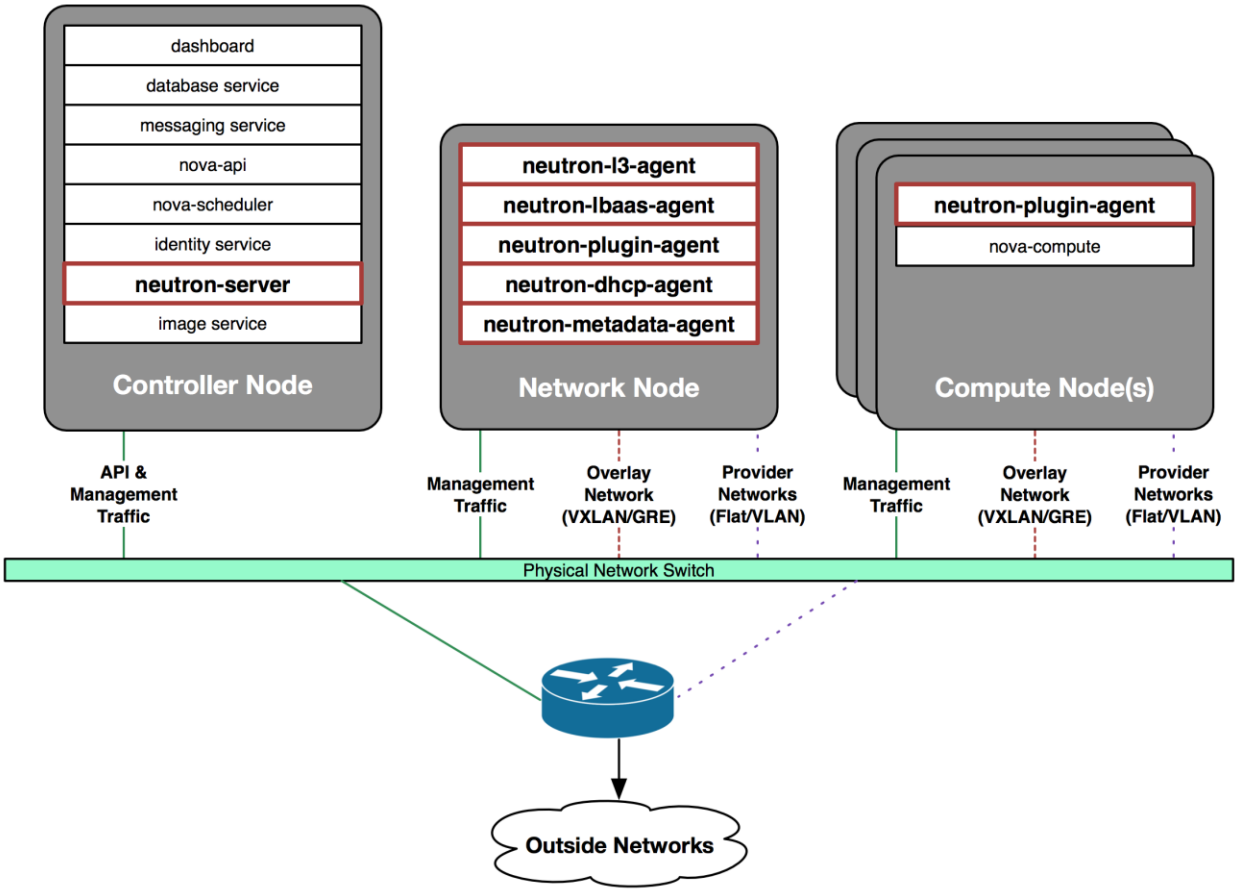
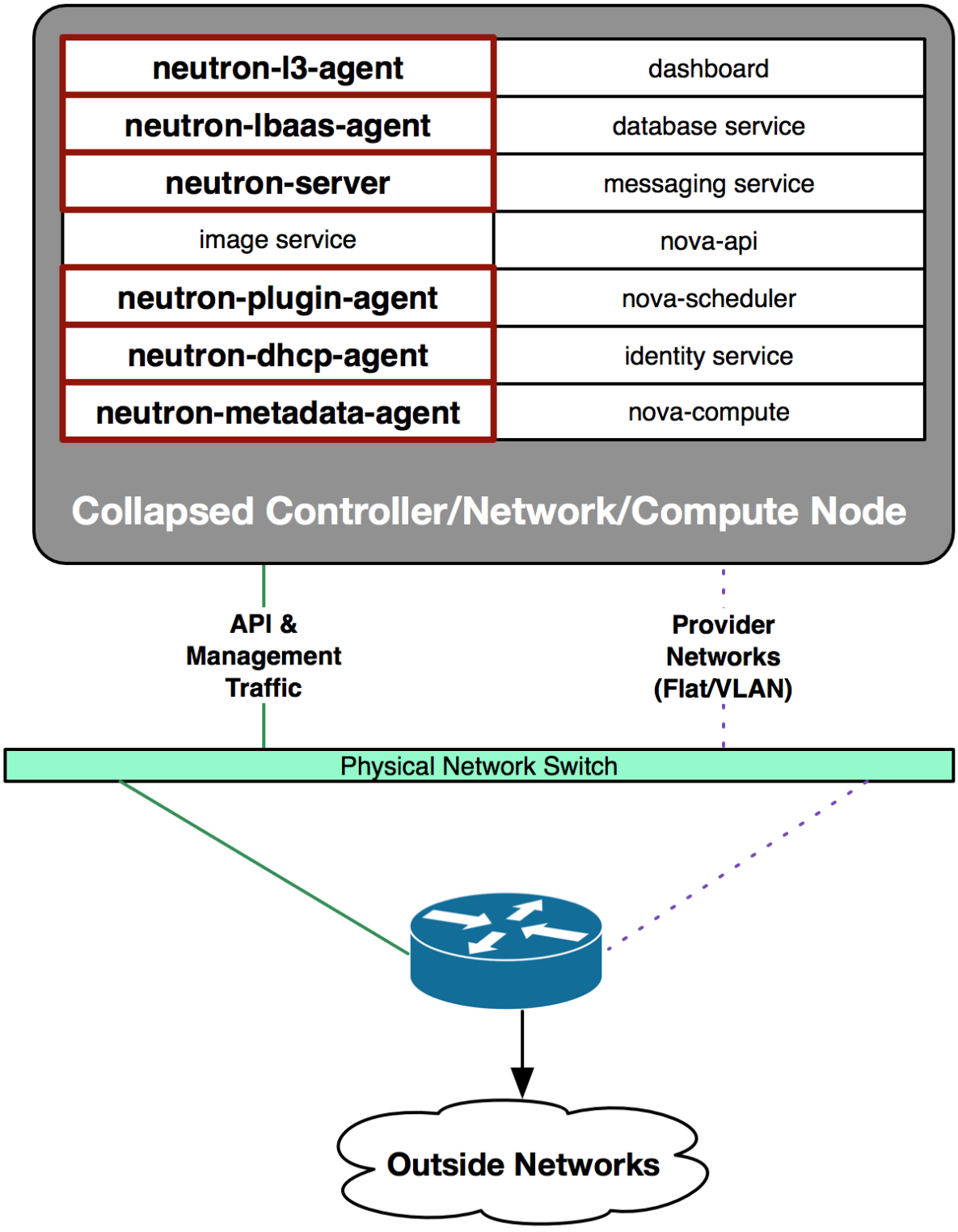
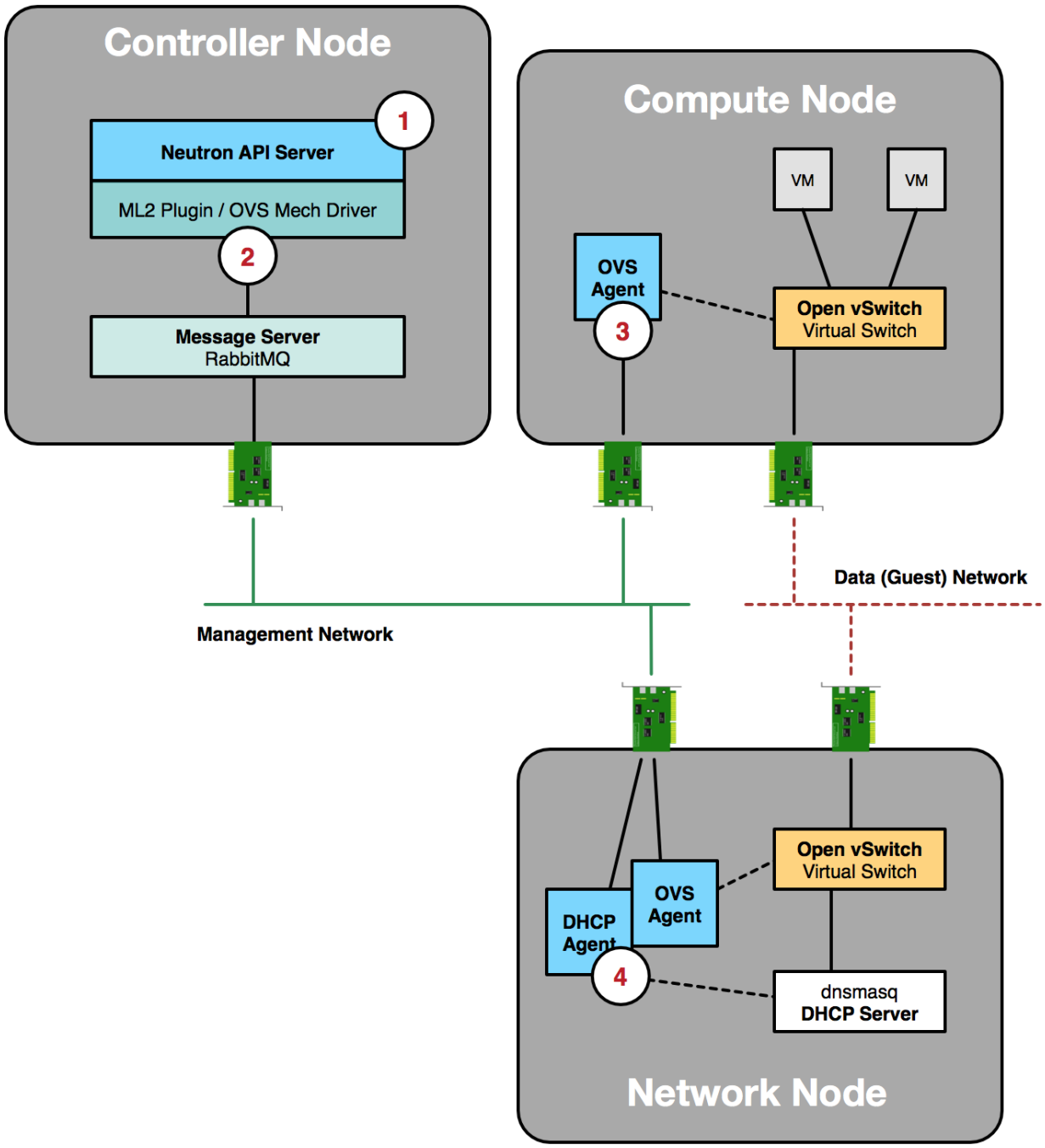
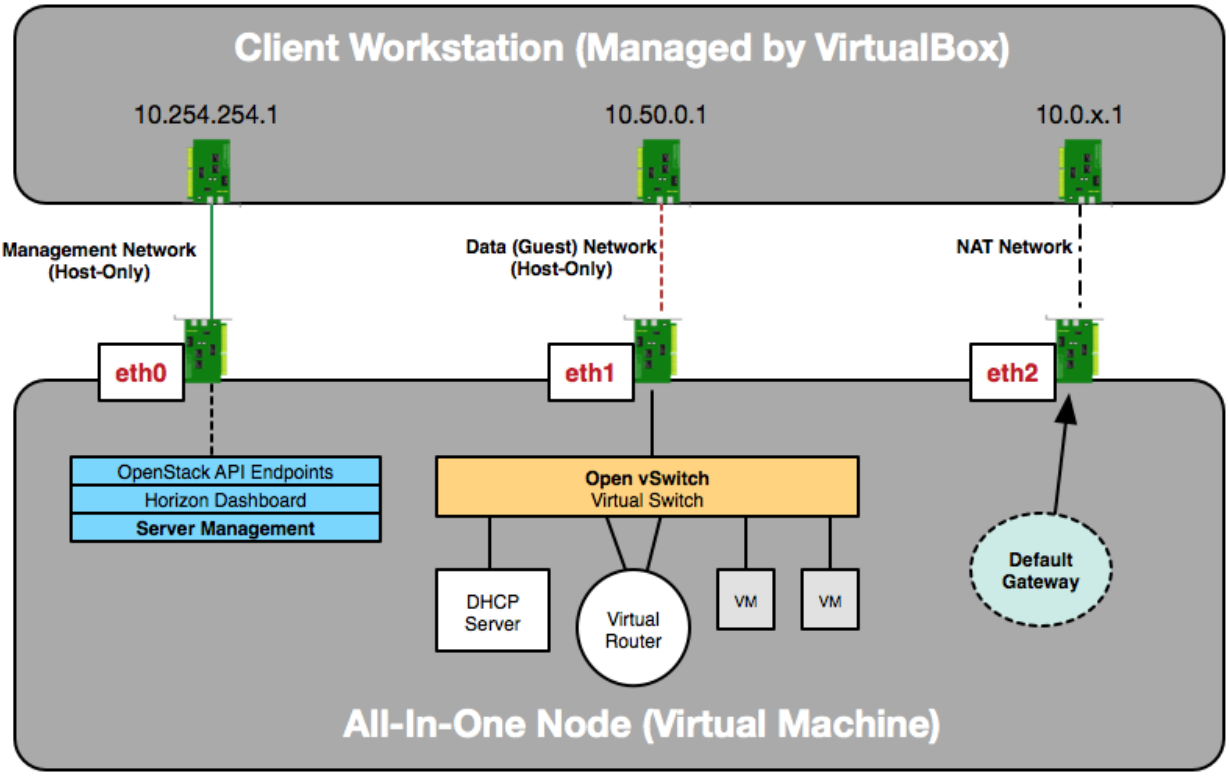
Chapter 1: OpenStack Networking Components – an Overview




neutron-l3-agent
dashboard
neutron-lbaas-agent
database service
neutron-server
messaging service
image service
nova-api
neutron-plugin-agent
nova-scheduler
neutron-dhcp-agent
identity service
neutron-metadata-agent
nova-compute
Collapsed Controller/Network/Compute Node
API &
Management
Traffic
Provider
Networks
(Flat/VLAN)
Physical Network Switch
Outside Networks


Controller Node
1
Neutron API Server
ML2 Plugin / OVS Mech Driver
2
Message Server
RabbitMQ
Compute Node
VM
VM
OVS
Agent
3
Open vSwitch
Virtual Switch
Data (Guest) Network
Management Network
Open vSwitch
Virtual Switch
DHCP
Agent
OVS
Agent
4
dnsmasq
DHCP Server
Network Node

Chapter 2: Installing OpenStack Using RDO

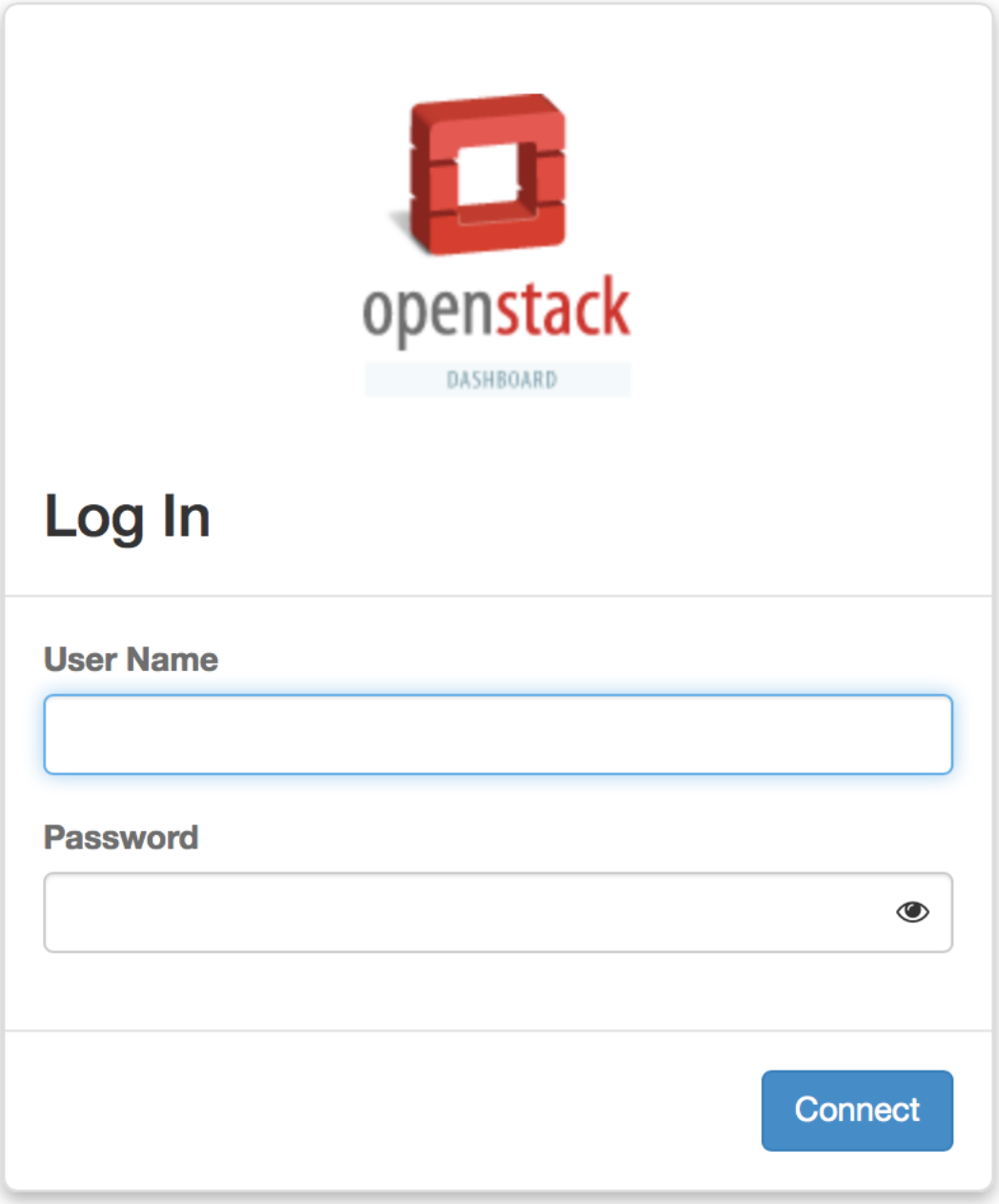


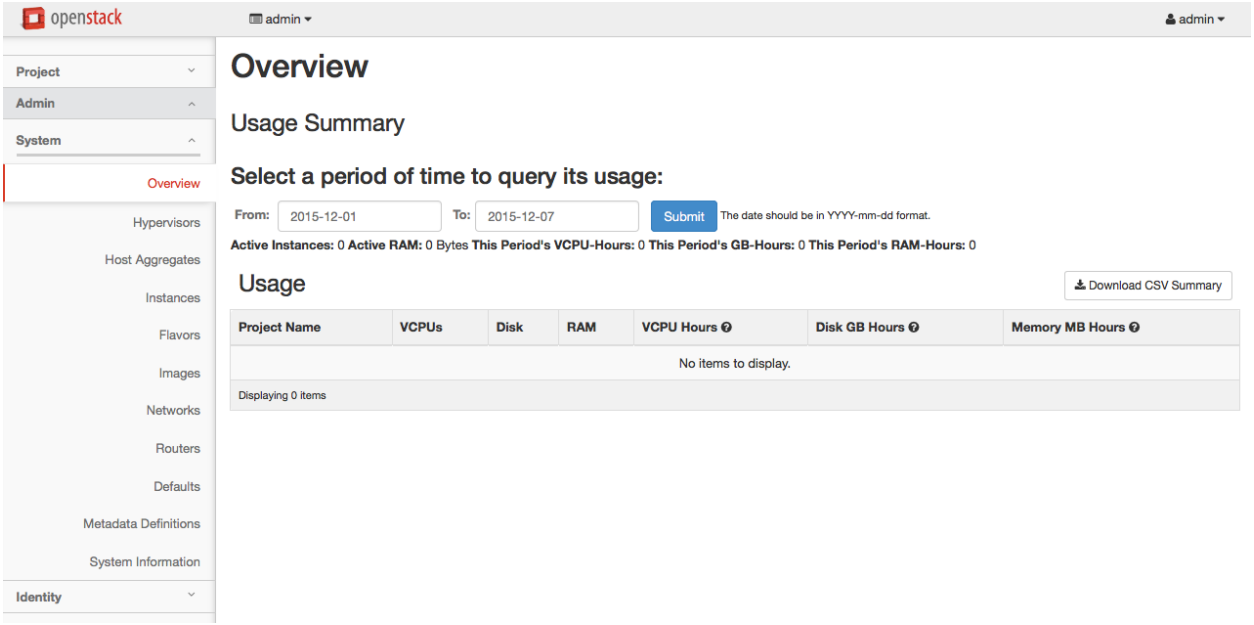

```
workstation:~ james.denton$ ssh jdenton@10.254.254.100
The authenticity of host '10.254.254.100 (10.254.254.100)' can't be established.
ECDSA key fingerprint is SHA256:1nbPfRKGjSZvCbpN+WT/OiyWs2r55Tn5AvAiGRO1YoE.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.254.254.100' (ECDSA) to the list of known hosts.
jdenton@10.254.254.100's password:
Last login: Mon Dec  7 10:38:11 2015 from 10.254.254.1
[jdenton@allinone ~]$
```

```
Welcome to the Packstack setup utility

The installation log file is available at: /var/tmp/packstack/20160223-230709-NWzMCg/openstack-se

Installing:
Clean Up                                             [ DONE ]
Discovering ip protocol version                      [ DONE ]
Setting up ssh keys                                  [ DONE ]
Preparing servers                                    [ DONE ]
Pre installing Puppet and discovering hosts' details [ DONE ]
Adding pre install manifest entries                  [ DONE ]
Setting up CACERT                                    [ DONE ]
Adding AMQP manifest entries                         [ DONE ]
Adding MariaDB manifest entries                      [ DONE ]
Fixing Keystone LDAP config parameters to be undef if empty[ DONE ]
Adding Keystone manifest entries                     [ DONE ]
Adding Glance Keystone manifest entries              [ DONE ]
Adding Glance manifest entries                       [ DONE ]
Adding Nova API manifest entries                     [ DONE ]
Adding Nova Keystone manifest entries                [ DONE ]
Adding Nova Cert manifest entries                    [ DONE ]
Adding Nova Conductor manifest entries               [ DONE ]
Creating ssh keys for Nova migration                 [ DONE ]
Gathering ssh host keys for Nova migration           [ DONE ]
Adding Nova Compute manifest entries                 [ DONE ]
Adding Nova Scheduler manifest entries               [ DONE ]
Adding Nova VNC Proxy manifest entries               [ DONE ]
Adding OpenStack Network-related Nova manifest entries[ DONE ]
Adding Nova Common manifest entries                  [ DONE ]
Adding Neutron VPNaaS Agent manifest entries         [ DONE ]
Adding Neutron FWaaS Agent manifest entries          [ DONE ]
Adding Neutron LBaaS Agent manifest entries          [ DONE ]
Adding Neutron API manifest entries                  [ DONE ]
Adding Neutron Keystone manifest entries             [ DONE ]
Adding Neutron L3 manifest entries                   [ DONE ]
Adding Neutron L2 Agent manifest entries             [ DONE ]
Adding Neutron DHCP Agent manifest entries           [ DONE ]
Adding Neutron Metering Agent manifest entries       [ DONE ]
Adding Neutron Metadata Agent manifest entries       [ DONE ]
Adding Neutron SR-IOV Switch Agent manifest entries  [ DONE ]
Checking if NetworkManager is enabled and running    [ DONE ]
Adding OpenStack Client manifest entries             [ DONE ]
Adding Horizon manifest entries                      [ DONE ]
Adding post install manifest entries                 [ DONE ]
Copying Puppet modules and manifests                 [ DONE ]
Applying 10.254.254.100_prescript.pp
10.254.254.100_prescript.pp:                         [ DONE ]
Applying 10.254.254.100_amqp.pp
Applying 10.254.254.100_mariadb.pp
10.254.254.100_amqp.pp:                              [ DONE ]
10.254.254.100_mariadb.pp:                           [ DONE ]
Applying 10.254.254.100_keystone.pp
Applying 10.254.254.100_glance.pp
10.254.254.100_keystone.pp:                          [ DONE ]
10.254.254.100_glance.pp:                            [ DONE ]
Applying 10.254.254.100_api_nova.pp
10.254.254.100_api_nova.pp:                          [ DONE ]
Applying 10.254.254.100_nova.pp
10.254.254.100_nova.pp:                              [ DONE ]
Applying 10.254.254.100_neutron.pp
10.254.254.100_neutron.pp:                           [ DONE ]
Applying 10.254.254.100_osclient.pp
Applying 10.254.254.100_horizon.pp
10.254.254.100_osclient.pp:                          [ DONE ]
10.254.254.100_horizon.pp:                           [ DONE ]
Applying 10.254.254.100_postscript.pp
10.254.254.100_postscript.pp:                        [ DONE ]
Applying Puppet manifests                            [ DONE ]
Finalizing                                           [ DONE ]
```

```
 **** Installation completed successfully ******

Additional information:

 * Time synchronization installation was skipped. Please note that unsynchronized time on server
 instances might be problem for some OpenStack components.

 * File /root/keystonerc_admin has been created on OpenStack client host 10.254.254.100. To use
 the command line tools you need to source the file.

 * To access the OpenStack Dashboard browse to http://10.254.254.100/dashboard .

Please, find your login credentials stored in the keystonerc_admin in your home directory.
 * The installation log file is available at: /var/tmp/packstack/20160223-230709-NWzMCg/openstack-setup.log
 * The generated manifests are available at: /var/tmp/packstack/20160223-230709-NWzMCg/manifests
```

```
[root@allinone jdenton]# source ~/keystonerc_admin
[root@allinone jdenton(keystone_admin)]# openstack user list
+----------------------------------+---------+
| ID                               | Name    |
+----------------------------------+---------+
| 1c4be314491940aba0f2283889426573 | nova    |
| 3e4af83768e54dc5853db81060ccadc6 | admin   |
| 7f4af67b070847d08ea87132dcee3f8d | neutron |
| b43b176c7de04e7e8d9b6d91c08e459b | glance  |
+----------------------------------+---------+
```


openstack
DASHBOARD
Log In
User Name
Password
Connect

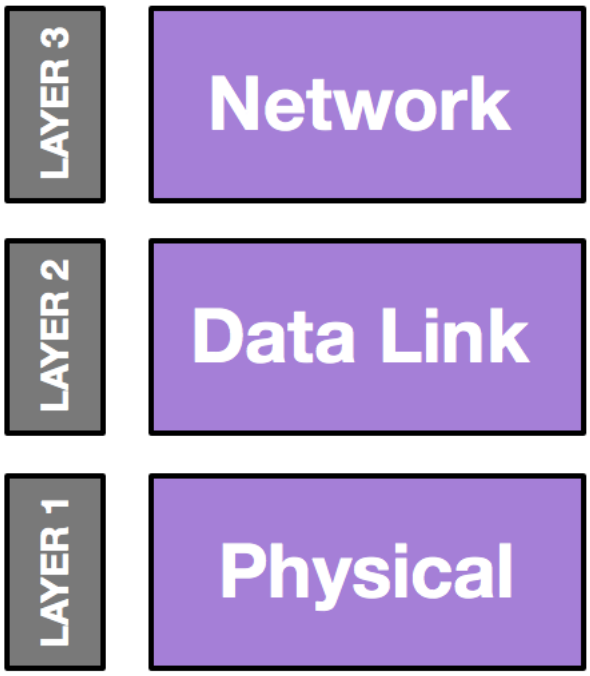


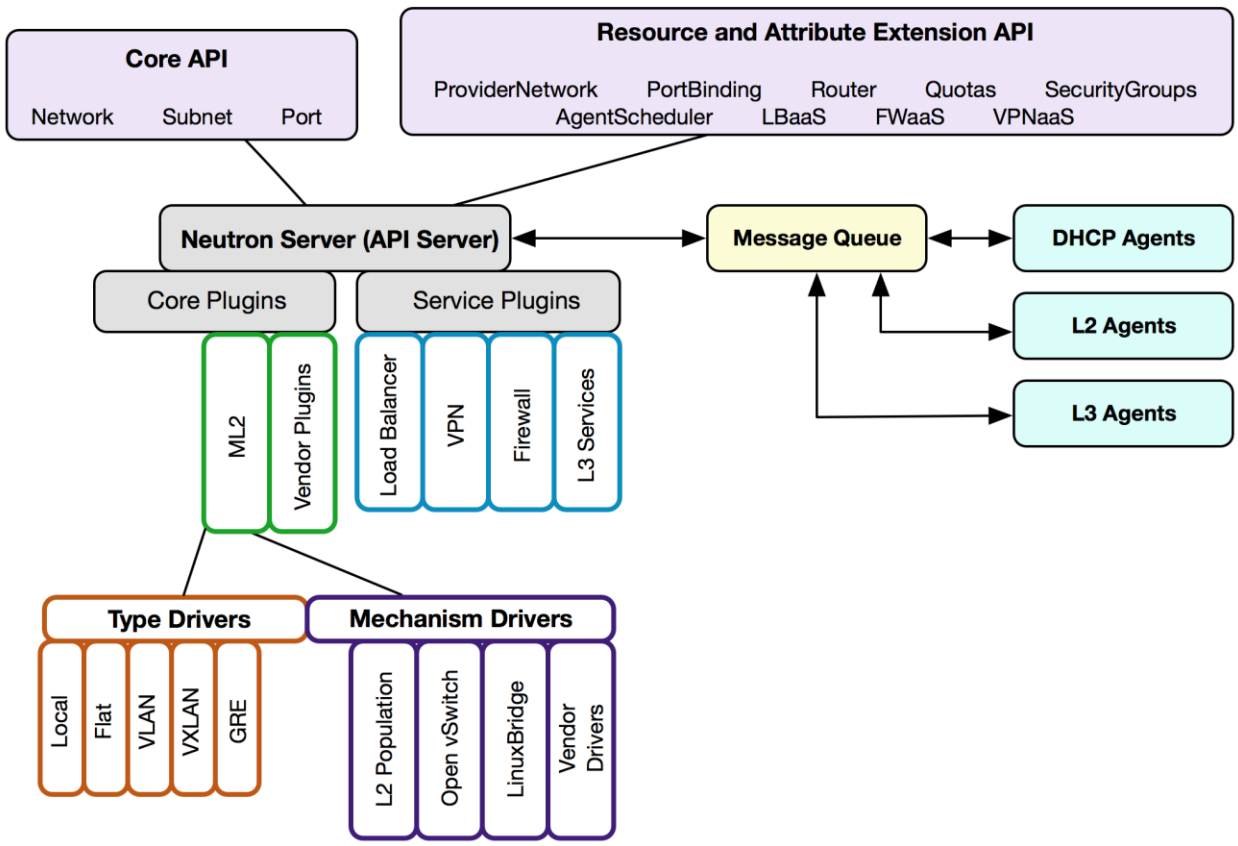

```
[root@allinone ~(keystone_admin)]# neutron security-group-rule-create default \
> --protocol tcp --port-range-min 22 --port-range-max 22

Created a new security_group_rule:
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| direction         | ingress                              |
| ethertype         | IPv4                                 |
| id                | 1dfcf2da-f4cb-4d92-88cc-d2932827b69b |
| port_range_max    | 22                                   |
| port_range_min    | 22                                   |
| protocol          | tcp                                  |
| remote_group_id   |                                      |
| remote_ip_prefix  |                                      |
| security_group_id | 454fcbb8-b655-49d7-a793-9de5fd4bd837 |
| tenant_id         | 496e391ab2ee4d92afb2461811a36013     |
+-------------------+--------------------------------------+

[root@allinone ~(keystone_admin)]# openstack project create --description "Demo Project" demo
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description | Demo Project                     |
| enabled     | True                             |
| id          | a15a1bccb55d40dfbaf0499c2cae6fcb |
| name        | demo                             |
+-------------+----------------------------------+
```

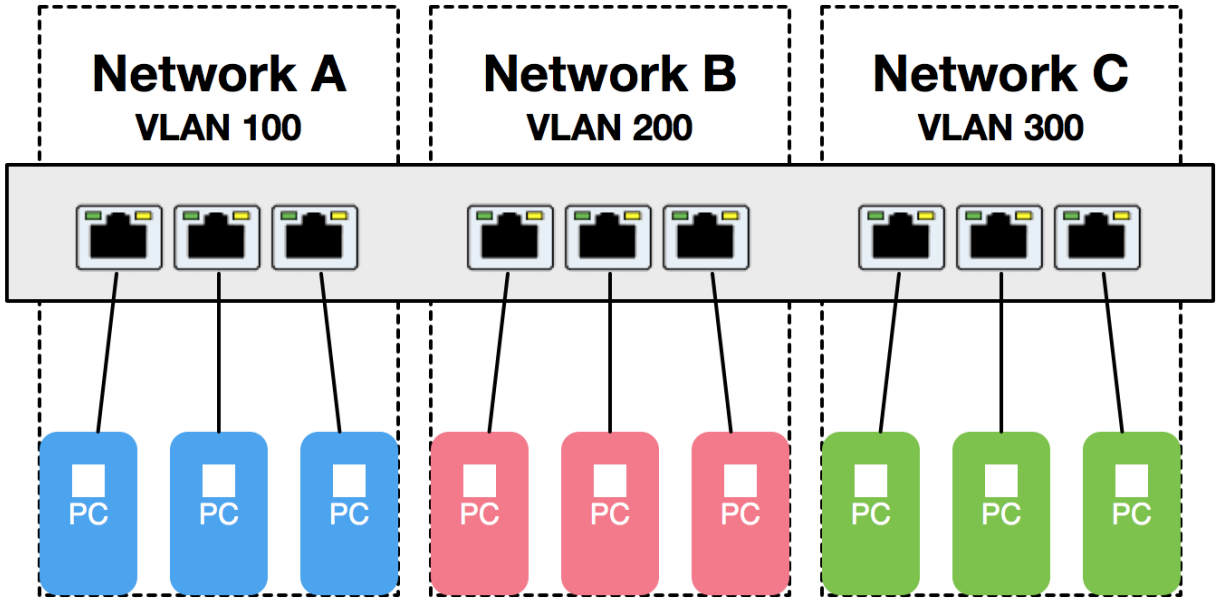
```
[root@allinone ~(keystone_admin)]# openstack user create demo --password openstack
+----------+----------------------------------+
| Field    | Value                            |
+----------+----------------------------------+
| email    | None                             |
| enabled  | True                             |
| id       | f3aa8c94b4cf4a89a0b302228e459cc3 |
| name     | demo                             |
| username | demo                             |
+----------+----------------------------------+

[root@allinone ~(keystone_admin)]# openstack role add --project demo --user demo _member_
+-------+----------------------------------+
| Field | Value                            |
+-------+----------------------------------+
| id    | 9fe2ff9ee4384b1894a90878d3e92bab |
| name  | _member_                         |
+-------+----------------------------------+
```

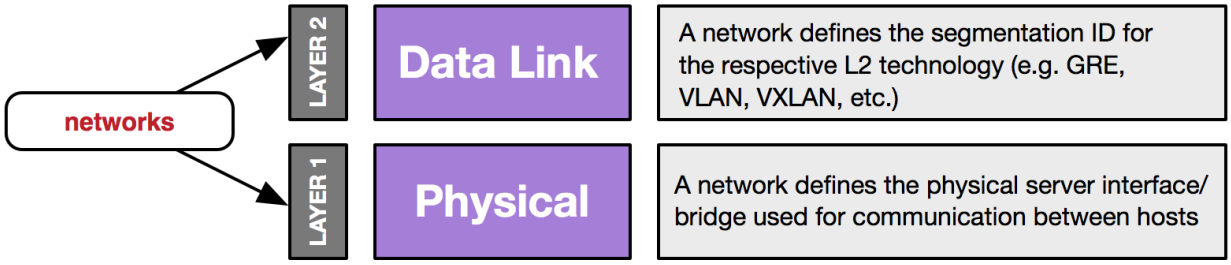
```
[root@allinone ~(keystone_admin)]# openstack image list
+--------------------------------------+---------------------+
| ID                                   | Name                |
+--------------------------------------+---------------------+
| 755ab1fb-77b8-4434-93eb-062084b46b0a | cirros-0.3.4-x86_64 |
+--------------------------------------+---------------------+
```

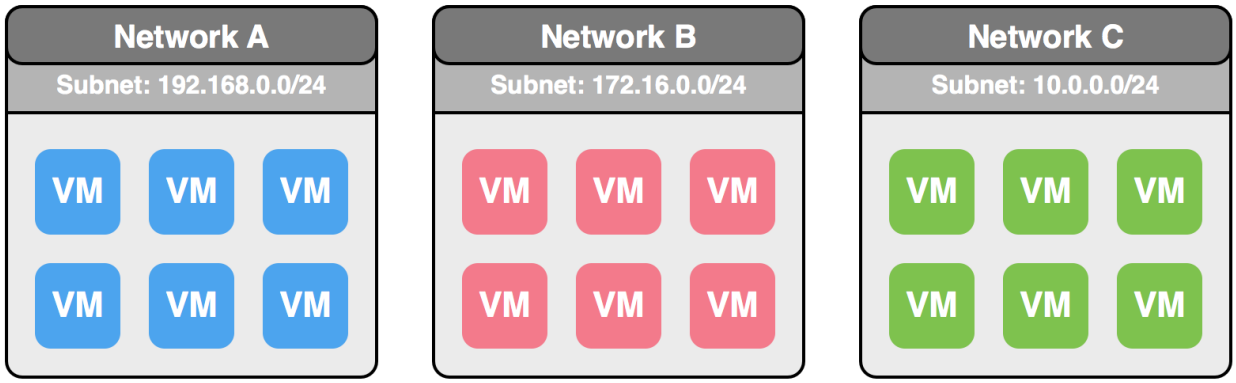
Chapter 3: Neutron API Basics

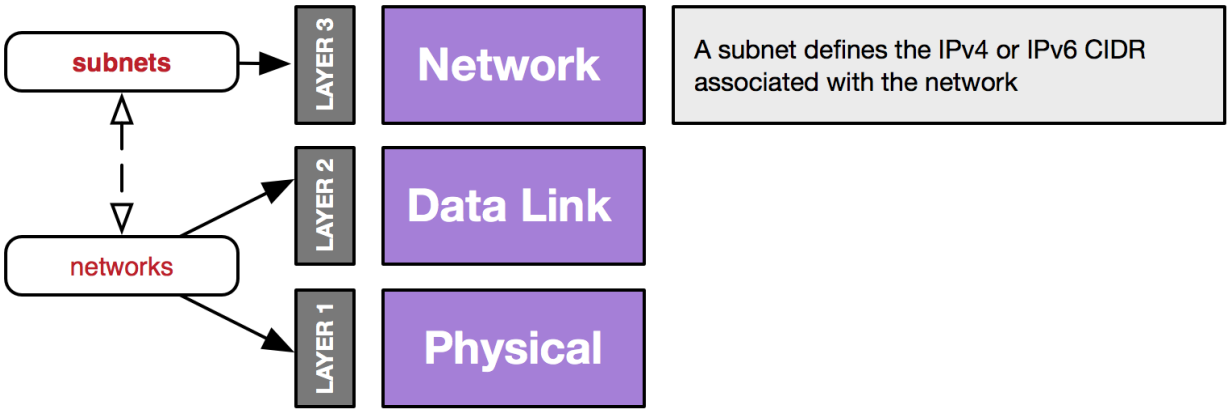


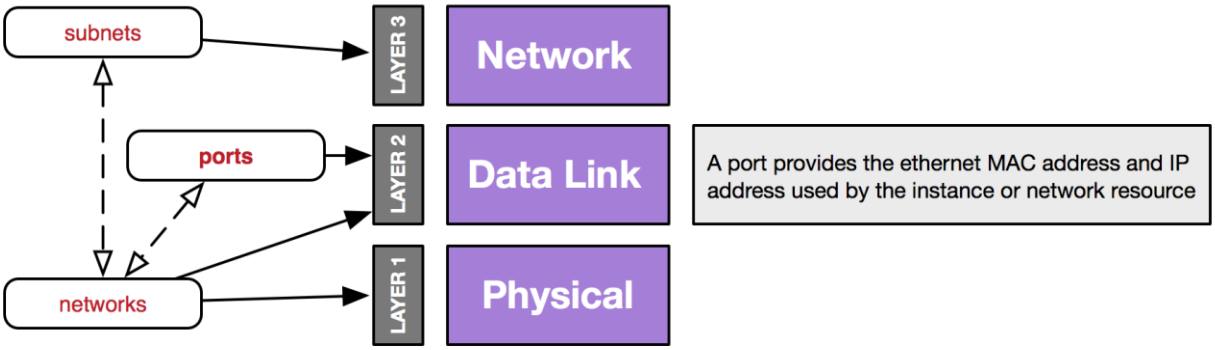


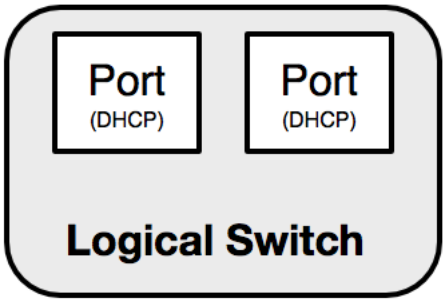

Network A
VLAN 100
Network B
VLAN 200
Network C
VLAN 300
PC
PC
PC
PC
PC
PC
PC
PC
PC

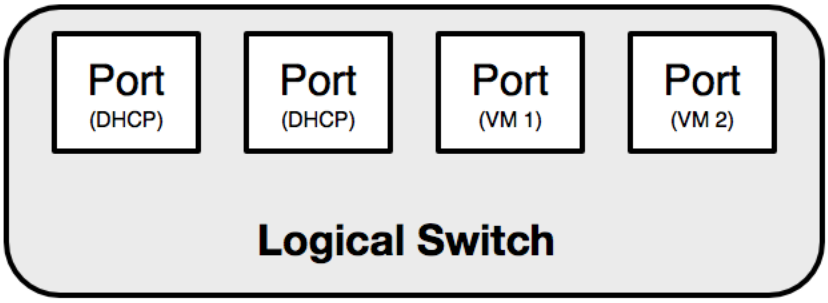

networks
LAYER 2
Data Link
A network defines the segmentation ID for the respective L2 technology (e.g. GRE, VLAN, VXLAN, etc.)
LAYER 1
Physical
A network defines the physical server interface/ bridge used for communication between hosts

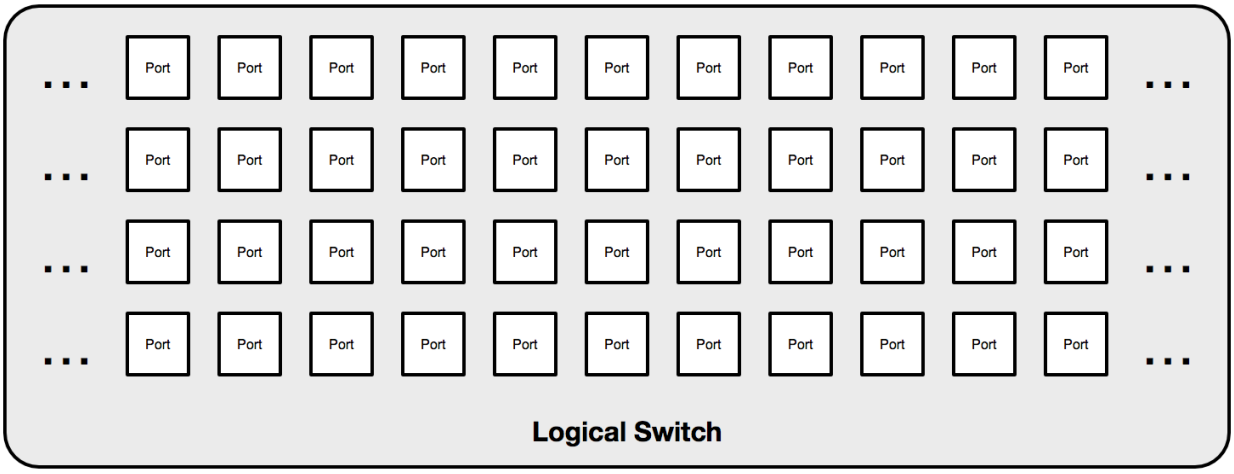

Network A
Subnet: 192.168.0.0/24
VM
VM
VM
VM
VM
VM
Network B
Subnet: 172.16.0.0/24
VM
VM
VM
VM
VM
VM
Network C
Subnet: 10.0.0.0/24
VM
VM
VM
VM
VM
VM


subnets
networks
LAYER 3
LAYER 2
LAYER 1
Network
Data Link
Physical
A subnet defines the IPv4 or IPv6 CIDR associated with the network


subnets
ports
networks
LAYER 3
LAYER 2
LAYER 1
Network
Data Link
Physical
A port provides the ethernet MAC address and IP address used by the instance or network resource


Port
(DHCP)
Port
(DHCP)
Logical Switch

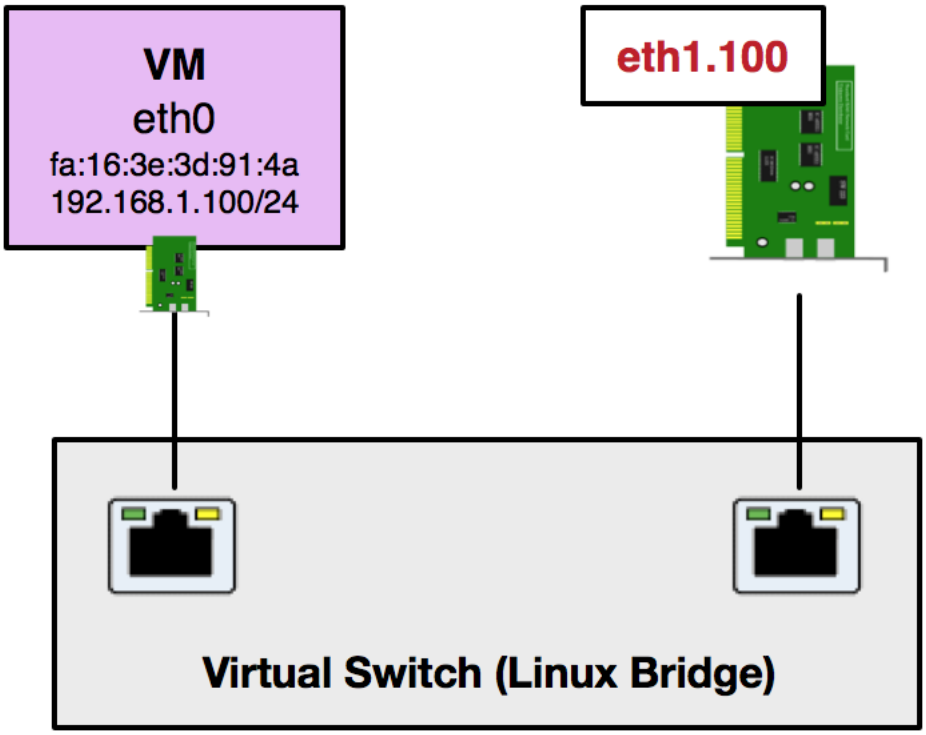

Port
(DHCP)
Port
(DHCP)
Port
(VM 1)
Port
(VM 2)
Logical Switch



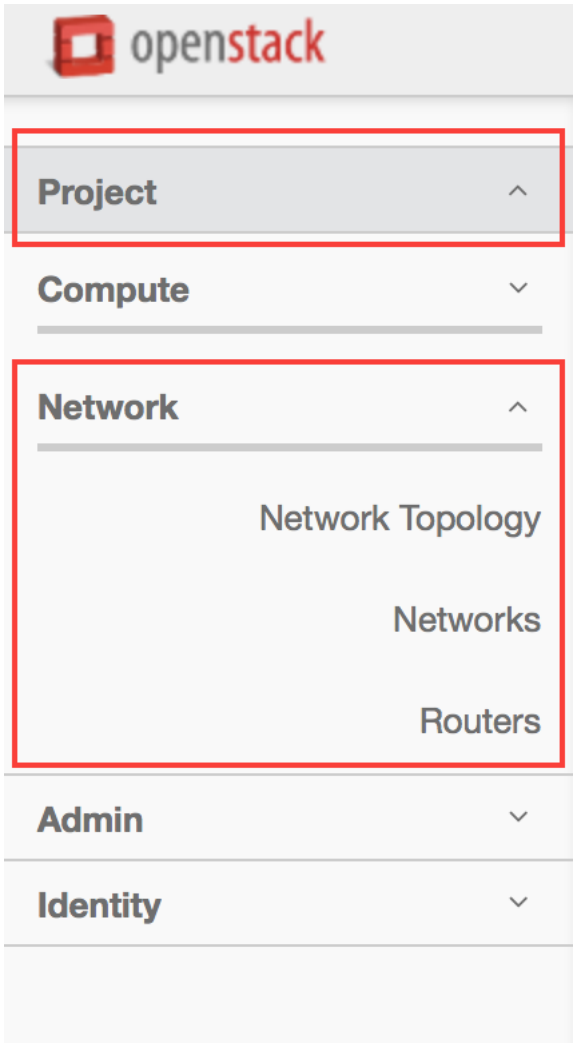
Port	
ID	XXXX-XXXX-XXXX
Network	YYYY-YYYY-YYYY
Host	Compute01
Type	Bridge
MAC	fa:16:3e:3d:91:4a
IP Addr	192.168.1.100

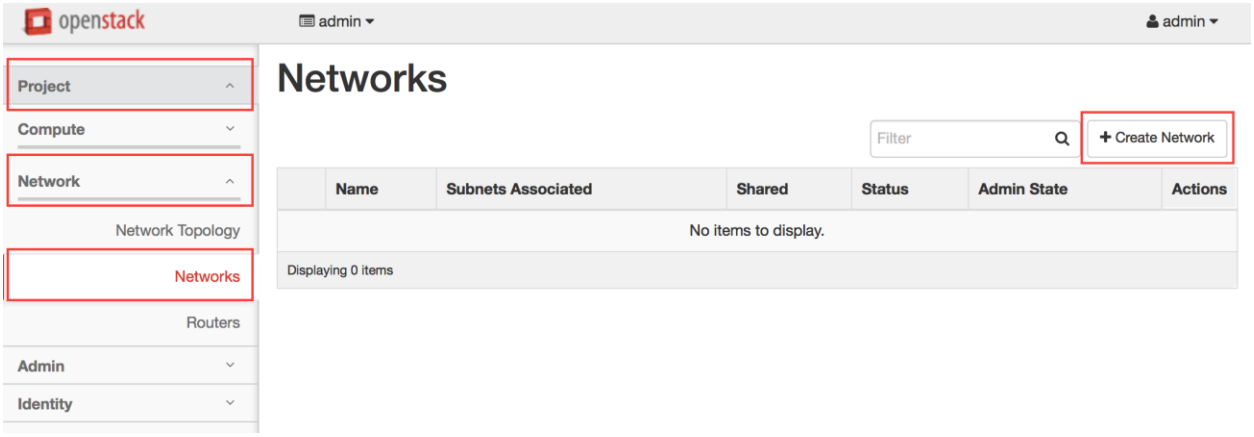
Network	
ID	YYYY-YYYY-YYYY
Name	Internal
Subnet	ZZZZ-ZZZZ-ZZZZ
Type	VLAN
SegID	100
Physical	eth1

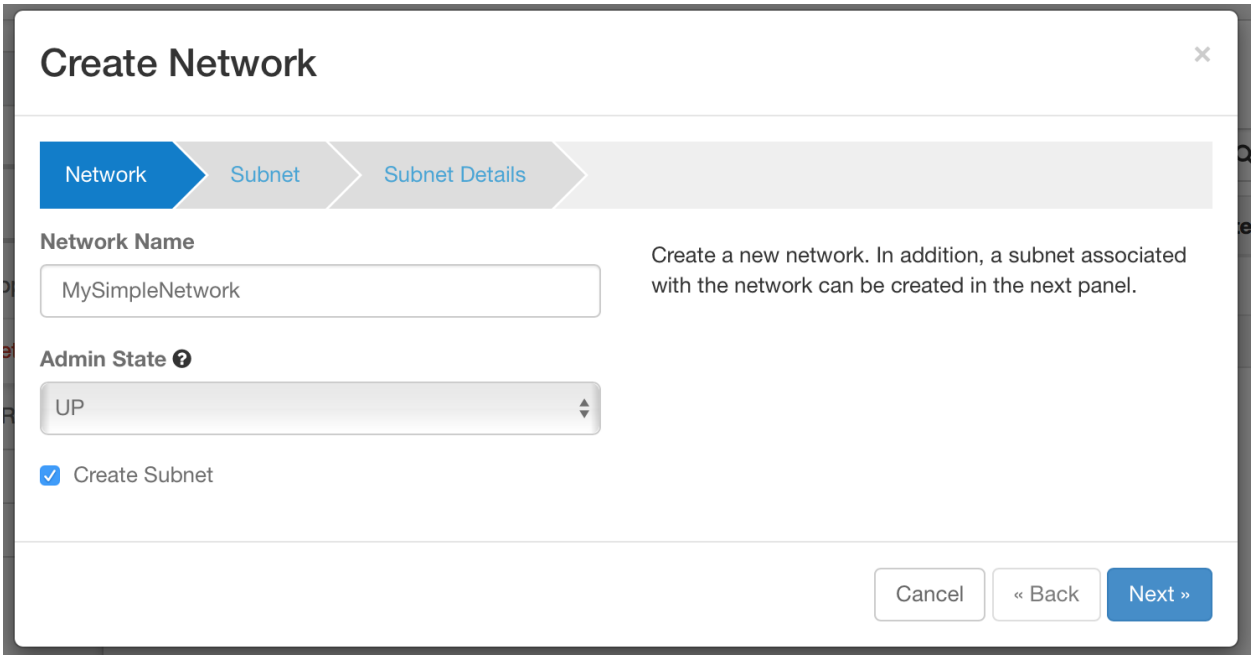
Subnet	
ID	ZZZZ-ZZZZ-ZZZZ
Name	Internal_Subnet
CIDR	192.168.1.0/24
Gateway	192.168.1.1
DHCP	True
Network	YYYY-YYYY-YYYY

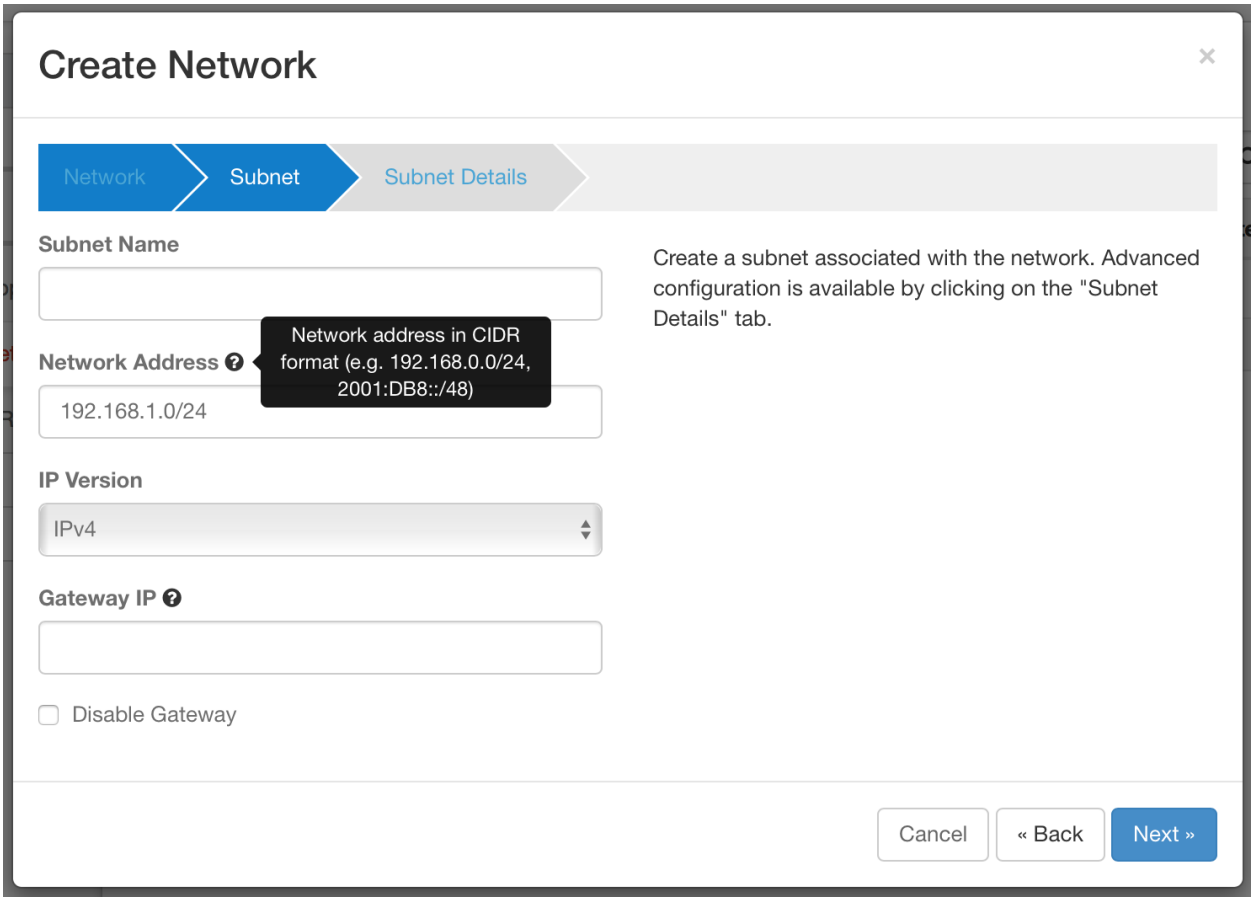

VM
eth0
fa:16:3e:3d:91:4a
192.168.1.100/24
eth1.100
Virtual Switch (Linux Bridge)

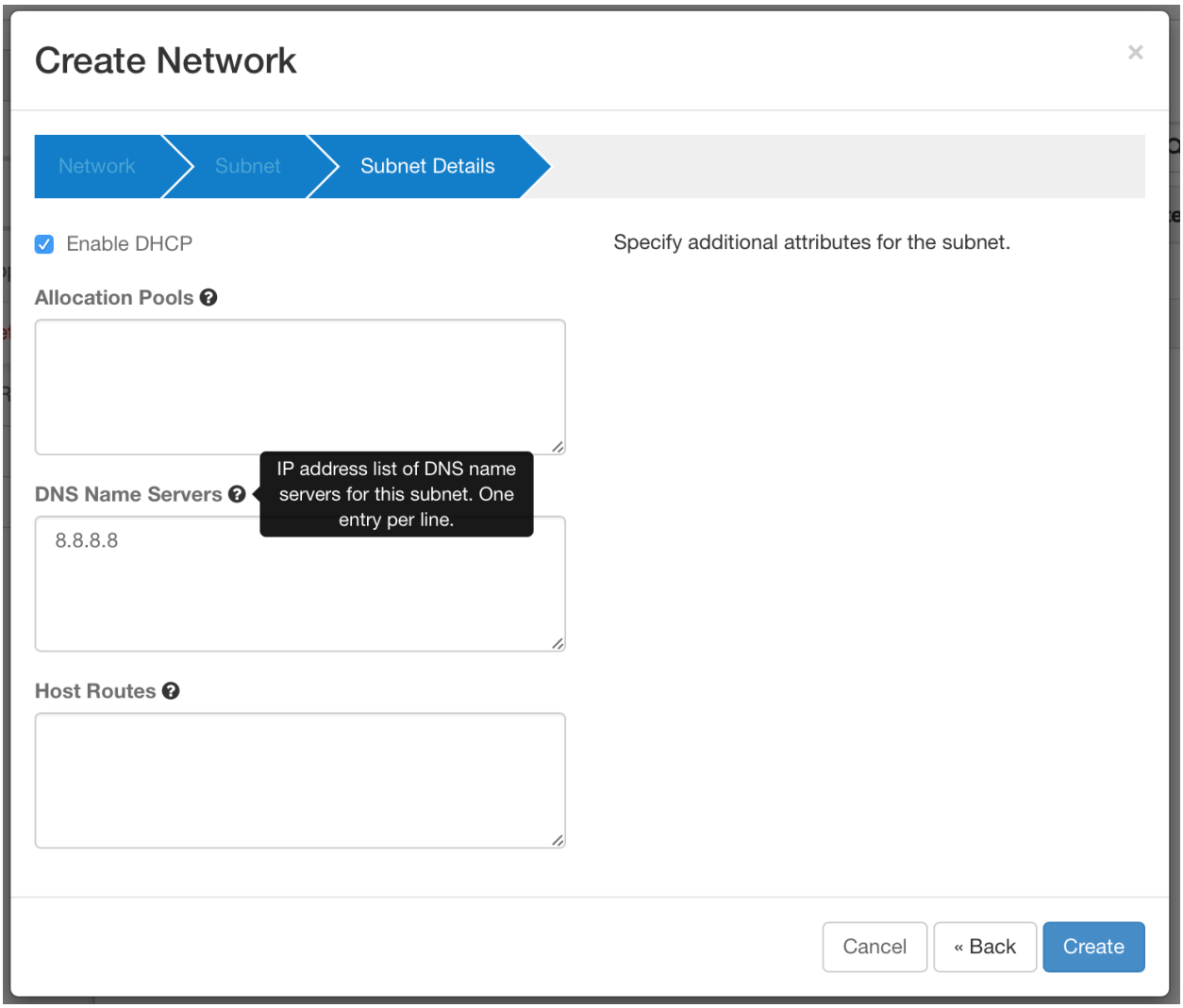
Chapter 4: Interfacing with Neutron

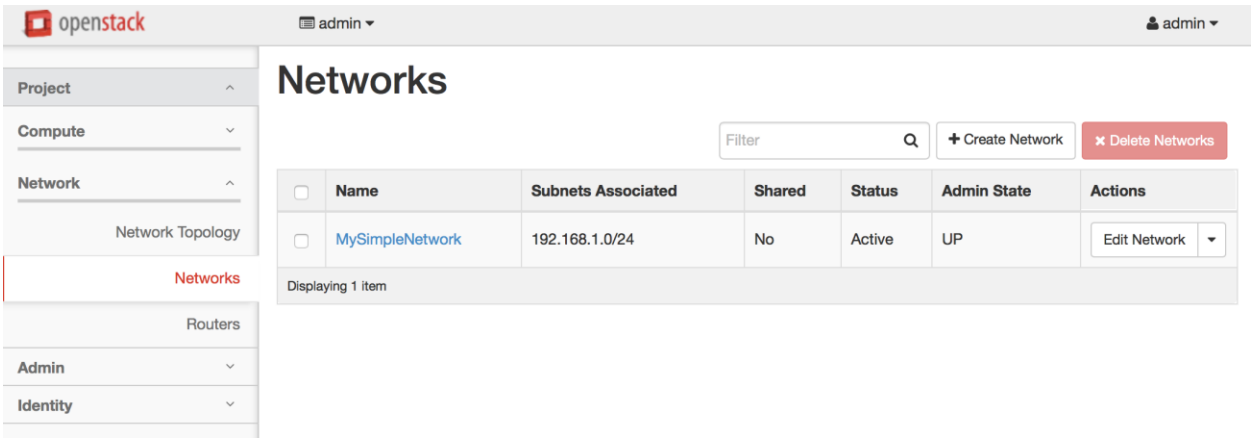


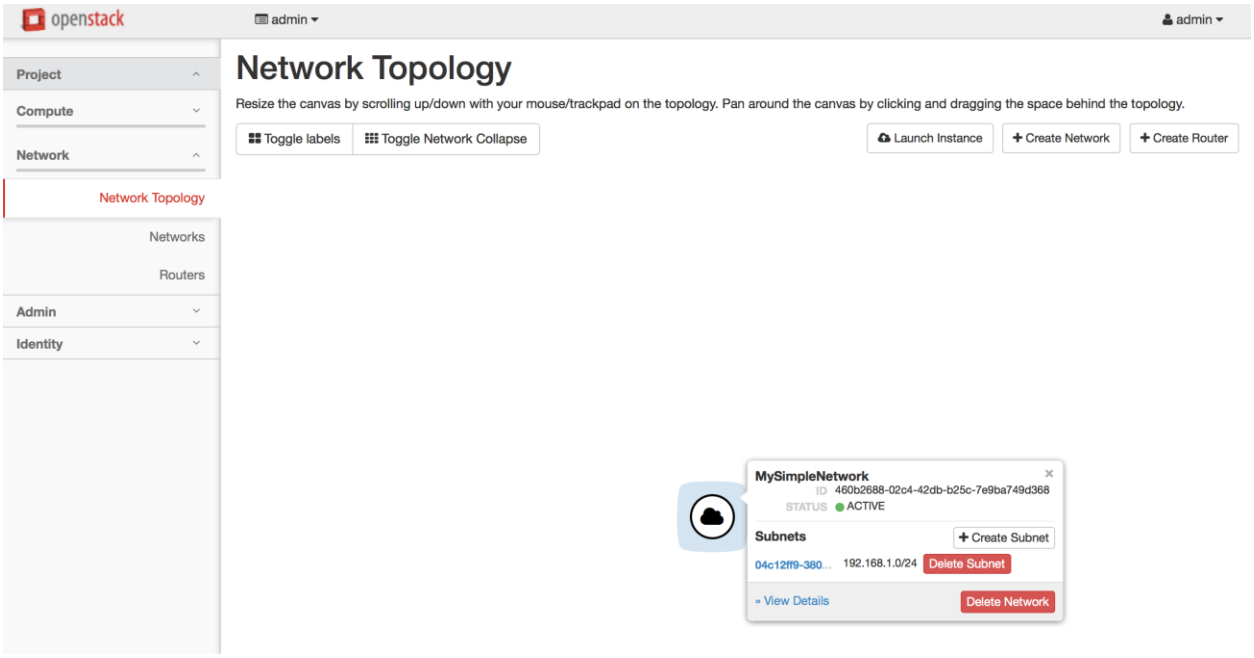


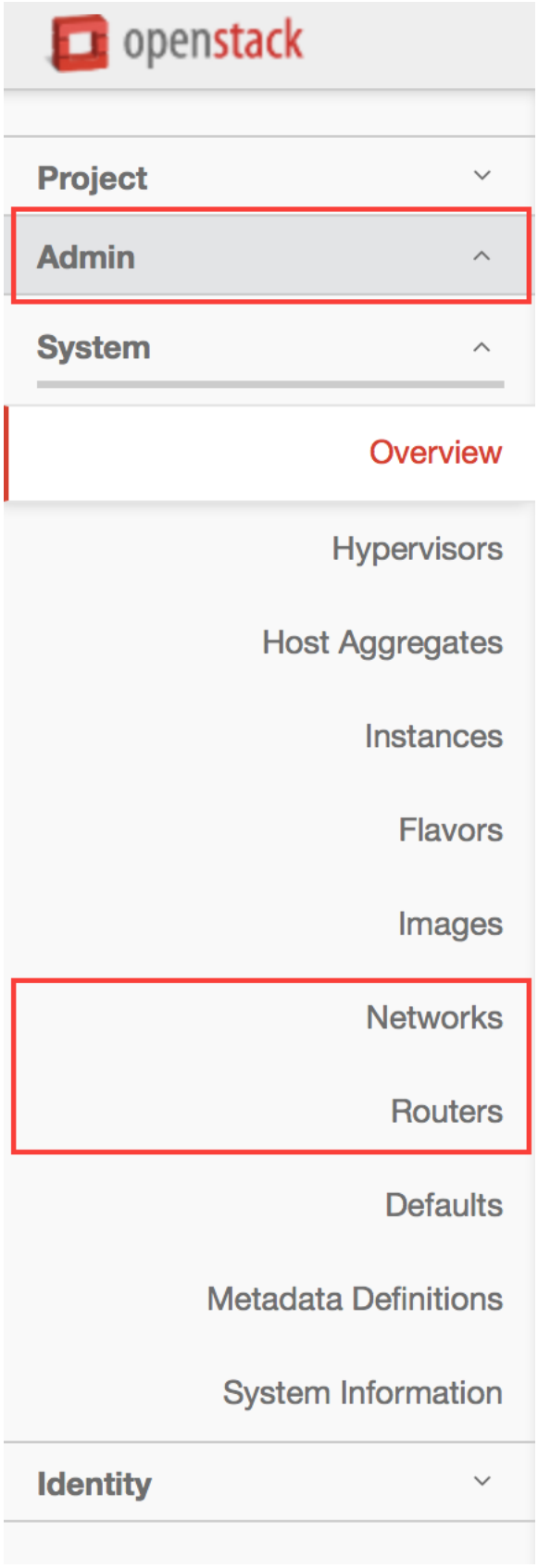

Create Network
Network
Subnet
Subnet Details
Network Name
MySimpleNetwork
Admin State
UP
Create Subnet
Create a new network. In addition, a subnet associated with the network can be created in the next panel.
Cancel
« Back
Next »

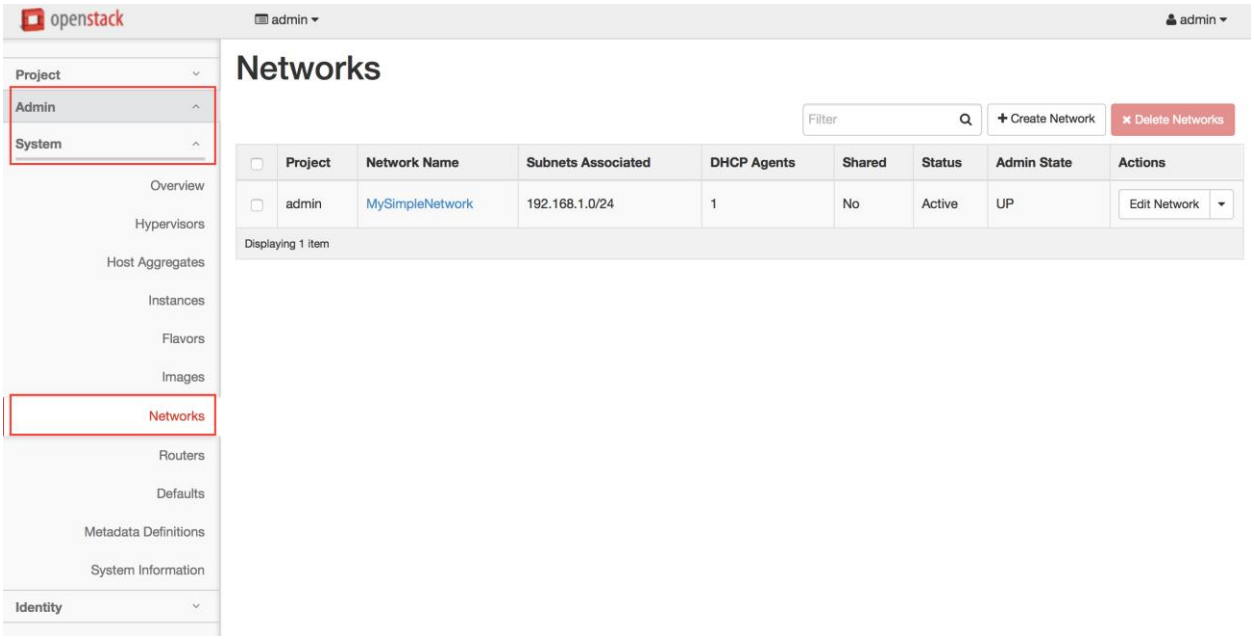

Create Network
Network
Subnet
Subnet Details
Subnet Name
Network Address
Network address in CIDR format (e.g. 192.168.0.0/24, 2001:DB8::/48)
192.168.1.0/24
IP Version
IPv4
Gateway IP
Disable Gateway
Create a subnet associated with the network. Advanced configuration is available by clicking on the "Subnet Details" tab.
Cancel
« Back
Next »


Create Network
Network
Subnet
Subnet Details
Enable DHCP
Specify additional attributes for the subnet.
Allocation Pools
DNS Name Servers
IP address list of DNS name servers for this subnet. One entry per line.
8.8.8.8
Host Routes
Cancel
« Back
Create


openstack
admin
admin
Project
Compute
Network
Network Topology
Networks
Routers
Admin
Identity
Networks
Filter
+ Create Network
Delete Networks
Name
Subnets Associated
Shared
Status
Admin State
Actions
MySimpleNetwork
192.168.1.0/24
No
Active
UP
Edit Network
Displaying 1 item


openstack
admin
admin
Project
Compute
Network
Network Topology
Networks
Routers
Admin
Identity
Network Topology
Resize the canvas by scrolling up/down with your mouse/trackpad on the topology. Pan around the canvas by clicking and dragging the space behind the topology.
Toggle labels
Toggle Network Collapse
Launch Instance
Create Network
Create Router
MySimpleNetwork
ID 460b2688-02c4-42db-b25c-7e9ba749d368
STATUS ACTIVE
Subnets
Create Subnet
04c12ff9-380...
192.168.1.0/24
Delete Subnet
» View Details
Delete Network


openstack
Project
Admin
System
Overview
Hypervisors
Host Aggregates
Instances
Flavors
Images
Networks
Routers
Defaults
Metadata Definitions
System Information
Identity



Network Details: MySimpleNetwork

Edit Network

Network Overview

Name	MySimpleNetwork
ID	460b2688-02c4-42db-b25c-7e9ba749d368
Project ID	c51a93428ada44f297e5fe65a3ac3b9f
Status	Active
Admin State	UP
Shared	No
External Network	No
MTU	Unknown
Provider Network	Network Type: vxlan Physical Network: - Segmentation ID: 99

Provider Attributes

Subnets

+ Create Subnet × Delete Subnets

Name	CIDR	IP Version	Gateway IP	Actions
(04c12ff9-380d)	192.168.1.0/24	IPv4	192.168.1.1	Edit Subnet

Displaying 1 item

Ports

+ Create Port × Delete Ports

Name	Fixed IPs	Attached Device	Status	Admin State	Actions
(94c668d7-5a95)	192.168.1.2	network:dhcp	Active	UP	Edit Port

Displaying 1 item

DHCP Agents

+ Add DHCP Agent × Delete DHCP Agents

Host	Status	Admin State	Updated At	Actions
allinone.learningneutron.com	Enabled	Up	0 minutes	Delete DHCP Agent

Displaying 1 item

```
[root@allinone ~(keystone_admin)]# neutron
(neutron) ?

Shell commands (type help <topic>):
===================================
cmdenvironment  edit  hi       l   list  pause  r    save  shell      show
ed              help  history  li  load  py     run  set   shortcuts

Undocumented commands:
======================
EOF  eof  exit  q  quit

Application commands (type help <topic>):
=========================================
address-scope-create          floatingip-associate          lbaas-agent-hosting-loadbalancer  nuage-netpartition-create        security-group-create
address-scope-delete          floatingip-create             lbaas-healthmonitor-create        nuage-netpartition-delete        security-group-delete
address-scope-list            floatingip-delete             lbaas-healthmonitor-delete        nuage-netpartition-list          security-group-list
address-scope-show            floatingip-disassociate       lbaas-healthmonitor-list          nuage-netpartition-show          security-group-rule-create
address-scope-update          floatingip-list               lbaas-healthmonitor-show          port-create                      security-group-rule-delete
agent-delete                  floatingip-show               lbaas-healthmonitor-update        port-delete                      security-group-rule-list
agent-list                    gateway-device-create         lbaas-listener-create             port-list                        security-group-rule-show
agent-show                    gateway-device-delete         lbaas-listener-delete             port-show                        security-group-show
agent-update                  gateway-device-list           lbaas-listener-list               port-update                      security-group-update
bash-completion               gateway-device-show           lbaas-listener-show               qos-available-rule-types         service-provider-list
cisco-credential-create       gateway-device-update         lbaas-listener-update             qos-bandwidth-limit-rule-create  subnet-create
cisco-credential-delete       help                          lbaas-loadbalancer-create         qos-bandwidth-limit-rule-delete  subnet-delete
cisco-credential-list         ipsec-site-connection-create  lbaas-loadbalancer-delete         qos-bandwidth-limit-rule-list    subnet-list
cisco-credential-show         ipsec-site-connection-delete  lbaas-loadbalancer-list           qos-bandwidth-limit-rule-show    subnet-show
cisco-network-profile-create  ipsec-site-connection-list    lbaas-loadbalancer-list-on-agent  qos-bandwidth-limit-rule-update  subnet-update
cisco-network-profile-delete  ipsec-site-connection-show    lbaas-loadbalancer-show           qos-policy-create                subnetpool-create
cisco-network-profile-list    ipsec-site-connection-update  lbaas-loadbalancer-update         qos-policy-delete                subnetpool-delete
cisco-network-profile-show    l3-agent-list-hosting-router  lbaas-member-create               qos-policy-list                  subnetpool-list
cisco-network-profile-update  l3-agent-router-add           lbaas-member-delete               qos-policy-show                  subnetpool-show
cisco-policy-profile-list     l3-agent-router-remove        lbaas-member-list                 qos-policy-update                subnetpool-update
cisco-policy-profile-show     lb-agent-hosting-pool         lbaas-member-show                 queue-create                     vpn-ikepolicy-create
cisco-policy-profile-update   lb-healthmonitor-associate    lbaas-member-update               queue-delete                     vpn-ikepolicy-delete
dhcp-agent-list-hosting-net   lb-healthmonitor-create       lbaas-pool-create                 queue-list                       vpn-ikepolicy-list
dhcp-agent-network-add        lb-healthmonitor-delete       lbaas-pool-delete                 queue-show                       vpn-ikepolicy-show
dhcp-agent-network-remove     lb-healthmonitor-disassociate lbaas-pool-list                   quota-delete                     vpn-ikepolicy-update
ext-list                      lb-healthmonitor-list         lbaas-pool-show                   quota-list                       vpn-ipsecpolicy-create
ext-show                      lb-healthmonitor-show         lbaas-pool-update                 quota-show                       vpn-ipsecpolicy-delete
firewall-create               lb-healthmonitor-update       meter-label-create                quota-update                     vpn-ipsecpolicy-list
firewall-delete               lb-member-create              meter-label-delete                rbac-create                      vpn-ipsecpolicy-show
firewall-list                 lb-member-delete              meter-label-list                  rbac-delete                      vpn-ipsecpolicy-update
firewall-policy-create        lb-member-list                meter-label-rule-create           rbac-list                        vpn-service-create
firewall-policy-delete        lb-member-show                meter-label-rule-delete           rbac-show                        vpn-service-delete
firewall-policy-insert-rule   lb-member-update              meter-label-rule-list             rbac-update                      vpn-service-list
firewall-policy-list          lb-pool-create                meter-label-rule-show             router-create                    vpn-service-show
firewall-policy-remove-rule   lb-pool-delete                meter-label-show                  router-delete                    vpn-service-update
firewall-policy-show          lb-pool-list                  net-create                        router-gateway-clear
firewall-policy-update        lb-pool-list-on-agent         net-delete                        router-gateway-set
firewall-rule-create          lb-pool-show                  net-external-list                 router-interface-add
firewall-rule-delete          lb-pool-stats                 net-gateway-connect               router-interface-delete
firewall-rule-list            lb-pool-update                net-gateway-create                router-list
firewall-rule-show            lb-vip-create                 net-gateway-delete                router-list-on-l3-agent
firewall-rule-update          lb-vip-delete                 net-gateway-disconnect            router-port-list
firewall-show                 lb-vip-list                   net-gateway-list                  router-show
firewall-update               lb-vip-show                   net-gateway-show                  router-update
                              lb-vip-update                 net-gateway-update
                                                            net-list
                                                            net-list-on-dhcp-agent
                                                            net-show
                                                            net-update
```

```
[root@allinone ~(keystone_admin)]# neutron net-list
+--------------------------------------+----------------+----------------------------------------------------+
| id                                   | name           | subnets                                            |
+--------------------------------------+----------------+----------------------------------------------------+
| 460b2688-02c4-42db-b25c-7e9ba749d368 | MySimpleNetwork | 04c12ff9-380d-4a4e-a8aa-f31536406ad4 192.168.1.0/24 |
+--------------------------------------+----------------+----------------------------------------------------+
```

```
[root@allinone ~(keystone_admin)]# source keystonerc_demo
[root@allinone ~(keystone_demo)]# neutron net-list

[root@allinone ~(keystone_demo)]#
```

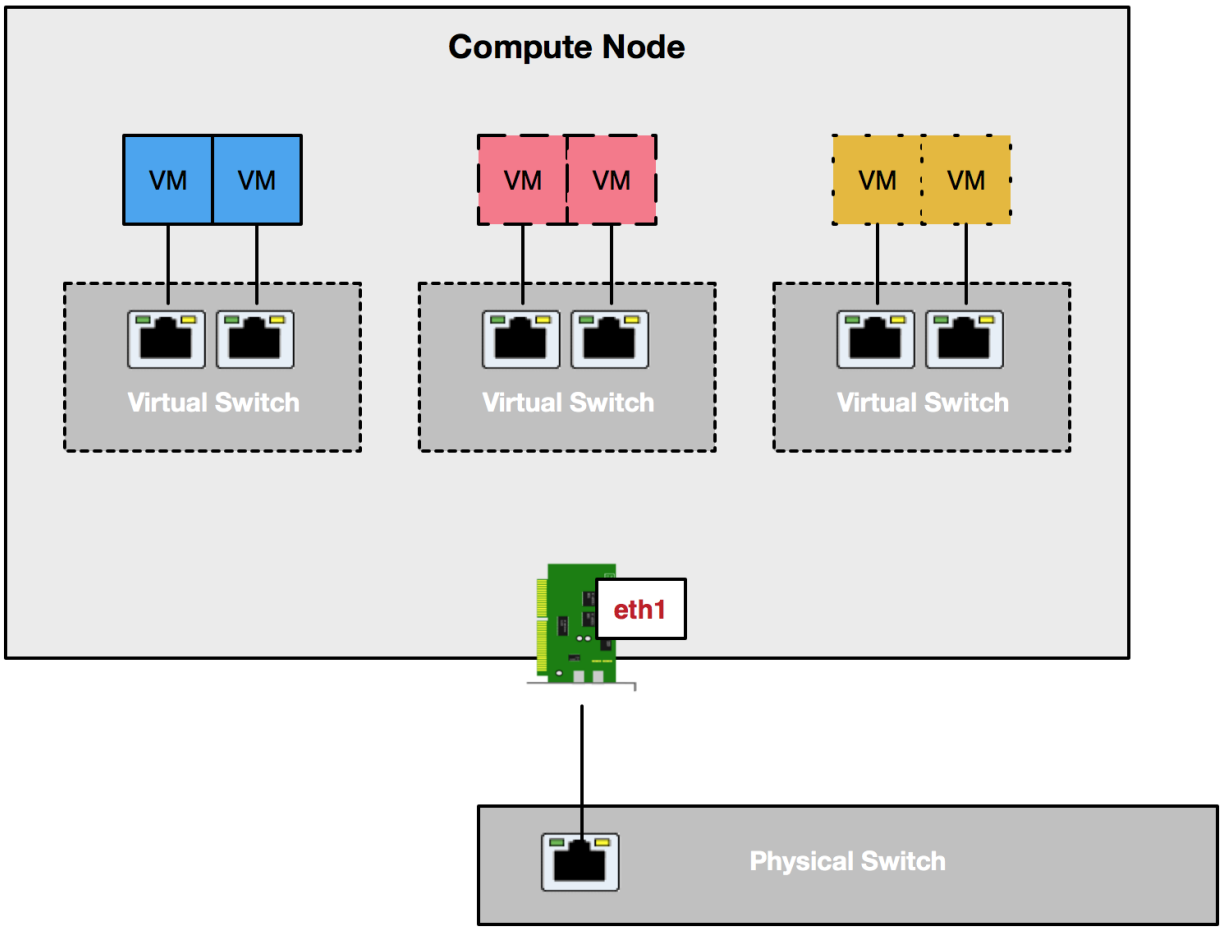
```
Created a new network:
+-----------------+--------------------------------------+
| Field           | Value                                |
+-----------------+--------------------------------------+
| admin_state_up  | True                                 |
| id              | c8cde907-9a30-4e86-8c31-11d11f56cb2c |
| mtu             | 0                                    |
| name            | MyDemoNetwork                        |
| router:external | False                                |
| shared          | False                                |
| status          | ACTIVE                               |
| subnets         |                                      |
| tenant_id       | b8e0562dab644c87aa693abf48d3040d     |
+-----------------+--------------------------------------+
```

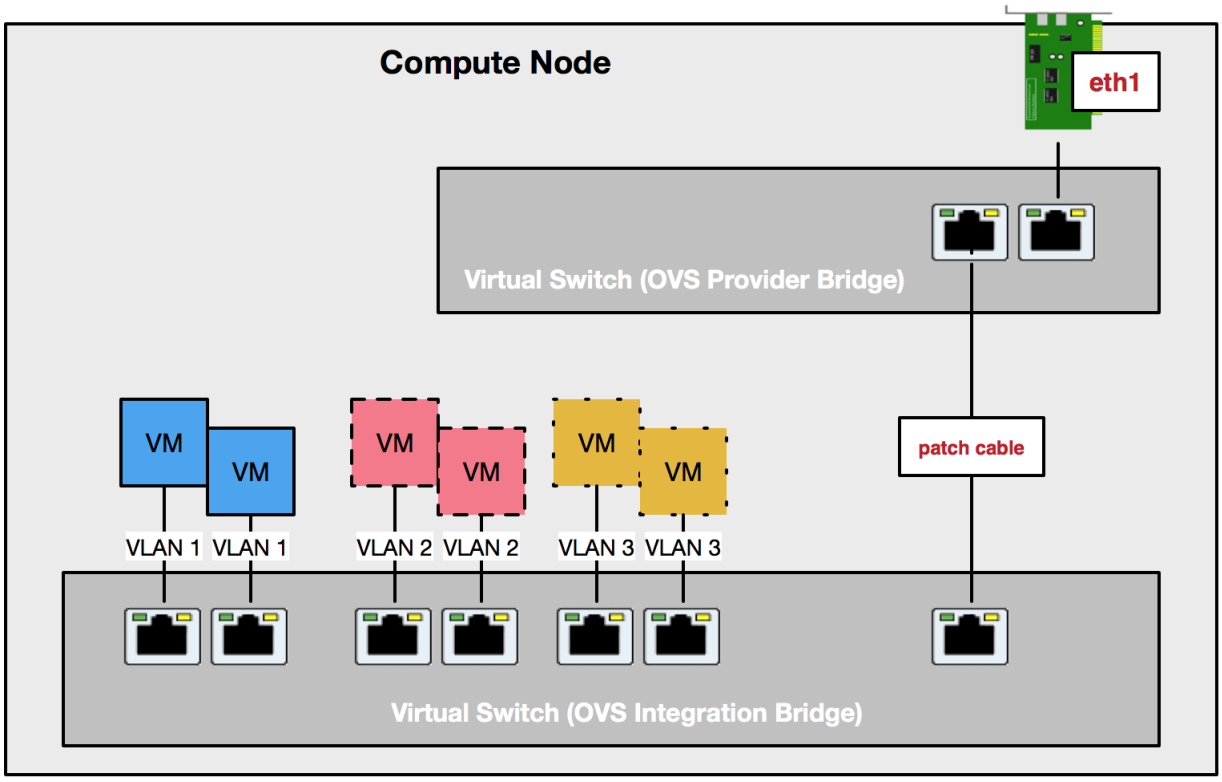
```
Created a new subnet:
+-------------------+------------------------------------------------------+
| Field             | Value                                                |
+-------------------+------------------------------------------------------+
| allocation_pools  | {"start": "192.168.8.2", "end": "192.168.8.254"}     |
| cidr              | 192.168.8.0/24                                       |
| dns_nameservers   |                                                      |
| enable_dhcp       | True                                                 |
| gateway_ip        | 192.168.8.1                                          |
| host_routes       |                                                      |
| id                | 6ee10d34-4d82-4901-9627-22a758096e52                 |
| ip_version        | 4                                                    |
| ipv6_address_mode |                                                      |
| ipv6_ra_mode      |                                                      |
| name              | MyDemoSubnet                                         |
| network_id        | c8cde907-9a30-4e86-8c31-11d11f56cb2c                 |
| subnetpool_id     |                                                      |
| tenant_id         | b8e0562dab644c87aa693abf48d3040d                     |
+-------------------+------------------------------------------------------+
```

```
+--------------------------------------+-------------+---------------+-------------------------------------------------------+
| id                                   | name        | cidr          | allocation_pools                                      |
+--------------------------------------+-------------+---------------+-------------------------------------------------------+
| 6ee10d34-4d82-4901-9627-22a758096e52 | MyDemoSubnet | 192.168.8.0/24 | {"start": "192.168.8.2", "end": "192.168.8.254"} |
+--------------------------------------+-------------+---------------+-------------------------------------------------------+
```

```
[root@allinone ~(keystone_demo)]# neutron subnet-show MyDemoSubnet
+-------------------+-----------------------------------------------------+
| Field             | Value                                               |
+-------------------+-----------------------------------------------------+
| allocation_pools  | {"start": "192.168.8.2", "end": "192.168.8.254"} |
| cidr              | 192.168.8.0/24                                      |
| dns_nameservers   |                                                     |
| enable_dhcp       | True                                                |
| gateway_ip        | 192.168.8.1                                         |
| host_routes       |                                                     |
| id                | 6ee10d34-4d82-4901-9627-22a758096e52                |
| ip_version        | 4                                                   |
| ipv6_address_mode |                                                     |
| ipv6_ra_mode      |                                                     |
| name              | MyDemoSubnet                                        |
| network_id        | c8cde907-9a30-4e86-8c31-11d11f56cb2c                |
| subnetpool_id     |                                                     |
| tenant_id         | b8e0562dab644c87aa693abf48d3040d                    |
+-------------------+-----------------------------------------------------+
```

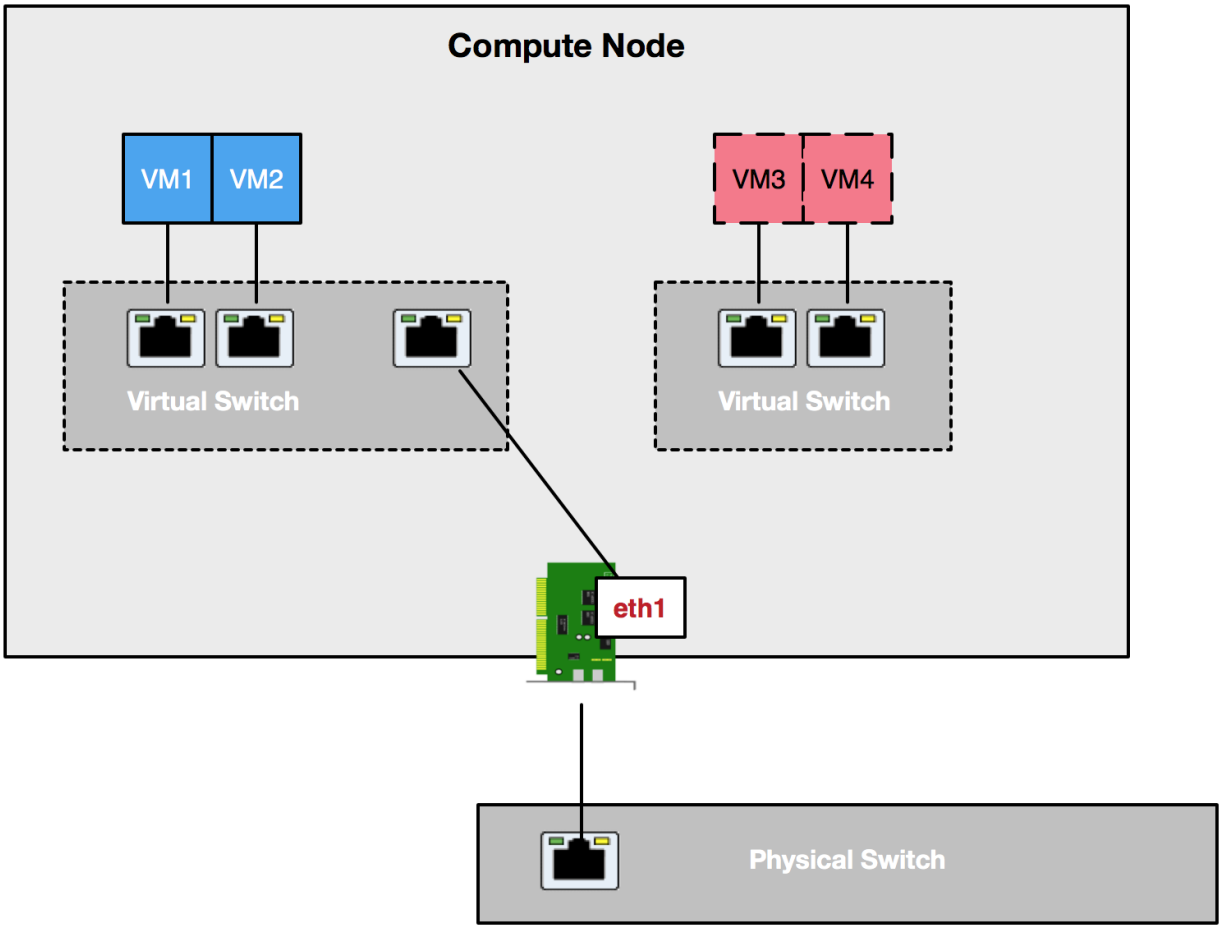
Chapter 5: Switching

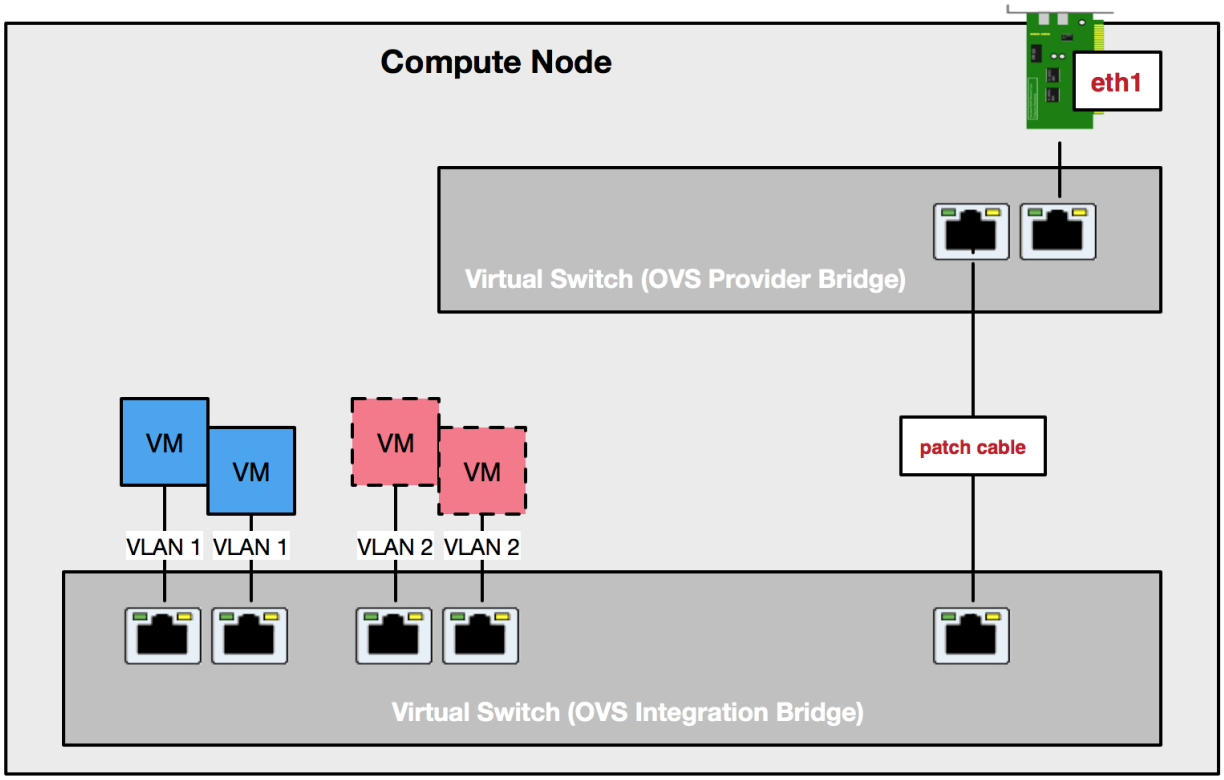




Pseudo-Flow Rules:

None

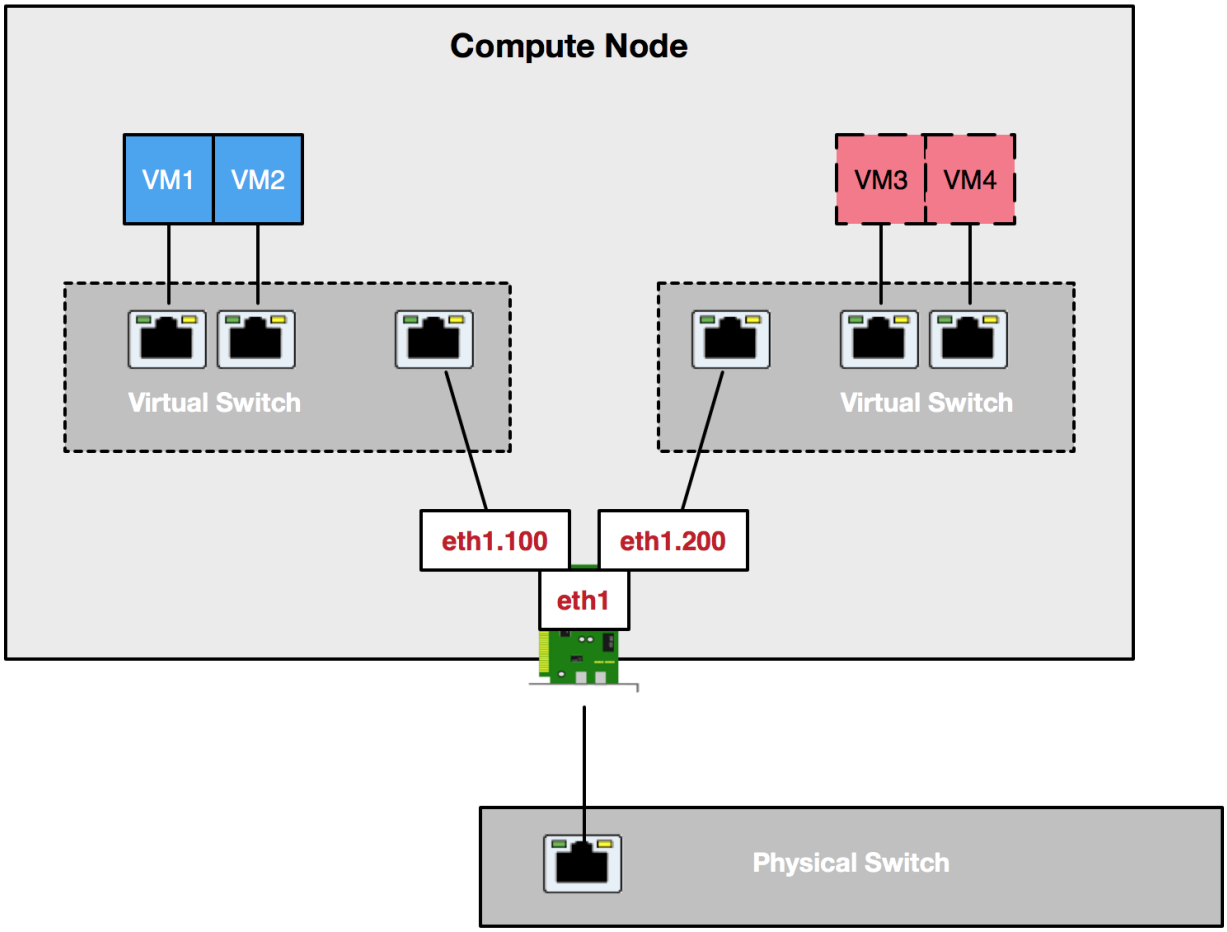

Compute Node
VM1
VM2
VM3
VM4
Virtual Switch
Virtual Switch
eth1
Physical Switch

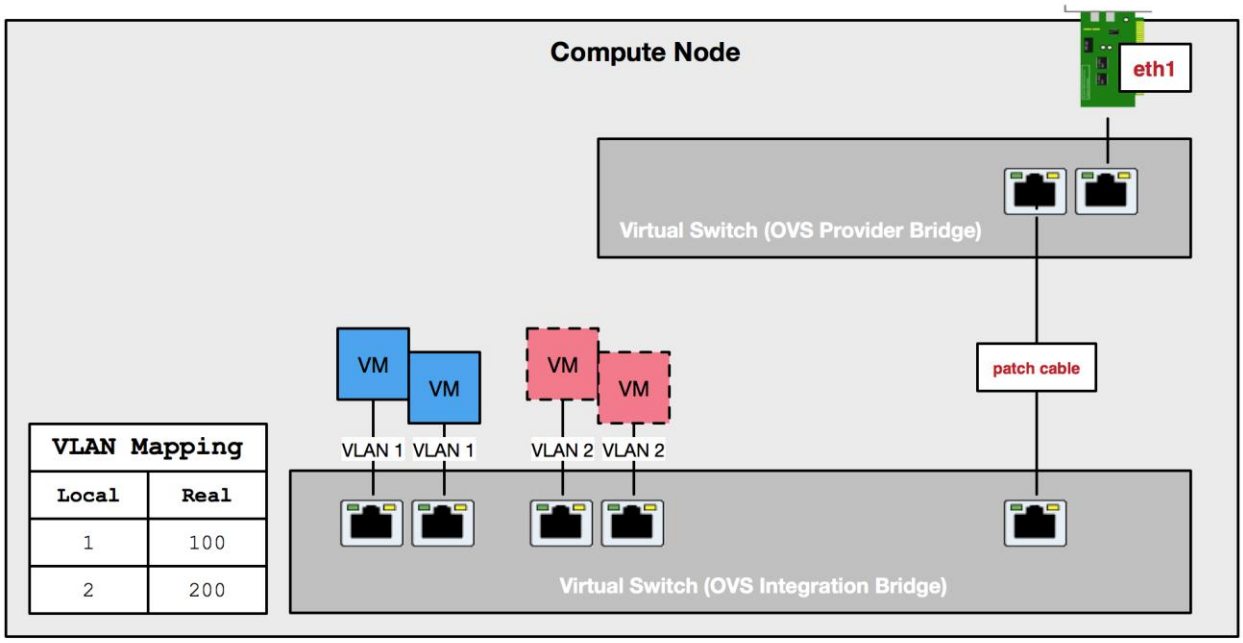


Pseudo-Flow Rules:

OUTBOUND: As traffic from VLAN 1 leaves the integration bridge, strip the VLAN tag and drop on eth1 untagged.

INBOUND: As untagged traffic enters eth1 towards the integration bridge, add a VLAN tag of 1 and forward to the appropriate VM.


Compute Node
VM1
VM2
VM3
VM4
Virtual Switch
Virtual Switch
eth1.100
eth1.200
eth1
Physical Switch

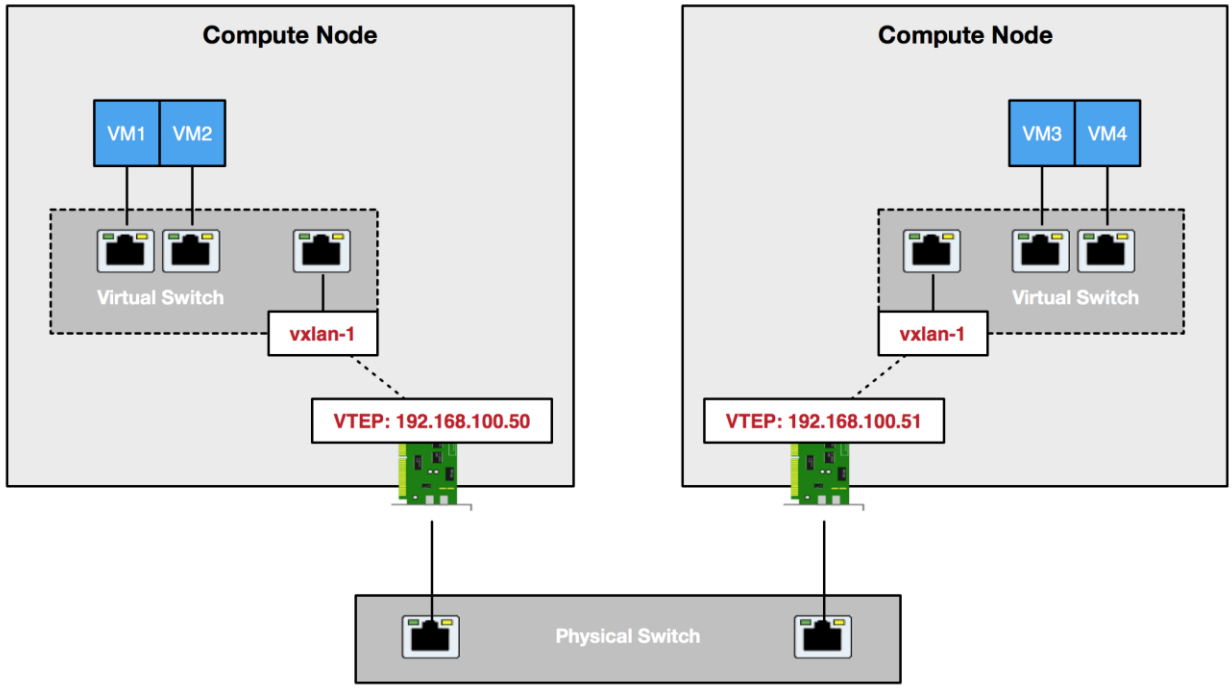


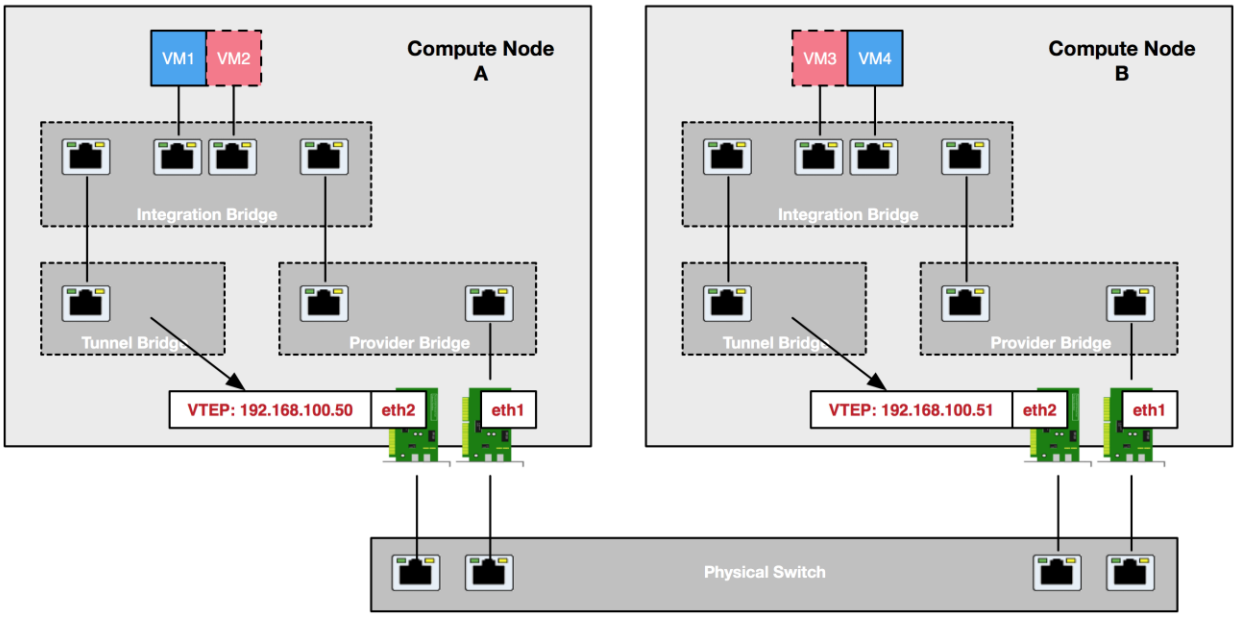
VLAN Mapping	
Local	Real
1	100
2	200

Pseudo-Flow Rules:

OUTBOUND: As traffic from VLAN 1 leaves the integration bridge, change the VLAN tag from 1 to 100 and forward out eth1.

INBOUND: As traffic tagged as VLAN 100 enters eth1 towards the integration bridge, change the VLAN tag from 100 to 1 and forward to the appropriate VM.





Pseudo-Flow Rules:

OUTBOUND: As traffic from VM1 on Compute Node A heads to VM4 on Compute Node B, forward to the tunnel bridge and strip the local VLAN ID. Encapsulate packet with network-specific VNI and send to remote VTEP 192.168.100.51.

Pseudo-Flow Rules:

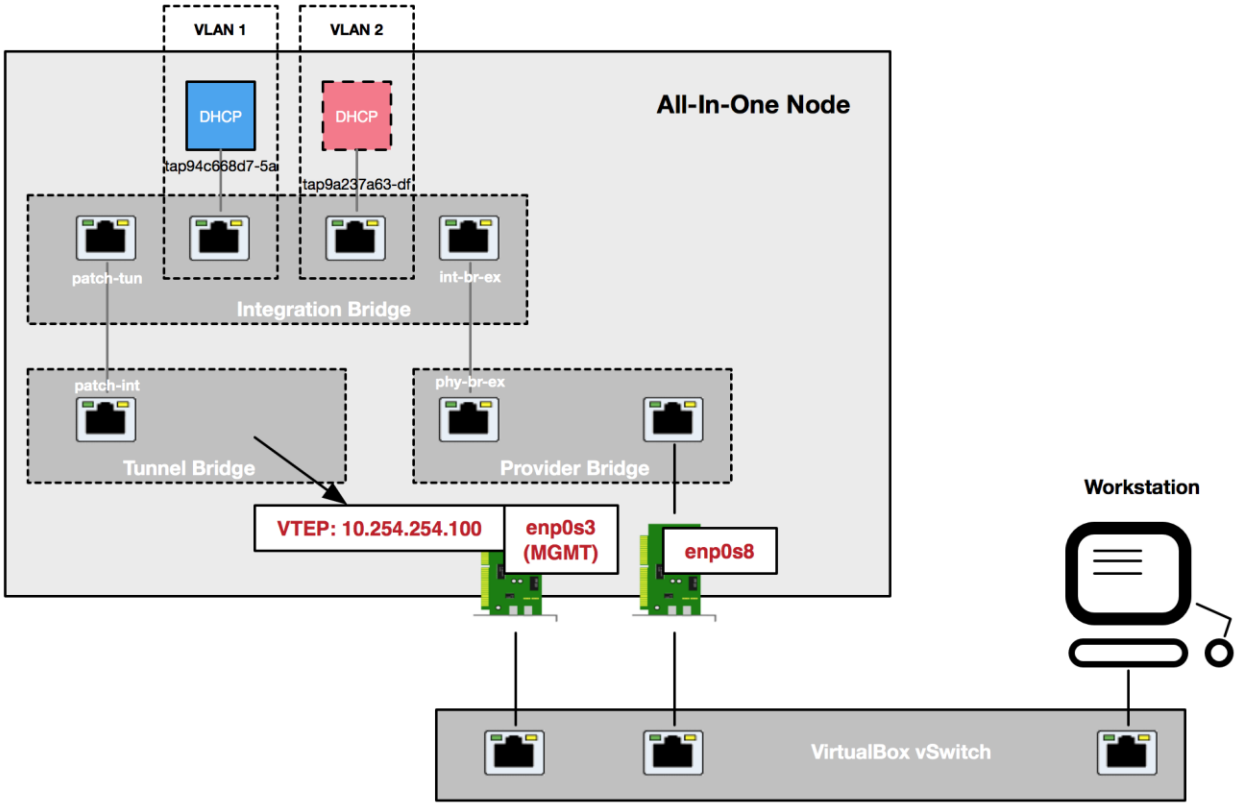
INBOUND: As traffic from Compute Node A VTEP 192.168.100.50 enters tunnel bridge, decapsulate the packet, add local VLAN ID that corresponds to network-specific VNI, and forward to VM2 on integration bridge.

```
[root@allinone ~]# source keystonerc_admin
[root@allinone ~(keystone_admin)]# neutron net-list
+--------------------------------------+----------------+-------------------------------------------------------+
| id                                   | name           | subnets                                               |
+--------------------------------------+----------------+-------------------------------------------------------+
| c8cde907-9a30-4e86-8c31-11d11f56cb2c | MyDemoNetwork  | 6ee10d34-4d82-4901-9627-22a758096e52 192.168.8.0/24 |
| 460b2688-02c4-42db-b25c-7e9ba749d368 | MySimpleNetwork | 04c12ff9-380d-4a4e-a8aa-f31536406ad4 192.168.1.0/24 |
+--------------------------------------+----------------+-------------------------------------------------------+
```

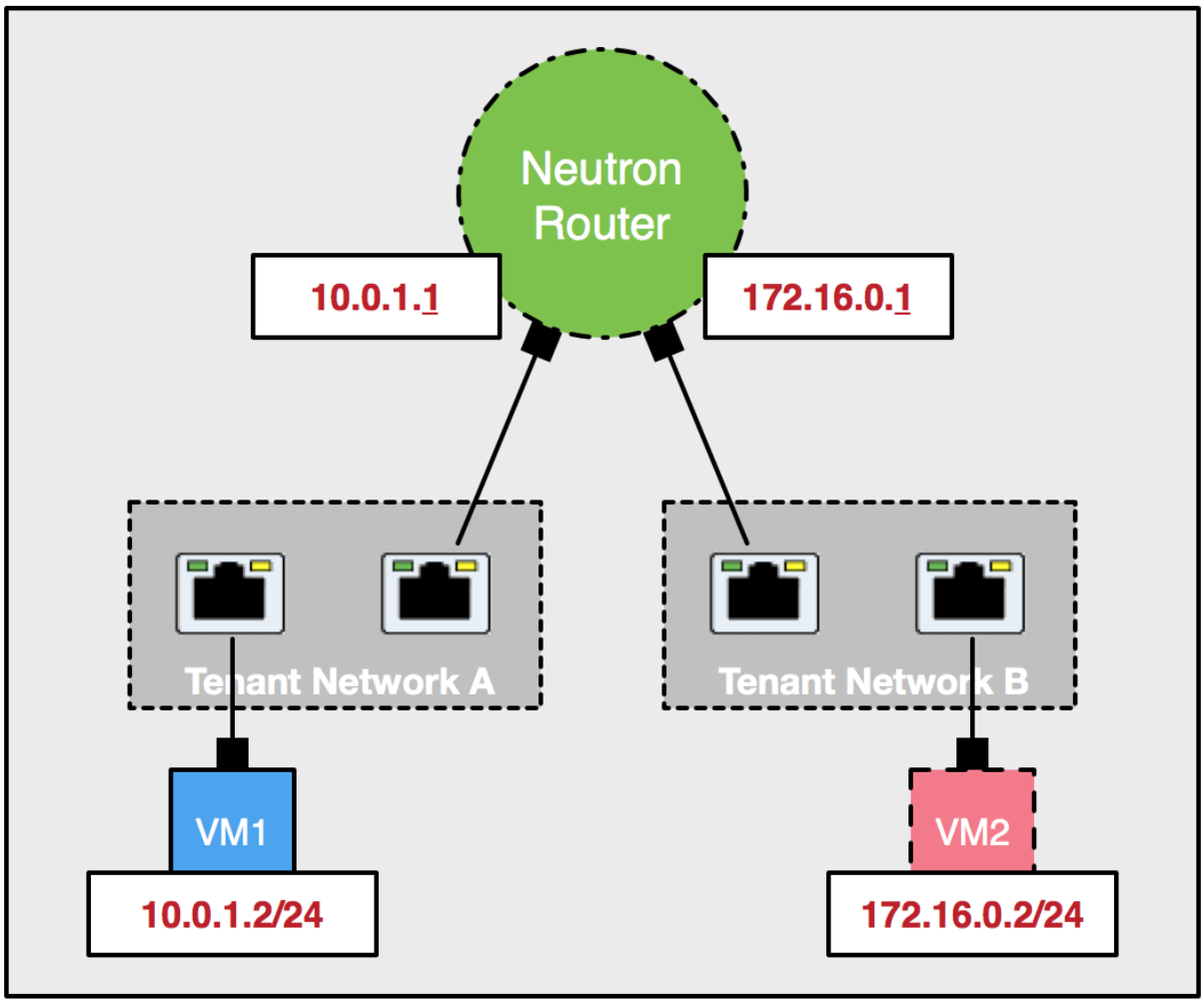
```
[root@allinone ~(keystone_admin)]# neutron net-show MyDemoNetwork
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | c8cde907-9a30-4e86-8c31-11d11f56cb2c |
| mtu                       | 0                                    |
| name                      | MyDemoNetwork                        |
| provider:network_type     | vxlan                                |
| provider:physical_network |                                      |
| provider:segmentation_id  | 38                                   |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   | 6ee10d34-4d82-4901-9627-22a758096e52 |
| tenant_id                 | b8e0562dab644c87aa693abf48d3040d     |
+---------------------------+--------------------------------------+
```

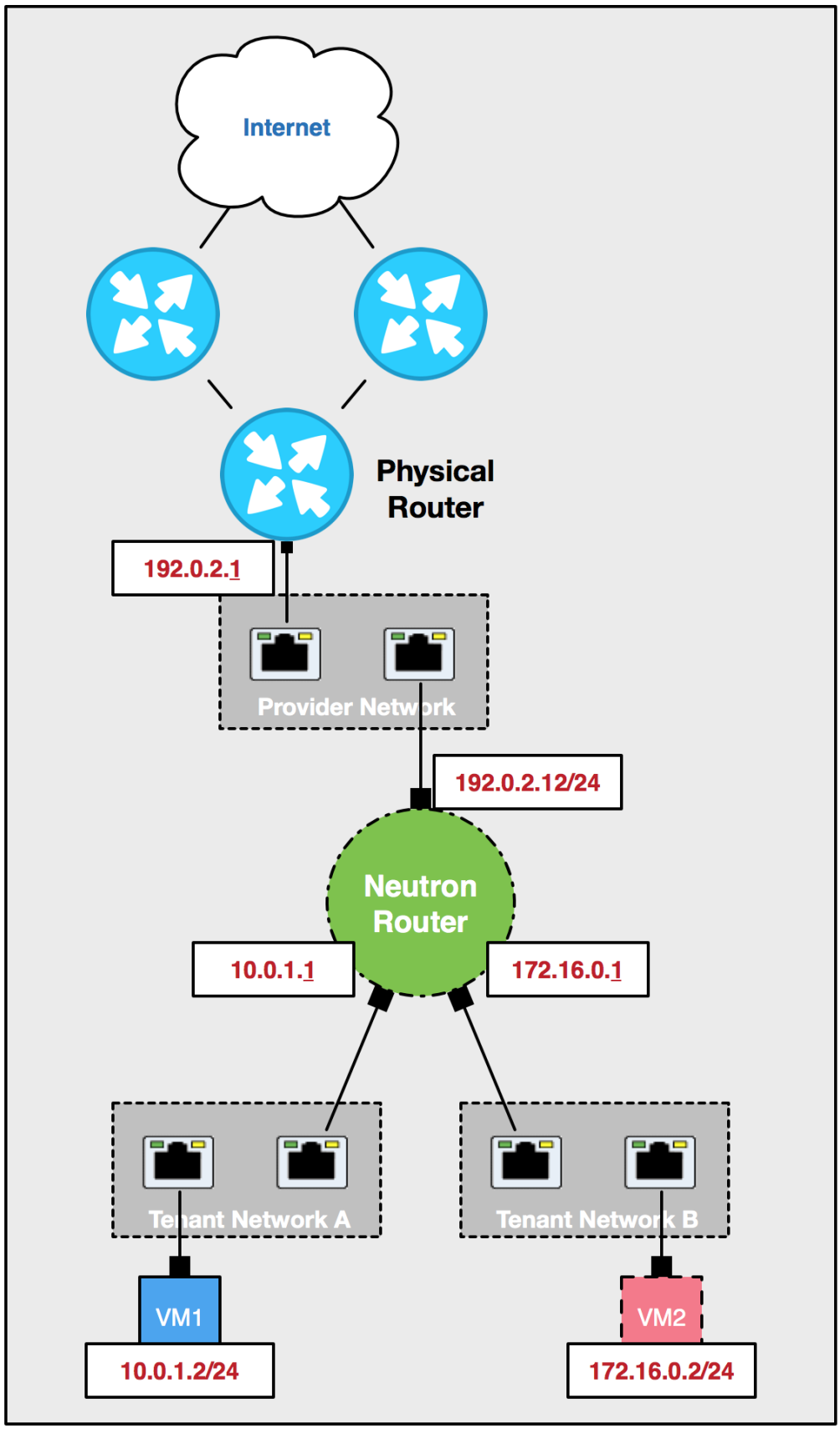
```
[root@allinone ~(keystone_admin)]# neutron net-show MySimpleNetwork
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | 460b2688-02c4-42db-b25c-7e9ba749d368 |
| mtu                       | 0                                    |
| name                      | MySimpleNetwork                      |
| provider:network_type     | vxlan                                |
| provider:physical_network |                                      |
| provider:segmentation_id  | 99                                   |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   | 04c12ff9-380d-4a4e-a8aa-f31536406ad4 |
| tenant_id                 | c51a93428ada44f297e5fe65a3ac3b9f     |
+---------------------------+--------------------------------------+
```

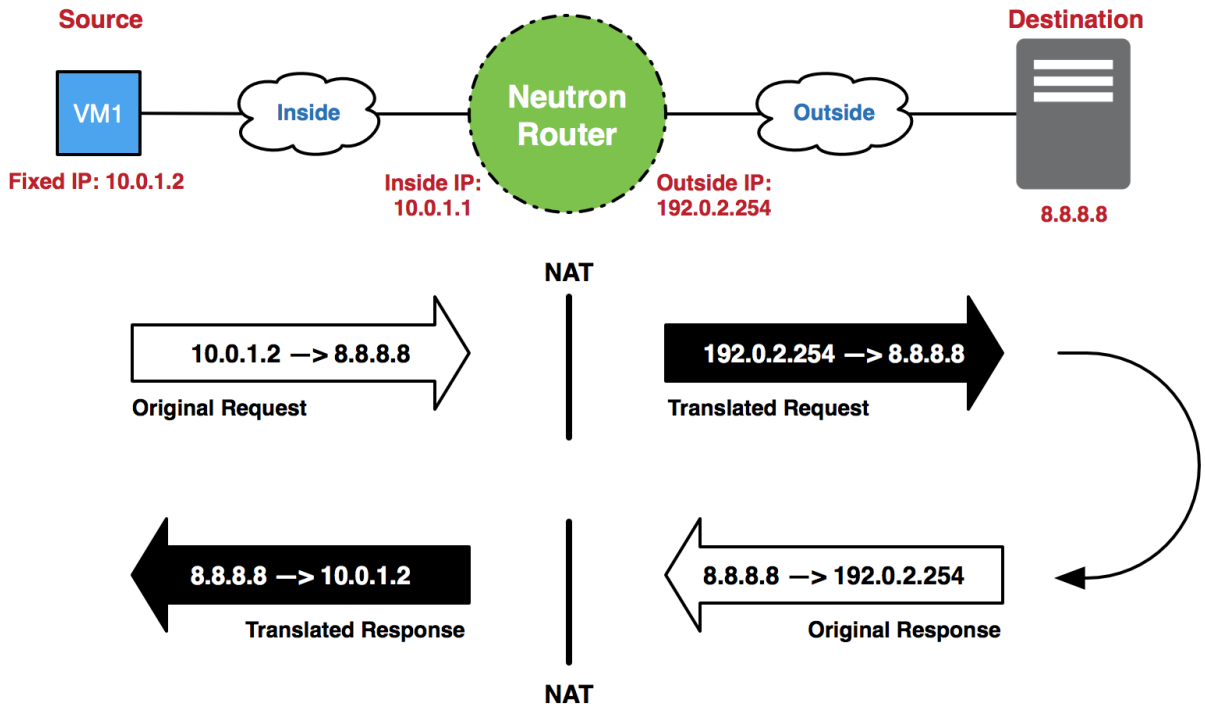
```
[root@allinone ~(keystone_admin)]# ovs-vsctl show
3295ca6c-23cf-4b55-9ed8-f5e1e6c39a30
    Bridge br-ex
        Port br-ex
            Interface br-ex
                type: internal
        Port "enp0s8"
            Interface "enp0s8"
        Port phy-br-ex
            Interface phy-br-ex
                type: patch
                options: {peer=int-br-ex}
    Bridge br-tun
        fail_mode: secure
        Port br-tun
            Interface br-tun
                type: internal
        Port patch-int
            Interface patch-int
                type: patch
                options: {peer=patch-tun}
    Bridge br-int
        fail_mode: secure
        Port br-int
            Interface br-int
                type: internal
        Port int-br-ex
            Interface int-br-ex
                type: patch
                options: {peer=phy-br-ex}
        Port patch-tun
            Interface patch-tun
                type: patch
                options: {peer=patch-int}
        Port "tap94c668d7-5a"
            tag: 1
            Interface "tap94c668d7-5a"
                type: internal
        Port "tap9a237a63-df"
            tag: 2
            Interface "tap9a237a63-df"
                type: internal
    ovs_version: "2.4.0"
```

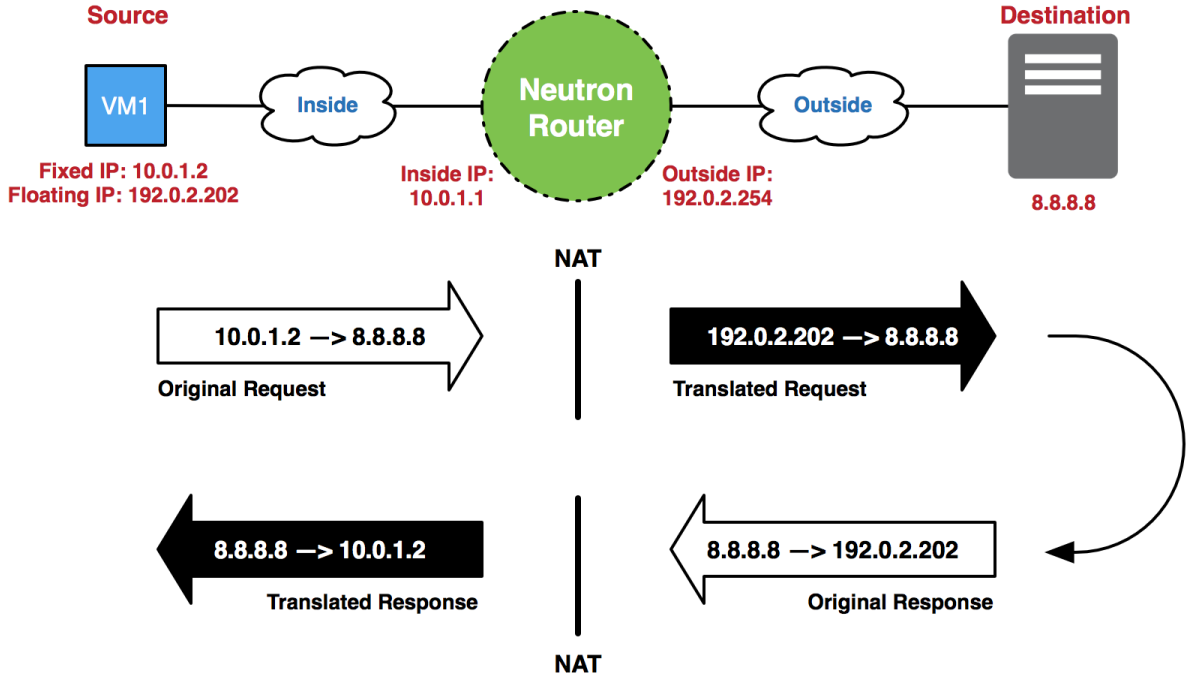

VLAN 1
VLAN 2
All-In-One Node
DHCP
DHCP
tap94c668d7-5a
tap9a237a63-df
patch-tun
int-br-ex
Integration Bridge
patch-int
phy-br-ex
Tunnel Bridge
Provider Bridge
VTEP: 10.254.254.100
enp0s3
(MGMT)
enp0s8
Workstation
VirtualBox vSwitch

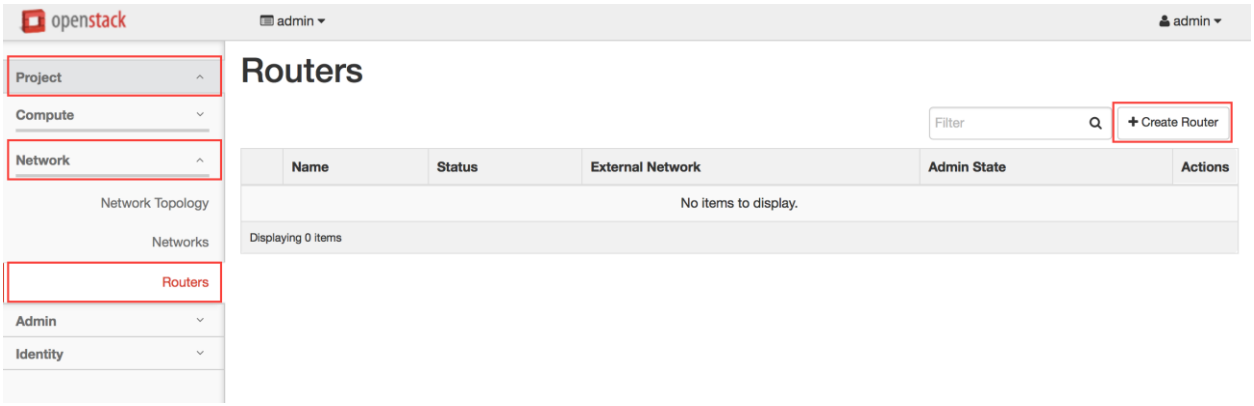
Chapter 6: Routing

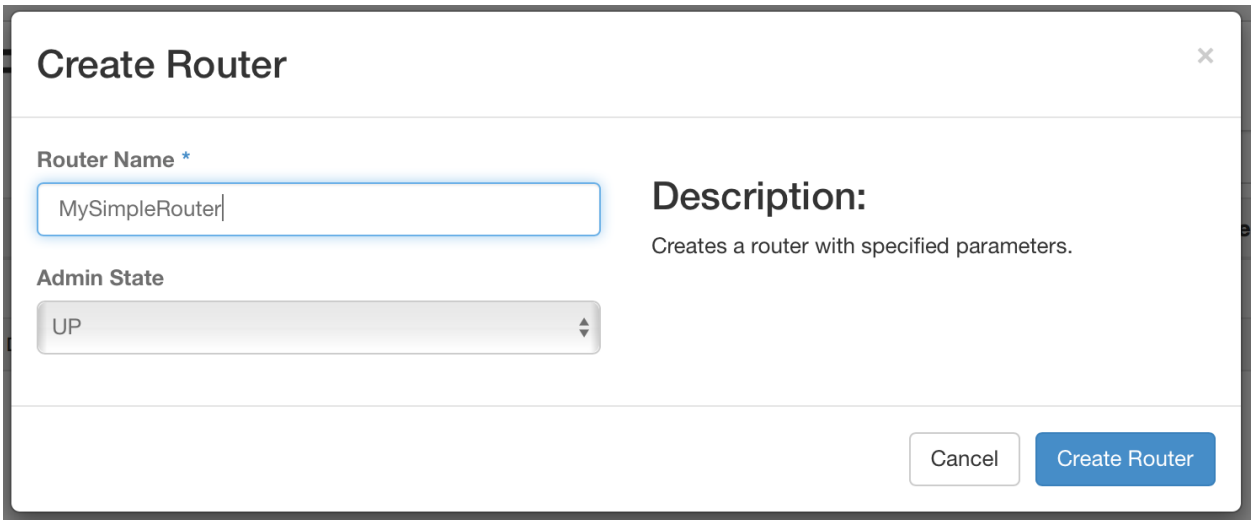


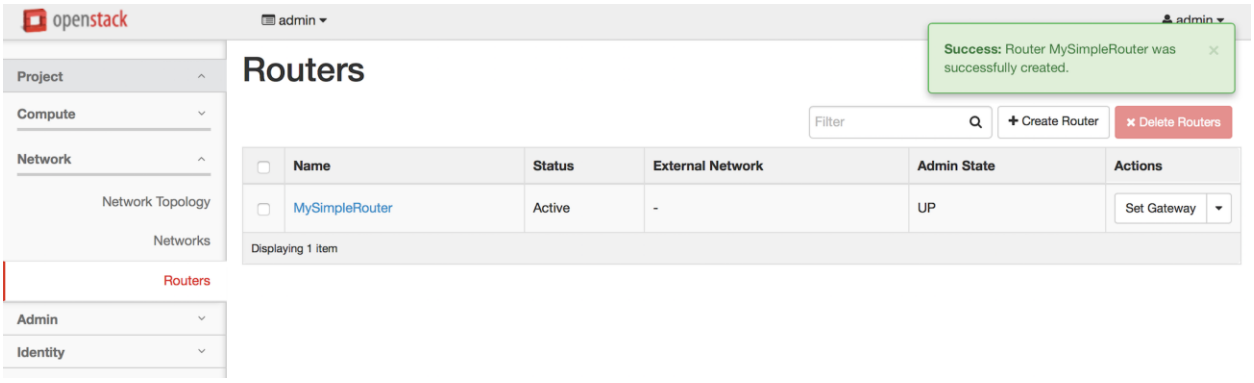

Internet
Physical Router
192.0.2.1
Provider Network
192.0.2.12/24
Neutron Router
10.0.1.1
172.16.0.1
Tenant Network A
Tenant Network B
VM1
10.0.1.2/24
VM2
172.16.0.2/24

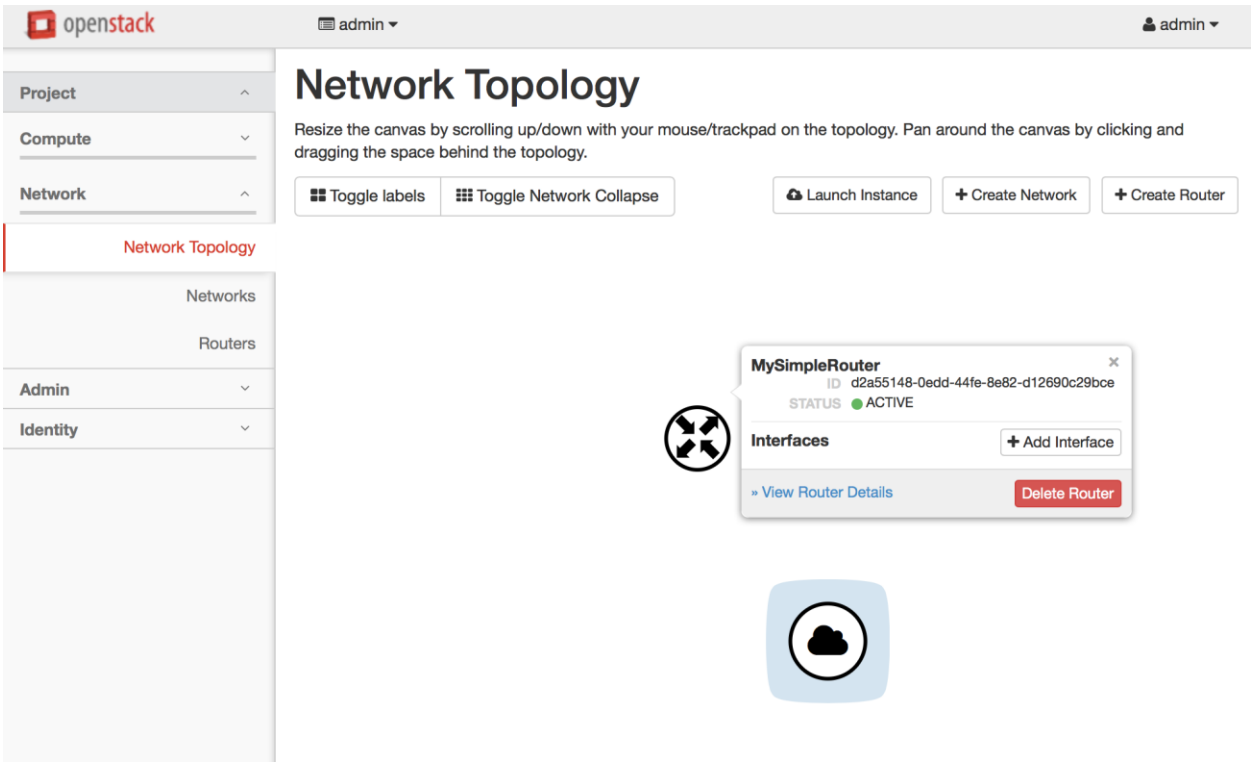

Source
Destination
VM1
Inside
Neutron Router
Outside
Fixed IP: 10.0.1.2
Inside IP: 10.0.1.1
Outside IP: 192.0.2.254
8.8.8.8
NAT
10.0.1.2 —> 8.8.8.8
Original Request
192.0.2.254 —> 8.8.8.8
Translated Request
8.8.8.8 —> 10.0.1.2
Translated Response
8.8.8.8 —> 192.0.2.254
Original Response
NAT

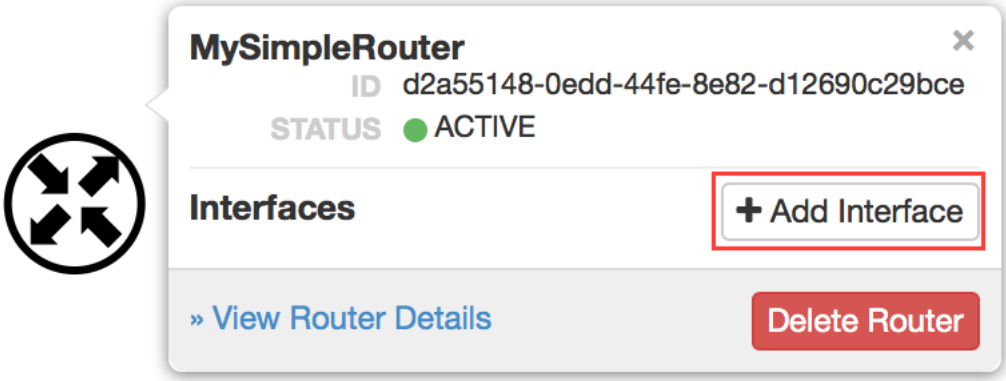

Source
Destination
VM1
Inside
Neutron Router
Outside
Fixed IP: 10.0.1.2
Floating IP: 192.0.2.202
Inside IP: 10.0.1.1
Outside IP: 192.0.2.254
8.8.8.8
NAT
10.0.1.2 —> 8.8.8.8
Original Request
192.0.2.202 —> 8.8.8.8
Translated Request
8.8.8.8 —> 10.0.1.2
Translated Response
8.8.8.8 —> 192.0.2.202
Original Response
NAT

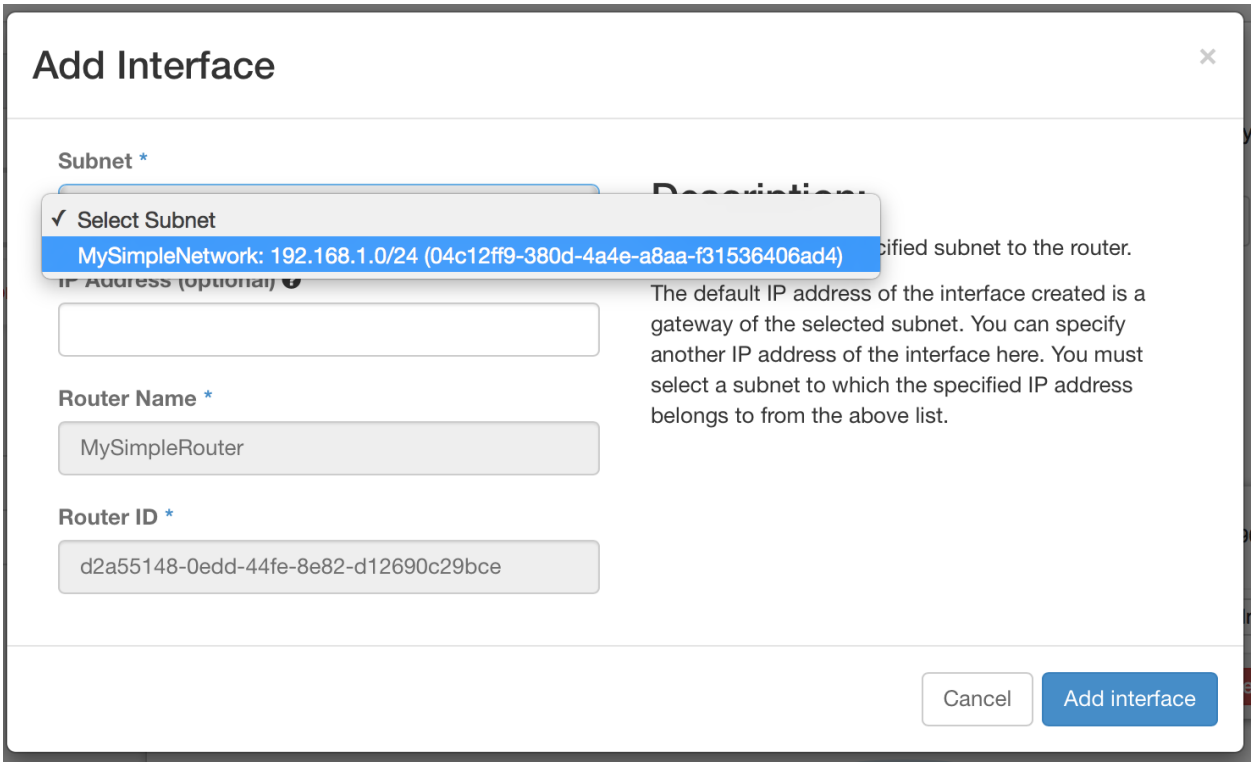

openstack
admin
admin
Project
Compute
Network
Network Topology
Networks
Routers
Admin
Identity
Routers
Filter
+ Create Router
Name
Status
External Network
Admin State
Actions
No items to display.
Displaying 0 items

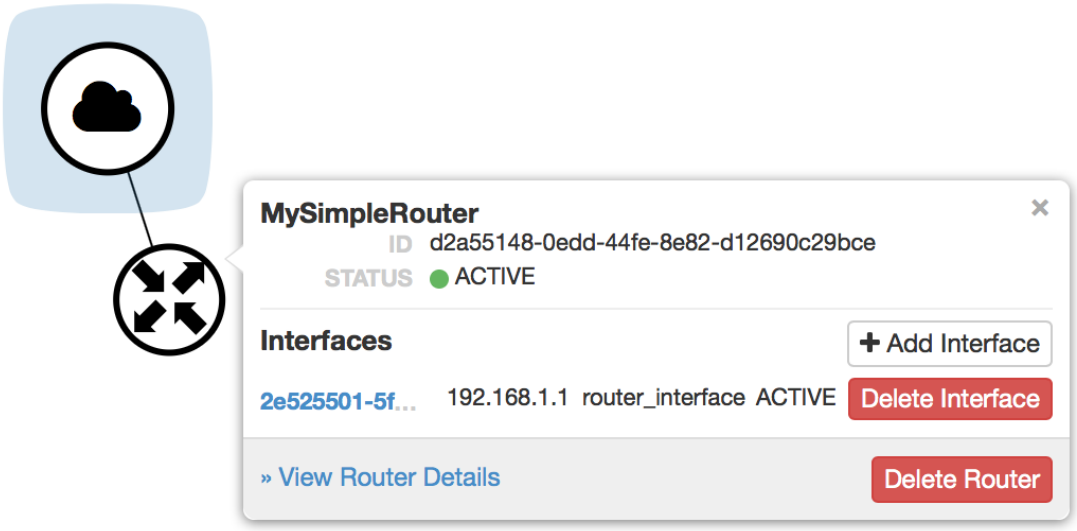

Create Router
Router Name *
MySimpleRouter
Admin State
UP
Description:
Creates a router with specified parameters.
Cancel
Create Router

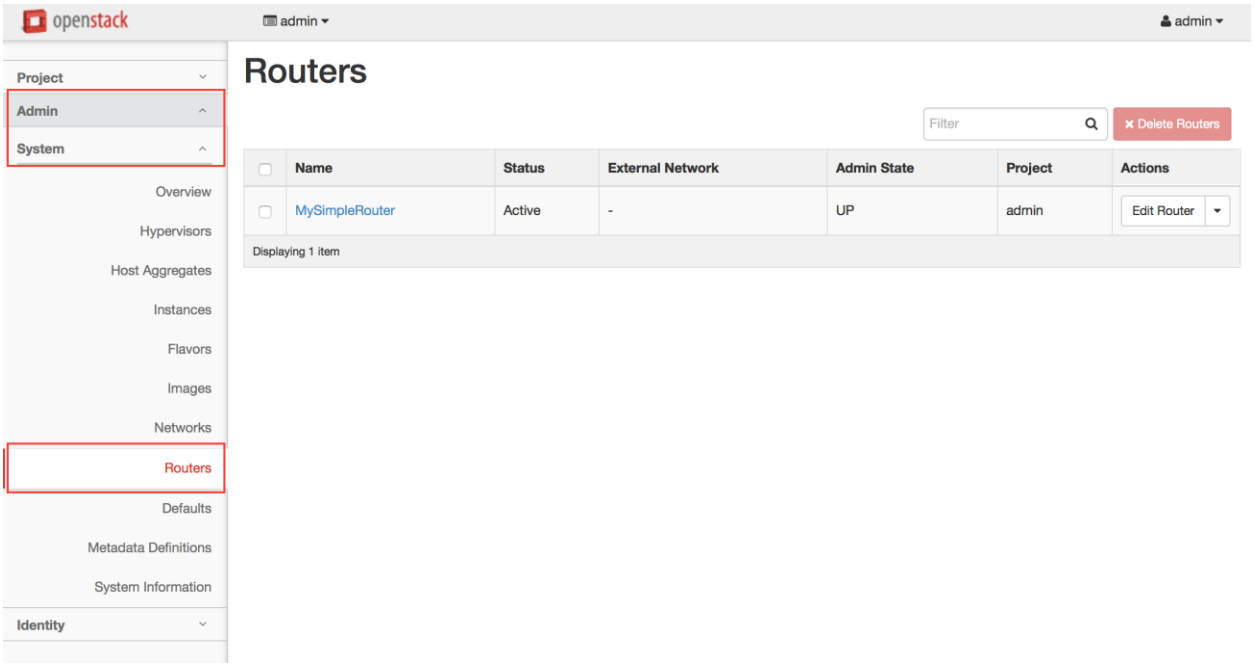

openstack
admin
admin
Project
Compute
Network
Network Topology
Networks
Routers
Admin
Identity
Routers
Success: Router MySimpleRouter was successfully created.
Filter
+ Create Router
Delete Routers
Name
Status
External Network
Admin State
Actions
MySimpleRouter
Active
-
UP
Set Gateway
Displaying 1 item


openstack
admin
admin
Project
Compute
Network
Network Topology
Networks
Routers
Admin
Identity
Network Topology
Resize the canvas by scrolling up/down with your mouse/trackpad on the topology. Pan around the canvas by clicking and dragging the space behind the topology.
Toggle labels
Toggle Network Collapse
Launch Instance
+ Create Network
+ Create Router
MySimpleRouter
ID d2a55148-0edd-44fe-8e82-d12690c29bce
STATUS ACTIVE
Interfaces
+ Add Interface
» View Router Details
Delete Router


MySimpleRouter
ID d2a55148-0edd-44fe-8e82-d12690c29bce
STATUS ACTIVE
Interfaces
+ Add Interface
» View Router Details
Delete Router


Add Interface
Subnet *
Select Subnet
MySimpleNetwork: 192.168.1.0/24 (04c12ff9-380d-4a4e-a8aa-f31536406ad4)
cified subnet to the router.
The default IP address of the interface created is a gateway of the selected subnet. You can specify another IP address of the interface here. You must select a subnet to which the specified IP address belongs to from the above list.
Router Name *
MySimpleRouter
Router ID *
d2a55148-0edd-44fe-8e82-d12690c29bce
Cancel
Add interface


MySimpleRouter
ID d2a55148-0edd-44fe-8e82-d12690c29bce
STATUS ACTIVE
Interfaces
+ Add Interface
2e525501-5f...
192.168.1.1
router_interface
ACTIVE
Delete Interface
» View Router Details
Delete Router



Router Details

Edit Router

Overview | Interfaces | Static Routes

Name	MySimpleRouter
ID	d2a55148-0edd-44fe-8e82-d12690c29bce
Project ID	c51a93428ada44f297e5fe65a3ac3b9f
Status	Active
Admin State	UP
External Gateway	None

```
[root@allinone ~(keystone_admin)]# neutron router-list
+--------------------------------------+----------------+-----------------------+-------------+-------+
| id                                   | name           | external_gateway_info | distributed | ha    |
+--------------------------------------+----------------+-----------------------+-------------+-------+
| d2a55148-0edd-44fe-8e82-d12690c29bce | MySimpleRouter | null                  | False       | False |
+--------------------------------------+----------------+-----------------------+-------------+-------+
```

```
[root@allinone ~(keystone_admin)]# source keystonerc_demo
[root@allinone ~(keystone_demo)]# neutron router-list

[root@allinone ~(keystone_demo)]#
```

Created a new router:

Field	Value
admin_state_up	True
external_gateway_info	
id	dfa617ad-3ded-4962-9484-a5e9ce138172
name	MyDemoRouter
routes	
status	ACTIVE
tenant_id	b8e0562dab644c87aa693abf48d3040d

```
[root@allinone ~(keystone_demo)]# neutron net-list
+--------------------------------------+--------------+------------------------------------------------------+
| id                                   | name         | subnets                                              |
+--------------------------------------+--------------+------------------------------------------------------+
| c8cde907-9a30-4e86-8c31-11d11f56cb2c | MyDemoNetwork | 6ee10d34-4d82-4901-9627-22a758096e52 192.168.8.0/24 |
+--------------------------------------+--------------+------------------------------------------------------+
```

```
[root@allinone ~(keystone_demo)]# neutron router-interface-add MyDemoRouter MyDemoSubnet
Added interface 9fff8744-fd64-4e34-b55b-ecd9ff402eba to router MyDemoRouter.
```

```
[root@allinone ~(keystone_demo)]# neutron router-port-list MyDemoRouter
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+
| id                                   | name | mac_address       | fixed_ips                                                                           |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+
| 9fff8744-fd64-4e34-b55b-ecd9ff402eba |      | fa:16:3e:86:50:2b | {"subnet_id": "6ee10d34-4d82-4901-9627-22a758096e52", "ip_address": "192.168.8.1"} |
+--------------------------------------+------+-------------------+-------------------------------------------------------------------------------------+
```

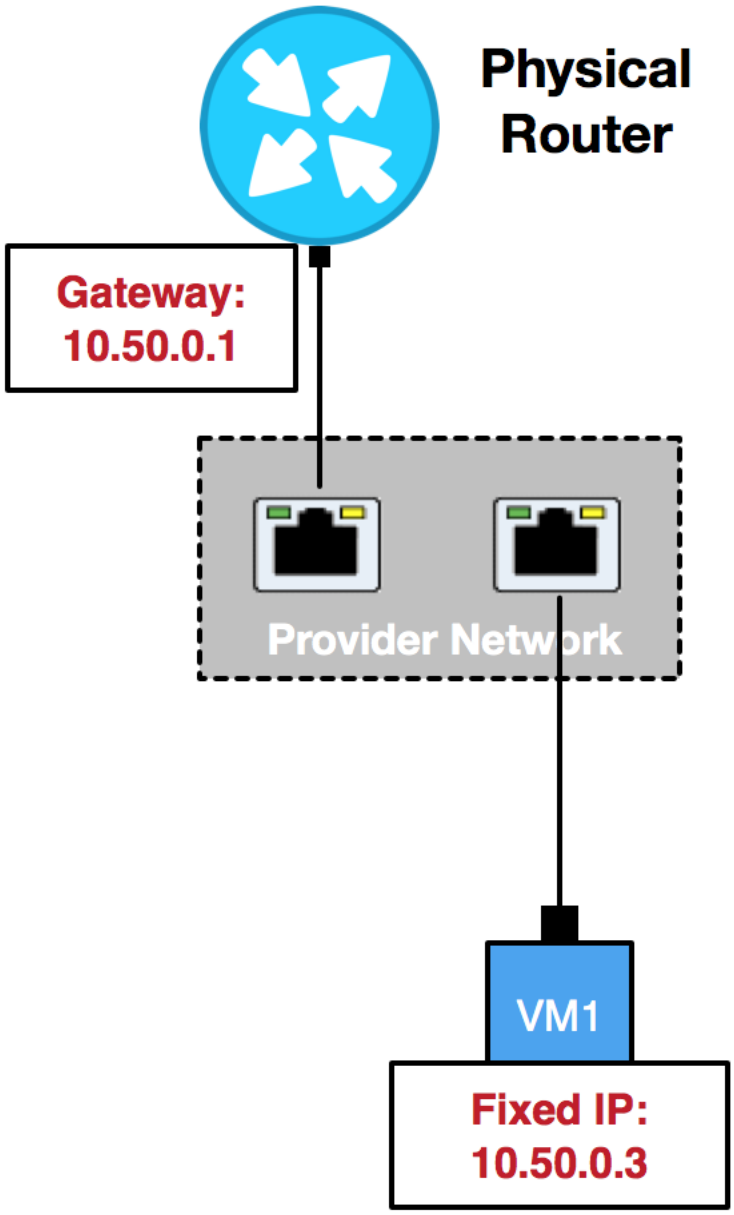
```
[root@allinone ~(keystone_admin)]# ip netns
qrouter-dfa617ad-3ded-4962-9484-a5e9ce138172
qrouter-d2a55148-0edd-44fe-8e82-d12690c29bce
qdhcp-460b2688-02c4-42db-b25c-7e9ba749d368
qdhcp-c8cde907-9a30-4e86-8c31-11d11f56cb2c
```

```
[root@allinone ~(keystone_admin)]# neutron router-list
+--------------------------------------+----------------+-----------------------+-------------+-------+
| id                                   | name           | external_gateway_info | distributed | ha    |
+--------------------------------------+----------------+-----------------------+-------------+-------+
| d2a55148-0edd-44fe-8e82-d12690c29bce | MySimpleRouter | null                  | False       | False |
| dfa617ad-3ded-4962-9484-a5e9ce138172 | MyDemoRouter   | null                  | False       | False |
+--------------------------------------+----------------+-----------------------+-------------+-------+
```

```
[root@allinone ~(keystone_admin)]# ip netns exec qrouter-d2a55148-0edd-44fe-8e82-d12690c29bce ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
14: qr-2e525501-5f: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN
    link/ether fa:16:3e:c5:b6:d8 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global qr-2e525501-5f
       valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fec5:b6d8/64 scope link
       valid_lft forever preferred_lft forever
```

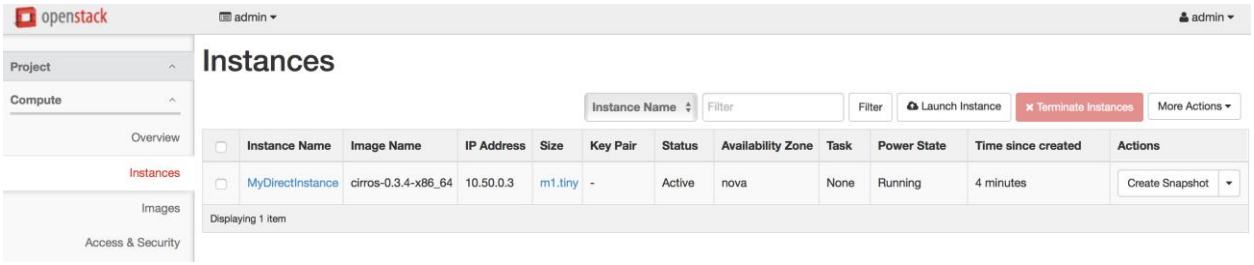
```
[root@allinone ~(keystone_admin)]# ovs-vsctl show
3295ca6c-23cf-4b55-9ed8-f5e1e6c39a30
    Bridge br-ex
        <snip>
    Bridge br-tun
        <snip>
    Bridge br-int
        fail_mode: secure
        Port br-int
            Interface br-int
                type: internal
        Port "qr-2e525501-5f"
            tag: 1
            Interface "qr-2e525501-5f"
                type: internal
        Port "tap9a237a63-df"
            tag: 2
            Interface "tap9a237a63-df"
                type: internal
        Port int-br-ex
            Interface int-br-ex
                type: patch
                options: {peer=phy-br-ex}
        Port "qr-9fff8744-fd"
            tag: 2
            Interface "qr-9fff8744-fd"
                type: internal
        Port patch-tun
            Interface patch-tun
                type: patch
                options: {peer=patch-int}
        Port "tap94c668d7-5a"
            tag: 1
            Interface "tap94c668d7-5a"
                type: internal
    ovs_version: "2.4.0"
```

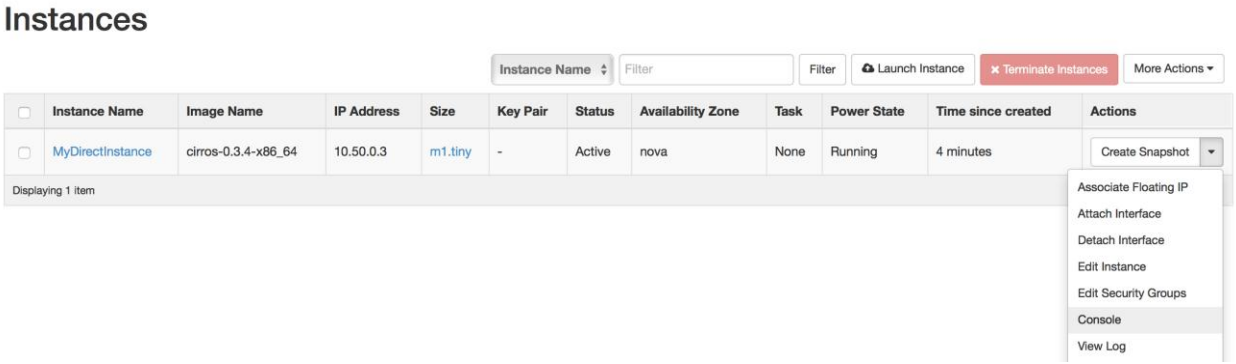
Chapter 7: Building Networks and Routers

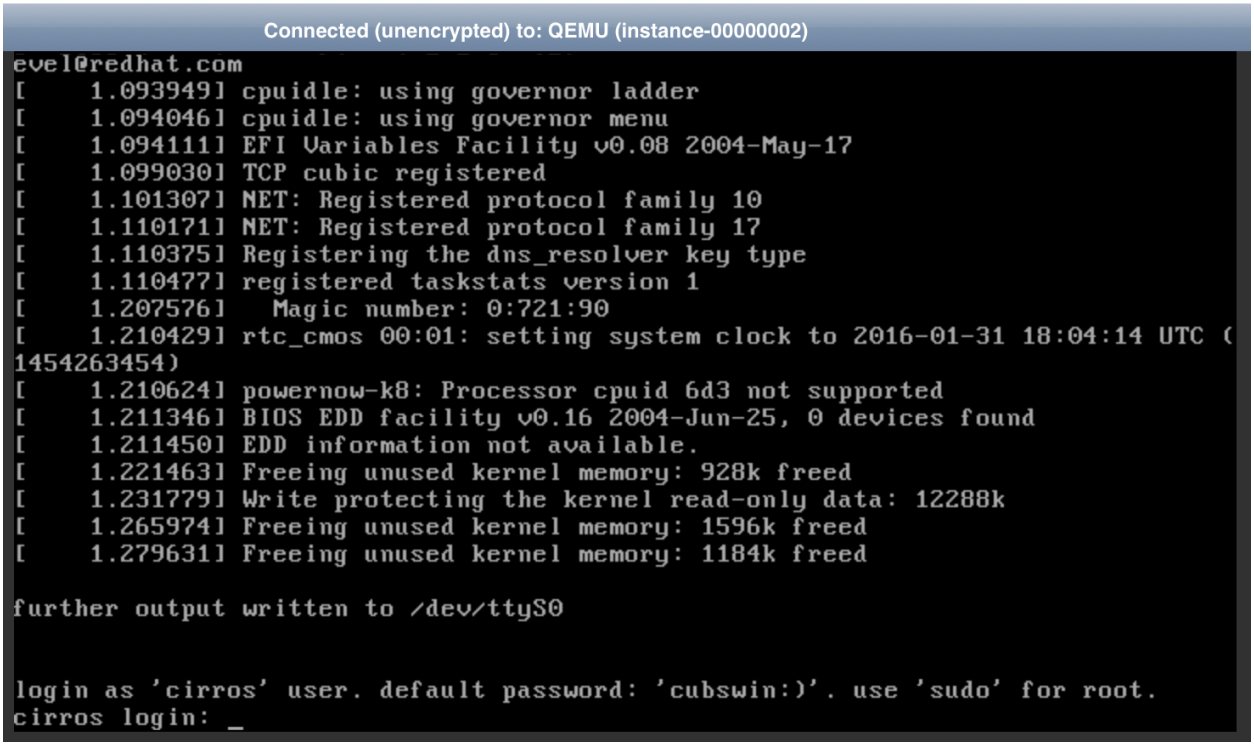


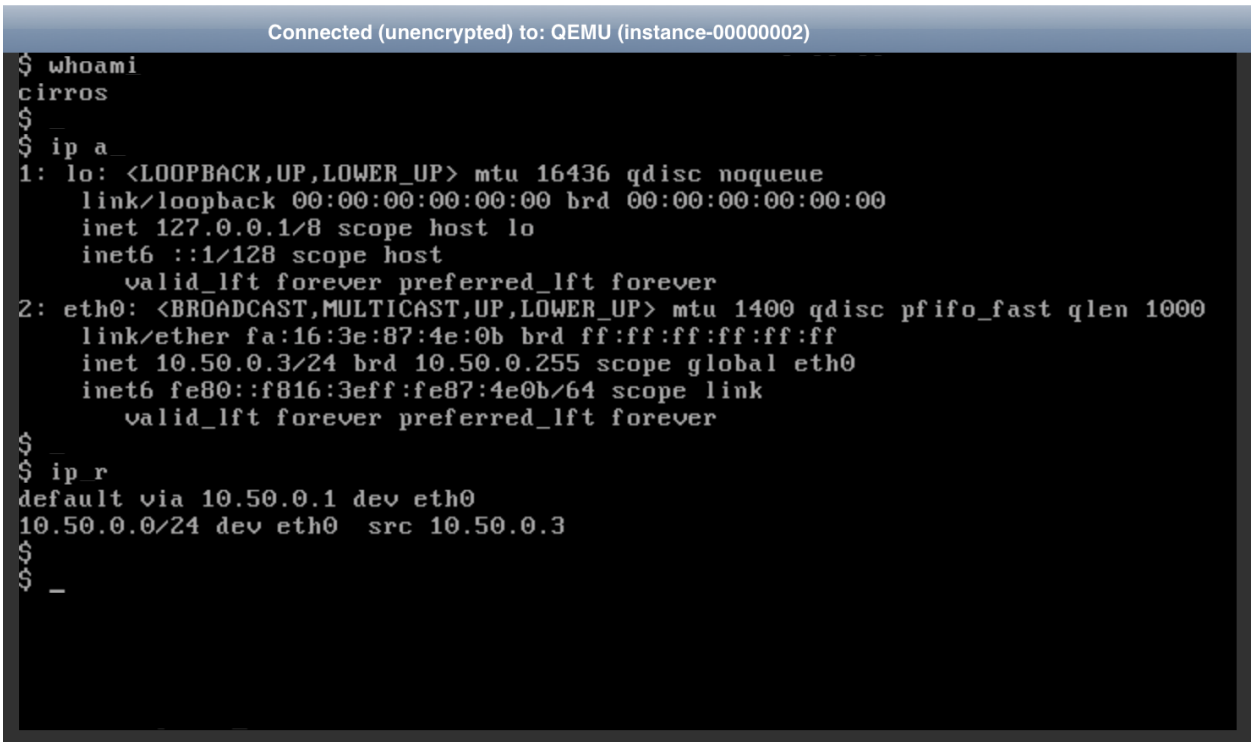
```
[root@allinone ~(keystone_admin)]# neutron net-create --provider:network_type=flat \
> --provider:physical_network=physnet1 MyExternalProviderNetwork

Created a new network:
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | 52550637-519f-496d-afd1-75ab7ff51e44 |
| mtu                       | 0                                    |
| name                      | MyExternalProviderNetwork            |
| provider:network_type     | flat                                 |
| provider:physical_network | physnet1                             |
| provider:segmentation_id  |                                      |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tenant_id                 | c51a93428ada44f297e5fe65a3ac3b9f     |
+---------------------------+--------------------------------------+


[root@allinone ~(keystone_admin)]# neutron subnet-create MyExternalProviderNetwork 10.50.0.0/24 \
> --name=MyExternalProviderSubnet --gateway_ip=10.50.0.1

Created a new subnet:
+-------------------+------------------------------------------------+
| Field             | Value                                          |
+-------------------+------------------------------------------------+
| allocation_pools  | {"start": "10.50.0.2", "end": "10.50.0.254"} |
| cidr              | 10.50.0.0/24                                   |
| dns_nameservers   |                                                |
| enable_dhcp       | True                                           |
| gateway_ip        | 10.50.0.1                                      |
| host_routes       |                                                |
| id                | fe581964-41b0-42c6-b08e-b09ca254d631           |
| ip_version        | 4                                              |
| ipv6_address_mode |                                                |
| ipv6_ra_mode      |                                                |
| name              | MyExternalProviderSubnet                       |
| network_id        | 52550637-519f-496d-afd1-75ab7ff51e44           |
| subnetpool_id     |                                                |
| tenant_id         | c51a93428ada44f297e5fe65a3ac3b9f               |
+-------------------+------------------------------------------------+
```

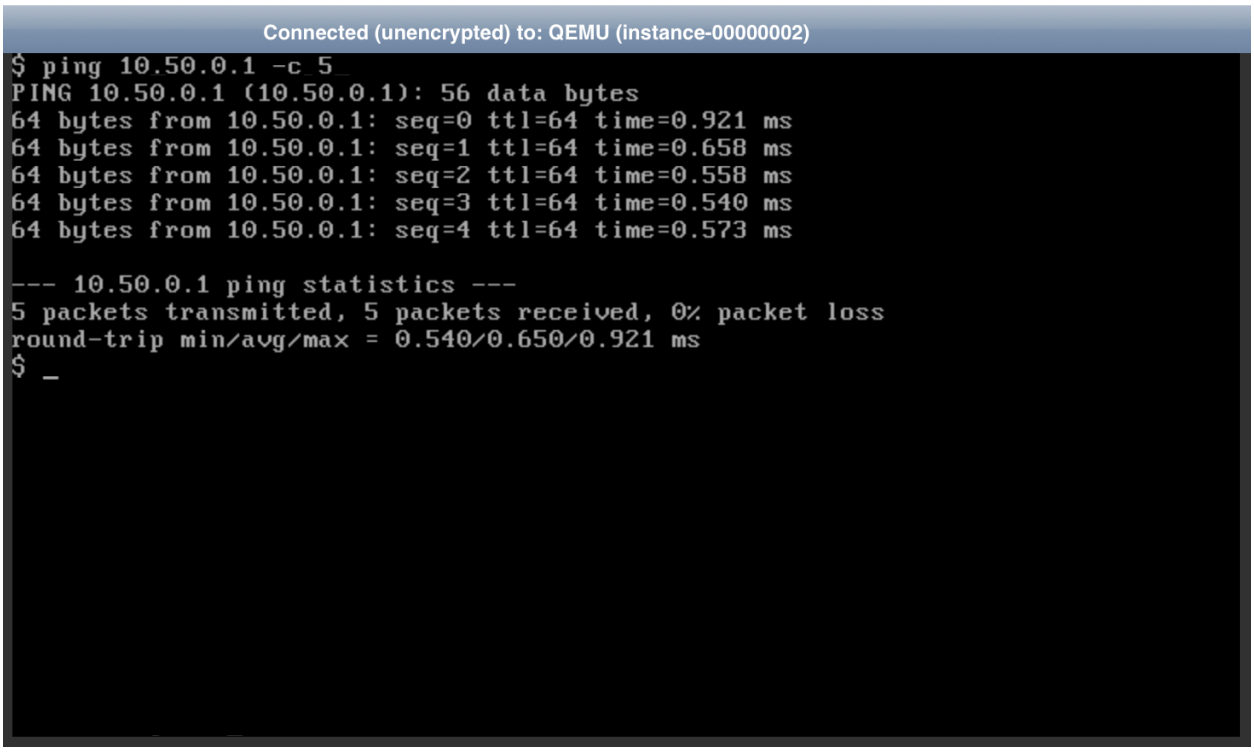
```
[root@allinone ~(keystone_admin)]# nova boot --image="cirros-0.3.4-x86_64" --flavor="m1.tiny" \
--nic net-id=52550637-519f-496d-afd1-75ab7ff51e44 MyDirectInstance
+--------------------------------------+------------------------------------------------------------+
| Property                             | Value                                                      |
+--------------------------------------+------------------------------------------------------------+
| OS-DCF:diskConfig                    | MANUAL                                                     |
| OS-EXT-AZ:availability_zone          |                                                            |
| OS-EXT-SRV-ATTR:host                 | -                                                          |
| OS-EXT-SRV-ATTR:hypervisor_hostname  | -                                                          |
| OS-EXT-SRV-ATTR:instance_name        | instance-00000002                                          |
| OS-EXT-STS:power_state               | 0                                                          |
| OS-EXT-STS:task_state                | scheduling                                                 |
| OS-EXT-STS:vm_state                  | building                                                   |
| OS-SRV-USG:launched_at               | -                                                          |
| OS-SRV-USG:terminated_at             | -                                                          |
| accessIPv4                           |                                                            |
| accessIPv6                           |                                                            |
| adminPass                            | h8pcM2pxLFr9                                               |
| config_drive                         |                                                            |
| created                              | 2016-01-31T16:34:15Z                                       |
| flavor                               | m1.tiny (1)                                                |
| hostId                               |                                                            |
| id                                   | 5b535f1e-1f6e-47f1-a527-3c4b56d38589                       |
| image                                | cirros-0.3.4-x86_64 (952c8431-f534-4c5f-bc06-c6122f112232) |
| key_name                             | -                                                          |
| metadata                             | {}                                                         |
| name                                 | MyDirectInstance                                           |
| os-extended-volumes:volumes_attached | []                                                         |
| progress                             | 0                                                          |
| security_groups                      | default                                                    |
| status                               | BUILD                                                      |
| tenant_id                            | c51a93428ada44f297e5fe65a3ac3b9f                           |
| updated                              | 2016-01-31T16:34:16Z                                       |
| user_id                              | f3596d7861514f92aae527ba6dec3e25                           |
+--------------------------------------+------------------------------------------------------------+
```



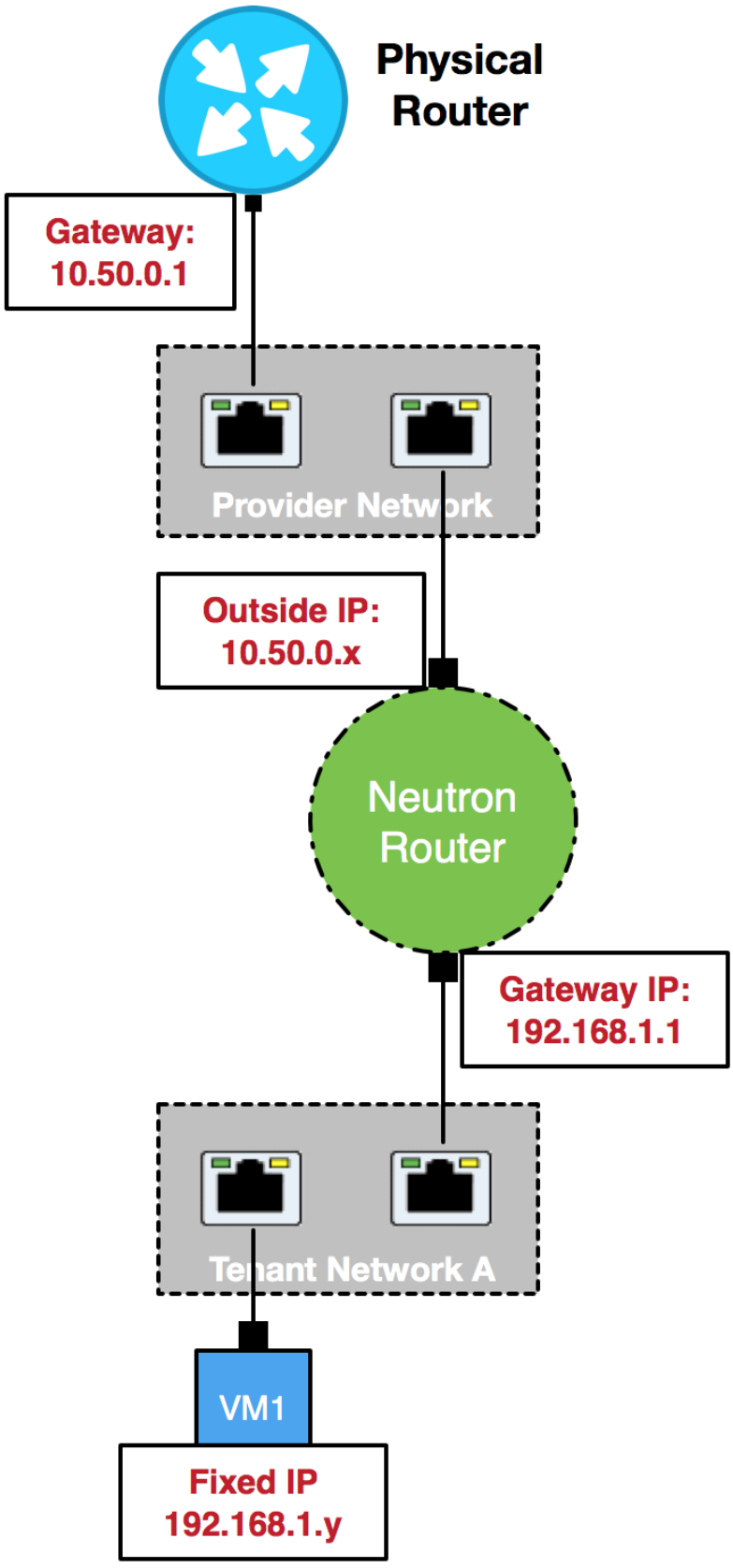



Connected (unencrypted) to: QEMU (instance-00000002)
evel@redhat.com
[1.093949] cpuidle: using governor ladder
[1.094046] cpuidle: using governor menu
[1.094111] EFI Variables Facility v0.08 2004-May-17
[1.099030] TCP cubic registered
[1.101307] NET: Registered protocol family 10
[1.110171] NET: Registered protocol family 17
[1.110375] Registering the dns_resolver key type
[1.110477] registered taskstats version 1
[1.207576] Magic number: 0:721:90
[1.210429] rtc_cmos 00:01: setting system clock to 2016-01-31 18:04:14 UTC (
1454263454)
[1.210624] powernow-k8: Processor cpuid 6d3 not supported
[1.211346] BIOS EDD facility v0.16 2004-Jun-25, 0 devices found
[1.211450] EDD information not available.
[1.221463] Freeing unused kernel memory: 928k freed
[1.231779] Write protecting the kernel read-only data: 12288k
[1.265974] Freeing unused kernel memory: 1596k freed
[1.279631] Freeing unused kernel memory: 1184k freed
further output written to /dev/ttyS0
login as 'cirros' user. default password: 'cubswin:)'. use 'sudo' for root.
cirros login: _

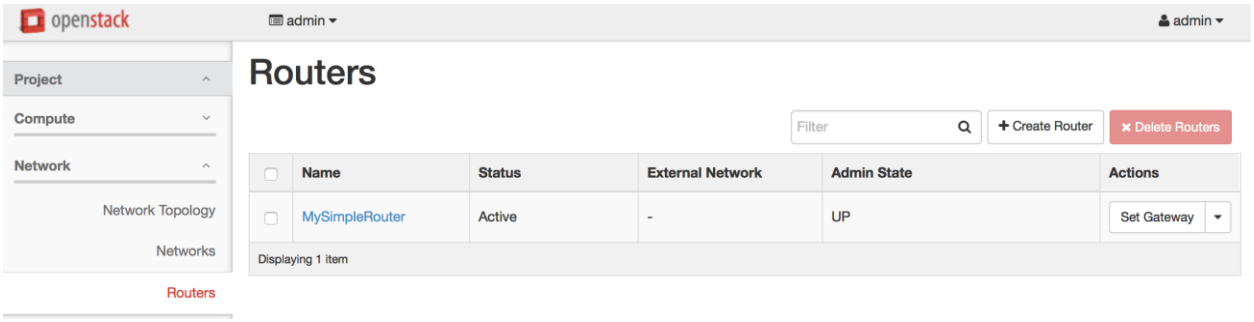

Connected (unencrypted) to: QEMU (instance-00000002)
$ whoami
cirros
$
$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
inet 127.0.0.1/8 scope host lo
inet6 ::1/128 scope host
valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc pfifo_fast qlen 1000
link/ether fa:16:3e:87:4e:0b brd ff:ff:ff:ff:ff:ff
inet 10.50.0.3/24 brd 10.50.0.255 scope global eth0
inet6 fe80::f816:3eff:fe87:4e0b/64 scope link
valid_lft forever preferred_lft forever
$
$ ip r
default via 10.50.0.1 dev eth0
10.50.0.0/24 dev eth0 src 10.50.0.3
$
$ _

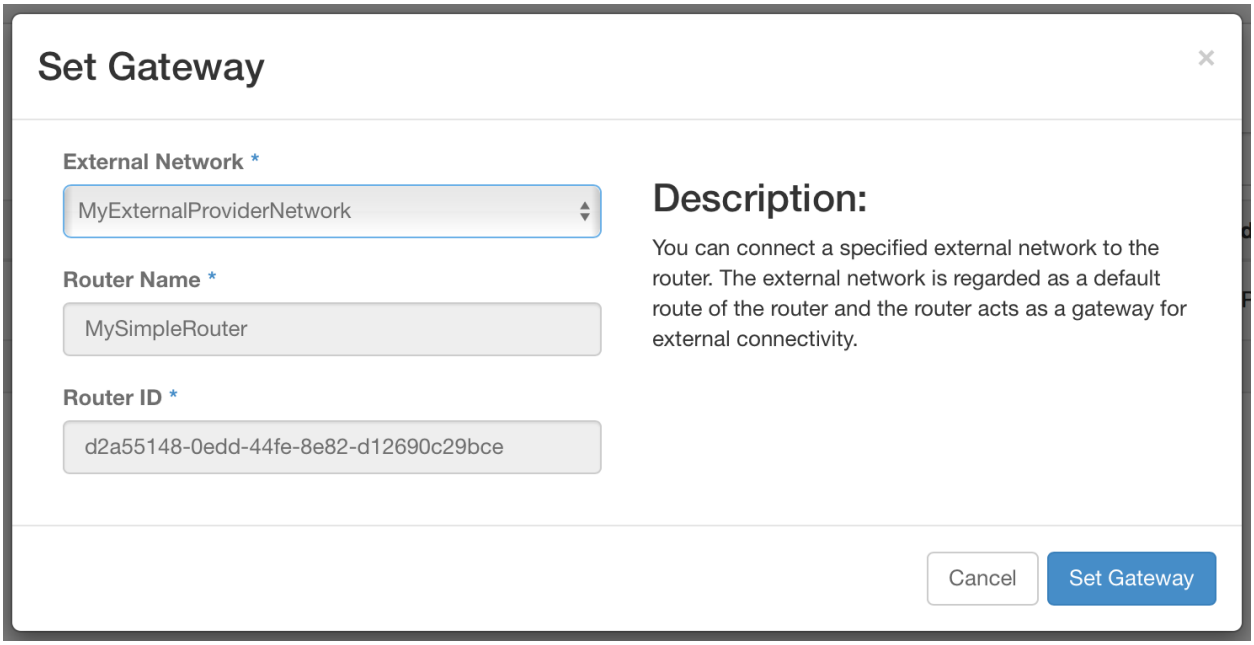


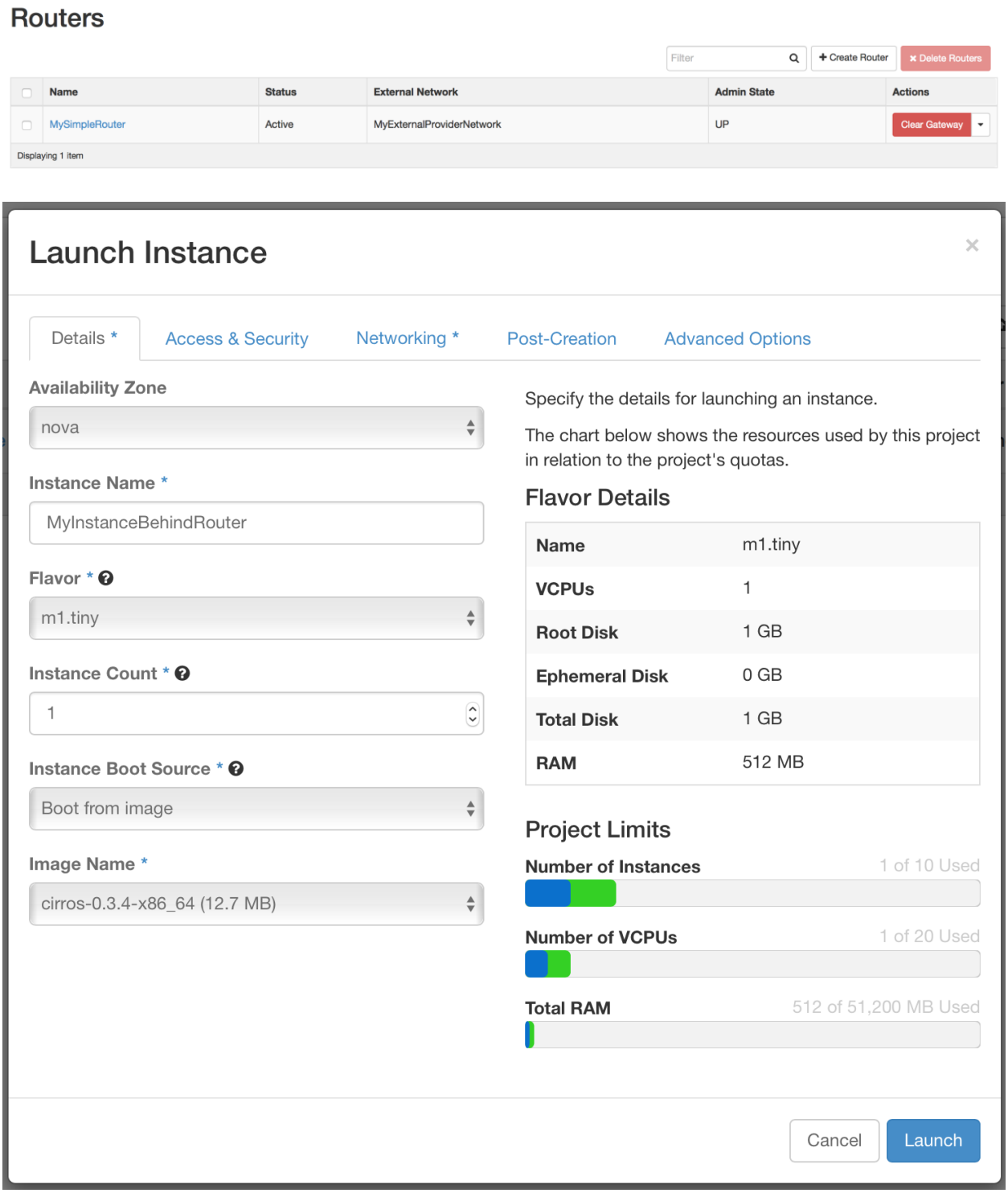

```
retina-imac:~ jdenton$ ssh cirros@10.50.0.3
The authenticity of host '10.50.0.3 (10.50.0.3)' can't be established.
RSA key fingerprint is SHA256:xvpZI+nz/K1tSqU2dChNSeEdWOVtQpIK7Naa9o/MKxY.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.50.0.3' (RSA) to the list of known hosts.
cirros@10.50.0.3's password:
$ exit
Connection to 10.50.0.3 closed.
```

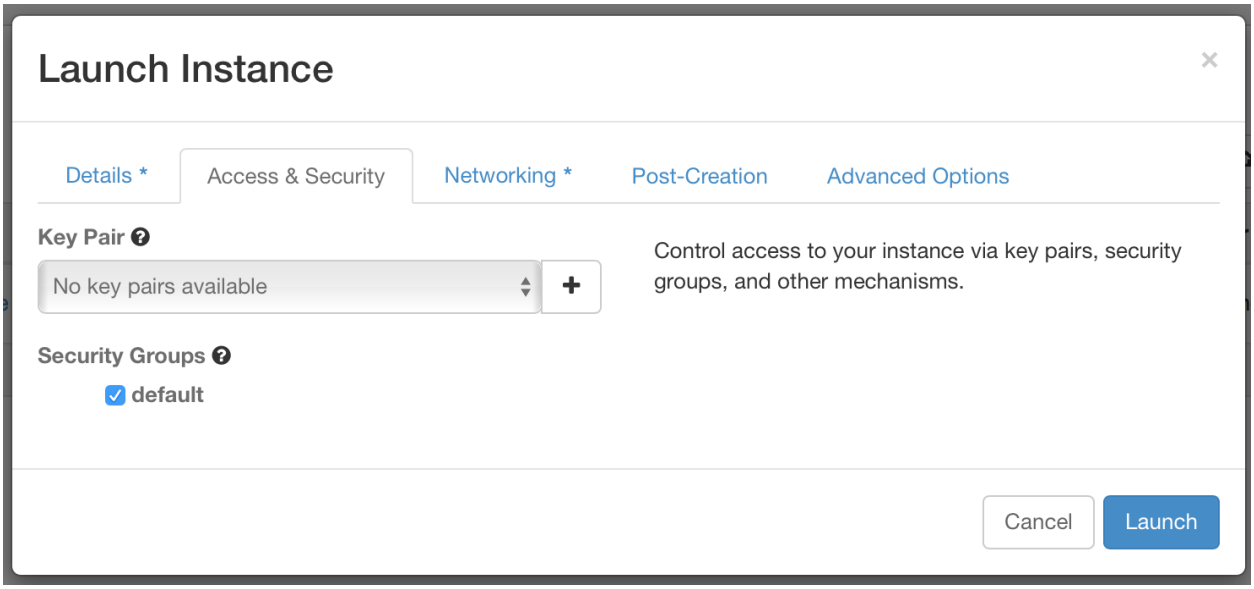

Physical Router
Gateway: 10.50.0.1
Provider Network
Outside IP: 10.50.0.x
Neutron Router
Gateway IP: 192.168.1.1
Tenant Network A
VM1
Fixed IP 192.168.1.y

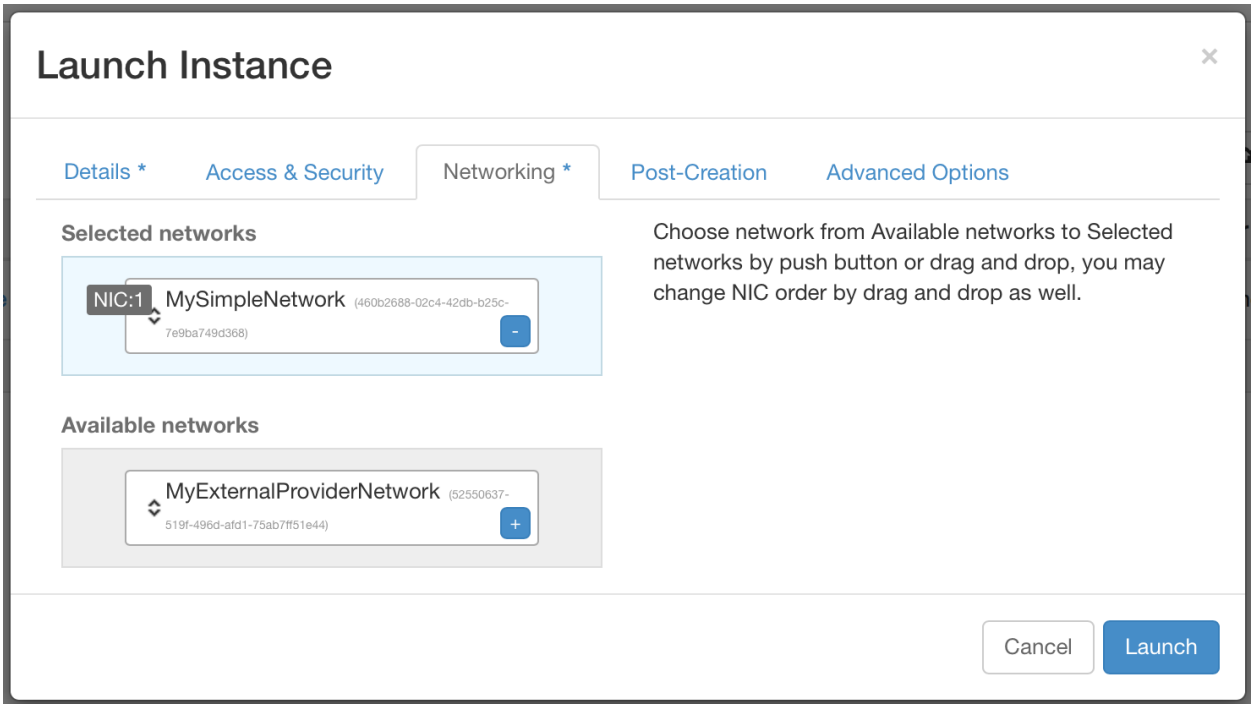
```
[root@allinone ~(keystone_admin)]# neutron net-update MyExternalProviderNetwork --router:external=true
Updated network: MyExternalProviderNetwork

[root@allinone ~(keystone_admin)]# neutron net-show MyExternalProviderNetwork
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | 52550637-519f-496d-afd1-75ab7ff51e44 |
| mtu                       | 0                                    |
| name                      | MyExternalProviderNetwork            |
| provider:network_type     | flat                                 |
| provider:physical_network | physnet1                             |
| provider:segmentation_id  |                                      |
| router:external           | True                                 |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   | fe581964-41b0-42c6-b08e-b09ca254d631 |
| tenant_id                 | c51a93428ada44f297e5fe65a3ac3b9f     |
+---------------------------+--------------------------------------+
```






Routers
Filter
+ Create Router
× Delete Routers
Name
Status
External Network
Admin State
Actions
MySimpleRouter
Active
MyExternalProviderNetwork
UP
Clear Gateway
Displaying 1 item
Launch Instance
Details *
Access & Security
Networking *
Post-Creation
Advanced Options
Availability Zone
nova
Instance Name *
MyInstanceBehindRouter
Flavor *
m1.tiny
Instance Count *
1
Instance Boot Source *
Boot from image
Image Name *
cirros-0.3.4-x86_64 (12.7 MB)
Specify the details for launching an instance.
The chart below shows the resources used by this project in relation to the project's quotas.
Flavor Details
Name
m1.tiny
VCPUs
1
Root Disk
1 GB
Ephemeral Disk
0 GB
Total Disk
1 GB
RAM
512 MB
Project Limits
Number of Instances
1 of 10 Used
Number of VCPUs
1 of 20 Used
Total RAM
512 of 51,200 MB Used
Cancel
Launch



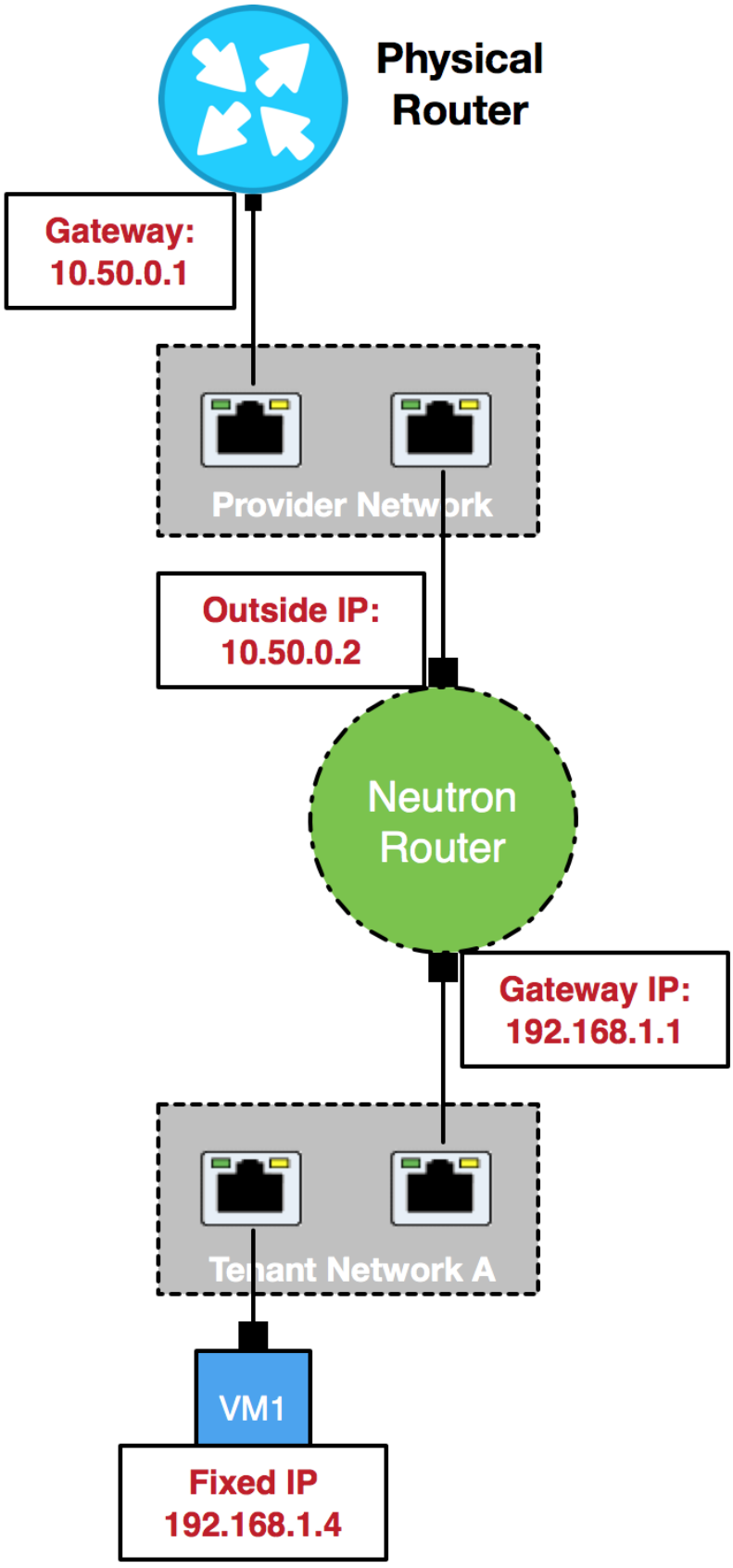


Instances

Instance Name | Filter | Filter | Launch Instance | Terminate Instances | More Actions

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
MyInstanceBehindRouter	cirros-0.3.4-x86_64	192.168.1.4	m1.tiny	-	Active	nova	None	Running	0 minutes	Create Snapshot
MyDirectInstance	cirros-0.3.4-x86_64	10.50.0.3	m1.tiny	-	Active	nova	None	Running	35 minutes	Create Snapshot

Displaying 2 items


Physical Router
Gateway: 10.50.0.1
Provider Network
Outside IP: 10.50.0.2
Neutron Router
Gateway IP: 192.168.1.1
Tenant Network A
VM1
Fixed IP 192.168.1.4

```
retina-imac:~ jdenton$ ssh cirros@192.168.1.4
ssh: connect to host 192.168.1.4 port 22: Operation timed out
```

Connected (unencrypted) to: QEMU (instance-00000003)

```
[    0.746236] cpuidle: using governor ladder
[    0.746333] cpuidle: using governor menu
[    0.746397] EFI Variables Facility v0.08 2004-May-17
[    0.749310] TCP cubic registered
[    0.750032] NET: Registered protocol family 10
[    0.756590] NET: Registered protocol family 17
[    0.756843] Registering the dns_resolver key type
[    0.759753] registered taskstats version 1
[    0.844324]   Magic number: 0:718:189
[    0.844582] acpi device:1b: hash matches
[    0.844937] rtc_cmos 00:01: setting system clock to 2016-01-31 17:11:49 UTC (
1454260309)
[    0.845103] powernow-k8: Processor cpuid 6d3 not supported
[    0.845770] BIOS EDD facility v0.16 2004-Jun-25, 0 devices found
[    0.845862] EDD information not available.
[    0.872258] Freeing unused kernel memory: 928k freed
[    0.883933] Write protecting the kernel read-only data: 12288k
[    0.905902] Freeing unused kernel memory: 1596k freed
[    0.920286] Freeing unused kernel memory: 1184k freed

further output written to /dev/ttyS0


login as 'cirros' user. default password: 'cubswin:)'. use 'sudo' for root.
myinstancebehindrouter login: _
```

Connected (unencrypted) to: QEMU (instance-00000003)

```
further output written to /dev/ttyS0


login as 'cirros' user. default password: 'cubswin:)'. use 'sudo' for root.
myinstancebehindrouter login: cirros
Password:
$ whoami
cirros
$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc pfifo_fast qlen 1000
    link/ether fa:16:3e:1c:14:15 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.4/24 brd 192.168.1.255 scope global eth0
    inet6 fe80::f816:3eff:fe1c:1415/64 scope link
       valid_lft forever preferred_lft forever
$ ip r
default via 192.168.1.1 dev eth0
169.254.169.254 via 192.168.1.1 dev eth0
192.168.1.0/24 dev eth0  src 192.168.1.4
$ _
```

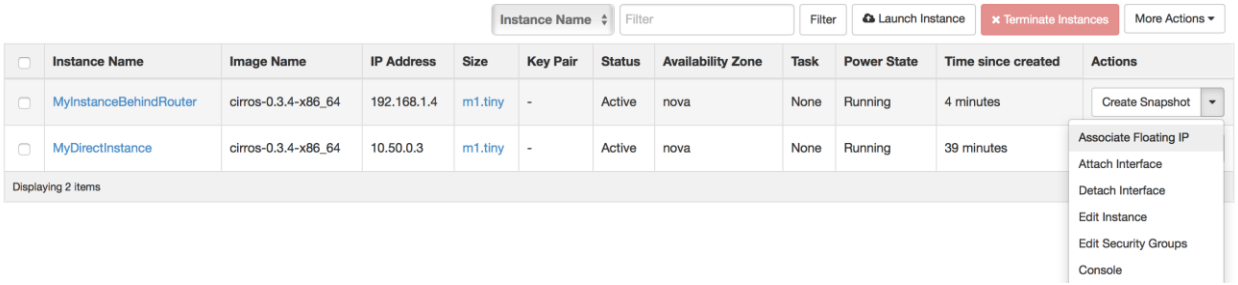
Connected (unencrypted) to: QEMU (instance-00000003)

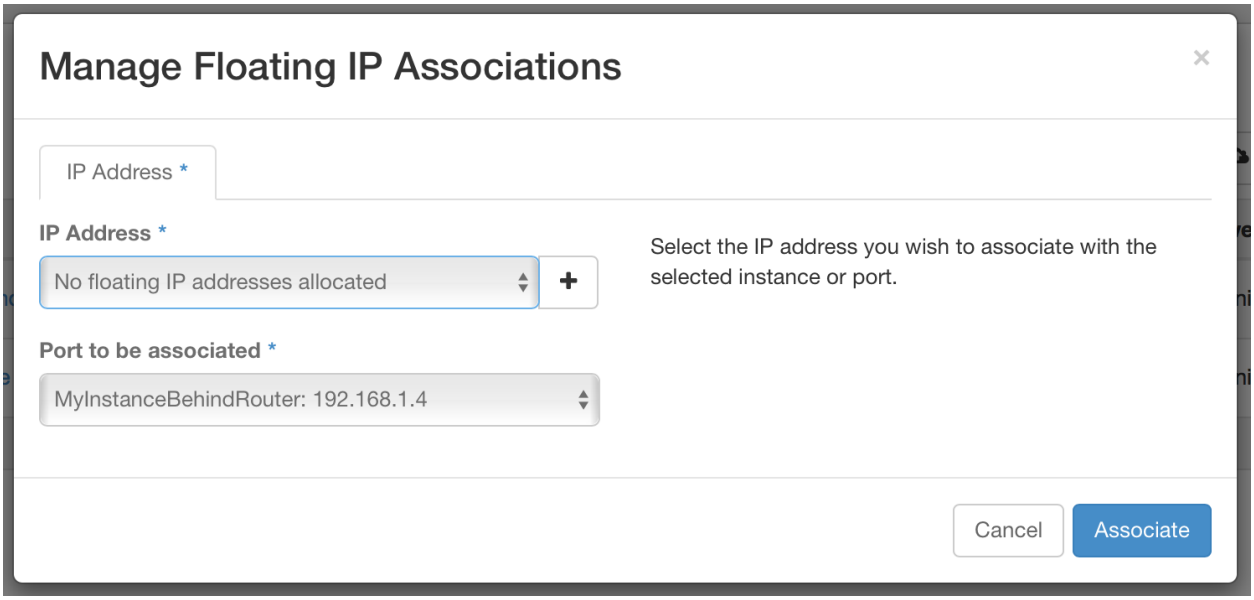
```
$ ping 10.50.0.1
PING 10.50.0.1 (10.50.0.1): 56 data bytes
64 bytes from 10.50.0.1: seq=0 ttl=63 time=1.395 ms
64 bytes from 10.50.0.1: seq=1 ttl=63 time=0.787 ms
64 bytes from 10.50.0.1: seq=2 ttl=63 time=0.569 ms
64 bytes from 10.50.0.1: seq=3 ttl=63 time=0.608 ms
64 bytes from 10.50.0.1: seq=4 ttl=63 time=0.583 ms

--- 10.50.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.569/0.788/1.395 ms
$ _
```

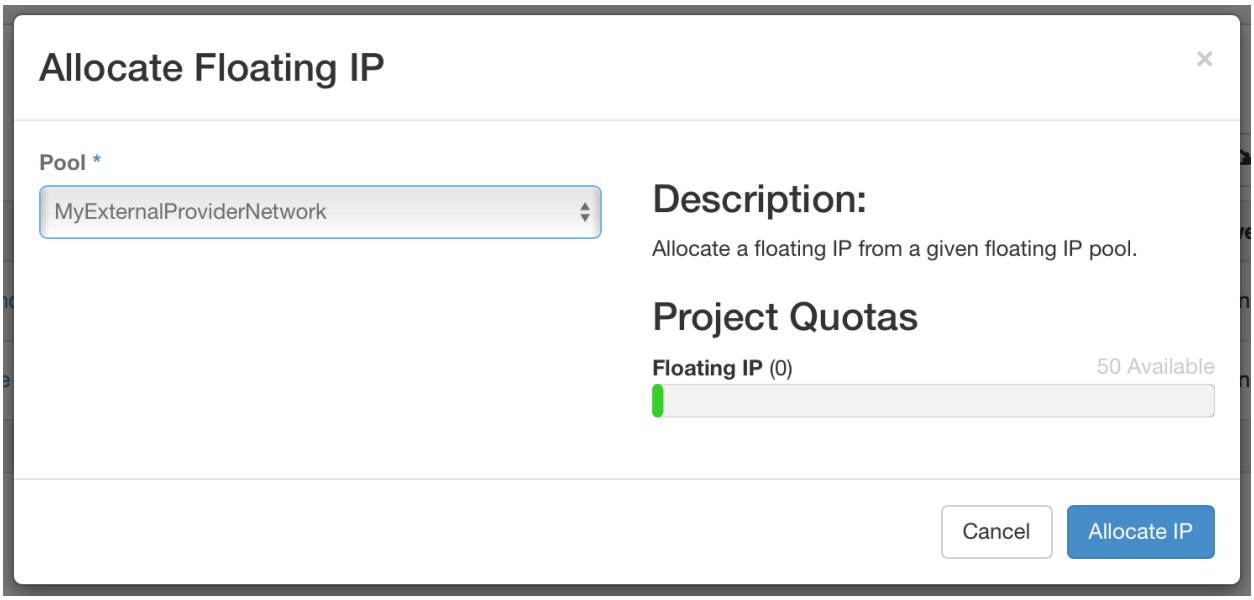
```
retina-imac:~ jdenton$ sudo tcpdump -i any host 10.50.0.1 and icmp
Password:
tcpdump: data link type PKTAP
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type PKTAP (Packet Tap), capture size 262144 bytes
11:12:42.218610 IP 10.50.0.2 > 10.50.0.1: ICMP echo request, id 12033, seq 0, length 64
11:12:42.218641 IP 10.50.0.1 > 10.50.0.2: ICMP echo reply, id 12033, seq 0, length 64
11:12:43.219151 IP 10.50.0.2 > 10.50.0.1: ICMP echo request, id 12033, seq 1, length 64
11:12:43.219180 IP 10.50.0.1 > 10.50.0.2: ICMP echo reply, id 12033, seq 1, length 64
11:12:44.219544 IP 10.50.0.2 > 10.50.0.1: ICMP echo request, id 12033, seq 2, length 64
11:12:44.219566 IP 10.50.0.1 > 10.50.0.2: ICMP echo reply, id 12033, seq 2, length 64
11:12:45.219875 IP 10.50.0.2 > 10.50.0.1: ICMP echo request, id 12033, seq 3, length 64
11:12:45.219905 IP 10.50.0.1 > 10.50.0.2: ICMP echo reply, id 12033, seq 3, length 64
11:12:46.220583 IP 10.50.0.2 > 10.50.0.1: ICMP echo request, id 12033, seq 4, length 64
11:12:46.220612 IP 10.50.0.1 > 10.50.0.2: ICMP echo reply, id 12033, seq 4, length 64
```

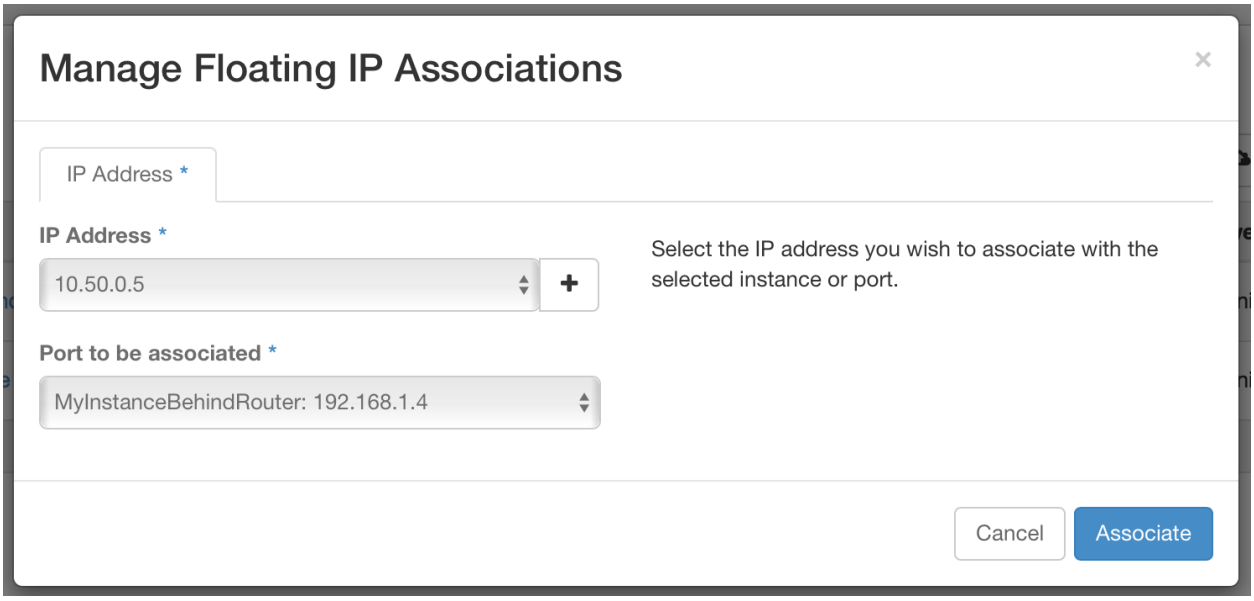
```
[root@allinone ~(keystone_admin)]# neutron router-show MySimpleRouter -c external_gateway_info
+-----------------------+---------------------------------------------------------------------------------------
----------------------------------------------------------------------------------+
| Field                 | Value
                                                                                  |
+-----------------------+---------------------------------------------------------------------------------------
----------------------------------------------------------------------------------+
| external_gateway_info | {"network_id": "52550637-519f-496d-afd1-75ab7ff51e44", "enable_snat": true,
"external_fixed_ips": [{"subnet_id": "fe581964-41b0-42c6-b08e-b09ca254d631", "ip_address": "10.50.0.2"}]} |
+-----------------------+---------------------------------------------------------------------------------------
----------------------------------------------------------------------------------+
```

Instances


Instance Name
Filter
Filter
Launch Instance
Terminate Instances
More Actions
Instance Name
Image Name
IP Address
Size
Key Pair
Status
Availability Zone
Task
Power State
Time since created
Actions
MyInstanceBehindRouter
cirros-0.3.4-x86_64
192.168.1.4
m1.tiny
-
Active
nova
None
Running
4 minutes
Create Snapshot
MyDirectInstance
cirros-0.3.4-x86_64
10.50.0.3
m1.tiny
-
Active
nova
None
Running
39 minutes
Displaying 2 items
Associate Floating IP
Attach Interface
Detach Interface
Edit Instance
Edit Security Groups
Console


Manage Floating IP Associations
IP Address *
IP Address *
No floating IP addresses allocated
Port to be associated *
MyInstanceBehindRouter: 192.168.1.4
Select the IP address you wish to associate with the selected instance or port.
Cancel
Associate


Allocate Floating IP
Pool *
MyExternalProviderNetwork
Description:
Allocate a floating IP from a given floating IP pool.
Project Quotas
Floating IP (0)
50 Available
Cancel
Allocate IP



Instances

Instance Name | Filter | Filter | Launch Instance | Terminate Instances | More Actions

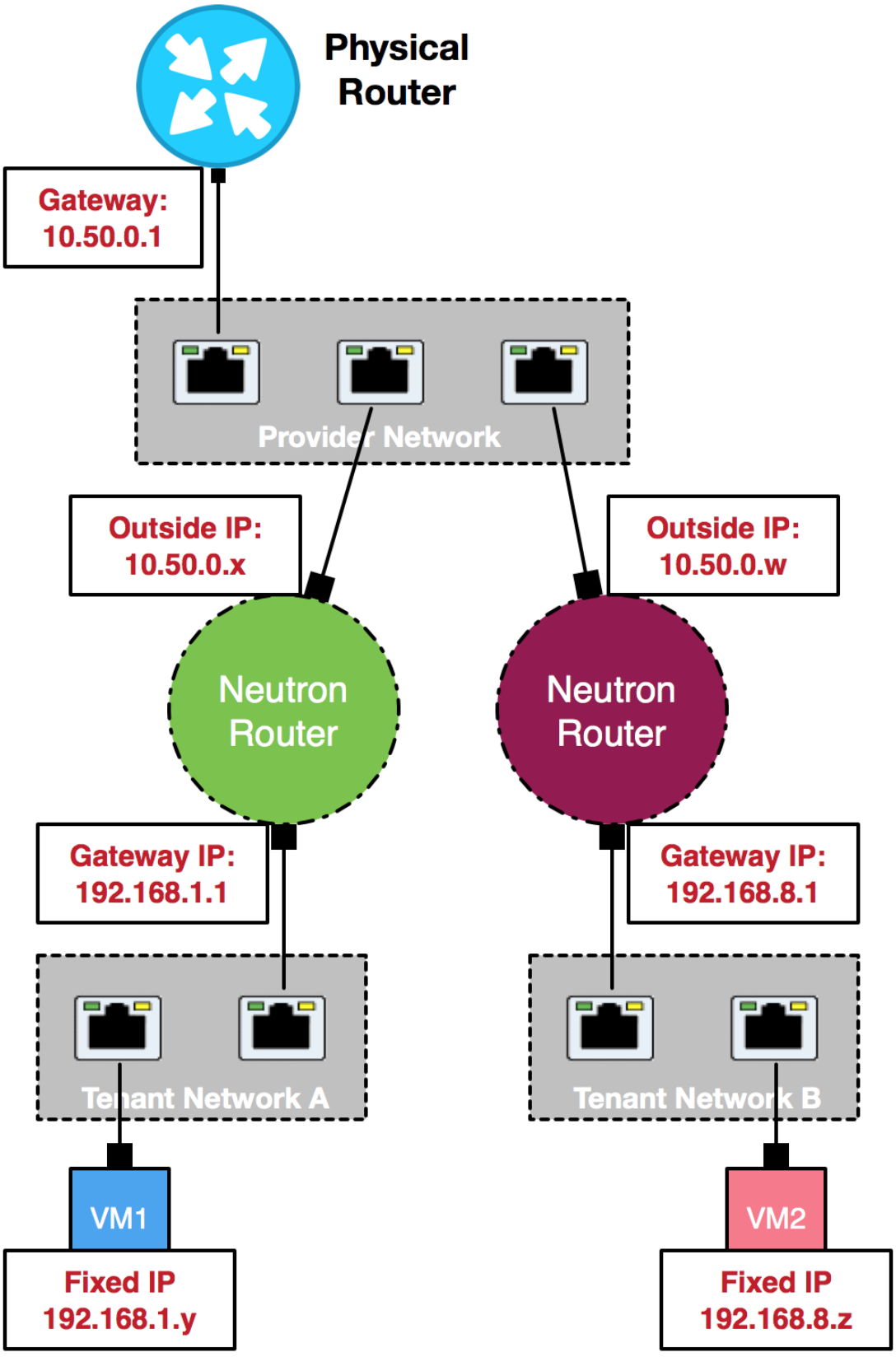
Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
MyInstanceBehindRouter	cirros-0.3.4-x86_64	192.168.1.4 Floating IPs: 10.50.0.5	m1.tiny	-	Active	nova	None	Running	5 minutes	Create Snapshot
MyDirectInstance	cirros-0.3.4-x86_64	10.50.0.3	m1.tiny	-	Active	nova	None	Running	40 minutes	Create Snapshot

Displaying 2 items

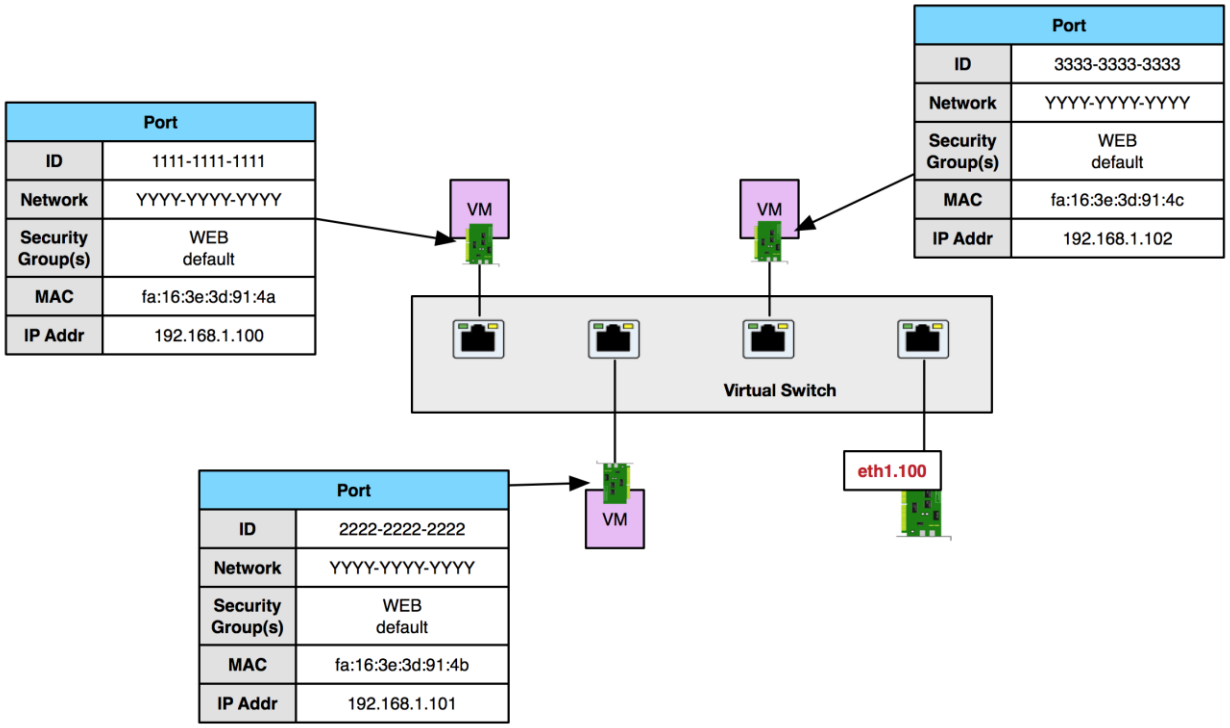
```
retina-imac:~ jdenton$ ssh cirros@10.50.0.5
The authenticity of host '10.50.0.5 (10.50.0.5)' can't be established.
RSA key fingerprint is SHA256:vkHKLrnBdy29h8vtOZGPo5XvK3bvU2c9uRyNoRyJ4x8.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.50.0.5' (RSA) to the list of known hosts.
cirros@10.50.0.5's password:
$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc pfifo_fast qlen 1000
    link/ether fa:16:3e:1c:14:15 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.4/24 brd 192.168.1.255 scope global eth0
    inet6 fe80::f816:3eff:fe1c:1415/64 scope link
       valid_lft forever preferred_lft forever
```

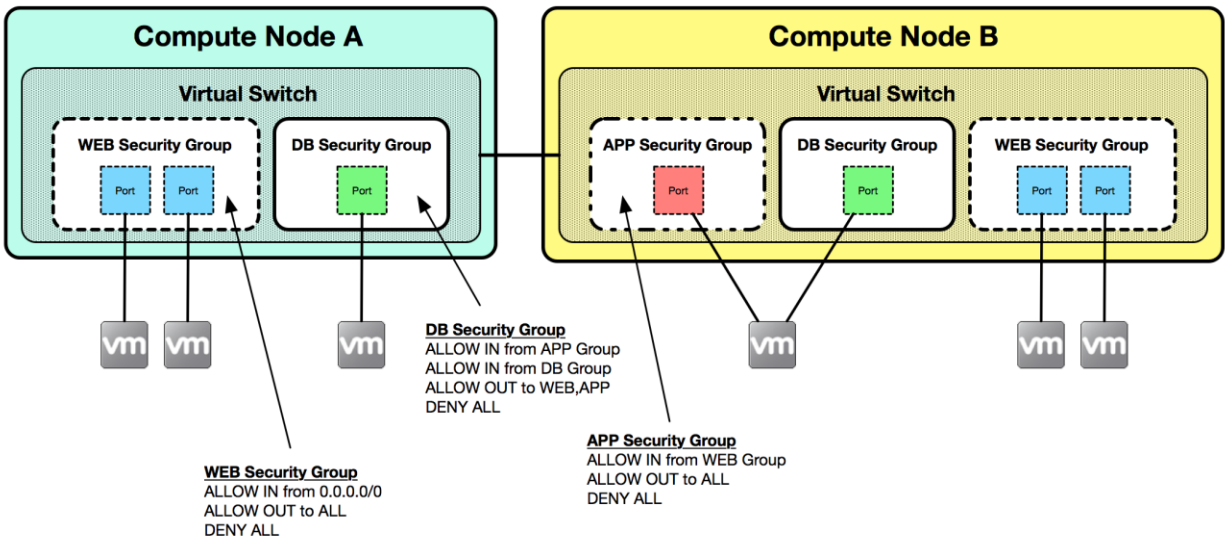
```
$ ping 10.50.0.1 -c 5
PING 10.50.0.1 (10.50.0.1): 56 data bytes
64 bytes from 10.50.0.1: seq=0 ttl=63 time=1.144 ms
64 bytes from 10.50.0.1: seq=1 ttl=63 time=0.685 ms
64 bytes from 10.50.0.1: seq=2 ttl=63 time=0.657 ms
64 bytes from 10.50.0.1: seq=3 ttl=63 time=0.616 ms
64 bytes from 10.50.0.1: seq=4 ttl=63 time=0.655 ms

--- 10.50.0.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.616/0.751/1.144 ms
```

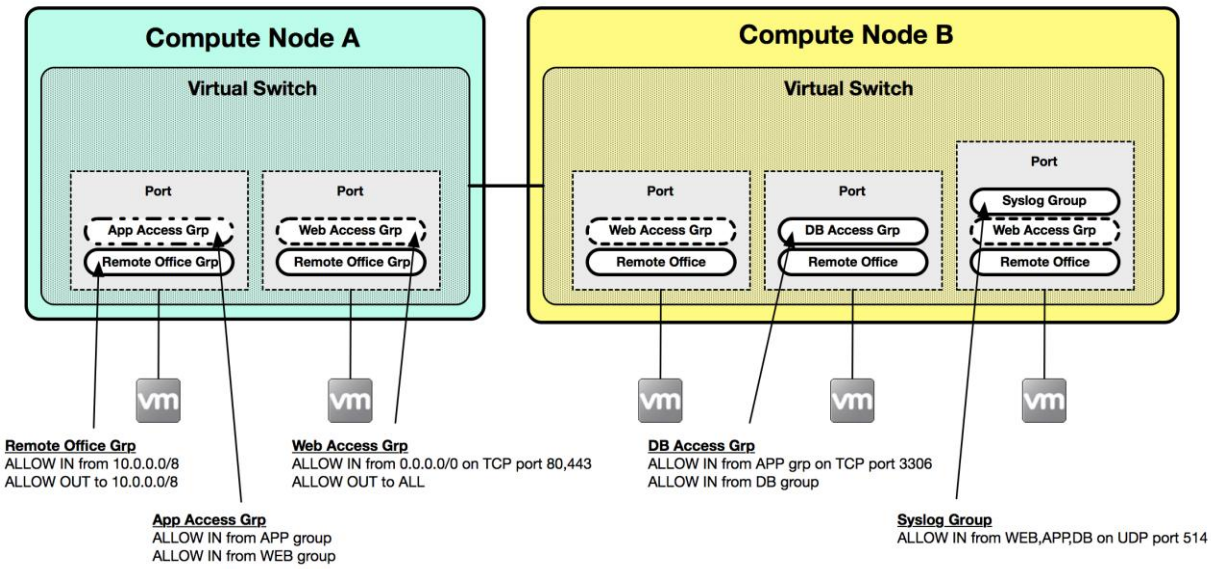
```
retina-imac:~ jdenton$ sudo tcpdump -i any host 10.50.0.1 and icmp
Password:
tcpdump: data link type PKTAP
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type PKTAP (Packet Tap), capture size 262144 bytes
11:15:48.799275 IP 10.50.0.5 > 10.50.0.1: ICMP echo request, id 14081, seq 0, length 64
11:15:48.799286 IP 10.50.0.1 > 10.50.0.5: ICMP echo reply, id 14081, seq 0, length 64
11:15:49.799741 IP 10.50.0.5 > 10.50.0.1: ICMP echo request, id 14081, seq 1, length 64
11:15:49.799771 IP 10.50.0.1 > 10.50.0.5: ICMP echo reply, id 14081, seq 1, length 64
11:15:50.800333 IP 10.50.0.5 > 10.50.0.1: ICMP echo request, id 14081, seq 2, length 64
11:15:50.800366 IP 10.50.0.1 > 10.50.0.5: ICMP echo reply, id 14081, seq 2, length 64
11:15:51.800756 IP 10.50.0.5 > 10.50.0.1: ICMP echo request, id 14081, seq 3, length 64
11:15:51.800789 IP 10.50.0.1 > 10.50.0.5: ICMP echo reply, id 14081, seq 3, length 64
11:15:52.801375 IP 10.50.0.5 > 10.50.0.1: ICMP echo request, id 14081, seq 4, length 64
11:15:52.801403 IP 10.50.0.1 > 10.50.0.5: ICMP echo reply, id 14081, seq 4, length 64
```


Physical Router
Gateway: 10.50.0.1
Provider Network
Outside IP: 10.50.0.x
Outside IP: 10.50.0.w
Neutron Router
Neutron Router
Gateway IP: 192.168.1.1
Gateway IP: 192.168.8.1
Tenant Network A
Tenant Network B
VM1
VM2
Fixed IP 192.168.1.y
Fixed IP 192.168.8.z

Chapter 8: Security Group Fundamentals







openstack demo demo

Project
Compute
Overview
Instances
Images
Access & Security
Network
Identity

Manage Security Group Rules: default (bdaf26c4-ac20-4c0d-8d95-ea354c7afe13)

+ Add Rule | × Delete Rules

	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
☐	Ingress	IPv6	Any	Any	-	default	Delete Rule
☐	Ingress	IPv4	Any	Any	-	default	Delete Rule
☐	Egress	IPv6	Any	Any	::/0	-	Delete Rule
☐	Egress	IPv4	Any	Any	0.0.0.0/0	-	Delete Rule

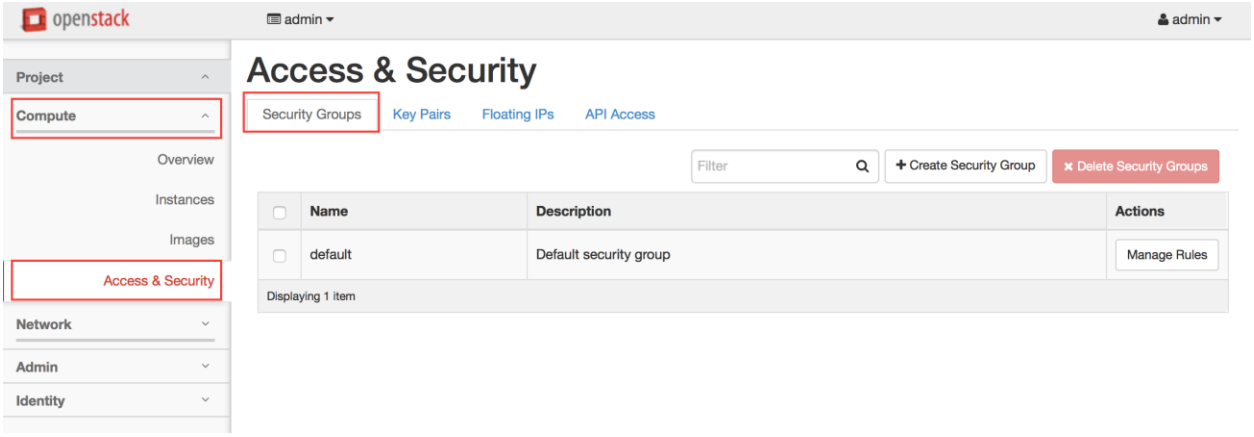
Displaying 4 items

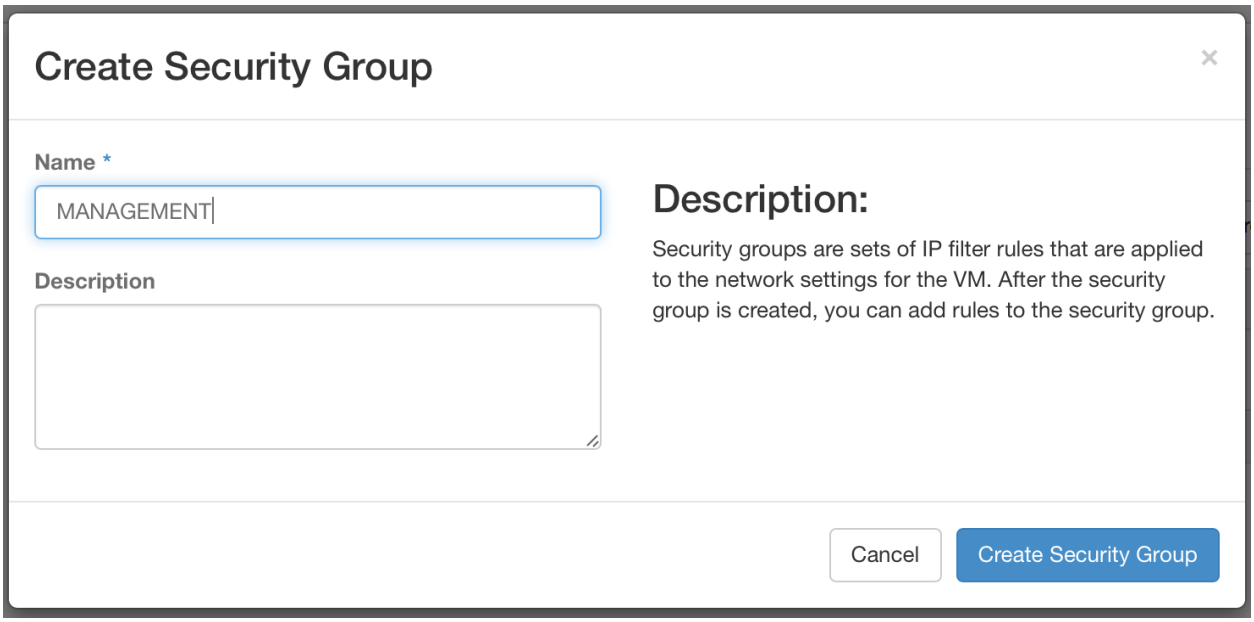
Manage Security Group Rules: default (63d2210d-0853-41e6-8905-5caa50724a29)

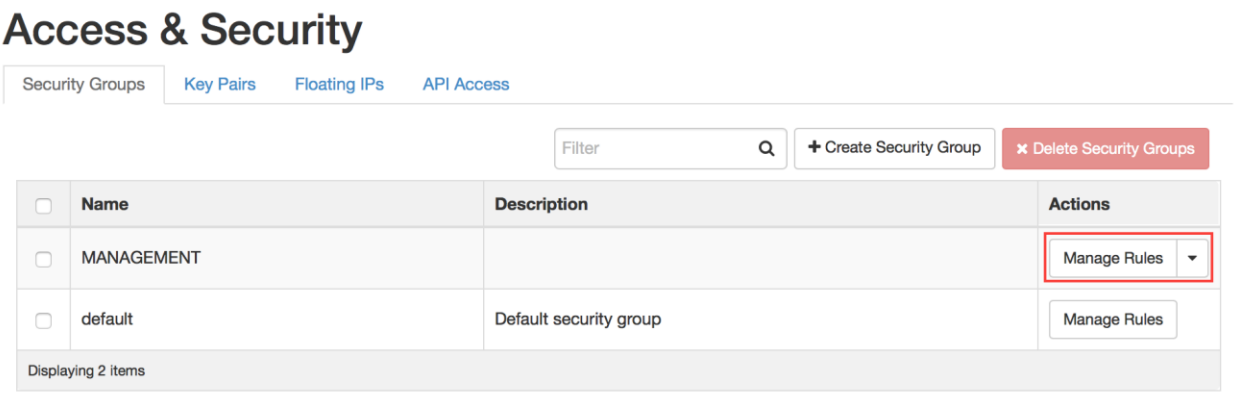
+ Add Rule | × Delete Rules

	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
☐	Egress	IPv4	Any	Any	0.0.0.0/0	-	Delete Rule
☐	Ingress	IPv4	Any	Any	-	default	Delete Rule
☐	Egress	IPv6	Any	Any	::/0	-	Delete Rule
☐	Ingress	IPv6	Any	Any	-	default	Delete Rule
☐	Ingress	IPv4	TCP	22 (SSH)	0.0.0.0/0	-	Delete Rule

Displaying 5 items


openstack
admin
admin
Project
Compute
Overview
Instances
Images
Access & Security
Network
Admin
Identity
Access & Security
Security Groups
Key Pairs
Floating IPs
API Access
Filter
+ Create Security Group
× Delete Security Groups
Name
Description
Actions
default
Default security group
Manage Rules
Displaying 1 item


Create Security Group
Name *
MANAGEMENT
Description
Description:
Security groups are sets of IP filter rules that are applied to the network settings for the VM. After the security group is created, you can add rules to the security group.
Cancel
Create Security Group


Access & Security
Security Groups
Key Pairs
Floating IPs
API Access
Filter
+ Create Security Group
× Delete Security Groups
Name
Description
Actions
MANAGEMENT
Manage Rules
default
Default security group
Manage Rules
Displaying 2 items

Manage Security Group Rules: MANAGEMENT (422d44f3-f37c-449d-8f2f-ed0c27c74539)

+ Add Rule | × Delete Rules

	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
☐	Egress	IPv6	Any	Any	::/0	-	Delete Rule
☐	Egress	IPv4	Any	Any	0.0.0.0/0	-	Delete Rule

Displaying 2 items

Add Rule

Rule *

SSH

Remote * ?

CIDR

CIDR ?

10.0.0.0/8

Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

Rule: You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

Open Port/Port Range: For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

Remote: You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of an IP address block (CIDR) or via a source group (Security Group). Selecting a security group as the source will allow any other instance in that security group access to any other instance via this rule.

Cancel | Add

Instances

Instance Name | Filter | Filter | Launch Instance | Terminate Instances | More Actions

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
MyDirectInstance	cirros-0.3.4-x86_64	10.50.0.3	m1.tiny	-	Active	nova	None	Running	2 weeks, 5 days	Create Snapshot
MyInstanceBehindRouter	cirros-0.3.4-x86_64	192.168.1.4 Floating IPs: 10.50.0.5	m1.tiny	-	Active	nova	None	Running	2 weeks, 5 days	Create Snapshot

Displaying 2 items

- Disassociate Floating IP
- Attach Interface
- Detach Interface
- Edit Instance
- Edit Security Groups
- Console

Edit Instance

Information * | Security Groups

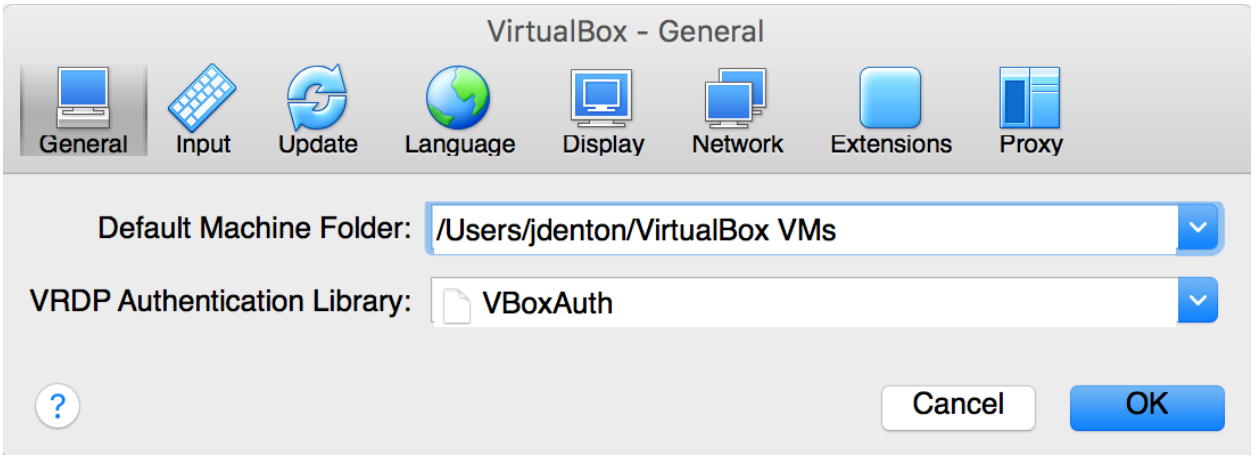
Add and remove security groups to this instance from the list of available security groups.

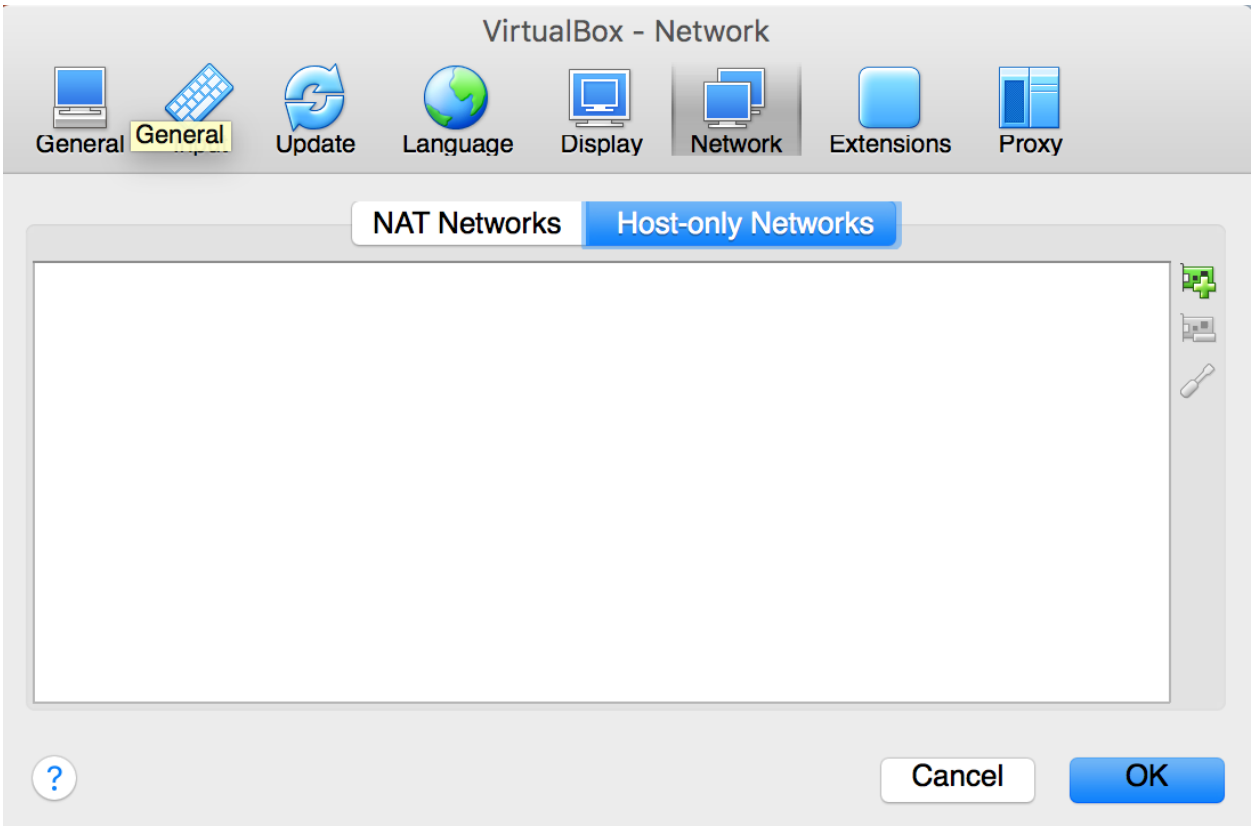
All Security Groups	Filter	Instance Security Groups	Filter
default	+	MANAGEMENT	-

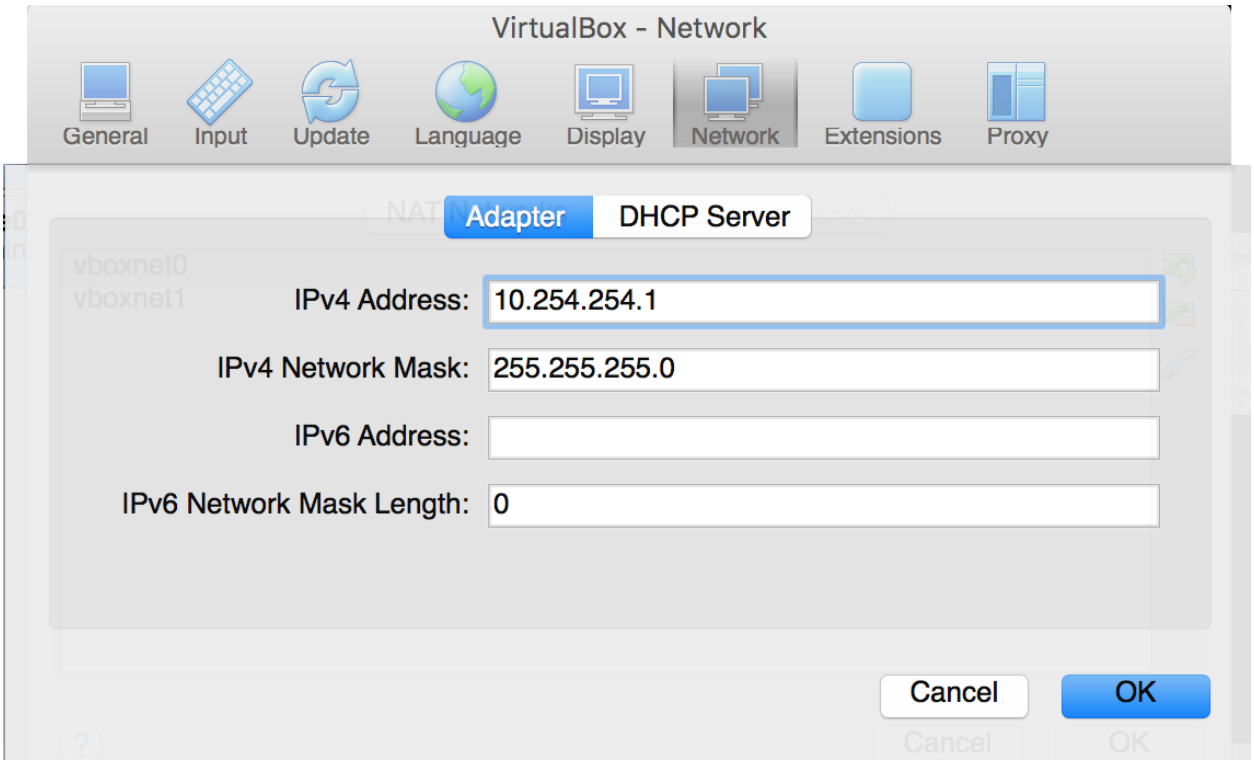
Cancel | Save

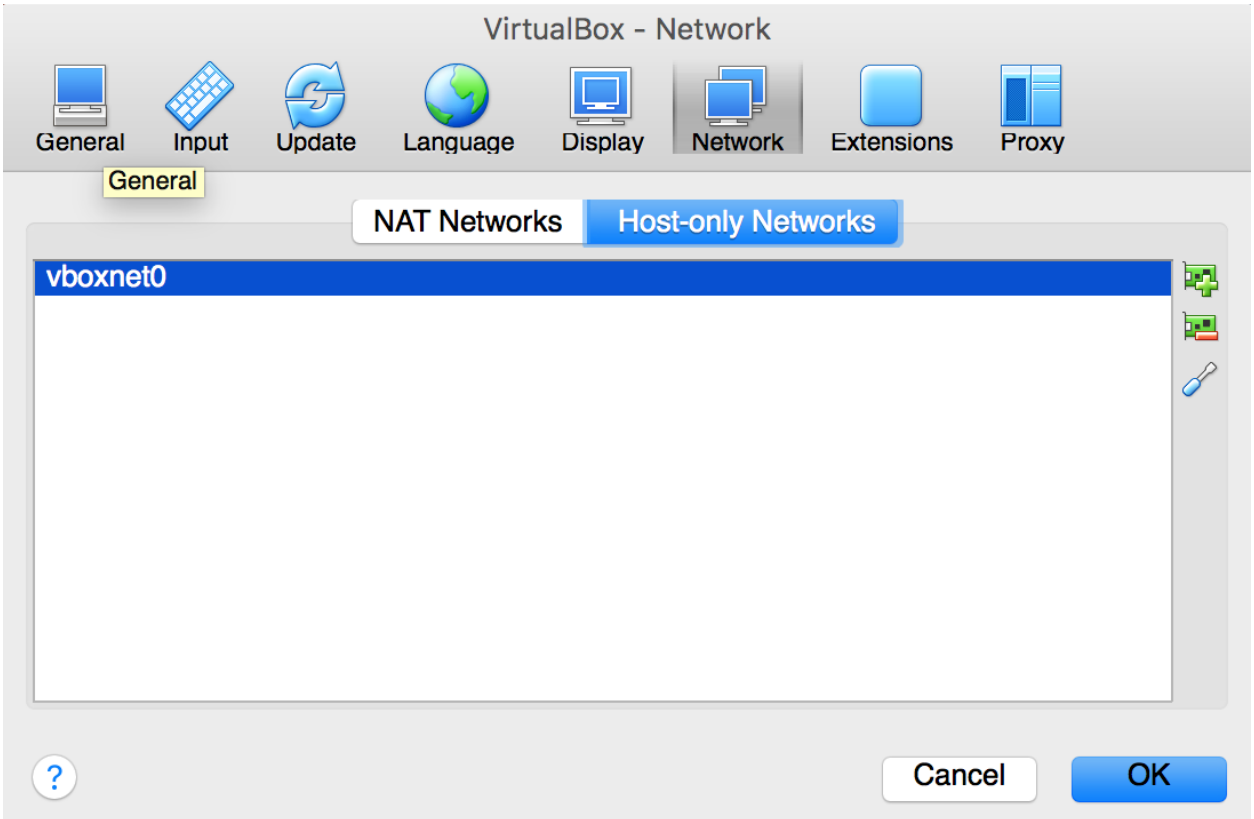
```
[root@allinone jdenton(keystone_admin)]# neutron net-create TestNet-NoSecurity --port_security_enabled=false
Created a new network:
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | f83b53ff-7d62-40fb-8aae-b713dfa3986e |
| mtu                       | 0                                    |
| name                      | TestNet-NoSecurity                   |
| port_security_enabled     | False                                |
| provider:network_type     | vxlan                                |
| provider:physical_network |                                      |
| provider:segmentation_id  | 27                                   |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tenant_id                 | c51a93428ada44f297e5fe65a3ac3b9f     |
+---------------------------+--------------------------------------+

[root@allinone jdenton(keystone_admin)]# neutron port-create --port-security-enabled=false MyDemoNetwork
Created a new port:
+-----------------------+-----------------------------------------------------------------------------------------------------------+
| Field                 | Value                                                                                                     |
+-----------------------+-----------------------------------------------------------------------------------------------------------+
| admin_state_up        | True                                                                                                      |
| allowed_address_pairs |                                                                                                           |
| binding:host_id       |                                                                                                           |
| binding:profile       | {}                                                                                                        |
| binding:vif_details   | {}                                                                                                        |
| binding:vif_type      | unbound                                                                                                   |
| binding:vnic_type     | normal                                                                                                    |
| device_id             |                                                                                                           |
| device_owner          |                                                                                                           |
| dns_assignment        | {"hostname": "host-192-168-8-3", "ip_address": "192.168.8.3", "fqdn": "host-192-168-8-3.openstacklocal."} |
| dns_name              |                                                                                                           |
| fixed_ips             | {"subnet_id": "6ee10d34-4d82-4901-9627-22a758096e52", "ip_address": "192.168.8.3"}                        |
| id                    | 616e4a2c-6780-4f3d-abc6-6b8eb8e9a677                                                                      |
| mac_address           | fa:16:3e:d2:5a:e7                                                                                         |
| name                  |                                                                                                           |
| network_id            | c8cde907-9a30-4e86-8c31-11d11f56cb2c                                                                      |
| port_security_enabled | False                                                                                                     |
| security_groups       |                                                                                                           |
| status                | DOWN                                                                                                      |
| tenant_id             | c51a93428ada44f297e5fe65a3ac3b9f                                                                          |
+-----------------------+-----------------------------------------------------------------------------------------------------------+
```

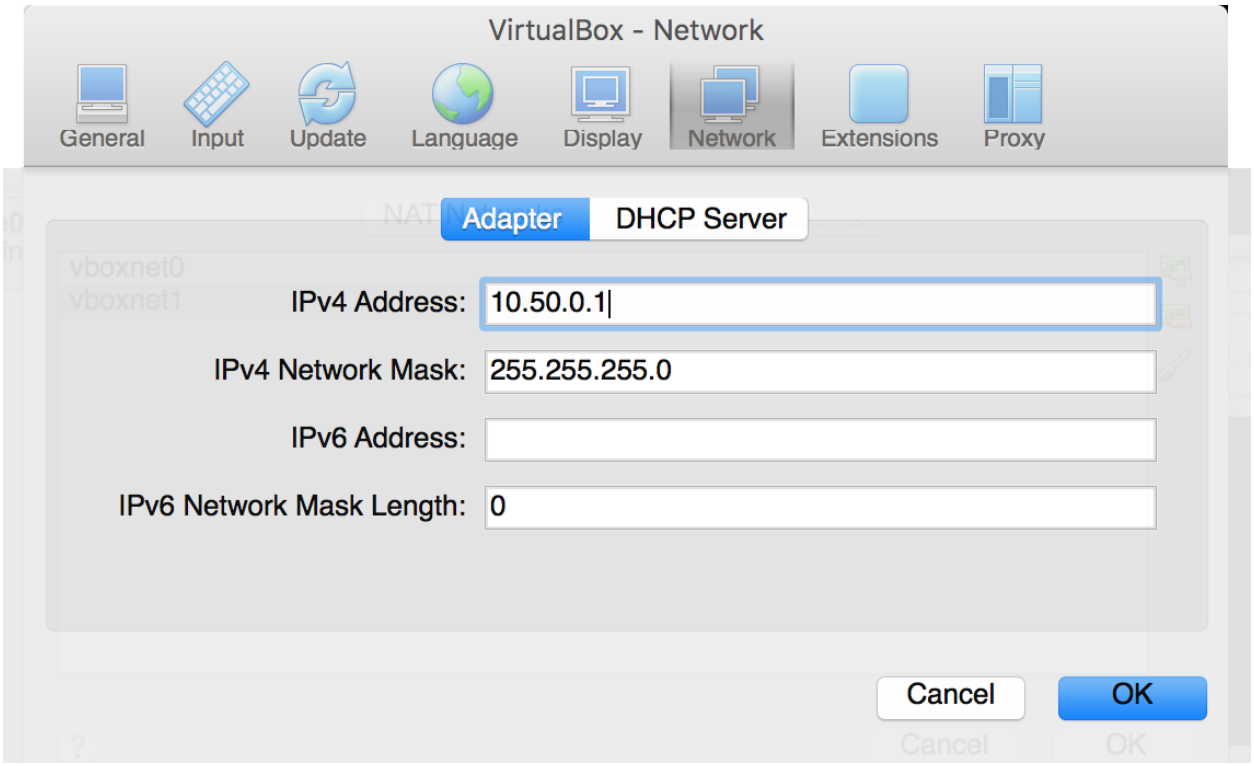
Appendix: Configuring VirtualBox

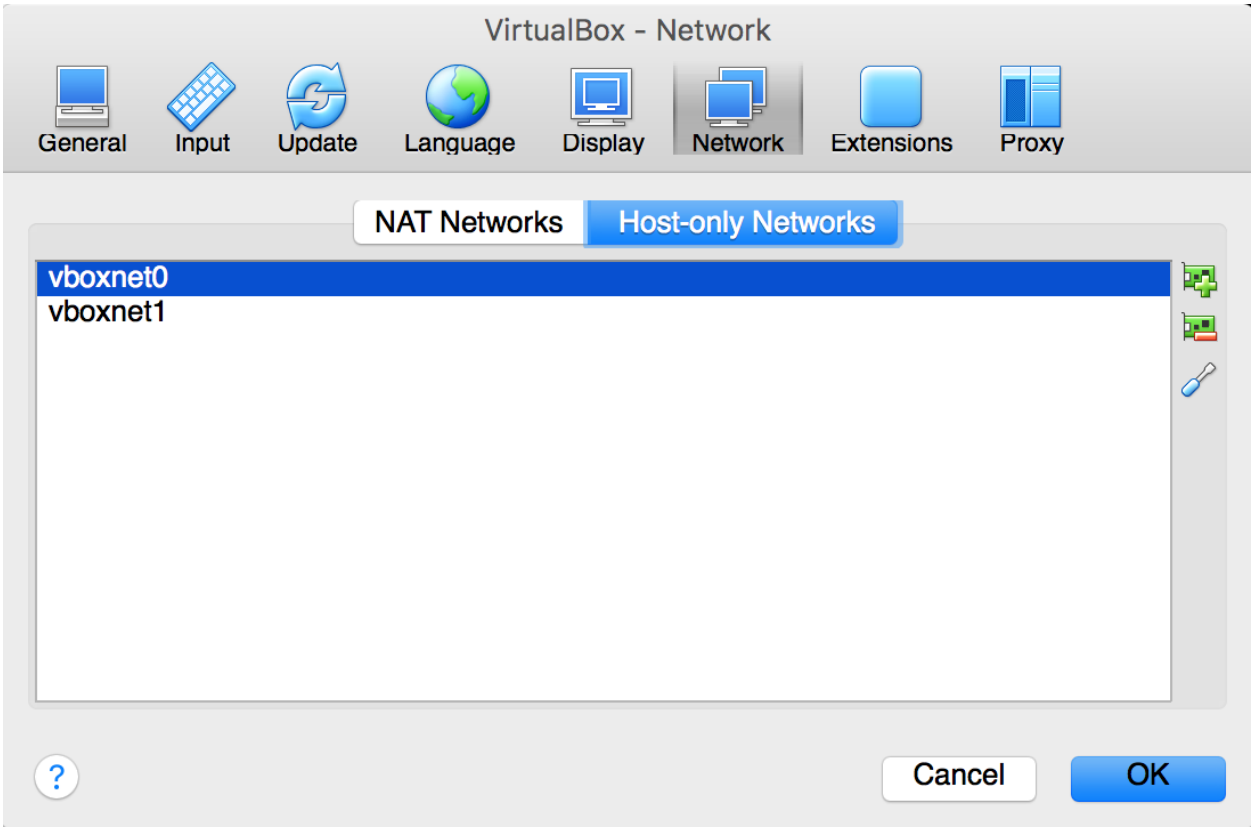


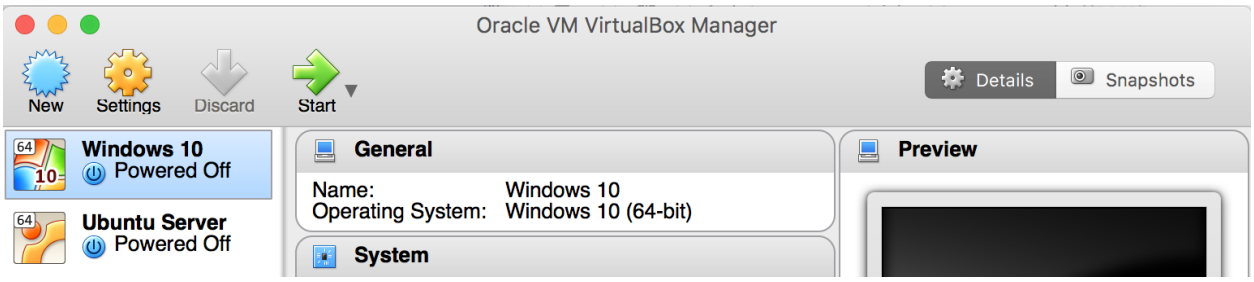


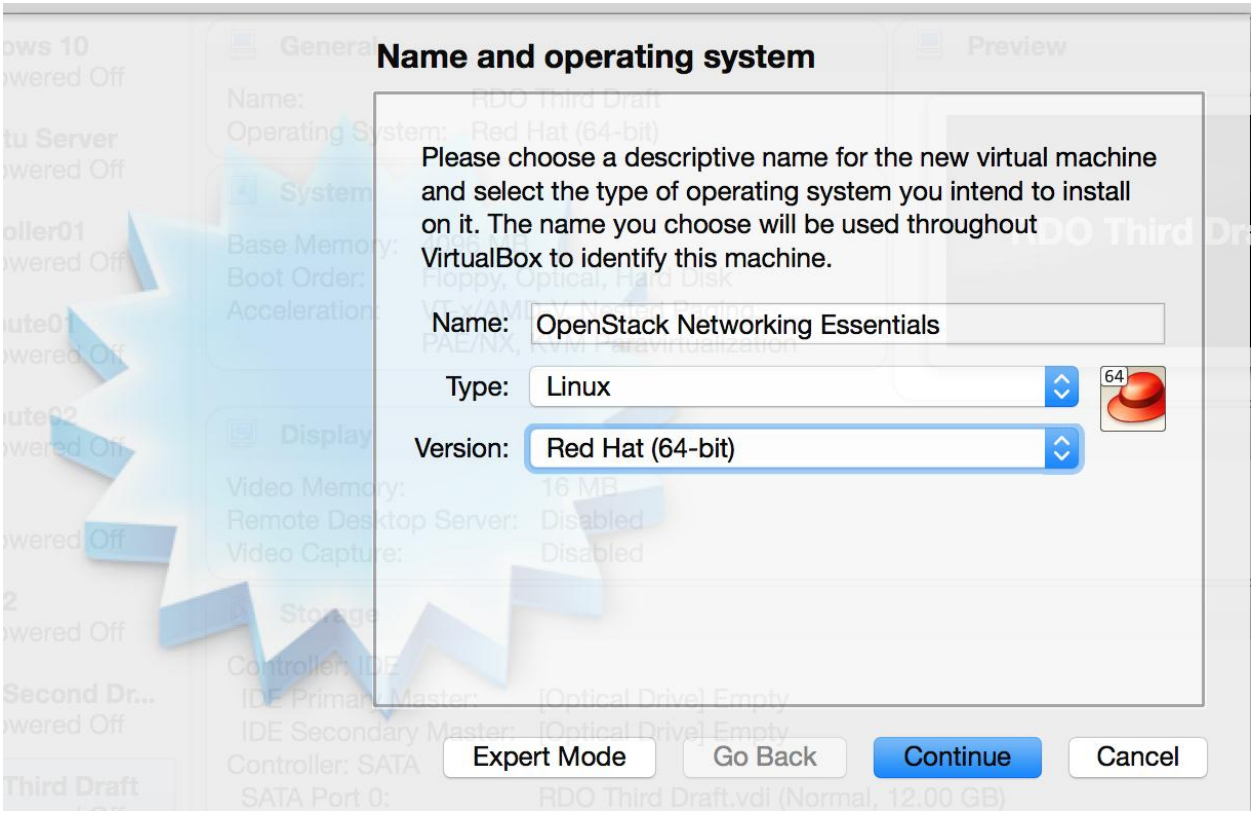

VirtualBox - Network
General
Input
Update
Language
Display
Network
Extensions
Proxy
Adapter
DHCP Server
vboxnet0
vboxnet1
IPv4 Address:
10.254.254.1
IPv4 Network Mask:
255.255.255.0
IPv6 Address:
IPv6 Network Mask Length:
0
Cancel
OK

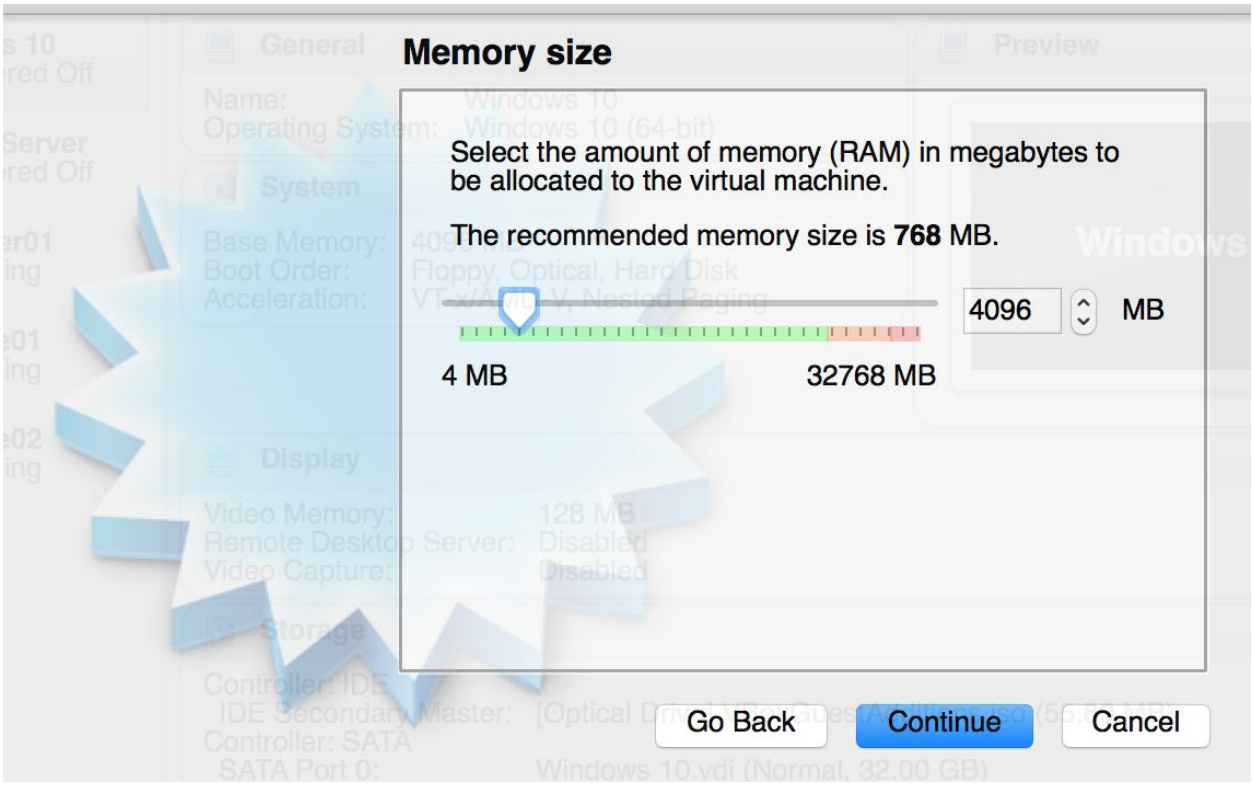

VirtualBox - Network
General
Input
Update
Language
Display
Network
Extensions
Proxy
General
NAT Networks
Host-only Networks
vboxnet0
Cancel
OK


VirtualBox - Network
General
Input
Update
Language
Display
Network
Extensions
Proxy
Adapter
DHCP Server
vboxnet0
vboxnet1
IPv4 Address:
10.50.0.1
IPv4 Network Mask:
255.255.255.0
IPv6 Address:
IPv6 Network Mask Length:
0
Cancel
OK


VirtualBox - Network
General
Input
Update
Language
Display
Network
Extensions
Proxy
NAT Networks
Host-only Networks
vboxnet0
vboxnet1
Cancel
OK


Oracle VM VirtualBox Manager
New
Settings
Discard
Start
Details
Snapshots
Windows 10
Powered Off
Ubuntu Server
Powered Off
General
Name: Windows 10
Operating System: Windows 10 (64-bit)
System
Preview

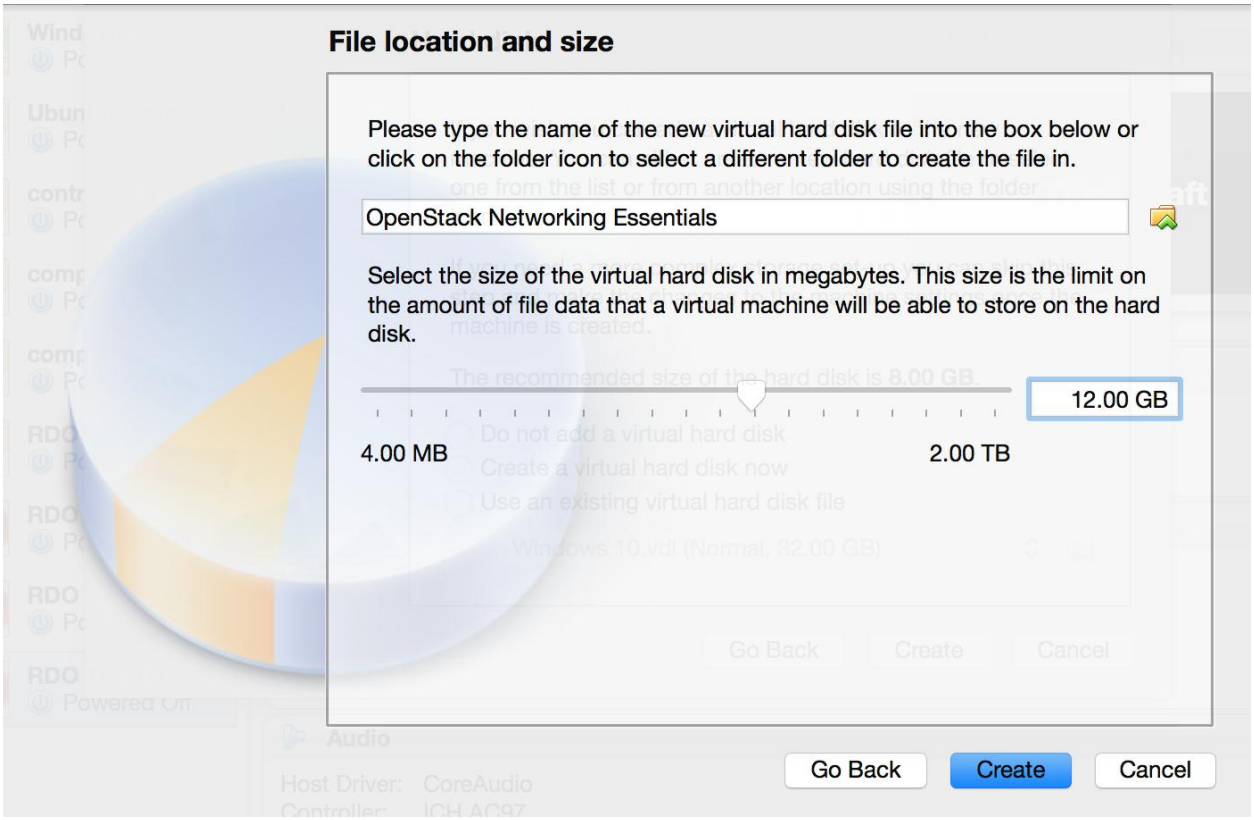

Name and operating system
Please choose a descriptive name for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name: OpenStack Networking Essentials
Type: Linux
Version: Red Hat (64-bit)
Expert Mode
Go Back
Continue
Cancel

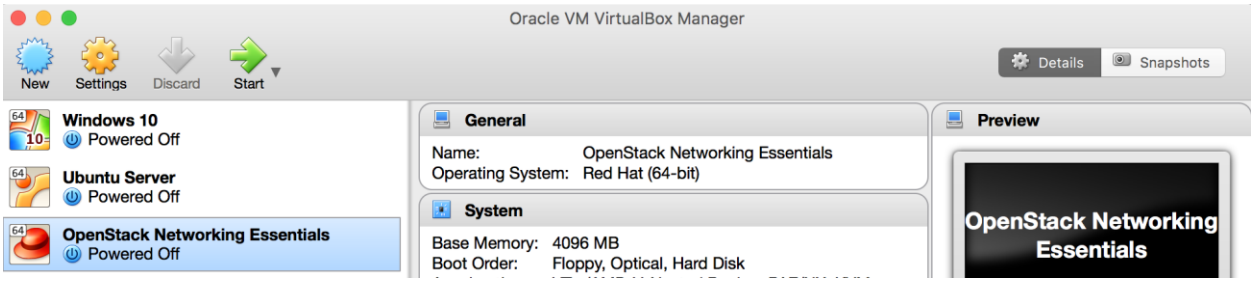

Memory size
Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.
The recommended memory size is 768 MB.
4096
MB
4 MB
32768 MB
Go Back
Continue
Cancel

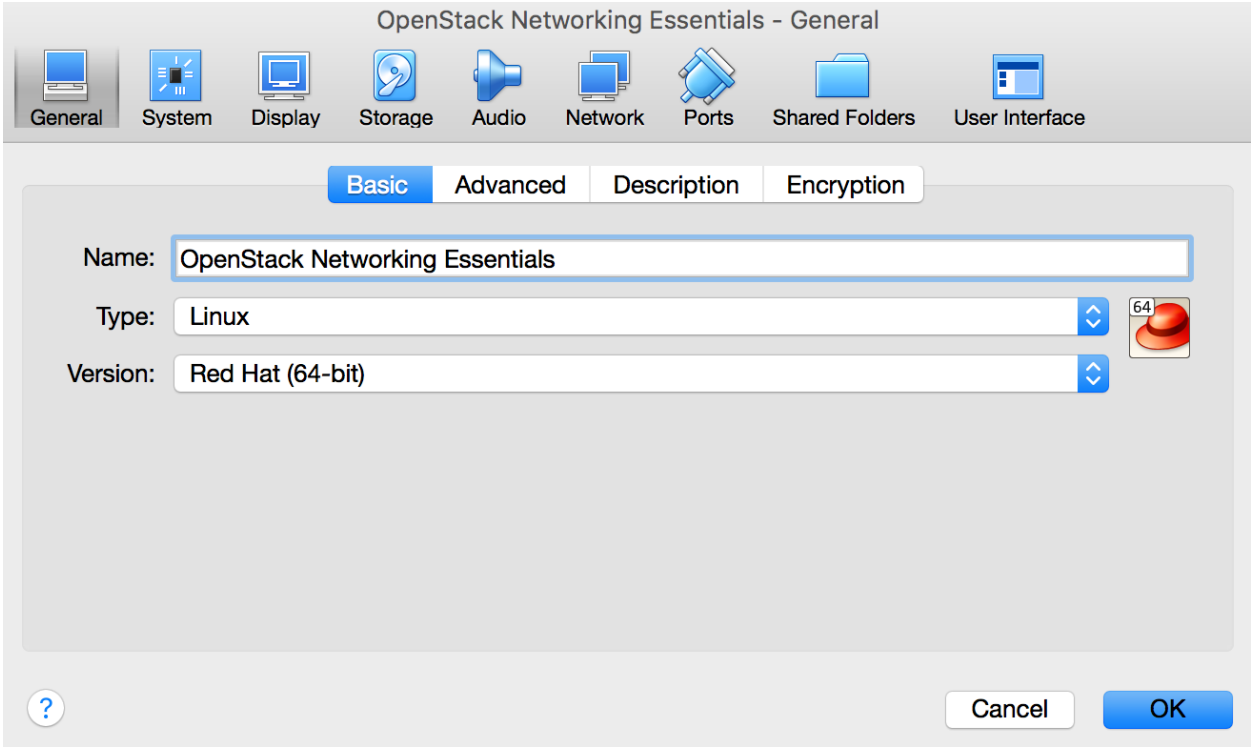

Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.
If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.
The recommended size of the hard disk is 8.00 GB.
Do not add a virtual hard disk
Create a virtual hard disk now
Use an existing virtual hard disk file
Windows 10.vdi (Normal, 32.00 GB)
Go Back
Create
Cancel

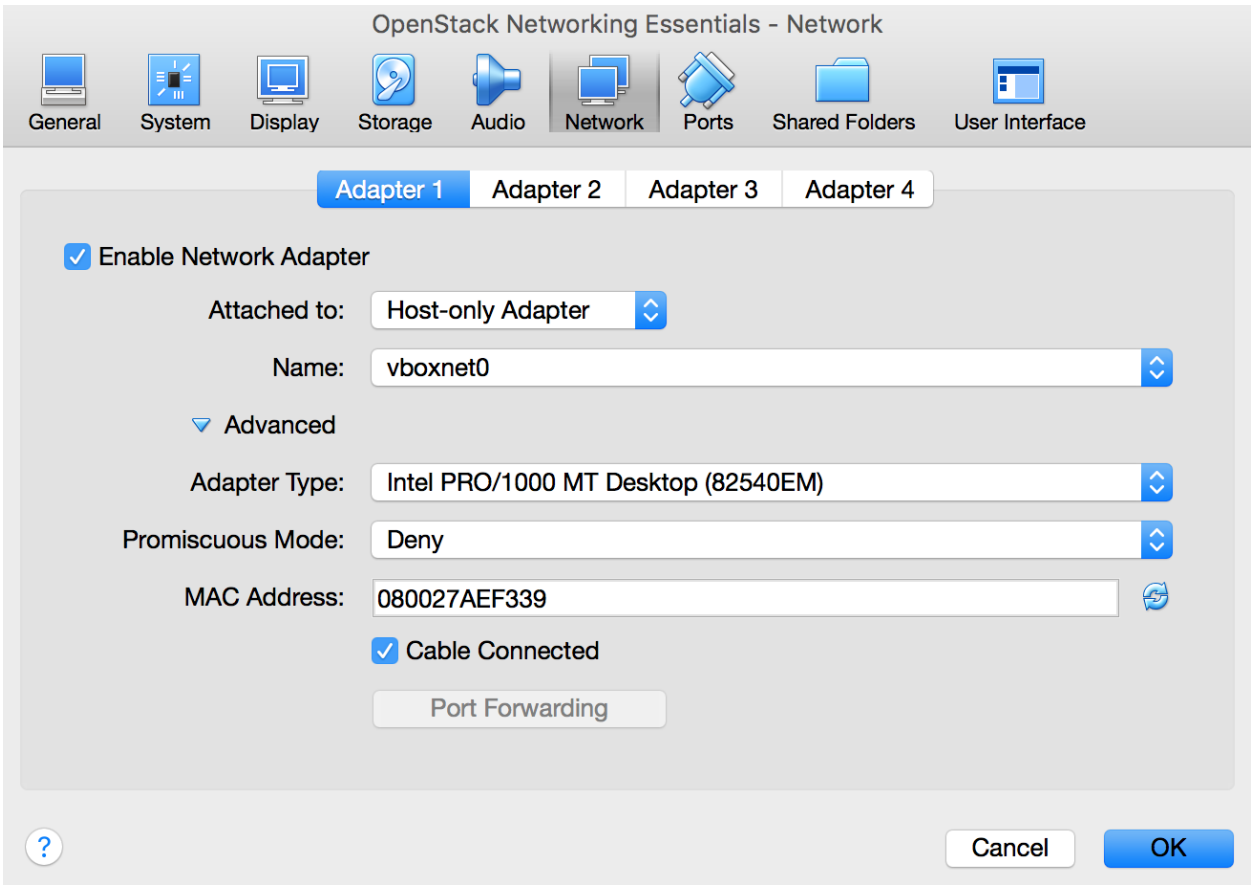

Hard disk file type
Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.
VDI (VirtualBox Disk Image)
VMDK (Virtual Machine Disk)
VHD (Virtual Hard Disk)
HDD (Parallels Hard Disk)
QED (QEMU enhanced disk)
QCOW (QEMU Copy-On-Write)
Expert Mode
Go Back
Continue
Cancel

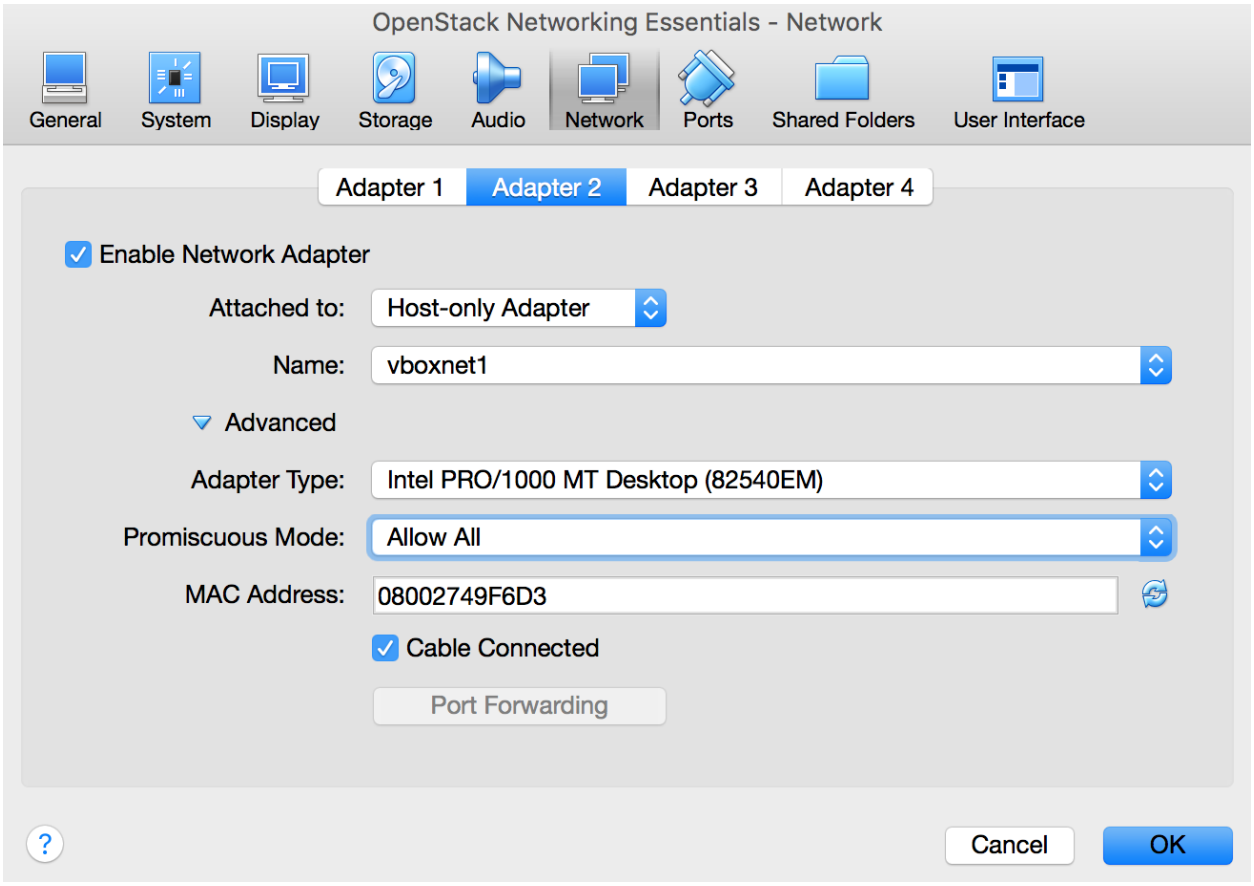

Storage on physical hard disk
Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).
A dynamically allocated hard disk file will only use space on your physical hard disk as it fills up (up to a maximum fixed size), although it will not shrink again automatically when space on it is freed.
A fixed size hard disk file may take longer to create on some systems but is often faster to use.
Dynamically allocated
Fixed size
Go Back
Continue
Cancel

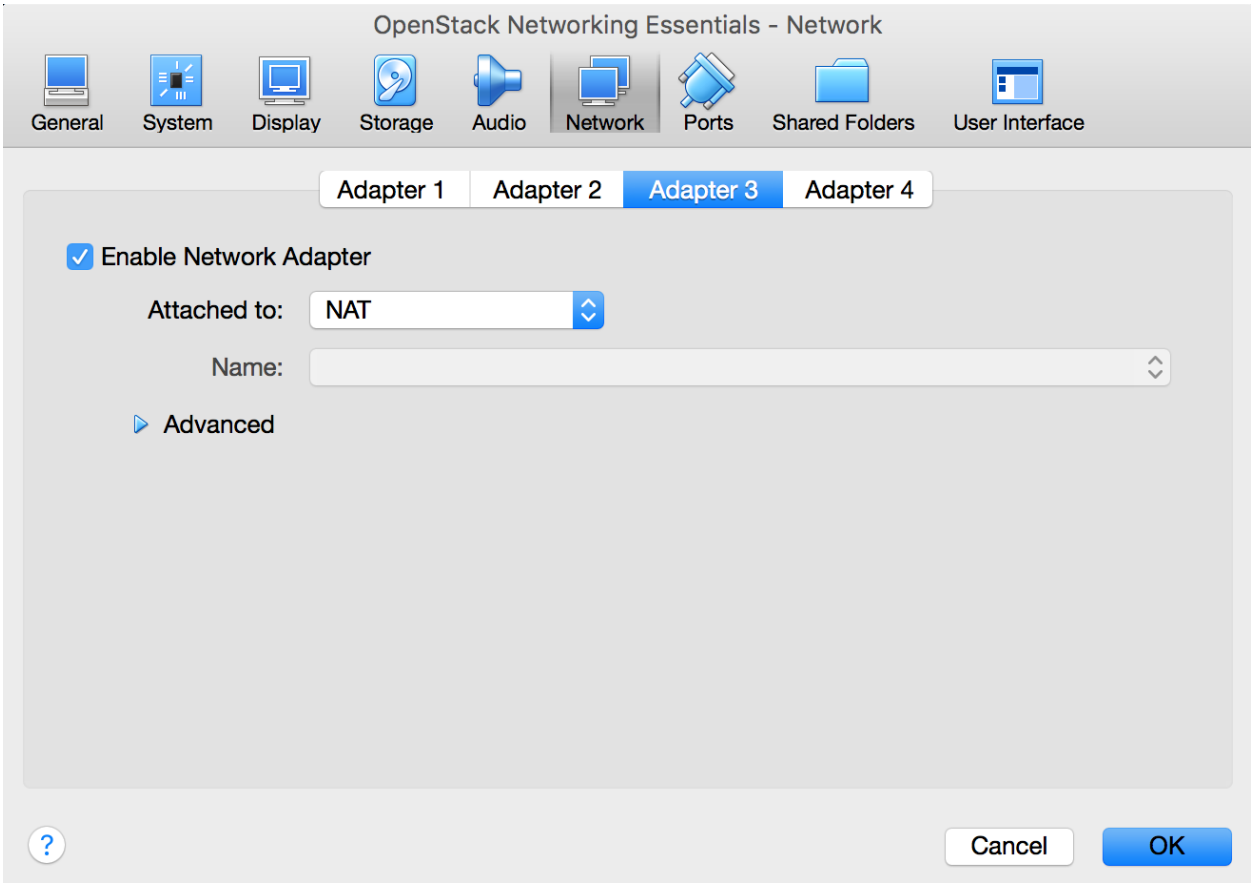

File location and size
Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.
OpenStack Networking Essentials
Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.
12.00 GB
4.00 MB
2.00 TB
Go Back
Create
Cancel

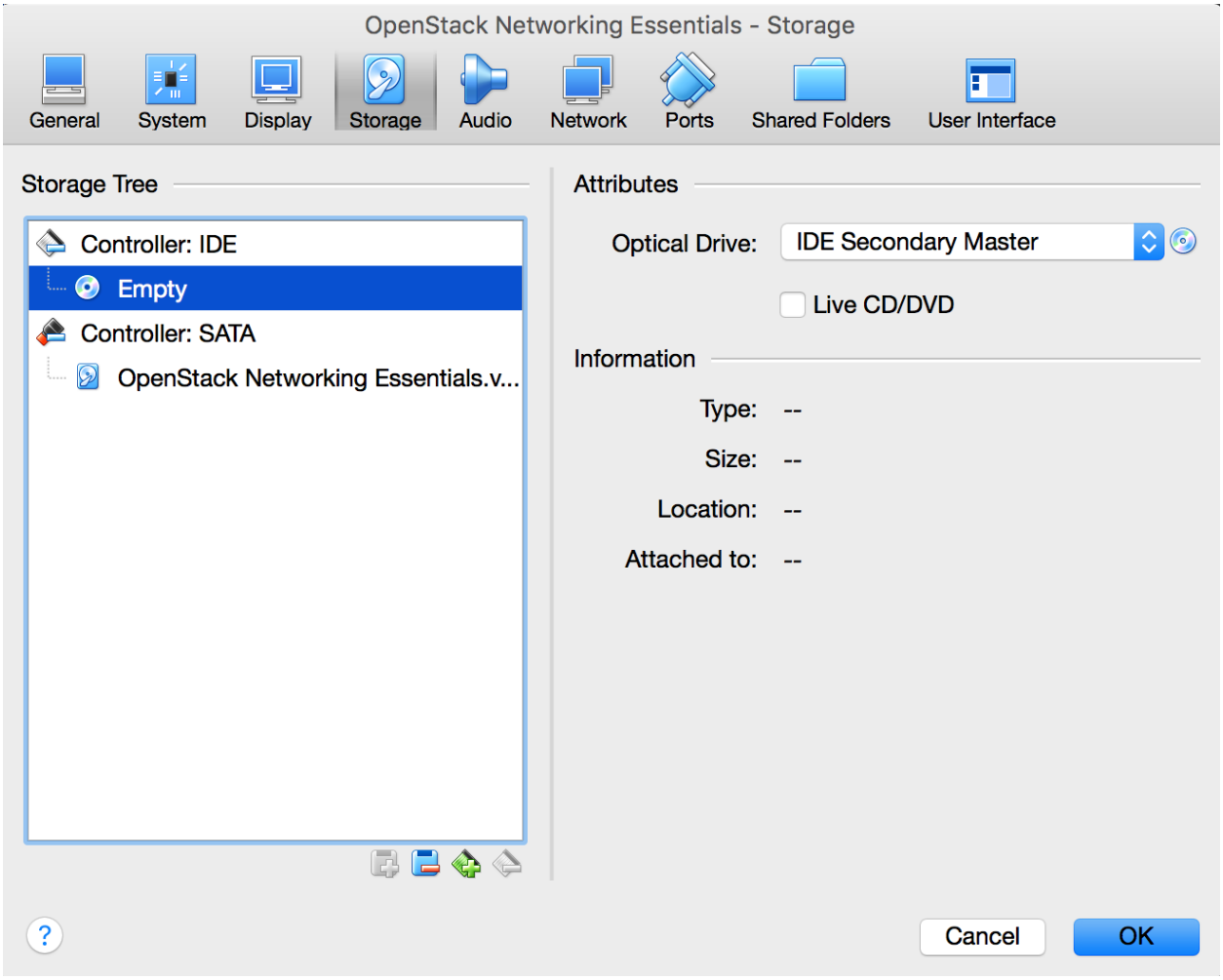

Oracle VM VirtualBox Manager
New
Settings
Discard
Start
Details
Snapshots
Windows 10
Powered Off
Ubuntu Server
Powered Off
OpenStack Networking Essentials
Powered Off
General
Name: OpenStack Networking Essentials
Operating System: Red Hat (64-bit)
System
Base Memory: 4096 MB
Boot Order: Floppy, Optical, Hard Disk
Preview
OpenStack Networking Essentials

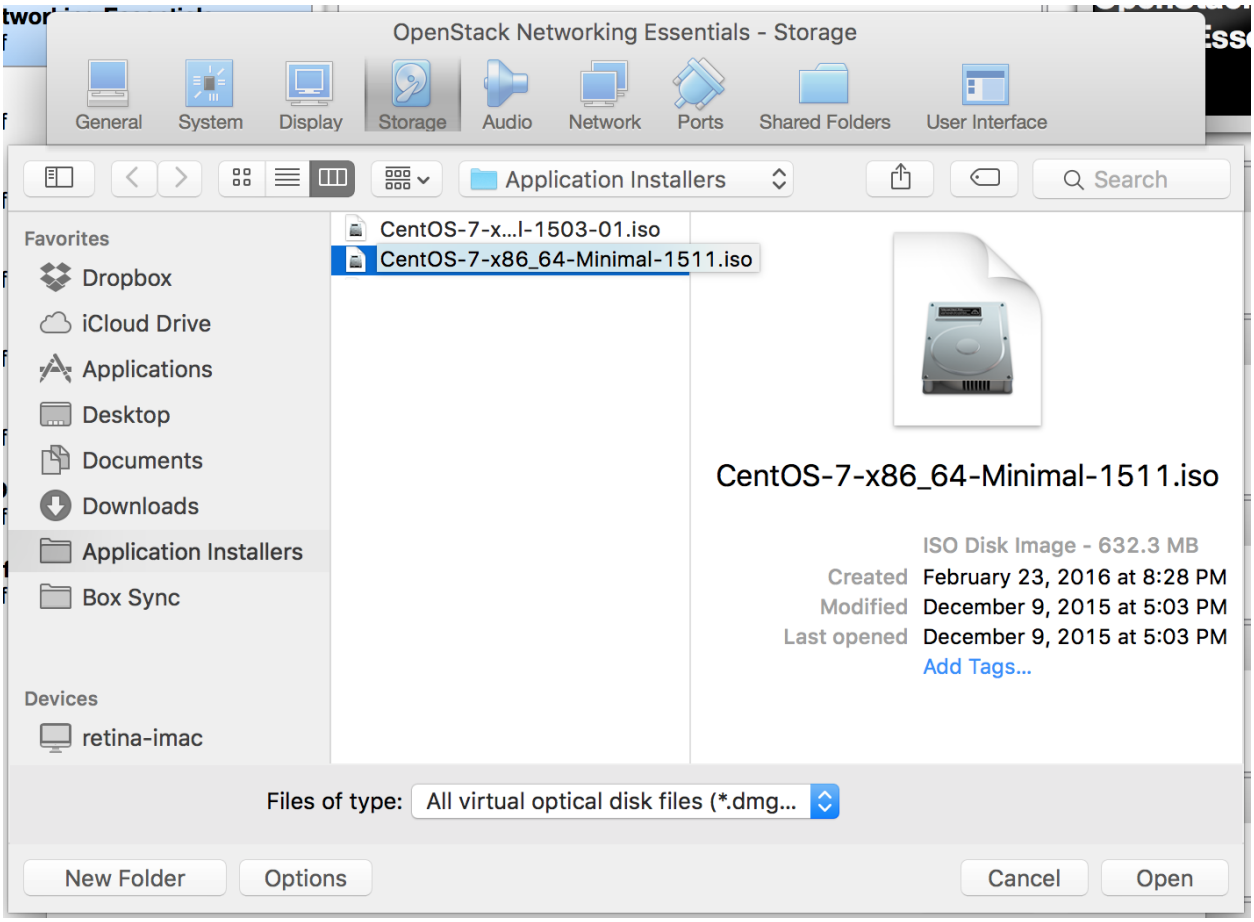

OpenStack Networking Essentials - General
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Basic
Advanced
Description
Encryption
Name:
OpenStack Networking Essentials
Type:
Linux
Version:
Red Hat (64-bit)
64
Cancel
OK

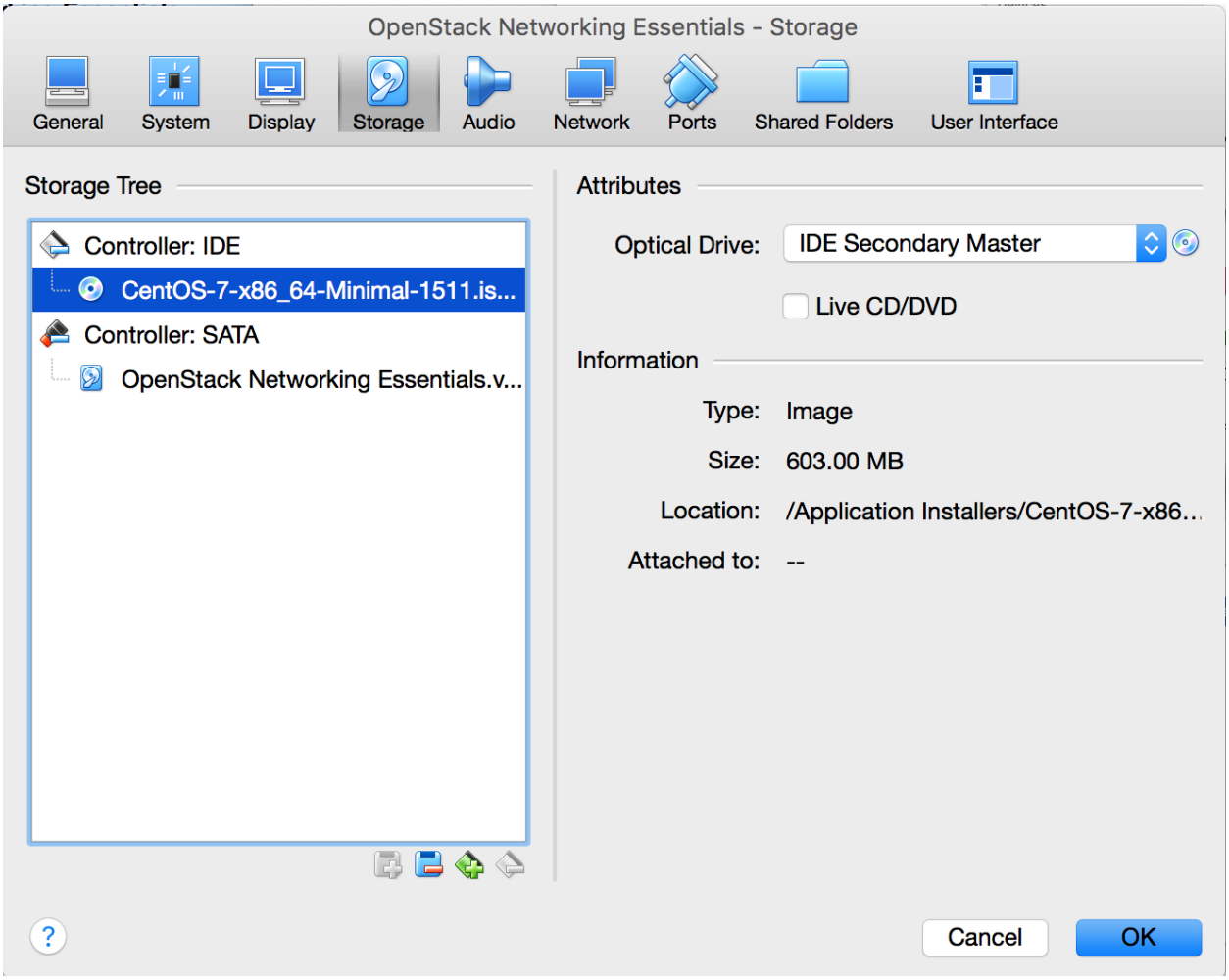

OpenStack Networking Essentials - Network
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Host-only Adapter
Name:
vboxnet0
Advanced
Adapter Type:
Intel PRO/1000 MT Desktop (82540EM)
Promiscuous Mode:
Deny
MAC Address:
080027AEF339
Cable Connected
Port Forwarding
Cancel
OK

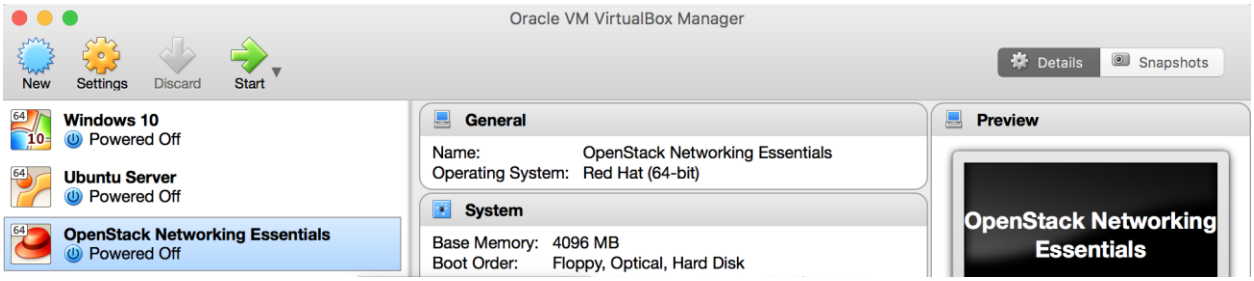

OpenStack Networking Essentials - Network
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Host-only Adapter
Name:
vboxnet1
Advanced
Adapter Type:
Intel PRO/1000 MT Desktop (82540EM)
Promiscuous Mode:
Allow All
MAC Address:
08002749F6D3
Cable Connected
Port Forwarding
Cancel
OK


OpenStack Networking Essentials - Network
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
NAT
Name:
Advanced
Cancel
OK


OpenStack Networking Essentials - Storage
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Storage Tree
Controller: IDE
Empty
Controller: SATA
OpenStack Networking Essentials.v...
Attributes
Optical Drive:
IDE Secondary Master
Live CD/DVD
Information
Type: --
Size: --
Location: --
Attached to: --
Cancel
OK


OpenStack Networking Essentials - Storage
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Application Installers
Search
Favorites
Dropbox
iCloud Drive
Applications
Desktop
Documents
Downloads
Application Installers
Box Sync
Devices
retina-imac
CentOS-7-x...l-1503-01.iso
CentOS-7-x86_64-Minimal-1511.iso
CentOS-7-x86_64-Minimal-1511.iso
ISO Disk Image - 632.3 MB
Created February 23, 2016 at 8:28 PM
Modified December 9, 2015 at 5:03 PM
Last opened December 9, 2015 at 5:03 PM
Add Tags...
Files of type: All virtual optical disk files (*.dmg...
New Folder
Options
Cancel
Open


OpenStack Networking Essentials - Storage
General
System
Display
Storage
Audio
Network
Ports
Shared Folders
User Interface
Storage Tree
Controller: IDE
CentOS-7-x86_64-Minimal-1511.is...
Controller: SATA
OpenStack Networking Essentials.v...
Attributes
Optical Drive:
IDE Secondary Master
Live CD/DVD
Information
Type: Image
Size: 603.00 MB
Location: /Application Installers/CentOS-7-x86...
Attached to: --
Cancel
OK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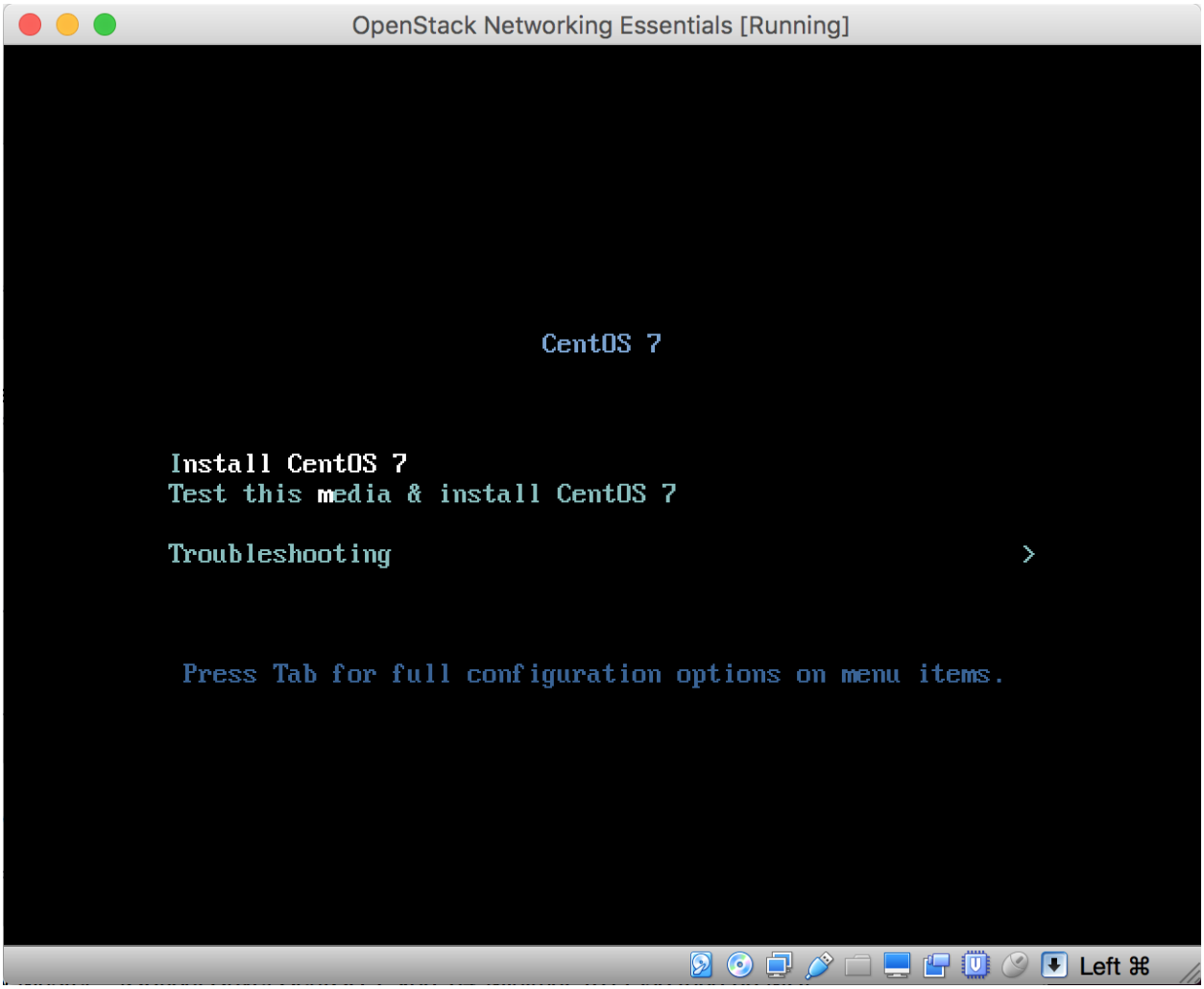
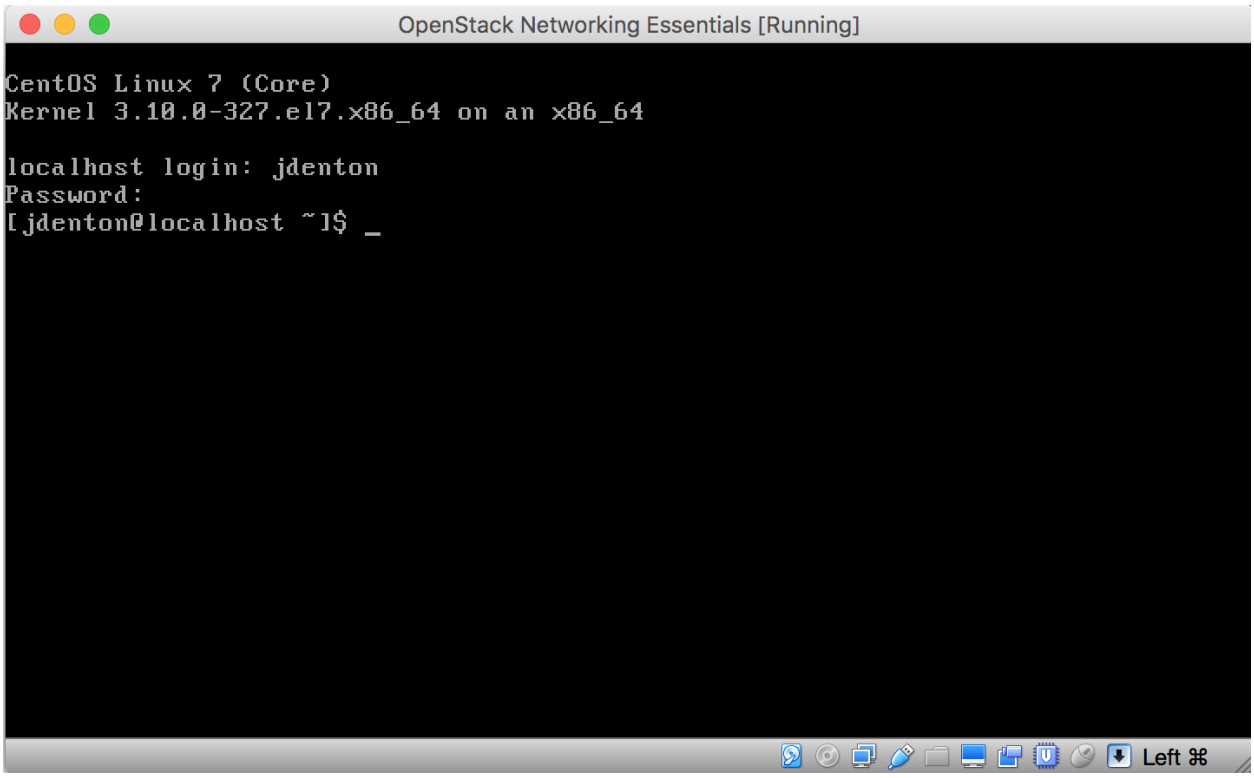
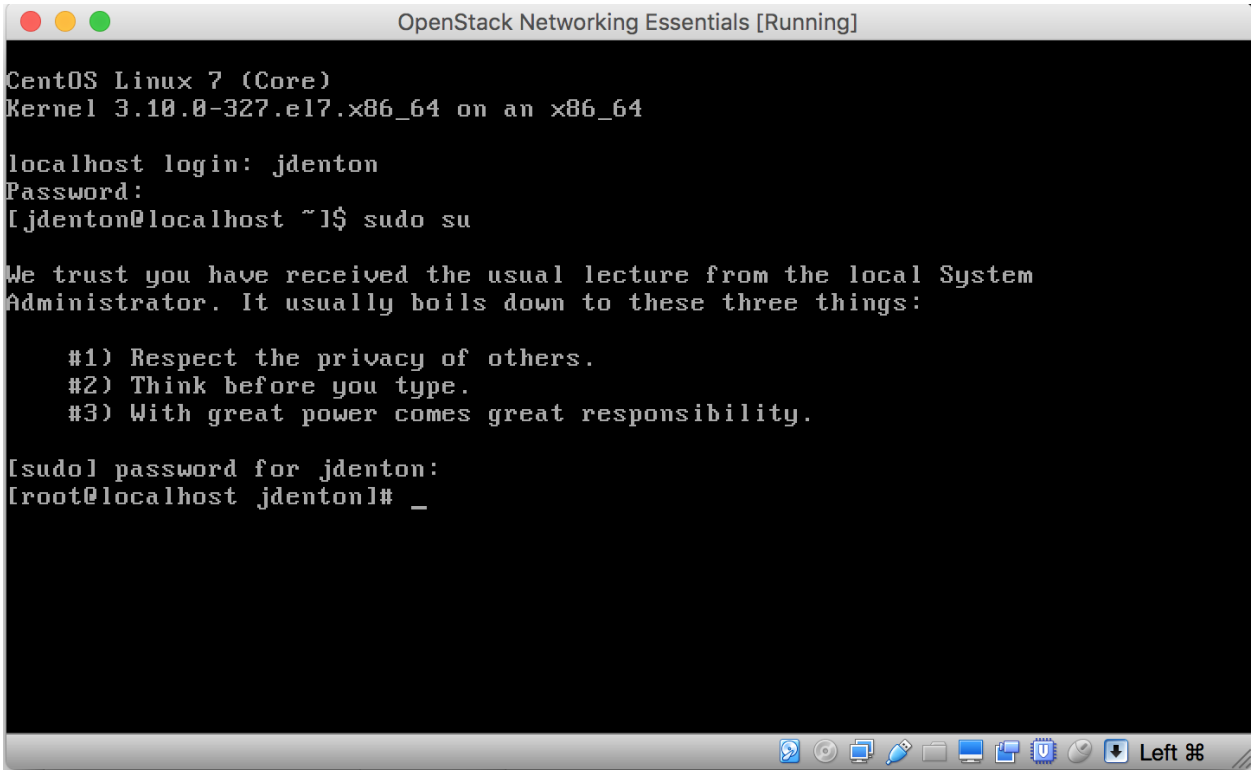
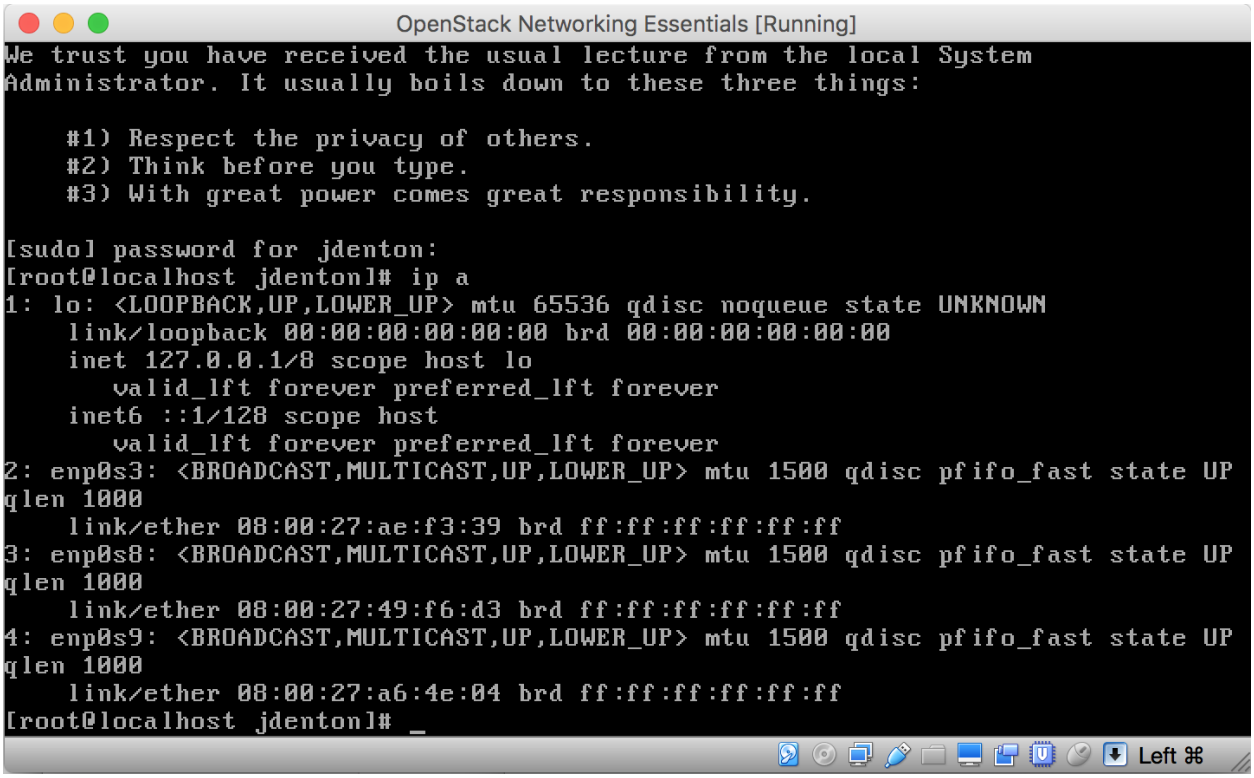

OpenStack Networking Essentials [Running]
CentOS 7
Install CentOS 7
Test this media & install CentOS 7
Troubleshooting
Press Tab for full configuration options on menu items.
Left ⌘


OpenStack Networking Essentials [Running]
CentOS Linux 7 (Core)
Kernel 3.10.0-327.el7.x86_64 on an x86_64
localhost login: jdenton
Password:
[jdenton@localhost ~]$ _
Left ⌘


OpenStack Networking Essentials [Running]
CentOS Linux 7 (Core)
Kernel 3.10.0-327.el7.x86_64 on an x86_64
localhost login: jdenton
Password:
[jdenton@localhost ~]$ sudo su
We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:
#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.
[sudo] password for jdenton:
[root@localhost jdenton]# _
Left ⌘




```
retina-imac:~ jdenton$ ssh jdenton@10.254.254.100
The authenticity of host '10.254.254.100 (10.254.254.100)' can't be established.
ECDSA key fingerprint is SHA256:CvnFumO6vR46AgVX3xGoMa51CeMz5eWMKGk2HBZcnGg.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.254.254.100' (ECDSA) to the list of known hosts.
jdenton@10.254.254.100's password:
Last login: Sun Mar 20 13:09:10 2016
[jdenton@localhost ~]$
```

```
[jdenton@localhost ~]$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=63 time=32.9 ms
^C
--- 8.8.8.8 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 32.990/32.990/32.990/0.000 ms
```