Block Storage in the Open Source Cloud called OpenStack

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Agenda

What are we going to cover in this presentation?

• What is OpenStack and it’s history
• What are the key components to Block Storage
• How do volumes get attached to virtual machines
• What transport protocols are supported
• What are some of the future efforts
What is OpenStack?

According to http://www.openstack.org/software

“OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed through a dashboard that gives administrators control while empowering their users to provision resources through a web interface.”

Code available under Apache 2.0 license. Design tenets – scale & elasticity, share nothing & distribute everything.
Open Development Process
Cloud computing fabric controller, the main part of an IaaS system

- **Time based release Cycles**
  - New software release every six months, with interim milestones

- **Twice Yearly Design Summits**
  - Immediately following software release to plan next version
  - Sessions led by developers and Project Technical Leads

- **Broad Contributions**
  - 1000+ developers, from over 50 companies worldwide

- **Elected Leadership**
  - Developers elect their own Project Technical Leaders
OpenStack Goals

• Open Platform
  • Community driven
  • Technology accessible in many ways
    • Hourly via source, Linux distributions, appliances, DIY

• Empower users and developers
  • Deep engagement from users and developers
  • Users have more control of their own destiny

• Broad, global support from companies
  • Not driven by a single Company; no single source
  • Aggregate investment is huge
OpenStack History
Where did it come from?

• Started in 2010
  • Joint project between Rackspace Hosting and NASA.

• First release October 2010
  • Austin was the first release name and only included Nova and Swift
  • Every 6 months since then has been a release.
  • Sessions led by developers and Project Technical Leads

• Cinder created in Folsom release
  • Cinder came out of Nova Volume codebase
  • Released on September 27, 2012

• Latest release is named Kilo
  • Officially released on April 30, 2015
## OpenStack Capabilities

<table>
<thead>
<tr>
<th>Capability</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Compute</strong></td>
<td>Provision and manage large pools of on-demand computing resources</td>
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<tr>
<td>(Nova)</td>
<td></td>
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<tr>
<td><strong>Object Storage</strong></td>
<td>Petabytes of reliable storage on standard gear</td>
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<tr>
<td>(Swift)</td>
<td></td>
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<tr>
<td><strong>Block Storage</strong></td>
<td>Volumes on commodity storage gear, and drivers for more advanced systems</td>
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<tr>
<td>(Cinder)</td>
<td>like HP, IBM, EMC, Red Hat/Gluster, Ceph/RBD, NetApp, SolidFire, and Nexenta</td>
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<tr>
<td><strong>Networking</strong></td>
<td>Software defined networking automation with plugable backends</td>
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<tr>
<td>(Neutron)</td>
<td></td>
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<tr>
<td><strong>Dashboard</strong></td>
<td>Self-service, role-based web interface for users and administrators</td>
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<tr>
<td>(Horizon)</td>
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<tr>
<td><strong>Shared Services</strong></td>
<td>Multi-tenant authentication system that ties to existing roles (e.g. LDAP),</td>
</tr>
<tr>
<td>(keystone, glance)</td>
<td>Image service</td>
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OpenStack Compute (Nova)
Cloud computing fabric controller, the main part of an IaaS system

-Relevant Components of Nova
- REST API
  - Exposes the provisioning capabilities of Nova
- Scheduler
  - Determines which compute node to use for requests
- Compute Manager
  - Handles the provisioning requests from the scheduler and sends requests to libvirt
- Libvirt Volume
  - Manages the discovery and removal of volumes
OpenStack Block Storage (Cinder)

Provides software defined block storage via abstraction and automation on top of various storage systems.

- **Relevant Components of Cinder**
  - **REST API**
    - Exposes the provisioning capabilities of Cinder
  - **Scheduler**
    - Determines which Cinder storage system to send provision requests
  - **Volume Manager**
    - Handles the provisioning requests from the scheduler and sends requests to storage system driver
  - **Backup**
    - Provides volume backup and restore cinder volumes to external services (Swift, Glance)
OpenStack Block Storage
The volume attachment process

- Nova manages the volume attachment process
  - Attachment is initiated by nova client
    - Nova volume-attach <nova id> <volume id>
  - Nova collects initiator information
    - Connector object is passed to Cinder which contains transport specific initiator information.
  - Nova calls Cinder to export volume
    - Cinder exports the volume from the specific cinder backend using the initiator connector information passed from Nova
    - Cinder replies with target information
  - Nova discovers host volume using target info
    - Nova’s libvirt volume drivers are used to discover the volume in the host OS, depending on the transport protocol information passed back from Cinder
OpenStack Block Storage

Supported transports

- Supported attachment transports/protocols
  - iSCSI
    - TCP (iscsiadm default)
    - Hardware transports
      - Be2iscsi, bnx2i, cxgb3i, cxgb4i, qla4xxx, ocs
    - iSER
  - Fibre Channel
  - Network
    - NFS, SMBFS, RBD (Ceph), GlusterFS
  - GPFS (General Parallel file system)
  - AoE (ATA over Ethernet)
  - Vendor specific
    - Scality
    - Quobyte
Future efforts

- Consolidate attachment code into python library, os-brick
  - Cinder has already migrated to os-brick
  - Nova migration in progress
- Add new additional transports to os-brick
  - Several vendors are working on new custom transports
- FCoE
- Break out Fibre Channel Zone Manager into standalone library
- Complete the addition of volume multi-attach
OpenStack Block Storage

Useful Links

- http://www.openstack.org
- http://docs.openstack.org
- http://www.openstack.org/software/kilo
- http://bugs.Launchpad.net/cinder
- http://bugs.Launchpad.net/nova
- http://review.openstack.org
- http://status.openstack.org
- http://status.openstack.org/zuul
After This Webcast

- This webcast and a PDF of the slides will be posted to the SNIA Ethernet Storage Forum (ESF) website and available on-demand
  - [http://www.snia.org/forums/esf/knowledge/webcasts](http://www.snia.org/forums/esf/knowledge/webcasts)

- A full Q&A from this webcast, including answers to questions we couldn't get to today, will be posted to the SNIA-ESF blog
  - [http://sniaesfblog.org/](http://sniaesfblog.org/)

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Thank You