Dell EMC Ready Bundle for Red Hat OpenStack

Technical Guide
Adding and Removing Compute and Storage Nodes
Version 6.0.1

DELLEMC

Dell EMC Converged Platforms and Solutions

Contents

Trademarks

Notes, Cautions, and Warnings

A **Note** indicates important information that helps you make better use of your system.

A **Caution** indicates potential damage to hardware or loss of data if instructions are not followed.

A **Warning** indicates a potential for property damage, personal injury, or death.

Chapter

1

Executive Summary

Topics:

- *Intended Audience*

One of the common needs of a cloud platform is to scale resources as compute and storage needs expand or contract. Over time there is often a need to add additional Compute resources, as the required VM (Virtual Machine) growth has exceeded planned capacity. Likewise, Storage resources must expand to keep up with demand. At other times, there may be a need to remove a Compute or Storage resource for upgrades, repairs, etc.

This technical guide explains the process of adding or removing the following nodes to or from an existing Dell EMC Ready Bundle for Red Hat OpenStack cluster:

- Compute nodes:

  - Dell EMC PowerEdge R430
  - Dell EMC PowerEdge R630
  - Dell EMC PowerEdge R730
- Storage node:

  - Dell EMC PowerEdge R730xd

Compute nodes are used for hosting VMs in the Dell EMC Ready Bundle for Red Hat OpenStack version 6.0.1.

Storage nodes are used for hosting Red Hat Ceph Storage version 1.3.2 which manages block, image, and ephemeral storage in the Dell EMC Ready Bundle for Red Hat OpenStack version 6.0.1.

The following documentation from Red Hat should be referenced when using the steps in this document:

https://access.redhat.com/documentation/en/red-hat-openstack-platform/9/paged/director-installation-and-usage/chapter-9-scaling-the-overcloud

https://access.redhat.com/documentation/en/red-hat-ceph-storage/1.3/paged/administration-guide/chapter-6-managing-cluster-size#removing-osds-manual

Intended Audience

This guide is written for OpenStack administrators or deployment engineers who are responsible for installation and ongoing operation of OpenStack clusters. It assumes that the reader is familiar with:

- OpenStack
- Red Hat Enterprise Linux (RHEL)
- Red Hat OpenStack Platform (RHOSP) documentation
- Networking and system administration

Chapter

2

Adding Nodes

Topics:

This section describes prerequisites and procedures to add a Compute or Storage node to a Dell EMC Ready Bundle for Red Hat OpenStack cluster.

Prerequisites

The following prerequisites must be met:

- Compute and Storage nodes' RAID and BIOS settings have been configured using the Dell EMC Toolkit (DTK) utility
- Dell EMC Ready Bundle for Red Hat OpenStack version 6.0.1 installed
- Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide available for reference

> **Note:** All nodes in the same roles must be of the same server models, with identical HDD, RAM, and NIC configurations. So, all Controller nodes must be identical to each other; all Compute nodes must be identical to each other; and so on. See the Dell EMC Ready Bundle for Red Hat OpenStack Reference Architecture for configuration options for each node role.

Adding a Node

To add a Compute or Storage node to a Dell EMC Ready Bundle for Red Hat OpenStack cluster:

> **Note:** If you add a new Compute node, **and** your existing installation uses Instance HA technology, you will need to do a manual install of Instance HA for the new Compute node after it is added to the cluster. See the instructions in the *Scripted HA Installation* section of the Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide.

1. Log onto the Director Node as the *admin_user* user (or user as configured in *Director Node Configuration Parameters*, in the Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide).
2. Navigate to the directory in which the Dell EMC Ready Bundle for Red Hat OpenStack was deployed (e.g., the */home/admin_user/pilot* directory.)
3. Run the following command specifying the iDRAC credentials (replace example below with actual values) and the IP address of the node being added:

```
./discover_nodes/discover_nodes.py -u root \
-p 'root_password' 192.168.110.122 \
> ~/newnodes.json
```

4. If more than one node is being added, then you can specify an IP range using two IP addresses separated by a dash:

```
./discover_nodes/discover_nodes.py -u root \
-p '<root_password>' \
192.168.110.122-192.168.110.126 \
> ~/newnodes.json
```

5. When discovery is complete, examine *~/newnodes.json* to verify that it contains an entry for every cluster node to be provisioned, and no other nodes:

```
{
  "nodes": [
    {
      "pm_addr": "192.168.110.50",
      "pm_password": "calvin",
      "pm_type": "pxe_ipmitool",
      "pm_user": "root"
    }
  ]
}
```

The `pm_user`, `pm_password`, and `pm_addr` attribute values are examples - the actual values should conform to your node specifications. The other attributes will be adjusted during the node introspection phase.

6. Execute the following command to register the new nodes:

```
$ openstack baremetal import --json ~/newnodes.json
```

7. Identify the new nodes by UUID, and start the introspection process. For example:

> **Note:** Your node UUIDs will differ.

```
$ ironic node-list
+-------------------------------------+------
+-------------------------------------+------------+--------------------
+-------------+
| UUID                                | Name | Instance UUID
          | Power State | Provisioning State | Maintenance |
+-------------------------------------+------
+-------------------------------------+------------+--------------------
+-------------+
| df221970-94d8-4ed0-9f68-835bd8e166d2 | None |
 855240f6-4943-4348-830f-2436b585d7e4 | power on    | active             |
 False       |
| af5ab2bf-6b82-4587-92ba-cfb6f5e7a759 | None | bceb5b21-a068-44b4-9444-
a89f1f4b1ace | power on    | active             | False       |
| d07bb1b2-13be-4762-8a99-4cef9ec26faf | None | df64c706-
b4d5-4cb7-8eab-65ec4ca3b810 | power on    | active             | False
       |
| 40a6b131-c17b-44ed-ac32-76e6f51d3aea | None | d6f05ce1-92ca-4ee8-adcd-
fe7e2e423d69 | power on    | active             | False       |
| f27bfbda-b69a-4d23-be07-93284d1c33f5 | None | 309a49d2-
c50a-46e5-89b1-9bd3906e8cc7 | power on    | active             | False
       |
| f5787449-2e37-4737-93d0-84b18117f649 | None | aed26822-b803-43fc-b293-
f66e98b851ab | power on    | active             | False       |
| f119bc65-9e51-4d0d-ad45-58916f7e8097 | None | ce43d39d-24f7-4e19-
ac2e-11fa5417b46a | power on    | active             | False       |
| 70c68e66-6465-4fd0-a91c-c4210045641e | None | ca0ca01c-8312-4752-8590-
ffdfa14c7192 | power on    | active             | False       |
| **f06aed59-b987-4634-83d4-5bed8d35b0c9** | None | None
          | None        | available          |
+-------------------------------------+------
+-------------------------------------+------------+--------------------
+-------------+
```

8. After registering the new node, launch the introspection process:

```
$ ironic node-set-provision-state <UUID> manage
$ openstack baremetal introspection start <UUID>
$ ironic node-set-provision-state <UUID> provide
```

9. Repeat the commands in Step 8 for each new node.

> **Caution:** You must not proceed until introspection is complete on each node.

10. Each node must then be assigned a role within the cluster. Use the `assign_role.py` script to assign roles to node:

```
$ ./assign_role.py <IP> <role> --file ~/newnodes.json
```

a. For <IP>, substitute the IP address of the node's iDRAC.
b. For <role>, substitute the role that the node will perform (*compute* or *storage*).

For example:

```
$ ./assign_role.py 192.168.110.50 compute --file ~/newnodes.json
```

11. Repeat the command in Step 10 for each new node, using its iDRAC IP address and node type.

12. The boot images used during deployment must be set for the new nodes. To get the UUIDs of the images:

```
$ glance image-list
```

The display returns a list similar to this:

```
+---------------------------------------+-----------------------
+-------------+-----------------+-----------+--------+
| ID                                    | Name                  | Disk
 Format | Container Format | Size      | Status |
+---------------------------------------+-----------------------
+-------------+-----------------+-----------+--------+
| 5f4bfcd7-24d3-436f-9c59-161ad862597e | bm-deploy-kernel       | aki
     | aki              | 5153184    | active |
| 1bf9ed8c-82c1-4ab0-ae54-f0067cc2abb9 | bm-deploy-ramdisk      | ari
     | ari              | 341547616  | active |
| 7fca165f-cd6b-4173-86a7-47b147c00320 | overcloud-full         | qcow2
     | bare             | 1019496448 | active |
| 94a365a2-bc82-4fa9-a2ec-13670050d454 | overcloud-full-initrd  | ari
     | ari              | 40323665   | active |
| c136dbe1-2960-492c-a1eb-3f7048b08b5c | overcloud-full-vmlinuz | aki
     | aki              | 5153184    | active |
+---------------------------------------+-----------------------
+-------------+-----------------+-----------+--------+
```

13. Set these UUIDs for each new nodes' `deploy_kernel` and `deploy_ramdisk` settings:

```
$ ironic node-update <UUID> add \
driver_info/deploy_kernel='<kernel_image_ID>'
$ ironic node-update <UUID> add \
driver_info/deploy_ramdisk='<ramdisk_image_ID>'
```

For example:

```
$ ironic node-update f06aed59-b987-4634-83d4-5bed8d35b0c9 add \
driver_info/deploy_kernel='5f4bfcd7-24d3-436f-9c59-161ad862597e'
$ ironic node-update f06aed59-b987-4634-83d4-5bed8d35b0c9 add \
driver_info/deploy_ramdisk='1bf9ed8c-82c1-4ab0-ae54-f0067cc2abb9'
```

14. Repeat the commands in Step 13 for each new node.

15. The new nodes are ready to be deployed. Specify the new total number of Compute or Storage nodes to the `deploy_overcloud.py` script, to have the cluster updated and the new nodes added and configured:

```
$ ./deploy_overcloud.py --computes 4 --storage 3 --vlans 201:250
```

a. Ensure that:

- You include all environment files and options from your initial Overcloud creation. This includes the same scale parameters for non-Compute nodes.
- If the `--static_ip` option was used in the original deployment, make sure to update the `~/pilot/templates/static-ip-environment.yaml` file to add the new static IP address for the added node.

b. To extract the original invocation of the `deployovercloud.py` script, execute the following command on the Solution Admin Host:

```
# grep \deploy-overcloud.py $(ls -tr /auto_results/ \
deployer.log.* | tail -1) | tail -1 | sed -e \
's/ ^.*running : //'
```

> **Note:** Running the `deploy_overcloud.py` script will take some time, as the OS will be installed and the OpenStack software deployed and configured on the additional node(s).

16. If a Storage node was added, attach the new Storage node to Calamari:

a. Execute the Calamari initialization scripts that enables you to use Calamari services:

```
# ./config_calamari_nodes.sh <calamari_node_ip> <root_password>
```

b. Log into the Calamari web interface.

c. Add the new Storage node to the Calamari group.

The new Storage node is now ready for use. The newly-added OSDs will automatically be used by existing Ceph pools that were created in the initial solution deployment.

17. If a Compute node was added to the cluster, add the Compute node to InstanceHA:

a. Execute the `install-instanceHA.py` script to add the Compute node to the instanceHA configuration:

```
# ./install-instanceHA.py --compute <compute_node_provisioning_IP>
```

18. If a Controller node was added to the cluster, add the Controller node to InstanceHA:

a. Execute the `install-instanceHA.py` script to add the Controller node to the instanceHA configuration:

```
# ./install-instanceHA.py --controller <compute_node_provisioning_IP>
```

The new nodes, and reconfigured cluster, are now ready for use.

Chapter
3

Removing Nodes

Topics:

This section describes prerequisites and procedures to remove a Compute or Storage node to a Dell EMC Ready Bundle for Red Hat OpenStack cluster.

Removing a Compute Node

Prerequisite:

• Instances must be migrated from the Compute node being removed to another active Compute node.

To remove a Compute node from a Dell EMC Ready Bundle for Red Hat OpenStack cluster:

📝 **Note:** If you remove a Compute node, **and** your existing installation uses Instance HA technology, you will need to do a manual uninstall of Instance HA of the Compute node from the cluster. See the instructions in the *Scripted HA Installation* section of the <u>Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide</u>).

1. Log onto the Director Node as the *admin_user* user (or user as configured in *Director Node Configuration Parameters*, in the <u>Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide</u>).
2. Source your `overcloudrc` file.

```
# source ~/overcloudrc
```

3. Identify the Compute node that will be removed, by executing the following command to get a list of the host names:

```
# nova service-list
```

4. Disable the Compute nodes service so that no new instances can be started from that node:

```
# nova service-disable <compute hostname> nova-compute
```

5. Source the Undercloud `stackrc` file:

```
# source ~/stackrc
```

6. Identify the ID of the Overcloud stack:

```
# openstack stack list
```

Example truncated output:

```
+----------------------------------------+------------+- ...
| ID                                     | Stack Name |  ...
+----------------------------------------+------------+- ...
| 4aefad19-5bc6-476b-9582-80dca79f2825   | overcloud  |  ...
+----------------------------------------+------------+- ...
```

7. Identify the Nova ID of the Compute node to delete:

```
# nova list
```

Example truncated output:

```
+----------------------------------------+-----------------------+- ...
| ID                                     | Name                  |  ...
+----------------------------------------+-----------------------+- ...
| 2e19c09b-4fc1-456b-8d23-91dff107f5c3   | overcloud-cephstorage-0 |  ...
| 901bf060-4cdf-4021-ac52-32c97001659f   | overcloud-cephstorage-1 |  ...
| 2cc1159d-50bc-404e-9ec0-767ffdd1446b   | overcloud-cephstorage-2 |  ...
| 99c8def0-35ce-4162-885b-23f85426f41c   | overcloud-cephstorage-3 |  ...
| 52f28960-1a91-4955-847b-9969b84067d2   | overcloud-compute-0   |  ...
| eef7edf3-ae98-4921-88ff-7fc296e8bef7   | overcloud-compute-1   |  ...
| cb68faf8-ba6c-405d-81ab-c8582138f536   | overcloud-compute-2   |  ...
```

```
| 143b488d-6e2a-44d0-aca3-c9a7c50b8035 | overcloud-controller-0 |  ...
| ea5378d6-8778-4d7a-950e-748b450710dd | overcloud-controller-1 |  ...
| fbcd5322-d79b-485d-80ad-86552bddbafa | overcloud-controller-2 |  ...
+--------------------------------------+------------------------+- ...
```

8. Identify the Ironic ID associated with the nova ID of the Compute node to delete, by executing the following command:

   Note: There is a single space between the quotation marks in the command below.

   ```
   # ironic node-list | grep [Nova_ID] | cut -d " " -f 2
   ```

   Example truncated output:

   ```
   59ad7668-8ba2-4972-99a8-e080dd06803f
   ```

9. Gather the path to the templates and environmental files used for the initial deployment:

   ```
   # cd ~/pilot
   # cat overcloud_deploy_cmd.log
   ```

10. Execute the following command to delete the Compute node and update the deployment:

    ```
    # openstack overcloud node delete --stack [STACK_ID] \
    --templates [TEMPLATE_DIRECTORY] \
    -e [ENVIRONMENT_FILE]...  \
    [Nova_ID]
    ```

    For example:

    ```
    # openstack overcloud node delete --stack
     4aefad19-5bc6-476b-9582-80dca79f2825
     --templates ~/pilot/templates/overcloud
     -e ~/pilot/templates/overcloud/environments/network-isolation.yaml
     -e ~/pilot/templates/network-environment.yaml
     -e ~/pilot/templates/static-ip-environment.yaml
     -e ~/pilot/templates/static-vip-environment.yaml
     -e ~/pilot/templates/node-placement.yaml
     -e ~/pilot/templates/overcloud/environments/storage-environment.yaml
     -e ~/pilot/templates/dell-environment.yaml
     -e ~/pilot/templates/overcloud/environments/puppet-pacemaker.yaml
     -e ~/pilot/templates/dell-cinder-backends.yaml
     52f28960-1a91-4955-847b-9969b84067d2
    ```

    Example output:

    ```
    deleting nodes ['52f28960-1a91-4955-847b-9969b84067d2'] from stack
    4aefad19-5bc6-476b-9582-80dca79f2825

    Two objects are equal when all of the attributes are equal, if you want to
     identify
    whether two objects are same one with same id, please use is_same_obj()
     function.
    ```

11. Execute the `nova list` command repeatedly until you no longer see the Compute node in the list.

12. Source your `overcloudrc` file:

    ```
    # source ~/overcloudrc
    ```

13. Identify the ID of the removed Compute node:

```
# nova service-list
```

14. Remove the Compute node from the OpenStack service:

```
# nova service-delete [Id]
```

15. Remove the Compute nodes Open vSwitch agent:

```
# neutron agent-list
# neutron agent-delete [ Open vSwitch agent id]
```

16. Delete the Compute node from Ironic by executing the following command:

```
# ironic node-delete [Ironic_ID]
```

You can now remove the Compute node from the environment.

Removing a Storage Node

Prerequisite:

• There must be at least 3 Storage nodes AFTER the removal of one of the Storage nodes. This ensures that the minimum data redundancy is maintained.

To remove a Storage node from a Dell EMC Ready Bundle for Red Hat OpenStack cluster:

1. Log onto the Director Node as the *admin_user* user (or user as configured in *Director Node Configuration Parameters*, in the Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide).

2. Source the undercloud `stackrc` file:

```
# source ~/stackrc
```

3. Identify the Storage node that will be removed, by executing the following command to get a list of the host names:

```
# nova list
```

4. Initiate an `ssh` session to the Storage node to be removed.

a. Change to the *root* user:

```
$ sudo -i
```

5. Identify the OSDs that need to be removed by executing the following command:

```
#root@cephstorage-3 /] ceph osd tree
```

To locate the OSDs associated with the Storage node to be removed, two essential pieces of information are required:

• The node number, indicated by the number in the first column
• The OSD associated with the node, indicated by *osd.n* in the third column

Example truncated output:

```
0   1.07999          osd.0          up   1.00000          1.00000
4   1.07999          osd.4          up   1.00000          1.00000
7   1.07999          osd.7          up   1.00000          1.00000
```

> ▨ **Note:** Although the OSDs are listed sequentially per node, the numeric identifiers may or may not be contiguous.

6. Remove every OSD on that storage node from the cluster.

> ▨ **Note:** OSDs should be removed one at a time, in order to minimize impact on the rest of the cluster.

a. Place the OSD in the *out* state. This must be performed for **all** OSDs identified in Step 5:

```
#root@cephstorage-3 /] ceph osd out osd.0
```

b. Wait for the data to migrate off the OSD:

a. Execute the following command to monitor the migration and rebalancing activity:

```
#root@cephstorage-3 /] ceph -w
```

b. Watch the output until the status is **active+clean**:

```
2016-10-03 16:11:23.045340 mon.0 [INF] from='client.?
 192.168.170.18:0/1163991'
entity='client.admin' cmd=[{"prefix": "osd out", "ids":
 ["osd.0"]}]: dispatch

2016-10-03 16:11:23.240194 mon.0 [INF] pgmap v34180: 3648 pgs: 3648
 active+clean;
45660 kB data, 4013 MB used, 53471 GB / 53475 GB avail

2016-10-03 16:11:23.245291 mon.0 [INF] from='client.?
 192.168.170.18:0/1163991'
entity='client.admin' cmd='[{"prefix": "osd out", "ids":
 ["osd.0"]}]': finished

2016-10-03 16:11:40.279607 mon.0 [INF] pgmap v34190: 3648 pgs:
 3648 active+clean;
45660 kB data, 3934 MB used, 52922 GB / 52926 GB avail
```

c. To exit the utility, press *[Ctrl-C]*.

c. Stop the OSD by executing the following command:

```
#root@cephstorage-3 /] /etc/init.d/ceph stop osd.0
```

A message similar to the following is displayed:

```
=== osd.0 ===
Stopping Ceph osd.0 on cephstorage-3...kill 66546...kill 66546...done
```

After running the stop command, the OSDs will be down. Now they need to be removed from the CRUSH map.

d. Remove the OSD from the storage node to be removed by executing the following command:

```
#root@cephstorage-3 /] ceph osd crush remove osd.0
```

A message similar to the following is displayed:

```
removed item id 0 name 'osd.0' from crush map
```

e. Delete the OSD's authentication token by executing the following command:

```
#root@cephstorage-3 /] ceph auth del osd.0
```

The following message is displayed:

```
updated
```

f. Delete the OSD by executing the following command:

> **Note:** The syntax for specifying the OSD is just the numberic identifier (e.g., *N*) and not *osd.N*.

```
#root@cephstorage-3 /] ceph osd rm 0
```

A message similar to the following is displayed:

```
removed osd.0
```

g. Repeat from Step 6a until all OSDs on the Storage node have been removed from the cluster.

7. Remove the Storage node from the CRUSH map by executing the following command:

```
#root@cephstorage-3 /] ceph osd crush remove <storage-node-to-be-removed>
```

8. Determine the ID of the Overcloud:

a. Log onto the Director Node as the *admin_user* (or the user configured in *Director Node Configuration Parameters*, in the Dell EMC Ready Bundle for Red Hat OpenStack Deployment Guide).

b. Source the *undercloud stackrc* file:

```
# source ~/stackrc
```

c. Identify the ID of the Overcloud stack by executing the following command:

```
# openstack stack list
```

Example truncated output:

```
+-------------------------------------+-----------+- ...
| ID                                  | Stack Name |  ...
+-------------------------------------+-----------+- ...
| 4aefad19-5bc6-476b-9582-80dca79f2825 | overcloud |  ...
+-------------------------------------+-----------+- ...
```

9. Identify the Nova ID of the Storage node to delete, by executing the following command:

```
# nova list
```

Example truncated output:

> **Note:** IDs, names, and networks will appear differently in actual output.

```
+------------------------------------+------------------------+- ...
| ID                                 | Name                   |  ...
+------------------------------------+------------------------+- ...
| 2e19c09b-4fc1-456b-8d23-91dff107f5c3 | overcloud-cephstorage-0 |  ...
| 901bf060-4cdf-4021-ac52-32c97001659f | overcloud-cephstorage-1 |  ...
| 2cc1159d-50bc-404e-9ec0-767ffdd1446b | overcloud-cephstorage-2 |  ...
| 99c8def0-35ce-4162-885b-23f85426f41c | overcloud-cephstorage-3 |  ...
| 52f28960-1a91-4955-847b-9969b84067d2 | overcloud-compute-0     |  ...
| eef7edf3-ae98-4921-88ff-7fc296e8bef7 | overcloud-compute-1     |  ...
| cb68faf8-ba6c-405d-81ab-c8582138f536 | overcloud-compute-2     |  ...
| 143b488d-6e2a-44d0-aca3-c9a7c50b8035 | overcloud-controller-0  |  ...
| ea5378d6-8778-4d7a-950e-748b450710dd | overcloud-controller-1  |  ...
```

```
| fbcd5322-d79b-485d-80ad-86552bddbafa | overcloud-controller-2 |  ...
+--------------------------------------+------------------------+- ...
```

10. Identify the Ironic ID associated with the nova ID of the Storage node to delete, by executing the following command:

> ◪ **Note:** There is a single space between the quotation marks in the command below.

```
# ironic node-list | grep [Nova_ID] | cut -d " " -f 2
```

Example truncated output:

```
e4b5ca84-823a-42ec-a0d5-1ce091952c11
```

11. Gather the path to the templates and the environmental files used for the initial deployment.

```
# cd ~/pilot
# cat overcloud_deploy_cmd.log
```

12. Execute the following command to delete the Storage node and update the deployment:

```
# openstack overcloud node delete --stack [STACK_ID] \
--templates [TEMPLATE_DIRECTORY] \
-e [ENVIRONMENT_FILE]...  \
[Nova_ID]
```

For example:

```
openstack overcloud node delete --stack
 4aefad19-5bc6-476b-9582-80dca79f2825
--templates ~/pilot/templates/overcloud
-e ~/pilot/templates/overcloud/environments/network-isolation.yaml
-e ~/pilot/templates/network-environment.yaml
-e ~/pilot/templates/static-ip-environment.yaml
-e ~/pilot/templates/static-vip-environment.yaml
-e ~/pilot/templates/node-placement.yaml
-e ~/pilot/templates/overcloud/environments/storage-environment.yaml
-e ~/pilot/templates/dell-environment.yaml
-e ~/pilot/templates/overcloud/environments/puppet-pacemaker.yaml
-e ~/pilot/templates/dell-cinder-backends.yaml
 99c8def0-35ce-4162-885b-23f85426f41c
```

Example output:

```
deleting nodes ['99c8def0-35ce-4162-885b-23f85426f41c'] from stack
4aefad19-5bc6-476b-9582-80dca79f2825

Two objects are equal when all of the attributes are equal, if you want to
 identify
whether two objects are same one with same id, please use is_same_obj()
 function.
```

13. Execute the `nova list` command repeatedly until you no longer see the Storage node in the list.
14. Validate proper Red Hat Ceph Storage operation after node removal:

   a. Close the `ssh` session to the Storage node, returning to the session on the Director Node.
   b. Change to the *admin_user*'s home directory.
   c. Source your *overcloudrc* file:

   ```
   $ source ~/overcloudrc
   ```

    d. Create a new Red Hat Ceph Storage object:

```
$ swift post foo_test
$ swift list
foo_test
```

    e. Upload a large file into the new Red Hat Ceph Storage container:

```
$ ls -alpS | head -2 | tail -1
 -rw-rw-r--. 1 stack stack 13200896 Sep  8  2014 cirros-0.3.3-x86_64-
disk.img
$ swift upload foo_test cirros-0.3.3-x86_64-disk.img
 cirros-0.3.3-x86_64-disk.img
```

    f. Verify that the large file exists in the container:

```
$ swift list
foo_test
$ swift list foo_test
cirros-0.3.3-x86_64-disk.img
```

    g. Validate proper storage of the object by downloading the test file to a different directory and comparing the contents:

```
$ swift list
$ cd /tmp
$ swift download foo_test cirros-0.3.3-x86_64-disk.img
cirros-0.3.3-x86_64-disk.img [auth 0.255s, headers 0.279s, total 0.342s,
 150.484 MB/s]
$ diff cirros-0.3.3-x86_64-disk.img ~/cirros-0.3.3-x86_64-disk.img; echo
 $?
0
```

15. Delete the Storage node from Ironic by executing the following command:

```
# ironic node-delete [Ironic_ID]
```

You can now remove the Storage node from the environment.

Appendix

A

Getting Help

Topics:

- *Contacting Dell EMC*
- *References*

This appendix details contact and reference information for the Dell EMC Ready Bundle for Red Hat OpenStack.

Contacting Dell EMC

For customers in the United States, call 800-WWW-DELL (800-999-3355).

Note: If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell EMC product catalog.

Dell EMC provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell EMC for sales, technical support, or customer service issues:

1. Visit *dell.com/support*.
2. Click your country/region at the bottom of the page. For a full listing of country/region, click **All**.
3. Click **All Support** from the **Support** menu.
4. Select the appropriate service or support link based on your need.
5. Choose the method of contacting Dell EMC that is convenient for you.

References

Additional information can be obtained at *http://www.dell.com/en-us/work/learn/openstack-cloud* or by e-mailing *openstack@dell.com*.

If you need additional services or implementation help, please contact your Dell EMC sales representative.

To Learn More

For more information on the Dell EMC Ready Bundle for Red Hat OpenStack visit *http://www.dell.com/learn/us/en/04/solutions/red-hat-openstack*.