Browbeat Documentation

OpenStack Foundation

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CHAPTER 1

Introduction

This started as a project to help determine the number of database connections a given OpenStack deployment uses via stress tests. It has since grown into a set of Ansible playbooks to help check deployments for known issues, install tools, run performance stress workloads and change parameters of the overcloud.

CHAPTER 2

Installation

Browbeat is currently installed via an ansible playbook. In a Tripleo environment it can be installed directly on the Undercloud or a separate machine. The installation can be run from either your local machine or directly on the machine you want Browbeat installed on.

2.1 Install Browbeat on Undercloud

This is usually the easiest installation due to many requirements are satisfied on the Undercloud. In some cases it may not be desired to install Browbeat on the Undercloud (Ex. Limited Resource requirements or Non-Tripleo installed cloud)

2.1.1 Requirements

Hardware

- Undercloud Machine (Baremetal or Virtual Machine)

Networking

- Access to Public API endpoints
- Access to Keystone Admin Endpoint

Note: For tripleo, public API endpoints are located on the External Network by default. The Keystone Admin Endpoint is deployed on the ctlplane network by default. These networking requirements should be validated before attempting an installation.

2.1.2 On the Undercloud

```
$ ssh undercloud-root
[root@undercloud ~]# su - stack
[stack@undercloud ~]$ git clone https://github.com/openstack/browbeat.git
[stack@undercloud ~]$ source stackrc
[stack@undercloud ~]$ cd browbeat/ansible
[stack@undercloud ansible]$ vi install/group_vars/all.yml # Make sure to edit the dns_
↪server to the correct ip address
[stack@undercloud ansible]$ ./generate_tripleo_inventory.sh -l
[stack@undercloud ansible]$ ansible-playbook -i hosts.yml install/browbeat.yml
```

2.1.3 (Optional) Install Browbeat instance workloads

Browbeat instance workloads are orchestrated Rally plugins that ship with Browbeat. We currently support a handful of workloads

- Pbench-Uperf - Networking throughput / RR test
- Linpack - Microbenchmark for CPU load

To enable installation of the Browbeat workloads set install_browbeat_workloads: true in ansible/install/group_vars/all.yml.

To build the custom images for workloads set enabled: true in ansible/install/group_vars/all.yml.

Example:

browbeat_workloads:

sysbench: name: browbeat-sysbench src: sysbench-user.file dest: "{{ browbeat_path }}/sysbench-user.file" image: centos7 enabled: true

It is also required to provide the neutron network id of a private network which has external access. To set this, edit ansible/install/group_vars/all.yml and provide the network id for the browbeat_network:

This work can either be done prior to installation of Browbeat, or after Browbeat has been installed. To skip directly to this task execute:

```
$ ansible-playbook -i hosts.yml install/browbeat.yml --start-at-task "Check browbeat_
↪network"
```

2.1.4 (Optional) Install Collectd

`collectd_container` is set to true if running on OpenStack version Stein or later. The containerized collectd can also work with Queens release but it is not recommended.

```
[stack@undercloud-0 ansible]$ ansible-playbook -i hosts.yml  install/collectd.yml
```

2.1.5 (Optional) Install Browbeat Grafana dashboards

Browbeat uses Grafyaml to upload dashboards to Grafana. Grafyaml is installed by browbeat at the location pointed to by the variable *browbeat_venv* in *ansible/install/group_vars/all.yml*. To upload dashboards, the api key is required which can be generated by following instructions at http://docs.grafana.org/http_api/auth/#create-api-token

```
[stack@undercloud ansible]$ # update the vars and make sure to update grafana_apikey␣
↪with value
[stack@undercloud ansible]$ vi install/group_vars/all.yml
[stack@undercloud ansible]$ ansible-playbook -i hosts.yml install/browbeat.yml # if␣
↪not run before.
[stack@undercloud ansible]$ ansible-playbook -i hosts.yml install/grafana-dashboards.
↪yml
```

2.1.6 (Optional) Install Browbeat Prometheus/Grafana/Collectd

:: [stack@undercloud ansible]$ ansible-playbook -i hosts.yml install/grafana-prometheus-dashboards.yml

Make sure grafana-api-key is added in the *install/group_vars/all.yml*

2.1.7 (Optional) Install Browbeat Common Logging through filebeat

Browbeat can be used to setup common logging on your OpenStack Cluster using Filebeat on the client side and Elasticsearch on the server side. Set the *cloud_prefix* and *es_ip* in *install/group_vars/all.yml* before running the playbook to setup common logging for your cloud.

```
[stack@undercloud ansible]$ # update the vars
[stack@undercloud ansible]$ vi install/group_vars/all.yml
[stack@undercloud ansible]$ # install filebeat
[stack@undercloud ansible]$ ansible-playbook -i hosts.yml common_logging/install_
↪logging.yml
[stack@undercloud ansible]$ # install and start filebeat
[stack@undercloud ansible]$ ansible-playbook -i hosts.yml common_logging/install_
↪logging.yml -e "start_filebeat=True"
```

2.2 (Optional) Install Kibana Visualizations

1. Update install/group_vars/all.yml (es_ip) to identify your ELK host.
2. Install Kibana Visualizations via Ansible playbook

```
[stack@undercloud ansible]# ansible-playbook -i hosts.yml install/kibana-visuals.yml
...
```

Now navigate to http://elk-host-address to verify Kibana is installed and custom visualizations are uploaded.

2.3 Install Browbeat from your local machine (Not Manintained)

This installs Browbeat onto your Undercloud but the playbook is run from your local machine rather than directly on the Undercloud machine.

2.3.1 From your local machine

```
$ ssh-copy-id stack@<undercloud-ip>
$ git clone https://github.com/openstack/browbeat.git
$ cd browbeat/ansible
$ ./generate_tripleo_hostfile.sh -t <undercloud-ip>
$ vi install/group_vars/all.yml # Review and edit configuration items
$ ansible-playbook -i hosts install/browbeat.yml
$ ansible-playbook -i hosts install/shaker_build.yml
```

Note: Your default network might not work for you depending on your underlay/overlay network setup. In such cases, user needs to create appropriate networks for instances to allow them to reach the internet. Some useful documentation can be found at: https://access.redhat.com/documentation/en-us/red_hat_openstack_platform/13/html/networking_guide/

2.3.2 (Optional) Install collectd

```
$ ansible-playbook -i hosts install/collectd-openstack.yml
```

2.3.3 (Optional) Install Browbeat Grafana dashboards

Browbeat uses Grafyaml to upload dashboards to Grafana. Grafyaml is installed by browbeat at the location pointed to by the variable *browbeat_venv* in *ansible/install/group_vars/all.yml*. So, you need to first run the browbeat install playbook *ansible/install/browbeat.yml* before running the below playbook.

```
$ ansible-playbook -i hosts install/grafana-dashboards.yml
```

2.4 Install/Setup Browbeat Machine

This setup is used when running Browbeat on a separate machine than the Undercloud. Using this method, you can create multiple users on the machine and each user can be pointed at a different cloud or the same cloud.

2.4.1 Requirements

Hardware

- Baremetal or Virtual Machine

Networking

- Access to Public API endpoints
- Access to Keystone Admin Endpoint

RPM

- epel-release
- ansible
- git

OpenStack

- overcloudrc file placed in browbeat user home directory

Note: For tripleo, public API endpoints are located on the External Network by default. The Keystone Admin Endpoint is deployed on the ctlplane network by default. These networking requirements should be validated before attempting an installation.

2.4.2 Preparing the Machine (CentOS 7)

1. Install Machine either from Image, ISO, or PXE
2. Check for Required Network Connectivity

Determine Overcloud Keystone endpoints

```
[stack@undercloud-1 ~]$ . overcloudrc
[stack@undercloud-1 ~]$ openstack catalog show identity
+-----------+----------------------------------------+
| Field     | Value                                  |
+-----------+----------------------------------------+
| endpoints | regionOne                              |
|           |   publicURL: http://172.21.0.10:5000   |
|           |   internalURL: http://172.16.0.16:5000 |
|           |   adminURL: http://192.168.24.61:35357 |
|           |                                        |
| name      | keystone                               |
| type      | identity                               |
+-----------+----------------------------------------+
```

Check network connectivity

```
$ ssh root@browbeatvm
[root@browbeatvm ~]$ # Ping Keystone Admin API IP Address
[root@browbeatvm ~]# ping -c 2 192.168.24.61
PING 192.168.24.61 (192.168.24.61) 56(84) bytes of data.
64 bytes from 192.168.24.61: icmp_seq=1 ttl=64 time=1.60 ms
64 bytes from 192.168.24.61: icmp_seq=2 ttl=64 time=0.312 ms

--- 192.168.24.61 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.312/0.957/1.603/0.646 ms
[root@browbeatvm ~]$ # Ping Keystone Public API IP Address
[root@browbeatvm ~]# ping -c 2 172.21.0.10
PING 172.21.0.10 (172.21.0.10) 56(84) bytes of data.
64 bytes from 172.21.0.10: icmp_seq=1 ttl=64 time=0.947 ms
64 bytes from 172.21.0.10: icmp_seq=2 ttl=64 time=0.304 ms

--- 172.21.0.10 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.304/0.625/0.947/0.322 ms
```

3. Create user for Browbeat and generate SSH key

```
[root@browbeatvm ~]# useradd browbeat1
[root@browbeatvm ~]# passwd browbeat1
Changing password for user browbeat1.
```

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```
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[root@browbeatvm ~]# echo "browbeat1 ALL=(root) NOPASSWD:ALL" | tee -a /etc/sudoers.d/
↪browbeat1; chmod 0440 /etc/sudoers.d/browbeat1
browbeat1 ALL=(root) NOPASSWD:ALL
[root@browbeatvm ~]# su - browbeat1
[browbeat1@browbeatvm ~]$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/browbeat1/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/browbeat1/.ssh/id_rsa.
Your public key has been saved in /home/browbeat1/.ssh/id_rsa.pub.
The key fingerprint is:
c2:b2:f0:cd:ef:d2:2b:a8:9a:5a:bb:ca:ce:c1:8c:3b browbeat1@browbeatvm
The key's randomart image is:
+--[ RSA 2048]----+
|                 |
|                 |
|                 |
|     .           |
|  . . o S        |
|+  o = .         |
|.+. o.o.         |
|E+... o..        |
|OB+o   ++.       |
+-----------------+
```

4. Enable passwordless SSH into localhost and Undercloud then copy overcloudrc over to Browbeat VM

```
[browbeat1@browbeatvm ansible]$ ssh-copy-id browbeat1@localhost
/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any␣
↪that are already installed
/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it␣
↪is to install the new keys
browbeat1@localhost's password:

Number of key(s) added: 1

Now try logging into the machine, with:   "ssh 'browbeat1@localhost'"
and check to make sure that only the key(s) you wanted were added.

[browbeat1@browbeatvm ~]$ ssh-copy-id stack@undercloud-1
The authenticity of host 'undercloud-1 (undercloud-1)' can't be established.
ECDSA key fingerprint is fa:3a:02:e8:8e:92:4d:a7:9c:90:68:6a:c2:eb:fe:e1.
Are you sure you want to continue connecting (yes/no)? yes
/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any␣
↪that are already installed
/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it␣
↪is to install the new keys
stack@undercloud-1's password:

Number of key(s) added: 1

Now try logging into the machine, with:   "ssh 'stack@undercloud-1'"
and check to make sure that only the key(s) you wanted were added.
```

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```
[browbeat1@browbeatvm ~]$ scp stack@undercloud-1:/home/stack/overcloudrc .
overcloudrc                                   100%  553     0.5KB/s   00:00
```

Note: In SSL environments, you must copy the certificate over and check that the "OS_CA_CERT" variable is set correctly to the copied certificate location

5. Install RPM requirements

```
[browbeat1@browbeatvm ~]$ sudo yum install -y epel-release
[browbeat1@browbeatvm ~]$ sudo yum install -y ansible git
```

6. Clone Browbeat

```
[browbeatuser1@browbeat-vm ~]$ git clone https://github.com/openstack/browbeat.git
Cloning into 'browbeat'...
remote: Counting objects: 7425, done.
remote: Compressing objects: 100% (15/15), done.
remote: Total 7425 (delta 14), reused 12 (delta 12), pack-reused 7398
Receiving objects: 100% (7425/7425), 5.23 MiB | 0 bytes/s, done.
Resolving deltas: 100% (4280/4280), done.
```

7. Generate hosts, ssh-config, and retrieve heat-admin-id_rsa.

```
[browbeat1@browbeatvm ~]$ cd browbeat/ansible/
[browbeat1@browbeatvm ansible]$ ./generate_tripleo_hostfile.sh -t undercloud-1 --
↪localhost
...
[browbeat1@browbeatvm ansible]$ ls ssh-config hosts heat-admin-id_rsa
heat-admin-id_rsa  hosts  ssh-config
```

Note use of "–localhost" to indicate the desire to install browbeat on the localhost rather than the undercloud.

8. Edit installation variables

```
[browbeat1@browbeatvm ansible]$ vi install/group_vars/all.yml
```

In this case, adjust browbeat_user, iptables_file and dns_server. Each environment is different and thus your configuration options will vary.

Note: If you require a proxy to get outside your network, you must configure http_proxy, https_proxy, no_proxy variables in the proxy_env dictionary in install/group_vars/all.yml

9. Run Browbeat install playbook

```
[browbeat1@browbeatvm ansible]$ ansible-playbook -i hosts install/browbeat.yml
```

10. Setup browbeat-config.yaml and test run Rally against cloud

```
[browbeat1@browbeatvm ansible]$ cd ..
[browbeat1@browbeatvm browbeat]$ vi browbeat-config.yaml
[browbeat1@browbeatvm browbeat]$ . .browbeat-venv/bin/activate
(browbeat-venv) [browbeat1@browbeatvm browbeat]$ python browbeat.py rally
```

11. Build Shaker image

```
[browbeatuser1@browbeat-vm ansible]$ ansible-playbook -i hosts install/shaker_build.
↪yml
```

Note: Your default network might not work for you depending on your underlay/overlay network setup. In such cases, user needs to create appropriate networks for instances to allow them to reach the internet. Some useful documentation can be found at: https://access.redhat.com/documentation/en/red-hat-openstack-platform/11/single/networking-guide/

2.4.3 (Optional) Install collectd

```
[browbeatuser1@browbeat-vm ansible]$ ansible-playbook -i hosts install/collectd-
↪openstack.yml
```

2.4.4 (Optional) Install Browbeat Grafana dashboards

Browbeat uses Grafyaml to upload dashboards to Grafana. Grafyaml is installed by browbeat at the location pointed to by the variable *browbeat_venv* in *ansible/install/group_vars/all.yml*. So, you need to first run the browbeat install playbook *ansible/install/browbeat.yml* before running the below playbook.

```
[browbeatuser1@browbeat-vm ansible]$ ansible-playbook -i hosts install/grafana-
↪dashboards.yml
```

2.4.5 Considerations for additional Browbeat Installs

If it is desired to run Browbeat against multiple clouds from the same machine. It is recommended to create a second user (Ex. browbeat2) and repeat above instructions. In order to expose the second user's Browbeat results via httpd, change the port (Variable browbeat_results_port) and thus each user's results will be available via http on different ports.

Note: Keep in mind that running multiple sets of control plane workloads from multiple Browbeat users at the same time will introduce variation into resulting performance data if the machine on which Browbeat is installed is resource constrained.

2.5 Using Keystone Public Endpoint

If your Browbeat installation can not reach the Keystone Admin API endpoint due to the networking, you can use Keystone V3 options. In your overcloudrc or rc file you can add the following environment variables.

```
export OS_IDENTITY_API_VERSION=3
export OS_INTERFACE=public
```

2.6 Uploading Images to the overcloud

Browbeat by default uploads CentOS and CirrOS images to the cloud for use in Rally and other workloads. It is recommended to upload RAW images if using ceph and hence the convert_to_raw variable must be set to true as shown below in ansible/install/group_vars/all.yml. The default is false.

```
images:
  centos7:
    name: centos7
    url: http://cloud.centos.org/centos/7/images/CentOS-7-x86_64-GenericCloud.qcow2
    type: qcow2
    convert_to_raw: true
```

CHAPTER 3

Additional Components Installation

3.1 Install Monitoring Host (Carbon/Graphite/Grafana)

A monitoring host exposes System and Application performance metrics to the Browbeat user via Grafana. It helps expose what may be causing your bottleneck when you encounter a performance issue.

3.1.1 Prerequisites

Hardware

- Baremetal or Virtual Machine
- SSD storage

Operating System

- RHEL 7
- CentOS 7

Repos

- Red Hat Enterprise Linux 7Server - x86_64 - Server
- Red Hat Enterprise Linux 7Server - x86_64 - Server Optional

RPM

- epel-release
- ansible
- git

3.1.2 Installation

1. Deploy machine (RHEL7 is used in this example)
2. Install RPMS

```
[root@dhcp23-93 ~]# yum install -y https://download.fedoraproject.org/pub/epel/epel-
↪release-latest-7.noarch.rpm
...
[root@dhcp23-93 ~]# yum install -y ansible git
```

3. Clone Browbeat

```
[root@dhcp23-93 ~]# git clone https://github.com/openstack/browbeat.git
Cloning into 'browbeat'...
remote: Counting objects: 7533, done.
remote: Compressing objects: 100% (38/38), done.
remote: Total 7533 (delta 30), reused 36 (delta 23), pack-reused 7469
Receiving objects: 100% (7533/7533), 5.26 MiB | 5.79 MiB/s, done.
Resolving deltas: 100% (4330/4330), done.
```

4. Add a hosts file into ansible directory

```
[root@dhcp23-93 ~]# cd browbeat/ansible/
[root@dhcp23-93 ansible]# vi hosts
```

Content of hosts file should be following

```
[graphite]
localhost

[grafana]
localhost
```

5. Setup SSH config, SSH key and exchange for Ansible

```
[root@dhcp23-93 ansible]# touch ssh-config
[root@dhcp23-93 ansible]# ssh-keygen
Generating public/private rsa key pair.
...
[root@dhcp23-93 ansible]# ssh-copy-id root@localhost
...
```

6. Edit install variables

```
[root@dhcp23-93 ansible]# vi install/group_vars/all.yml
```

Depending on the environment you may need to edit more than just the following variables - graphite_host and grafana_host

---

Note: If you require a proxy to get outside your network, you must configure http_proxy, https_proxy, no_proxy variables in the proxy_env dictionary in install/group_vars/all.yml

---

7. Install Carbon and Graphite via Ansible playbook

```
[root@dhcp23-93 ansible]# ansible-playbook -i hosts install/graphite.yml
...
```

8. Install Grafana via Ansible playbook

```
[root@dhcp23-93 ansible]# ansible-playbook -i hosts install/grafana.yml
...
```

9. Install Grafana dashboards via Ansible playbook

```
[root@dhcp23-93 ansible]# ansible-playbook -i hosts install/grafana-dashboards.yml -e
↪'cloud_dashboards=false'
...
```

10. (Optional) Monitor the Monitor Host

```
[root@dhcp23-93 ansible]# ansible-playbook -i hosts install/collectd-generic.yml --
↪tags graphite
...
```

Now navigate to http://monitoring-host-address:3000 to verify Grafana is installed, the Graphite data source exists and custom dashboards are uploaded.

You can now point other clouds at this host in order to view System and Application performance metrics. Depending on the number of clouds and machines pointed at your monitoring server, you may need to add more disk IO capacity, disk storage or carbon-cache+carbon-relay processes depending entirely on the number of metrics and your environments capacity. There is a Graphite dashboard included and it is recommended to install collectd on your monitoring host such that you can see if you hit resource issues with your monitoring host.

CHAPTER 4

Usage

4.1 Run Browbeat performance tests from Undercloud

For Running the workloads from Undercloud

```
$ ssh undercloud-root
[root@undercloud ~]# su - stack
[stack@undercloud ~]$ cd browbeat/
[stack@undercloud browbeat]$ . .browbeat-venv/bin/activate
(.browbeat-venv)[stack@undercloud browbeat]$ vi browbeat-config.yaml # Edit browbeat-
↪config.yaml to control how many stress tests are run.
(.browbeat-venv)[stack@undercloud browbeat]$ ./browbeat.py <workload> #rally, shaker␣
↪or "all"
```

4.2 Running Shaker

Running Shaker requires the shaker image to be built, which in turn requires instances to be able to access the internet. The playbooks for this installation have been described in the installation documentation but for the sake of convenience they are being mentioned here as well.

```
$ ansible-playbook -i hosts.yml install/shaker_build.yml
```

Note: The playbook to setup networking is provided as an example only and might not work for you based on your underlay/overlay network setup. In such cases, the exercise of setting up networking for instances to be able to access the internet is left to the user.

Once the shaker image is built, you can run Shaker via Browbeat by filling in a few configuration options in the configuration file. The meaning of each option is summarized below:

shaker:

enabled Boolean `true` or `false`, enable shaker or not

server IP address of the shaker-server for agent to talk to (undercloud IP by default)

port Port to connect to the shaker-server (undercloud port 5555 by default)

flavor OpenStack instance flavor you want to use

join_timeout Timeout in seconds for agents to join

sleep_before Time in seconds to sleep before executing a scenario

sleep_after Time in seconds to sleep after executing a scenario

shaker_region OpenStack region you want to use

external_host IP of a server for external tests (should have `browbeat/util/shaker-external.sh` executed on it previously and have iptables/firewalld/selinux allowing connections on the ports used by network testing tools netperf and iperf)

scenarios: List of scenarios you want to run

- name Name for the scenario. It is used to create directories/files accordingly

enabled Boolean `true` or `false` depending on whether or not you want to execute the scenario

density Number of instances

compute Number of compute nodes across which to spawn instances

placement `single_room` would mean one instance per compute node and `double_room` would give you two instances per compute node

progression `null` means all agents are involved, `linear` means execution starts with one agent and increases linearly, `quadratic` would result in quadratic growth in number of agents participating in the test concurrently

time Time in seconds you want each test in the scenario file to run

file The base shaker scenario file to use to override options (this would depend on whether you want to run L2, L3 E-W or L3 N-S tests and also on the class of tool you want to use such as flent or iperf3)

To analyze results sent to Elasticsearch (you must have Elasticsearch enabled and the IP of the Elasticsearch host provided in the browbeat configuration file), you can use the following playbook to setup some prebuilt dashboards for you:

```
$ ansible-playbook -i hosts.yml install/kibana-visuals.yml
```

Alternatively you can create your own visualizations of specific shaker runs using some simple searches such as:

```
shaker_uuid: 97092334-34e8-446c-87d6-6a0f361b9aa8 AND record.concurrency: 1 AND␣
↪result.result_type: bandwidth
shaker_uuid: c918a263-3b0b-409b-8cf8-22dfaeeaf33e AND record.concurrency:1 AND record.
↪test:Bi-Directional
```

4.3 Correlating test run with logs

If filebeat is enabled in the browbeat configuration file and filebeat was previously installed by running:

```
$ ansible-playbook -i hosts.yml common_logging/install_logging.yml
```

as explained in the installation documentation, then

By enabling filebeat logging within the browbeat configuration file, a playbook *ansible/common_logging/browbeat_logging.yml* is run which appends browbeat_uuid to log messages and starts filebeat pre-browbeat workload run so that log messages have browbeat uuid appended and clears the uuid from the configuration file and stops filebeat from sending more logs post-browbeat workload run

4.4 Interpreting Browbeat Results

By default results for each test will be placed in a timestamped folder *results/* inside your Browbeat folder. Each run folder will contain output files from the various workloads and benchmarks that ran during that Browbeat run, as well as a report card that summarizes the results of the tests.

Browbeat for the most part tries to restrict itself to running tests, it will only exit with a nonzero return code if a workload failed to run. If, for example, Rally where to run but not be able to boot any instances on your cloud Browbeat would return with RC 0 without any complaints, only by looking into the Rally results for that Browbeat run would you determine that your cloud had a problem that made benchmarking it impossible.

Likewise if Rally manages to run at a snails pace, Browbeat will still exit without complaint. Be aware of this when running Browbeat and take the time to either view the contents of the results folder after a run. Or setup Elasticsearch and Kibana to view them more easily.

4.5 Working with Multiple Clouds

If you are running playbooks from your local machine you can run against more than one cloud at the same time. To do this, you should create a directory per-cloud and clone Browbeat into that specific directory:

```
[browbeat@laptop ~]$ mkdir cloud01; cd cloud01
[browbeat@laptop cloud01]$ git clone git@github.com:openstack/browbeat.git
...
[browbeat@laptop cloud01]$ cd browbeat/ansible
[browbeat@laptop ansible]$ ./generate_tripleo_hostfile.sh -t <cloud01-ip-address>
[browbeat@laptop ansible]$ ansible-playbook -i hosts (Your playbook you wish to run...
↪)
[browbeat@laptop ansible]$ ssh -F ssh-config overcloud-controller-0  # Takes you to␣
↪first controller
```

Repeat the above steps for as many clouds as you have to run playbooks against your clouds.

4.6 Compare software-metadata from two different runs

Browbeat's metadata is great to help build visuals in Kibana by querying on specific metadata fields, but sometimes we need to see what the difference between two builds might be. Kibana doesn't have a good way to show this, so we added an option to Browbeat CLI to query ElasticSearch.

To use :

```
$ python browbeat.py --compare software-metadata --uuid "browbeat-uuid-1" "browbeat-
↪uuid-2"
```

Real world use-case, we had two builds in our CI that used the exact same DLRN hash, however the later build had a 10x performance hit for two Neutron operations, router-create and add-interface-to-router. Given we had exactly the

same DLRN hash, the only difference could be how things were configured. Using this new code, we could quickly identify the difference – TripleO enabled l3_ha.

Below is an example output of comparing metadata:

```
+-----------------------------------------------------------------------------------------------
↪-----------------------------------------------+
Host                  | Service              | Option                | Key                ␣
↪     | Old Value             | New Value
+-----------------------------------------------------------------------------------------------
↪-----------------------------------------------+
overcloud-controller-2 | nova                 | conductor             | workers            ␣
↪       | 0                     | 12
overcloud-controller-2 | nova                 | DEFAULT               | metadata_
↪workers     | 0                     | 12
overcloud-controller-2 | nova                 | DEFAULT               | my_ip              ␣
↪       | 172.16.0.23           | 172.16.0.16
overcloud-controller-2 | nova                 | DEFAULT               | enabled_apis       ␣
↪       | osapi_compute,metadata | metadata
overcloud-controller-2 | nova                 | DEFAULT               | osapi_compute_
↪workers | 0                     | 12
overcloud-controller-2 | nova                 | neutron               | region_name        ␣
↪       | RegionOne             | regionOne
overcloud-controller-2 | neutron-plugin       | ovs                   | local_ip           ␣
↪       | 172.17.0.11           | 172.17.0.16
overcloud-controller-2 | neutron-plugin       | securitygroup         | firewall_
↪driver      | openvswitch           | iptables_hybrid
overcloud-controller-2 | heat                 | DEFAULT               | num_engine_
↪workers   | 0                     | 16
overcloud-controller-2 | keystone             | admin_workers         | processes          ␣
↪       | 32                    |
overcloud-controller-2 | keystone             | admin_workers         | threads            ␣
↪       | 1                     |
overcloud-controller-2 | keystone             | eventlet_server       | admin_workers      ␣
↪       | 8                     | 12
overcloud-controller-2 | keystone             | eventlet_server       | public_workers     ␣
↪       | 8                     | 12
overcloud-controller-2 | keystone             | oslo_messaging_notifications | driver     ␣
↪              | messaging             | messagingv2
overcloud-controller-2 | keystone             | main_workers          | processes          ␣
↪       | 32                    |
overcloud-controller-2 | keystone             | main_workers          | threads            ␣
↪       | 1                     |
overcloud-controller-2 | keystone             | token                 | provider           ␣
↪       | uuid                  | fernet
overcloud-controller-2 | rabbitmq             | DEFAULT               | file               ␣
↪       | 65436                 |
overcloud-controller-2 | mysql                | DEFAULT               | max                ␣
↪       | 4096                  |
overcloud-controller-2 | cinder               | DEFAULT               | exec_dirs          ␣
↪       | /sbin,/usr/sbin,/bin,/usr/bin | /sbin,/usr/sbin,/bin,/usr/bin,/usr/local/
↪bin,/usr/local/sbin,/usr/lpp/mmfs/bin
overcloud-controller-2 | cinder               | DEFAULT               | osapi_volume_
↪workers | 32                    | 12
overcloud-controller-2 | glance               | DEFAULT               | bind_port          ␣
↪       | 9191                  | 9292
overcloud-controller-2 | glance               | DEFAULT               | workers            ␣
↪       | 32                    | 12
```

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```
overcloud-controller-2 | glance                | DEFAULT                | log_file
↪       | /var/log/glance/registry.log | /var/log/glance/cache.log
overcloud-controller-2 | glance                | ref1                   | auth_version
↪       | 2                      | 3
overcloud-controller-2 | glance                | glance_store           | stores
↪       | glance.store.http.Store,glance.store.swift.Store | http,swift
overcloud-controller-2 | glance                | glance_store           | os_region_name
↪       | RegionOne              | regionOne
overcloud-controller-2 | gnocchi               | metricd                | workers
↪       | 8                      | 12
overcloud-controller-2 | gnocchi               | storage                | swift_auth_
↪version    | 2                        | 3
overcloud-controller-2 | neutron               | DEFAULT                | global_physnet_
↪mtu    | 1496                   | 1500
overcloud-controller-2 | neutron               | DEFAULT                | rpc_workers
↪       | 32                     | 12
overcloud-controller-2 | neutron               | DEFAULT                | api_workers
↪       | 32                     | 12
overcloud-controller-1 | nova                  | conductor              | workers
↪       | 0                      | 12
overcloud-controller-1 | nova                  | DEFAULT                | metadata_
↪workers     | 0                      | 12
overcloud-controller-1 | nova                  | DEFAULT                | my_ip
↪       | 172.16.0.11            | 172.16.0.23
overcloud-controller-1 | nova                  | DEFAULT                | enabled_apis
↪       | osapi_compute,metadata | metadata
overcloud-controller-1 | nova                  | DEFAULT                | osapi_compute_
↪workers | 0                        | 12
overcloud-controller-1 | nova                  | neutron                | region_name
↪       | RegionOne              | regionOne
overcloud-controller-1 | neutron-plugin        | ovs                    | local_ip
↪       | 172.17.0.15            | 172.17.0.11
overcloud-controller-1 | neutron-plugin        | securitygroup          | firewall_
↪driver      | openvswitch            | iptables_hybrid
overcloud-controller-1 | heat                  | DEFAULT                | num_engine_
↪workers    | 0                      | 16
overcloud-controller-1 | keystone              | admin_workers          | processes
↪       | 32                     |
overcloud-controller-1 | keystone              | admin_workers          | threads
↪       | 1                      |
overcloud-controller-1 | keystone              | eventlet_server        | admin_workers
↪       | 8                      | 12
overcloud-controller-1 | keystone              | eventlet_server        | public_workers
↪       | 8                      | 12
overcloud-controller-1 | keystone              | oslo_messaging_notifications | driver
↪              | messaging              | messagingv2
overcloud-controller-1 | keystone              | main_workers           | processes
↪       | 32                     |
overcloud-controller-1 | keystone              | main_workers           | threads
↪       | 1                      |
overcloud-controller-1 | keystone              | token                  | provider
↪       | uuid                   | fernet
overcloud-controller-1 | rabbitmq              | DEFAULT                | file
↪       | 65436                  |
overcloud-controller-1 | mysql                 | DEFAULT                | max
↪       | 4096                   |
overcloud-controller-1 | cinder                | DEFAULT                | exec_dirs
↪       | /sbin,/usr/sbin,/bin,/usr/bin | /sbin,/usr/sbin,/bin,/usr/bin,/usr/local/sb
↪bin,/usr/local/sbin,/usr/lpp/mmfs/bin
```

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```
overcloud-controller-1 | cinder                | DEFAULT                | osapi_volume_
↪workers | 32                    | 12
overcloud-controller-1 | glance                | DEFAULT                | bind_port
↪       | 9191                  | 9292
overcloud-controller-1 | glance                | DEFAULT                | workers
↪       | 32                    | 12
overcloud-controller-1 | glance                | DEFAULT                | log_file
↪       | /var/log/glance/registry.log | /var/log/glance/cache.log
overcloud-controller-1 | glance                | ref1                   | auth_version
↪       | 2                     | 3
overcloud-controller-1 | glance                | glance_store           | stores
↪       | glance.store.http.Store,glance.store.swift.Store | http,swift
overcloud-controller-1 | glance                | glance_store           | os_region_name
↪       | RegionOne             | regionOne
overcloud-controller-1 | gnocchi               | metricd                | workers
↪       | 8                     | 12
overcloud-controller-1 | gnocchi               | storage                | swift_auth_
↪version    | 2                     | 3
overcloud-controller-1 | neutron               | DEFAULT                | global_physnet_
↪mtu    | 1496                  | 1500
overcloud-controller-1 | neutron               | DEFAULT                | rpc_workers
↪       | 32                    | 12
overcloud-controller-1 | neutron               | DEFAULT                | api_workers
↪       | 32                    | 12
overcloud-controller-0 | nova                  | conductor              | workers
↪       | 0                     | 12
overcloud-controller-0 | nova                  | DEFAULT                | metadata_
↪workers     | 0                     | 12
overcloud-controller-0 | nova                  | DEFAULT                | my_ip
↪       | 172.16.0.15           | 172.16.0.10
overcloud-controller-0 | nova                  | DEFAULT                | enabled_apis
↪       | osapi_compute,metadata | metadata
overcloud-controller-0 | nova                  | DEFAULT                | osapi_compute_
↪workers | 0                     | 12
overcloud-controller-0 | nova                  | neutron                | region_name
↪       | RegionOne             | regionOne
overcloud-controller-0 | neutron-plugin        | ovs                    | local_ip
↪       | 172.17.0.10           | 172.17.0.18
overcloud-controller-0 | neutron-plugin        | securitygroup          | firewall_
↪driver      | openvswitch           | iptables_hybrid
overcloud-controller-0 | heat                  | DEFAULT                | num_engine_
↪workers   | 0                     | 16
overcloud-controller-0 | keystone              | admin_workers          | processes
↪       | 32                    |
overcloud-controller-0 | keystone              | admin_workers          | threads
↪       | 1                     |
overcloud-controller-0 | keystone              | eventlet_server        | admin_workers
↪       | 8                     | 12
overcloud-controller-0 | keystone              | eventlet_server        | public_workers
↪       | 8                     | 12
overcloud-controller-0 | keystone              | oslo_messaging_notifications | driver
↪              | messaging             | messagingv2
overcloud-controller-0 | keystone              | main_workers           | processes
↪       | 32                    |
overcloud-controller-0 | keystone              | main_workers           | threads
↪       | 1                     |
overcloud-controller-0 | keystone              | token                  | provider
↪       | uuid                  | fernet
```

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```
overcloud-controller-0 | rabbitmq              | DEFAULT               | file
↪       | 65436                 |
overcloud-controller-0 | mysql                 | DEFAULT               | max
↪       | 4096                  |
overcloud-controller-0 | cinder                | DEFAULT               | exec_dirs
↪       | /sbin,/usr/sbin,/bin,/usr/bin | /sbin,/usr/sbin,/bin,/usr/bin,/usr/local/
↪bin,/usr/local/sbin,/usr/lpp/mmfs/bin
overcloud-controller-0 | cinder                | DEFAULT               | osapi_volume_
↪workers | 32                    | 12
overcloud-controller-0 | glance                | DEFAULT               | bind_port
↪       | 9191                  | 9292
overcloud-controller-0 | glance                | DEFAULT               | workers
↪       | 32                    | 12
overcloud-controller-0 | glance                | DEFAULT               | log_file
↪       | /var/log/glance/registry.log | /var/log/glance/cache.log
overcloud-controller-0 | glance                | ref1                  | auth_version
↪       | 2                     | 3
overcloud-controller-0 | glance                | glance_store          | stores
↪       | glance.store.http.Store,glance.store.swift.Store | http,swift
overcloud-controller-0 | glance                | glance_store          | os_region_name
↪       | RegionOne             | regionOne
overcloud-controller-0 | gnocchi               | metricd               | workers
↪       | 8                     | 12
overcloud-controller-0 | gnocchi               | storage               | swift_auth_
↪version    | 2                     | 3
overcloud-controller-0 | neutron               | DEFAULT               | global_physnet_
↪mtu    | 1496                  | 1500
overcloud-controller-0 | neutron               | DEFAULT               | rpc_workers
↪       | 32                    | 12
overcloud-controller-0 | neutron               | DEFAULT               | api_workers
↪       | 32                    | 12
+-------------------------------------------------------------------------------------------
↪-----------------------------------------------+
```

4.7 Compare performance of two different runs

Using the CLI the user can determine, run to run performance differences. This is a good tool for spot checking performance of an OpenStack release.

You'll need to install extra dependencies for browbeat insights, which will provide additional modules needed for providing insights.

To install :

```
$ source browbeat/.browbeat-venv/bin/activate
$ pip install .[insights]
```

To use :

```
$ python browbeat.py -q -u browbeat_uuid1 browbeat_uuid2
```

Example output from running this CLI command

```
python browbeat.py -q -u 6b50b6f7-acae-445a-ac53-78200b5ba58c 938dc451-d881-4f28-a6cb-
↪ad502b177f3b
2018-07-13 14:38:49,516 - browbeat.config -    INFO - Config bs.yaml validated
2018-07-13 14:38:49,646 - browbeat.elastic -    INFO - Making query against browbeat-
↪rally-*
2018-07-13 14:38:54,292 - browbeat.elastic -    INFO - Searching through ES for uuid:␣
↪6b50b6f7-acae-445a-ac53-78200b5ba58c
2018-07-13 14:38:54,293 - browbeat.elastic -    INFO - Scrolling through Browbeat 336␣
↪documents...
2018-07-13 14:38:54,432 - browbeat.elastic -    INFO - Making query against browbeat-
↪rally-*
2018-07-13 14:38:54,983 - browbeat.elastic -    INFO - Searching through ES for uuid:␣
↪938dc451-d881-4f28-a6cb-ad502b177f3b
2018-07-13 14:38:54,983 - browbeat.elastic -    INFO - Scrolling through Browbeat 22␣
↪documents...
+-------------------------------------------------------------------------------------
↪-----------------------------------------------------------------+
Scenario                          | Action                                          |␣
↪concurrency     | times           | 0b5ba58c   | 2b177f3b   | % Difference
+-------------------------------------------------------------------------------------
↪-----------------------------------------------------------------+
create-list-router                | neutron.create_router                           |
↪     500 |              32 |     19.940 |     15.656 |       -21.483
create-list-router                | neutron.list_routers                            |
↪     500 |              32 |      2.588 |      2.086 |       -19.410
create-list-router                | neutron.create_network                          |
↪     500 |              32 |      3.294 |      2.366 |       -28.177
create-list-router                | neutron.create_subnet                           |
↪     500 |              32 |      4.282 |      2.866 |       -33.075
create-list-router                | neutron.add_interface_router                    |
↪     500 |              32 |     12.741 |     10.324 |       -18.973
create-list-port                  | neutron.list_ports                              |
↪     500 |              32 |     52.627 |     43.448 |       -17.442
create-list-port                  | neutron.create_network                          |
↪     500 |              32 |      4.025 |      2.771 |       -31.165
create-list-port                  | neutron.create_port                             |
↪     500 |              32 |     19.458 |      5.412 |       -72.189
create-list-security-group        | neutron.create_security_group                   |
↪     500 |              32 |      3.244 |      2.708 |       -16.514
create-list-security-group        | neutron.list_security_groups                    |
↪     500 |              32 |      6.837 |      5.720 |       -16.339
create-list-subnet                | neutron.create_subnet                           |
↪     500 |              32 |     11.366 |      4.809 |       -57.689
create-list-subnet                | neutron.create_network                          |
↪     500 |              32 |      6.432 |      4.286 |       -33.368
create-list-subnet                | neutron.list_subnets                            |
↪     500 |              32 |     10.627 |      7.522 |       -29.221
create-list-network               | neutron.list_networks                           |
↪     500 |              32 |     15.154 |     13.073 |       -13.736
create-list-network               | neutron.create_network                          |
↪     500 |              32 |     10.200 |      6.595 |       -35.347
+-------------------------------------------------------------------------------------
↪-----------------------------------------------------------------+
+-------------------------------------------------------------------------------------
↪----------------------------+
UUID                                  | Version              | Build                 ␣
↪ | Number of runs
```

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```
+--------------------------------------------------------------------------------------
↪-----------------------------+
938dc451-d881-4f28-a6cb-ad502b177f3b     | queens               | 2018-03-20.2       ␣
↪ |                     1
6b50b6f7-acae-445a-ac53-78200b5ba58c     | ocata                | 2017-XX-XX.X       ␣
↪ |                     3
+--------------------------------------------------------------------------------------
↪-----------------------------+
```

We can see from the output above that we also provide the user with some metadata regarding the two runs, like the amount version and the number of runs each UUID contained.

4.8 Cleanup Rally resources

Rally cleans up resources automatically at the end of testing. However, we disable cleanup in rally sometimes during testing and later try to manually delete these resources. Cleaning up the resources at scale is very time consuming, so we came up with a python process to speed up this activity.

To cleanup :

```
$ source browbeat/.rally-venv/bin/activate
$ source ~/overcloudrc
$ python browbeat/rally_cleanup.py
```

4.9 Cleanup sqlalchemy collectd configuration

Browbeat adds configuration for sqlalchemy collectd on the configuration files of many Openstack API containers on controller hosts. This causes issues in the next overcloud deployment. There is a playbook to clean up sqlalchemy collectd configuration installed by Browbeat from Openstack API containers.

To cleanup :

:: $ cd ansible $ ansible-playbook -i hosts.yml install/cleanup_sqlalchemy_collectd.yml

4.10 Generate CSV file/Google Sheets from Rally json file

Rally generates a json file with data about atomic actions duration from each iteration. These atomic actions often occur multiple times within one iteration. Browbeat has a script which allows a user to generate a CSV file and also has an option to generate a Google Sheet about individual resource duration through the Rally json file. To use the script to upload to Google Sheets, a Google Drive service account is required. The script sends an email to the email id of the user with the Google sheet if the –uploadgooglesheet option is enabled.

To generate only a CSV file and not upload to Google Sheets :

```
$ source .browbeat-venv/bin/activate && cd utils
$ python rally_google_sheet_gen.py -c -f <path to directory to write csv file locally>
  -j <path to rally json file>
  -a <space separated list of atomic actions(Eg.: boot_server create_network)>
```

To only upload to Google Sheets and not generate CSV files :

:: $ source .browbeat-venv/bin/activate && cd utils $ python rally_google_sheet_gen.py

-j <path to rally json files> -a <space separated list of atomic actions(Eg.: boot_server create_network)> -g -s <path to google service account json credentials file> -e <email id of user> -n <name of google sheet to be created>

To only upload to Google Sheets along with SLA failures and not generate CSV files :

::

$ source .browbeat-venv/bin/activate && cd utils

$ python rally_google_sheet_gen.py -j <path to rally json files> -a <space separated list of atomic actions(Eg.: boot_server create_network)> -g -v <space separated list of max durations as per SLA criteria(Eg.: 10 20 120). The ordering must match the ordering of atomic actions> -s <path to google service account json credentials file> -e <email id of user> -n <name of google sheet to be created>

To generate a CSV file and upload to Google Sheets :

:: $ source .browbeat-venv/bin/activate && cd utils $ python rally_google_sheet_gen.py -c -f <path to directory to write csv file locally>

-j <path to rally json files> -a <space separated list of atomic actions(Eg.: boot_server create_network)> -g -s <path to google service account json credentials file> -e <email id of user> -n <name of google sheet to be created>

CHAPTER 5

Plugins

5.1 Rally

5.1.1 Scenario - dynamic-workloads

Dynamic workloads are workloads that aim to simulate a realistic Openstack customer environment, by introducing elements of randomness into the simulation. A list of the different workloads that are part of this Browbeat Rally Plugin is mentioned below.

VM:

- create_delete_servers: Create 'N' VMs(without floating IP), and delete 'M' randomly chosen VMs from this list of VMs.
- migrate_servers: Create 'N' VMs(with floating IP), and migrate 'M' randomly chosen VMs from this list of VMs across computes, before resizing them.
- swap_floating_ips_between_servers: Swap floating IPs between 2 servers. Ping until failure after dissociating floating IPs, before swapping them. Ping until success after swapping floating IPs between 2 servers.

Octavia:

- create_loadbalancers: Create 'N' loadbalancers with specified 'M' pools and 'K' clients per Loadbalancer.
- delete_loadbalancers: Deletes 'M' loadbalancers randomly from 'N' loadbalancers
- delete_members_random_lb: Deletes 'M' members from a random loadbalancer

Trunk(pod simulation):

- pod_fip_simulation: Simulate pods with floating ips using subports on trunks and VMs. Create 'N' trunks and VMs and 'M' subports per trunk/VM. Ping a random subport of each trunk/VM from a jumphost.
- add_subports_to_random_trunks: Add 'M' subports to 'N' randomly chosen trunks. This is to simulate pods being added to an existing VM.
- delete_subports_from_random_trunks: Delete 'M' subports from 'N' randomly chosen trunks. This is is to simulate pods being destroyed.

- swap_floating_ips_between_random_subports: Swap floating IPs between 2 randomly chosen subports from 2 trunks.

Provider network:

- provider_netcreate_nova_boot_ping: Creates a provider Network and Boots VM and ping
- provider_net_nova_boot_ping: Boots a VM and ping on random existing provider network
- provider_net_nova_delete: Delete all VM's and provider network

Shift on Stack:

shift_on_stack: Runs specified kube-burner workload through e2e-benchmarking. e2e-benchmarking is a [repository](https://github.com/cloud-bulldozer/e2e-benchmarking.git) that contains scripts to stress Openshift clusters. This workload uses e2e-benchmarking to test Openshift on Openstack.

5.1.2 Context - browbeat_delay

This context allows a setup and cleanup delay to be introduced into a scenario.

5.1.3 Context - browbeat_persist_network

This context creates network resources that persist upon completion of a rally run. It is used in conjunction with the nova_boot_persist_with_network and nova_boot_persist_with_network_volume plugin scenarios. You can also use *neutron purge* command to purge a project/tenant of neutron network resources.

5.1.4 Scenario - nova_boot_persist

This scenario creates instances without a network that persist upon completion of a rally run. This scenario is best used for excerising the Telemetry systems within an OpenStack Cloud. Alternatively, it can be used to put idle instances on a cloud for other workloads to compete for resources. The scenario is referenced in the Telemetry Browbeat configurations in order to build a "stepped" workload that can be used to analyze Telemetry performance and scalability.

5.1.5 Scenario - nova_boot_persist_with_volume

This scenario creates instances that have an attached volume and persist upon completion of a rally run. This scenario is best used for excerising the Telemetry systems within an OpenStack Cloud. It increases the Telemetry workload by creating more resources that the Telemetry services must collect and process metrics over. Alternatively, it can be used to put idle instances on a cloud for other workloads to compete for resources. The scenario is referenced in the Telemetry Browbeat configurations in order to build a "stepped" workload that can be used to analyze Telemetry scalability.

5.1.6 Scenario - nova_boot_persist_with_network

This scenario creates instances that are attached to a network and persist upon completion of a rally run. This scenario is best used for excerising the Telemetry systems within an OpenStack Cloud. It increases the Telemetry workload by creating more resources that the Telemetry services must collect and process metrics over. Alternatively, it can be used to put idle instances on a cloud for other workloads to compete for resources. The scenario is referenced in the Telemetry Browbeat configurations in order to build a "stepped" workload that can be used to analyze Telemetry scalability.

5.1.7 Scenario - nova_boot_persist_with_network_fip

This scenario creates instances with a nic and associates a floating ip that persist upon completion of a rally run. It is used as a workload with Telemetry by spawning many instances that have many metrics for the Telemetry subsystem to collect upon.

5.1.8 Scenario - nova_boot_persist_with_network_volume

This scenario create instances with a nic and a volume that persist upon completion of a rally run. It is used as a workload with Telemetry by spawning many instances that have many metrics for the Telemetry subsystem to collect upon.

5.1.9 Scenario - nova_boot_persist_with_network_volume_fip

This scenario creates instances with a nic, a volume and associates a floating ip that persist upon completion of a rally run. It is used as a workload with Telemetry by spawning many instances that have many metrics for the Telemetry subsystem to collect upon.

CHAPTER 6

Charts

To include any of the custom charts from Browbeat in a scenario, the following lines will have to be included in the python file of the program.

```
import sys
import os
sys.path.append(os.path.abspath(os.path.join(os.path.dirname(__file__), '../reports
↪')))
from generate_scenario_duration_charts import ScenarioDurationChartsGenerator  #␣
↪noqa: E402
```

The custom charts will appear in the "Scenario Data" section of the Rally HTML report.

6.1 Chart - add_per_iteration_complete_data

This plugin generates a stacked area graph for duration trend for each atomic action in an iteration. To include this chart in any scenario, add the following lines at the end of the run() function of the scenario in the python file.

```
self.duration_charts_generator = ScenarioDurationChartsGenerator()
self.duration_charts_generator.add_per_iteration_complete_data(self)
```

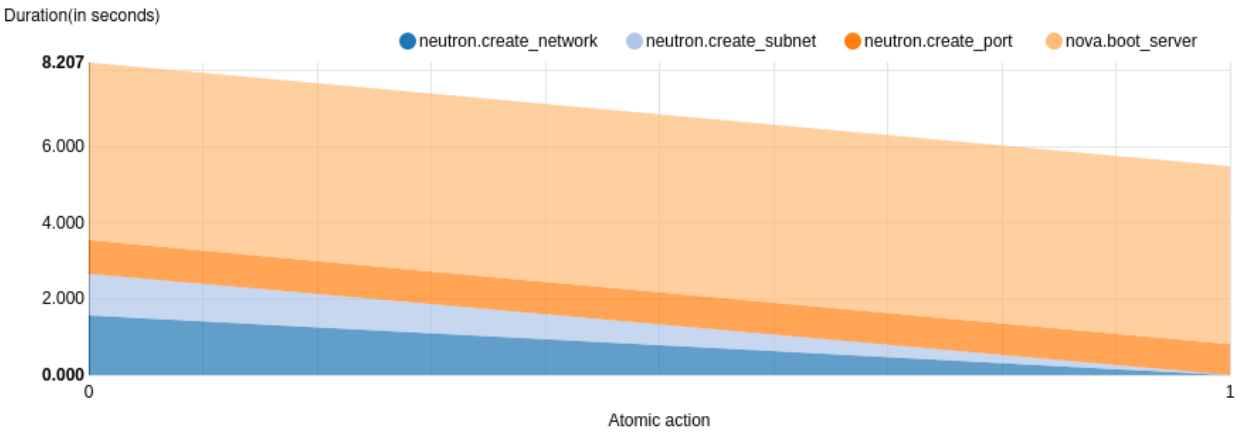
The graphs will appear under the "Per iteration" section of "Scenario Data" in the Rally HTML report. The resulting graphs will look like the images below.

Aggregated Per iteration

Iteration 0

Atomic actions duration data as stacked area

Iterations trend

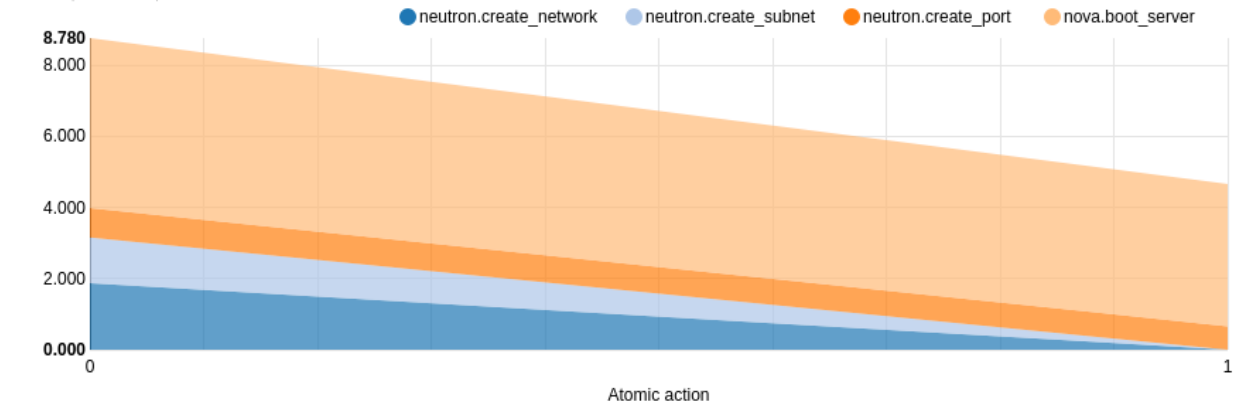


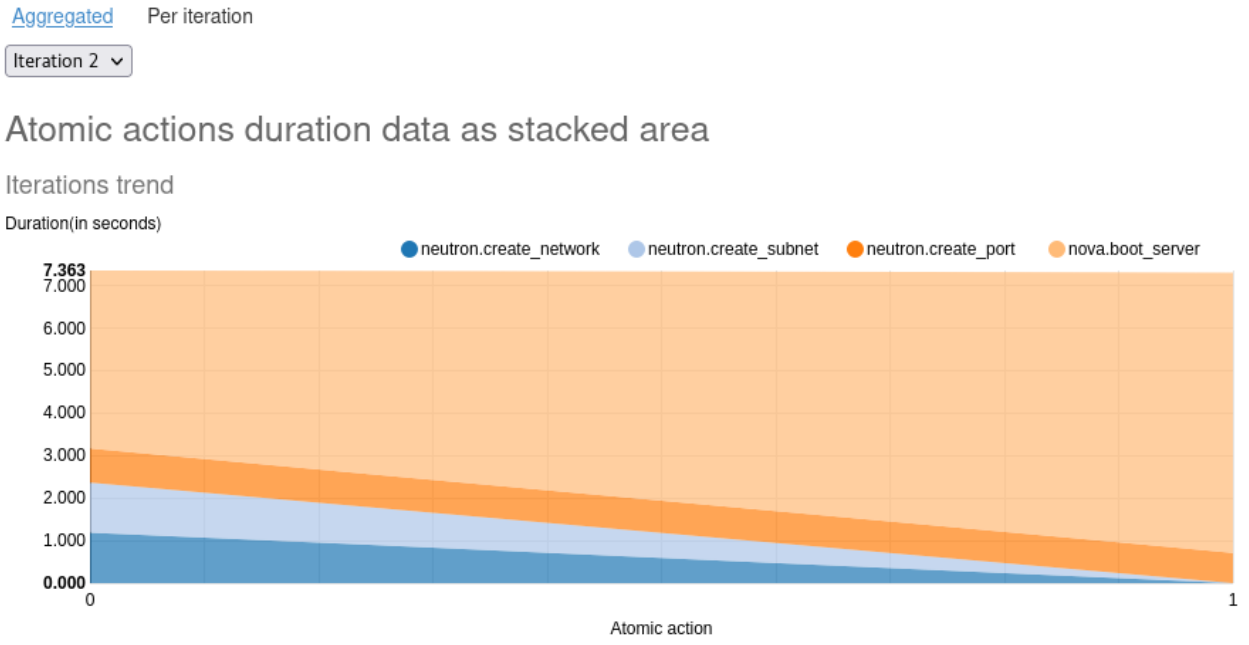
Aggregated Per iteration

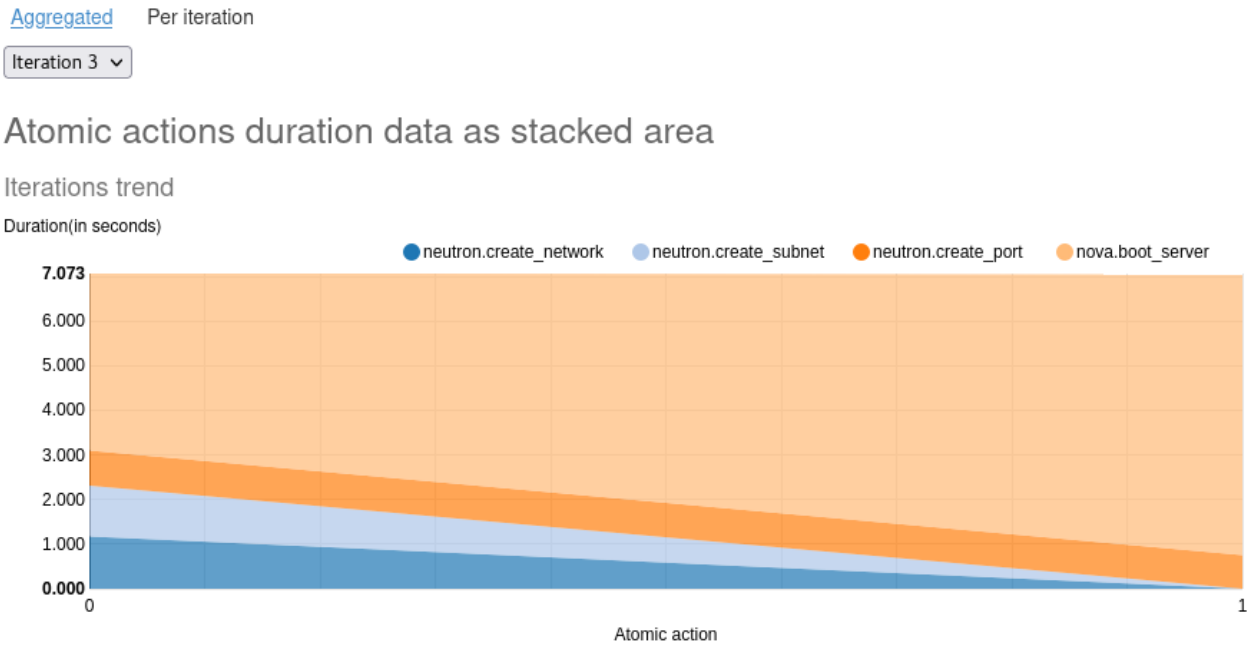
Iteration 1

Atomic actions duration data as stacked area

Iterations trend





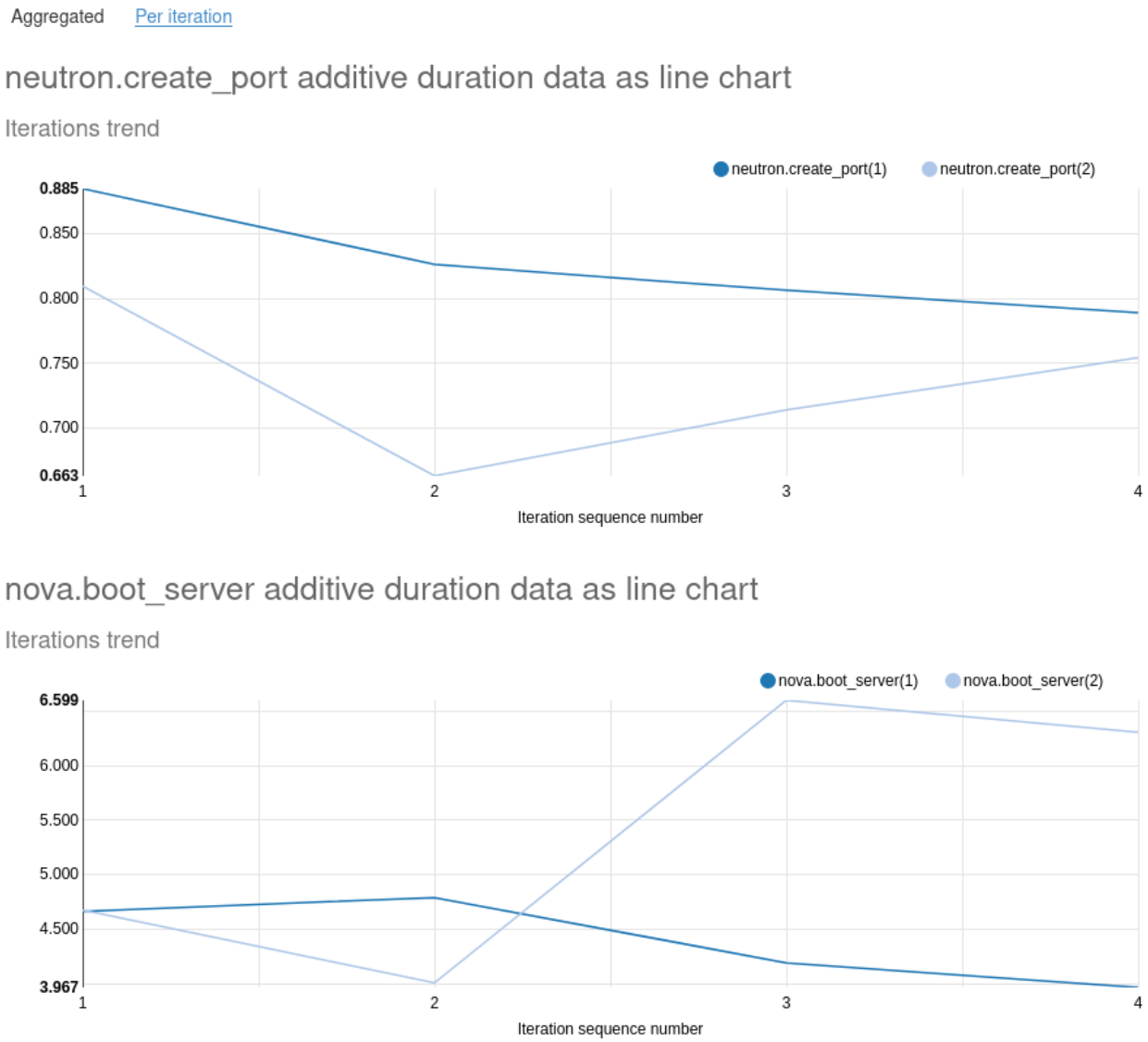


6.2 Chart - add_duplicate_atomic_actions_iteration_additive_data

This plugin generates line graphs for atomic actions that have been executed more than once in the same iteration. To include this chart in any scenario, add the following lines at the end of the run() function of the scenario in the python file.

```
self.duration_charts_generator = ScenarioDurationChartsGenerator()
self.duration_charts_generator.add_duplicate_atomic_actions_iteration_additive_
↪data(self)
```

The graphs will appear under the "Aggregated" section of "Scenario Data" in the Rally HTML report. The resulting graphs will look like the images below.

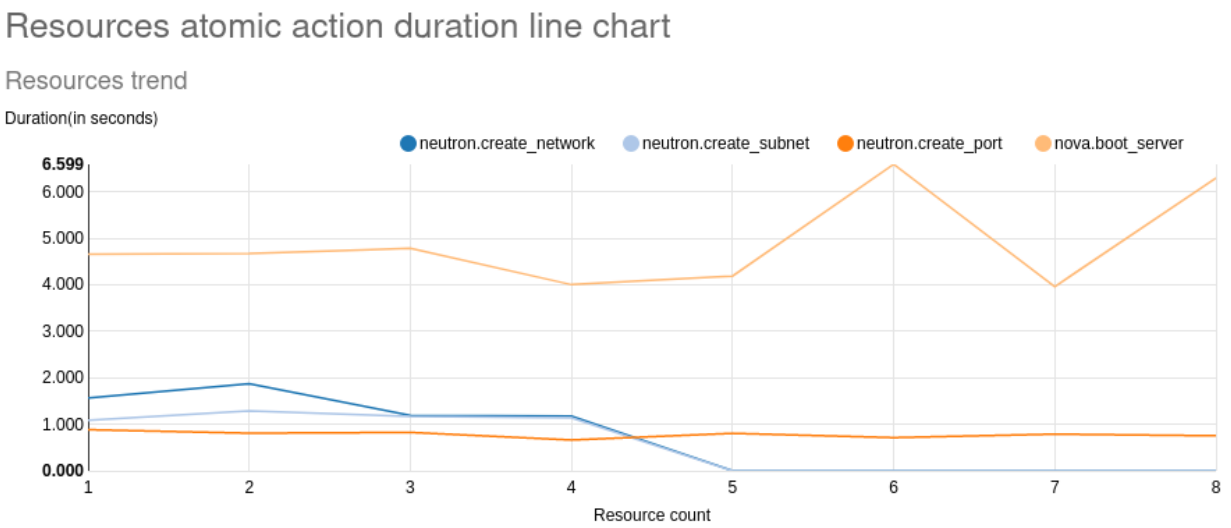


6.3 Chart - add_all_resources_additive_data

This plugin generates a line graph for duration data from each resource created by Rally. To include this chart in any scenario, add the following lines at the end of the run() function of the scenario in the python file.

```
self.duration_charts_generator = ScenarioDurationChartsGenerator()
self.duration_charts_generator.add_all_resources_additive_data(self)
```

The graphs will appear under the "Aggregated" section of "Scenario Data" in the Rally HTML report. The resulting graphs will look like the images below.


Resources atomic action duration line chart
Resources trend
Duration(in seconds)
neutron.create_network
neutron.create_subnet
neutron.create_port
nova.boot_server
6.599
6.000
5.000
4.000
3.000
2.000
1.000
0.000
1
2
3
4
5
6
7
8
Resource count

CHAPTER 7

Developing against Quickstart

This document helps you with creating a Tripleo Virtual Cloud on your local machine to assist with developing/testing Browbeat.

7.1 Why use Quickstart?

Tripleo-Quickstart enables us to have an entire tiny cloud to run Browbeat against. It gives you a virtual Undercloud, virtual Overcloud Controller and Computes and other virtual nodes as well. This allows you (with understood limitations) to run Browbeat, test commits, or develop actively with new code without requring a full set of hardware or to run code through CI.

7.2 Limitations

Since everything is virtualized on your local hardware, any performance results are subject to the limitations of your hardware as well as performance behaving with "noisy neighbors". This is only recommended for testing Browbeat and/or gaining familiarity with OpenStack Tripleo Clouds.

7.3 Hardware Requirements

Memory will most likely be your limitation:

- 16GiB Memory+Swap
  - Undercloud, 1 Controller
- 32GiB Memory is recommended
  - Undercloud, 1 Controller
  - Undercloud, 1 Controller, 1 Compute

- Undercloud, 3 Controllers

4 physical cpu cores is recommended with at least 50GB of free disk space ideally on an SSD.

7.4 Localhost Preparation

Ensure that sshd is running on your localhost

```
[akrzos@bithead ~]$ sudo systemctl enable sshd
[akrzos@bithead ~]$ sudo systemctl start sshd
```

Map 127.0.0.2 to your local host

```
[akrzos@bithead ~]$ sudo cat /etc/hosts
127.0.0.1   localhost localhost.localdomain localhost4 localhost4.localdomain4 127.0.
↪0.2
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
```

7.5 Create a Quickstart cloud

7.5.1 Download quickstart.sh

```
[akrzos@bithead ~]$ curl -O https://raw.githubusercontent.com/openstack/tripleo-
↪quickstart/master/quickstart.sh
```

7.5.2 Install dependencies

```
[akrzos@bithead ~]$ bash quickstart.sh --install-deps
```

7.5.3 Create Configuration and Nodes YAML Files

For this usage of Tripleo-quickstart, there are two configuration files to build a cloud, quickstart_config.yml and quickstart_nodes.yml configuration file. Quickstart_config.yml contains some basic options you may configure for your under/over clouds including ssl, cached image urls, enabling telemetry, and the networking setup. The nodes configuration file defines the amount of resources for your virtual overcloud including node count, Three examples are included here.

quickstart_config.yml

```
# Allow unsupported distros to deploy QuickStart (Ex. Fedora 24)
supported_distro_check: false

# Turn off Undercloud SSL
undercloud_generate_service_certificate: false

# Turn off Overcloud SSL
ssl_overcloud: false

# Turn off introspection
```

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```
step_introspect: false

# Version of OpenStack (Ex: newton, ocata, pike)
release: ocata

#overcloud_as_undercloud: false
#force_cached_images: true
#dlrn_hash: current-passed-ci

# Use cached images when possible
#undercloud_image_url: http://walkabout.foobar.com/ci-images/ocata/current-passed-ci/
↪undercloud.qcow2
#ipa_image_url: http://walkabout.foobar.com/ci-images/ocata/current-passed-ci/ironic-
↪python-agent.tar
#overcloud_image_url: http://walkabout.foobar.com/ci-images/ocata/current-passed-ci/
↪overcloud-full.tar

# Tell tripleo how we want things done.
extra_args: >-
  --ntp-server pool.ntp.org

# This config is extremely resource intensive, so we disable telemetry
# in order to reduce the overall memory footprint
# This is not required in newton
telemetry_args: >-
   {% if release != 'newton' %}
   -e {{ overcloud_templates_path }}/environments/disable-telemetry.yaml
   {% endif %}

network_isolation: true
network_isolation_type: 'single-nic-vlans'

# Network setting on the virthost
external_network_cidr: 192.168.23.0/24
networks:
  - name: overcloud
    bridge: brovc
    address: "{{ undercloud_network_cidr|nthhost(2) }}"
    netmask: "{{ undercloud_network_cidr|ipaddr('netmask') }}"

  - name: external
    bridge: brext
    forward_mode: nat
    address: "{{ external_network_cidr|nthhost(1) }}"
    netmask: "{{ external_network_cidr|ipaddr('netmask') }}"
    dhcp_range:
      - "{{ external_network_cidr|nthhost(10) }}"
      - "{{ external_network_cidr|nthhost(50) }}"
    nat_port_range:
      - 1024
      - 65535

# Below are the networking options you will most likely need to adjust for your local␣
↪environment
# some are dervived from other vars and do not need to be adjusted.
undercloud_external_network_cidr: 172.21.0.0/24
undercloud_networks:
```

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```
  external:
    address: "{{ undercloud_external_network_cidr|nthhost(1) }}"
    netmask: "{{ undercloud_external_network_cidr|ipaddr('netmask') }}"
    address6: "{{ undercloud_external_network_cidr6|nthhost(1) }}"
    device_type: ovs
    type: OVSIntPort
    ovs_bridge: br-ctlplane
    ovs_options: '"tag=10"'
    tag: 10

network_environment_args:
  ControlPlaneSubnetCidr: "{{ undercloud_network_cidr|ipaddr('prefix') }}"
  ControlPlaneDefaultRoute: "{{ undercloud_network_cidr|nthhost(1) }}"
  EC2MetadataIp: "{{ undercloud_network_cidr|nthhost(1) }}"

  ExternalNetCidr: 172.21.0.0/24
  ExternalAllocationPools: [{"start": "172.21.0.10", "end": "172.21.0.100"}]
  ExternalInterfaceDefaultRoute: 172.21.0.1
  NeutronExternalNetworkBridge: "''"

  InternalApiNetCidr: 172.16.0.0/24
  InternalApiAllocationPools: [{"start": "172.16.0.10", "end": "172.16.0.200"}]

  StorageNetCidr: 172.18.0.0/24
  StorageAllocationPools: [{"start": "172.18.0.10", "end": "172.18.0.200"}]

  StorageMgmtNetCidr: 172.19.0.0/24
  StorageMgmtAllocationPools: [{"start": "172.19.0.10", "end": "172.19.0.200"}]

  TenantNetCidr: 172.17.0.0/24
  TenantAllocationPools: [{"start": "172.17.0.10", "end": "172.17.0.250"}]
  DnsServers: [ '{{ external_network_cidr6|nthhost(1) }}' ]
```

quickstart_nodes.yml - 1 Controller

```
# Undercloud Virtual Hardware
undercloud_memory: 8192
undercloud_vcpu: 2

# Controller Virtual Hardware
control_memory: 6144
control_vcpu: 2

# Define a single controller node
overcloud_nodes:
  - name: control_0
    flavor: control
    virtualbmc_port: 6230

node_count: 1

deployed_server_overcloud_roles:
  - name: Controller
    hosts: "$(sed -n 1,1p /etc/nodepool/sub_nodes)"

topology: >-
  --compute-scale 0
```

quickstart_nodes.yml - 1 Controller, 1 Compute

```
# Undercloud Virtual Hardware
undercloud_memory: 8192
undercloud_vcpu: 2

# Controller Virtual Hardware
control_memory: 6144
control_vcpu: 2

# Compute Virtual Hardware
compute_memory: 4096
compute_vcpu: 1

overcloud_nodes:
  - name: control_0
    flavor: control
    virtualbmc_port: 6230
  - name: compute_0
    flavor: compute
    virtualbmc_port: 6231

node_count: 2

deployed_server_overcloud_roles:
  - name: Controller
    hosts: "$(sed -n 1,1p /etc/nodepool/sub_nodes)"

topology: >-
  --compute-scale 1
  --control-scale 1
```

quickstart_nodes.yml - 3 Controllers

```
# Undercloud Virtual Hardware
undercloud_memory: 8192
undercloud_vcpu: 2

# Controller Virtual Hardware
control_memory: 6144
control_vcpu: 1

# Define a single controller node
overcloud_nodes:
  - name: control_0
    flavor: control
    virtualbmc_port: 6230
  - name: control_1
    flavor: control
    virtualbmc_port: 6231
  - name: control_2
    flavor: control
    virtualbmc_port: 6232

node_count: 3

deployed_server_overcloud_roles:
  - name: Controller
```

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```
    hosts: "$(sed -n 1,1p /etc/nodepool/sub_nodes)"

topology: >-
  --compute-scale 0
  --control-scale 3
```

Run quickstart.sh playbooks

You can change version of OpenStack (Ex. newton, ocata, master) you need by editing the *release* yaml parameter in quickstart_config.yaml (above).

```
time bash quickstart.sh -v -c quickstart_config.yml -N quickstart_nodes.yml -I -t all␣
↪-p quickstart.yml -T all -X 127.0.0.2
```

```
time bash quickstart.sh -v -c quickstart_config.yml -N quickstart_nodes.yml -I -t all␣
↪-p quickstart-extras-undercloud.yml -T none 127.0.0.2
```

```
time bash quickstart.sh -v -c quickstart_config.yml -N quickstart_nodes.yml -I -t all␣
↪-p quickstart-extras-overcloud-prep.yml -T none 127.0.0.2
```

```
time bash quickstart.sh -v -c quickstart_config.yml -N quickstart_nodes.yml -I -t all␣
↪-p quickstart-extras-overcloud.yml -T none 127.0.0.2
```

If all 4 playbooks completed without errors, you should have a local tripleo quickstart cloud. In order to validate, I would recommend ssh-ing into the Undercloud and issuing various openstack cli commands against the overcloud to verify the health of your quickstart-deployment.

7.6 Connecting to your Undercloud/Overcloud from your local machine

Create a vlan10 for external network access

```
[root@bithead network-scripts]# cat ifcfg-brovc.10
DEVICE=brovc.10
ONBOOT=yes
HOTPLUG=no
NM_CONTROLLED=no
VLAN=yes
IPADDR=172.21.0.2
NETMASK=255.255.255.0
BOOTPROTO=none
MTU=1500
[root@bithead network-scripts]# ifup brovc.10
```

You can now access the overcloud's external/public api endpoints from your local machine and install Browbeat for benchmarking against it.

7.7 Setup Browbeat against your Quickstart Cloud

After you have your Quickstart cloud up and the networking connectivity working, you will want to run Browbeat against it so you can begin contributing. Simply run the script in the utils folder to install Browbeat for usage on the

new Tripleo Quickstart cloud.

```
[akrzos@bithead ~]$ git clone git@github.com:openstack/browbeat.git
Cloning into 'browbeat'...
Warning: Permanently added 'github.com,192.30.253.112' (RSA) to the list of known␣
↪hosts.
remote: Counting objects: 8567, done.
remote: Compressing objects: 100% (28/28), done.
remote: Total 8567 (delta 19), reused 18 (delta 15), pack-reused 8523
Receiving objects: 100% (8567/8567), 5.52 MiB | 3.44 MiB/s, done.
Resolving deltas: 100% (4963/4963), done.
Checking connectivity... done.
[akrzos@bithead ~]$ cd browbeat/
[akrzos@bithead browbeat]$ ./utils/oooq-browbeat-install.sh
Installing Browbeat on localhost
...(Truncated)
~/code/browbeat-refactor/browbeat
[akrzos@bithead browbeat]$ . .browbeat-venv/bin/activate
(.browbeat-venv) [akrzos@bithead browbeat]$ ./browbeat.py -s conf/quickstart.yml rally
2017-12-13 15:46:34,648 - browbeat.config -    INFO - Config conf/quickstart.yml␣
↪validated
2017-12-13 15:46:34,657 - browbeat.config -    INFO - Workload quickstart-shaker-l2␣
↪validated as shaker
2017-12-13 15:46:34,665 - browbeat.config -    INFO - Workload quickstart-rally␣
↪validated as rally
2017-12-13 15:46:34,665 - browbeat -    INFO - Browbeat test suite kicked off
2017-12-13 15:46:34,665 - browbeat -    INFO - Browbeat UUID: 8e869626-a596-4ec7-b0b1-
↪ac7f2bf915a7
2017-12-13 15:46:34,666 - browbeat -    INFO - Running workload(s): rally
2017-12-13 15:46:34,666 - browbeat -    INFO - shaker workload quickstart-shaker-l2␣
↪disabled via cli
2017-12-13 15:46:34,666 - browbeat -    INFO - rally workload quickstart-rally is␣
↪enabled
2017-12-13 15:46:34,666 - browbeat.rally -    INFO - Running Rally workload:␣
↪quickstart-rally
2017-12-13 15:46:34,666 - browbeat.rally -    INFO - Running Scenario: authentic-
↪keystone
2017-12-13 15:46:34,669 - browbeat.rally -    INFO - Running with scenario_args: {
↪'concurrency': 1, 'times': 1}
2017-12-13 15:47:08,665 - browbeat.rally -    INFO - Generating Rally HTML for task_
↪id : 399b90d9-5bc2-431c-b7c9-b7782fef2dde
2017-12-13 15:47:10,224 - browbeat.rally -    INFO - Running Scenario: create-list-
↪network
2017-12-13 15:47:10,226 - browbeat.rally -    INFO - Running with scenario_args: {
↪'concurrency': 1, 'times': 1}
2017-12-13 15:47:45,781 - browbeat.rally -    INFO - Generating Rally HTML for task_
↪id : 544b7cc4-b15c-4308-8f1b-158f06f1b002
2017-12-13 15:47:47,414 - browbeat.rally -    INFO - Running Scenario: boot-list-
↪cirros
2017-12-13 15:47:47,417 - browbeat.rally -    INFO - Running with scenario_args: {
↪'flavor_name': 'm1.xtiny', 'concurrency': 1, 'image_name': 'cirros', 'times': 1}
2017-12-13 15:53:42,181 - browbeat.rally -    INFO - Generating Rally HTML for task_
↪id : 52c348d4-edba-4a3e-bfd9-48ee97cd6613
2017-12-13 15:53:44,566 - browbeat.workloadbase -    INFO - Total scenarios executed:3
2017-12-13 15:53:44,566 - browbeat.workloadbase -    INFO - Total tests executed:3
2017-12-13 15:53:44,566 - browbeat.workloadbase -    INFO - Total tests passed:3
2017-12-13 15:53:44,566 - browbeat.workloadbase -    INFO - Total tests failed:0
2017-12-13 15:53:44,568 - browbeat -    INFO - Saved browbeat result summary to /home/
↪akrzos/code/browbeat-refactor/browbeat/results/20171213-154634.report
```

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```
2017-12-13 15:53:44,568 - browbeat -    INFO - Browbeat finished successfully, UUID:␣
↪8e869626-a596-4ec7-b0b1-ac7f2bf915a7
(.browbeat-venv) [akrzos@bithead browbeat]$ ls results/
20171213-154634  20171213-154634.report  browbeat-Rally-run.log
```

7.8 Troubleshooting

7.8.1 View Undercloud and Overcloud Instance

```
[root@bithead ~]# sudo su - stack -c 'virsh list --all'
 Id    Name                           State
----------------------------------------------------
 1     undercloud                     running
 3     compute_0                      running
 4     control_0                      running
```

7.8.2 Accessing Virtual Baremetal Nodes consoles

```
[root@bithead ~]# sudo su - stack -c 'virsh -c qemu:///session console undercloud'
Connected to domain undercloud
Escape character is ^]

Red Hat Enterprise Linux Server 7.3 (Maipo)
Kernel 3.10.0-514.26.2.el7.x86_64 on an x86_64

undercloud login:
```

7.8.3 Get to Undercloud via ssh

```
[akrzos@bithead ~]$ ssh -F ~/.quickstart/ssh.config.ansible undercloud
Warning: Permanently added '127.0.0.2' (ECDSA) to the list of known hosts.
Warning: Permanently added 'undercloud' (ECDSA) to the list of known hosts.
Last login: Tue Sep 19 13:25:33 2017 from gateway
[stack@undercloud ~]$
```

7.8.4 Get to Overcloud nodes via ssh

```
[akrzos@bithead ~]$ ssh -F ~/.quickstart/ssh.config.ansible overcloud-controller-0
Warning: Permanently added '127.0.0.2' (ECDSA) to the list of known hosts.
Warning: Permanently added 'undercloud' (ECDSA) to the list of known hosts.
Last login: Tue Sep 19 13:25:33 2017 from gateway
[heat-admin@overcloud-controller-0 ~]$
```

7.8.5 Other gotchas

Make sure your / partition does not fill up with cached images as they can take a large amount of space

```
[root@bithead ~]# df -h /var/cache/tripleo-quickstart/
Filesystem                          Size  Used Avail Use% Mounted on
/dev/mapper/fedora_dhcp23--196-root   50G   40G  6.9G  86% /
[root@bithead ~]# du -sh /var/cache/tripleo-quickstart/
5.4G  /var/cache/tripleo-quickstart/
```

7.8.6 Further Documentation

Tripleo Quickstart docs

CHAPTER 8

Contributing

Contributions are most welcome! You must first create a Launchpad account and follow the instructions here to get started as a new OpenStack contributor.

Once you've signed the contributor license agreement and read through the above documentation, add your public SSH key under the 'SSH Public Keys' section of review.openstack.org.

You can view your public key using:

```
$ cat ~/.ssh/id_*.pub
```

8.1 Setup

Set your username and email for review.openstack.org:

```
$ git config --global user.email "example@example.com"
$ git config --global user.name "example"
$ git config --global --add gitreview.username "example"
```

Next, Clone the github repository:

```
$ git clone https://github.com/openstack/browbeat.git
```

You need to have git-review in order to be able to submit patches using the gerrit code review system. You can install it using:

```
$ sudo yum install git-review
```

To set up your cloned repository to work with OpenStack Gerrit

```
$ git review -s
```

8.2 Making changes

It's useful to create a branch to do your work, name it something related to the change you'd like to introduce.

```
$ cd browbeat
$ git branch my_special_enhancement
$ git checkout !$
```

Now you can make your changes and then commit.

```
$ git add /path/to/files/changed
$ git commit
```

Use a descriptive commit title followed by an empty space. You should type a small justification of what you are changing and why.

8.3 Local testing

Before submitting code to Gerrit you *should* do at least some minimal local testing, like running `tox -e linters`. This could be automated if you activate pre-commit hooks:

```
pip install --user pre-commit
# to enable automatic run on commit:
pre-commit install --install-hooks
# to uninstall hooks
pre-commit uninstall
```

Please note that the pre-commit feature is available only on repositories that do have .pre-commit-config.yaml file.

Running `tox -e linters` is recommended as it may include additional linting commands than just pre-commit. So, if you run tox you don't need to run pre-commit manually.

Implementation of pre-commit is very fast and saves a lot of disk space because internally it does cache any linter-version and reuses it between repositories, as opposed to tox which uses environments unique to each repository (usually more than one). Also by design pre-commit always pins linters, making less like to break code because linter released new version.

Another reason why pre-commit is very fast is because it runs only on modified files. You can force it to run on the entire repository via *pre-commit run -a* command.

Upgrading linters is done via `pre-commit autoupdate` but this should be done only as a separate change request.

8.4 Submit Changes

Now you're ready to submit your changes for review:

```
$ git review
```

If you want to make another patchset from the same commit you can use the amend feature after further modification and saving.

```
$ git add /path/to/files/changed
$ git commit --amend
$ git review
```

8.5 Changes to a review

If you want to submit a new patchset from a different location (perhaps on a different machine or computer for example) you can clone the Browbeat repo again (if it doesn't already exist) and then use git review against your unique Change-ID:

```
$ git review -d Change-Id
```

Change-Id is the change id number as seen in Gerrit and will be generated after your first successful submission.

The above command downloads your patch onto a separate branch. You might need to rebase your local branch with remote master before running it to avoid merge conflicts when you resubmit the edited patch. To avoid this go back to a "safe" commit using:

```
$ git reset --hard commit-number
```

Then,

```
$ git fetch origin
```

```
$ git rebase origin/master
```

Make the changes on the branch that was setup by using the git review -d (the name of the branch is along the lines of review/username/branch_name/patchsetnumber).

Add the files to git and commit your changes using,

```
$ git commit --amend
```

You can edit your commit message as well in the prompt shown upon executing above command.

Finally, push the patch for review using,

```
$ git review
```

8.5.1 Adding functionality

If you are adding new functionality to Browbeat please add testing for that functionality in.

```
$ ci-scripts/install-and-check.sh
```

See the README.rst in the ci-scripts folder for more details on the structure of the script and how to add additional tests.

8.5.2 Contributing to stockpile

We currently use featureset001 of stockpile to gather config. Please follow instructions to contribute to stockpile.

CHAPTER 9

Indices and tables

- genindex
- modindex
- search