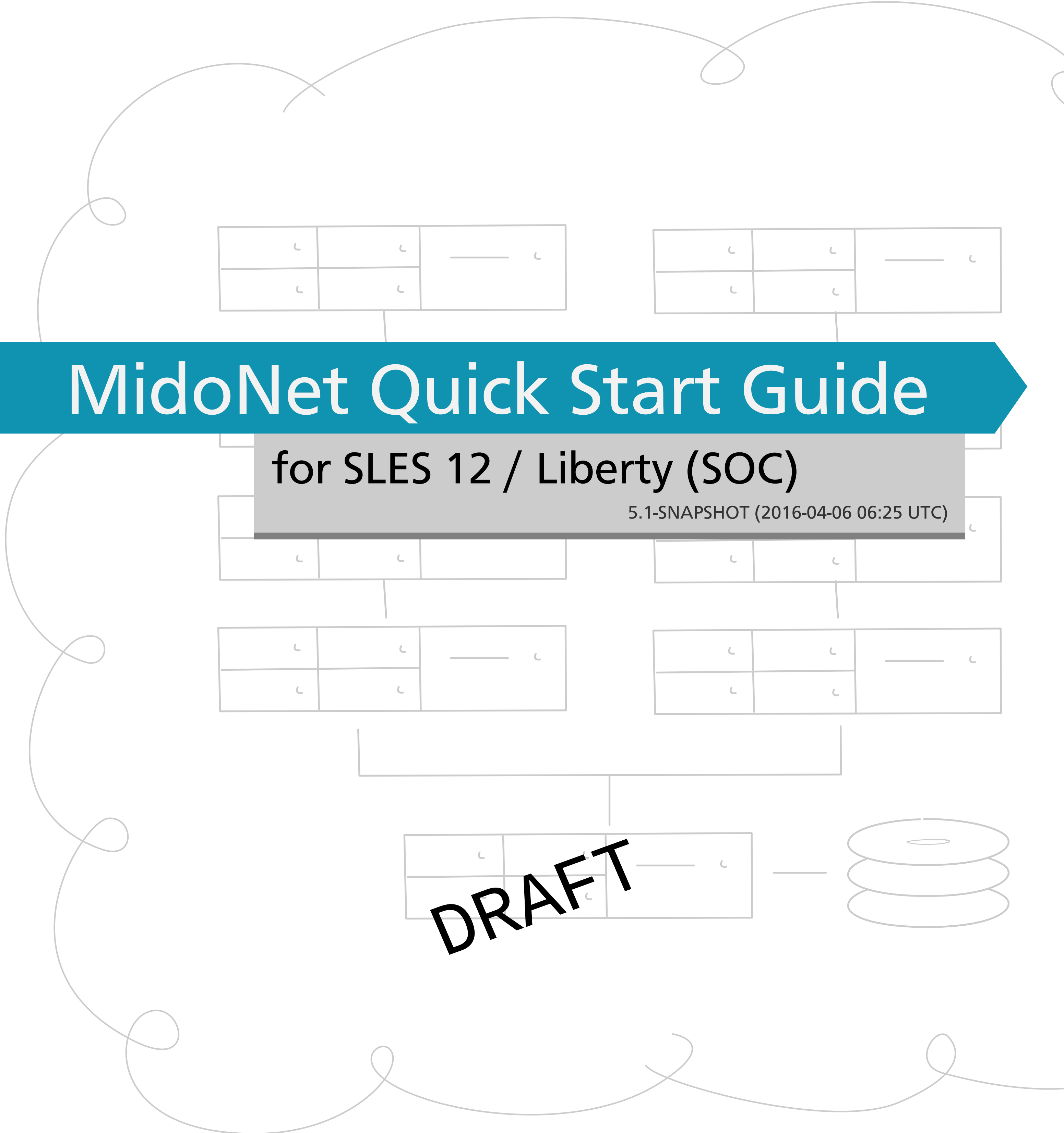
MidoNet Quick Start Guide

for SLES 12 / Liberty (SOC)

5.1-SNAPSHOT (2016-04-06 06:25 UTC)



DRAFT

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5.1-SNAPSHOT (2016-04-06 06:25 UTC)

MidoNet is a network virtualization software for Infrastructure-as-a-Service (IaaS) clouds.

It decouples your IaaS cloud from your network hardware, creating an intelligent software abstraction layer between your end hosts and your physical network.

This guide walks through the minimum installation and configuration steps neccessary to use MidoNet with OpenStack.

Caution

This document is a DRAFT. It may be MISSING relevant information or contain UNTESTED information. Use it at your own risk.

Note

Please consult the MidoNet Mailing Lists or Chat if you need assistance.

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Preface

Conventions

The MidoNet documentation uses several typesetting conventions.

Notices

Notices take these forms:

Note

A handy tip or reminder.

Important

Something you must be aware of before proceeding.

Warning

Critical information about the risk of data loss or security issues.

Command prompts

$ prompt

Any user, including the root user, can run commands that are prefixed with the $ prompt.

 # prompt

The root user must run commands that are prefixed with the # prompt. You can also prefix these commands with the **sudo** command, if available, to run them.

1. Architecture

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Hosts and Services 2

This guide assumes the following example system architecture.

OpenStack Controller Node:

- Controller Node (**controller**)

Compute Node:

- Compute Node (**compute1**)

Since MidoNet is a distributed system, it does not have the concept of a Network Node as being used with the default OpenStack networking plugin. Instead it uses two or more Gateway Nodes that utilize Quagga to provide connectivity to external networks via the Border Gateway Protocol (BGP).

- Gateway Node 1 (**gateway1**)
- Gateway Node 2 (**gateway2**)

Three or more hosts are being used for the MidoNet Network State Database (NSDB) cluster which utilizes ZooKeeper and Cassandra to store virtual network topology and connection state information:

- NSDB Node 1 (**nsdb1**)
- NSDB Node 2 (**nsdb2**)
- NSDB Node 3 (**nsdb3**)

Important

Ideally, both the ZooKeeper transaction log and Cassandra data files need their own dedicated disks, with additional disks for other services on the host. However, for small POCs and small deployments, it is ok to share the Cassandra disk with other services and just leave the ZooKeeper transaction log on its own.

The *MidoNet Agent (Midolman)* has to be installed on all nodes where traffic enters or leaves the virtual topology. In this guide this are the **controller**, **gateway1**, **gateway2** and **compute1** hosts.

The *Midonet Cluster* can be installed on a separate host, but this guide assumes it to be installed on the **controller** host.

The *Midonet Command Line Interface (CLI)* can be installed on any host that has connectivity to the MidoNet Cluster. This guide assumes it to be installed on the **controller** host.

The *Midonet Neutron Plugin* replaces the ML2 Plugin and has to be installed on the **controller**.

Hosts and Services

Controller Node (controller)

- General
  - Database (MariaDB)
  - Message Broker (RabbitMQ)
- OpenStack
  - Identity Service (Keystone)
  - Image Service (Glance)
  - Compute (Nova)
  - Networking (Neutron)
    - Neutron Server
  - Dashboard (Horizon)
- MidoNet
  - Cluster
  - CLI
  - Neutron Plugin

Compute Node (compute1)

- OpenStack
  - Compute (Nova)
  - Networking (Neutron)
- MidoNet
  - Agent (Midolman)

NSDB Nodes (nsdb1, nsdb2, nsdb3)

- Network State Database (NSDB)
  - Network Topology (ZooKeeper)
  - Network State Information (Cassandra)

Gateway Nodes (gateway1, gateway2)

- BGP Daemon (Quagga)

- MidoNet
  - Agent (Midolman)

2. Basic Environment Configuration

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Networking Configuration

Important

All hostnames must be resolvable, either via DNS or locally.

This guide assumes that you follow the instructions in Network of the SUSE OpenStack Cloud Documentation.

SuSEfirewall2 Configuration

Note

SuSEfirewall2 is a stateful network packet filter also known as firewall.

Disable it by executing the following command:

```
# /sbin/SuSEfirewall2 off
```

Repository Configuration

Configure necessary software repositories and update installed packages.

1. **Enable MidoNet repositories**

   Use the following commands to add the MidoNet repositories:

   ```
   # zypper addrepo -f http://builds.midonet.org/midonet-5/stable/sles12/
    midonet
   ```

   ```
   # zypper addrepo -f http://builds.midonet.org/openstack-liberty/stable/
   sles12/ midonet-plugin-liberty
   ```

2. **Install available updates**

   ```
   # zypper update
   ```

3. **If necessary, reboot the system**

   ```
   # reboot
   ```

3. OpenStack Installation

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Important

Follow the Suse Cloud 6 Deployment Guide , but **note the following differences**.

Identity Service (Keystone)

Important

Follow the SUSE OpenStack Cloud documentation's Deploying Keystone instructions, but **note the following additions**.

1. **Verify Admin Token Authentication**

   The MidoNet API uses the Keystone admin token for authentication purposes, therefore **`admin_token_auth`** has to be kept in the corresponding Keystone pipeline configuration sections.

   Ensure that **`admin_token_auth`** is included in the following pipelines in `/usr/share/keystone/keystone-dist-paste.ini`:

```
[pipeline:public_api]
pipeline = [...] admin_token_auth [...]

[pipeline:admin_api]
pipeline = [...] admin_token_auth [...]

[pipeline:api_v3]
pipeline = [...] admin_token_auth [...]
```

2. **Create MidoNet API Service**

   As Keystone admin, execute the following command:

```
$ openstack service create --name midonet --description "MidoNet API
 Service" midonet
```

3. **Create MidoNet Administrative User**

   As Keystone admin, execute the following commands:

```
$ openstack user create --domain default --password-prompt midonet
$ openstack role add --project service --user midonet admin
```

Compute Services (Nova)

Important

Follow the SUSE OpenStack Cloud documentation's Deploying Nova instructions, but **note the following differences**.

Controller Node

Note

Follow the SUSE OpenStack Cloud documentation's Deploying the OpenStack Services instructions as is.

Compute Node

Important

Follow the OpenStack documentation's Deploying Nova instructions, but **note the following additions**.

1. **Configure libvirt**

   Edit the `/etc/libvirt/qemu.conf` file to contain the following:

   ```
   user = "root"
   group = "root"

   cgroup_device_acl = [
       "/dev/null", "/dev/full", "/dev/zero",
       "/dev/random", "/dev/urandom",
       "/dev/ptmx", "/dev/kvm", "/dev/kqemu",
       "/dev/rtc","/dev/hpet", "/dev/vfio/vfio",
       "/dev/net/tun"
   ]
   ```

2. **Restart the libvirt service**

   ```
   # service libvirtd restart
   ```

3. **Edit the nova-rootwrap network filters `/etc/nova/rootwrap.d/network.filters` file to contain the following**

   ```
   # nova-rootwrap command filters for network nodes
   # This file should be owned by (and only-writeable by) the root user

   [Filters]
   # nova/virt/libvirt/vif.py: 'ip', 'tuntap', 'add', dev, 'mode', 'tap'
   # nova/virt/libvirt/vif.py: 'ip', 'link', 'set', dev, 'up'
   # nova/virt/libvirt/vif.py: 'ip', 'link', 'delete', dev
   # nova/network/linux_net.py: 'ip', 'addr', 'add', str(floating_ip)+'/
   32'i..
   # nova/network/linux_net.py: 'ip', 'addr', 'del', str(floating_ip)+'/
   32'..
   # nova/network/linux_net.py: 'ip', 'addr', 'add', '169.254.169.254/32',.
   .
   # nova/network/linux_net.py: 'ip', 'addr', 'show', 'dev', dev, 'scope',.
   .
   # nova/network/linux_net.py: 'ip', 'addr', 'del/add', ip_params, dev)
   # nova/network/linux_net.py: 'ip', 'addr', 'del', params, fields[-1]
   ```

```
# nova/network/linux_net.py: 'ip', 'addr', 'add', params, bridge
# nova/network/linux_net.py: 'ip', '-f', 'inet6', 'addr', 'change', ..
# nova/network/linux_net.py: 'ip', 'link', 'set', 'dev', dev, 'promisc',
..
# nova/network/linux_net.py: 'ip', 'link', 'add', 'link', bridge_if ...
# nova/network/linux_net.py: 'ip', 'link', 'set', interface, address,..
# nova/network/linux_net.py: 'ip', 'link', 'set', interface, 'up'
# nova/network/linux_net.py: 'ip', 'link', 'set', bridge, 'up'
# nova/network/linux_net.py: 'ip', 'addr', 'show', 'dev', interface, ..
# nova/network/linux_net.py: 'ip', 'link', 'set', dev, address, ..
# nova/network/linux_net.py: 'ip', 'link', 'set', dev, 'up'
# nova/network/linux_net.py: 'ip', 'route', 'add', ..
# nova/network/linux_net.py: 'ip', 'route', 'del', .
# nova/network/linux_net.py: 'ip', 'route', 'show', 'dev', dev
ip: CommandFilter, ip, root

# nova/virt/libvirt/vif.py: 'ovs-vsctl', ...
# nova/virt/libvirt/vif.py: 'ovs-vsctl', 'del-port', ...
# nova/network/linux_net.py: 'ovs-vsctl', ....
ovs-vsctl: CommandFilter, ovs-vsctl, root

# nova/network/linux_net.py: 'ovs-ofctl', ....
ovs-ofctl: CommandFilter, ovs-ofctl, root

# nova/virt/libvirt/vif.py: 'ivs-ctl', ...
# nova/virt/libvirt/vif.py: 'ivs-ctl', 'del-port', ...
# nova/network/linux_net.py: 'ivs-ctl', ....
ivs-ctl: CommandFilter, ivs-ctl, root

# nova/virt/libvirt/vif.py: 'ifc_ctl', ...
ifc_ctl: CommandFilter, /opt/pg/bin/ifc_ctl, root

# nova/virt/libvirt/vif.py: 'ebrctl', ...
ebrctl: CommandFilter, ebrctl, root

# nova/virt/libvirt/vif.py: 'mm-ctl', ...
mm-ctl: CommandFilter, mm-ctl, root

# nova/network/linux_net.py: 'ebtables', '-D' ...
# nova/network/linux_net.py: 'ebtables', '-I' ...
ebtables: CommandFilter, ebtables, root
ebtables_usr: CommandFilter, ebtables, root

# nova/network/linux_net.py: 'ip[6]tables-save' % (cmd, '-t', ...
iptables-save: CommandFilter, iptables-save, root
ip6tables-save: CommandFilter, ip6tables-save, root

# nova/network/linux_net.py: 'ip[6]tables-restore' % (cmd,)
iptables-restore: CommandFilter, iptables-restore, root
ip6tables-restore: CommandFilter, ip6tables-restore, root

# nova/network/linux_net.py: 'arping', '-U', floating_ip, '-A', '-I', ..
.
# nova/network/linux_net.py: 'arping', '-U', network_ref['dhcp_server'],
..
arping: CommandFilter, arping, root

# nova/network/linux_net.py: 'dhcp_release', dev, address, mac_address
dhcp_release: CommandFilter, dhcp_release, root

# nova/network/linux_net.py: 'kill', '-9', pid
# nova/network/linux_net.py: 'kill', '-HUP', pid
kill_dnsmasq: KillFilter, root, /usr/sbin/dnsmasq, -9, -HUP

# nova/network/linux_net.py: 'kill', pid
```

```
kill_radvd: KillFilter, root, /usr/sbin/radvd

# nova/network/linux_net.py: dnsmasq call
dnsmasq: EnvFilter, env, root, CONFIG_FILE=, NETWORK_ID=, dnsmasq

# nova/network/linux_net.py: 'radvd', '-C', '%s' % _ra_file(dev, 'conf'.
.
radvd: CommandFilter, radvd, root

# nova/network/linux_net.py: 'brctl', 'addbr', bridge
# nova/network/linux_net.py: 'brctl', 'setfd', bridge, 0
# nova/network/linux_net.py: 'brctl', 'stp', bridge, 'off'
# nova/network/linux_net.py: 'brctl', 'addif', bridge, interface
brctl: CommandFilter, brctl, root

# nova/network/linux_net.py: 'sysctl', ....
sysctl: CommandFilter, sysctl, root

# nova/network/linux_net.py: 'conntrack'
conntrack: CommandFilter, conntrack, root
```

4. **Restart the Compute service**

```
# service openstack-nova-compute restart
```

Networking Services (Neutron)

Important

Follow the SUSE OpenStack Cloud documentation's Deploying Neutron instructions, but **note the following differences**.

Controller Node

Important

Follow the OpenStack documentation's Deploying Nova instructions, but **note the following differences and additions**.

1. **Prerequisites**

   Apply as is.

2. **Configure networking options**

   Do **not** apply.

   a. Instead, install the following packages:

   ```
   # zypper install openstack-neutron python-networking-midonet python-
   neutronclient
   ```

   b. Configure the server component:

   Edit the `/etc/neutron/neutron.conf` file and configure the following keys:

   ```
   [DEFAULT]
   ...
   core_plugin = midonet.neutron.plugin_v1.MidonetPluginV2
   ...
   ```

```
allow_overlapping_ips = True
...
rpc_backend = rabbit
...
auth_strategy = keystone
...
notify_nova_on_port_status_changes = True
notify_nova_on_port_data_changes = True
nova_url = http://controller:8774/v2

[database]
...
connection = psql://neutron:NEUTRON_DBPASS@controller/neutron

[oslo_messaging_rabbit]
...
rabbit_host = controller
rabbit_userid = openstack
rabbit_password = RABBIT_PASS

[keystone_authtoken]
...
auth_uri = http://controller:5000
auth_url = http://controller:35357
auth_plugin = password
project_domain_id = default
user_domain_id = default
project_name = service
username = neutron
password = NEUTRON_PASS

[nova]
...
auth_url = http://controller:35357
auth_plugin = password
project_domain_id = default
user_domain_id = default
region_name = RegionOne
project_name = service
username = nova
password = NOVA_PASS

[oslo_concurrency]
...
lock_path = /var/lib/neutron/tmp
```

3. **Configure the MidoNet plug-in**

   a. Create the directory for the MidoNet plugin:

   ```
   mkdir /etc/neutron/plugins/midonet
   ```

   b. Create the `/etc/neutron/plugins/midonet/midonet.ini` file and edit it to contain the following:

   ```
   [DATABASE]
   sql_connection = psql://neutron:NEUTRON_DBPASS@controller/neutron

   [MIDONET]
   # MidoNet API URL
   midonet_uri = http://controller:8080/midonet-api
   # MidoNet administrative user in Keystone
   username = midonet
   password = MIDONET_PASS
   # MidoNet administrative user's tenant
   ```

```
project_id = service
```

c. Create a symbolic link to direct Neutron to the MidoNet configuration:

```
# ln -s /etc/neutron/plugins/midonet/midonet.ini /etc/neutron/plugin.
ini
```

4. **Configure the metadata agent**

   Do **not** apply.

5. **To configure Compute to use Networking**

   Apply as is.

6. **Configure Load-Balancer-as-a-Service (LBaaS)**

   Additionally to the OpenStack Installation Guide, configure Load-Balancer-as-a-Service (LBaaS) as described in the section called "Configure Load-Balancer-as-a-Service (LBaaS)" [10].

7. **To finalize installation**

   Do **not** apply.

   Instead, perform the following steps.

   a. Populate the database:

```
# su -s /bin/sh -c "neutron-db-manage --config-file /etc/neutron/
neutron.conf --config-file /etc/neutron/plugins/midonet/midonet.ini
 upgrade head" neutron
# su -s /bin/sh -c "neutron-db-manage --subproject networking-midonet
 upgrade head" neutron
```

   b. Restart the Compute service:

```
# service openstack-nova-api restart
```

   c. Start the Networking service and configure it to start when the system boots:

```
# service neutron-server start
```

Configure Load-Balancer-as-a-Service (LBaaS)

1. **Install Neutron Load-Balancing-as-a-Service**

```
# zypper install python-neutron-lbaas
```

2. **Enable the MidoNet driver**

   Enable the MidoNet driver by using the `service_provider` option in the `/etc/neutron/neutron.conf` file:

```
[service_providers]
service_provider = LOADBALANCER:Midonet:midonet.neutron.services.
loadbalancer.driver.MidonetLoadbalancerDriver:default
```

3. **Enable the LBaaS plug-in**

   Enable the LBaaS plug-in by using the `service_plugins` option in the `/etc/neutron/neutron.conf` file:

```
service_plugins = lbaas
```

4. **Enable load balancing in the dashboard**

   Change the `enable_lb` option to `True` in the `/srv/www/openstack-dashboard/openstack_dashboard/local/local_settings.py` file:

   ```
   OPENSTACK_NEUTRON_NETWORK = {
      'enable_lb': True,
      ...
   }
   ```

5. **To finalize installation**

   Finalize the installation as described in Neutron Controller Node Installation.

Configure FireWall-as-a-Service (FWaaS)

1. **Install Neutron FireWall-as-a-Service**

   ```
   # zypper install python-neutron-fwaas
   ```

2. **Enable the MidoNet FWaaS plug-in**

   Enable the MidoNet FWaaS plug-in by using the `service_plugins` option in the `/etc/neutron/neutron.conf` file:

   ```
   service_plugins = midonet.neutron.services.firewall.plugin.
   MidonetFirewallPlugin
   ```

3. **Enable firewall in the dashboard**

   Change the `enable_firewall` option to `True` in the `/etc/openstack-dashboard/local_settings.py` file:

   ```
   OPENSTACK_NEUTRON_NETWORK = {
      'enable_firewall': True,
      ...
   }
   ```

4. **To finalize installation**

   Finalize the installation as described in Neutron Controller Node Installation.

Compute Node

Important

Follow the SUSE OpenStack Cloud documentation's Deploying Nova instructions.

4. MidoNet Installation

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NSDB Nodes

ZooKeeper Installation

1. **Install ZooKeeper packages**

```
# zypper install java-1.7.0-openjdk
# zypper install zookeeper
```

2. **Configure ZooKeeper**

   a. **Common Configuration**

   Edit the `/etc/zookeeper/zoo.cfg` file to contain the following:

```
server.1=nsdb1:2888:3888
server.2=nsdb2:2888:3888
server.3=nsdb3:2888:3888
```

   Create data directory:

```
# mkdir /var/lib/zookeeper/data
# chown zookeeper:zookeeper /var/lib/zookeeper/data
```

   Important

   For production deployments it is recommended to configure the storage of snapshots in a different disk than the commit log. This can be set by changing the parameter `dataDir` in `zoo.cfg` to a different disk.

   b. **Node-specific Configuration**

   i. **NSDB Node 1**

   Create the `/var/lib/zookeeper/data/myid` file and edit it to contain the host's ID:

```
# echo 1 > /var/lib/zookeeper/data/myid
```

   ii. **NSDB Node 2**

   Create the `/var/lib/zookeeper/data/myid` file and edit it to contain the host's ID:

```
# echo 2 > /var/lib/zookeeper/data/myid
```

iii. **NSDB Node 3**

Create the `/var/lib/zookeeper/data/myid` file and edit it to contain the host's ID:

```
# echo 3 > /var/lib/zookeeper/data/myid
```

3. **Create Java Symlink**

```
# mkdir -p /usr/java/default/bin/
# ln -s /usr/lib64/jvm/java-1.7.0-openjdk-1.7.0/jre/bin/java /usr/java/
default/bin/java
```

4. **Enable and start ZooKeeper**

```
#  /usr/bin/zkServer.sh start
```

5. **Verify ZooKeeper Operation**

After installation of all nodes has been completed, verify that ZooKeeper is operating properly.

A basic check can be done by executing the `ruok` (Are you ok?) command on all nodes. This will reply with `imok` (I am ok.) if the server is running in a non-error state:

```
$ echo ruok | nc 127.0.0.1 2181
imok
```

More detailed information can be requested with the `stat` command, which lists statistics about performance and connected clients:

```
$ echo stat | nc 127.0.0.1 2181
Zookeeper version: 3.4.5--1, built on 06/10/2013 17:26 GMT
Clients:
 /127.0.0.1:34768[0](queued=0,recved=1,sent=0)
 /192.0.2.1:49703[1](queued=0,recved=1053,sent=1053)

Latency min/avg/max: 0/4/255
Received: 1055
Sent: 1054
Connections: 2
Outstanding: 0
Zxid: 0x260000013d
Mode: follower
Node count: 3647
```

Cassandra Installation

1. **Install Cassandra packages**

```
# zypper install java-1.7.0-openjdk
# zypper install cassandra
```

2. **Configure Cassandra**

a. **Common Configuration**

Edit the `/etc/cassandra/conf/cassandra.yaml` file to contain the following:

```
# The name of the cluster.
```

```
cluster_name: 'midonet'

...

# Addresses of hosts that are deemed contact points.
seed_provider:
    - class_name: org.apache.cassandra.locator.SimpleSeedProvider
      parameters:
          - seeds: "nsdb1,nsdb2,nsdb3"
```

b. **Node-specific Configuration**

i. **NSDB Node 1**

Edit the `/etc/cassandra/conf/cassandra.yaml` file to contain the following:

```
# Address to bind to and tell other Cassandra nodes to connect to.
listen_address: nsdb1

...

# The address to bind the Thrift RPC service.
rpc_address: nsdb1
```

ii. **NSDB Node 2**

Edit the `/etc/cassandra/conf/cassandra.yaml` file to contain the following:

```
# Address to bind to and tell other Cassandra nodes to connect to.
listen_address: nsdb2

...

# The address to bind the Thrift RPC service.
rpc_address: nsdb2
```

iii. **NSDB Node 3**

Edit the `/etc/cassandra/conf/cassandra.yaml` file to contain the following:

```
# Address to bind to and tell other Cassandra nodes to connect to.
listen_address: nsdb3

...

# The address to bind the Thrift RPC service.
rpc_address: nsdb3
```

3. **Edit the service's init script**

On installation, the `/var/run/cassandra` directory is created, but because it is located on a temporary file system it will be lost after system reboot. As a result it is not possible to stop or restart the Cassandra service anymore.

To avoid this, edit the `/etc/init.d/cassandra` file to create the directory on service start:

```
[...]
case "$1" in
    start)
```

```
        # Cassandra startup
        echo -n "Starting Cassandra: "
        mkdir -p /var/run/cassandra
        chown cassandra:cassandra /var/run/cassandra
        su $CASSANDRA_OWNR -c "$CASSANDRA_PROG -p $pid_file" > $log_file
 2>&1
        retval=$?
[...]
```

4. **Enable and start Cassandra**

```
# service cassandra start
```

5. **Verify Cassandra Operation**

   After installation of all nodes has been completed, verify that Cassandra is operating properly.

   ### Important

   If Cassandra fails to start and prints a "buffer overflow" error message in its log file, you may try associating `127.0.0.1` with the hostname in `etc/hosts` (so that `hostname -i` will show `127.0.0.1`). This may solve the Cassandra start problem.

   A basic check can be done by executing the `nodetool status` command. This will reply with UN (Up / Normal) in the first column if the servers are running in a non-error state:

```
$ nodetool -host 127.0.0.1 status
[...]
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  Address    Load       Tokens  Owns   Host ID
       Rack
UN  192.0.2.1  123.45 KB  256     33.3%
 11111111-2222-3333-4444-555555555555  rack1
UN  192.0.2.2  234.56 KB  256     33.3%
 22222222-3333-4444-5555-666666666666  rack1
UN  192.0.2.3  345.67 KB  256     33.4%
 33333333-4444-5555-6666-777777777777  rack1
```

Controller Node

MidoNet Cluster Installation

1. **Install MidoNet Cluster package**

```
# zypper install midonet-cluster
```

2. **Set up mn-conf**

   Edit `/etc/midonet/midonet.conf` to point mn-conf to the ZooKeeper cluster:

```
[zookeeper]
zookeeper_hosts = nsdb1:2181,nsdb2:2181,nsdb3:2181
```

3. **Configure access to the NSDB**

   This step needs to happen only once, it will set up access to the NSDB for the MidoNet Cluster and Agent nodes.

Run the following command to set the cloud-wide values for the ZooKeeper and Cassandra server addresses:

```
$ cat << EOF | mn-conf set -t default
zookeeper {
    zookeeper_hosts = "nsdb1:2181,nsdb2:2181,nsdb3:2181"
}

cassandra {
    servers = "nsdb1,nsdb2,nsdb3"
}
EOF
```

Run the following command to set the Cassandra replication factor:

```
$ echo "cassandra.replication_factor : 3" | mn-conf set -t default
```

4. **Configure Keystone access**

   This step needs to happen only once, it will set up access to Keystone for the MidoNet Cluster node(s).

   This step will configure the local Midonet Cluster node to be able to use Keystone.

```
$ cat << EOF | mn-conf set -t default
cluster.auth {
    provider_class = "org.midonet.cluster.auth.keystone.KeystoneService"
    admin_role = "admin"
    keystone.tenant_name = "admin"
    keystone.admin_token = "ADMIN_TOKEN"
    keystone.host = controller
    keystone.port = 35357
}
EOF
```

5. **Start the MidoNet Cluster**

```
# systemctl enable midonet-cluster.service
# systemctl start midonet-cluster.service
```

MidoNet CLI Installation

1. **Install MidoNet CLI package**

```
# zypper install python-midonetclient
```

2. **Configure MidoNet CLI**

   Create the `~/.midonetrc` file and edit it to contain the following:

```
[cli]
api_url = http://controller:8080/midonet-api
username = admin
password = ADMIN_PASS
project_id = admin
```

Midolman Installation

The *MidoNet Agent (Midolman)* has to be installed on all nodes where traffic enters or leaves the virtual topology, in this guide this are the **controller**, **gateway1**, **gateway2** and **compute1** nodes.

1. **Install Midolman package**

   ```
   # zypper install midolman
   ```

2. **Set up mn-conf**

   Edit `/etc/midolman/midolman.conf` to point mn-conf to the ZooKeeper cluster:

   ```
   [zookeeper]
   zookeeper_hosts = nsdb1:2181,nsdb2:2181,nsdb3:2181
   ```

3. **Configure access to the NSDB for all agents**

   This step needs to happen only once, it will set up access to the NSDB for all MidoNet Agent nodes.

   Run the following command to set the cloud-wide values for the ZooKeeper and Cassandra server addresses:

   ```
   $ cat << EOF | mn-conf set -t default
   zookeeper {
       zookeeper_hosts = "nsdb1:2181,nsdb2:2181,nsdb3:2181"
   }

   cassandra {
       servers = "nsdb1,nsdb2,nsdb3"
   }
   EOF
   ```

   Run the following command to set the Cassandra replication factor:

   ```
   $ echo "cassandra.replication_factor : 3" | mn-conf set -t default
   ```

4. **Configure resource usage**

   Run these steps on **each agent host** in order to configure resource usage.

   ### Important

   For production environments the **large** templates are strongly recommended.

   a. **Midolman resource template**

      Run the following command to configure the Midolman resource template:

      ```
      $ mn-conf template-set -h local -t TEMPLATE_NAME
      ```

      Replace **TEMPLATE_NAME** with one of the following templates:

      ```
      agent-compute-large
      agent-compute-medium
      agent-gateway-large
      agent-gateway-medium
      default
      ```

   b. **Java Virtual Machine (JVM) resource template**

      Replace the default `/etc/midolman/midolman-env.sh` file with one of the below to configure the JVM resource template:

      ```
      /etc/midolman/midolman-env.sh.compute.large
      /etc/midolman/midolman-env.sh.compute.medium
      ```

```
/etc/midolman/midolman-env.sh.gateway.large
/etc/midolman/midolman-env.sh.gateway.medium
```

5. **Start Midolman**

```
# systemctl enable midolman.service
# systemctl start midolman.service
```

MidoNet Host Registration

1. **Launch MidoNet CLI**

```
$ midonet-cli
midonet>
```

2. **Create tunnel zone**

MidoNet supports the Virtual Extensible LAN (VXLAN) and Generic Routing Encapsulation (GRE) protocols to communicate to other hosts within a tunnel zone.

To use the VXLAN protocol, create the tunnel zone with type 'vxlan':

```
midonet> tunnel-zone create name tz type vxlan
tzone0
```

To use the GRE protocol, create the tunnel zone with type 'gre':

```
midonet> tunnel-zone create name tz type gre
tzone0
```

Important

Make sure to allow GRE/VXLAN traffic for all hosts that belong to the tunnel zone. For VXLAN MidoNet uses UDP port 6677 as default.

1. **Add hosts to tunnel zone**

```
midonet> list tunnel-zone
tzone tzone0 name tz type vxlan

midonet> list host
host host0 name controller alive true
host host1 name gateway1 alive true
host host2 name gateway2 alive true
host host3 name compute1 alive true

midonet> tunnel-zone tzone0 add member host host0
 address ip_address_of_host0
zone tzone0 host host0 address ip_address_of_host0

midonet> tunnel-zone tzone0 add member host host1
 address ip_address_of_host1
zone tzone0 host host1 address ip_address_of_host1

midonet> tunnel-zone tzone0 add member host host2
 address ip_address_of_host2
zone tzone0 host host2 address ip_address_of_host2

midonet> tunnel-zone tzone0 add member host host3
 address ip_address_of_host3
zone tzone0 host host3 address ip_address_of_host3
```

5. Initial Network Configuration

1. **To create the external network**

   Use the following command to create the external network:

   ```
   $ neutron net-create ext-net --router:external
   ```

6. Edge Router Setup

Prior to v5.0, with Neutron, you could set up the gateway in only one way, which was to have a special singleton gateway router called the Provider Router created implicitly when an external network was created in Neutron. The provider router sits at the edge of the cloud and interfaces with the uplink router. The Provider Router is where BGP was typically configured. The biggest limitation of this approach was that it took away the scenario in which you wanted to have an L2 network at the edge instead of a router. Another limitation was that only one such router could exist for the entire cloud.

These limitations are removed in v5.0, where you could design your gateway to be either L2 network or router with as many routers as you wish, all using the Neutron API.

There are two main changes:

Edge Router

The Provider Router is no longer implicitly created upon the external network creation. Instead, the edge gateway routers, called the Edge Routers, are created explicitly using standard Neutron API. With this approach, multiple Edge Routers can be created, and they are optional.

Gateway Virtual Topology

In the previous model, the Provider Router was connected directly to the tenant routers, with the external networks hanging off of the Provider Router.

In the new model, the external networks exist between the edge and the tenant routers.

To create the gateway topology issue the following Neutron commands.

Create a standard neutron router:

```
neutron router-create <EDGE_ROUTER_NAME>
```

Attach the edge router to an external network:

```
neutron router-interface-add <EDGE_ROUTER_ID> <EXT_SUBNET_ID>
```

Create a special network called `uplink` network, representing the physical network outside of the cloud:

```
neutron net-create <UPLINK_NET_NAME> --tenant_id admin --
provider:network_type uplink
```

Create a subnet for the uplink network matching the CIDR used in the uplink network (could just be /30 if linked directly to another router):

```
neutron subnet-create --tenant_id admin --disable-dhcp --name
 <UPLINK_SUBNET_NAME> <UPLINK_NET_NAME> <CIDR>
```

Create a port on the uplink network with a specific IP that you want to use and the binding details so that this virtual port gets bound to a specific NIC on the gateway host:

```
neutron port-create <UPLINK_NET_ID> --binding:host_id <HOST_NAME> --
binding:profile type=dict interface_name=<INTERFACE_NAME> --fixed-ip
 ip_address=<IP_ADDR>
```

Attach the uplink port to the Edge Router:

```
neutron router-interface-add <EDGE_ROUTER_ID> port=<UPLINK_PORT_ID>
```

7. BGP Uplink Configuration

MidoNet utilizes the Border Gateway Protocol (BGP) for external connectivity.

For production deployments it is strongly recommended to use BGP due to it's scalability and redundancy.

For demo or POC environments, alternatively static routing can be used.

The following instructions assume below sample environment:

- One floating IP network
  - *192.0.2.0/24*
- Two MidoNet gateway nodes
  - *gateway1*, connecting to *bgp1* via *eth1*
  - *gateway2*, connecting to *bgp2* via *eth1*
- Two remote BGP peers
  - *bgp1*, *198.51.100.1*, AS *64513*
  - *bgp2*, *203.0.113.1*, AS *64514*
- Corresponding MidoNet BGP peers
  - *198.51.100.2*, AS *64512*
  - *203.0.113.2*, AS *64512*

Follow these steps to configure the BGP uplinks.

1. Launch the MidoNet CLI and find the Edge Router

   ```
   midonet-cli> router list
   router router0 name Edge Router state up
   router router1 name Tenant Router state up infilter chain0 outfilter
    chain1
   ```

   In this example the Edge Router is **router0**.

2. Create and bind virtual ports for the BGP sessions

   Refer to Chapter 6, "Edge Router Setup" [20] for instructions on how to create the necessary ports and bind them to the Gateway hosts' physical network interfaces.

   You can confirm the port configuration within MidoNet CLI by listing the Edge Router's ports:

   ```
   midonet> router router0 port list
   port port0 device router0 state up mac fa:16:3e:11:11:11
    address 198.51.100.2 net 198.51.100.0/30
   port port1 device router0 state up mac fa:16:3e:22:22:22
    address 203.0.113.2 net 203.0.113.0/30
   [...]
   ```

3. Configure basic BGP settings

```
midonet> router router0 set asn 64512

midonet> router router0 add bgp-peer asn 64513 address 198.51.100.1
router0:peer0

midonet> router router0 add bgp-peer asn 64514 address 203.0.113.1
router0:peer1

midonet> router router0 list bgp-peer
peer peer0 asn 64513 address 198.51.100.1
peer peer1 asn 64514 address 203.0.113.1
```

4. If needed, configure MD5 authentication:

```
midonet> router router0 bgp-peer peer0 set password BGP_PASSWORD
midonet> router router0 bgp-peer peer1 set password BGP_PASSWORD
```

5. If needed, configure custom timers that will take precedence over the default ones defined in the MidoNet configuration:

```
midonet> router router0 bgp-peer peer0 set connect-retry 10
midonet> router router0 bgp-peer peer0 set hold-time 5
midonet> router router0 bgp-peer peer0 set keep-alive 5
midonet> router router0 bgp-peer peer1 set connect-retry 10
midonet> router router0 bgp-peer peer1 set hold-time 5
midonet> router router0 bgp-peer peer1 set keep-alive 5
midonet> router router0 list bgp-peer
peer peer0 asn 64513 address 198.51.100.1 keep-alive 5 hold-time 5
 connect-retry 10
peer peer1 asn 64514 address 203.0.113.1 keep-alive 5 hold-time 5
 connect-retry 10
```

6. Add routes to the remote BGP peers

   In order to be able to establish connections to the remote BGP peers, corresponding routes have to be added.

```
midonet> router router0 route add src 0.0.0.0/0 dst 198.51.100.0/30
 port router0:port0 type normal
router0:route0

midonet> router router0 route add src 0.0.0.0/0 dst 203.0.113.0/30
 port router0:port1 type normal
router0:route1
```

7. Advertise BGP routes

   In order to provide external connectivity for hosted virtual machines, the floating IP network has to be advertised to the BGP peers.

```
midonet> router router0 add bgp-network net 192.0.2.0/24
router0:net0

midonet> router router0 list bgp-network
net net0 net 192.0.2.0/24
```

8. Further Steps

MidoNet installation and integration into OpenStack is completed.

Note

Consult the **Operations Guide** for further instructions on operating MidoNet.