Better Testing Through Statistics

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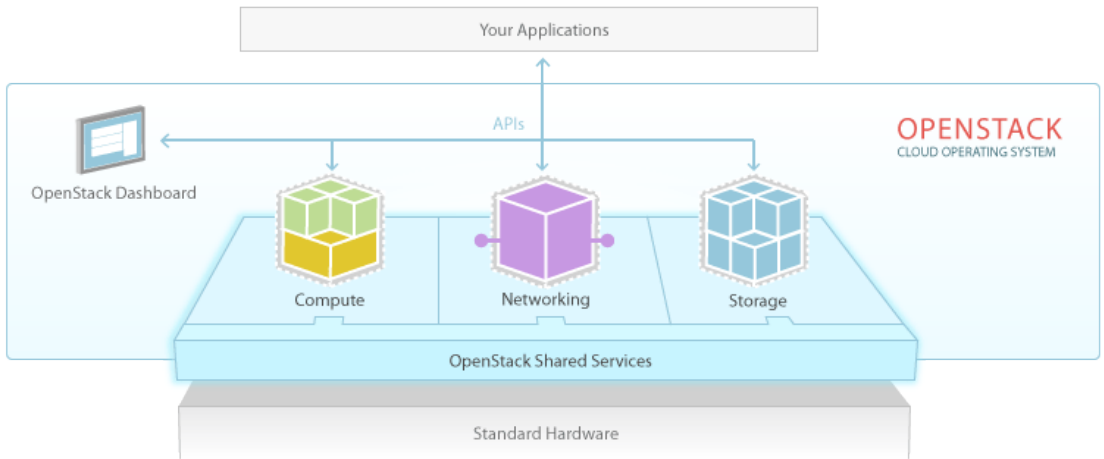
https://github.com/masayukig/better-testing-through-statistics

What is “the OpenStack”?

- Open Source Cloud Software: Apache License Version 2.0
- consists of a lot of projects: 57 projects
- released every 6 month: Latest version is called ‘Mitaka’



What is "the OpenStack QA"

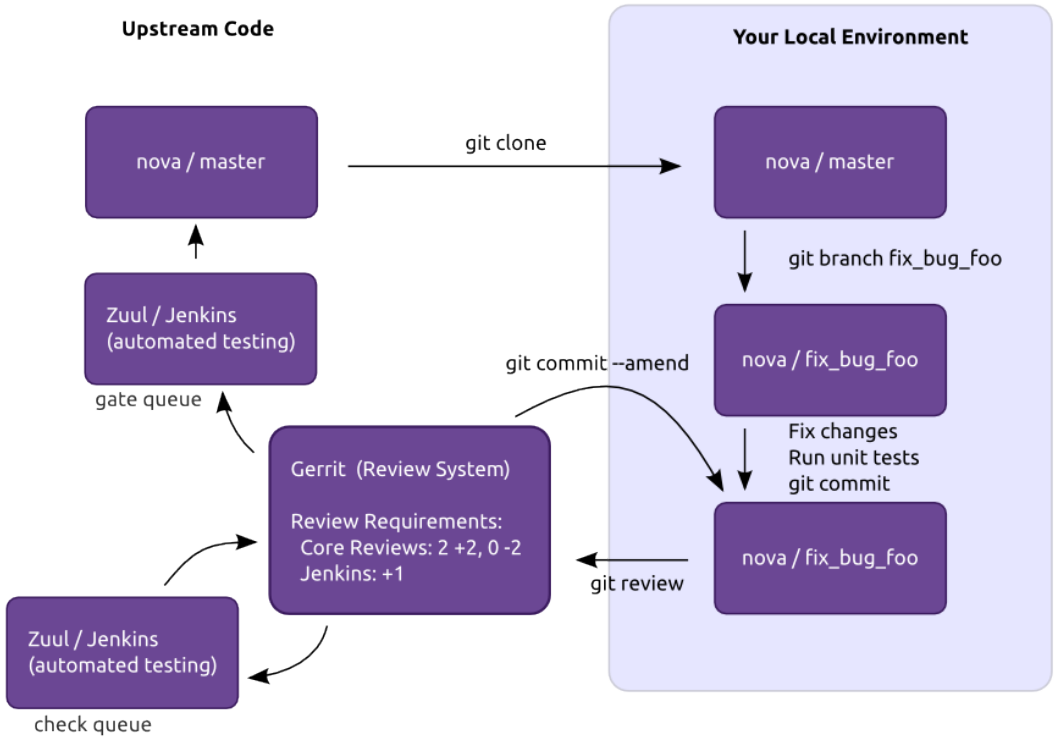
- An official OpenStack project team
- Develop, maintain, and initiate tools and plans to ensure the upstream stability and quality of OpenStack, and its release readiness at any point during the release cycle.

Current QA Projects

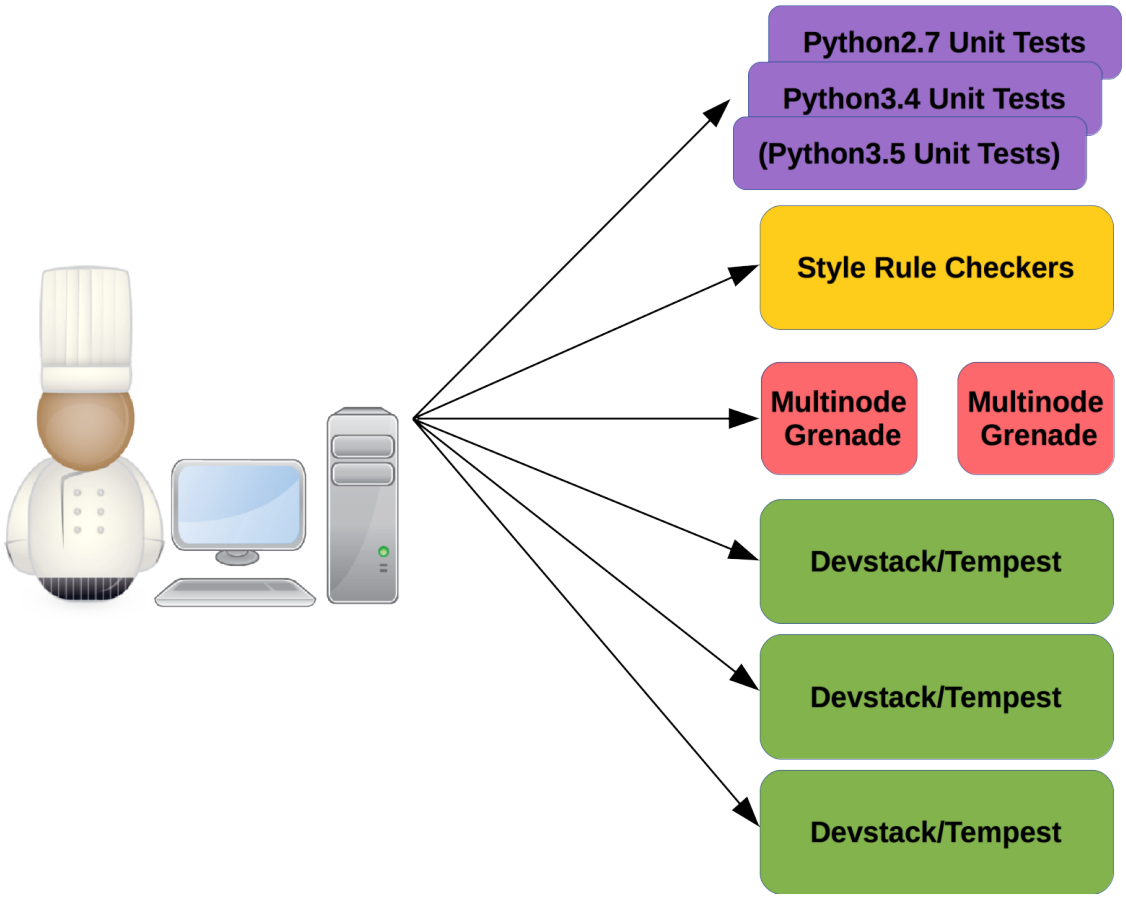
17 repositories (2016/7/8)

- devstack
- devstack-plugin-cookiecutter
- devstack-plugin-ceph
- devstack-vagrant
- grenade
- tempest
- tempest-lib
- tempest-plugin-cookiecutter
- bashate
- stackviz
- hacking
- eslint-config-openstack
- os-testr
- os-performance-tools
- openstack-health dashboard
- karma-subunit-reporter

What is “the OpenStack Gate”?



What Happens when you push a change?



check (268)

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

Change queue: openstack/neutron

openstack/neutron 181674,23	unknown 3 hr 57 min
gate-neutron-docs:	SUCCESS
gate-neutron-pep8:	SUCCESS
gate-neutron-python27:	FAILURE
gate-neutron-python34:	FAILURE
gate-tempest-dsvm-neutron-full:	queued
gate-grenade-dsvm-neutron:	SUCCESS
gate-neutron-dsvm-api:	SUCCESS
gate-neutron-dsvm-functional:	SUCCESS
gate-neutron-dsvm-fullstack: (non-voting)	SUCCESS
gate-rally-dsvm-neutron-neutron: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-dvr:	SUCCESS
gate-tempest-dsvm-neutron-identity-v3-only-full-nv: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-linuxbridge:	SUCCESS
gate-tempest-dsvm-neutron-pg-full: (non-voting)	SUCCESS
gate-neutron-lbaasv2-dsvm-minimal:	SUCCESS
gate-grenade-dsvm-neutron-multinode: (non-voting)	SUCCESS
gate-grenade-dsvm-neutron-dvr-multinode: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-multinode-full: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-dvr-multinode-full: (non-voting)	SUCCESS
gate-tempest-dsvm-ironic-pxe_ipa-nv: (non-voting)	SUCCESS

Change queue: openstack/networking-generic-swi...

openstack/networking-generic-switch 308884,3	unknown 3 hr 52 min
gate-networking-generic-switch-docs:	queued
gate-networking-generic-switch-pep8:	SUCCESS
gate-networking-generic-switch-python27:	SUCCESS
gate-networking-generic-switch-python34:	SUCCESS
gate-networking-generic-switch-dsvm:	SUCCESS

Change queue: openstack/neutron

openstack/neutron 280595,12	unknown 3 hr 38 min
gate-neutron-docs:	SUCCESS
gate-neutron-pep8:	SUCCESS
gate-neutron-python27:	SUCCESS
gate-neutron-python34:	SUCCESS
gate-tempest-dsvm-neutron-full:	SUCCESS
gate-grenade-dsvm-neutron:	SUCCESS
gate-neutron-dsvm-api:	SUCCESS
gate-neutron-dsvm-functional:	SUCCESS
gate-neutron-dsvm-fullstack: (non-voting)	FAILURE
gate-rally-dsvm-neutron-neutron: (non-voting)	queued
gate-tempest-dsvm-neutron-dvr:	SUCCESS
gate-tempest-dsvm-neutron-identity-v3-only-full-nv: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-linuxbridge:	SUCCESS
gate-tempest-dsvm-neutron-pg-full: (non-voting)	SUCCESS
gate-neutron-lbaasv2-dsvm-minimal:	SUCCESS
gate-grenade-dsvm-neutron-multinode: (non-voting)	SUCCESS
gate-grenade-dsvm-neutron-dvr-multinode: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-multinode-full: (non-voting)	SUCCESS
gate-tempest-dsvm-neutron-dvr-multinode-full: (non-voting)	SUCCESS
gate-tempest-dsvm-ironic-pxe_ipa-nv: (non-voting)	SUCCESS

Change queue: integrated

openstack/horizon 308887,1	0 min 3 hr 23 min
gate-horizon-docs:	SUCCESS
gate-horizon-pep8:	SUCCESS

gate (26)

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: integrated

openstack/nova 307269,1	0 min 1 hr 10 min
gate-nova-docs:	SUCCESS
gate-nova-pep8:	SUCCESS
gate-nova-python27-db:	SUCCESS
gate-nova-python34-db:	SUCCESS
gate-nova-requirements:	SUCCESS
gate-tempest-dsvm-full:	SUCCESS
gate-tempest-dsvm-postgres-full:	SUCCESS
gate-tempest-dsvm-neutron-full:	
gate-grenade-dsvm:	SUCCESS
gate-nova-releasenotes:	SUCCESS
gate-nova-tox-db-functional:	SUCCESS
gate-grenade-dsvm-multinode:	SUCCESS
gate-tempest-dsvm-cells:	SUCCESS
gate-tempest-dsvm-full-devstack-plugin-ceph:	SUCCESS

openstack/nova 304730,1	0 min 1 hr 10 min
gate-nova-docs:	SUCCESS
gate-nova-pep8:	SUCCESS
gate-nova-python27-db:	SUCCESS
gate-nova-python34-db:	SUCCESS
gate-tempest-dsvm-full:	SUCCESS
gate-tempest-dsvm-postgres-full:	SUCCESS
gate-tempest-dsvm-neutron-full:	SUCCESS
gate-grenade-dsvm:	SUCCESS
gate-nova-releasenotes:	SUCCESS
gate-nova-tox-db-functional:	SUCCESS
gate-grenade-dsvm-multinode:	SUCCESS
gate-tempest-dsvm-cells:	SUCCESS
gate-tempest-dsvm-full-devstack-plugin-ceph:	SUCCESS

openstack/nova 303995,1	0 min 1 hr 5 min
gate-nova-docs:	SUCCESS
gate-nova-pep8:	SUCCESS
gate-nova-python27-db:	SUCCESS
gate-nova-python34-db:	SUCCESS
gate-tempest-dsvm-full:	SUCCESS
gate-tempest-dsvm-postgres-full:	SUCCESS
gate-tempest-dsvm-neutron-full:	
gate-grenade-dsvm:	SUCCESS
gate-nova-tox-db-functional:	SUCCESS
gate-grenade-dsvm-multinode:	SUCCESS
gate-tempest-dsvm-cells:	SUCCESS
gate-tempest-dsvm-full-devstack-plugin-ceph:	SUCCESS

openstack-dev/devstack 308791,1	0 min 1 hr 5 min
gate-devstack-docs:	SUCCESS
gate-devstack-bashate:	SUCCESS

openstack/horizon 303350,6	0 min 1 hr 0 min
gate-horizon-docs:	SUCCESS
gate-horizon-pep8:	SUCCESS
gate-horizon-python27:	SUCCESS
gate-horizon-python34:	SUCCESS
gate-horizon-npm-run-lint:	SUCCESS
gate-horizon-npm-run-test:	SUCCESS
gate-horizon-tox-py27dj18:	SUCCESS
gate-horizon-tox-py27dj19:	SUCCESS

post (79)

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

Change queue: openstack/oslo.concurrency

openstack/oslo.concurrency 342efd3	unknown 5 hr 2 min
oslo.concurrency-branch-tarball:	SUCCESS
oslo.concurrency-docs:	queued
oslo.concurrency-upstream-translation-update:	SUCCESS
oslo.concurrency-coverage:	queued

Change queue: openstack-infra/project-config

openstack-infra/project-config 08001cc	unknown 5 hr 0 min
publish-infra-docs-index:	queued
publish-specs-site:	queued

Change queue: openstack-infra/project-config

openstack-infra/project-config bd07b6c	unknown 4 hr 56 min
publish-infra-docs-index:	queued
publish-specs-site:	queued

Change queue: openstack/networking-vsphere

openstack/networking-vsphere 193febe	unknown 4 hr 55 min
networking-vsphere-branch-tarball:	queued
networking-vsphere-docs:	queued

Change queue: openstack-infra/project-config

openstack-infra/project-config d7f06f6	unknown 4 hr 54 min
publish-infra-docs-index:	queued
publish-specs-site:	queued

Change queue: openstack-infra/project-config

openstack-infra/project-config 8cb6337	unknown 4 hr 52 min
publish-infra-docs-index:	queued
publish-specs-site:	queued

Change queue: openstack/stackalytics

openstack/stackalytics 40f07b8	unknown 4 hr 7 min
hook-stackalytics-rtfd:	SUCCESS
stackalytics-branch-tarball:	queued

Change queue: openstack/stackalytics

openstack/stackalytics ae58a37	unknown 4 hr 7 min
hook-stackalytics-rtfd:	SUCCESS
stackalytics-branch-tarball:	queued

Change queue: openstack/governance

openstack/governance 4b8124a	unknown 4 hr 2 min
static-governance-publish:	queued

Change queue: openstack/glance_store

openstack/glance_store 25e5d19	unknown 3 hr 54 min
glance_store-branch-tarball:	queued
glance_store-docs:	queued
glance_store-releasenotes:	queued
glance_store-upstream-translation-update:	SUCCESS

The Size of the Gate

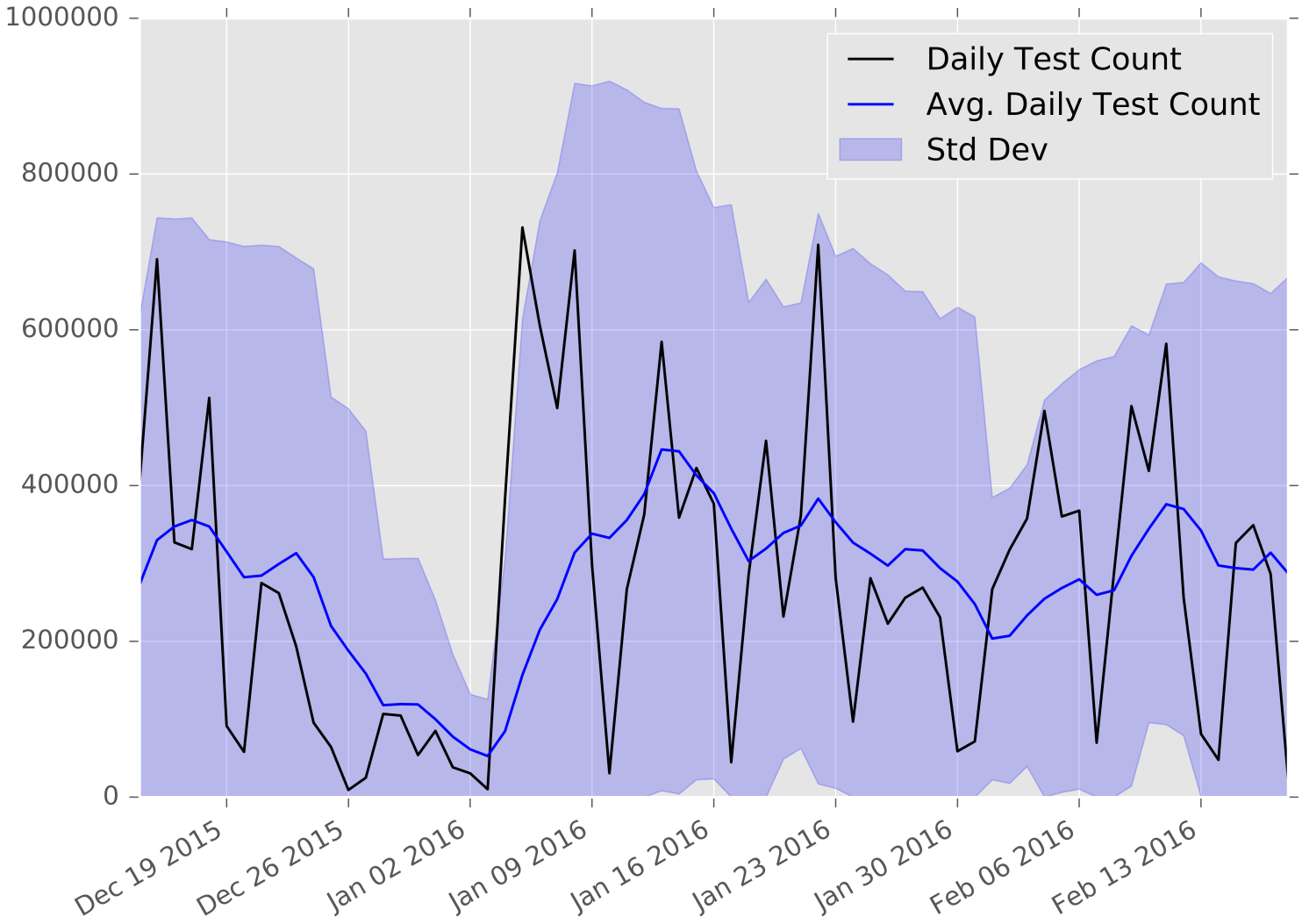
One Proposed Change Generates:

- 5–25 Devstacks
- ~10,000 integration tests (roughly 1.5k per devstack)
- ~151 2nd level guests created in each devstack cloud
- ~1 GB of logs uncompressed for each run

In aggregate:

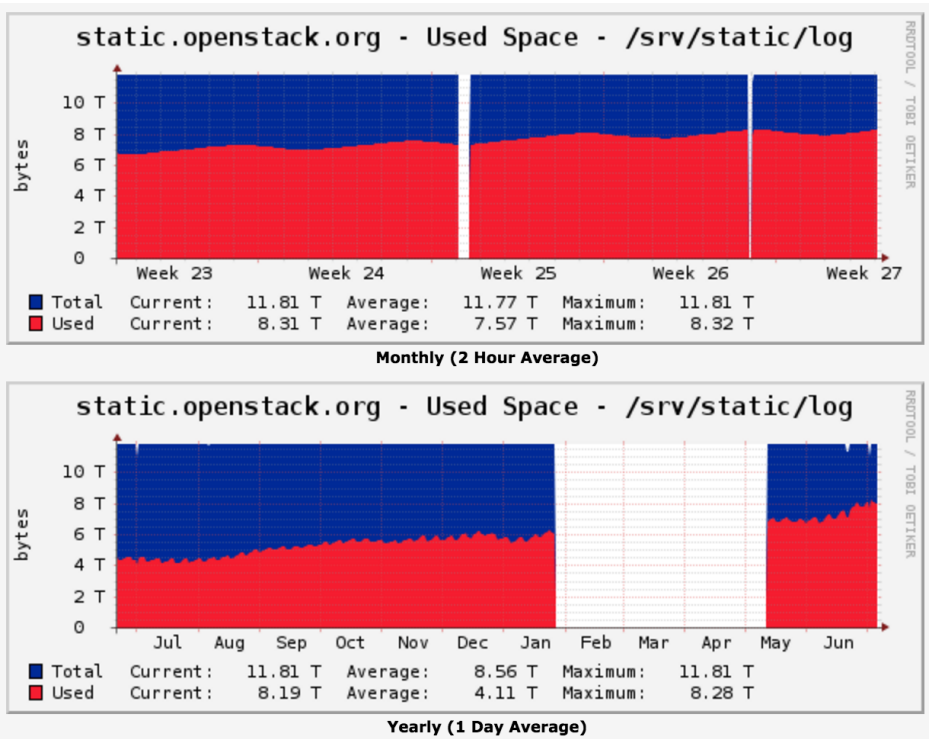
- ~12,500 jobs run in check and gate daily
- ~0.01% individual tempest test failure rate
- ~.77% tempest run failure rate

Number of Tempest Tests per Day in the Gate Queue:



Log Server

- Log Server: http://logs.openstack.org/
- Archive of all artifacts from all jobs for ~4 months
- ~8 TB of data compressed



Problem/Issue

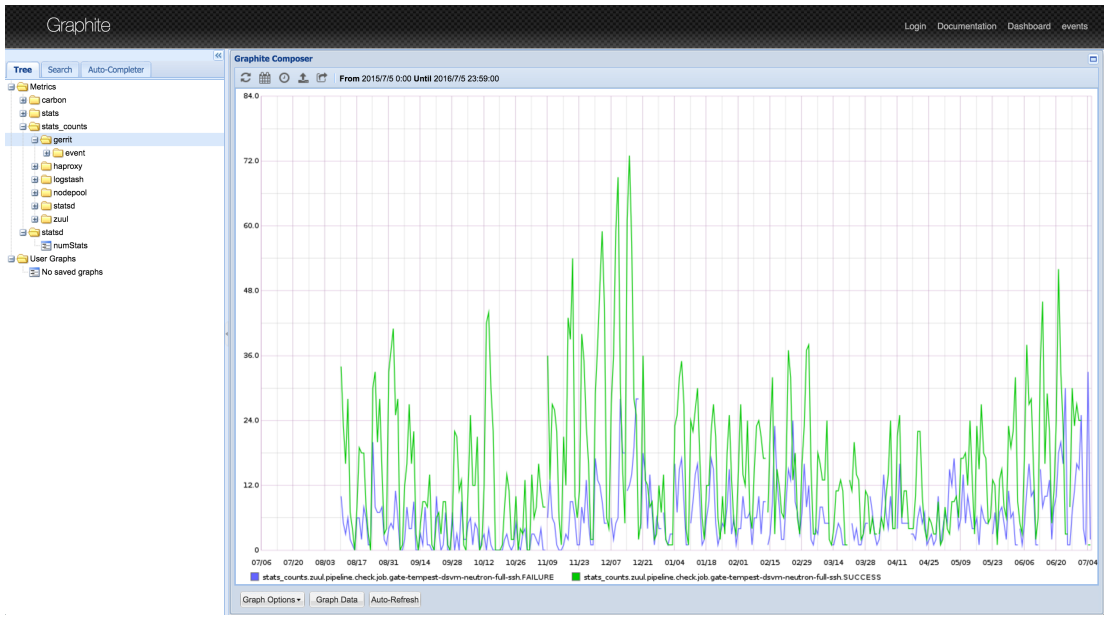
- It's difficult to find a problem from the large amount of log
- It's difficult to find performance regression/improvement
-

General Approach

- Look at things on the larger scale
- Use statistics and data mining to find
- Make the data from test runs open and accesible to
- Ensure there are APIs for accessing everything

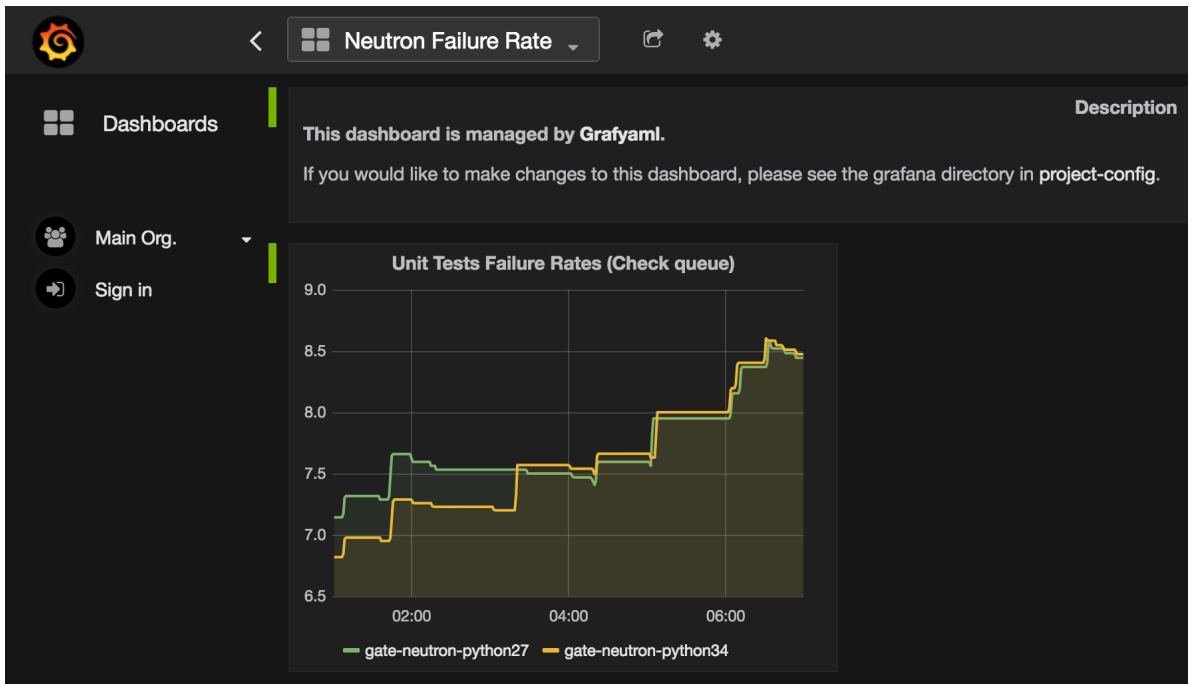
Graphite

- http://graphite.openstack.org/
- Infra services report to graphite
- Include job results
- Limited to job level data
- Time based, can't be linked to an individual job
-



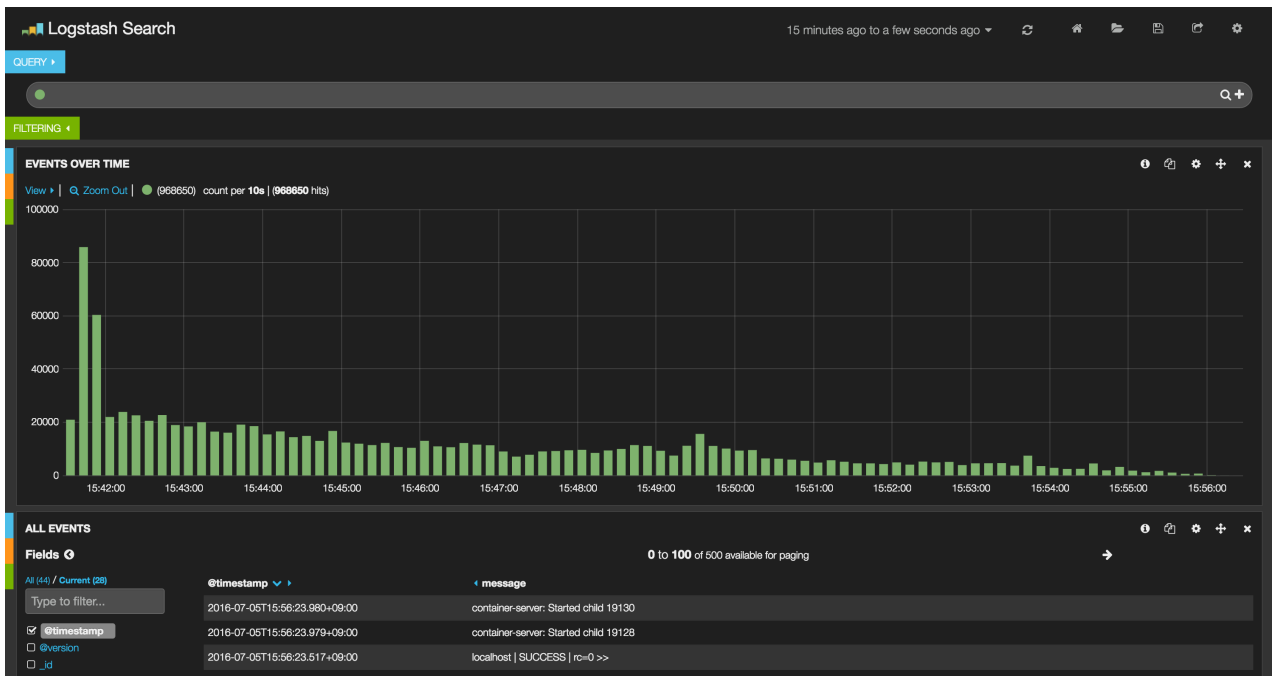
Grafana

- http://grafana.openstack.org/
- Provides a layer on top of graphite to easily make useful visualizations
- Adds a number of dashboards
- Some projects using this to track job failure rates



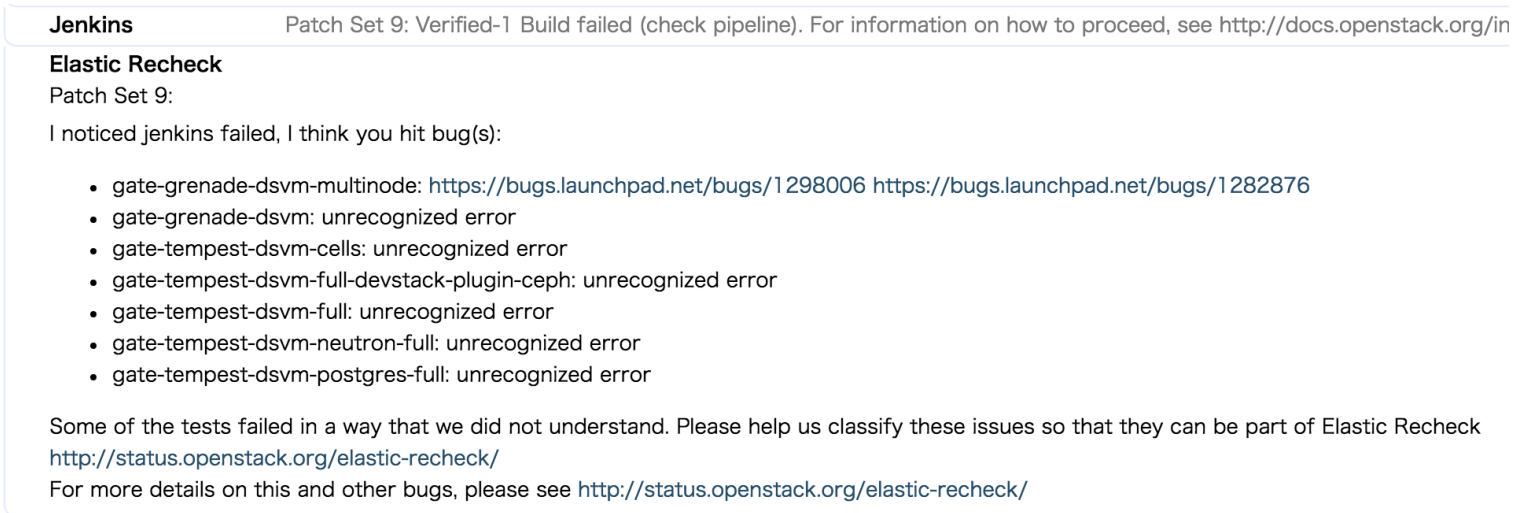
ELK

- Elasticsearch, Logstash, Kibana
- http://logstash.openstack.org
- Provides a search engine on top of are job artifacts
- Limited to 10 days of results



Elastic Recheck

- Designed to answer the question “Have you seen this recently?”
- http://status.openstack.org/elastic-recheck/
-



Jenkins Patch Set 9: Verified-1 Build failed (check pipeline). For information on how to proceed, see http://docs.openstack.org/in

Elastic Recheck
Patch Set 9:

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

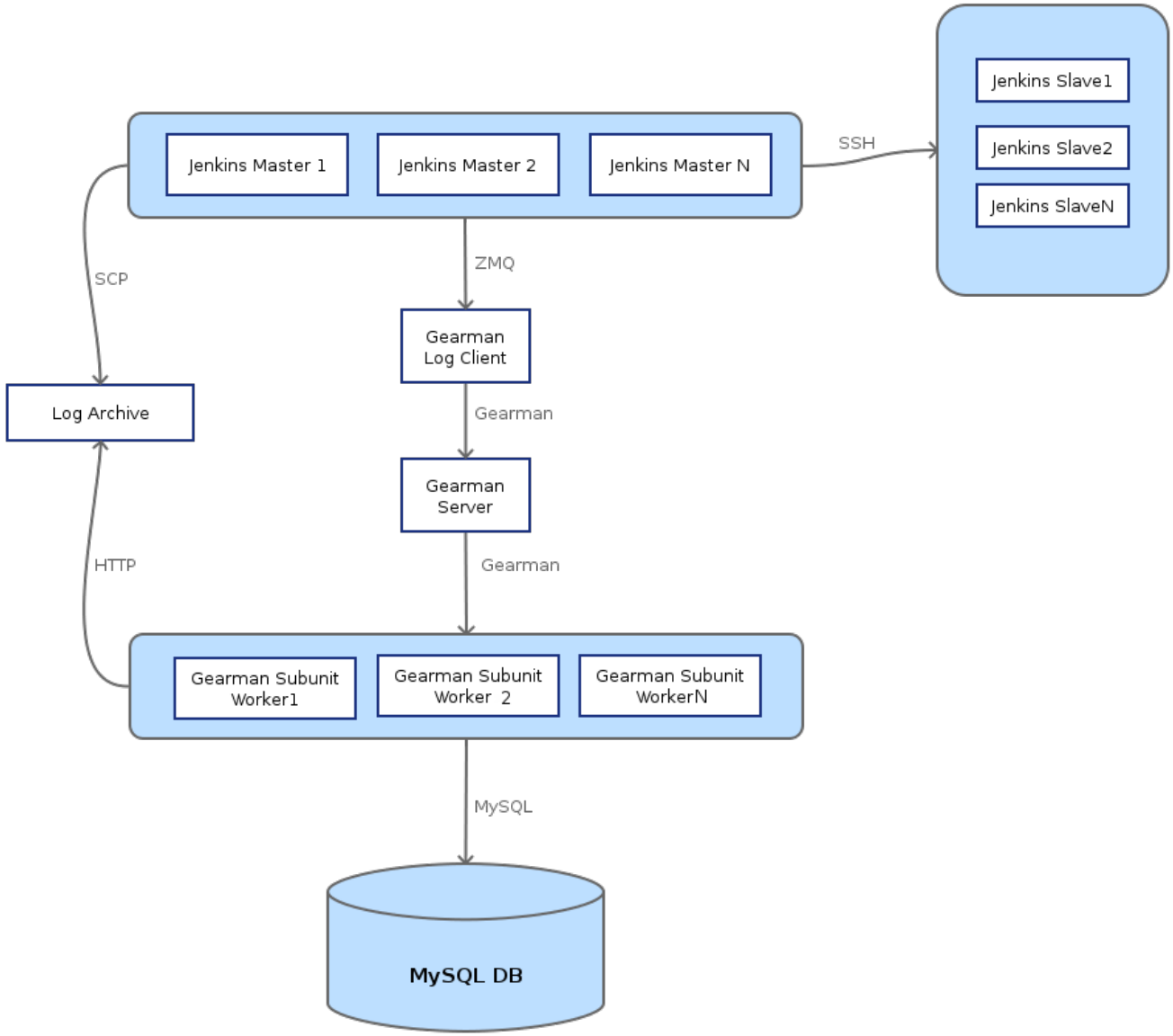
- gate-grenade-dsvm-multinode: https://bugs.launchpad.net/bugs/1298006 https://bugs.launchpad.net/bugs/1282876
- gate-grenade-dsvm: unrecognized error
- gate-tempest-dsvm-cells: unrecognized error
- gate-tempest-dsvm-full-devstack-plugin-ceph: unrecognized error
- gate-tempest-dsvm-full: unrecognized error
- gate-tempest-dsvm-neutron-full: unrecognized error
- gate-tempest-dsvm-postgres-full: unrecognized error

Some of the tests failed in a way that we did not understand. Please help us classify these issues so that they can be part of Elastic Recheck http://status.openstack.org/elastic-recheck/
For more details on this and other bugs, please see http://status.openstack.org/elastic-recheck/

subunit2sql

- Designed to store test results data in a sql database
- Provides a DB schema and a python API for interacting with the database
- Used to the results from test runs for 6 months
-

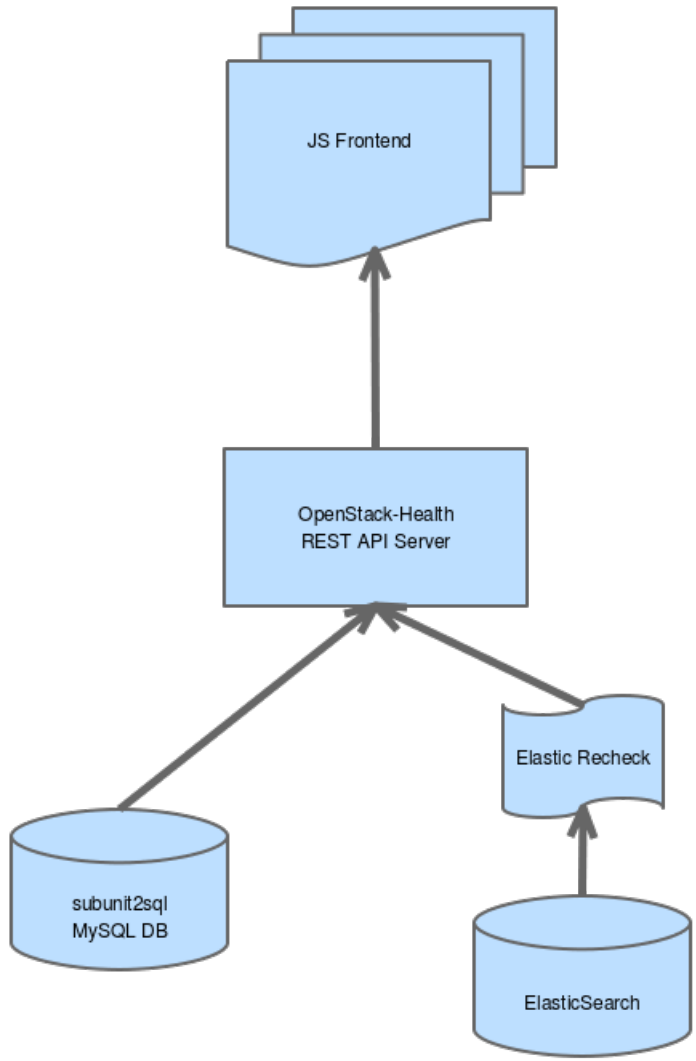
subunit2sql in OpenStack Infrastructure



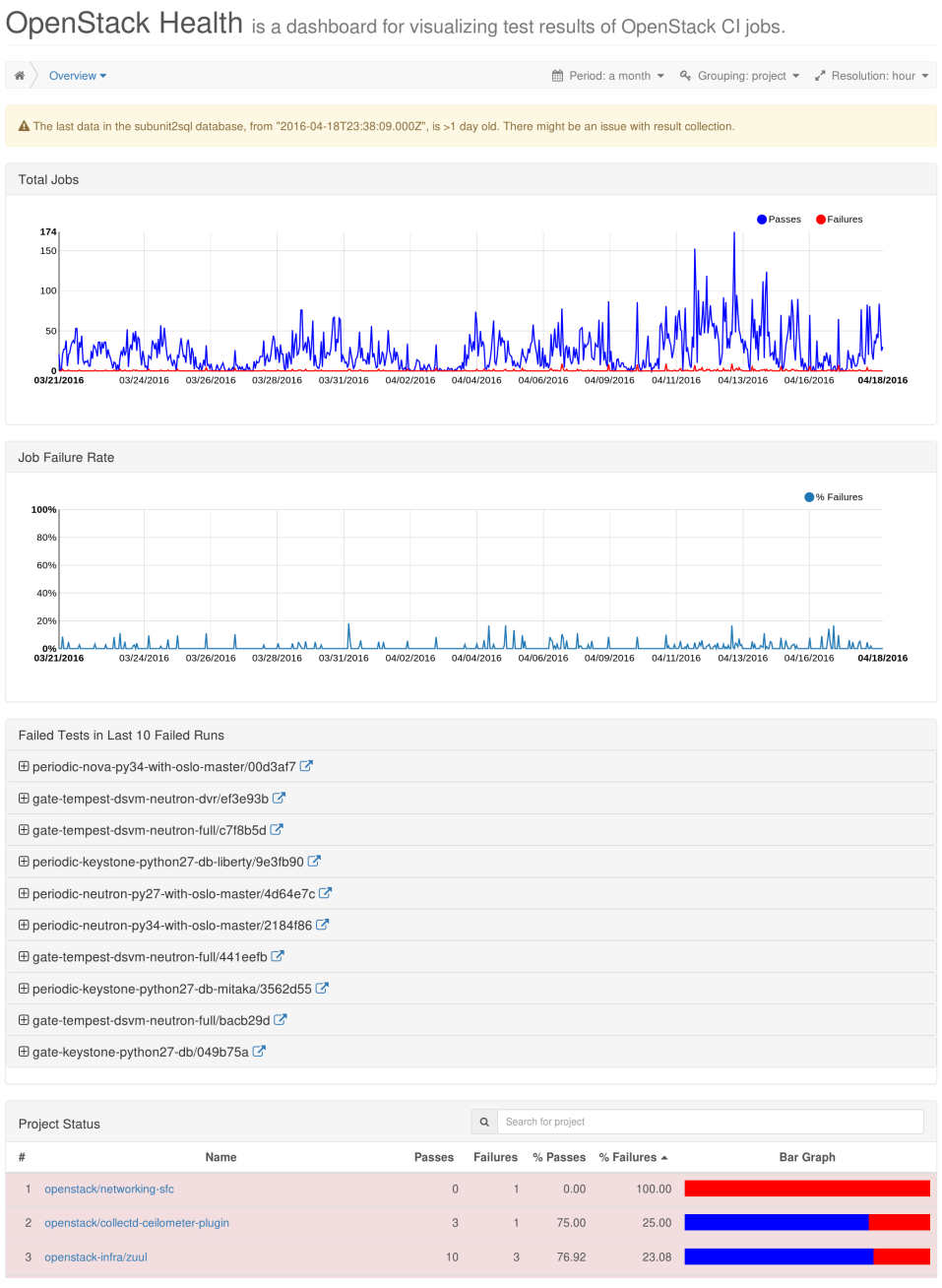
openstack-health

- http://status.openstack.org/openstack-health/#/
- Designed to be a single point of access for all the data about the gate
- Currently can leverage subunit2sql and elastic-recheck

OpenStack-Health Architecture



Using OpenStack Health



Data Driven Decision Making

- Determine when it's time to skip a test
- Identify tests that are actually catching bugs
- Determine if failures are isolated to region, config, etc.
-

Finding trends amongst the noise

- Catch performance regressions
-

Issues

- Too many varied data sources each with unique limitations
- Only Gate and Periodic Job data (subunit2sql)
- No views for infra failure (subunit2sql)
- It'd difficult to get contribution from employees of companies

Future work

- Integrate all the things in openstack-health
- Use the data to optimize our test runner scheduler
- (Auto cause of failure detection with machine learning or something:)

Where to get more information

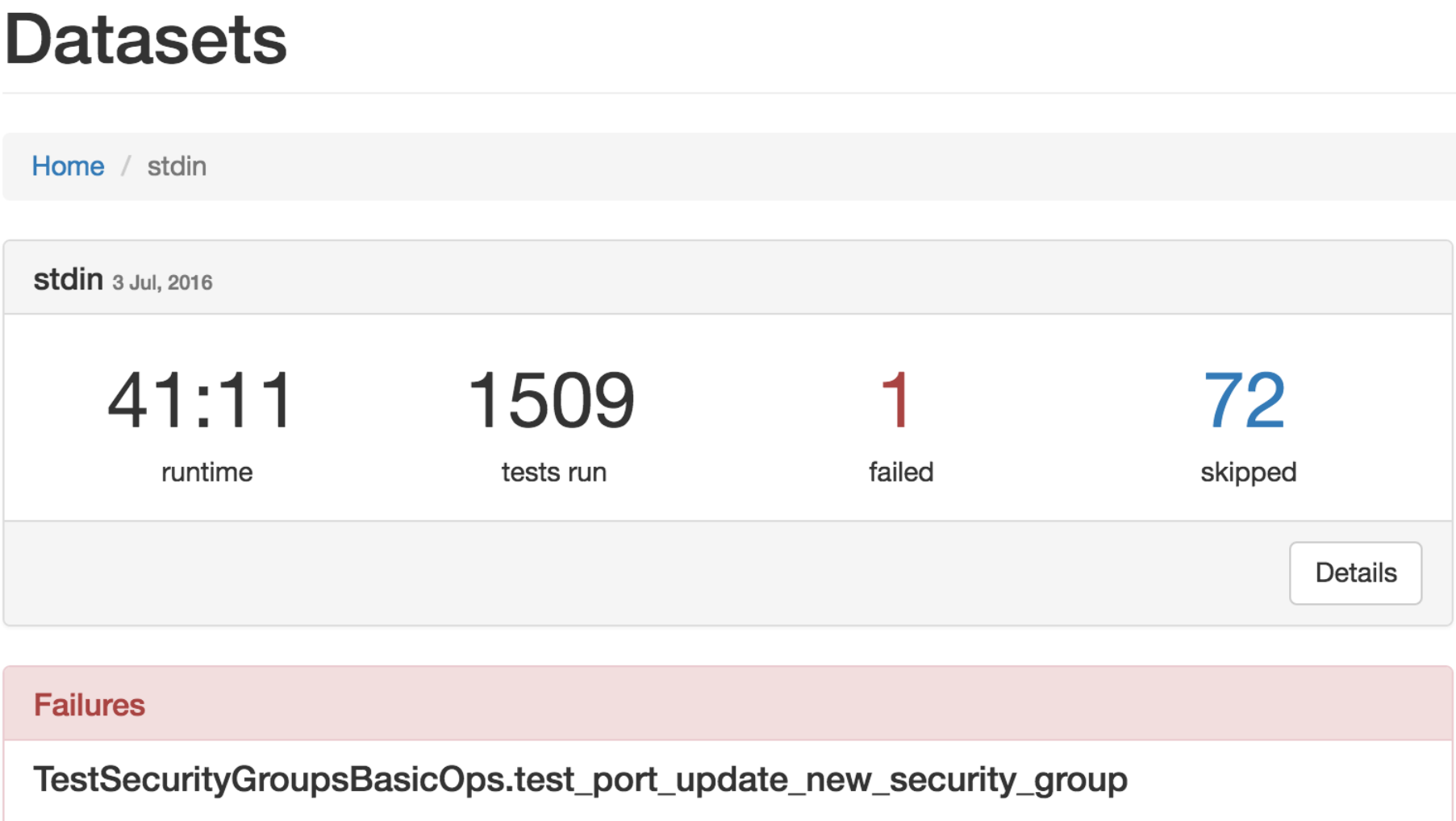
- openstack-dev ML openstack-dev@lists.openstack.org
- #openstack-qa on Freenode
- http://git.openstack.org/cgit/openstack/openstack-health/
- http://git.openstack.org/cgit/openstack-infra/subunit2sql
- http://git.openstack.org/cgit/openstack-infra/elastic-recheck/

Questions?

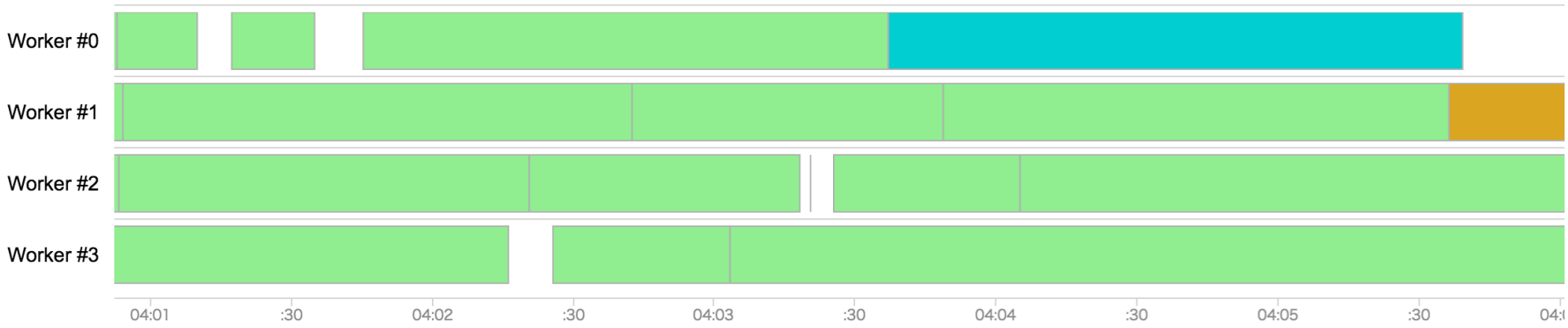
Appendix: StackViz

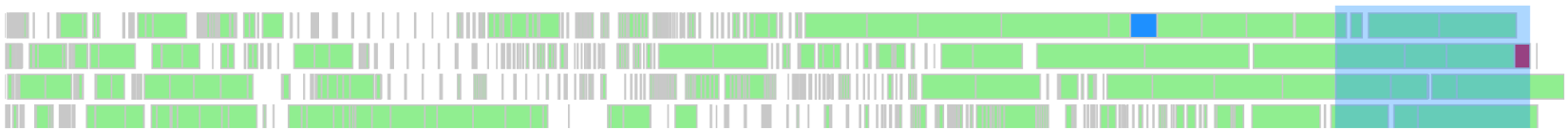
Visualization tool of individual CI build results

- git.openstack.org/cgit/openstack/stackviz



Timeline





Show in OpenStack-health

Details: test_port_update_new_security_group fail

Class	TestSecurityGroupsBasicOps
Module	tempest.scenario.test_security_groups_basic_ops
Tags	worker-1
Duration	24.7 seconds
Start	Jul 3, 2016 4:05:36 PM
End	Jul 3, 2016 4:06:01 PM

TestSecurityGroupsBasicOps.test_port_update_new_security_group

Summary | traceback | pythonlogging

```
Traceback (most recent call last):
  File "tempest/scenario/test_security_groups_basic_ops.py", line 188, in setUp
    self._deploy_tenant(self.primary_tenant)
  File "tempest/scenario/test_security_groups_basic_ops.py", line 352, in _deploy_tenant
    self._set_access_point(tenant)
  File "tempest/scenario/test_security_groups_basic_ops.py", line 320, in _set_access_point
    self._assign_floating_ips(tenant, server)
  File "tempest/scenario/test_security_groups_basic_ops.py", line 326, in _assign_floating_ips
    client=tenant.manager.floating_ips_client)
  File "tempest/scenario/manager.py", line 868, in create_floating_ip
    port_id, ip4 = self._get_server_port_id_and_ip4(thing)
  File "tempest/scenario/manager.py", line 847, in _get_server_port_id_and_ip4
    "No IPv4 addresses found in: %s" % ports)
  File "/opt/stack/new/tempest/.tox/tempest/local/lib/python2.7/site-packages/unittest2/case.py", line 845, in assertNotEqual
    raise self.failureException(msg)
AssertionError: 0 == 0 : No IPv4 addresses found in: [{u'extra_dhcp_opts': [], u'admin_state_up': True, u'mac_address': u'fa:16:3e:ee:7f:bc'
```

Timeline