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Brocade SDN Controller

OpenStack Integration Guide

Supporting OpenStack Juno and Brocade SDN Controller v2.0.1

BROCADE

Contents

Preface

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
bold text	Identifies command names
	Identifies keywords and operands
	Identifies the names of user-manipulated GUI elements
	Identifies text to enter at the GUI
italic text	Identifies emphasis
	Identifies variables
	Identifies document titles
`Courier font`	Identifies CLI output
	Identifies command syntax examples

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
italic text	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, **--show** WWN.

Convention	Description
[ ]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ **x** | **y** | **z** }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options. In Fibre Channel products, square brackets may be used instead for this purpose.
x | **y**	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, *member*[*member*...].
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE
A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION
An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.

CAUTION
A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.

DANGER
A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

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- For questions regarding service levels and response times, contact your OEM/Solution Provider.

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Provide the publication title, part number, and as much detail as possible, including the topic heading and page number if applicable, as well as your suggestions for improvement.

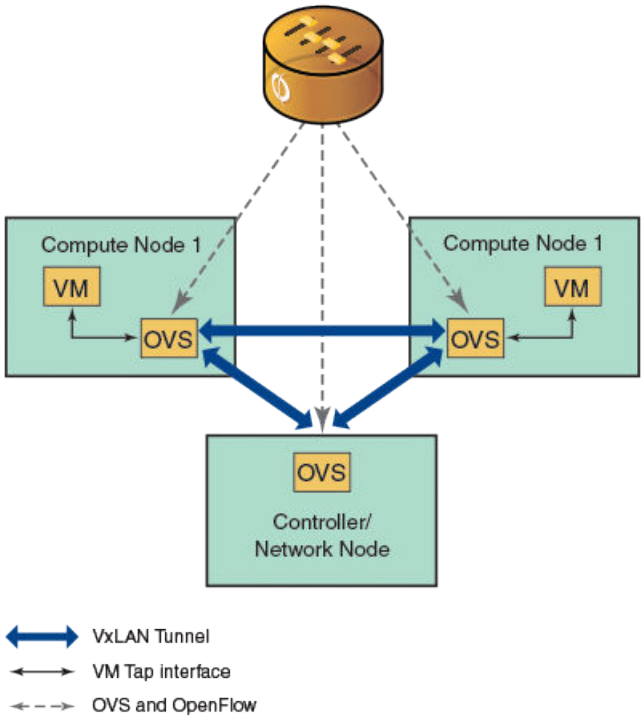
Brocade SDN Controller Integration with OpenStack Overview

About OpenStack integration

OpenStack is a popular open-source project that provides compute, storage, and network management. OpenStack can use the Brocade SDN Controller through the Modular Layer 2 (ML2) northbound plug-in. The controller manages the network flows for the OpenStack compute and network nodes through the Open vSwitch Database (OVSDB) management protocol southbound plug-in.

When the controller is integrated with OpenStack, it manages the Layer 2 networks on the OpenStack nodes and controls the Open vSwitch (OVS) that is running on OpenStack nodes, as shown in the following figure. When a new virtual machine (VM) is created and attached to a network, the controller creates a VxLAN tunnel between OpenStack nodes. After the tunnel is created, the tenant VMs on different compute nodes are able to reach other.

FIGURE 1 Brocade SDN Controller Integration with OpenStack



With this integration, the controller is responsible for the following operations:

- Controlling OpenStack Layer 2 network CRUD operations on the controller
- Creating the VxLAN tunnel, which provides the network type for communication among VMs
- Attaching the VM interface to the network when tenant VMs are instantiated by creating ports and wiring them to the VxLAN tunnel on the integration bridge (br-int) of the OVS

Deploying OpenStack by Using PackStack

About PackStack

PackStack is a command line utility that uses Puppet modules to support rapid deployment of OpenStack on existing servers over an SSH connection.

Before installing PackStack

This section describes the prequisite tasks for installing PackStack.

OpenStack integration with Brocade SDN Controller requires three physical servers.

- Control node and network node (one server)
- Two compute nodes (two servers)

Ensure that you have installed the following software before you use PackStack to deploy OpenStack with the Brocade SDN Controller.

- Red Hat Enterprise Linux (RHEL) 7.1 distribution on the three physical servers
- Brocade SDN Controller version 2.0.0 or a later version that is running on a RHEL 7.1 VM

Before installing PackStack, you must disable NetworkManager, set up the software repositories, ensure that SELinux runs in permissive mode, and add firewall services that allow traffic from the control and compute nodes.

Disabling NetworkManager

This section describes how to disable the NetworkManager.

NOTE
If you are using NetworkManager, you must disable it before installing PackStack.

1. Enter the following commands to stop and disable NetworkManager.
```
systemctl stop NetworkManager
systemctl disable NetworkManager
systemctl enable network
```
2. Ensure devices are named properly for the network daemon by confirming that the following line is present in the /etc/sysconfig/network-scripts/ifcfg-<interface-name> directory.

The *interface-name* variable is usually eth0 or em0.
```
DEVICE=<interface-name>
```
3. Enter the following command to shut down all interfaces except the one to which you are connected and start the network daemon.
```
ifdown <interface-name> && systemctl start network
```

Setting up the software repositories

This section describes how to set up the software repositories on the control and compute nodes.

1. Enter the following command to update the current packages.
```
sudo yum update -y
```
2. Enter the following command to set up the RDO repositories.
```
sudo yum install -y https://rdo.fedorapeople.org/rdo-release.rpm
```

Enabling SELinux to run in permissive mode

This section describes how to enable SELinux to run in permissive mode.

Enable SELinux to run in permissive mode at run time and ensure that it is set to start in this mode at boot time by entering the following commands.
```
#setenforce 0
#sed -i -e 's/SELINUX=enforcing/SELINUX=permissive/g'
```

NOTE
Skip this step if SELinux is set to disabled in the/etc/selinux/config file.

Configuring firewall rules on the controller node

This section describes how to configure firewall services that allow traffic from control and compute nodes on the Brocade SDN Controller node.

1. Enter the following command to check the status of the firewall service that is running on the controller.
```
#systemctl status firewalld
```
2. If the firewall service is running, add the following rule to allow traffic from the control and compute nodes by adding their IP addresses to the trusted zone.
```
# firewall-cmd --zone=trusted --add-source=<CONTROL_NODE_IP>/24
# firewall-cmd --zone=trusted --add-source=<COMPUTE_NODE1_IP>/24
# firewall-cmd --zone=trusted --add-source=<COMPUTE_NODE2_IP>/24
```
3. If the firewall service is not running, enter the following command to dump the contents of the IP table that is on the host and verify that port 8181 is open.
```
# iptables-save
```

Installing PackStack

This section describes how to install PackStack.

NOTE
Perform the following steps as a root user on the control node.

1. Enter the following command to install the PackStack installer.
   ```
   sudo yum install -y openstack-packstack
   ```
2. Enter the following command to generate the PackStack FILE answers file.
   ```
   packstack --gen-answer-file=FILE
   ```
3. Open the FILE answers file and modify the parameters to configure the IP addresses of the compute and control nodes.
   ```
   CONFIG_CONTROLLER_HOST=<CONTROL_NODE_IP>
   CONFIG_COMPUTE_HOSTS=<COMPUTE_NODE1_IP>, <COMPUTE_NODE2_IP>
   CONFIG_NETWORK_HOSTS=<CONTROL_NODE_IP>
   ```
4. Enter the following command to run the PackStack installer with the answers file.
   ```
   packstack --answer-file=FILE
   ```

Verifying the installation of PackStack

This section describes how to verify that PackStack is installed successfully.

Use the Horizon dashboard to verify the PackStack setup. After PackStack is installed, the PackStack Horizon dashboard can be accessed at http://<CONTROL_NODE_IP> .

NOTE
Use the IP address of the control node for <CONTROL_NODE_IP>.

1. Create a tenant network.
2. Create tenant VMs on the network.
3. Spawn VMs on each compute node.
4. Confirm that basic operations, such as Ping, are successful between VMs.

Configuring the Brocade SDN Controller to Integrate with OpenStack

Cleaning up network resources

This section describes how to clean up network resources on control and compute nodes. Perform this task to clean up resources from previous OpenStack deployments before integrating OpenStack with the Brocade SDN Controller.

1. Enter the following command to ensure that no networks are created. If any networks are listed, delete the networks and also the attached VMs.
   ```
   neutron net-list
   ```
2. Enter the following command to ensure no neutron routers are created. If any routers are listed, delete the routers.
   ```
   neutron router-list
   ```
3. Enter the following command to verify that all neutron ports are cleared. The list should be empty. If any ports are listed, delete the ports.
   ```
   neutron port-list
   ```
4. Enter the following commands to delete demo users.
   ```
   keystone tenant-list
   keystone tenant-delete demo
   ```

Enabling VNC on all nodes

This section describes how to enable Virtual Network Computing (VNC)on all nodes. For nova VNC console access, OpenStack provides the noVNC client, a web-based VNC client. The noVNC client proxy allows you to connect remotely to the consoles of running compute instances.

1. Edit the path/etc/nova/nova.conf file in the control node and enter the following configuration. The following parameters must be set to access the VNC console of the spawned VMs through the

Horizon dashboard. For <CONTROL_NODE_IP>, enter the IP address of the node that is running the control and neutron services.

```
novncproxy_host=0.0.0.0
novncproxy_port=6080
novncproxy_base_url=http://<CONTROL_NODE_IP>:6080/vnc_auto.html
```

2. Enter the following commands to start the openstack-nova-novncproxy and openstack-nova-consoleauth services. These services must be started for the noVNC proxy configuration to work.

```
sudo service openstack-nova-novncproxy restart
sudo service openstack-nova-consoleauth restart
```

3. Edit the /etc/nova/nova.conf file in both compute notes and enter the following configuration. For <CONTROL_NODE_IP>, enter the IP address of the node that is running the control and neutron services. For <COMPUTE_IP>, enter the IP address of the compute nodes that are running the nova services.

```
vnc_enabled=True
novncproxy_base_url=http://<CONTROL_NODE_IP>:6080/
vnc_auto.html vncserver_listen=0.0.0.0
vncserver_proxyclient_address=<COMPUTE_NODE1_IP>
```

4. Restart the nova service for the changes to take effect.

```
sudo service openstack-nova-compute restart
```

Configuring the control and network node to use the ML2 plug-in

This section describes how to configure the control and network nodes to use the Brocade SDN Controller Modular Layer 2 (ML2) northbound plug-in.

1. Enter the following commands on the control node. These commands configure the control node to use the ML2 plug-in to communicate with the controller.

```
sudo systemctl stop neutron-server
sudo systemctl stop neutron-openvswitch-agent
sudo systemctl disable neutron-openvswitch-agent
# Stops, cleans, and restarts Open vSwitch. Log files are captured.
sudo systemctl stop openvswitch
sudo rm -rf /var/log/openvswitch/*
sudo rm -rf /etc/openvswitch/conf.db
sudo systemctl start openvswitch

sudo crudini --set /etc/neutron/plugins/ml2/ml2_conf.ini ml2 mechanism_drivers
opendaylight
sudo crudini --set /etc/neutron/plugins/ml2/ml2_conf.ini ml2 tenant_network_types
vxlan

cat <<EOT | sudo tee -a /etc/neutron/plugins/ml2/ml2_conf.ini >
/dev/null
[ml2_odl]
password = admin
username = admin
url = http://<BSC_IP>:8181/controller/nb/v2/neutron EOT
# <BSC_IP> is the IP address of the node on which BSC is running. It should be
reachable from the control node and all compute nodes.

sudo mysql -e "drop database if exists neutron_ml2;"
sudo mysql -e "create database neutron_ml2 character set utf8;"
sudo mysql -e "grant all on neutron_ml2.* to 'neutron'@'%';"
sudo neutron-db-manage --config-file /usr/share/neutron/neutron-dist.conf --
config-file /etc/neutron/neutron.conf --config-file /etc/neutron/plugin.ini
upgrade head
```

2. Place the mechanism_odl.py driver file under the /usr/lib/python2.7/site-packages/neutron/plugins/ml2/drivers/ directory. The mechanism_odl.py driver is available at: https://github.com/openstack/neutron/blob/stable/juno/neutron/plugins/ml2/drivers/mechanism_odl.py
3. Restart the neutron server.

```
sudo systemctl start neutron-server
```

4. Run the cleanup_network.sh script to remove namespaces, ports, and bridge artifacts.

```
#!/bin/bash
```

```
for ns in `ip netns`
do
    `sudo ip netns del $ns`
done

for qvb in `ifconfig -a | grep qvb | cut -d' ' -f1`
do
    `sudo ip link set $qvb down`
    `sudo ip link delete $qvb`
done
for qbr in `ifconfig -a | grep qbr | cut -d' ' -f1`
do
    `sudo ip link set $qbr down`
    `sudo ip link delete $qbr`
done
for qvo in `ifconfig -a | grep qvo | cut -d' ' -f1`
do
    `sudo ovs-vsctl --if-exists del-port br-int $qvo`
done
for tap in `ifconfig -a | grep tap | cut -d' ' -f1`
do
    tap="${tap%?}"
    `sudo ip link set $tap down`
    `sudo ovs-vsctl --if-exists del-port br-int $tap`
done

for i in `sudo ovs-vsctl show | grep Bridge | awk '{print $2}'` ; do
    if [[ $i == *br-eth1* ]]; then
        sudo ovs-vsctl --if-exists del-br 'br-eth1'
    else
        sudo ovs-vsctl --if-exists del-br $i
    fi
done

for i in `ip addr | grep tap | awk '{print $2}'`; do
    tap="${i%?}"
    echo "tap=$tap"
    sudo ip link del dev $tap
done

for i in phy-br-eth1 int-br-eth1; do
    ip -o link show dev $i &> /dev/null
    if [ $? -eq 0 ]; then
        sudo ip link del dev $i
    fi
done

for iface in br-ex br-int br-tun; do
    sudo ovs-dpctl del-if ovs-system $iface
done

echo "Delete vxlan_xxx if present"
for iface in `sudo ovs-dpctl show | awk 'match($0, /[Pp]ort\s+[[:digit:]]+\s*\:
\s*(.+).+\(vxlan/, m) { print m[1]; }'` ; do
   echo ${iface} ; sudo ovs-dpctl del-if ovs-system ${iface}
done

sudo ovs-dpctl show
```

Cleaning up compute nodes and resetting the Open vSwitch

This section describes how to clean up the compute nodes and reset the Open vSwitch.

1. Use the following script to stop the Open vSwitch agent.
   ```
   sudo systemctl stop neutron-openvswitch-agent
   sudo systemctl disable neutron-openvswitch-agent
   # Stops, cleans and restarts Open vSwitch. Log files are captured.
   ```
2. Enter the following commands to reset the Open vSwitch.
   ```
   sudo systemctl stop openvswitch
   sudo rm -rf /var/log/openvswitch/*
   sudo rm -rf /etc/openvswitch/conf.db
   ```

```
sudo systemctl start openvswitch
sudo ovs-vsctl show
```

Configuring nodes to connect to the controller

This section describes how to configure the nodes to connect to the Brocade SDN Controller.

1. Run the set_ovs.sh script on all three nodes to connect the OVS instances to the controller.

```
#/bin/bash
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ethif=$(ip -o addr show dev <ethX> | grep -w inet | awk '{print $4}' | sed
-e 's/\/.*//g')

read ovstbl <<< $(ovs-vsctl get Open_vSwitch . _uuid)

ovs-vsctl set Open_vSwitch $ovstbl other_config:local_ip=$ethif

ovs-vsctl set-manager tcp:<BSC_IP>:6640
```

NOTE
Replace the <BSC_IP> variable with the IP address of the host that is running the controller. Replace the <ethX> variable with the interface name that you are using in your node to connect to the controller and other nodes.

2. Run the **ovs-vsctl show** command on all three nodes. The manager and integration bridge (br-int) displays `is connected: true` similar to the following output.

```
5f18525a-a25e-4ce7-8cc9-b162e355a80d
Manager "tcp:10.30.5.77:6640\r" is_connected: true
Bridge br-int
Controller "tcp:10.30.5.77:6633" is_connected: true
fail_mode: secure Port br-int
Interface br-int ovs_version: "2.1.3"
```

Verifying OpenStack integration with the controller

This section describes how to verify that OpenStack is properly integrated with the Brocade SDN Controller.

1. Create a private network and spawn two VMs on the network.
2. Use the VNC console of either VM and try to ping the other VM. Use the Horizon GUI or CLI commands to perform this step.
3. Enter the following commands on the control node to create a VxLAN network and its corresponding subnet.

```
neutron net-create vx-net
--provider:network_type vxlan
--provider:segmentation_id 1400
neutron subnet-create vx-net 10.100.5.0/24 --name vx-subnet
```

Troubleshooting OpenStack integration with the controller

This section describes how to reset the OpenStack setup with Brocade SDN Controller.

1. Delete all neutron networks, subnets, and ports, if created.
2. Delete the integration bridge (br-int) and manager by entering the following commands on all three nodes.
```
sudo ovs-vsctl del-br br-int
sudo ovs-vsctl del-manager
```
3. Stop the controller.
4. Delete the "journals" and "snapshots" directories in the /opt/bvc/controller directory.
5. Start the controller.
6. Navigate to the following URL and verify that ovsdb:1 is up at: http://<BSC_IP>/restconf/config/network-topology:network-topology/topology/ovsdb:1/. Replace the IP address of the controller for the <BSC_IP> variable in the URL.
7. Run the set_ovs.sh script on all three nodes to connect Open vSwitch to the controller.
```
#/bin/bash

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ethif=$(ip -o addr show dev <ethX> | grep -w inet | awk '{print $4}' | sed -e 's/
\/.*//g')
read ovstbl <<< $(ovs-vsctl get Open_vSwitch . _uuid)
ovs-vsctl set Open_vSwitch $ovstbl other_config:local_ip=$ethif
ovs-vsctl set-manager tcp:<BSC_IP>:6640
```