# Managing Cisco NFVI

The following topics provide general management procedures that you can perform if your implementation is Cisco VIM by itself or if it is Cisco VIM and Cisco VIM Unified Management.

# Managing Cisco NFVI Pods

You can perform OpenStack management operations on Cisco NFVI pods including addition and removal of Cisco NFVI compute and Ceph nodes, and replacement of controller nodes. Each action is mutually exclusive. You can perform only one pod management action at a time. Before you perform a pod action, ensure that the following requirements are met:

- The node is part of an existing pod.
- The node information exists in the setup_data.yaml file, if the pod management task is removal or replacement of a node.
- The node information does not exist in the setup_data.yaml file, if the pod management task is to add a node.

For more information on operations that can be performed on pods, see the Managing Hosts in Cisco VIM or NFVI Pods , on page 5 section.

## General Guidelines for Pod Management

The setup_data.yaml file is the only user-generated configuration file that is used to install and manage the cloud. While many instances of pod management indicate that the setup_data.yaml file is modified, the administrator does not update the system generated `setup_data.yaml` file directly.

**Note** To avoid translation errors, we recommend that you avoid copying and pasting commands from the documents to the Linux CLI.

Follow these steps to update the `setup_data.yaml` file:

1. Copy the setup data into a local directory:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cd MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml <my_setup_data.yaml>
```

2. Update the setup data manually:

```
[root@mgmt1 ~]# vi my_setup_data.yaml (update the targeted fields for the setup_data)
```

3. Run the reconfiguration command:

```
[root@mgmt1 ~]# ciscovim --setupfile ~/MyDir/<my_setup_data.yaml>
<pod_management_action>
```

In Cisco VIM, you can edit and enable a selected set of options in the setup_data.yaml file using the reconfigure option. After installation, you can change the values of the feature parameters. Unless specified, Cisco VIM does not allow you to undo the feature configuration.

The following table provides the list of features that you can reconfigure after installing a pod.

| Features Enabled after post-pod deployment | Comment |
|---|---|
| Optional OpenStack Services | • Heat: OpenStack Orchestration Program<br>• LDAP: Works only with Keystone v3. Full or partial reconfiguration can be done. Except for domain, all attributes are reconfigurable.<br>• Ironic: Baremetal workload post install<br>• Container: Cloud-native workload as a technical preview |
| Pod Monitoring | CVIM-MON: monitoring host and service level with or without ui_access |
| Export of EFK logs to External Syslog Server | Reduces single point of failure on management node and provides data aggregation. |
| NFS for Elasticsearch Snapshot | NFS mount point for Elastic-search snapshot is used so that the disk on management node does not get full. |
| Admin Source Networks | White list filter for accessing management node admin service over IPv4 or IPv6. |
| NFVBench | Tool to help measure cloud performance. Management node needs a dedicated 10G/40G Intel NIC (4x10G 710, or 2x40G XL710 Intel NIC). |
| EFK settings | Enables you to set EFK rotation frequency and size. |
| OpenStack service password | Implemented for security reasons, so that OpenStack passwords can be reset on-demand. |
| CIMC Password Reconfigure Post Install | Implemented for security reasons, so that CIMC passwords for C-series pod, can be reset on-demand. |
| SwiftStack Post Install | Integration with third-party Object-Store. The SwiftStack Post Install feature works only with Keystone v2. |
| TENANT_VLAN_RANGES and PROVIDER_VLAN_RANGES | Ability to increase the tenant and provider VLAN ranges on a pod that is up and running. It gives customers flexibility in network planning. |

| Features Enabled after post-pod deployment | Comment |
|---|---|
| Support of Multiple External Syslog Servers | Ability to offload the OpenStack logs to an external Syslog server post-install. |
| Replace of Failed APIC Hosts and add more leaf nodes | Ability to replace Failed APIC Hosts, and add more leaf nodes to increase the fabric influence. |
| Make Netapp block storage end point secure | Ability to move the Netapp block storage endpoint from Clear to TLS post-deployment |
| Auto-backup of Management Node | Ability to enable/disable auto-backup of Management Node. It is possible to unconfigure the Management Node. |
| VIM Admins | Ability to configure non-root VIM Administrators.<br>Ability to configure VIM admins authenticated by LDAP. |
| EXTERNAL_LB_VIP_FQDN | Ability to enable TLS on external_vip through FQDN. |
| EXTERNAL_LB_VIP_TLS | Ability to enable TLS on external_vip through an IP address. |
| http_proxy and/or https_proxy | Ability to reconfigure http and/or https proxy servers. |
| Admin Privileges for VNF Manager (ESC) from a tenant domain | Ability to enable admin privileges for VNF Manager (ESC) from a tenant domain. |
| SRIOV_CARD_TYPE | Mechanism to switch between 2-X520 and 2-XL710 as an SRIOV option in Cisco VIC NIC settings at a global and per compute level through reconfiguration. In the absence of per compute and global level, X520 card type is set by default. |
| NETAPP | Migrate NETAPP transport protocol from http to https. |
| Reset of KVM console passwords for servers | Aids to recover the KVM console passwords for servers. |
| Horizon behind NAT or with DNS alias(es) | Ability to host Horizon behind NAT or with DNS alias(es) |
| Login banner for SSH sessions | Support of configurable login banner for SSH sessions |
| Ability to add Layer 3 BGP session | Ability to switch BGP sessions from Layer 2 to Layer 3 in the presence of VXLAN configuration. |
| Add/remove of head-end-replication option | Ability to add or remove head-end-replication option, in the presence of VXLAN configuration |

# Identifying the Install Directory

If you are an administrator and want to use CLI to manage the pods, you must know the location of the installer directory. To identify the installer directory of a pod, execute the following commands:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# ls –lrt | grep openstack-configs
lrwxrwxrwx.  1 root root      38 Mar 12 21:33 openstack-configs ->
/root/installer-<tagid>/openstack-configs
```

From the output, you can understand that the OpenStack-configs is a symbolic link to the installer directory.

Verify that the REST API server is running from the same installer directory location, by executing the following commands:

```
# cd installer-<tagid>/tools
#./restapi.py -a status
Status of the REST API Server:   active (running) since Thu 2016-08-18 09:15:39 UTC; 9h ago
REST API launch directory: /root/installer-<tagid>/
```

# Managing Hosts in Cisco VIM or NFVI Pods

In Cisco VIM, a node can participate in multiple roles based on the pod type. The following rules apply for hardware management of a node:

1. If a node is a Micropod node that acts as controller, compute, and Ceph, the node can only go through the action of replace controller for its swap. You can perform this action on one node at a time.
2. If a node is a hyper-converged node (that is, acting as both compute and Ceph), the node is treated as a ceph node from hardware management point of view and the node can only go through the action of add or remove of Ceph. This action can be done only on one node at a time.
3. If a node is a standalone compute node, the node can only go through the action of add or remove of compute. You can add or remove multiple nodes at a time, but you cannot operate the pod with zero compute at any given time.
4. If a node is a dedicated controller node, the node can only go through the action of replace controller for its swap. This action can be done only on one node at a time.
5. If a node is a dedicated Ceph node, the node can only go through the action of add or remove of Ceph. This action can be done only on one node at a time and you cannot have a pod with less than two node Ceph at a time.

Based on the prceding rules, to perform hardware management actions on the pod, run the commands specified in the following table. If you log in as root, manually change the directory to /root/installer-xxx to get to the correct working directory for these Cisco NFVI pod commands.

*Table 1: Cisco NFVI Pod Management*

| Action | Steps | Restrictions |
|---|---|---|
| Remove block_storage or compute node | 1. Remove the node information from the ROLES and SERVERS section of the setup_data.yaml file for the specific node.<br>2. Enter one of the following commands.<br>For compute nodes:<br>`ciscovim remove-computes --setupfile ~/MyDir/my_setup_data.yaml <"compute-1,compute-2"> [--force]`<br>For storage nodes:<br>`ciscovim remove-storage --setupfile ~/MyDir/my_setup_data.yaml <"storage-1"> [--force]` | You can remove multiple compute nodes and only one storage at a time;<br>The pod must have a minimum of one compute and two storage nodes after the removal action.<br>In Cisco VIM, the number of Ceph OSD nodes vary from 3 to 20. You can remove one OSD node at a time as part of the pod management.<br>**Note**<br>• On a Micro or edge pod expanded with standalone computes, only the standalone compute nodes can be removed. Pod management operation for storage node is not supported for Micro or edge pod<br>• Compute management operations are not supported for hyper-converged nodes<br>• In UMHC or NGENAHC pod, if a VM is running on the storage node, remove-storage operation fails in pre-validation and gives a warning to the user about running VM's. Use force option to forcefully remove the storage node.<br>• In Ceph pod, pod management operations for compute is not supported. Removal of storage node is only allowed for servers that are exclusively available with cephosd roles. |

| Action | Steps | Restrictions |
|---|---|---|
| Add block_storage or compute node | 1. Add the node information from the ROLES and SERVERS section of the setup_data.yaml file for the specific node.<br>2. Enter one of the following commands.<br>For compute nodes:<br>`ciscovim add-computes --setupfile ~/MyDir/my_setup_data.yaml <"compute-1,compute-2">`<br>For storage nodes:<br>`ciscovim add-storage --setupfile ~/MyDir/my_setup_data.yaml <"storage-1">` | You can add multiple compute nodes and only one storage node at a time.<br>The pod must have a minimum of one compute, and two storage nodes before the addition action.<br>In Cisco VIM the number of ceph OSD nodes can vary from 3 to 20. You can add one OSD node at a time as part of the pod management.<br>**Note**<br>• On a Micro or edge pod expanded with standalone computes, you can add only the standalone compute nodes. Pod management operation for storage node is not supported.<br>• In hyper-converged mode, compute management operations are not supported for hyper-converged nodes. |

| Action | Steps | Restrictions |
|---|---|---|
| Replace controller node | 1. If the controller node is in a rack based deployment (UCS C-Series or Quanta based pod), update the CIMC info node in the SERVERS section of the setup_data.yaml file for the specific node<br>2. For B-series only update the blade and chassis info<br>3. Enter the following command:<br>**ciscovim replace-controller --setupfile ~/MyDir/my_setup_data.yaml <"control-1"> [--force]** | You can replace only one controller node at a time. The pod can have a maximum of three controller nodes.<br>In Cisco VIM, the replace controller node operation is supported in Micro-pod.<br>**Note**<br>• While replacing the controller node, the IP address and hostname are reused. So, do not update any other controller information other than CIMC access and hardware information for C-series, and blade and chassis information for B-series<br>• For Micro, edge and Ceph pod, this operation is supported on the AIO (all in one), compute-control, and cephcontrol nodes, respectively. In a Micro or edge pod, If a VM is running on the controller node, the replace controller operation fails during pre-validation and gives a warning to the user about running VM's. Use force option to forcefully replace the controller. |

When you add a compute or storage node to a rack based pod (UCS C-Series or Quanta), you can increase the management/provision address pool. Similarly, for a UCS B-Series pod, you can increase the Cisco IMC pool to provide routing space flexibility for pod networking. Along with server information, these are the only items you can change in the setup_data.yaml file after the pod is deployed. To make changes to the management or provisioning sections and/or CIMC (for UCS B-Series pods) network section, you must not change the existing address block as defined on day 0. You can add only to the existing information by adding new address pool block(s) of address pool as shown in the following example:

```
NETWORKING:
  :
  :

  networks:
  -
    vlan_id: 99
    subnet: 172.31.231.0/25
    gateway: 172.31.231.1
    ## 'pool' can be defined with single ip or a range of ip
```

```
    pool:
      - 172.31.231.2, 172.31.231.5 -→ IP address pool on Day-0
      - 172.31.231.7 to 172.31.231.12 -→ IP address pool ext. on Day-n
      - 172.31.231.20
    segments:
    ## CIMC IP allocation. Needs to be an external routable network
      - cimc
  -
    vlan_id: 2001
    subnet: 192.168.11.0/25
    gateway: 192.168.11.1
    rt_prefix: < Local to POD > #optional, only for segment management/provision, storage,
 tenant and ToR-type NCS-5500
    rt_suffix: < Region>:< pod_region_number > #optional, only for segement
management/provision, storage, tenant and ToR-type NCS-5500

    ## 'pool' can be defined with single ip or a range of ip
    pool:
      - 192.168.11.2 to 192.168.11.5   -→ IP address pool on Day-0
      - 192.168.11.7 to 192.168.11.12  → IP address pool on day-n
      - 192.168.11.20 → IP address pool on day-n
    segments:
    ## management and provision goes together
      - management
   - provision
  :
  :
```

The IP address pool is the only change allowed in the networking space of the specified networks management/provision and/or CIMC (for B-series). The overall network must have enough address space to accommodate for future enhancement on day-0. After making the changes to servers, roles, and the corresponding address pool, you can execute the add compute/storage CLI shown above to add new nodes to the pod.

For C-series M5 pods, with Cisco NCS 5500 as ToR with splitter cable connection onto the server, along with the server (cimc_ip), and connection (tor_info, dp_tor_info, sriov_tor_info) details, you have to adjust the entry for the splitter_opt_4_10 in respective SWITCHDETAILS for the Cisco NCS 5500 ToR pairs.

For example, to add compute or storage with Cisco NCS 5500 as ToR with splitter cable, add the following entry to the respective Cisco NCS 5500:

```
TORSWITCHINFO:
CONFIGURE_TORS: true # Mandatory
TOR_TYPE: NCS-5500   # Mandatory
ESI_PREFIX:91.<Pod_number>.<podregion_number>.00.00.00.00 #optional – only for NCS-5500
SWITCHDETAILS: -
hostname: <NCS-5500-1> # hostname of NCS-5500-1
username: admin
password: <ssh_password of NCS-5500-1>
...
splitter_opt_4_10: 'FortyGigE<C/D/X/Y>,HundredGigE<E/F/A/B>, …' # Optional for NCS-5500,
only when
     splitter is needed on per switch basis (i.e. the peer switch may or may not have the
entry)

ESI_PREFIX:91.<Pod_number>.<podregion_number>.00.00.00.00 #optional for NCS-5500 only
```

To remove a compute or a storage, delete the respective information. To replace the controller, swap the relevant port information from which the splitter cables originate.

**Note** For replace controller, you can change only a subset of the server information. For C-series, you can change the server information such as CIMC IP, CIMC Username, CIMC password, rack_id, and tor_info. For B-series, you can change the rack_id, chassis_id, and blade_id, but not the server hostname and management IP during the operation of replace controller.

# Recovering Cisco NFVI Pods

This section describes the recovery processes for Cisco NFVI control node and the pod that is installed through Cisco VIM. For recovery to succeed, a full Cisco VIM installation must have occurred in the past, and recovery is caused by a failure of one or more of the controller services such as Rabbit MQ, MariaDB, and other services. The management node must be up and running and all the nodes must be accessible through SSH without passwords from the management node. You can also use this procedure to recover from a planned shutdown or accidental power outage.

Cisco VIM supports the following control node recovery command:

```
# ciscovim cluster-recovery
```

The control node recovers after the network partition is resolved.

**Note** It may be possible that database sync between controller nodes takes time, which can result in cluster-recovery failure. In that case, wait for some time for the database sync to complete and then re-run cluster-recovery.

To make sure Nova services are good across compute nodes, execute the following command:

```
# source /root/openstack-configs/openrc
# nova service-list
```

To check for the overall cloud status, execute the following command:

```
# ciscovim cloud-sanity create test all
```

To view the results of cloud-sanity, use the following command:

```
# ciscovim cloud-sanity show result all –id <uid of the test >
```

In case of a complete pod outage, you must follow a sequence of steps to bring the pod back. The first step is to bring up the management node, and check that the management node containers are up and running using the docker ps –a command. After you bring up the management node, bring up all the other pod nodes. Make sure every node is reachable through password-less SSH from the management node. Verify that no network IP changes have occurred. You can get the node SSH IP access information from /root/openstack-config/mercury_servers_info.

Execute the following command sequence:

- Check the setup_data.yaml file and runtime consistency on the management node:

  ```
  # cd /root/installer-<tagid>/tools
  # ciscovim run --perform 1,3 -y
  ```

- Execute the cloud sanity using Cisco VIM command:

  ```
  # ciscovim cloud-sanity create test all
  ```

- To view the results of cloud-sanity, use the command `# ciscovim cloud-sanity show result all -id <uid of the test >`
- Check the status of the REST API server and the corresponding directory where it is running:

```
# cd/root/installer-<tagid>/tools
#./restapi.py -a status
Status of the REST API Server:  active (running) since Thu 2016-08-18 09:15:39 UTC; 9h
 ago
REST API launch directory: /root/installer-<tagid>/
```

- If the REST API server is not running from the right installer directory, execute the following to get it running from the correct directory:

```
# cd/root/installer-<tagid>/tools
#./restapi.py -a setup

Check if the REST API server is running from the correct target directory
#./restapi.py -a status
Status of the REST API Server:  active (running) since Thu 2016-08-18 09:15:39 UTC; 9h
 ago
REST API launch directory: /root/new-installer-<tagid>/
```

- Verify Nova services are good across the compute nodes by executing the following command:

```
# source /root/openstack-configs/openrc
# nova service-list
```

If cloud-sanity fails, execute cluster-recovery (ciscovim cluster-recovery), then re-execute the cloud-sanity and nova service-list steps as listed above.

Recovery of compute and OSD nodes requires network connectivity and reboot so that they can be accessed using SSH without password from the management node.

To shut down, bring the pod down in the following sequence:

1. Shut down all VMs, then all the compute nodes
2. Shut down all storage nodes serially
3. Shut down all controllers one at a time
4. Shut down the management node
5. Shut down the networking gears

   Bring the nodes up in reverse order, that is, start with networking gears, then the management node, storage nodes, control nodes, and compute nodes. Make sure that each node type is completely booted up before you move on to the next node type.

   Validate the Cisco API server by running the following command:

   ```
   ciscovim run --perform 1,3 -y
   ```

Run the cluster recovery command to bring up the POD post power-outage

```
# help on sub-command
ciscovim help cluster-recovery

# execute cluster-recovery
ciscovim cluster-recovery
```

```
# execute docker cloudpulse check
# ensure all containers are up
cloudpulse run --name docker_check
```

Validate if all the VMs are up (not in shutdown state). If any of the VMs are in down state, bring them up using the Horizon dashboard.

# Managing Nova Compute Scheduler Filters and User Data

OpenStack Nova is an OpenStack component that provides on-demand access to compute resources by provisioning large networks of virtual machines (VMs). In addition to the standard Nova filters, Cisco VIM supports the following additional scheduler filters:

- ServerGroupAffinityFilter—Ensures that an instance is scheduled onto a host from a set of group hosts. To use this filter, you must create a server group with an affinity policy and pass a scheduler hint using group as the key and the server group UUID as the value. Use the **nova** command-line tool and the **--hint** flag. For example:

  ```
  $ nova server-group-create --policy affinity group-1
  $ nova boot --image IMAGE_ID --flavor 1 --hint group=SERVER_GROUP_UUID server-1
  ```

- ServerGroupAntiAffinityFilter—Ensures that each group instance is on a different host. To use this filter, you must create a server group with an anti-affinity policy and pass a scheduler hint, using group as the key and the server group UUID as the value. Use the **nova** command-line tool and the **--hint** flag. For example:

  ```
  $ nova server-group-create --policy anti-affinity group-1
  $ nova boot --image IMAGE_ID --flavor 1 --hint group=SERVER_GROUP_UUID server-1
  ```

- SameHostFilter—Within an instance set, schedules one instance on the same host as another instance. To use this filter, pass a scheduler hint using **same_host** as the key and a list of instance UUIDs as the value. Use the **nova** command-line tool and the **--hint** flag. For example:

  ```
  $ nova boot --image IMAGE_ID --flavor 1 --hint same_host=INSTANCE_ID server-1
  ```

- DifferentHostFilter—Within an instance set, schedules one instance on a different host than another instance. To use this filter, pass a scheduler hint using **different_host** as the key and a list of instance UUIDs as the value. The filter is the opposite of SameHostFilter. Use the **nova**command-line tool and the **--hint** flag. For example:

  ```
  $ nova boot --image IMAGE_ID --flavor 1 --hint different_host=INSTANCE_ID server-1
  ```

In addition to scheduler filters, you can set up user data files for cloud application initializations. A user data file is a special key in the metadata service that holds a file that cloud-aware applications in the guest instance can access. For example, one application that uses user data is the cloud-init system, an open-source package that is available on various Linux distributions. The cloud-init system handles early cloud instance initializations. The typical use case is to pass a shell script or a configuration file as user data during the Nova boot, for example:

```
$ nova boot --image IMAGE_ID --flavor 1 --hint user-data FILE_LOC server-1
```

# Monitoring Cisco NFVI Health with CloudPulse

You can query the state of various Cisco NFVI OpenStack endpoints using CloudPulse, an OpenStack health-checking tool. By default, the tool automatically polls OpenStack Cinder, Glance, Nova, Neutron,

Keystone, Rabbit, Mariadb, and Ceph every four minutes. However, you can use a CLI REST API call from the management node to get the status of these services in real time. You can integrate the CloudPulse API into your applications and get the health of the OpenStack services on demand. You can find additional information about using CloudPulse in the following OpenStack sites:

- https://wiki.openstack.org/wiki/Cloudpulse
- https://wiki.openstack.org/wiki/Cloudpulseclient
- https://wiki.openstack.org/wiki/Cloudpulse/DeveloperNotes
- https://wiki.openstack.org/wiki/Cloudpulse/OperatorTests
- https://wiki.openstack.org/wiki/Cloudpulse/APIDocs

CloudPulse has two set of tests: endpoint_scenario (runs as a cron or manually) and operator test (run manually). The supported Cloudpulse tests groups include:

- nova_endpoint
- neutron_endpoint
- keystone_endpoint
- glance_endpoint
- cinder_endpoint

Operator tests include:

- ceph_check—Executes the command, "ceph -f json status" on the Ceph-mon nodes and parses the output. If the result of the output is not “HEALTH_OK” ceph_check the reports for an error.
- docker_check—Finds out if all the Docker containers are in the running state in all the nodes. It the report for an error if any containers are in the Exited state. It runs the command “docker ps -aq --filter 'status=exited'”.
- galera_check—Executes the command, "mysql 'SHOW STATUS;” on the controller nodes and displays the status.
- node_check—Checks if all the nodes in the system are up and online. It also compares the result of “nova hypervisor list” and finds out if all the computes are available.
- rabbitmq_check—Runs the command, “rabbitmqctl cluster_status” on the controller nodes and finds out if the rabbitmq cluster is in quorum. If nodes are offline in the cluster rabbitmq_check the report is considered as failed.

CloudPulse servers are installed in containers on all control nodes. The CloudPulse client is installed on the management node by the Cisco VIM installer. To execute CloudPulse, source the openrc file in the openstack-configs directory and execute the following:

```
[root@MercRegTB1 openstack-configs]# cloudpulse --help
usage: cloudpulse [--version] [--debug] [--os-cache]
                  [--os-region-name <region-name>]
                  [--os-tenant-id <auth-tenant-id>]
                  [--service-type <service-type>]
                  [--endpoint-type <endpoint-type>]
                  [--cloudpulse-api-version <cloudpulse-api-ver>]
                  [--os-cacert <ca-certificate>] [--insecure]
                  [--bypass-url <bypass-url>] [--os-auth-system <auth-system>]
```

```
                [--os-username <username>] [--os-password <password>]
                [--os-tenant-name <tenant-name>] [--os-token <token>]
                [--os-auth-url <auth-url>]
                <subcommand> ...
```

To check the results of periodic CloudPulse, enter the following command:

```
[root@MercRegTB1 openstack-configs]# cloudpulse result
+--------------------------------------+------+-------------------+----------+---------+
| uuid                                 | id   | name              | testtype | state   |
+--------------------------------------+------+-------------------+----------+---------+
| 4f4c619a-1ba1-44a7-b6f8-3a06b5903260 | 7394 | ceph_check        | periodic | success |
| 68b984fa-2edb-4d66-9d9b-7c1b77d2322e | 7397 | keystone_endpoint | periodic | success |
| c53d5f0f-a710-4612-866d-caa896e2d135 | 7400 | docker_check      | periodic | success |
| 988d387c-1160-4601-b2ff-9dbb98a3cd08 | 7403 | cinder_endpoint   | periodic | success |
| 5d702219-eacc-47b7-ae35-582bb8e9b970 | 7406 | glance_endpoint   | periodic | success |
| 033ca2fc-41c9-40d6-b007-16e06dda812c | 7409 | rabbitmq_check    | periodic | success |
| 8476b21e-7111-4b1a-8343-afd634010b07 | 7412 | galera_check      | periodic | success |
| a06f8d6e-7b68-4e14-9b03-bc4408b55b48 | 7415 | neutron_endpoint  | periodic | success |
| ef56b26e-234d-4c33-aee1-ffc99de079a8 | 7418 | nova_endpoint     | periodic | success |
| f60021c7-f70a-44fb-b6bd-03804e5b7bf3 | 7421 | node_check        | periodic | success |
+--------------------------------------+------+-------------------+----------+---------+
```

To view all CloudPulse tests:

```
# cd /root/openstack-configs
# source openrc
# cloudpulse test-list
```

To run a CloudPulse test on demand:

```
# cd /root/openstack-configs
# source openrc
# cloudpulse run --name <test_name>
# cloudpulse run  --all-tests
# cloudpulse run --all-endpoint-tests
# cloudpulse run --all-operator-tests
```

To run a specific CloudPulse test on demand:

```
# cloudpulse run --name neutron_endpoint
+------------+--------------------------------------+
| Property   | Value                                |
+------------+--------------------------------------+
| name       | neutron_endpoint                     |
| created_at | 2016-03-29T02:20:16.840581+00:00     |
| updated_at | None                                 |
| state      | scheduled                            |
| result     | NotYetRun                            |
| testtype   | manual                               |
| id         | 3827                                 |
| uuid       | 5cc39fa8-826c-4a91-9514-6c6de050e503 |
+------------+--------------------------------------+
```

To show detailed results of a specific CloudPulse run:

```
#cloudpulse show 5cc39fa8-826c-4a91-9514-6c6de050e503
+------------+--------------------------------------+
| Property   | Value                                |
+------------+--------------------------------------+
| name       | neutron_endpoint                     |
| created_at | 2016-03-29T02:20:16+00:00            |
```

```
| updated_at | 2016-03-29T02:20:41+00:00            |
| state      | success                              |
| result     | success                              |
| testtype   | manual                               |
| id         | 3827                                 |
| uuid       | 5cc39fa8-826c-4a91-9514-6c6de050e503 |
+------------+--------------------------------------+
```

To see the CloudPulse options, source the openrc file in openstack-configs dir and execute:

```
#cloudpulse --help
```

The CloudPulse project has a RESTful Http service called the Openstack Health API. Through this API cloudpulse allows the user to list the cloudpulse tests, create new cloudpulse tests and see the results of the cloudpulse results.

The API calls described in this documentation require keystone authentication. From release Cisco VIM 3.0.0 onwards, only keystone v3 is supported.

The Identity service generates authentication tokens that permit access to the Cloudpulse REST APIs. Clients obtain this token and the URL endpoints for other service APIs, by supplying their valid credentials to the authentication service. Each time you make a REST API request to Cloudpulse, you must provide your authentication token in the X-Auth-Token request header.

**Note** Cloudpulse is not applicable Ceph pod.

# Assessing Cisco NFVI Status with Cloud-Sanity

The cloud-sanity tool is designed to give you a quick overall status of the pods health checks. Cloud-sanity can run tests on all node types in the Pod: management, control, compute and ceph storage.

The following are test areas supported in cloud-sanity:

1. RAID Disk health checks.
2. Basic network connectivity between the management node and all other nodes in the Pod.
3. Mariadb cluster size.
4. RabbitMQ operation and status.
5. Nova service and hypervisor list.
6. CEPHMON operation and status.
7. CEPHOSD operation and status.

To run the cloud-sanity tool, login to the management node and run the ciscovim command with the cloud-sanity option

Cloud-Sanity user workflow:

1. Use “ciscovim cloud-sanity create …” command to initiate a test.
2. Use “ciscovim cloud-sanity list …” command to view summary/status of current test jobs.

3. Use “ciscovim cloud-sanity show … --id <ID>” command to view detail test results.
4. Use “ciscovim cloud-sanity delete … --id <ID>” to delete test results no longer needed.

The results are maintained so that you can view them any time.

**Note** Delete the results which are no longer needed.

**Step 1** To run the cloud sanity complete the following steps:

```
# ciscovim help cloud-sanity
usage: ciscovim cloud-sanity [--id <id>] [--skip-disk-checks] [-y]
                             create|delete|list|show test|result
                             all|control|compute|cephmon|cephosd|management

Run cloud-sanity test suite

Positional arguments:
  create|delete|list|show         The control command to perform
  test|result                     The identity of the task/action
  all|control|compute|cephmon|cephosd|management
                                  The sanity check

Optional arguments:
  --id <id>                       ID used to identify specific item to
                                  show/delete.
  --skip-disk-checks              Flag to skip running disk-checks during
                                  cloud-sanity test
  -y, --yes                       Yes option to perform the action
```

**Step 2** To run the cloud sanity test, you need to create a test job. Once the test job is created, the system displays a message with the time and the ID when the test job was created.

Run the following command to create a test job:

```
# ciscovim cloud-sanity create test all
+------------+--------------------------------------+
| Field      | Value                                |
+------------+--------------------------------------+
| command    | create                               |
| created_at | 2018-03-07T15:37:41.727739           |
| id         | c000ca20-34f0-4579-a997-975535d51dda |
| result     |                                      |
| status     | not_run                              |
| test_name  | all                                  |
| updated_at | None                                 |
+------------+--------------------------------------+
The user can create different test suites based on target roles.  All, management, control, compute,
 cephmon and cephosd.  Only one test will be run at any time.

Example test create commands:
• ciscovim cloud-sanity create test control
o Runs control node tests only
• ciscovim cloud-sanity create test compute
o Runs compute nodes tests only
• ciscovim cloud-sanity create test management
o Runs management node tests only
• ciscovim cloud-sanity create test cephmon
o Runs cephmon tests only
```

```
• ciscovim cloud-sanity create test cephosd
o Runs cephosd tests only
```

The cloud-sanity tests use the disk-maintenance and osd-maintenance tools to assess overall health and status of the RAID disks and OSD status.

**Note** Failures detected in RAID disk health and CEPHOSD operational status can be future evaluated with the disk-maintenance and osd-maintenance tools. See the sections on those tools for information on their use.

**Step 3** The ciscovim cloud-sanity list … command is used to monitor a currently running test or just view all the tests that have been run/completed in the past.

```
# ciscovim cloud-sanity list test all
+--------------------------------------+--------------+----------+----------------------+
| ID                                   | Sanity Check | Status   | Created              |
+--------------------------------------+--------------+----------+----------------------+
| c000ca20-34f0-4579-a997-975535d51dda | all          | Complete | 2018-03-07 15:37:41 |
| 83405cf0-e75a-4ce2-a438-0790cf0a196a | cephmon      | Complete | 2018-03-07 15:52:27 |
| 6beceb00-4029-423b-87d6-5aaf0ce087ff | cephmon      | Complete | 2018-03-07 15:55:01 |
| 2707a2e1-d1b5-4176-8715-8664a86bbf7d | cephosd      | Complete | 2018-03-07 16:11:07 |
| b30e1f49-a9aa-4f90-978a-88ba1f0b5629 | control      | Complete | 2018-03-07 16:14:29 |
| f024ff94-ac3e-4745-ba57-626b58ca766b | compute      | Running  | 2018-03-07 16:16:44 |
+--------------------------------------+--------------+----------+----------------------+

We can filter on cephmon if needed
# ciscovim cloud-sanity list test cephmon
+--------------------------------------+--------------+----------+----------------------+
| ID                                   | Sanity Check | Status   | Created              |
+--------------------------------------+--------------+----------+----------------------+
| 83405cf0-e75a-4ce2-a438-0790cf0a196a | cephmon      | Complete | 2018-03-07 15:52:27 |
| 6beceb00-4029-423b-87d6-5aaf0ce087ff | cephmon      | Complete | 2018-03-07 15:55:01 |
+--------------------------------------+--------------+----------+----------------------+

Example cloud-sanity list commands:
• ciscovim cloud-sanity list control
• ciscovim cloud-sanity list compute
• ciscovim cloud-sanity list management
• ciscovim cloud-sanity list cephmon
• ciscovim cloud-sanity list cephosd
```

**Step 4** This functionality allows you to view the details results of the test-sanity. Cloud-sanity test results can be passed, failed, or skipped. A skipped test is one that is not supported on this particular POD (ex. RAID test is only support with Hardware RAID.) A skipped test does not count to the overall pass/fail status.

```
# ciscovim cloud-sanity show test all --id c000ca20-34f0-4579-a997-975535d51dda
Cloud sanity Results
+------------+-----------------------------------------------------------+---------+
| Role       | Task                                                      | Result  |
+------------+-----------------------------------------------------------+---------+
| Management | Management - Disk Maintenance RAID Health *************** | PASSED  |
|            |                                                           |         |
| Management | Management - Container Version Check ******************** | PASSED  |
|            |                                                           |         |
| Management | Management - Disk Maintenance VD Health ***************** | PASSED  |
|            |                                                           |         |
| Control    | Control - Check RabbitMQ is Running ********************** | PASSED  |
|            |                                                           |         |
| Control    | Control - Check RabbitMQ Cluster Status ***************** | PASSED  |
|            |                                                           |         |
| Control    | Control - Container Version Check *********************** | PASSED  |
|            |                                                           |         |
| Control    | Control - Check MariaDB Cluster Size ******************** | PASSED  |
|            |                                                           |         |
```

```
| Control    | Control - Ping All Controller Nodes ********************** | PASSED  |
|            |                                                             |         |
| Control    | Control - Check Nova Service List ************************ | PASSED  |
|            |                                                             |         |
| Control    | Control - Ping Internal VIP ****************************** | PASSED  |
|            |                                                             |         |
| Control    | Control - Disk Maintenance RAID Health ******************* | PASSED  |
|            |                                                             |         |
| Control    | Control - Disk Maintenance VD Health ********************* | PASSED  |
|            |                                                             |         |
| Compute    | Compute - Check Nova Hypervisor List ********************* | PASSED  |
|            |                                                             |         |
| Compute    | Compute - Disk Maintenance RAID Health ******************* | PASSED  |
|            |                                                             |         |
| Compute    | Compute - Ping All Compute Nodes ************************* | PASSED  |
|            |                                                             |         |
| Compute    | Compute - Container Version Check ************************ | PASSED  |
|            |                                                             |         |
| Compute    | Compute - Disk Maintenance VD Health ********************* | PASSED  |
|            |                                                             |         |
| CephOSD    | CephOSD - Ping All Storage Nodes ************************* | PASSED  |
|            |                                                             |         |
| CephOSD    | CephOSD - Check OSD Result Without OSDinfo *************** | PASSED  |
|            |                                                             |         |
| CephOSD    | CephOSD - OSD Overall Status ***************************** | PASSED  |
|            |                                                             |         |
| CephOSD    | CephOSD - Check OSD Result With OSDinfo ****************** | PASSED  |
|            |                                                             |         |
| CephMon    | CephMon - Check Cephmon Status *************************** | PASSED  |
|            |                                                             |         |
| CephMon    | CephMon - Ceph Cluster Check ***************************** | PASSED  |
|            |                                                             |         |
| CephMon    | CephMon - Check Cephmon Results ************************** | PASSED  |
|            |                                                             |         |
| CephMon    | CephMon - Check Cephmon is Running *********************** | PASSED  |
|            |                                                             |         |
+------------+-------------------------------------------------------------+---------+
[PASSED] Cloud Sanity All Checks Passed
```

**Step 5** To delete the cloud sanity test results run the following command:

```
# ciscovim cloud-sanity delete test all --id c000ca20-34f0-4579-a997-975535d51dda

Perform the action. Continue (Y/N)Y
Delete of UUID c000ca20-34f0-4579-a997-975535d51dda Successful

# ciscovim cloud-sanity list test all
+--------------------------------------+--------------+----------+----------------------+
| ID                                   | Sanity Check | Status   | Created              |
+--------------------------------------+--------------+----------+----------------------+
| 83405cf0-e75a-4ce2-a438-0790cf0a196a | cephmon      | Complete | 2018-03-07 15:52:27 |
| 6beceb00-4029-423b-87d6-5aaf0ce087ff | cephmon      | Complete | 2018-03-07 15:55:01 |
| 2707a2e1-d1b5-4176-8715-8664a86bbf7d | cephosd      | Complete | 2018-03-07 16:11:07 |
| b30e1f49-a9aa-4f90-978a-88ba1f0b5629 | control      | Complete | 2018-03-07 16:14:29 |
| f024ff94-ac3e-4745-ba57-626b58ca766b | compute      | Complete | 2018-03-07 16:16:44 |
+--------------------------------------+--------------+----------+----------------------+
```

The cloud-sanity tests use the disk-maintenance and osd-maintenance tools to assess overall health and status of RAID disks and OSD status.

**Note** Failures detected in RAID disk health and CEPHOSD operational status can be future evaluated with the disk-maintenance and osd-maintenance tools. See the sections on those tools for information on their use.

# Service Catalog URL

The OpenStack Keystone service catalog allows API clients to dynamically discover and navigate to cloud services. Cloudpulse has its own service URL which is added to the Keystone service catalog. You need to send a token request to Keystone to find the service URL of cloudpulse. The token request lists all the catalog of services available.

## Get Token from Keystone

To get the token from keystone run the following commands:

**Resource URI**

| Verb | URI |
|---|---|
| POST | http://<controller_lb_ip>:5000/v2.0/tokens |

**Example**

```
JSON Request
POST / v2.0/tokens
Accept: application/json
{
    "auth": {
        "passwordCredentials":{
                  "username": "admin",
                  "password": "iVP1YciVKoMGId1O"
        }
    }
}

JSON Response
200 OK
Content-Type: application/json
{
  "access": {
    "token": {
      "issued_at": "2017-03-29T09:54:01.000000Z",
      "expires": "2017-03-29T10:54:01Z",
      "id":
"gAAAAABY24Q5TDIqizuGmhOXakV2rIzSvSPQpMAmC7SA2UzUXZQXSH-ME98d3Fp4Fsj16G561a420B4BK0fylcykL22EcO9",
……
……..
}
```

## Get Service Catalog URL for Cloudpulse

**Resource URI**

| Verb | URI |
|---|---|
| GET | http://<controller_ip>:35357/v2.0/endpoints |

**Example**

```
JSON Request
GET /v2.0/endpoints
Accept: application/json

JSON Response
200 OK
Content-Type: application/json
{"endpoints": [
     {"internalurl": "http://<controller>:9999",
      "adminurl": "http://<controller>:9999",
      "publicurl":"http://<controller>:9999"
}]}
}
```

## Cloudpulse APIs

The following are a list of APIs and the corresponding functions that the API performs. The cloudpulse APIs is accessed with the X-Auth-Token which contains the token which is received from the Keystone token generation API mentioned in the preceding panel.

# List of Cloudpulse Tests

To get the list of cloudpulse tests:

**Resource URI**

| Verb | URI |
|---|---|
| GET | http://<controller_ip>:9999/cpulse |

**Example**

```
JSON Request
GET /cpulse
Accept: application/json

JSON Response
200 OK
Content-Type: application/json
{
  "cpulses": [
    {
      "name": "galera_check",
      "state": "success",
      "result":"ActiveNodes:16.0.0.37,16.0.0.17,16.0.0.27",
      "testtype": "periodic",
      "id": 4122,
      "uuid": "a1b52d0a-ca72-448a-8cc0-5bf210438d89"
    }]
}
```

# Get detailed result of 1 test

To get detailed result of the test.

**Resource URI**

| Verb | URI |
|---|---|
| GET | http://<controller_ip>:9999/cpulse/<uuid> |

**Uuid :** uuid of the test

**Example**

```
JSON Request
GET /cpulse/e6d4de91-8311-4343-973b-c507d8806e94
Accept: application/json

JSON Response
200 OK
Content-Type: application/json
{
      "name": "galera_check",
      "state": "success",
      "result":"ActiveNodes:16.0.0.37,16.0.0.17,16.0.0.27",
      "testtype": "periodic",
      "id": 4122,
      "uuid": " e6d4de91-8311-4343-973b-c507d8806e94"
}
```

# Get List of Tests Available

To get a list of available cloudpulse tests:

**Resource URI**

| Verb | URI |
|---|---|
| GET | http://<controller_ip>:9999/cpulse/list_tests |

**Example**

```
JSON Request
GET /cpulse/list_tests
Accept: application/json

JSON Response
200 OK
Content-Type: application/json
{
  "endpoint_scenario":
"all_endpoint_tests\ncinder_endpoint\nglance_endpoint\nkeystone_endpoint\nneutron_endpoint\nnova_endpoint",

  "operator_scenario":
"all_operator_tests\nceph_check\ndocker_check\ngalera_check\nnode_check\nrabbitmq_check"
}
```

# Schedule a manual cloudpulse test:

To schedule a manual test of cloudpulse run the following commands:

**Resource URI**

| Verb | URI |
|---|---|
| POST | http://<controller_ip>:9999/cpulse |

**Example**

```
JSON Request
POST /cpulse
Accept: application/json
{
"name": "galera_check"
}

JSON Response
200 OK
Content-Type: application/json
{
      "name": "galera_check",
      "state": "scheduled",
      "result":"NotYetRun",
      "testtype": "manual",
      "id": 4122,
      "uuid": " e6d4de91-8311-4343-973b-c507d8806e94"
}
```

# Remove the results of a test

To remove the results of a test.

**Resource URI**

| Verb | URI |
|---|---|
| DELETE | http://<controller_ip>:9999/cpulse/<uuid> |

**Uuid :** uuid of the test

**Example**

```
JSON Request
DELETE /cpulse/68ffaae3-9274-46fd-b52f-ba2d039c8654
Accept: application/json

JSON Response
204 No Content
```

# Checking Network Connections

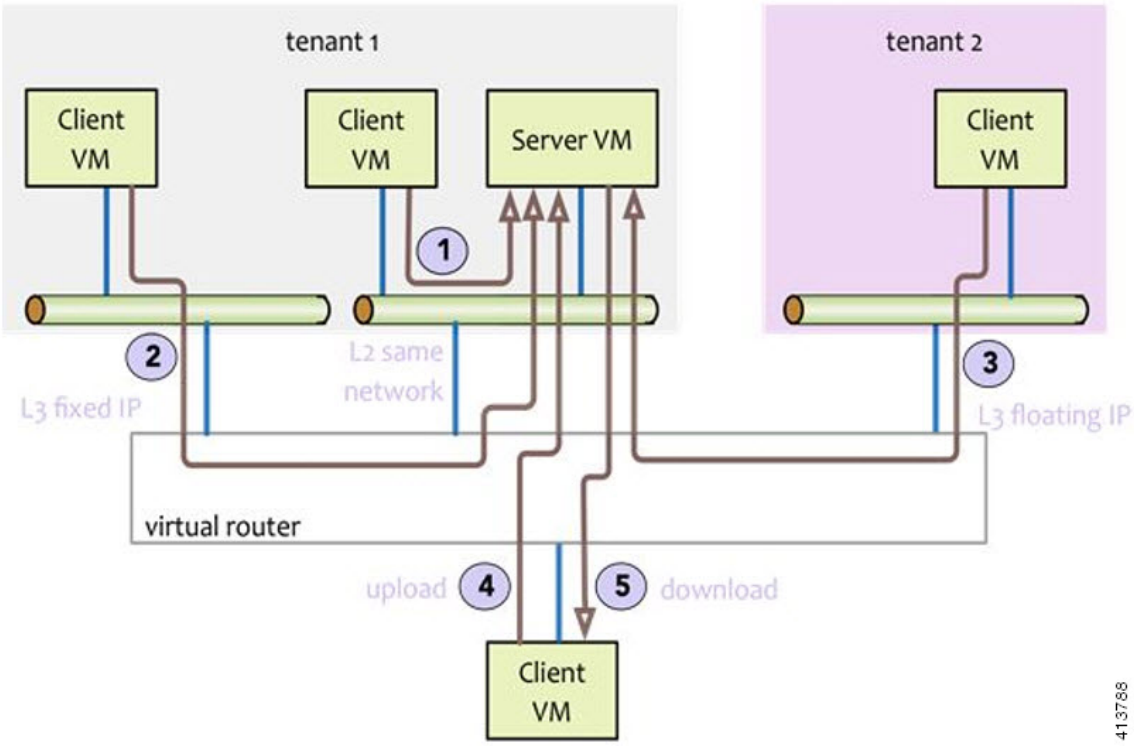
You can use Virtual Machine Through Put (VMTP) to check Layer 2 and Layer 3 data plane traffic between Cisco NFVI compute nodes. VMTP performs ping connectivity, round trip time measurement (latency), and TCP/UDP throughput measurement for the following Cisco NFVI east to west VM-to-VM flows:

- Same network (private fixed IP, flow number 1).
- Different network using fixed IP (same as intra-tenant L3 fixed IP, flow number 2).
- Different network using floating IP and NAT (same as floating IP inter-tenant L3, flow number 3.)
- When an external Linux host is available for testing north to south flows, external host to VM download and upload throughput and latency (L3/floating IP, flow numbers 4 and 5).

The following figure shows the traffic flows VMTP measures. Cloud traffic flows are checked during Cisco VIM installation and can be checked at any later time by entering the following command:

```
$ ciscovim run --perform 8 -y
```

*Figure 1: VMTP Cloud Traffic Monitoring*




# Enabling NFVBench Post Deployment

NFVBench is a data plane performance benchmark tool for NFVI that can be optionally installed after the pod deployment.

NFVBench is used to:

- Verify that the data plane is working properly and efficiently when using well defined packet paths that are typical of NFV service chains.
- Measure the actual performance of your data plane so that you can estimate what VNFs can expect from the infrastructure when it comes to receiving and sending packets.

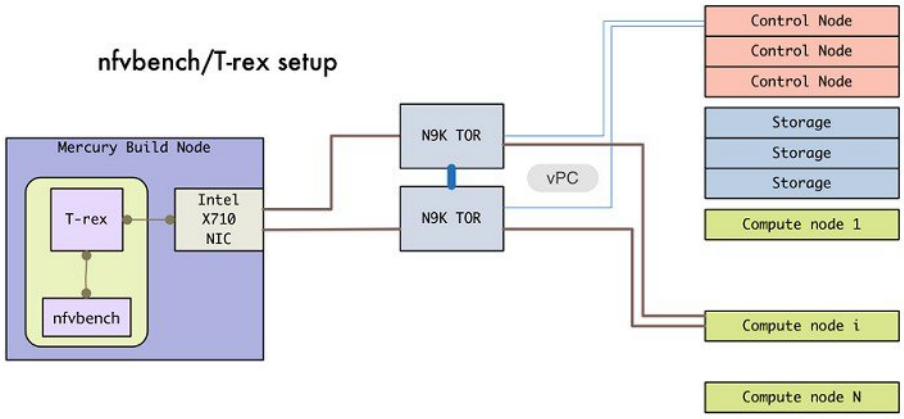
While VMTP only measures VM to VM traffic, NFVBench measures traffic flowing from an integrated software traffic generator (TRex) running on the management node to the ToR switches to test VMs running in compute nodes.

In Cisco VIM, the NFVBench (performance benchmark) is an optional tool. You can deploy NFVBench after the installation of the pod.

### Before you begin

- If you are using Quanta servers, see **Installing the Management Node on the Quanta Servers** section of Cisco *Virtualized Infrastructure Manager Installation Guide*, for the day-0 BIOS setting of the management node.
- An extra 10 GE (Intel X710 NIC) or 40GE (Intel XL710 NIC) or 25G (xxv710 for Quanta Server) must be installed on the management node.
- A TRex traffic generator which uses the DPDK interface to interact with Intel NIC and makes use of hardware, instead of software to generate packets. This approach is more scalable and enables NFVBench to perform tests without software limitations.
- Wire two physical interfaces of the Intel NIC to the TOR switches (as shown in the following figure).

***Figure 2: NFVBench topology setup***




### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | Enable the NFVBench configuration in the setup_data.yaml file. | Sample configuration files for OVS/VLAN or VPP mechanism driver: |

| | Command or Action | Purpose |
|---|---|---|
| | | NFVBENCH:<br>enabled: True # True or False<br>tor_info: {TORa: eth1/42, TORb: eth1/42} # mandatory<br># tor_info: {TOR: 'eth1/42,eth1/43'} # use if there is only one TOR switch<br># nic_ports: 3,4 # Optional input, indicates which 2 of the 4 available ports<br># of 10G Intel NIC on the management node is NFVbench tool using<br># to send and receive traffic.<br><br># Defaults to the first 2 ports of NIC (ports 1 and 2) if not specified.<br># Port number must be between 1 and 4, one port cannot be used twice.<br># nic_slot: <int> # Optional, defaults to 1st set of unbonded pair of NIC ports<br>in an Intel 710 or 520 card the code finds; Via this option, one can choose<br>to run NFVbench via XL710, 520 or X710 card<br># Example:<br># nic_ports: 1,4 # the first and the last port of Intel NIC are used<br># nic_slot: 2 # # Optional, defaults to 1st set of unbonded pair of NIC ports in an<br>Intel 710 or 520 card the code finds; Via this option, one can choose to run NFVbench<br>via XL710, 520 or X710 card<br># nic_slot: Management node slot on which the NFVbench NIC card is anchored off<br># For VTS/VXLAN<br># vteps: "vtep_ip1,vtep_ip2" # Mandatory and needed only for VTS/VXLAN. Specify separated IP pairs in tenant network and not in the tenant pool, reconfigurable<br>#<br># For VXLAN over vxlan-tenant network<br># vteps: "vtep_ip1,vtep_ip2" # Mandatory, specify separated IP pairs in vxlan-tenant network and not in the vxlan-tenant pool, reconfigurable<br># vnis: "vni_id1, vni_id2" # Mandatory, specify the VNI range to be used for all vxlan networks created by NFVbench for benchmarking<br><br>Sample configuration for VTS mechanism driver:<br><br>NFVBENCH:<br>enabled: True # True or False<br>tor_info: {TORa: eth1/42, TORb: eth1/42} # mandatory<br>vtep: "ip1, ip2" # Mandatory and needed only for VTS/VXLAN.<br># Specify any pair of unused VLAN ids to be used<br># for VLAN to VxLAN encapsulation in TOR switch.<br># tor_info: {TOR: 'eth1/42,eth1/43'} # Use if there is only one TOR switch. |

| | Command or Action | Purpose |
|---|---|---|
| | | `# nic_ports: 3,4 # Optional input, indicates which 2 of the 4 available ports`<br>`# of 10G Intel NIC on the management node is NFVbench tool using`<br>`# to send and receive traffic.`<br><br>`# Defaults to the first 2 ports of NIC (ports 1 and 2) if not specified.`<br>`# Port number must be between 1 and 4, one port cannot be used twice.`<br>`# Example:`<br>`# nic_ports: 1,4 # the first and the last port of Intel NIC are used`<br>`# nic_slot: 2 # # Optional, defaults to 1st set of unbonded pair of NIC ports in an Intel 710 or 520 card the code finds; Via this option, one can choose to run NFVbench via XL710 or X710 card`<br><br>`# Note: if nic_ports are defined, then nic_slot has to be defined and vice-versa`<br><br>`VTS_PARAMETERS:`<br>`…`<br>`VTS_DAY0: '<True\|False>'# Required parameter when VTS enabled`<br>`VTS_USERNAME: '<vts_username>'# Required parameter when VTS enabled`<br>`VTS_PASSWORD: '<vts_password>'# Required parameter when VTS enabled`<br>`VTS_NCS_IP: '11.11.11.111'# '<vts_ncs_ip>', mandatory when VTS enabled`<br>`VTC_SSH_USERNAME: 'admin'# '<vtc_ssh_username>', mandatory for NFVbench`<br>`VTC_SSH_PASSWORD: 'my_password'# '<vtc_ssh_password>', mandatory for NFVbench` |
| **Step 2** | Configuring minimal settings of NFVBench: | `# Minimal settings required for NFVbench`<br>`TORSWITCHINFO:`<br>`CONFIGURE_TORS: <True or False> # True if switches should be configured to support NFVbench`<br>`…`<br>`SWITCHDETAILS:`<br>`- hostname: 'TORa' # Hostname matching 'tor_info' switch name.`<br>`username: 'admin' # Login username for switch user.`<br>`password: 'my_password' # Login password for switch user.`<br>`ssh_ip: '172.31.230.123' # SSH IP for switch.`<br><br>`- hostname: 'TORb'`<br>`username: 'admin'`<br>`password: 'my_password'`<br>`ssh_ip: '172.31.230.124'`<br><br>TOR switches will be configured based on information provided in tor_info. Two ports specified by interfaces are configured in trunk mode. It is not required to set 'CONFIGURE_TORS' to 'True', but then manual configuration is necessary. |

| | Command or Action | Purpose |
|---|---|---|
| | | With VTS as mechanism driver additional settings are needed. NFVBench needs access to VTS NCS to perform cleanup after it detaches the traffic generator port from VTS. Also a pair of VTEP VLANs is required for VLAN to VxLAN mapping. Value can be any pair of unused VLAN ID. |
| **Step 3** | Reconfigure Cisco VIM to start or restart the NFVBench container. To reconfigure add necessary configuration to the setup_data.yaml file, run the reconfigure command as follows. | `[root@mgmt1 ~]# cd /root/`<br>`[root@mgmt1 ~]# mkdir MyDir`<br>`[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/`<br>`[root@mgmt1 ~]# cd /root/`<br>`[root@mgmt1 ~]# # update the setup_data to include NFVBENCH section`<br>`[root@mgmt1 ~]# cd /root/MyDir/`<br>`[root@mgmt1 ~]# vi setup_data.yaml`<br>`[root@mgmt1 ~]# cd ~/installer-xxxx`<br>`[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml`<br>After the reconfiguration, you can see that the NFVBench container is up and ready for use. |

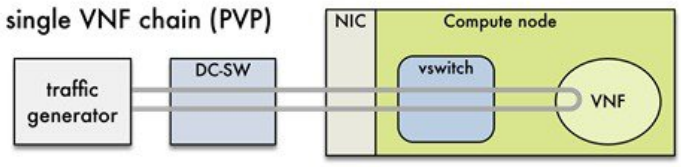
# NFVBench Usage

**Built-in packet paths**

NFVBench can setup and stage three different packet paths.

The default packet path is called **PVP** (Physical - VM - Physical) and represents a typical service chain made of 1 VNF/VM:

***Figure 3: Single VNF chain (PVP)***




The traffic generator runs inside the NFVBench container on the management node. DC-SW represents the top of rack switch(es). The VNF is a test VM that contains a fast L3 router based on FD.io VPP. This VNF image can also be configured to run an L2 forwarder based on DPDK testpmd (both options generally yield roughly similar throughput results).

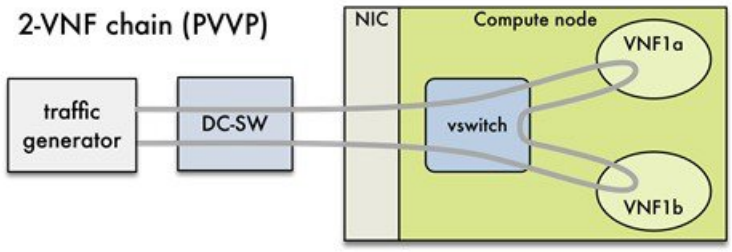
Traffic is made of UDP packets generated on the 2 physical interfaces (making it a bi-directional traffic). Packets are forwarded by the switch to the appropriate compute node before arriving to the virtual switch, then to the VNF before looping back to the traffic generator on the other interface. Proper stitching of the traffic on the switch is performed by NFVbench by using the appropriate mechanism (VLAN tagging for VLAN based deployments, VxLAN VTEP in the case of VTS deployments).

The performance of the PVP packet path provides a very good indication of the capabilities and efficiency of the NFVi data plane in the case of a single service chain made of 1 VNF/VM.

NFVBench also supports more complex service chains made of 2 VM in sequence and called PVVP (Physical-VM-VM-Physical).

In a PVVP packet path, the 2 VMs reside on the same compute node (PVVP intra node).

***Figure 4: 2-VNF chain (PVVP)***




# NFVBench Command-Line Options and Status

You can execute most of the benchmark variants using CLI options from the shell promp on the management node. The common NFVBench command-line options are displayed using the --help option:

```
[root@mgmt1 ~]# nfvbench --help
```

Use the --status option to check the NFVbench version and see if benchmark is running:

```
[root@mgmt1 ~]# nfvbench –status
2018-12-19 20:29:49,656 INFO Version: 3.X.X
2018-12-19 20:29:49,656 INFO Status: idle
2018-12-19 20:29:49,704 INFO Discovering instances nfvbench-loop-vm...
2018-12-19 20:29:50,645 INFO Discovering flavor nfvbench.medium...
2018-12-19 20:29:50,686 INFO Discovering networks...
2018-12-19 20:29:50,828 INFO No matching NFVbench resources found
```

# Using NFVBench Configuration File

More advanced use-cases require passing a yaml NFVbench configuration file. You can get the default NFVbench configuration file by using the -show-default-config option.

Navigate to the host folder mapped to a container `(/root/nfvbench)` and copy the default NFVBench configuration by using the following command:

```
[root@mgmt1 ~]# cd /root/nfvbench
[root@mgmt1 ~]# nfvbench --show-default-config > nfvbench.cfg
```

Edit the configuration file to remove all the properties that are not changed and retain the properties that are required. You can then pass the edited file to NFVbench using the -c option.

Ensure that you use a container visible pathname as this file is read from the container. The `/root/nfvbench` folder on the host is mapped to the `/tmp/nfvbench` folder in the container, so that the configuration file stored under `/root/nfvbench` can be referenced as `/tmp/nfvbench/<file>` in the CLI option.

For example:

```
[root@mgmt1 ~]# nfvbench -c /tmp/nfvbench/nfvbench.cfg
```

# Control Plane Verification

If you are trying NFVbench for the first time, verify that the tool can stage the default packet path properly without sending any traffic.

The --no-traffic option exercises the control plane by creating a single test service chain with one VM, but does not send any traffic.

The following command stages only the default PVP packet path (but does not generate any traffic):

```
[root@mgmt1 ~]# nfvbench --no-traffic
```

# Fixed Rate Run Test

The data plane traffic test is done to generate traffic at a fixed rate for a fixed duration. For example, you can generate a total of 10000 packets per second (which is 5000 packets per second per direction) for the default duration (60 seconds), with the default frame size of 64 bytes using the following configuration:

```
[root@mgmt1 ~]# nfvbench
```

## Packet Sizes

You can specify any list of frame sizes using the -frame-size option (pass as many as desired), including IMIX.

Following is an example, to run a fixed rate with IMIX and 1518 byte frames:

```
[root@mgmt1 ~]# nfvbench --rate 10kpps --frame-size IMIX --frame-size 1518
```

# NDR and PDR Test

NDR and PDR test is used to determine the performance of the data plane in terms of throughput at a given drop rate.

- No Drop Rate(NDR) is the highest throughput achieved while allowing zero packet drop (allows a very low drop rate usually lesser than 0.001%).
- Partial Drop Rate (PDR) is the highest throughput achieved while allowing most at a given drop rate (typically less than 0.1%).

NDR is always less or equal to PDR.

To calculate the NDR and PDR for your pod, run the following command:

```
[root@mgmt1 ~]# nfvbench --rate ndr_pdr
```

# Multi-chain Test

In multi-chain test, each chain represents an independent packet path symbolizing real VNF chain. You can run multiple concurrent chains and better simulate network conditions in real production environment. Results with single chain versus with multiple chains usually vary because of services competing for resources (RAM, CPU, and network).

To stage and measure multiple service chains at the same time, use *--service-chain-count* flag or shorter *-scc* version.

The following example shows how to run the fixed rate run test with ten PVP chains:

```
[root@mgmt1 ~]# nfvbench -scc 10 --rate 100kpps
```

The following example shows how to run the NDR/PDR test with ten PVP chains:

```
[root@mgmt1 ~]# nfvbench -scc 10 --rate ndr_pdr
```

# Multi-Flow Test

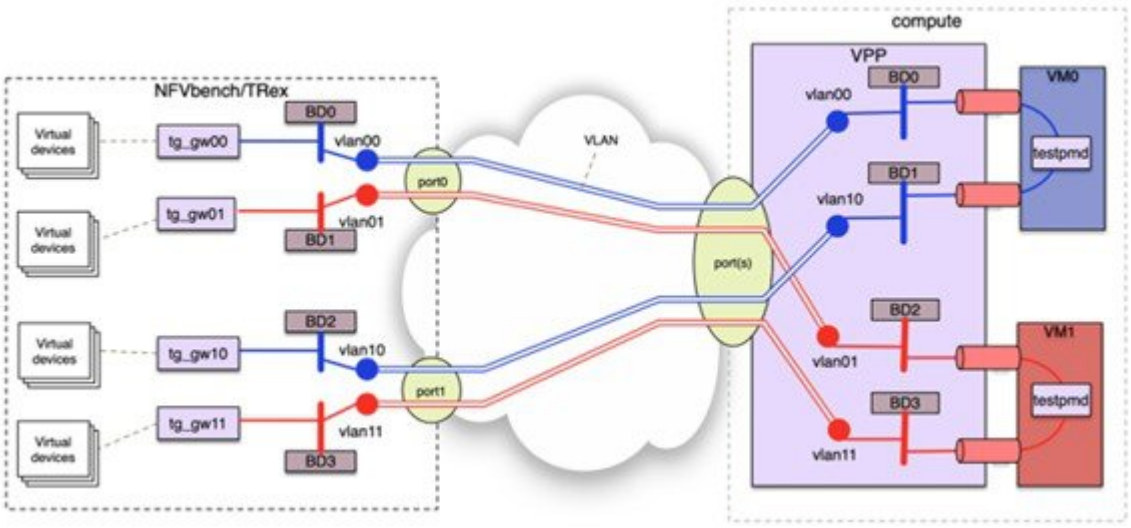
In Multi-flow test, one flow is defined by a source and destination MAC/IP/port tuple in the generated packets. It is possible to have many flows per chain. The maximum number of flows that are supported is in the order of 1 million flows per direction.

The following command runs three chains with a total of 100K flows per direction (for all chains):

```
[root@mgmt1 ~]# nfvbench -scc 3 -fc 100k
```

# Encapsulation

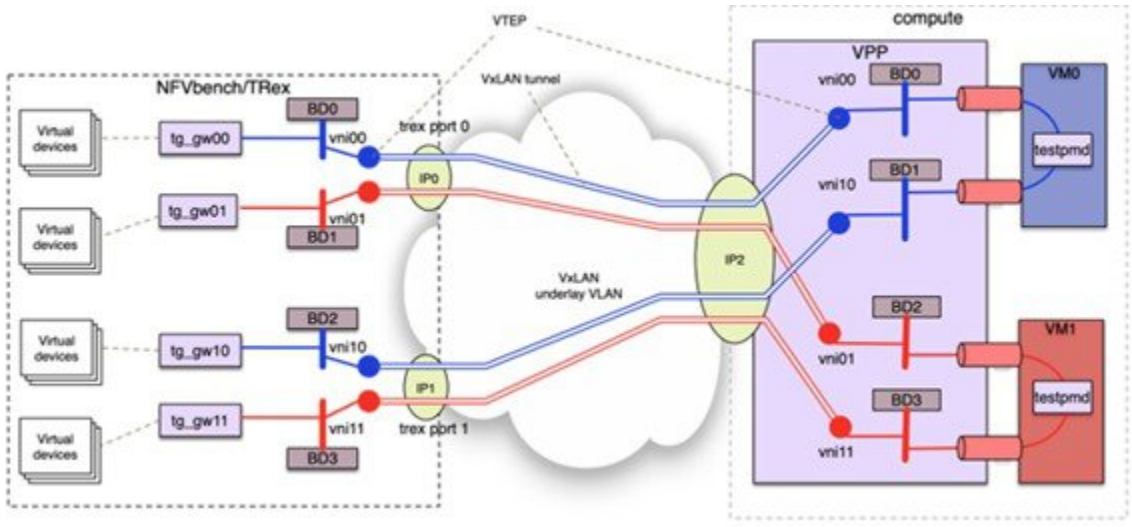
By default, NFVbench uses vlan tagging for the generated traffic and directs the traffic to the vswitch in the target compute node (OVS or VPP). The following diagram illustrates an example of NFVBench execution with two chains using VLAN and when VPP is vswitch.




If VxLAN is enabled, it is possible to force the use of VxLAN using the –vxlan CLI option.

The provision of custom configuration allows you to specify more VxLAN options such as specific VNIs to use. For more details, check the default configuration file.

The following diagram illustrates an example of NFVBench execution with two chains using VxLAN and when VPP is vswitch.




## SR-IOV

If SR-IOV is deployed, NFVbench can support to send the traffic to the test VMs that use SR-IOV instead of vswitch.

To test SR-IOV, you must have compute nodes configured to support one or more SR-IOV interfaces (also knows as PF or physical function) and OpenStack to support SR-IOV.

You need to know:

- The name of the physical networks associated with the SR-IOV interfaces (this is a configuration in Nova compute).
- The VLAN range that can be used on the switch ports that are wired to the SR-IOV ports. Such switch ports are normally configured in trunk mode with a range of VLAN ids enabled on that port.

For example, if two SR-IOV ports exist per compute node, two physical networks are generally configured in OpenStack with a distinct name.

The VLAN range to use is is also allocated and reserved by the network administrator and in coordination with the corresponding top of rack switch port configuration.

To enable SR-IOV test, you must provide the following configuration options to NFVbench in the configuration file.

This example instructs NFVbench to create the left and right networks of a PVP packet flow to run on two SRIOV ports named "phys_sriov0" and "phys_sriov1" using resp. segmentation_id 2000 and 2001:

```
sriov: true
internal_networks:
       left:
           segmentation_id: 2000
           physical_network: phys_sriov0
       right:
           segmentation_id: 2001
           physical_network: phys_sriov1
```

The segmentation ID fields must be different.

In case of PVVP, the middle network must be provisioned properly. The same physical network can also be shared by the virtual networks, but with different segmentation IDs.

# External Chain Test

NFVBench measures the performance of chains that are pre-staged (using any means external to NFVBench). These chains can be real VNFs with L3 routing capabilities or L2 forwarding chains.

The external chain test is used when you want to use NFVBench only for traffic generation. In this case, NFVBench sends traffic from traffic generator and reports results without performing any staging or configuration.

Ensure that the setup is staged externally prior to running NFVbench by creating networks and VMs with a configuration that allows generated traffic to pass. You need to provide the name of the two edge neutron networks to which the traffic generators are to be attached, during configuration so that NFVbench can discover the associated segementation ID (VLAN or VNI).

If the external chains support only L2 forwarding, the NFVBench configuration must specify the destination MAC to use in each direction for each chain

If the external chains support IPv4 routing, the NFVBench configuration must specify the public IP addresses of the service chain end points (gateway IP) that are used to discover destination MAC using ARP.

To measure performance for external chains, use the *--service-chain EXT* (or *-sc EXT*) option:

```
[root@mgmt1 ~]# nfvbench -sc EXT
```

# NFVBench Results

You can store the NFVBench detailed results in JSON format using the below command, if you pass the --json option with a destination file name or the --std-json option with a destination folder pathname to use the standard file name generated by NFVBench.

```
[root@mgmt1 ~]# nfvbench -scc 3 -fc 10 -fs 64 --json /tmp/nfvbench/my.json
```

The above command stores the results in JSON file in `/tmp/nfvbench` container directory, which is mapped to the host `~/nfvbench` directory. The first file is named as my.json.

## Examples of NFVIBench Result Execution

### VLAN Fixed Rate

The following example shows the generation of the default frame size (64B) over 100Kpps for the default duration (60s) with the default chain type (PVP), default chain count (1) and default flow count (10k):

```
# nfvbench -rate 100kpps -fs IMIX
```

The summary of NFVBench result is shown below:

```
Date: 2018-12-19 21:26:26
NFVBench version 3.0.4.dev2
Openstack Neutron:
  vSwitch: VPP
  Encapsulation: VLAN
Benchmarks:
> Networks:
  > Components:
```

```
  > Traffic Generator:
      Profile: trex-local
      Tool: TRex
  > Versions:
    > Traffic_Generator:
        build_date: Nov 13 2017
        version: v2.32
        built_by: hhaim
        mode: STL
        build_time: 10:58:17
    > VPP: 18.07
    > CiscoVIM: 2.4.3-15536
> Service chain:
  > PVP:
    > Traffic:
        Profile: custom_traffic_profile
        Bidirectional: True
        Flow count: 10000
        Service chains count: 1
        Compute nodes: [u'nova:c45-compute-2']
```

The following NFVBench Result Execution Summary table provides the drop rate measured (in this example no drops) and latency measurements in micro-seconds (time for a packet to be sent on one port and receive back on the other port)

***Table 2: NFVBench Result Execution Summary***

| L2 Frame Size | Drop Rate | Avg Latency (usec) | Min Latency (usec) | Max Latency (usec) |
|---|---|---|---|---|
| IMIX | 0.0000% | 28 | 20 | 330 |

The following NFVBench Result Configuration table provides the mode details for both forward and reverse directions, where:

- Requested TX Rate is the rate that is requested in bps and pps.
- Actual TX Rate is the actual rate achieved by the traffic generator. It can be lower than the requested rate if there is not enough CPU.
- RX Rate is the rate of packets received.

***Table 3: NFVBench Result Configuration***

| Direction | Requested TX Rate (bps) | Actual TX Rate (bps) | RX Rate (bps) | Requested TX Rate (pps) | Actual TX Rate (pps) | RX Rate (pps) |
|---|---|---|---|---|---|---|
| \| Forward | 152.7333 Mbps | 152.7334 Mbps | 152.7344 Mbps | 50,000 pps | 50,000 pps | 50,000 pps |
| Reverse | 152.7333 Mbps | 152.7334 Mbps | 152.7344 Mbps | 50,000 pps | 50,000 pps | 50,000 pps |
| Total | 305.4667 Mbps | 305.4668 Mbps | 305.4688 Mbps | 100,000 pps | 100,000 pps | 100,000 pps |

The Forward and Reverse Chain Packet Counters and Latency table shows the number of packets sent or received at different hops in the packet path, where:

- TRex.TX.p0 or p1 shows the number of packets sent from each port by the traffic generator.
- Vpp.RX.vlan.<id> shows the number of packets received on the VLAN subinterface with VLAN id <id> in the VPP vswitch.
- Vpp.TX.veth/<id> shows the number of packets sent to the VM.
- Vpp.RX.veth/<id> shows the number of packets received from the VM.

***Table 4: Forward Chain Packet Counters and Latency***

| Chain | TRex.TX.p0 | \| vppRXvlan1547 | vppTXveth2 | \| vppRXveth1 | vppTXvlan1511 | \| TRex.RX.p1 | Avg Lat. | Min lat. | Max lat |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 3,000,001 | => | => | => | => | 3,000,001 | 28 usec | 20 usec | 320 usec |

***Table 5: Reverse Chain Packet Counters and Latency***

| Chain | TRex.TX.p1 | \| vppRXvlan1511 | vppTXveth1 | vppRXveth2 | vppTXvlan1547 | \| TRex.RX.p0 | Avg Lat. | Min lat. | Max lat |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 3,000,001 | => | => | => | => | 3,000,001 | 28 usec | 20 usec | 330 usec |

**Note** '=>' indicates that no packets are dropped. Otherwise the value will indicate the number of packets dropped.

### VLAN NDR/PDR

Use the following command to meassure NDR and PDR for IMIX, with the default chain type (PVP), default chain count (1) and default flow count (10k):

```
# nfvbench -fs IMIX
```

The summary of the NFVBench result execution is shown below:

```
Date: 2018-12-20 23:11:01
NFVBench version 3.0.5.dev2
Openstack Neutron:
  vSwitch: VPP
  Encapsulation: VLAN
Benchmarks:
> Networks:
  > Components:
    > Traffic Generator:
        Profile: trex-local
        Tool: TRex
    > Versions:
      > Traffic_Generator:
          build_date: Nov 13 2017
          version: v2.32
          built_by: hhaim
          mode: STL
          build_time: 10:58:17
      > VPP: 18.07
      > CiscoVIM: 2.3.46-17358
```

```
> Measurement Parameters:
    NDR: 0.001
    PDR: 0.1
> Service chain:
  > PVP:
    > Traffic:
        Profile: custom_traffic_profile
        Bidirectional: True
        Flow count: 10000
        Service chains count: 1
        Compute nodes: [u'nova:a22-mchester-micro-3']
```

The NFVBench Result Execution Summary table shows the following:

- L2 frame size
- Highest throughput achieved in bps and pps below the drop rate thresholds being the sum of TX for both ports.
- Drop rate measured
- Latency measured (average, min, max)

***Table 6: NFVBench Result Execution Summary***

| | L2 Frame Size | Rate (fwd+rev) in Gbps | Rate (fwd+rev) in pps | Avg Drop Rate | Avg Latency (usec) | Min Latency (usec) | Max Latency (usec) |
|---|---|---|---|---|---|---|---|
| NDR | IMIX | 8.5352 | 2,794,136 | \| 0.0000% | 124 | 10 | 245 |
| PDR | IMIX | 9.5703 | 3,133,012 | 0.0680% | 167 | 10 | 259 |

### VXLAN Fixed Rate

It is applicable for platforms that support VxLAN only

**Example 1:**

In this example, default frame size of 64B is sent over 1Mpps on two chains using VxLAN with flow count of 10k:

```
# nfvbench --duration 10 -scc 2 --rate 1Mpps --vxlan
```

The summary of the NFVBench Result is shown below:

```
2018-12-20 23:28:24,715 INFO --duration 10 -scc 2 --rate 1Mpps --vxlan
2018-12-20 23:28:24,716 INFO VxLAN: vlan_tagging forced to False (inner VLAN tagging must
be disabled)
2018-12-20 23:28:24,716 INFO Using default VxLAN segmentation_id 5034 for middle internal
network
2018-12-20 23:28:24,716 INFO Using default VxLAN segmentation_id 5017 for right internal
network
2018-12-20 23:28:24,716 INFO Using default VxLAN segmentation_id 5000 for left internal
network
```

**Example 2:**

In this example, VxLAN benchmark is ran and 64B frames are sent over 100kpps for the default duration.

```
# nfvbench -rate 100kpps --vxlan

2018-12-18 19:25:31,056 INFO VxLAN: vlan_tagging forced to False (inner VLAN tagging must
be disabled)
2018-12-18 19:25:31,056 INFO Using default VxLAN segmentation_id 5034 for middle internal
network
2018-12-18 19:25:31,056 INFO Using default VxLAN segmentation_id 5017 for right internal
network
2018-12-18 19:25:31,056 INFO Using default VxLAN segmentation_id 5000 for left internal
network
```

The NFVBench result summary is as follows:

```
Date: 2018-12-18 19:26:40
NFVBench version 3.0.5.dev2
Openstack Neutron:
  vSwitch: VPP
  Encapsulation: VxLAN
Benchmarks:
> Networks:
  > Components:
    > Traffic Generator:
        Profile: trex-local
        Tool: TRex
    > Versions:
      > Traffic_Generator:
          build_date: Nov 13 2017
          version: v2.32
          built_by: hhaim
          mode: STL
          build_time: 10:58:17
      > VPP: 18.07
      > CiscoVIM: 2.3.46-17358
  > Service chain:
    > PVP:
      > Traffic:
          Profile: traffic_profile_64B
          Bidirectional: True
          Flow count: 10000
          Service chains count: 1
          Compute nodes: [u'nova:a22-mchester-micro-1']
```

***Table 7: NFVBench Result Summary***

| L2 Frame Size | Drop Rate | Avg Latency (usec) | Min Latency (usec) | Max Latency (usec) |
|---|---|---|---|---|
| 64 | \| 0.0000% | 0 | nan | 0 |

***Table 8: NFVBench Result Configuration***

| Direction | Requested TX Rate (bps) | Actual TX Rate (bps) | RX Rate (bps | Requested TX Rate (pps) | Actual TX Rate (pps) | RX Rate (pps) |
|---|---|---|---|---|---|---|
| Forward | 33.6000 Mbps | 33.6000 Mbps | 33.6000 Mbps | 50,000 pps | 50,000 pps | 50,000 pps |
| Reverse | 33.6000 Mbps | 33.6000 Mbps | 33.6000 Mbps | 50,000 pps | 50,000 pps | 50,000 pps |
| Total | 67.2000 Mbps | 67.2000 Mbps | 67.2000 Mbps | 100,000 pps | 100,000 pps | 100,000 pps |

*Table 9: Forward Chain Packet Counters and Latency*

| Chain | TRex.TX.p0 | vpp.RX.vxlan_tunnel0 | vpp.TX.veth/0 | vpp.RX.veth/1 | vpp.TX.vxlan_tunnel1 | TRex.RX.p1 |
|---|---|---|---|---|---|---|
| 0 | 50,000 | => | => | => | => | 50,000 |

*Table 10: Reverse Chain Packet Counters and Latency*

| Chain | TRex.TX.p1 | vpp.RX.vxlan_tunnel1 | vpp.TX.veth/1 | vpp.RX.veth/0 | vpp.TX.vxlan_tunnel0 | TRex.RX.p0 |
|---|---|---|---|---|---|---|
| 0 | 50,000 | => | => | => | => | 50,000 |

# Cisco VIM CLI

An alternate way to NFVBench CLI is to use ciscovimclient. Ciscovimclient is meant to provide an interface that is more consistent with the CiscoVIM CLI and can run remotely while the NFVBench CLI is executed on the management node.

Pass JSON configuration matching structure of the NFVBench config file to start a test:

```
[root@mgmt1 ~]# ciscovim nfvbench --config '{"rate": "10kpps"}
+------------------+--------------------------------------+
| Name             | Value                                |
+------------------+--------------------------------------+
| status           | not_run                              |
| nfvbench_request | {"rate": "5kpps"}                    |
| uuid             | 0f131259-d20f-420f-840d-363bdcc26eb9 |
| created_at       | 2017-06-26T18:15:24.228637           |
+------------------+--------------------------------------+
```

Run the following command with the returned UUID to poll status:

```
[root@mgmt1 ~]# ciscovim nfvbench --stat  0f131259-d20f-420f-840d-363bdcc26eb9
+------------------+--------------------------------------+
| Name             | Value                                |
+------------------+--------------------------------------+
| status           | nfvbench_running                     |
| nfvbench_request | {"rate": "5kpps"}                    |
| uuid             | 0f131259-d20f-420f-840d-363bdcc26eb9 |
| created_at       | 2017-06-26T18:15:24.228637           |
| updated_at       | 2017-06-26T18:15:32.385080           |
+------------------+--------------------------------------+

+------------------+--------------------------------------+
| Name             | Value                                |
+------------------+--------------------------------------+
| status           | nfvbench_completed                   |
| nfvbench_request | {"rate": "5kpps"}                    |
| uuid             | 0f131259-d20f-420f-840d-363bdcc26eb9 |
| created_at       | 2017-06-26T18:15:24.228637           |
| updated_at       | 2017-06-26T18:18:32.045616           |
+------------------+--------------------------------------+
```

When the test is done, retrieve results in a JSON format:

```
[root@mgmt1 ~]# ciscovim nfvbench --json 0f131259-d20f-420f-840d-363bdcc26eb9
{"status": "PROCESSED", "message": {"date": "2017-06-26 11:15:37", …}}
```

## NFVBench REST Interface

When enabled, the NFVBench container can also take benchmark request from a local REST interface. Access is only local to the management node in the current Cisco VIM version (that is the REST client must run on the management node).

Details on the REST interface calls can be found in Chapter 2, Cisco VIM REST API Resources.

# Enabling or Disabling Autobackup of Management Node

Cisco VIM supports the backup and recovery of the management node. By default, the feature is enabled. Auto snapshot of the management node happens during pod management operation. You can disable the auto backup of the management node.

To enable or disable the management node, update the setup_data.yaml file as follows:

```
# AutoBackup Configuration
# Default is True
#autobackup: <True or False>
```

Take a backup of **setupdata** file and update it manually with the configuration details by running the following command:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/
[root@mgmt1 ~]# # update the setup_data to change autobackup
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Forwarding ELK logs to External Syslog Server

Cisco VIM supports backup and recovery of the management node. To keep the process predictable and to avoid loss of logs, the software supports the capability of forwarding the ELK logs to multiple external syslog servers (Minimum 1 and Maximum 3). The capability is introduced to enable this feature after the pod is up and running, with Cisco VIM, through the reconfigure option.

The Syslog Export reconfigure option supports the following options:

- Enable forwarding of ELK logs to External Syslog Server on a pod that is already up and running.
- Reconfigure existing External Syslog Setting to point to a different syslog cluster.

The following section needs to be configured in the setup_data.yaml file.

```
###################################
## SYSLOG EXPORT SETTINGS
###################################
SYSLOG_EXPORT_SETTINGS:
  -
    remote_host: <Syslog_ipv4_or_v6_addr> # requiredIP address of the remote syslog
    server protocol : udp # defaults to udp
    facility : <string> # required; possible values local[0-7]or user
```

```
    severity : <string; suggested value: debug>
    port : <int>; # defaults, port number to 514
    clients : 'ELK' # defaults and restricted to ELK;

remote_host: <Syslog_ipv4_or_v6_addr> #
  required
  protocol : udp # defaults to udp
  facility : <string> # required; possible values local[0-7]or user
  severity : <string; suggested value: debug>
  port : <int>; # defaults, port number to 514
                          clients : 'ELK' # defaults and restricted to ELK;
```

Take a backup of the setupdata file and update the file manually with the configuration listed in the preceeding section. Then run the reconfiguration command as follows:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/
[root@mgmt1 ~]# # update the setup_data to include Syslog Export info
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

With this configuration, you should now be able to use export ELK logs to an external syslog server. On the remote host, verify if the logs are forwarded from the management node.

# Adding and Reconfiguring VIM Administrators

Cisco VIM supports management of the VIM Administrators.VIM administrator has the permission to log in to the management node through SSH or the console using the configured password. By configuring to one VIM admin account, administrators do not have to share credentials. Administrators have individual accountability.

To enable one or more VIM administrators, perform the following steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configurations listed as,

```
vim_admins:
- vim_admin_username: <username>
  vim_admin_password_hash: <sha512-password-hash>
- vim_admin_username: <username>
  vim_admin_password_hash: <sha512-password-hash>
- vim_admin_username: <username>
  vim_admin_password_hash: <sha512-password-hash>

The value of password hash must be in the standard sha512 format. # To generate the hash
admin_password_hash should be the output from on the management node
#  python -c "import crypt; print crypt.crypt('<plaintext password>')"
```

**Step 2** Run the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to include vim_admin info
[root@mgmt1 ~]# cd /root/MyDir/
```

```
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

**Note** Cisco VIM administrators can manage their own passwords using the Linux passwd command. You can add or remove Cisco VIM administrator through the reconfigure option, while the passwords for their existing accounts remain unchanged.

# Adding Read-Only OpenStack Role

By default, Cisco VIM's deployment of OpenStack supports two roles: admin and user. The admin can view and change all OpenStack resources including system and project resources. The user can view and change only the project resources.

Cisco VIM, optionally provides OpenStack user role, which is the read-only administrator or **readonly**. The read-only user can view project resources, but cannot make any changes.

To enable read-only OpenStack role and create read-only OpenStack administrator, perform the following steps

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration given below:

```
ENABLE_READONLY_ROLE: True
```

**Step 2** Enable the OpenStack user role, by executing the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to include vim_admin info
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

When the feature is enabled, an OpenStack administrator can create new user accounts that will have the special privileges of a Read-Only user.

**Step 3** From the management node, load the OpenStack authentication variables:

```
[root@management-server-cisco ~]# source ~/openstack-configs/openrc
```

**Step 4** Create a new user account with a strong password.

```
[root@management-server-cisco images]# openstack user create --password-prompt reader
User Password:
Repeat User Password:
+----------+----------------------------------+
| Field    | Value                            |
+----------+----------------------------------+
```

```
| email    | None                             |
| enabled  | True                             |
| id       | e2f484de1e7d4faa9c9de2446ba8c3de |
| name     | reader                           |
| username | reader                           |
+----------+----------------------------------+
```

**Step 5** Assign the project and role to that user account:

```
[root@management-server-cisco images]# openstack role add --project admin --user reader
readonly
+-----------+----------------------------------+
| Field     | Value                            |
+-----------+----------------------------------+
| domain_id | None                             |
| id        | ed2fb5b2c88e4241918573624090174b |
| name      | readonly                         |
+-----------+----------------------------------+
```

Alternatively, the OpenStack admin logged into the Horizon dashboard can perform the above steps. The actions corresponding to the CLI commands can be done on the Identity/Users panel in the dashboard.

The OpenStack read-only user can:

- Access the project and identity dashboards, but not the admin dashboard.
- View all the project resources, but cannot make any changes to them.

**Note** If the ENABLE_READONLY_ROLE is False (the default value), the readonly role will have no special permissions or restrictions. It has create, update, and delete permissions to project resources, similar to that of the project member. You need to assign users to the role of readonly, when ENABLE_READONLY_ROLE is set to True.

# Reconfiguration of Proxy Post Install

During post-install you can update the http/https proxy server information that is listed in NETWORKING section of the setup_data.yaml.

To update the proxy in the post-VIM install follow these steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
http_proxy_server: <a.b.c.d:port> # optional, needed if install is through internet, and the pod is
 behind a proxy
and/or
https_proxy_server: <a.b.c.d:port> # optional, needed if install is through internet, and the pod is
 behind a proxy
```

**Step 2** Run the following command to reconfigure:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to update the proxy info
```

```
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Reconfiguring Sever KVM Console Password Post Install

You need the reconfigure option to reset the KVM console password for the servers, if the administrator forgets the KVM console password post cloud installation. The risk of forgetting the password leads to the failure of SSH connectivity to the server and the option of debugging through KVM console.

During post-install, you can update the admin_password_hash information that is listed in COBBLER section of the setup_data.yaml.

To update the password post-install, follow the below steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
COBBLER:
       admin_password_hash: <$6…> # <Please generate the admin pwd hash via the command below; verify
 the output starts with $6>
 # execute the following on the management node to get the admin_password_hash
       # python -c 'import crypt; print crypt.crypt("<plaintext_strong_password>")'
```

**Step 2** Run the following reconfiguration command:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to update the proxy info [root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Enabling Head-End Replication Option

For the releases Cisco VIM 2.4.9 and later, the multi-VXLAN EVPN based design optionally supports the static implementation of VXLAN technology using head-end replication (HER). HER helps leverage the VXLAN technology, regardless of the hardware or software limitation of the VXLAN feature set at the remote end of the VTEP tunnel.

With the static information defined in the HER`setup_data`, VPP performs the head-end replication to all defined remote VTEPs and the Layer-2 Forwarding Information Base (L2FIB) MAC-IP table is populated based on flood and learn. When EVPN coexists with HER, Cisco VIM considers them as two different sets of BGP speakers each giving the information which ends up in the same etcd FIB table.

In Cisco VIM, the EVPN acts as the primary mechanism and HER as the fallback methodology. You can add or remove HER to or from an existing EVPN pod through Cisco VIM reconfigure option.

Following are the assumptions for the HER feature:

- VNIs can be allowed in the range of 1 to 65535.
- VNIs can be repeated across two or more remote POD VTEPs for HA.
- VNIs cannot be repeated for the same remote POD VTEP.
- Within the same network segment, no remote POD VTEPs IP address can be repeated.

**Step 1** Ensure that multi-VXLAN feature exists in day-0 configuration of the setup_data. Add a new section called head-end-replication under the NETWORK_OPTIONS -> vxlan -> vxlan-ecn and vxlan-tenant sections.

```
NETWORK_OPTIONS:
  vxlan:
  vxlan-tenant:
  head_end_replication: # Optional and reconfigurable
     -  vtep_ips: vni_id1:vni_id2, vni_id3, … (upto as many remote POD vteps as required)

  vxlan-ecn:
  head_end_replication: # Optional and reconfigurable
       - vtep_ips: vni_id1:vni_id2, vni_id3, … (upto as many remote POD vteps as required)

Update all compute nodes with vtep_ip information under the SERVERS section:
SERVERS:
  Compute1:
    …
For head-end-replication option, define vtep_ips on all servers that act as control and compute nodes

# vtep_ips: {vxlan-tenant: <ip address>, vxlan-ecn: <ip address>} # These IPs must belong to the
              associated IP pool of vxlan-tenant and vxlan-ecn networks, and must match the existing

              assigned vtep_ip for EVPN as they are brought in as part of reconfiguration.
```

**Step 2** To determine the respective vtep_ip on a per segment and server basis, run the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

[root@mgmt1 ~]# cd /root/installer-<x.y.z>/tools
[root@mgmt1 ~]#./vtep_ip_server_mapping.py
# Update the setup_data to include the HER section and vtep_ip corresponding to the network segment
 for the respective servers


[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Enabling Layer BGP Adjacency Between Controllers and Peering Route Reflector

From release Cisco VIM 2.4.9 onwards, the Layer 2 or Layer 3 BGP adjacency with the peering route-reflector is supported.

**Note** For releases prior to Cisco VIM 2.4.9, only Layer 2 BGP adjacency is supported.

Following are the assumptions made to move a pod from a Layer 2 BGP adjacency to that of Layer 3:

- The controllers with the bgp_speaker_addresses peer with the route-reflector over Layer 3.
- This option is only available when vxlan is enabled as NETWORK_OPTIONS.
- Every vxlan segment (vxlan-ecn and vxlan-tenant) will have its own IPs.
- IPs are picked up from management subnet, but they do not belong in the management pool.
- Switching from Layer 2 to Layer 3 peering is only supported, but not vice-versa.
- Once enabled, the only way to change the bgm_mgmt_address is through a replace controller.

**Step 1** Update all controller nodes with bgp_mgmt_address where the IPs reside in the management subnet, but not in the management IP pool.

**Note**
- VXLAN feature must exists in day-0 configuration of the setup_data.
- One unique IP must be available per VXLAN segment.

```
SERVERS:
  Control1:
    …
# bgp_mgmt_address: {vxlan-tenant: <ip address>, vxlan-ecn: <ip address>} # These IPs must belong to
 the
                           management segment, but not in the management IP pool.
```

**Step 2** Run the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to include HER section and vtep_ips info
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Enabling Custom Policy for VNF Manager Post Install

During the post-installation of a cloud, Cisco VIM helps to enable a VNF Manager (such as ESC) to operate and manage tenant VMs in the OpenStack cloud, with additional privileged features.

Following are the steps to enable the custom policy for VNF Manager:

**Step 1** Take a backup of the setupdata file and update the file manually with the configurations listed as,

```
ENABLE_ESC_PROV: True
```

**Step 2** Run the following commands to reconfigure:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update the setup_data to update the proxy info
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Migrate SRIOV from 2-X520 to 2-XL710 in a VIC/NIC POD

To use this feature, ensure that both the card types are available on the SRIOV compute nodes of the pod and with one of the card type participating in SRIOV as part of installation, and then execute the following steps:

### Before you begin

In Cisco VIM, you can redeploy the SRIOV ports between 2-X520 and 2-XL710, in a Cisco VIM pod where the control and data plane are running OFF Cisco VIC. This is driven through an optional parameter SRIOV_CARD_TYPE listed in the setup_data.yaml.

It is assumed that all computes participating in SRIOV has two sets of card types. Reconfiguration fails if the card type with a total of 4 ports is not available. Cisco recommends you to have two of each of the card type inserted on a per-compute basis, so that the correct network ports from the target network cards are picked by the orchestrator. However, if the SRIOV_CARD_TYPE is present during the fresh install or during add compute, the SRIOV_CARD_TYPE parameter is given preference for the target/configured card type.

You can define the SRIOV_CARD_TYPE at a per-compute level, to override the global definition. This option allows some computes to run with XL-710, while others to run with X-520 for SRIOV ports. It should be noted that computes without SRIOV can co-exist in this pod.

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
SRIOV_CARD_TYPE: <X520 or XL710>
and/or update the hardware_info at a per compute level (see example below)
compute-xx:
```

```
hardware_info: {SRIOV_CARD_TYPE: <XL710 or X520>}
```

**Step 2** Run the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/
[root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/
# update the setup_data to include the target SRIOV card type
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml
[root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Augmenting Cisco VIM M4 VIC/(10/40G) NIC pods with M5-based 40G VIC/NIC Computes

From release Cisco VIM 2.4.9 onwards, the augmentation of an existing M4 VIC/NIC based pod (some computes have X520, while others have XL710 for SRIOV), with the M5-based VIC/NIC (40G) computes is supported. To use this augmentation feature, you must define the SRIOV_CARD_TYPE at a per compute level (default is X520).

You can add M5-based 40G VIC/NIC computes into the pod in the following scenarios:

**Use Case 1:** If you run a pod with M4-based computes having only X520 cards, execute the reconfiguration operation and define the SRIOV_CARD_TYPE as XL710 under the hardware_info section of the target compute, to add the compute of M5 with 40G Cisco VIC and two XL710 cards,.

**Use Case 2:** If you run the pod with M4-based VIC/NIC computes having XL710 cards, execute the add compute operation and define the SRIOV_CARD_TYPE as XL710 for the target compute, to add M5-based compute nodes with XL710 cards.

**Note** The following steps 1 through 3 are not applicable for Use Case 2, and you can directly add/remove compute when required.

### Before you begin

Identify if the pod has M4 computes running with two XL710 or not, that is, whether the pod is running with **Use Case 1** or **Use Case 2**.

**Step 1** If the pod is running with **Use Case 1**, execute the following command:

```
# ciscovim reconfigure
```

**Step 2** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
Update the hardware_info at a per compute level (see example below)
```

```
compute-xx:
hardware_info: {SRIOV_CARD_TYPE: <XL710 or X520>}
```

**Step 3** Run the following reconfiguration commands:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/ # update the setup_data to
include the target SRIOV card type [root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim --setupfile /root/MyDir/setup_data.yaml add-computes <m5compute1, …>
```

# Adding and Reconfiguring VIM Administrators Authenticated with External LDAP Server

Cisco VIM supports management of the VIM administrators whose access to the management node can be authenticated through an external LDAP server. For the users to obtain sudo access, you need to manually add the root user or any user with root privileges to the wheel group in the external LDAP server. Also, you must enable the pod with external TLS. To enable VIM administrators with LDAP authentication, perform the following steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
vim_ldap_admins:
  - domain_name: corp_ldap1
    ldap_uri: "ldaps://10.30.116.253:636,ldaps://10.30.116.254:636"
    ldap_search_base: "dc=cisco,dc=com"
    ldap_schema: rfc2307  # Optional
    ldap_user_object_class: posixAccount  # Optional
    ldap_user_uid_number: uidNumber       # Optional
    ldap_user_gid_number: gidNumber       # Optional
    ldap_group_member: memberUid          # Optional
```

**Note** Multiple entries of the LDAP domain are allowed. For each entry, only domain_name and ldap_uri info are mandatory. Ensure that the ldap_uri is secured over ldaps. As part of reconfiguration, you can add new domain_name, but cannot change the domain_name once it is configured.

.

**Step 2** To reconfigure the VIM administrator, run the following commands:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update/include the vim_ldap_admin in the setup_data
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Hosting Horizon through NAT/DNS Alias

Cisco VIM supports hosting of the Horizon dashboard through NAT or with a DNS alias.

To host Horizon, perform the following steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
HORIZON_ALLOWED_HOSTS:
  - <NAT_IP1>
  - <NAT_IP2>
```

**Step 2** Run the following commands for reconfiguration:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update/include the vim_ldap_admin in the setup_data
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Enabling Banner During SSH Login

Cisco VIM supports enabling of banner during ssh login to the management node. To enable banner during login, perform the following steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
ssh_banner:
  <your Banner Text>
```

**Step 2** Run the following commands for reconfiguration:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update/include the vim_ldap_admin in the setup_data
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

# Enabling Ironic Post Installation

Cisco VIM supports enabling of reference architecture of Ironic to host Baremetal workload. Ensure that you have a separate network segment for ironic-management. Additionally, if you need to deploy ironic inspector, you must have a separate network segment for ironic-inspector. The inspector is a service used to automate the creation of the Openstack baremetal port with switch interface, for example, eth 1/39 and MAC address information of both the switch MAC and server interface MAC, apart from automatically adding the deployment image information to the Ironic node.

Cisco VIM supports deployment of ironic without inspector. In this case, you must manually add the above mentioned details through Openstack CLI commands.

**Note** Ensure that the ironic management, ironic inspector, Cisco VIM management, and Ironic CIMC networks are routed to each other.

The Cisco VIM management network must be able to reach :

- Ironic management network and vice-versa.
- CIMC network of the ironic nodes. This allows the Cisco VIM controller servers to directly reach the CIMC IP of the ironic servers

To enable network reachability, follow one of the below conditions:

- All three networks such as Cisco VIM management, Ironic management and CIMC must be private networks with SVI interfaces on the ToR.
- Routed network must be deployed for all three network segments. In this case, the need for SVI interface on ToR is eliminated.

You must include the ironic-management and ironic-inspector VLANs (if enabled) on the ToR interfaces that are connected to the mercury controller servers

To enable ironic into an existing pod running Cisco VIM 3.0.0 or higher with provider network segment defined from the day-0 installation, perform the following steps:

**Step 1** Take a backup of the setupdata file and update the file manually with the configuration listed below:

```
# Optional Services:
OPTIONAL_SERVICE_LIST:
 - ironic

IRONIC:  # Optional, for fine tuning of ironic options
  IRONIC_INSPECTOR: true # Optional, used to disable ironic_inspector; default if not defined is true

  IRONIC_SWITCHDETAILS: # Optional, list of switches off which the ironic servers are hanging. This
 is mainly used to provide ironic switch details to neutron
  - {hostname: <switch_name>, password: <password>, ssh_ip: <ssh_ip>, username: <switch_admin_username>}


NETWORKING:
```

```
.....

  - gateway: <gateway_information>   # Mandatory, if optional service ironic is present unless
IRONIC_INSPECTOR is disabled. The pool information has to be in 3 ",” separated blocks belonging to
 ironic_inspector network
    pool: [<ip_start1 to ip_end1, ip_start2 to ip_end2, ip_start3 to ip_end3]
    segments: [ironic_inspector]
    subnet: <subnet with/mask>
    vlan_id: <unique vlan id across the pod >

  - gateway: <gateway_information> # Mandatory if ironic is present
    pool: [<ip_start1 to ip_end1]
    segments: [ironic_management]
    subnet: <subnet with/mask>
    vlan_id: <unique vlan id across the pod>
```

**Step 2** Run the following commands for reconfiguration:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/

# update/include the vim_ldap_admin in the setup_data
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml
```

For more information, see Launching OpenStack Baremetal Instances

# Updating Containers in a Running Cisco VIM Cloud

Cisco VIM allows you to update all OpenStack and infrastructure services such as RabbitMQ, MariaDB, HAProxy, and management node containers such as Cobbler, ELK, VMTP and repo containers with almost no impact to the Cisco NFVI implementation. Updates allows you to integrate Cisco VIM patch releases without redeploying the Cisco NFVI stack from the beginning. Updates have minimal service impact because they run serially component by component one node at a time. If an error occurs during an update, auto-rollback is triggered to return the cloud to its pre-update state. After an update you can check for any functional impacts on the cloud. If everything is fine you can commit the update, which deletes the old containers and old images from the nodes. Should you see any functional cloud impact you can perform a manual rollback to start the old containers again.

Before you begin a container update, keep the following in mind:

- Updates are not supported for registry-related containers and authorized_keys.
- You cannot roll back the repo containers on the management node to an older version after they are updated because rollbacks will delete node packages and might cause the cloud to destabilize.
- To prevent double-faults, a cloud sanity check is performed before the update is started. A cloud sanity check is performed as the last step of the update.

The following table provides an overview to the methods to start the OpenStack update using Cisco VIM. The Internet options refer to management node connectivity to the Internet. If your management server lacks Internet access, you must have a staging server with Internet access to download the Cisco VIM installation artifacts to a USB drive. Ensure that you select one method and stay with it for the full pod lifecycle.

*Table 11: OpenStack Update Options*

| | Without Cisco VIM Unified Management | With Cisco VIM Unified Management |
|---|---|---|
| Without Internet | • Prepare the USB on a staging server<br>• Plug the USB into the management node.<br>• Follow the update steps in the update without Internet procedure. | • Prepare the USB on a staging server<br>• Plug the USB into the management node.<br>• Follow the update steps in the update without Internet procedure. |
| With Internet | • Download the .tgz file from the registry.<br>• Follow the update steps in the update with Internet procedure. | • Download the .tgz file from the registry.<br>• Follow the update steps in the update with Internet procedure. |

# Updating Cisco VIM Software Using a USB

The following procedure describes you how to load the Cisco VIM installation files onto a Cisco NFVI management node that does not have Internet access. Installation files include: buildnode-K9.iso, mercury-installer.tar.gz, nova-libvirt.tar, registry-2.3.1.tar.gz, and respective checksums.

### Before you begin

This procedure requires a CentOS 7 staging server (VM, laptop, or UCS server) with a 64 GB USB 2.0 stick. You can save the VIM installation files on a USB stick and then use the USB stick to load the installation files onto the management node. The installation files are around 24 GB in size, downloading them to the USB stick might take several hours, depending on the speed of your Internet connection, so plan accordingly. Before you begin, disable the CentOS sleep mode.

**Step 1** On the staging server, use yum to install the following packages:

- PyYAML (yum install PyYAML)
- python-requests (yum install python-requests)

**Step 2** Connect to the Cisco VIM software download site using a web browser and login credentials provided by your account representative and download the **getartifacts.py** script from the external registry.

```
# download the new getartifacts.py file (see example below)
curl -o getartifacts.py -u '<username>:<password>'
https//cvim-registry.com/mercury-releases/cvim24-rhel7-osp10/releases/<2.4.0>/getartifacts.py

curl -o getartifacts.py-checksum.txt -u '<username>:<password>'
https//cvim-registry.com/mercury-releases/cvim24-rhel7-osp10/releases/<2.4.0>/getartifacts.py-checksum.txt

# calculate the checksum and verify that with one in getartifacts.py-checksum.txt
sha512sum getartifacts.py
```

```
# Change the permission of getartificats.py
chmod +x getartifacts.py
```

**Step 3** Run the **getartifacts.py** script. The script formats the USB 2.0 stick and downloads the installation artifacts. Provide the registry username and password, the tag ID, and the USB partition on the staging server. For example:

Run the getartifacts.py script. The script formats the USB 2.0 stick and downloads the installation artifacts. You will need to provide the registry username and password, the tag ID, and the USB partition on the staging server. For example: To identify the USB drive, execute the lsblk command before and after inserting the USB stick. (The command displays a list of available block devices.) The output delta will help find the USB drive location. Provide the entire drive path in the –d option, instead of any partition.

**sudo ./ getartifacts.py -t <tag_id> -u <username> -p <password> -d </dev/sdc>**

**Note** Do not remove the USB stick while the synchronization is going on.

**Step 4** Verify the integrity of the downloaded artifacts and the container images:

```
# create a directory
sudo mkdir -p /mnt/Cisco

# /dev/sdc is the USB drive, same as supplied in get artifacts.py python script
sudo mount /dev/sdc1 /mnt/Cisco
cd /mnt/Cisco

# execute the verification script
./test-usb

# failures will be explicitly displayed on screen, sample success output below
# sample output of ./test-usb execution with 2.4.x release [root@mgmtnode Cisco]# /test-usb
INFO: Checking the integrity of this USB stick
INFO: Checking artifact buildnode-K9-13401.iso
INFO: Checking artifact registry-2.6.2-13401.tar.gz
INFO: Checking required layers:
INFO: 605 layer files passed checksum.
[root@mgmtnode Cisco]#
```

**Step 5** To resolve download artifact failures, unmount the USB and run the getartifacts command again with the --retry option:

```
sudo ./getartifacts.py -t <tag_id> -u <username> -p <password> -d </dev/sdc> --retry
```

**Step 6** Mount the USB and then run the test-usb command to validate all the files are downloaded:

```
# /dev/sdc is the USB drive, same as supplied in get artifacts.py python script
sudo mount /dev/sda1 /mnt/Cisco
cd /mnt/Cisco

# execute the verification script
./test-usb

# In case of failures the out of the above command is explicitly displayed the same on the screen
```

**Step 7** After the synchronization finishes, unmount the USB stick:

```
sudo umount /mnt/Cisco
```

**Step 8** After the synchronization finishes, remove the USB stick from the staging server then insert it into the management node.

**Step 9** Complete the following steps to import the Cisco NFVI installation artifacts onto the management node:

a) Identify the USB on the management node:

```
blkid -L Cisco-VIM
```

b) Mount the USB device on the management node:

```
mount < /dev/sdc > /mnt/
 cd /tmp/
```

c) Extract the import_artifacts.py script:

```
tar --no-same-owner -xvzf /mnt/Cisco/mercury-installer.tar.gz
```

d) Unmount the USB device:

```
umount /mnt/Cisco/
```

e) Import the artifacts:

```
cd /tmp/installer-<2.4.x>/tools/
./import_artifacts.sh
```

f) Change directory and remove /tmp/installer-< xxxx >

```
cd /root/
rm -fr /tmp/installer-<2.4.x>
```

**Step 10** Execute the update from the old working directory:

```
cd $old_workspace/installer;
ciscovim update --file /var/cisco/artifacts/mercury-installer.tar.gz
```

After the update is complete, use the newly created directory from here onwards (unless a rollback is planned).

**Step 11** Commit the update by running the following command:

```
ciscovim commit # from the new workspace
```

**Step 12** To revert the update changes before entering the commit command, enter:

```
ciscovim rollback # and then use older workspace
```

**Note** Do not run any other Cisco VIM actions while the update is in progress.

In Cisco VIM, if updates bring in Kernel changes, then the reboot of the compute node with VNFs in ACTIVE state is postponed. This is done to mitigate the unpredictability of data plane outage when compute nodes go for a reboot for the kernel changes to take effect, during the rolling upgrade process.

At the end of ciscovim update, the Cisco VIM orchestrator displays the following message on the console and logs:

```
Compute nodes require reboot Kernel updated
<compute_1_with_VM_running>
<compute_3_with_VM_running>
<compute_4_with_VM_running>
<compute_12_with_VM_running>
```

After the Kernel update on Management node, reboot the compute node before proceeding. The logs for this run are available in <mgmt._ip_address>:/var/log/mercury/<UUID>

**Note** As the redundancy in controller and storage nodes are built into the product, the reboot of those nodes are automatic during the software update. Also, computes that does not have any VNFs in ACTIVE state, gets automatically rebooted during software update.To monitor and reboot the compute nodes through ciscovim cli, refer to the sections titled “Managing Reboot of Cisco VIM Nodes: and “Managing Reboot Status of Cisco VIM Nodes” , in the later part of this guide. It should be noted no pod management operation is allowed till reboot of all Cisco VIM nodes are successful.

# Updating Cisco VIM Software Using Network Installation

**Step 1** From the download site that is provided by your Cisco account representative, download the mercury-installer.gz

```
curl -o mercury-installer.tar.gz
https://{username}:{password}@cvim-registry.com/
mercury-releases/mercury-rhel7-osp10/releases/{release number}/
mercury-installer.tar.gz
```

The link to the tar ball preceding is an example.

**Step 2** Execute the update from the old working directory:

**Note** Do not run any other Cisco VIM actions while the update is in progress.

```
cd /root/installer-<tagid>
ciscovim update --file /root/mercury-installer.tar.gz
```

After the update is complete, use the newly created directory from here onwards (unless a rollback is planned).

**Step 3** Commit the update by running the following command:

```
ciscovim commit
```

**Step 4** To revert the update changes before entering the commit command, enter:

```
ciscovim rollback # and then use older workspace
```

In Cisco VIM, if updates bring in Kernel changes, then the reboot of the compute node with VNFs in ACTIVE state is postponed. This is done to mitigate the unpredictability of data plane outage when compute nodes go for a reboot for the kernel changes to take effect, during the rolling upgrade process.

At the end of ciscovim update, the Cisco VIM orchestrator displays the following message on the console and logs:

```
Compute nodes require reboot Kernel updated
<compute_1_with_VM_running>
<compute_3_with_VM_running>
<compute_4_with_VM_running>
<compute_12_with_VM_running>
```

After the Kernel update on the Management node, reboot the compute node before proceeding

The logs for this run are available in <mgmt._ip_address>:/var/log/mercury/<UUID>

**Note** The redundancy in controller, and storage nodes are built into the product, the reboot of those nodes are automatic during the software update. Also, computes that does not have any VNFs in ACTIVE state, gets automatically rebooted during the software update. To monitor and reboot the compute nodes through ciscovim cli, refer to the sections titled "Managing Reboot of Cisco VIM Nodes: and "Managing Reboot Status of Cisco VIM Nodes", in the later part of this guide. It should be noted no pod management operation is allowed till reboot of all Cisco VIM nodes are successful.

# Upgrading Containers in a Running Cisco VIM Cloud

Cisco VIM allows you to upgrade all OpenStack services, infrastructure services such as RabbitMQ, MariaDB, HAProxy, and management node containers such as Cobbler, ELK, VMTP and repo containers. You can upgrade to new releases of OpenStack without redeploying the Cisco NFVI stack from the beginning. During upgrade, you can expect limited service impact as the upgrade is run serially on component by component (one node at a time).

Cisco VIM supports upgrade from a known version of VIM running Cisco VIM 2.2.24 to the current version of Cisco VIM.

As part of the Cisco VIM cloud upgrade:

- The runner.py script is used to automatically upgrade the REST API server managing the VIM orchestrator.
- The setup_data.yaml file is automatically translated, so that, the setup_data.yaml file is compatible to the target release version.

Before you begin a container update, consider the following:

- Plan for the downtime, as the upgrade involves moving the Kernel version.
- Updates are not supported for registry-related containers and authorized_keys.
- Perform a cloud sanity check before initiating the update, to prevent double-faults. A cloud sanity check is performed as the last step of the update.
- Update the CIMC of all the servers to 2.0(13n).

Before you begin a pod upgrade, consider the following:

- No option is available to roll-back after the upgrade.Cisco recommends you to stage the upgrade in the lab and test it to identify and rectify any customer environment specific issues that might occur.
- The vim_upgrade_orchestrator.py script for upgrade is available as part of the 2.4.5 artifacts. You have to save a copy of the upgrade script to the /root/ location before upgrade.
- For disconnected upgrade, one USBs 2.0 (64GB) must be pre-populated with artifacts from 2.4.5.
- Upgrade from 2.2.24 to 2.4.5 is restricted to specific start and end point.
- Upgrade of the cloud is supported in both connected and disconnected mode.
- Upgrade of Unified Management from 2.2.24 to 2.4.5 is not supported. After upgrade, you have to bring up the Unified Management service on its own and register the pod to it.
- Cisco recommends you to not change the install mode during upgrade.

- Upgrade is a one-way operation, there is no rollback option. Hence, planning must be done before upgrade. If you face any issue after upgrade, reach out to Cisco TAC or BU to recover the cloud.

At a high level, the vim_upgrade_orchestrator.py script is broken into two logical steps to abort on failure. In case of failure, reach out to Cisco support for recovery. We do not recommend you to recover the cloud on your own.

The following are the two high level steps into which the vim_upgrade_orchestrator.py script is broken into:

- **Pre-upgrade Check**
  - Registry connectivity (if connected, installation is initiated)
  - Setup_data pre check: No UCSM_PLUGIN, sufficient storage pool size
  - Backup the setup_data.yaml file, before translation
  - Check and update INSTALL_MODE in the setup_data.yaml file (connected or disconnected)
  - run cloud sanity on cloud from 2.2.24 workspace
  - Check for reachability to all nodes including compute, controller, and storage

- **Upgrade to 2.4.5**
  - Upgrade to 2.4.5
  - Backup the management node
  - Run sanity test on cloud from 2.4.5
  - Check for reachability to all nodes (compute, controller, and storage)

- Connect to the CIMC of the management node and validate if the boot-order list has SDCARD as the first choice.
- Power-cycle the management node to complete the management node upgrade.

The following table provides an overview of upgrade methods available to update OpenStack using Cisco VIM. The Internet options refer to management node connectivity to the Internet. If your management server lacks Internet access, you must have a staging server with Internet access to download the Cisco VIM installation artifacts to a USB drive. Ensure that you to select one method and stay with it for the full pod lifecycle.

| Upgrade Method | Without Cisco VIM Unified Management |
|---|---|
| Without Internet | • Prepare 2 USB 2.0 (64G) on a staging server and populate them with 2.4.5 artifacts.<br>• Plug both the USB into the management node.<br>• Copy the vim_upgrade_orchestrator.py script and follow the upgrade steps in the *Upgrade without Internet* procedure. |
| With Internet | Copy the vim_upgrade_orchestrator.py script and follow the upgrade steps in the *Upgrade with Internet* procedure. |

**Note** The upgrade of VTS from 2.2.24 to 2.4.5 is not supported. The VTS upgarde support will only be available when VTS 2.6.2 is integrated with Cisco VIM, so that the multi-step upgrade of VTS works. For pods running with VPP, after upgrade, ensure that the switch ports connected to the data plane ports on the server are running in LACP mode.

# Upgrading VIM Software Using a USB

The following procedure describes how to load the Cisco VIM installation files onto a Cisco NFVI management node that does not have Internet access. Installation files include: buildnode-K9.iso, mercury-installer.tar.gz, nova-libvirt.tar, registry-2.3.1.tar.gz, and respective checksums.

### Before you begin

This procedure requires a CentOS 7 staging server (VM, laptop, or UCS server) with a 64 GB USB 2.0 stick. You can download the VIM installation files using the staging server with Internet access (wired access is recommended), and save the files to a USB stick. You can use the USB stick to load the installation files onto the management node. The size of the installation files comes to around 24 GB, so downloading them to the USB stick might take several hours, depending on the speed of your Internet connection, so plan accordingly. Before you begin, disable the CentOS sleep mode.

**Step 1** On the staging server, use yum to install the following packages:

- PyYAML (yum install PyYAML)
- python-requests (yum install python-requests)

**Step 2** Connect to the Cisco VIM software download site using a web browser and login credentials provided by Cisco account representative and download the **getartifacts.py** script from the external registry.

```
# download the new getartifacts.py file (see example below)
curl -o getartifacts.py -u '<username>:<password>'
https//cvim-registry.com/mercury-releases/cvim24-rhel7-osp10/releases/2.4.1/getartifacts.py

curl -o getartifacts.py-checksum.txt -u '<username>:<password>'
https//cvim-registry.com/mercury-releases/cvim24-rhel7-osp10/releases/2.4.1>/getartifacts.py-checksum.txt

# calculate the checksum and verify that with one in getartifacts.py-checksum.txt sha512sum
getartifacts.py

# Change the permission of getartificats.py
chmod +x getartifacts.py
```

**Step 3** Run the **getartifacts.py** script. The script formats the USB 2.0 stick and downloads the installation artifacts. Provide the registry username and password, the tag ID, and the USB partition on the staging server.

For example, to identify the USB drive, execute the **lsblk** command before and after inserting the USB stick. (The command displays a list of available block devices.) You can find the USB drive location from the delta output, and provide the entire drive path in the –d option instead of any partition.

**sudo ./ getartifacts.py -t <tag_id> -u <username> -p <password> -d </dev/sdc>**

**Note** Do not remove the USB stick during synchronization.

**Step 4** Verify the integrity of the downloaded artifacts and the container images.

```
# create a directory
sudo mkdir -p /mnt/Cisco
# /dev/sdc is the USB drive, same as supplied in get artifacts.py python script
sudo mount /dev/sdc1 /mnt/Cisco
cd /mnt/Cisco
# execute the verification script
./test-usb

# failures will be explicitly displayed on screen. A sample success output is shown
# sample output of ./test-usb execution with 2.4.x release

[root@mgmtnode Cisco]# /test-usb
INFO: Checking the integrity of this USB stick
INFO: Checking artifact buildnode-K9-13401.iso
INFO: Checking artifact registry-2.6.2-13401.tar.gz
INFO: Checking required layers:
INFO: 605 layer files passed checksum.
[root@mgmtnode Cisco]#
```

**Step 5** To resolve download artifact failures, unmount the USB and run the **getartifacts** command again with the --retry option.

```
sudo ./getartifacts.py -t <tag_id> -u <username> -p <password> -d </dev/sdc> --retry
```

**Step 6** Mount the USB and run the **test-usb** command to validate if all the files are downloaded.

```
# /dev/sdc is the USB drive, same as supplied in get artifacts.py python script
sudo mount /dev/sda1 /mnt/Cisco
cd /mnt/Cisco

# execute the verification script
./test-usb

# In case of failures, the output of the above command will explicitly display the failure on the
screen
```

**Step 7** After synchronization, unmount the USB stick.

```
sudo umount /mnt/Cisco
```

**Step 8** After synchronization, remove the USB stick from the staging server and insert the USB stick into the management node.

**Step 9** Insert the pre-populated USBs into the management node of the pod running 2.2.24.

**Step 10** Copy the vim_upgrade_orchestrator.py script available in CVIM 2.4 artifacts in the /root/ folder, to the management node of the pod running 2.2.24.

**Step 11** Execute the update from the /root/ location:

```
# cd /root/
# ./vim_upgrade_orchestrator.py -i disconnected [-y] # -y if you don’t want any interactive mode
```

After upgrade, start using the newly created directory.

**Note** Upgrade process takes several hours (> 6 hours), so execute this process in a VNC. Do not run any other Cisco VIM actions during upgrade.

**Step 12** Copy the management node backup created during the upgrade, and paste it into a separate server through rsync (for more information, see Managing Backup and Restore Operations).

**Step 13** Check if the SDCARD is stated as priority 1 in the boot order, from the CIMC of the management node. If not, set it accordingly. Reboot the management node, and wait for it to up.

# Upgrading Cisco VIM Software Using Network Installation

**Step 1** From the software download site provided by your Cisco account representative, download the `vim_upgrade_orchestrator.py curl -o vim_upgrade_orchestrator.py` file.

For example:

```
https://{username}:{password}@cvim-registry.com/mercury-releases/mercury-rhel7-osp10/releases/{release
number}/vim_upgrade_orchestrator.py
```

**Step 2** Execute the upgrade from the `/root/` directory:

```
 $ cd /root/
$ ./vim_upgrade_orchestrator.py –i connected
```

**Note** During the upgrade process, do not run any other Cisco VIM actions.

After the upgrade, use the newly created folder.

# Migrating Server Configuration from Bonding to Teaming on Post-Upgrade

From the release Cisco VIM 2.4.2 onwards, the teaming driver is used as the default configuration for link aggregation support where Cisco Nexus N9K acts as ToR.

For the systems running Cisco VIM 2.2.24, the bonding driver is the default configuration for link aggregation support where Cisco Nexus N9K acts as ToR. A standalone option is provided so that the link aggregation support can be migrated from bonding to teaming driver seamlessly.

**Note** The nodes are re-booted as part of this migration and hence maintenance downtime should be planned for this activity.

To migrate server configuration to teaming driver across the pod, post 2.4.2 upgrade, execute the following command from the upgraded management node during the maintenance window.

```
# cd /root/
# ./vim_upgrade_orchestrator.py –i connected –bond2team
```

When the interfaces of all the nodes are switched from bonding to teaming serially, the nodes are internally rebooted for the changes to take effect. You have no control of when the node will get rebooted to move the VNFs around for avoiding data plane outage. To alleviate unpredictable data plane outage, the command has been extended to support the migration of bonding to teaming configuration on a per node basis. You can

plan the migration to the teaming configuration for each node by moving the VNFs around other computes accordingly.

To initiate the migration of bonding to teaming on a per node basis, execute the following command:

```
# cd /root/
# ./vim_upgrade_orchestrator.py -bond2team <"one or more , separated target nodes"> -i
connected
```

The targeted nodes are automatically rebooted and a file named `bond_2_teaming_node_info.txt` in the `/root/openstack-configs/ directory` is updated to keep track of the nodes where the migration from bonding to teaming has been done.

**Note** Reboot the management node to migrate the rest of the pod to use teaming driver, once the script is executed.

# Supporting RMA of ToRs with Auto-ToR Configuration

When Cisco VIM cloud uses auto-ToR configuration to manage switch ports, you need to replace the existing switches if one malfunctions.

Consider the following assumptions made during RMA of ToR with auto-ToR configuration:

- When a switch is getting RMAed, it is in a virtual port-channel (vPC) mode with another switch to support full switch redundancy.
- You can replace multiple switches through Cisco VIM CLI, but only one switch from each pair.
- Administrator is responsible for manual configuration of the spine connection and L3 Out for the ToR.

**Note** When replacing the ToR, ensure that you use same server ports to have minimal changes in the setup_data.

To initiate ToR RMA, take a backup of the setupdata file and update it manually with the configuration details by running the following command:

```
[root@mgmt1 ~]# cd /root/ [root@mgmt1 ~]# mkdir MyDir
[root@mgmt1 ~]# cp /root/openstack-configs/setup_data.yaml /root/MyDir/ [root@mgmt1 ~]# #
update the setup_data to include
               the changes associated to the ToR that needs to be RMAs
[root@mgmt1 ~]# cd /root/MyDir/
[root@mgmt1 ~]# vi setup_data.yaml [root@mgmt1 ~]# cd ~/installer-xxxx
[root@mgmt1 ~]# ciscovim reconfigure --setupfile /root/MyDir/setup_data.yaml  -rma_tors
<"," separated target ToRs>
```

# Launching OpenStack Baremetal Instances

You can use OpenStack Ironic service to launch baremetal instances. For release Cisco VIM 3.0.0, it is recommended to deploy ironic without inspector and to manually add the baremetal servers to the ironic database.

**Note** Ironic inspector deployment is not supported in an ACI testbed and in a NIC only testbed.

Once ironic is enabled through Cisco VIM, you can perform the following steps based on the two scenarios given below

**Scenario 1: Cisco VIM Ironic without Ironic Inspector**

**Step 1** Deploy VIM with ironic

**Step 2** Post VIM deployment, set the following environment variables on a per ironic node basis

a) Set the bare metal specific IPMI details

- USER=admin
- PASS=XXXXXX
- ADDRESS=172.31.230.180
- MAC_ADDRESS=fc:5b:39:0e:5a:42

**Note** MAC_ADDRESS is for the single VIC/NIC that you choose for your baremetal server to be configured by ironic.

b) Set the following ironic switch details

- SWITCH_MAC_ADDRESS="84:b8:02:0e:65:ac"
- SWITCH_HOSTNAME="9332PQ-TOR1-RU12"
- SWITCH_PORT="eth1/38"

You can get SWITCH MAC by running the command `# sh int mac <SWITCH_PORT>` on your Nexus switch.

SWITCH_HOSTNAME should match IRONIC.IRONIC_SWITCHDETAILS.<switch>.hostname value in setup_data.yaml (if it is specified in setup_data).

SWITCH_PORT is the name of the port where the baremetal server is wired

**Step 3** Run the following OpenStack commands on the management node, to create the ironic node and ironic port associated with it:

```
# NODE_UUID=$(openstack baremetal node create --network-interface neutron --driver ipmi --name
node-${ADDRESS} \
 --driver-info ipmi_username=$USER \
 --driver-info ipmi_password=$PASS \
 --driver-info ipmi_address=$ADDRESS \
 --driver-info deploy_kernel=$DEPLOY_VMLINUZ_UUID \
```

```
 --driver-info deploy_ramdisk=$DEPLOY_INITRD_UUID \
 --property cpus=${CPU:-2} \
 --property memory_mb=${RAM_MB:-1024} \
 --property local_gb=${DISK_GB:-20} \
 --property capabilities='disk_label:gpt,boot_option:local' | awk '/ uuid /{print $4}')
```

where, DEPLOY_VMLINUZ_UUID is the UUID of the image `deploy-image-centos.kernel`' found in glance and DEPLOY_INITRD_UUID is the UUID of the image `deploy-image-centos.initramfs` found in glance.

```
# openstack baremetal node add trait $NODE_UUID CUSTOM_BAREMETAL
```

**Note** The trait is required to distinguish baremetal nodes during scheduling process.

```
# openstack baremetal port create --node $NODE_UUID \
  --local-link-connection switch_id=$SWITCH_MAC_ADDRESS \
  --local-link-connection switch_info=$SWITCH_HOSTNAME \
  --local-link-connection port_id=$SWITCH_PORT \
  --pxe-enabled true $MAC_ADDRESS
```

**Step 4** Ensure that the baremetal node is not in maintenance mode.

```
# openstack baremetal node list
+--------------------------------------+----+-------------+-----------+------------------+-----------+
| UUID                                 |Name|Instance UUID|Power State|Provisioning State|Maintenance|
+--------------------------------------+----+-------------+-----------+------------------+-----------+
|e677a8af-7222-4622-ad7a-13cf3c7f4078|None| None        | None      |enroll            | False
|
+--------------------------------------+----+-------------+-----------+------------------+-----------+
```

**Step 5** Verify whether the following are done in the baremetal server CIMC before proceeding:

- IPMI connections over LAN are allowed.
- In BIOS configured boot order, only pxeboot is present and available as the first option.
- PXE is enabled in VNIC being used by Cisco VIC Adapters
- Set the VLAN mode on the VNIC being used as TRUNK.

**Step 6** Ensure that the ironic management VLAN is specified in all control interfaces of the mercury controller servers, so that the images from the controller can reach the baremetal server.

In non-ACI mode of ToR, ensure that there are no existing configuration on the interface of the ToR connected to the baremetal. The interface is in ACCESS mode.

**Note** If ironic is being deployed in an ACI mode testbed, ensure that the ironic management network VLAN and all the tenant VLANs from setup_data are configured on the interface of the ToR connected to the baremetal. Here, the interface is in TRUNK mode and the ironic management network is set as the native VLAN.

**Step 7** Make the baremetal node ready for use:

```
# openstack baremetal node manage $NODE_UUID --> This sets node to verified and manageable. Mercury
 controller servers need to be able to reach CIMC IP for this.
# openstack baremetal node list
+--------------------------------------+------+--------------+-------------+-------------------+-------------+
| UUID                                 | Name | Instance UUID | Power State | Provisioning State |
Maintenance |
+--------------------------------------+------+--------------+-------------+-------------------+-------------+
| e677a8af-7222-4622-ad7a-13cf3c7f4078 | None | None          | power on    | manageable         |
False       |
+--------------------------------------+------+--------------+-------------+-------------------+-------------+
```

```
# openstack baremetal node provide $NODE_UUID --> This PXE boots the deploy image via cleaning and
sets node to available once done.
# openstack baremetal node list
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
| UUID                                 | Name | Instance UUID | Power State | Provisioning State |
Maintenance |
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
| e677a8af-7222-4622-ad7a-13cf3c7f4078 | None | None          | power on    | cleaning           |
False       |
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
# openstack baremetal node list   -> Once cleaning is done, the ironic node will move to available
state and is ready for use.
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
| UUID                                 | Name | Instance UUID | Power State | Provisioning State |
Maintenance |
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
| e677a8af-7222-4622-ad7a-13cf3c7f4078 | None | None          | power off   | available          |
False       |
+--------------------------------------+------+--------------+-------------+--------------------+-------------+
```

**Note** Repeat all of the above steps for each server to be added to the ironic DB.

### Scenario 2: Cisco VIM Ironic with Ironic Inspector

The following section discusses the scenario of Cisco VIM Ironic with an Ironic inspector. This scenario is supported only in non-ACI and VIC only testbeds.

#### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | Follow the pre-VIM deployment steps: | |
| **Step 2** | Deploy VIM | |
| **Step 3** | After the deployment, run the following commands: | `# openstack baremetal node list --> Once VIM install has completed, the ironic node will move to manageable state and is ready for use.`<br>`# openstack baremetal node provide $NODE_UUID --> This PXE boots the deploy image via cleaning and sets node to available once done. Do this for all of the ironic nodes` |
| **Step 4** | (Optional) If you want to add more ironic nodes after VIM installation, execute the steps running from Step (1c) given under pre-VIM deployment and then add the nodes. Use correct cimc credentials for $USER, $PASS, and $ADDRESS | `# openstack baremetal node create --network-interface neutron --driver pxe_ipmitool --name new-node-$ADDRESS \`<br>`--driver-info ipmi_username=$USER \`<br>`--driver-info ipmi_password=$PASS \`<br>`--driver-info ipmi_address=$ADDRESS`<br><br>`# openstack baremetal node manage $NODE_UUID`<br>`# openstack baremetal node inspect $NODE_UUID`<br><br>Once inspection is completed, run the below commands: |

| | Command or Action | Purpose |
|---|---|---|
| | | openstack baremetal node show $NODE_UUID -->to verify node's resources and capabilities set during inspection process<br>openstack baremetal port list --> to verify ports. It should have one port of a baremetal node.<br>openstack baremetal node provide $NODE_UUID --> This PXE boots the deploy image via cleaning and sets node to available<br>once done. Do this for all of the ironic nodes |

# Deploying Baremetal Instances

Once the ironic nodes are available for use, you can launch an instance on the baremetal using the following steps:

**Step 1** Create the Nova baremetal flavor

```
nova flavor-create my-baremetal-flavor auto $RAM_MB $DISK_GB $CPU

nova flavor-key my-baremetal-flavor set capabilities:boot_option="local"

nova flavor-key my-baremetal-flavor set capabilities:disk_label="gpt"
```

The trait name should match with the baremetal node. Here, it is CUSTOM_BAREMETAL.

```
 nova flavor-key my-baremetal-flavor set trait:CUSTOM_BAREMETAL=required
```

**Step 2** Add user images into glance. For example, if you are using ubuntu image, use the following commands:

```
IMAGE_OS=ubuntu

MY_VMLINUZ_UUID=$(glance image-create --name user-image-${IMAGE_OS}.vmlinuz --disk-format aki
--container-format aki < user-image-${IMAGE_OS}.vmlinuz | awk '/ id /{print $4}')

MY_INITRD_UUID=$(glance image-create --name user-image-${IMAGE_OS}.initrd --disk-format ari
--container-format ari < user-image-${IMAGE_OS}.initrd | awk '/ id /{print $4}')

glance image-create --name user-image-${IMAGE_OS}.qcow2 --disk-format qcow2 --container-format bare
 --property kernel_id=$MY_VMLINUZ_UUID --property ramdisk_id=$MY_INITRD_UUID <
user-image-${IMAGE_OS}.qcow2
```

**Step 3** Use the following commanands, to create the neutron tenant network to be used with the bare metal node

```
# openstack network create my-tenant-net-name

# openstack subnet create --network my-tenant-net-name --subnet-range X.X.X.X/XX --ip-version 4
my_tenant_subnet_name
```

**Step 4** Create a simple cloud-init script to log into the node after the instance is up

**Example**

```
#cloud-config
password: Lab1234!
```

```
chpasswd: { expire: False }
ssh_pwauth: True
```

If this is an ACI testbed, add the following to the cloud-init script:

**Example**

```
#cloud-config
password: Lab1234!
chpasswd: { expire: False }
ssh_pwauth: True
runcmd:
  - ip link add link enp6s0 name enp6s0.3086 type vlan id <3086 - this will be the segment_id of your
 tenant net>
  - ip link set dev enp6s0.<3086> up
  - dhclient enp6s0.<3086>
```

**Step 5** Boot the bare metal node using the below command:

```
# openstack server create --flavor <baremetal_flavor uuid> --image <centos/ubuntu image uuid> --nic
 net-id=<tenant network uuid> --config-drive true --user-data user-data.txt <instance-name>
```

# VM Resizing

VM resize is the process of changing the flavor of an existing VM. Thus, using VM resize you can upscale a VM according to your needs. The size of a VM is indicated by the flavor based on which the VM is launched.

Resizing an instance means using a different flavor for the instance.

By default, the resizing process creates the newly sized instance on a new node, if more than one compute node exists and the resources are available. By default, the software, allows you to change the RAM size, VDISK size, or VCPU count of an OpenStack instance using **nova resize**. Simultaneous or individual adjustment of properties for the target VM is allowed. If there is no suitable flavor for the new properties of the VM, you can create a new one.

```
nova resize [--poll] <server> <flavor>
```

The resize process takes some time as the VM boots up with the new specifications. For example, the Deploying a Cisco CSR (size in MB) would take approximately 60mins. After the resize process, execute `nova resize-confirm <server>` to overwrite the old VM image with the new one. If you face any issue, you can revert to the old VM using the `nova-resize-revert <server>` command. At this point, you can access the VM through SSH and verify the correct image is configured.

**Note** The OpenStack **shutdown** the VM before the resize, so you have to plan for a **downtime.**

**Note** We recommend you not to resize a vdisk to a smaller value, as there is the risk of losing data.

# Telemetry for OpenStack

If ceilometer is enabled in setup_data.yaml file, the Telemetry service in Cisco VIM collects the metrics within the OpenStack deployment. This section provides a summary of the metrics that are collected with the Cisco VIM using ceilometer/gnocchi OpenStack REST-API.

**OpenStack Compute:**

The following metrics are collected for OpenStack Compute:

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| memory | Gauge | MB | instance ID | Notification | Volume of RAM allocated to the instance |
| memory.usage | Gauge | MB | instance ID | Pollster | Volume of RAM used by the instance from the amount of its allocated memory |
| cpu | Cumulative | ns | instance ID | Pollster | CPU time used |
| cpu.delta | Delta | ns | instance ID | Pollster | CPU time used since previous datapoint |
| cpu_util | Gauge | % | instance ID | Pollster | Average CPU utilization |
| vcpus | Gauge | vcpu | instance ID | Notification | Number of virtual CPUs allocated to the instance |
| disk.read.requests | Cumulative | request | instance ID | Pollster | Number of read requests |
| disk.read.requests.rate | Gauge | request/s | instance ID | Pollster | Average rate of read requests |
| disk.write.requests | Cumulative | request | instance ID | Pollster | Number of write requests |
| disk.write.requests.rate | Gauge | request/s | instance ID | Pollster | Average rate of write requests |
| disk.read.bytes | Cumulative | B | instance ID | Pollster | Volume of reads |
| disk.read.bytes.rate | Gauge | B/s | instance ID | Pollster | Average rate of reads |

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| disk.write.bytes | Cumulative | B | instance ID | Pollster | Volume of writes |
| disk.write.bytes.rate | Gauge | B/s | instance ID | Pollster | Average rate of writes |
| disk.device.read.requests | Cumulative | request | disk ID | Pollster | Number of read requests |
| disk.device.read.requests.rate | Gauge | request/s | disk ID | Pollster | Average rate of read requests |
| disk.device.write.requests | Cumulative | request | disk ID | Pollster | Number of write requests |
| disk.device.write.requests.rate | Gauge | request/s | disk ID | Pollster | Average rate of write requests |
| disk.device.read.bytes | Cumulative | B | disk ID | Pollster | Volume of reads |
| disk.device.read.bytes .rate | Gauge | B/s | disk ID | Pollster | Average rate of reads |
| disk.device.write.bytes | Cumulative | B | disk ID | Pollster | Volume of writes |
| disk.device.write.bytes .rate | Gauge | B/s | disk ID | Pollster | Average rate of writes |
| disk.root.size | Gauge | GB | instance ID | Notification | Size of root disk |
| disk.ephemeral.size | Gauge | GB | instance ID | Notification | Size of ephemeral disk |
| disk.capacity | Gauge | B | instance ID | Pollster | The amount of disk that the instance can see |
| disk.allocation | Gauge | B | instance ID | Pollster | The amount of disk occupied by the instance on the host machine |
| disk.usage | Gauge | B | instance ID | Pollster | The physical size in bytes of the image container on the host |

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| disk.device.capacity | Gauge | B | disk ID | Pollster | The amount of disk per device that the instance can see |
| disk.device.allocation | Gauge | B | disk ID | Pollster | The amount of disk per device occupied by the instance on the host machine |
| disk.device.usage | Gauge | B | disk ID | Pollster | The physical size in bytes of the image container on the host per device |
| network.incoming.bytes | Cumulative | B | interface ID | Pollster | Number of incoming bytes |
| network.incoming.bytes.rate | Gauge | B/s | interface ID | Pollster | Average rate of incoming bytes |
| network.outgoing.bytes | Cumulative | B | interface ID | Pollster | Number of outgoing bytes |
| network.outgoing.bytes.rate | Gauge | B/s | interface ID | Pollster | Average rate of outgoing bytes |
| network.incoming.packets | Cumulative | packet | interface ID | Pollster | Number of incoming packets |
| network.incoming.packets.rate | Gauge | packet/s | interface ID | Pollster | Average rate of incoming packets |
| network.outgoing.packets | Cumulative | packet | interface ID | Pollster | Number of outgoing packets |
| network.outgoing.packets.rate | Gauge | packet/s | interface ID | Pollster | Average rate of outgoing packets |
| network.incoming.packets.drop | Cumulative | packet | interface ID | Pollster | Number of incoming dropped packets |
| network.outgoing.packets.drop | Cumulative | packet | interface ID | Pollster | Number of outgoing dropped packets |

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| network.incoming.packets.error | Cumulative | packet | interface ID | Pollster | Number of incoming error packets |
| network.outgoing.packets.error | Cumulative | packet | interface ID | Pollster | Number of outgoing error packets |
| memory.swap.in | Cumulative | MB | interface ID | Pollster | Memory swap in |
| memory.swap.out | Cumulative | MB | interface ID | Pollster | Memory swap out |
| disk.device.read.latency | Cumulative | ns | Disk ID | Pollster | Total time read operations have taken |

**OpenStack Image**

The following metrics are collected for OpenStack Image service:

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| image.size | Gauge | B | image ID | Notification, Pollster | Size of the uploaded image |
| image.download | Delta | B | image ID | Notification | Image is downloaded |
| image.serve | Delta | B | image ID | Notification | Image is served out |

**OpenStack Block Storage**

The following metrics are collected for OpenStack Block Storage:

| Name | Type | Unit | Resource | Origin | Note |
|---|---|---|---|---|---|
| volume.size | Gauge | GB | Voulume ID | Notification | Size of the volume |

**Metrics Polling and Retention Policy**

Cisco VIM telemetry service polls metrics every 5 minutes and retains the metrics for 48 hours

# Nova Migrate

The nova migrate command is used to move an instance from one compute host to another compute host. The scheduler chooses the destination compute host based on the availability of the zone settings. This process does not assume that the instance has shared storage available on the target host.

To initiate the cold migration of the VM, you can execute the following command:

```
nova migrate [--poll] <server>
```

The VM migration can take a while, as the VM boots up with the new specifications. After the VM migration process, you can execute `nova resize-confirm <server>` --to overwrite the old VM image with the new one. If you encounter an problem, use the `nova-resize-revert <server>` command to revert to the old VM image. At this point, access the VM through SSH and verify the correct image is configured.

**Note** The OpenStack **shutdown** the VM before the migrate, so plan for a **downtime**.

# Live Migrate

Live-migrating an instance means moving its virtual machine to a different OpenStack Compute server while the instance continues running. The operator can select which host to live migrate the instance. If the destination host is not selected, the nova scheduler chooses the destination compute based on the availability of the zone settings. Live migration cannot be used without shared storage except a booted from volume VM which does not have a local disk.

To initiate the live migration of the VM, you can execute the following command:

```
openstack server migrate <server>--live
```

The VM migration can take a while. The virtual machine status can be checked with the command:

```
openstack server show < server>
```

**Note** With NFV_HOST enabled, you must ensure that the vCPUs are available on the destination host (to avoid collision). With cold migration, the vCPUs that are available on the destination host are automatically selected andassigned to the VM.

# Power Management Of Computes (for C-Series)

### Before you begin

In Cisco VIM 2.4, the power management function of computes optimizes the overall power consumption of the data center. Powering down the server through an API/CLI helps you to have a power backup.

**Step 1** To power off one or more compute nodes, run the following commands:

```
Run ciscovim power-off help command
# ciscovim help power-off
usage: ciscovim power-off --setupfile SETUPFILE [-y] <node1,node2,...>

Power Off compute-nodes

Positional arguments:
  <node1,node2,...>      Power off Compute Nodes

Optional arguments:
```

```
  --setupfile SETUPFILE  <setupdata_file>. Mandatory for any POD management
                         operation.
  -y, --yes              Yes option to perform the action
```

**Step 2** To list all the nodes in the Openstack Cloud run the following command:

```
# ciscovim list-nodes
```

**Step 3** Choose one or more *Active* compute node to be powered off

**Step 4** Run the following command:

```
# ciscovim power-off <compute-server-1, compute-server-2, …. > --setupfile <path_setup_data.yaml>
```

**Step 5** Run the following command to verify that the computes are power off

```
# ciscovim list-nodes
```

**Note** The Status for compute nodes that are powered off has to be *InActive* state.

**Note** To prevent cloud destabilization, you must ensure that at least one compute node is in the Active state.Pod management operation that applies to the entire pod (such as a update, reconfigure, and so on) cannot be performed if one or more compute nodes are powered off. Computes which run VMs or which provide other roles (such as All-in-one (AIO) nodes in a micropod) cannot be powered-off using this API. Power error-handling methods are added to ensure that such cases are handled. As part of the power-off action, internally cloud-sanity is run and if the cloud sanity fails, then the power-off action is aborted.

# Power On Compute Nodes

Following are the steps to power on the compute nodes:

**Step 1** Run the following command to power onone or more compute nodes

```
Run ciscovim power-on help command
# ciscovim help power-on
usage: ciscovim power-on --setupfile SETUPFILE [-y] <node1,node2,...>

Power On compute-nodes

Positional arguments:
  <node1,node2,...>      Power on Compute Nodes

Optional arguments:
  --setupfile SETUPFILE  <setupdata_file>. Mandatory for any POD management
                         operation.
  -y, --yes              Yes option to perform the action
```

**Step 2** To list all the nodes in the Openstack Cloud:

```
# ciscovim list-nodes
```

**Step 3** Choose one or more Active compute node to be powered on

**Step 4** Run the following command:

```
# ciscovim power-on <compute-server-1, compute-server-2, …. > --setupfile <path_setup_data.yaml>
```

**Step 5** Run the following command to verify the compute(s) are powerd on

```
# ciscovim list-nodes
```

**Note** The Status for compute nodes that were powered on has to be *Active*

# Managing Reboot of Cisco VIM Nodes

Cisco VIM 2.4 has a ciscovim CLI to reboot the Cisco VIM nodes. CLI can be used for rebooting the Cisco VIM nodes in general. During software update, core libraries like kernel, glibc, systemd and so on. require rebooting the system to run the latest version. Cisco VIM has the functionality to reboot nodes (if needed) during an update, but we defer the update of compute nodes which are running application VM's.

Reboot the nodes using the CLI before migrating the VM's on another computes as shown in the following steps:

**Step 1** Run the following command to Reboot one or more compute nodes:

```
Run ciscovim reboot help command
# ciscovim help reboot
usage: ciscovim reboot [-y] <node1,node2,...>

Reboot compute-nodes

Positional arguments:
  <node1,node2,...>  Reboot Compute Nodes

Optional arguments:
  -y, --yes          Yes option to perform the action
```

**Step 2** Run the following command to select one or more compute nodes

```
# ciscovim reboot<compute-server-1, compute-server-2, …. >
```

**Note** You cannot reboot all the compute nodes simultaneously. At least one node has to be Active to prevent the cloud destabilization. Also, computes on which VMs are running cannot be rebooted, the CLI prevents it (see the following steps on mitigation). The nodes which are associated with multiple roles (For Example: All-in-one (AIO) nodes in a micro-pod or Hyper-converged) can be rebooted one at a time.

# Cisco VIM Client Reboot and Remove Compute Using Force Option

When VM's are running on a particular compute node, you cannot reboot or remove that compute node. Cisco VIM installer internally checks for the presence of VM's and aborts the operation, if VM is running on the target compute node.

To execute remove-compute operation without any failure, migrate or terminate VMs running on compute nodes and execute remove or reboot operations using "-f/--force" option in Cisco VIM client.

Note the following before executing reboot or remove compute operations with force option.

- If a remove compute operation is executed with force option, the VMs running on that compute node are deleted.
- If a reboot compute operation is executed with force option, the VMs are restored to last running status post successful reboot of that compute node.

**Example of Remove Compute**

```
# ciscovim help remove-computes
  usage: ciscovim remove-computes --setupfile SETUPFILE [-y] [-f] <node1,node2,...>
                         Remove compute-nodes from the Openstack cloud

  Positional arguments:
  <node1,node2,...>      Remove compute nodes

  Optional arguments:
  --setupfile SETUPFILE  <setupdata_file>. Mandatory for any POD management
                         operation.
  -y, --yes              Yes option to perform the action
  -f, --force            Force option to remove or reboot
# ciscovim remove-computes --setupfile /tmp/remove_computes_setup_data.yaml gg34-4 -y --force

                         monitoring remove_compute (gg34-4) operation

 .........................
 Cisco VIM Runner logs
 .........................
```

**Example of removing multiple computes**

```
# ciscovim remove-computes --setupfile /tmp/remove_computes_setup_data.yaml gg34-1, gg34-2
 -y -force
```

If ToR_TYPE is Cisco NCS 5500, you must manually remove all the sub-interfaces that were manually configured on the NCS switch, as the Cisco VIM automation does not unconfigure/configure the sub-interfaces for which the VLANs were not defined in the setup_data.yaml. If sub-interfaces are not removed, it results in remove-compute operation.

**Example of reboot compute**

```
# ciscovim help reboot
  usage: ciscovim reboot [-y] [-f] <node1,node2,...>

  Reboot compute-nodes

  Positional arguments:
  <node1,node2,...>  Reboot Compute Nodes

 Optional arguments:
  -y, --yes          Yes option to perform the action
  -f, --force        Force option to perform the action

 # ciscovim reboot gg34-4 -y --force

 monitoring reboot (gg34-4) operation

 .........................
 Cisco VIM Runner logs
```

```
.........................
```

**Example of rebooting multiple computes**

```
# ciscovim reboot gg34-1, gg34-2 -y --force
```

# Managing Reboot Status of Cisco VIM Nodes

Cisco VIM 2.4, has a CLI which helps you to find which CVIM nodes require a reboot after an update. Reboot the nodes after an update so that the cloud is running latest host packages.

**Note** It is mandatory for the operator to reboot nodes to be able to perform next update or pod management operation.

Run the following command to check the reboot pending status for nodes in the pod (post update):

```
Run ciscovim reboot-status help command
# ciscovim help reboot-status
usage: ciscovim reboot-status

List of Openstack Nodes that require a reboot

Sample command execution:
# ciscovim reboot-status

Fetching Nodes that require a Reboot

+--------------------------+-----------------+
|        Node Name         | Reboot Required |
+--------------------------+-----------------+
| sjc04-c33-tb2-micropod-1 |        No       |
| sjc04-c33-tb2-micropod-2 |        No       |
| sjc04-c33-tb2-micropod-3 |        No       |
+--------------------------+-----------------+
```

# Cisco UCS Firmware Upgrade

In Cisco VIM 2.4.2, the Cisco Host Upgrade Utility (HUU) tool developed using Cisco Integrated Management Controller (IMC) Python SDK module (imcsdk-0.9.2.0) is leveraged automatically to upgrade all firmware components running on Cisco UCS C-Series servers.

**Note** The wrapper tool only updates the CIMC bundle packages, as the entire Cisco IMC Software bundle (that includes CIMC, BIOS, adapter and storage controller firmware images through HUU images) is updated by default. Adequate planning is required for CIMC upgrade, as it causes the server to get rebooted.

For Cisco VIM 2.4, the CIMC upgrade tool supports the:

- Upgrade of CIMC bundle images for C-series only.
- Concurrent upgrade of CIMC bundle images on multiple C-series servers.
- Pre-validation check for server type and available HUU images.
- Support of the external http server, Cisco VIM Software Hub, or Cisco VIM Management node for the target CIMC upgrade image mounts.
- Checks if the cloud is deployed successfully, and notifies the user with a proper message.
- Checks if selected hosts have any active VMs running on them and notifies the user with a proper message.
- Generation of consolidated summary on firmware version status, on completing the pre-upgrade and post-upgrade.

**Note**

- Firmware upgrade is supported only on UCS C-series platform and not on UCS B-series and HP platforms.
- If you upgrade CIMC firmware on an existing cloud deployment, it might impact the cloud functionality as the firmware upgrade reboots the host. Hence, ensure that the cloud is operational, post CIMC firmware upgrade.

To check if the cloud is operational, execute the following steps:

- Run the cloud sanity.
- If cloud sanity failure occurs, run cluster recovery and then re-run cloud sanity.

Also for the upgrade operation to work, ensure that the image has the following syntax: ucs-<server_type>-huu-<version_number>.iso; for example ucs-c220m4-huu-2.0.13n.iso or ucs-c240m4-huu-2.0.13n.iso;

**Note** Running the UCS Firmware upgrade on host(s) running active VMs results in downtime on those VMs.

# Limitations During Cisco IMC Upgrade

The following are the CVIM management operations which are not allowed when the firmware upgrade is in progress:

- POD management operations: Add, Remove or Replace of nodes
- CVIM Software Update
- CVIM Software Upgrade
- Reconfigure of CVIM features

# Tools Usage

The CIMC upgrade utility is a standalone python file (ucsc_host_upgrade_utility) which is located under <cvim_install_dir>/tools/ directory.

To use the tool, execute the following command:

```
[root@hiccup-mgmt-228 tools]# python ucsc_host_upgrade_utility.py -h
usage: ucsc_host_upgrade_utility.py [-h] [--file SETUPFILELOCATION]
                                    [--http-server HTTP_SERVER_IP]
                                    [--sds-server SDS_SERVER_NAME]
                                    [--server-uname UNAME]
                                    [--server-pwd PASSWD]
                                    [--huu-image-path HUU_IMAGE_PATH]
                                    [--host HOSTS] [--exclude-hosts E_HOSTS]
                                    [-y]

Script to perform firmware upgrade

optional arguments:
  -h, --help            show this help message and exit
  --file SETUPFILELOCATION, -f SETUPFILELOCATION
                        Optional, if not defined will read the setup_data.yaml
                        in /root/openstack-configs dir for CIMC information of
                        servers; To override, provide a valid YAML file
                        with the CIMC Credentials.
  --http-server HTTP_SERVER_IP, -hs HTTP_SERVER_IP
                        Optional, only needed if a http server is used to host
                        the target CIMC bundle image(s).
  --sds-server SDS_SERVER_NAME, -sds SDS_SERVER_NAME
                        Optional, only needed if a Software Distribution
                        Server (SDS) is used to host the target CIMC bundle
                        image(s).
  --server-uname UNAME, -u UNAME
                        Optional, only needed if a http server is used to host
                        the target CIMC bundle image(s).
  --server-pwd PASSWD, -p PASSWD
                        Optional, only needed if a http server is used to host
                        the target CIMC bundle image(s).
  --huu-image-path HUU_IMAGE_PATH, -path HUU_IMAGE_PATH
                        Comma separated absolute path of the HUU ISO file(s);
                        In the case of a web server hosting the files,
                        provide the absolute path of the URL that includes the
                        file names; that is, exclude the scheme://host/ part
  --host HOSTS
        Comma separated list of host names targeted for CIMC
                        bundle upgrade defined in the target setup_data.yaml
  --exclude-hosts E_HOSTS, -e E_HOSTS
                        Comma separated list of hostnames excluded for CIMC
                        bundle upgrade defined in the target setup_data.yaml
  -y, -yes
[root@hiccup-mgmt-228 tools]#
```

If the target CIMC upgrade images are available on Cisco VIM Management node, use the below command:

```
  python ucsc_host_upgrade_utility.py [--file <setup_data_test.yaml/cimc_servers.yaml>]
-path <huu_image_paths>
```

If the target CIMC upgrade images are hosted in an external http server that is reachable from the Cisco VIM Management node and CIMC of the servers, use the below command:

```
  python ucsc_host_upgrade_utility.py [--file <setup_data_test.yaml/cimc_servers.yaml>]
-hs <http_server_ip/hostname> -u
   <https_server_un> -path <http_server_pwd> -path <huu_image_paths>
```

If the target CIMC upgrade images are hosted in Ciso VIM Software Hub, use the below command:

```
python ucsc_host_upgrade_utility.py --file [setup_data_test.yaml/cimc_servers.yaml] -sds
[Ciso VIM Software Hub_server_ip/hostname] -u
    [sds_server_un] -path [sds_server_pwd] -path [huu_image_paths]
```

**Note** Pre-requisites to use Ciso VIM Software Hub for hosting the target CIMC bundle image(s) are:

- Ciso VIM Software Hub server must be reachable from the management node over HTTPS.
- Ciso VIM Software Hub server TLS certificate must be trusted by the management node to make TLS connection in verified context.

If setup_data.yaml file is not available, you can create it using below command:

```
# UCSC (C-series) sample format of yaml file to specify the CIMC details
SERVERS:
 server-1:
   cimc_info:
     cimc_ip: "cimc-ip-address"
     cimc_username: "cimc-user-name"
     cimc_password: "cimc-password"
 server-2:
   cimc_info:
     cimc_ip: "cimc-ip-address"
     cimc_username: "cimc-user-name"
     cimc_password: "cimc-password"
 server-3:
   cimc_info:
     cimc_ip: "cimc-ip-address"
     cimc_username: "cimc-user-name"
     cimc_password: "cimc-password"
```