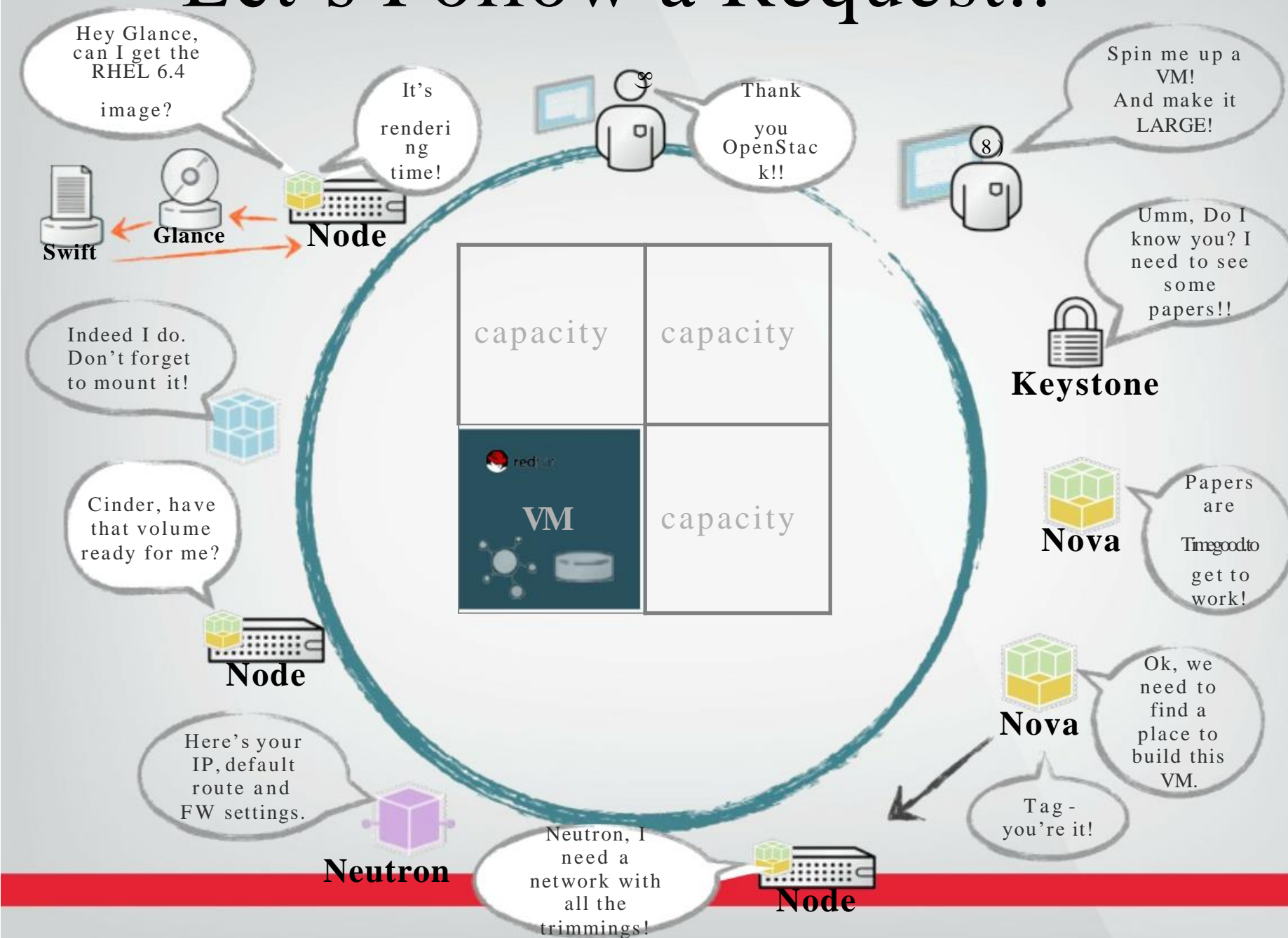


## Horizon

- 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..

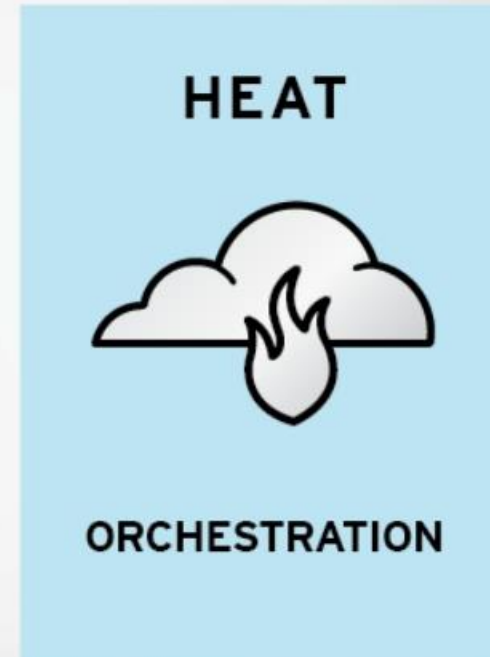


# OPENSTACK INCUBATING PROJECTS

## 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

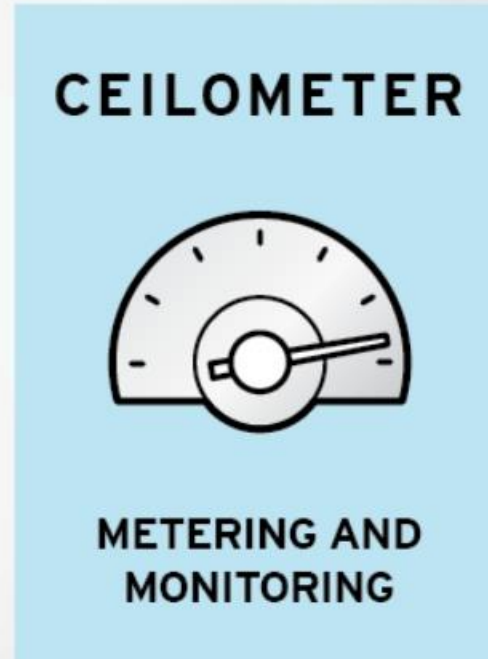


# OPENSTACK INCUBATING PROJECTS

## **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



# 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



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=aflmoFeuDnY#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

[edit](#)

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](https://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](#)

- [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](#)

### Networking

[edit](#)

- [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](#)

### Storage

[edit](#)

- [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)

---



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: 2013-10-01

To: 2013-10-07

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*

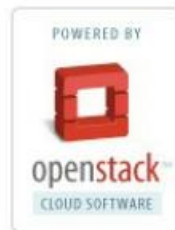
# OPENSTACK SANDBOX

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

Project

CURRENT PROJECT

facebook688981323

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Object Store

Containers

## Overview

Logged in as: facebook688981323

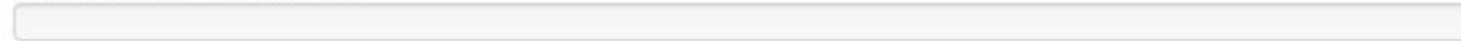
[Settings](#)

[Help](#)

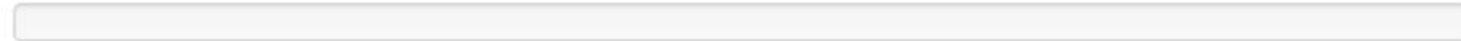
[Sign Out](#)

### Quota Summary

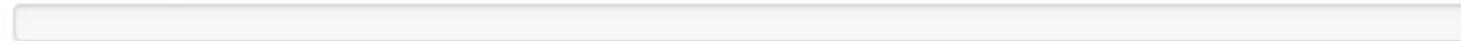
Used 0 of 10 Available Instances



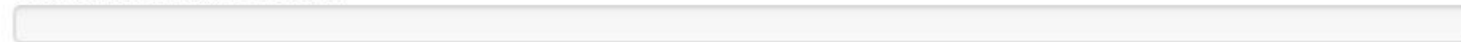
Used 0 of 20 Available vCPUs



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



Submit

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

### Usage Summary

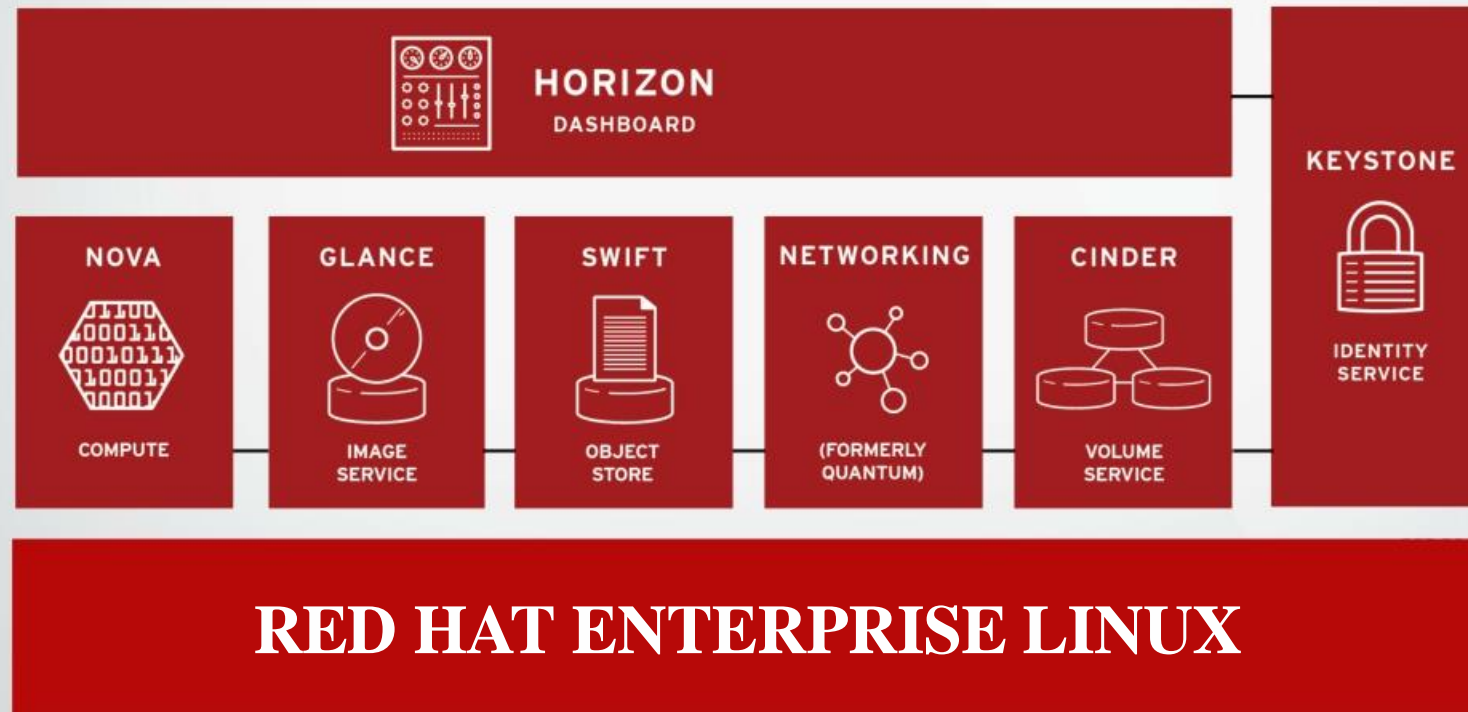
Download CSV Summary

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



# 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



# 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 ~250 VMs in ~5min\_



# 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