

# Preventing craziness

A deep dive into OpenStack testing automation

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openstack™  
CLOUD SOFTWARE

# OpenStack is large & growing

- ◆ 95+ code repositories
- ◆ 1.9+ MLOC

## Contributors per Month



## Commits per Month







# OpenStack is painful

- ◆ Difficult to deploy
- ◆ Difficult to test
- ◆ Difficult to keep up with changes



# OpenStack is open innovation

- ◆ Anyone can propose a change
- ◆ Lots of different companies
- ◆ No traditional management structure
- ◆ Technical meritocracy (no DFL)
- ◆ Global community



# And yet...

- ◆ We release every 6 months
- ◆ Master branches are always usable
- ◆ We keep on growing
- ◆ We retained (most of) our sanity



# 1. Code reviews

- ◆ Everyone's code should be reviewed
- ◆ At worst it's a learning opportunity
- ◆ Elite committers vs. Peer reviewers
- ◆ Everyone can review





## 2. Automated testing

- ◆ Not tested → Not working
- ◆ Not automatically tested → Not tested



## 2. Automated testing

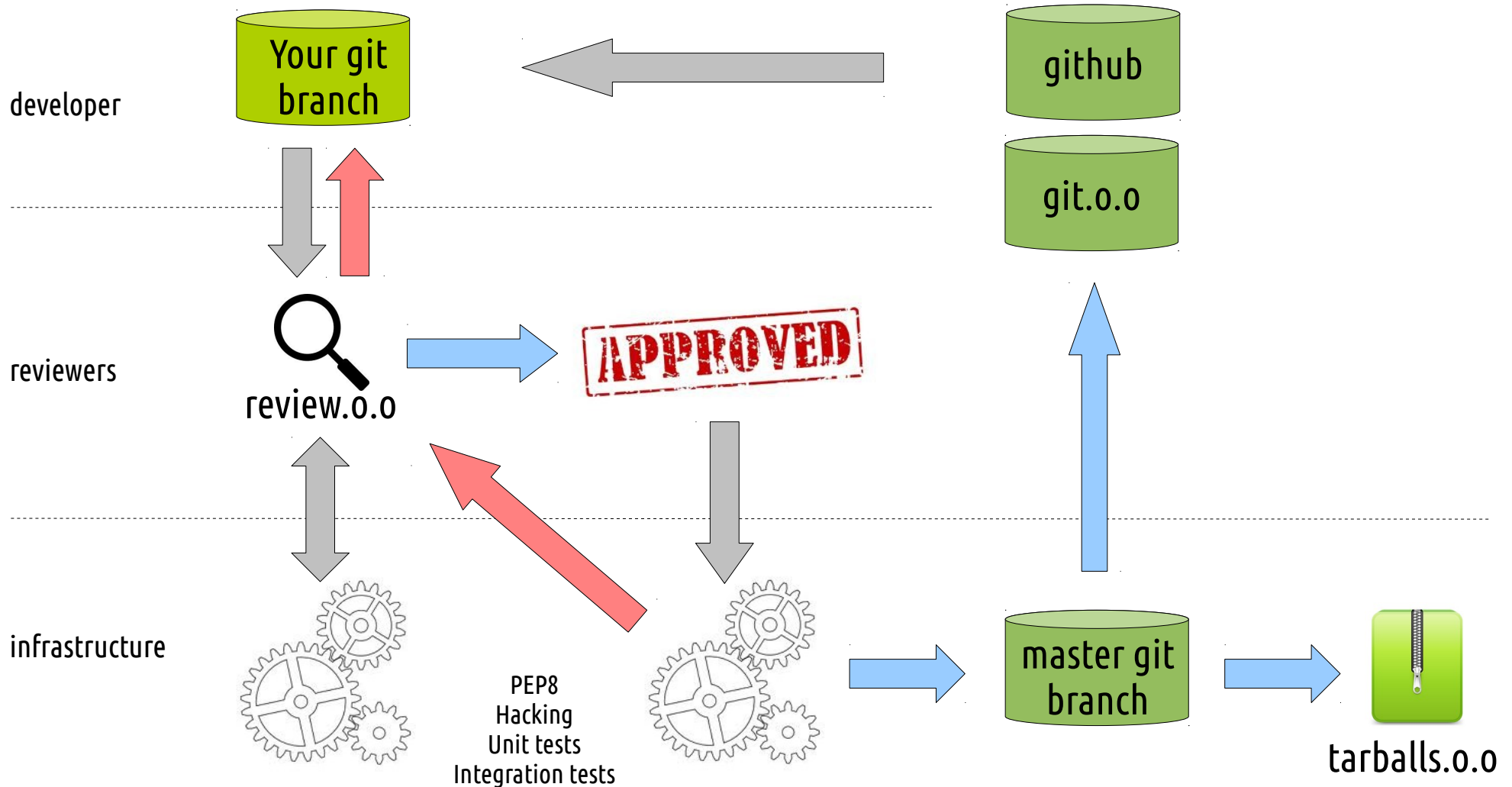
- ◆ Unit tests
- ◆ Integration tests
- ◆ Upgrade tests
- ◆ Syntax tests (PEP8)
- ◆ Hacking style tests (flake8/hacking)



## 3. Trunk gating

- ◆ Do not merge unless it passes tests
- ◆ « Automation for code review »
- ◆ Always-good trunk

# All together now...



# git


- ◆ git is used everywhere
- ◆ git is fast & powerful
- ◆ git-review lets us submit to Gerrit
- ◆ Github only used as a repo mirror



# Gerrit

- ◆ Code review
- ◆ Inline comments, vote tracking

# Gerrit



**openstack** Code Review  
CLOUD SOFTWARE

**All** My Admin Documentation

Changes Important Changes Drafts Watched Changes Starred Changes

**Change Id6634921: Fix os.getlogin() problem with no tty**

<b>Change-Id:</b> Id6634921cdf0deb77cf32a5b9101ec475946aa81	Fix os.getlogin() problem with no tty
<b>Owner:</b> Davanum Srinivas (dims)	Catch OSError(s) from os.getlogin() and fall back to looking at environment variables to figure out the user's name. The OSError is thrown where there is no tty for the python process when os.getlogin() is called.
<b>Project:</b> openstack/oslo-incubator	
<b>Branch:</b> master	
<b>Topic:</b> bug/1221491	
<b>Uploaded:</b> Sep 6, 2013 05:19	
<b>Updated:</b> Sep 6, 2013 13:17	Fixes LP: 1221491
<b>Status:</b> Review in Progress	Change-Id: Id6634921cdf0deb77cf32a5b9101ec475946aa81

[Permalink](#)

Reviewer	Verified	Code-Review	Approved
Thierry Carrez	<input checked="" type="checkbox"/>	+1	
Jenkins	+1		
Flavio Percoco		✓	
Mark McLoughlin			

Need Verified  
Need Approved

**Dependencies**

**Old Version History:** Base

**Patch Set 1** 9deb951859ae33a07ac0bdef30b562d088f2b42d (gitweb)

**Author:** Davanum Srinivas <dims@linux.vnet.ibm.com> Sep 6, 2013 05:12

**Committer:** Davanum Srinivas <dims@linux.vnet.ibm.com> Sep 6, 2013 05:12

**Parent(s):** 9bfa4ec4240e0f33f854d37e10dbc65a5f3b2789 Merge "Introduces The Guru Meditation Report"

**Download:** [checkout](#) | [pull](#) | [cherry-pick](#) | [patch](#) | [Anonymous HTTP](#) | [SSH](#) | [HTTP](#)

git fetch https://review.openstack.org/openstack/oslo-incubator refs/changes/67/45367/1 && git checkout FETCH\_HEAD

	File Path	Comments	Size	Diff	Reviewed
▶	Commit Message			Side-by-Side	Unified
M	openstack/common/rootwrap/cmd.py		+10, -1	Side-by-Side	Unified ✓
M	tests/unit/test_rootwrap.py		+17, -0	Side-by-Side	Unified ✓
			+27, -1		

**Comments** [Expand Recent](#) | [Expand All](#) | [Collapse All](#)

**Jenkins** Patch Set 1: Works for me Build succeeded. - gate-oslo-incubator-pep8 ... Sep 6

**Thierry Carrez** Patch Set 1: Looks good to me, but someone else must approve Sep 6

**Flavio Percoco** Sep 6

Patch Set 1: Looks good to me (core reviewer)

# Gerrit

openstack Code Review CLOUD SOFTWARE

All My Differences Admin Documentation Thierry Carrez <thierry@openstack.org>  
Side-by-Side Unified Commit Message Preferences Patch Sets Files Change #, SHA-1, trid, owner@email or review

nova/compute/manager.py Reviewed

←compute.filters ↑ Up to change test\_compute.py→

Old Version (Download)	New Version (Download)
<i>Expand 10 before (... skipping 2903 common lines ...) Expand 10 after</i>	
2904 with excutils.save_and_reraise_exception():	2904 with excutils.save_and_reraise_exception():
2905 capi = self.conductor_api	2905 capi = self.conductor_api
2906 capi.block_device_mapping_destroy_by_instance_and_device( 2907 context, instance, mountpoint)	2906 capi.block_device_mapping_destroy_by_instance_and_device( 2907 context, instance, mountpoint)
2908	2908
2909 def _attach_volume(self, context, volume_id, mountpoint, instance):	2909 def _attach_volume(self, context, volume_id, mountpoint, instance):
2910 context = context.elevated()	2910 context = context.elevated()
2911 LOG.audit(_('Attaching volume %(volume_id)s to %(mountpoint)s'), 2912 locals(), context=context, instance=instance)	2911 LOG.audit(_('Attaching volume %(volume_id)s to %(mountpoint)s'), 2912 locals(), context=context, instance=instance)
2913 try:	2913 try:
2914 connector = self.driver.get_volume_connector(instance)	2914 connector = self.driver.get_volume_connector(instance)
2915 connection_info = self.volume_api.initialize_connection(context, 2916 volume_id, 2917 connector)	2915 connection_info = self.volume_api.initialize_connection(context, 2916 volume_id, 2917 connector)
2918	2918
2919 except Exception: # pylint: disable=W0702	2919 except Exception: # pylint: disable=W0702
2920 with excutils.save_and_reraise_exception():	2920 with excutils.save_and_reraise_exception():
2921 msg = _("Failed to connect to volume %(volume_id)s " 2922 "while attaching at %(mountpoint)s")	2921 msg = _("Failed to connect to volume %(volume_id)s " 2922 "while attaching at %(mountpoint)s")
2923 LOG.exception(msg % locals(), context=context, 2924 instance=instance)	2923 LOG.exception(msg % locals(), context=context, 2924 instance=instance)
2925 self.volume_api.unreserve_volume(context, volume_id)	2925 self.volume_api.unreserve_volume(context, volume_id)
2926	2926
2927 if 'serial' not in connection_info: 2928 connection_info['serial'] = volume_id	2926 if 'serial' not in connection_info: 2927 connection_info['serial'] = volume_id
2929	2928 volume = self.volume_api.get(context, volume_id) 2929
	John Garbutt can we not extend connection info with this data? If we keep this extra ... Jun 14
	Joel Coffman Adding the information to connection_info is simpler, but it does ... Jul 2
2929 try:	2929 try:
2930 self.driver.attach_volume(connection_info, 2931 instance, 2932 mountpoint)	2930 self.driver.attach_volume(connection_info, 2931 instance, 2932 mountpoint, 2933 volume_type=volume. 2934 get('volume_type_id'))
2933	2933
2934 except Exception: # pylint: disable=W0702	2934 except Exception: # pylint: disable=W0702
2935 with excutils.save_and_reraise_exception():	2935 with excutils.save_and_reraise_exception():
2936 msg = _("Failed to attach volume %(volume_id)s " 2937 "at %(mountpoint)s")	2936 msg = _("Failed to attach volume %(volume_id)s " 2937 "at %(mountpoint)s")
2938 LOG.exception(msg % locals(), context=context, 2939 instance=instance)	2938 LOG.exception(msg % locals(), context=context, 2939 instance=instance)
2940 self.volume_api.terminate_connection(context, 2941 volume_id, 2942 connector)	2940 self.volume_api.terminate_connection(context, 2941 volume_id, 2942 connector)
2943	2943
2944	2944
2945	2945



# Gerrit

- ◆ Code review
- ◆ Inline comments, vote tracking
- ◆ Issues :
  - ◆ Automating configuration (Jeepyb)
  - ◆ no private reviews

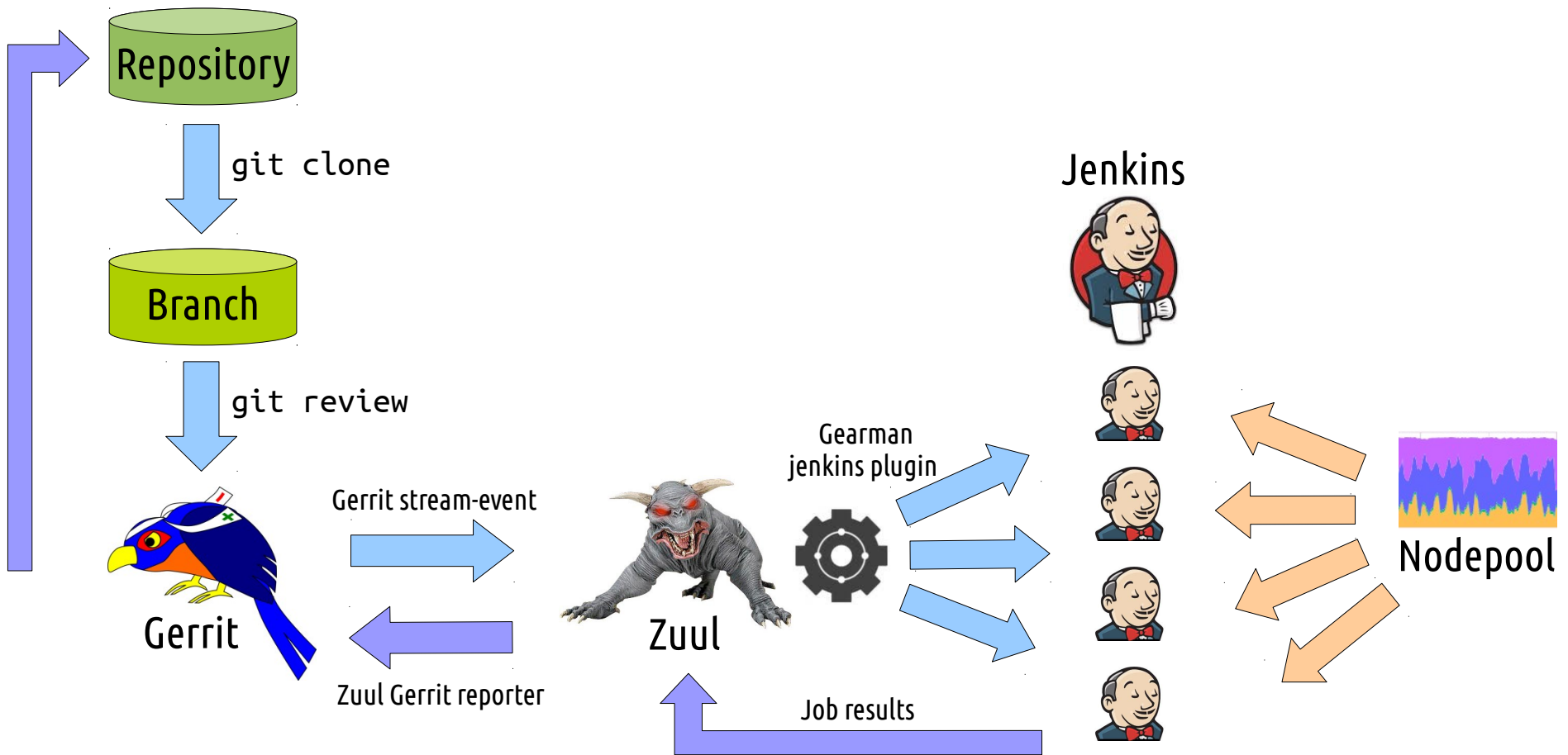
# Zuul

- ◆ Triggered by gerrit event firehose
- ◆ Handles test pipelines (see later)
- ◆ Launches tests
- ◆ Uses Gearman to distribute tests
- ◆ Reports results back to Gerrit

# Jenkins

- ◆ Runs tests on slaves
- ◆ Nodepool ensures slaves availability
- ◆ Devstack-gate scripts prepare slaves
- ◆ Issues :
  - ◆ Jjb
  - ◆ Avoid plugins
  - ◆ Not really useful at this point

# All together now...





# Everyone loves numbers

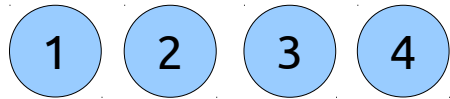
- ◆ 900 patchsets proposed per day
- ◆ 4000 Gerrit comments/votes per day
- ◆ 7 Jenkins masters, 250-500 slaves
- ◆ 15K test jobs per day
- ◆ 200 patchsets merged per day



# Scaling Jenkins & Gerrit

- ◆ Multiple master setup
- ◆ Log storage : logstash, Gearman
- ◆ Log search : Elasticsearch / Kibana
- ◆ Mirroring master git repo to cgit pool

# Gating at scale



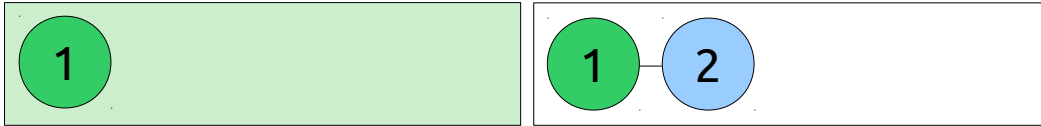
- ◆ Serial gating is easy but limited

# Serial gating

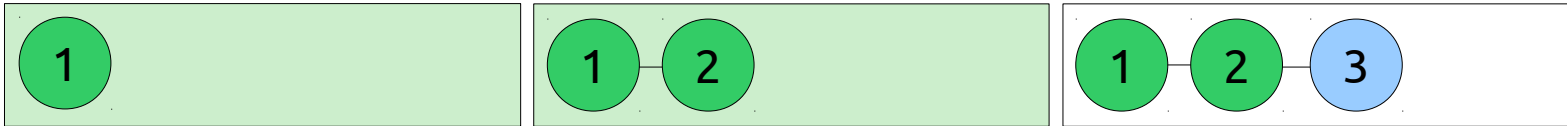
1



# Serial gating



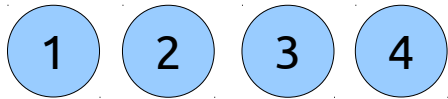
# Serial gating



# Serial gating



# Gating at scale



- ◆ Serial gating is easy but limited
- ◆ Parallel gating ? Yay clouds
- ◆ But parallel gating may introduce fails

# Parallel gating

1	
2	
3	
4	

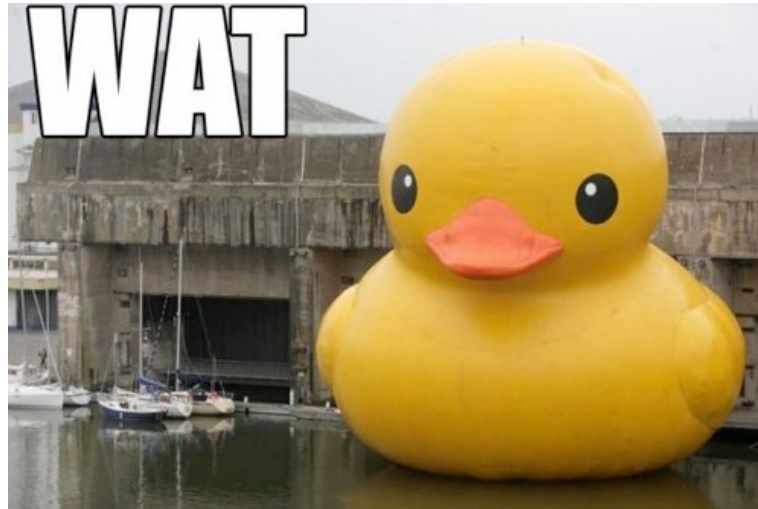
# Parallel gating

1

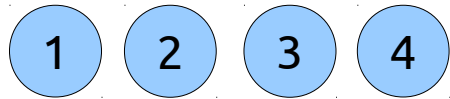
2

3

4

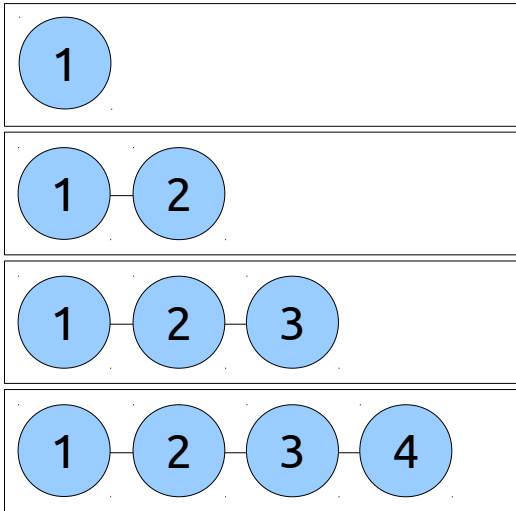


# Gating at scale



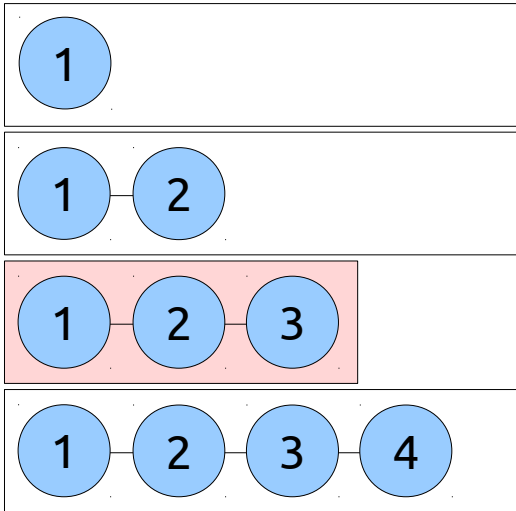
- ◆ Serial gating is easy but limited
- ◆ Parallel gating ? Yay clouds
- ◆ But parallel gating may introduce fails
- ◆ Zuul : Speculative execution of tests

# Speculative gating

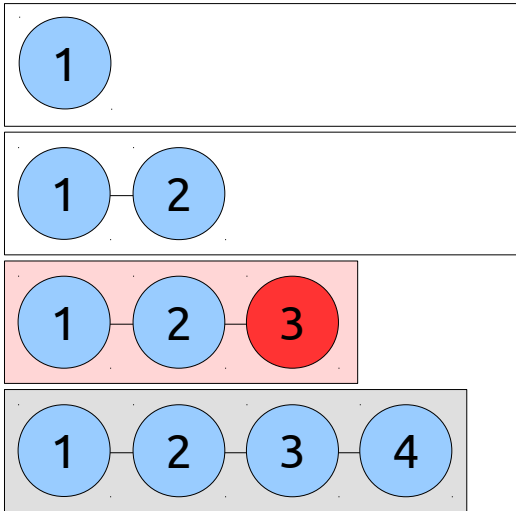




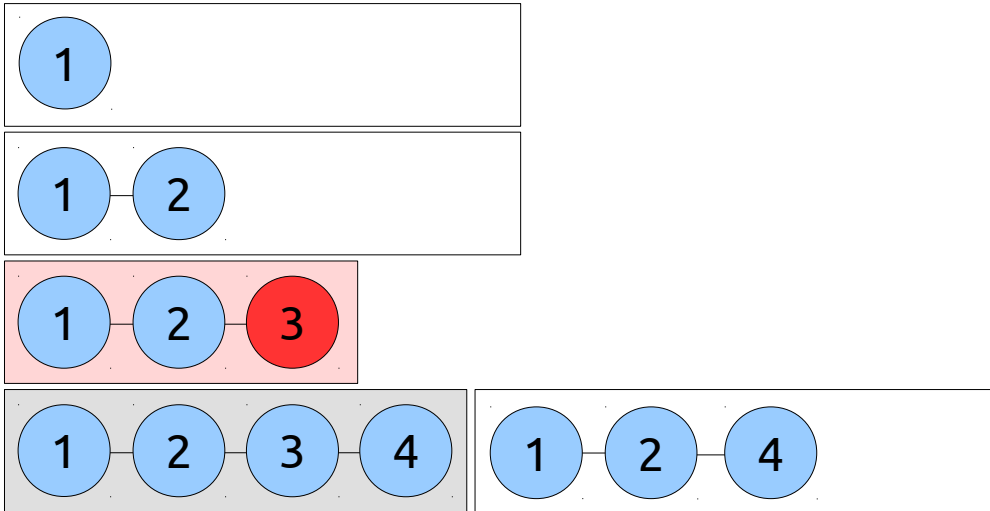
# Speculative gating



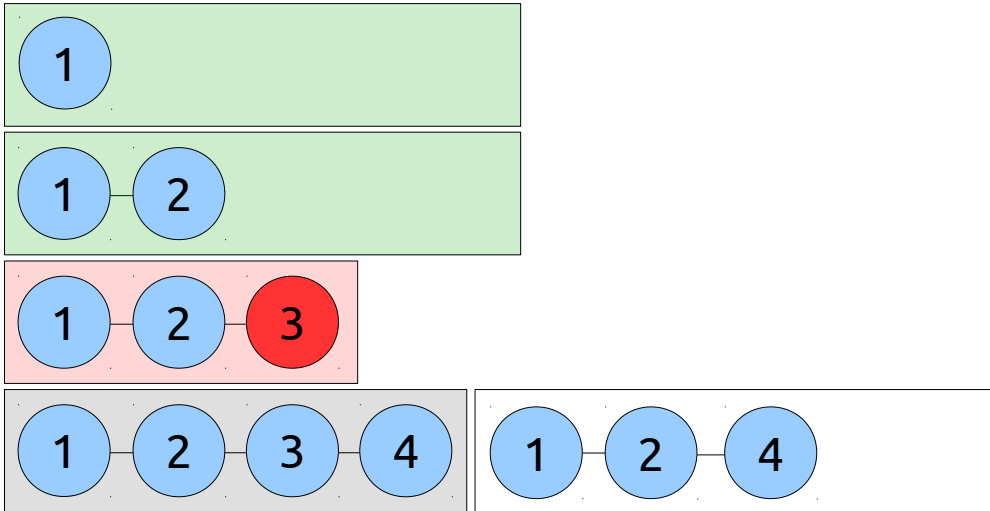
# Speculative gating



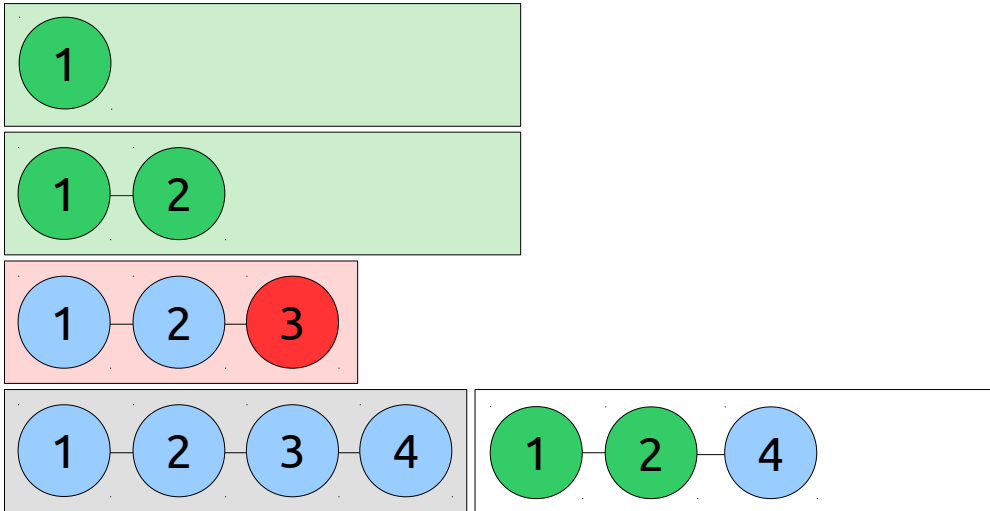
# Speculative gating



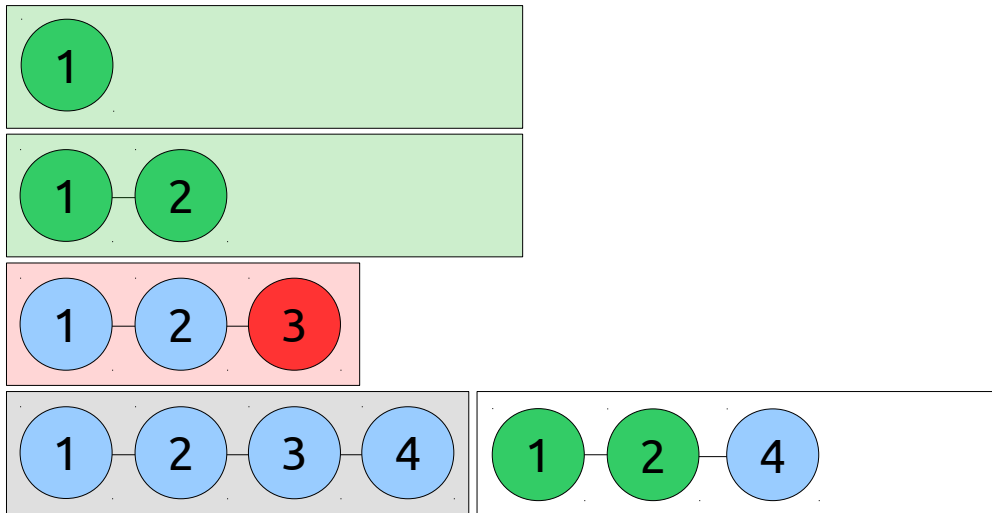
# Speculative gating



# Speculative gating



# Speculative vs. serial gating



# Visualizing Zuul

## check

 (76)

Newly uploaded patchsets enter this pipeline to receive an initial +/-1 Verified vote from Jenkins.





 openstack/heat 67396,1	0 min
 openstack/glance 57969,20	0 min
 openstack/nova 67408,1	0 min
 openstack/python-keystoneclient 67409,1	0 min
 openstack/nova 67410,1	0 min
 openstack/nova 67412,1	5 min
 openstack/nova 67402,3	6 min
 openstack/nova 63451,10	3 min
 openstack/nova 66950,5	5 min
 openstack/nova 66951,5	14 min
 openstack/nova 67417,1	0 min
 openstack/swift 67145,2	18 min
 openstack/cinder 62691,5	16 min
 openstack/heat 66804,5	19 min
 openstack/nova 67421,2	23 min
 openstack/nova 67422,1	2 min
 openstack/nova 55444,8	24 min

## gate

 (92)

Changes that have been approved by core developers are enqueued in order in this pipeline, and if they pass tests in Jenkins, will be merged.

Change queue: openstack-dev/devstack, openstac...




openstack/glance 63693,2	26 min
gate-glance-docs:	SUCCESS
gate-glance-pep8:	SUCCESS
gate-glance-python26:	SUCCESS
gate-glance-python27:	SUCCESS
gate-tempest-dsvm-full:	
gate-tempest-dsvm-postgres-full:	
gate-tempest-dsvm-neutron:	
gate-tempest-dsvm-large-ops:	SUCCESS
gate-tempest-dsvm-neutron-large-ops:	SUCCESS
gate-grenade-dsvm:	

openstack/keystone 63570,7	30 min
openstack/cinder 58599,7	41 min
openstack/cinder 66667,2	42 min
openstack/cinder 65416,2	42 min
openstack/cinder 65662,2	45 min
openstack/cinder 66047,3	47 min
openstack/python-novaclient 64686,6	47 min
openstack/glance 64773,5	47 min
openstack/horizon 66742,2	50 min
openstack/horizon 65675,2	unknown
openstack/python-keystoneclient 65995,2	42 min

## post

 (3)

This pipeline runs jobs that operate after each change is merged.

 openstack/swift ddb937c	unknown
 openstack/ceilometer 87c1a8a	unknown
 openstack/savanna 1c7bb72	unknown

## tag

This pipeline runs jobs in response to any tag event.

## pre-release

This pipeline runs jobs on projects in response to pre-release tags.

## release

When a commit is tagged as a release, this pipeline runs jobs that publish archives and documentation.

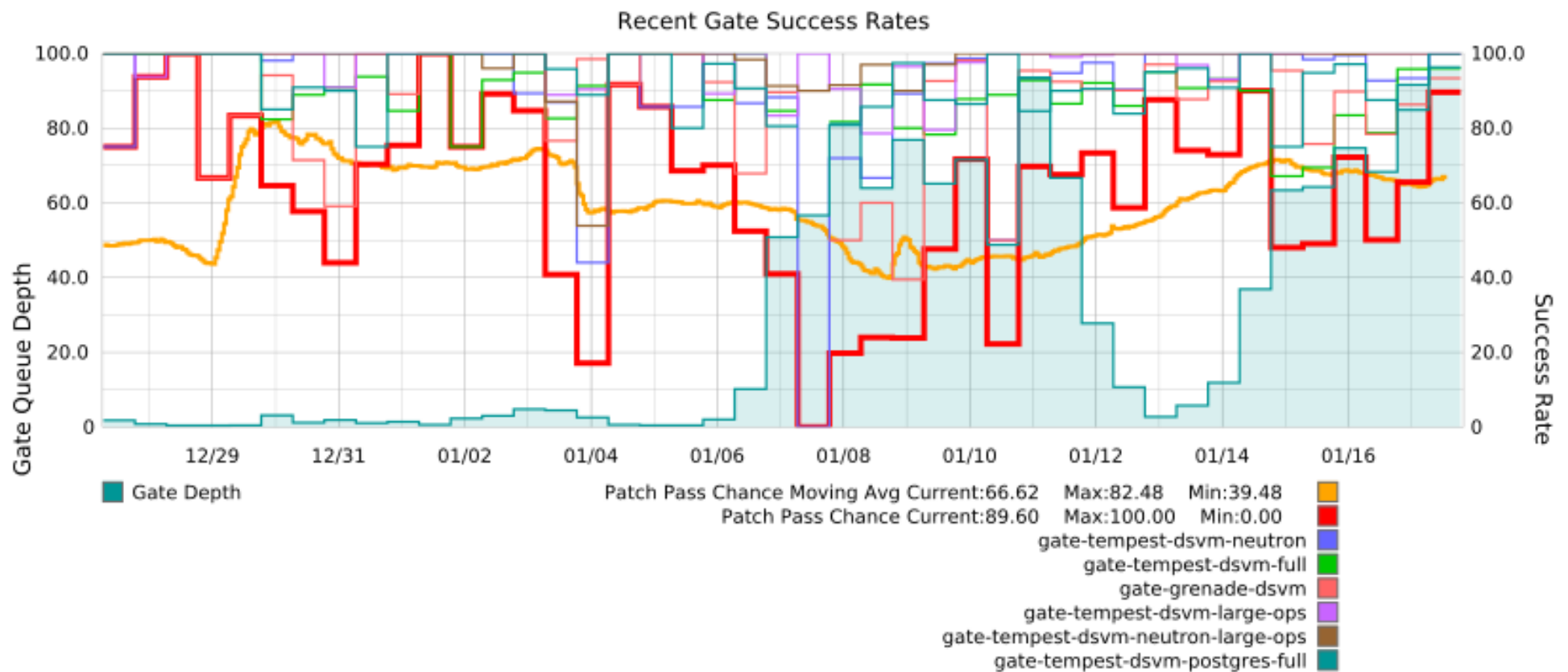
## silent

This pipeline is used for silently testing new jobs.

## experimental

On-demand pipeline for requesting a run against a set of jobs that are not yet gating. Leave review comment of "check experimental" to run jobs in this pipeline.

# False negatives





# Tracking rechecks

## Jenkins

01:47

Patch Set 1: Fails

Build failed. For information on how to proceed, see [https://wiki.openstack.org/wiki/GerritJenkinsGit#Test\\_Failures](https://wiki.openstack.org/wiki/GerritJenkinsGit#Test_Failures)

gate-swift-docs	SUCCESS in 2m 04s
gate-swift-pep8	SUCCESS in 1m 29s
gate-swift-python26	SUCCESS in 3m 54s
gate-swift-python27	SUCCESS in 3m 11s
gate-swift-dsvm-functional	SUCCESS in 12m 43s
gate-tempest-dsvm-full	SUCCESS in 54m 51s
gate-tempest-dsvm-neutron	SUCCESS in 56m 12s
gate-tempest-dsvm-postgres-full	FAILURE in 52m 05s
gate-tempest-dsvm-large-ops	SUCCESS in 13m 50s
gate-tempest-dsvm-neutron-large-ops	SUCCESS in 13m 44s
gate-grenade-dsvm	SUCCESS in 50m 44s

## Samuel Merritt

01:49

Patch Set 1:

reverify bug 1254890

Jenkins Patch Set 1: No score Starting gate ...

02:59

# Tracking rechecks

## Bug 1264755: tempest.scenario.test\_minimum\_basic.TestMinimumBasicScenario failed

First seen: 2013-12-28 22:44:17 UTC

Last seen: 2014-01-17 11:13:29 UTC

Rechecks: 49

Affecting projects: openstack/nova, openstack/tempest, openstack-dev/devstack, openstack/heat, openstack/glance, openstack/horizon, openstack/cinder, openstack/python-cinderclient, openstack/oslo.messaging, openstack/ceilometer, openstack/neutron

Affecting changes: 52867, 58292, 64622, 64655, 60991, 64893, 61597, 64874, 59733, 65772, 65395, 62216, 65637, 63147, 64361, 65472, 65966, 66166, 66187, 63658, 61786, 65841, 61930, 63723, 65943, 64271, 66541, 65358, 66854, 65515, 64217, 67003, 66796, 66983, 66514, 67295

## Bug 1269192: tempest.api.compute.servers.test\_server\_actions.ServerActionsTestXML.test\_create\_backup fails gate sporadically

First seen: 2014-01-14 23:52:00 UTC

Last seen: 2014-01-17 11:10:08 UTC

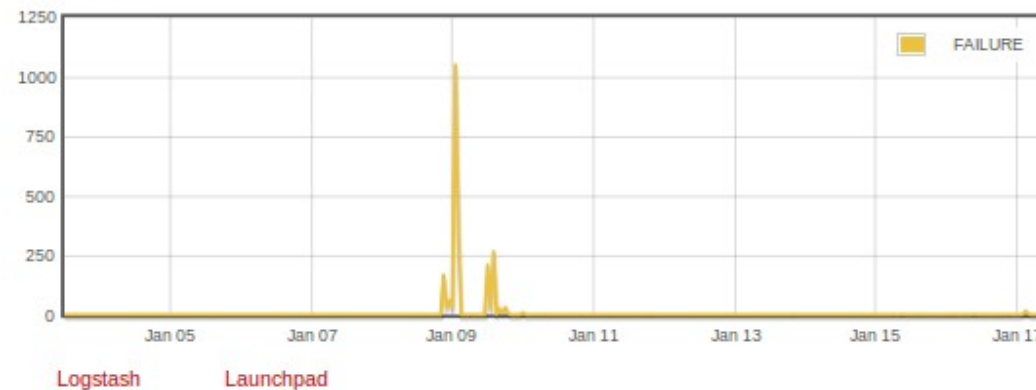
Rechecks: 7

Affecting projects: openstack/swift, openstack/python-cinderclient, openstack/keystone, openstack/heat, openstack/nova, openstack/tempest

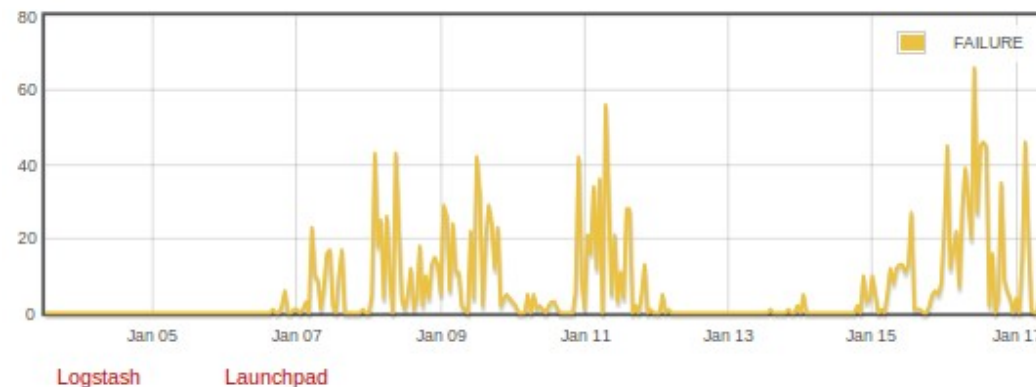
Affecting changes: 66489, 64003, 66719, 63041, 59778, 64590, 63723

# Failure tracking by signature

Bug 1260654



Bug 1260311



# Elastic rechecks

## Jenkins

Dec 24

Patch Set 3:

Build failed. For information on how to proceed, see [https://wiki.openstack.org/wiki/GerritJenkinsGit#Test\\_Failures](https://wiki.openstack.org/wiki/GerritJenkinsGit#Test_Failures)

gate-requirements-pep8	SUCCESS in 29s
gate-requirements-python27	SUCCESS in 1m 55s
gate-requirements-pypy	SUCCESS in 2m 05s
check-requirements-integration-dsvm	SUCCESS in 1h 01m 06s
check-tempest-dsvm-full	SUCCESS in 58m 18s
check-tempest-dsvm-postgres-full	SUCCESS in 43m 53s
check-tempest-dsvm-neutron	FAILURE in 39m 14s
gate-tempest-dsvm-large-ops	SUCCESS in 13m 41s
gate-tempest-dsvm-neutron-large-ops	SUCCESS in 20m 49s
check-grenade-dsvm	SUCCESS in 24m 46s
check-swift-dsvm-functional	SUCCESS in 12m 16s

## Elastic Recheck

Dec 24

Patch Set 3:

I noticed tempest failed, I think you hit bug(s):

<https://bugs.launchpad.net/bugs/1249065>

We don't automatically recheck or reverify, so please consider doing that manually if someone hasn't already. For a code review which is not yet approved, you can recheck by leaving a code review comment with just the text:

```
recheck bug 1249065
```

For a code review which has been approved but failed to merge, you can reverify by leaving a comment like this:

```
reverify bug 1249065
```

ChangBo Guo Patch Set 3: recheck bug 1249065

Dec 25

# Automation for the win

HOW LONG CAN YOU WORK ON MAKING A ROUTINE TASK MORE EFFICIENT BEFORE YOU'RE SPENDING MORE TIME THAN YOU SAVE?  
(ACROSS FIVE YEARS)

		HOW OFTEN YOU DO THE TASK					
		50/DAY	5/DAY	DAILY	WEEKLY	MONTHLY	YEARLY
HOW MUCH TIME YOU SHAVE OFF	1 SECOND	1 DAY	2 HOURS	30 MINUTES	4 MINUTES	1 MINUTE	5 SECONDS
	5 SECONDS	5 DAYS	12 HOURS	2 HOURS	21 MINUTES	5 MINUTES	25 SECONDS
	30 SECONDS	4 WEEKS	3 DAYS	12 HOURS	2 HOURS	30 MINUTES	2 MINUTES
	1 MINUTE	8 WEEKS	6 DAYS	1 DAY	4 HOURS	1 HOUR	5 MINUTES
	5 MINUTES	9 MONTHS	4 WEEKS	6 DAYS	21 HOURS	5 HOURS	25 MINUTES
	30 MINUTES		6 MONTHS	5 WEEKS	5 DAYS	1 DAY	2 HOURS
	1 HOUR		10 MONTHS	2 MONTHS	10 DAYS	2 DAYS	5 HOURS
	6 HOURS				2 MONTHS	2 WEEKS	1 DAY
1 DAY					8 WEEKS	5 DAYS	



# Infrastructure as code

- ◆ Puppet-driven infrastructure
- ◆ All project infrastructure is open
- ◆ Yes, everything is in a code repo
- ◆ Apply our key principles to infra too

# Join us !

- ◆ State-of-the-art dev infrastructure
- ◆ Openly developed
- ◆ Reused at Wikimedia and elsewhere



#openstack-infra on  IRC

# Questions ?

thierry@openstack.org  
<http://fnords.wordpress.com>  
@tcarrez on   
ttx on  IRC

