Introduction to OpenStack

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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

Cloud workload
OpenStack is ...

Self Service

- APIs
- Web Dashboard
OpenStack is …

Building blocks
OpenStack is …

Illusion of Infinite Capacity
OpenStack is ... Massive Scale
OPENSTACK

Connects to apps via APIs

Self-service Portals for users

Users

Admins

CLOUD OPERATING SYSTEM

Creates Pools of Resources

Automates the Network
OPENSTACK COMMUNITY

In 4 years

The second largest after Linux
Contribution by companies

*Havana
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

Credit: Bill Baker @ Microsoft & Tim Bell @ CERN
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

Grizzly – April 2013 (planned)
- Ceilometer and Heat incubated
- Focus on upgrade support

Havana – October 2013
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
OpenStack Architecture
OPENSTACK ARCHITECTURE

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

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

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

Hey Glance, can I get the RHEL 6.4 image?

It’s rendering time!

Thank you OpenStack!!

Spin me up a VM! And make it LARGE!

Umm, Do I know you? I need to see some papers!!

Keystone

Ok, we need to find a place to build this VM.

Nova

Tag - you’re it!

Neutron

Here’s your IP, default route and FW settings.

Indeed I do. Don’t forget to mount it!

Cinder, have that volume ready for me?

Papers are good. Time to get to work!

Nova

Neutron, I need a network with all the trimmings!

Swift

Glance

Node

VM

capacity  
capacity

capacity

Node

Node

Node

Node

Swift

Glance

Node

Node

Node

Node

Swift

Glance

Node

Node

Node

Node
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 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.

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

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
- 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
- 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
- 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
Overview

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  Submit
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

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>VCPUs</th>
<th>Disk</th>
<th>RAM</th>
<th>Uptime</th>
</tr>
</thead>
<tbody>
<tr>
<td>fed</td>
<td>1</td>
<td>20</td>
<td>2GB</td>
<td>2 weeks, 5 days</td>
</tr>
<tr>
<td>RHEL64</td>
<td>1</td>
<td>20</td>
<td>2GB</td>
<td>2 weeks, 5 days</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>1</td>
<td>20</td>
<td>2GB</td>
<td>2 weeks, 5 days</td>
</tr>
<tr>
<td>Windows2012</td>
<td>1</td>
<td>20</td>
<td>2GB</td>
<td>2 weeks, 4 days</td>
</tr>
</tbody>
</table>

Displaying 4 items
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
OpenStack Grizzly on x86/RHEL

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!
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  ▼  Submit

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

Usage Summary

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>VCPUs</th>
<th>Disk</th>
<th>RAM</th>
<th>Uptime</th>
</tr>
</thead>
</table>

No items to display.

Displaying 0 items
• 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 ~5 min
Conclusion
TO LEARN MORE

• Learn more about RDO
  – openstack.redhat.com
• Learn more about RHOS
  – redhat.com/products/cloud-computing/openstack
• 90-day RHOS Eval (Includes RHEL lics for 3 RHOS nodes)
  – 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