OpenStack

Operational details of a large python project

http://www.pixelbeat.org/talks/openstack_python/

Pádraig Brady – Red Hat
Agenda

- OpenStack Overview
- Public / Private cloud description
- Development Process
- Related python projects
About Me

Open Source user for 12 years
Python user for 10 years
Gnu Coreutils co-maintainer (4 of us) for 4 years
Red Hatter for 1 year
OpenStacker for 10 months
OpenStack Nova core member for 4 months
Fedora OpenStack release manager for 5 months
What is OpenStack

- IaaS platform (like AWS)
- Open Source
  - unlike VMware, AWS, Compute Engine etc.
- Leverages lots of existing Linux technologies
- Written mainly in 2.6 <= python < 3.0
- 2 years old
- 400K lines of python
The shift to cloud

• Division of labour
• Economies of scale
• Automation of provisioning
• Increased resiliency
  • Decreased MTTR
    - Due to scale and automation
Public or Private

- Need for private
  - Leverage existing systems
  - Specific requirements
  - Large scale economies
  - Sensitive logic or data
- Amazon acknowledged in March 2012 the need for private cloud by partnering with Eucalyptus
- Traditionally separate implementations
- OpenStack aims to support both with consistent implementation and APIs
Who uses OpenStack?

• private clouds
  • mercado libre
    - ebay of south america, +1000 compute nodes, cactus -> essex
  • Wikimedia
  • scientific community
    - NASA
    - HEPIX
      - CERN (15K servers, 300K VMs by 2015)
    - ISI.edu

• Public clouds
  • Rackspace
  • HP
Linux Kernel Similarities

- Open Source
- Released early
- OpenStack Foundation is very similar to the Linux Foundation
- Replaced the proprietary incumbents
- One could consider the abstractions quite similar too:
Core Projects Overview

- Nova akin to EC2 – Controls VMs
- Swift akin to S3 – Object storage
- Glance – VM image, registration service
- Keystone – Identity/Auth
- Horizon – Self service and Admin UI
- Quantum – Advanced networking
- Volume akin to EBS – Storage service
Nova Compute Service

- Plugable components
  - KVM -> XenServer or LXC, ...
  - Qpid -> RabbitMQ or ØMQ
  - DB can be postgres, mysql, ...
- Components can be distributed
  - See wikimedia slide
Scalability notes

- Services use eventlet and greenthread to support concurrency
  - Some explicit locking required in various places
- Can scale almost everything horizontally
- There is a single AMQP/DB though per "cell"
  - Supports 500-1000 hosts
- Several "cells" (zones) can be used for further scalability
Who develops OpenStack

• An older estimate from the Nova project:

```bash
$ curl -s https://raw.github.com/openstack/nova/master/Authors | 
  sed -n 's/.*<.*@\([^<]*\)>\</[^>]*\>/\1/p' | 
  sort | uniq -c | sort -n | 
  tail -n20 | column
```

<table>
<thead>
<tr>
<th>IP Address</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>midokura.jp</td>
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<td>netapp.com</td>
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<td>wikimedia.org</td>
<td>2</td>
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<tr>
<td>canonical.com</td>
<td>3</td>
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<td>cloudscaling.com</td>
<td>3</td>
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<tr>
<td>dreamhost.com</td>
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<tr>
<td>eu.citrix.com</td>
<td>3</td>
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<td>mirantis.com</td>
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<td>gmail.com</td>
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</table>
Who developed Folsom
Python technologies used (Folsom)

```bash
$ for proj in nova quantum glance keystone horizon cinder; do cat $proj/tools/pip-requires done | sed '/^ *#/d; /^ *$/d; s/ \?[^=<>#].*/\//' | sort -f | uniq -ci | column | expand
```

<table>
<thead>
<tr>
<th>Package</th>
<th>Count</th>
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<td>Babel</td>
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<td>boto</td>
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<td>Django</td>
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<td>django_opens_auth</td>
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<td>python-migrate</td>
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<td>sqlalchemy-migrate</td>
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<td>pysendfile, xattr</td>
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<tr>
<td>pysendfile, xattr</td>
<td>1</td>
</tr>
<tr>
<td>pysendfile, xattr</td>
<td>1</td>
</tr>
</tbody>
</table>
Project Packaging

- Given the number of parts and options there is a large gain with consuming through distros
- Distro package dependencies are a good way to get overall position and leverage of a project

```bash
yum install rpmorphan graphviz
for pkg in nova glance dashboard keystone quantum quantum-openvswitch;
done
rpmdep -dot $pkg.dot openstack-$pkg
dot -Tsvg $pkg.dot -o $pkg.svg
done
```
Release History

- 6 monthly, design summit after each, monthly milestones
- **Austin** Oct 2010
  - Nova + Swift
- **Cactus** Apr 2011
  - Glance
- **Diablo** Sep 2011
  - First “production ready” release
- **Essex** Apr 2012
  - Horizon + Keystone
- **Folsom** Sep 2012
  - Quantum + Volume
Development

- Development done on always open trunk
- Releases done to a stable branch
- Standardized tools across all projects
- Git
- Gerrit
  - Standalone patch review server
  - Created by Google for Android development
- Jenkins
  - Continuous integration
  - Gates commits on unit tests
Commit process

- git branch; git commit
  - Commit hook inserts Change-Id: for gerrit tracking
- ./run_tests.sh [subset]
  - Unit tests within a virtualenv
  - Nose used to extend unittest
  - Pep8 enforced [https://github.com/jcrocholl/pep8](https://github.com/jcrocholl/pep8)
- git-review python tool used to submit to gerrit
  - Developed for OpenStack but not specific to it
<table>
<thead>
<tr>
<th>ID</th>
<th>Subject</th>
<th>Owner</th>
<th>Project</th>
<th>Branch</th>
<th>Updated</th>
<th>V</th>
<th>R</th>
<th>A</th>
</tr>
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<tbody>
<tr>
<td>19a332a79</td>
<td>CVS plugin support for v2 Quantum API</td>
<td>Aaron Rosen</td>
<td>openstack/quantum</td>
<td>master (bug/1011457)</td>
<td>1:10 AM</td>
<td>+</td>
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<td></td>
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<tr>
<td>13bb1b83b</td>
<td>Implement IP address allocation.</td>
<td>gayk</td>
<td>openstack/quantum</td>
<td>master (bug/10090)</td>
<td>1:03 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>11d73204ca</td>
<td>Switch to common logging</td>
<td>andrewboggott</td>
<td>openstack/quantum</td>
<td>master (another)</td>
<td>1:59 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>15aee3389</td>
<td>use import_object_ns for compute_driver loading</td>
<td>Swan Dague</td>
<td>openstack/nova</td>
<td>master (bp/virt-driver-cleanup)</td>
<td>1:57 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>18d535cb6</td>
<td>Updated files from openstack-common.</td>
<td>andrewboggott</td>
<td>openstack/nova</td>
<td>master (another)</td>
<td>1:56 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1e6090bf0</td>
<td>Adds additional volume api class for cinder</td>
<td>sleepsonthefloor</td>
<td>openstack/nova</td>
<td>master (6073)</td>
<td>1:56 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>180d7a1d9f</td>
<td>Switch ClI to support underscores and dashes.</td>
<td>Dan Prince</td>
<td>openstack/nova</td>
<td>master (bug/1019467)</td>
<td>1:56 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>17875c58d</td>
<td>Include all tests in generated tarballs</td>
<td>Thierry Carrez</td>
<td>openstack/glance</td>
<td>master (bug/108380)</td>
<td>1:50 AM</td>
<td>-</td>
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<tr>
<td>1a71d996f7</td>
<td>Add check for no domains in libvirt driver.</td>
<td>David Shrewsbury</td>
<td>openstack/nova</td>
<td>master (count_domains)</td>
<td>1:22 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>124f180fd</td>
<td>Add links to change pages on /zulu/status page.</td>
<td>Clark Boylan</td>
<td>openstack-ci/zulu</td>
<td>master (change_links_in_html_status)</td>
<td>1:18 AM</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1f3c62965</td>
<td>implement dhcp agent for quantum</td>
<td>markmclain</td>
<td>openstack/quantum</td>
<td>master (bp/quantum-dhcp)</td>
<td>1:13 AM</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1c356dcb5</td>
<td>Add 'allocation_pools' parameter to the subnet resource in Quantum v2 API.</td>
<td>Salvatore Orlando</td>
<td>openstack/quantum</td>
<td>master (bug/1015306)</td>
<td>Jun 29</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>122dd1099</td>
<td>Use ip instead of ifconfig. Should work on F16, F17 and Dabian based systems.</td>
<td>ayoung</td>
<td>openstack/dew/devstack</td>
<td>master (master)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td>1b136ec913</td>
<td>Additional CommandLineFilters to fix rootwrap on SLES</td>
<td>rhafer</td>
<td>openstack/dew/devstack</td>
<td>stable/essess (bug/1013147)</td>
<td>Jun 29</td>
<td>±</td>
<td>±</td>
<td>±</td>
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<tr>
<td>1a06c8080</td>
<td>If no password in env or command line try prompting.</td>
<td>Ken Thomas</td>
<td>openstack/python-openstackclient</td>
<td>master (bp/password-promt)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>1386c39525</td>
<td>Add support for hypervisor-uptime.</td>
<td>Kevin L Mitchell</td>
<td>openstack/python-novaclient</td>
<td>master (hyper-uptime)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>1e26596587</td>
<td>Get hypervisor uptime</td>
<td>Kevin L Mitchell</td>
<td>openstack/python-novaclient</td>
<td>master (hyper-uptime)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>1af775930</td>
<td>devstack support for v2 nova/quantum integration</td>
<td>Aaron Rosen</td>
<td>openstack/dew/devstack</td>
<td>master (bug/1017760)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>1d43175fd</td>
<td>Add tests for volume attach and detach</td>
<td>Dan Smith</td>
<td>openstack/tempest</td>
<td>master (master)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>165b46eae</td>
<td>Redefine the domain's XML on volume attach/detach</td>
<td>Dan Smith</td>
<td>openstack/tempest</td>
<td>master (bug/1004791)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td>1d7d6d547</td>
<td>Do not use pickle for serialization in memcache, but JSON</td>
<td>Vincent Urntz</td>
<td>openstack/swift</td>
<td>master (bug/1006414)</td>
<td>Jun 29</td>
<td>±</td>
<td>±</td>
<td>±</td>
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<tr>
<td>167966b027</td>
<td>change metadata_host to metadata_host_ip</td>
<td>Matt Joyce</td>
<td>openstack/quantum</td>
<td>master (master)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
<td>±</td>
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<tr>
<td>13563d548a</td>
<td>Refactoring code to kornel Dom0 plugin</td>
<td>Rick Harris</td>
<td>openstack/quantum</td>
<td>master (kern_dom0_plugin)</td>
<td>Jun 29</td>
<td>+</td>
<td>±</td>
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<tr>
<td>1cab5951c</td>
<td>Fixes bug 989920</td>
<td>rskolkov</td>
<td>openstack/quantum</td>
<td>stable/essess (bug/989920)</td>
<td>Jun 29</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>1b7ff9292e</td>
<td>Make get fetching in gerrit git-recv more robust</td>
<td>Clark Boylan</td>
<td>openstack/openstack-ci-puppet</td>
<td>master (retry_fetches)</td>
<td>Jun 29</td>
<td>±</td>
<td>±</td>
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</table>
Change I3e5ffccf: Add compatibility for CPU model config with libvirt < 0.9.10

Add compatibility for CPU model config with libvirt < 0.9.10

Libvirt versions prior to 0.9.10 do not support the simpler 'node' attribute for choosing CPU model. So with such libvirt releases we must explicitly construct the guest CPU model from the host capabilities info when node=host-passthrough at all with these earlier libvirt versions.

This change can be reverted in the future, if the value of the MIN_LIBVIRT_VERSION constant is increased to 0.9.10 or later.

Fixes: bug #1003373

Implements: blueprint libvirt-xml-cpu-model

Change-Id: I3e5ffccf308e18454f810e9eb5c2014e0b94d60
Signed-off-by: Daniel P. Berrange <berrange@redhat.com>

Reviewer | Verified | Code-Review | Approved
---|---|---|---
Daniel Berrange | +1 | | 
Jenkins | | | 
SmokeStack | | | 
Johannes Erdelt | | | 
Mark McLoughlin | | | 
Matt Dietz | | | 
Need Verified
Need Code-Review
Need Approved

Name or Email or Group

Add Reviewer

Dependencies

Old Version History:

Patch Set 1: 433fff2d3045f0a7b18b0a6b5e65c3de3d3b9d81 (gtweb)
Patch Set 2: 7df13d9953cbeaf773e3c4d1303f6f5e65c308ca7e5 (gtweb)
Patch Set 3: 5b407e1c0f118121e7793ada0882ca808de4c (gtweb)
Patch Set 4: e5b5e140f083e8794e82b1348f85e0a6f861238 (gtweb)
Patch Set 5: 59067afff6b2d9eaa396198543cc7b57f83ccf726 (gtweb)
Patch Set 6: 36c15fbd05e6509c78e9cdd64cc0c6725c65311 (gtweb)

Author: Daniel P. Berrange <berrange@redhat.com> Jun 19, 2012 2:42 PM
Review Process

- Gated trunk
  - Reviewers
    - Anyone can ±1
    - Only project core members can approve
  - Automated tests
    - Through Jenkins
    - Using OpenStack infrastructure itself
    - Sets up test systems and runs gerrit branch
      - Libvirt, Xen, python 2.6, python 2.7, ...
    - If OK, merges gerrit branch to trunk
    - Ancillary jobs like doc builds, pylint reports, more tests, ...
Glance activity week 10 2012

Weekly history of changes per author

- Dan Prince: 156 lines added, 69 lines removed
- Brian Lamar: 58 lines added
- Ken Pepple: 21 lines added, 13 lines removed
- Maru Newby: 14 lines removed
- Chuck Short: 0 lines added, 0 lines removed
- James E. Blair: 0 lines added, 0 lines removed

Lines added/removed

- Orange: Lines added
- Yellow: Lines removed
Horizon activity week 10 2012

Weekly history of changes per author

Lines added/removed

- Gabriel Hurley: 7,214
- Andy Chong: 6,551
- Jim Yeh: 0
- Jakedahn: 0
- John Postlethwait: 0
- Tres Henry: 0
- Thomir Trifonov: 0
- Cole Robinson: 0
- Dean Troyer: 0
- Devin Carlen: 0

Legend:
- Lines added
- Lines removed
Keystone activity week 10 2012

Weekly history of changes per author

- Dolph Mathews: 715 lines added, 164 lines removed
- termie: 575 lines added, 169 lines removed
- Brian Waldon: 74 lines added, 69 lines removed
- Chmouel Boudjnah: 72 lines added
- Alan Pevec: 0 lines added/removed
- Michael Basnight: 0 lines added/removed
- Deepak Garg: 0 lines added/removed
- Russell Bryant: 0 lines added/removed
- Joe Heck: 0 lines added/removed
- Devin Carlen: 0 lines added/removed
- Monty Taylor: 0 lines added/removed
- Yaguang Tang: 0 lines added/removed
- Dean Troyer: 0 lines added/removed
- Dan Prince: 0 lines added/removed
- Jesse Andrews: 0 lines added/removed

Lines added/removed

- Orange: Lines added
- Yellow: Lines removed
Quantum activity week 10 2012

Weekly history of changes per author

- Sumit Naiksatam: 198 lines added, 0 lines removed
- Dan Wendlandt: 173 lines added, 0 lines removed
- Mark McClain: 1 line added, 0 lines removed
- Maru Newby: 0 lines added, 0 lines removed

Legend:
-橙色: Lines added
-黄色: Lines removed
Swift activity week 10 2012

Weekly history of changes per author

- Eamonn O'Toole: 188 Lines added, 98 Lines removed
- Maru Newby: 98 Lines added, 98 Lines removed
- gholt: 1,184 Lines added, 98 Lines removed
- Samuel Merritt: 1 Lines added, 98 Lines removed
- Chmoul Boudjnah: 1 Lines added, 98 Lines removed
- Florian Hines: 1 Lines added, 98 Lines removed
- Derek Higgins: 1 Lines added, 98 Lines removed
- Doug Weimer: 1 Lines added, 98 Lines removed
- Julien Danjou: 1 Lines added, 98 Lines removed
- John Dickinson: 1 Lines added, 98 Lines removed

Legend:
- Orange: Lines added
- Yellow: Lines removed
Weekly history of changes per author

- Daryl Walleck: 234 lines added, 240 lines removed
- Eoghan Glynn: 10 lines removed

Legend:
- Orange: Lines added
- Yellow: Lines removed
Manuals activity week 10 2012

Weekly history of changes per author

- Russell Bryant: 315 lines added, 237 lines removed
- Jesse Andrews: 2,350 lines added, 2,250 lines removed
- Joe Savak: 750 lines added, 700 lines removed
- annegentle: 500 lines added, 450 lines removed
- Xiaohua Guan: 250 lines added, 200 lines removed
- Mike Pittaro: 100 lines added, 50 lines removed
- termie: 50 lines added, 25 lines removed
- Anthony Young: 25 lines added, 15 lines removed
- Tyler North: 5 lines added, 10 lines removed
- James E. Blair: 0 lines added, 20 lines removed

Legend: Orange - Lines added, Yellow - Lines removed
Nova activity week 10 2012

Weekly history of changes per author

Lines added/removed

<table>
<thead>
<tr>
<th>Russell Bryant</th>
<th>Adrian Clark</th>
<th>Vishvanath</th>
<th>Andrew</th>
<th>Philip</th>
<th>Timo</th>
<th>Tony</th>
<th>Mark Walbot</th>
<th>David</th>
<th>Matt Strong</th>
<th>Tad</th>
<th>Ben</th>
<th>John</th>
<th>Jun</th>
<th>Sumit</th>
<th>Peter</th>
<th>Tim</th>
<th>David</th>
<th>Drew</th>
<th>Adam</th>
<th>Mark</th>
<th>Yong</th>
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<tbody>
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<td>Lines added</td>
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</table>

Legend:
- Orange: Lines added
- Yellow: Lines removed
Related python projects

• OZ
  • Generate guest images from install ISOs
    – Optional customization
      • Install packages, run script, ...
  • List of OZ built images from RackSpace
    – https://github.com/rackerjoe/oz-image-build
  • ISO -> image -> glance -> nova -> libvirt -> KVM
• http://aeolusproject.org/oz.html
Related python projects

• Heat API
  • AWS Cloudformation type service
  • V6 just released
  • Provisions apps in the cloud
  • And keeps them provisioned
    - Leverages cloud attributes to provide HA
  • https://github.com/heat-api
Related python projects

- cloud-init
  - Installed in guests to configure at boot time
  - Directives for package install etc.
  - Support for many distros
  - https://launchpad.net/cloud-init/
Similar non python projects

• **oVirt** - java
  • More aligned with private datacenters
• **Eucalyptus** - C
  • Less general, Closed editions.
• **CloudStack** - java
  • Started closed (cloud.com). Closed addons.
• **OpenNebula** - C++
  • Again focusing on datacenters
Trying it out

- http://trystack.org/
  - Register to try out a test public OpenStack cloud
- http://devstack.org/
  - Script to setup simple/developer installs
- fedoraproject.org/wiki/Getting_started_with_OpenStack
  - Basic setup instructions for machine or VM
Jobs!

- It's cool!
  - Broad range of technologies
  - Cloud buzzword compliant
  - All python (>= 2.6)
- [http://www.openstack.org/community/jobs/](http://www.openstack.org/community/jobs/)
  - Currently about 100 positions listed
  - Red Hat have 5 location flexible positions there
More info

- http://docs.openstack.org/
  - The compute admin guide is a good overview
- http://ci.openstack.org/
  - OpenStack Continuous Integration info
- http://review.openstack.org/
  - OpenStack gerrit interface
- http://jenkins.openstack.org/
  - OpenStack Continuous Integration interface
- http://openstacksummitfall2012.sched.org/
  - OpenStack Grizzly direction