#### OpenStack

Operational details of a large python project

http://www.pixelbeat.org/talks/openstack\_python/

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# 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





Wikimedia implementation

#### http://ryandlane.com/blog/?attachment\_id=505

## Nova Compute Service

Scheduler

- 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:

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

- 2 midokura.jp 2 netapp.com 2 wikimedia.org 3 canonical.com 3 cloudscaling.com 3 dreamhost.com 3 eu.citrix.com 3 mirantis.com 3 nicira.com
- 4 lab.ntt.co.jp

- 4 ubuntu.com
- 5 pistoncloud.com
- 6 isi.edu
- 6 nttdata.co.jp
- 6 openstack.org
- 8 hp.com
- 9 redhat.com
- 10 citrix.com
- 22 rackspace.com
- 31 gmail.com

#### Who developed Folsom



# Python technologies used (Folsom)

\$ 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</pre>

3	amqplib	4	kombu	1	python-novaclient
4	anyjson	2	lockfile	3	python-quantumcli
1	argparse	5	lxml	2	python-swiftclient
2	Babel	3	netaddr	1	pytz
2	boto	1	pam	1	pyudev
1	Cheetah	2	paramiko	5	routes
1	Django	2	passlib	1	<del>setuptools_git</del>
1	django_compressor	5	paste	5	sqlalchemy
1	django_opensauth	5	PasteDeploy	4	sqlalchemy-migrate
5	eventlet	1	pycrypto	2	suds
5	greenlet	1	python-cinderclient	5	webob
3	httplib2	1	python-daemon	2	wsgiref
5	iso8601	3	python-glanceclient	1	python-libvirt
1	jsonschema	1	python-keystonecli	1	pysendfile, xattr

# **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

yum install rpmorphan graphviz for pkg in nova glance dashboard keystone quantum quantum-openvswitch; do 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
- git-review python tool used to submit to gerrit
  - Developed for OpenStack but not specific to it

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I 6796b027       change metadata_host to metadata_host_ip       Matt Joyce       openstack/nova       master (master)       Jun 29       +1          I 363d54ea       Refactoring code to kernel DomO plugin.       Rick Harris       openstack/nova       master (kernel_domO_plugin)       Jun 29       +1           I cab9551c       Fixes bug 989920       rsokolkov       openstack/nova       stable/essex (bug/989920)       Jun 29       +1       +1       +1         I b7f9292e       Make git fetching in gerrit-git-prep more robust.       Clark Boylan       openstack/openstack-ci-puppet       master (retry_fetches)       Jun 29       +1       +1	☆ Id7d6d547	Do not use pickle for serialization in memcache, but JSON	Vincent Untz	openstack/swift	master (bug/1006414)	Jun 29	-1	-1				
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Project openstack/nova				'mode' attribute for choosing CPU model. So with such libvirt					
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Daniel Berrange									
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#### **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

### Horizon activity week 10 2012



### Keystone activity week 10 2012



#### Quantum activity week 10 2012



Weekly history of changes per author

#### Swift activity week 10 2012



#### Tempest activity week 10 2012



#### Manuals activity week 10 2012



#### Nova activity week 10 2012



# 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/
  - 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