

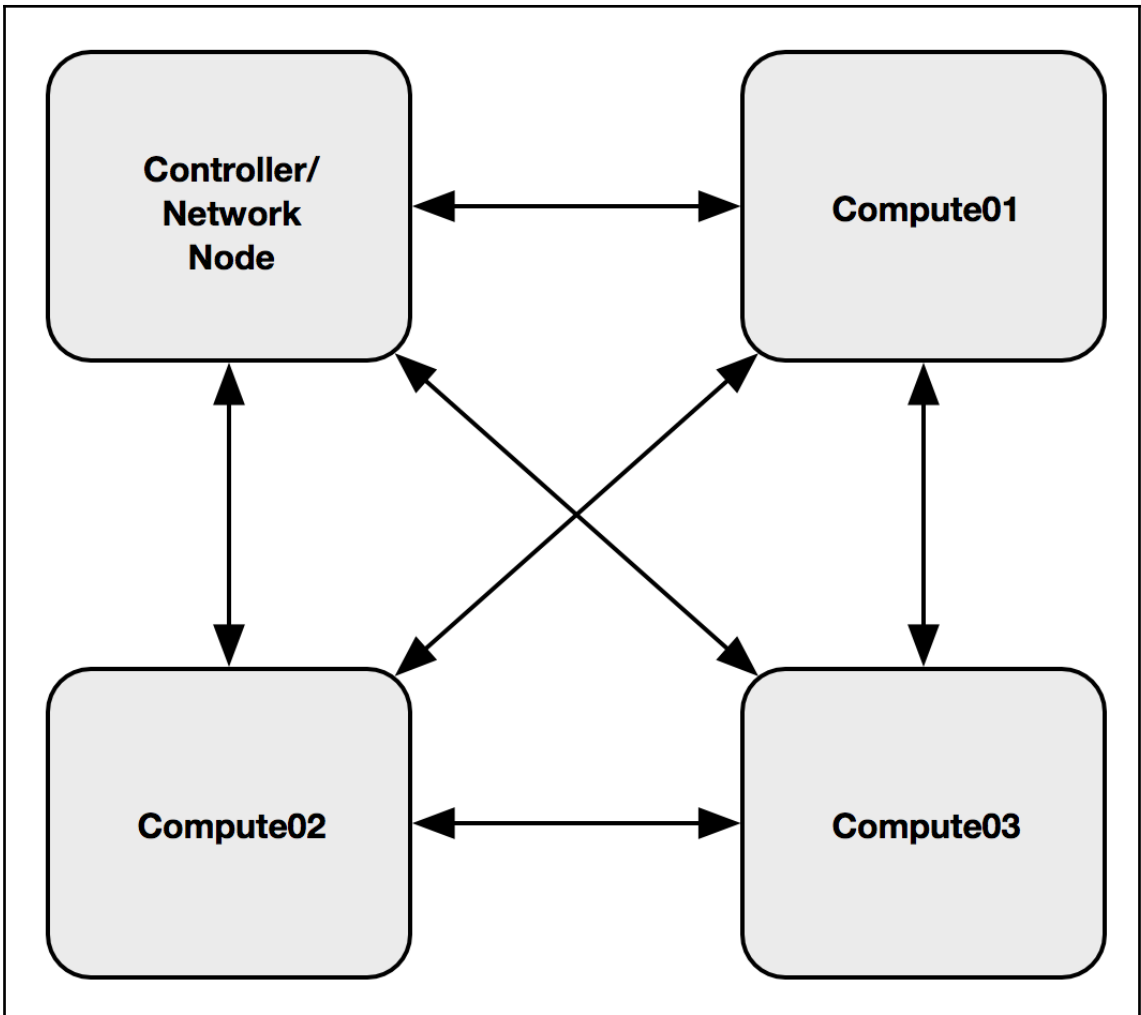
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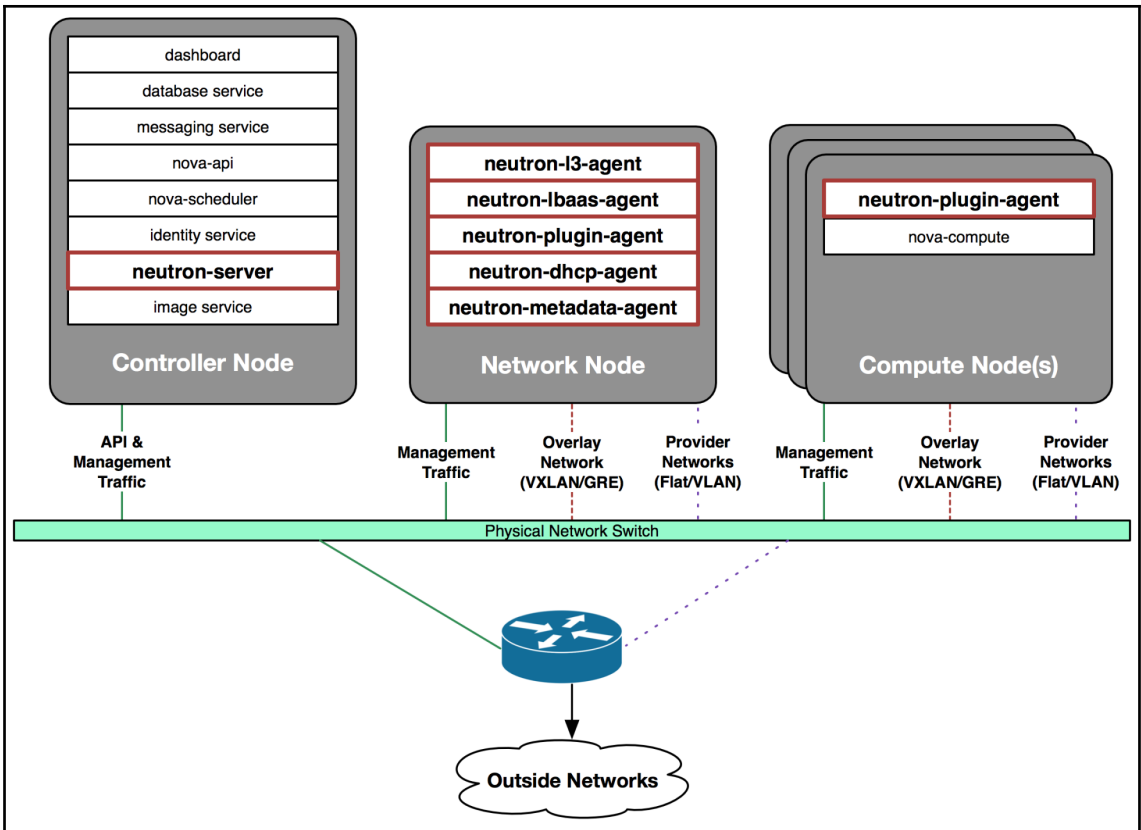
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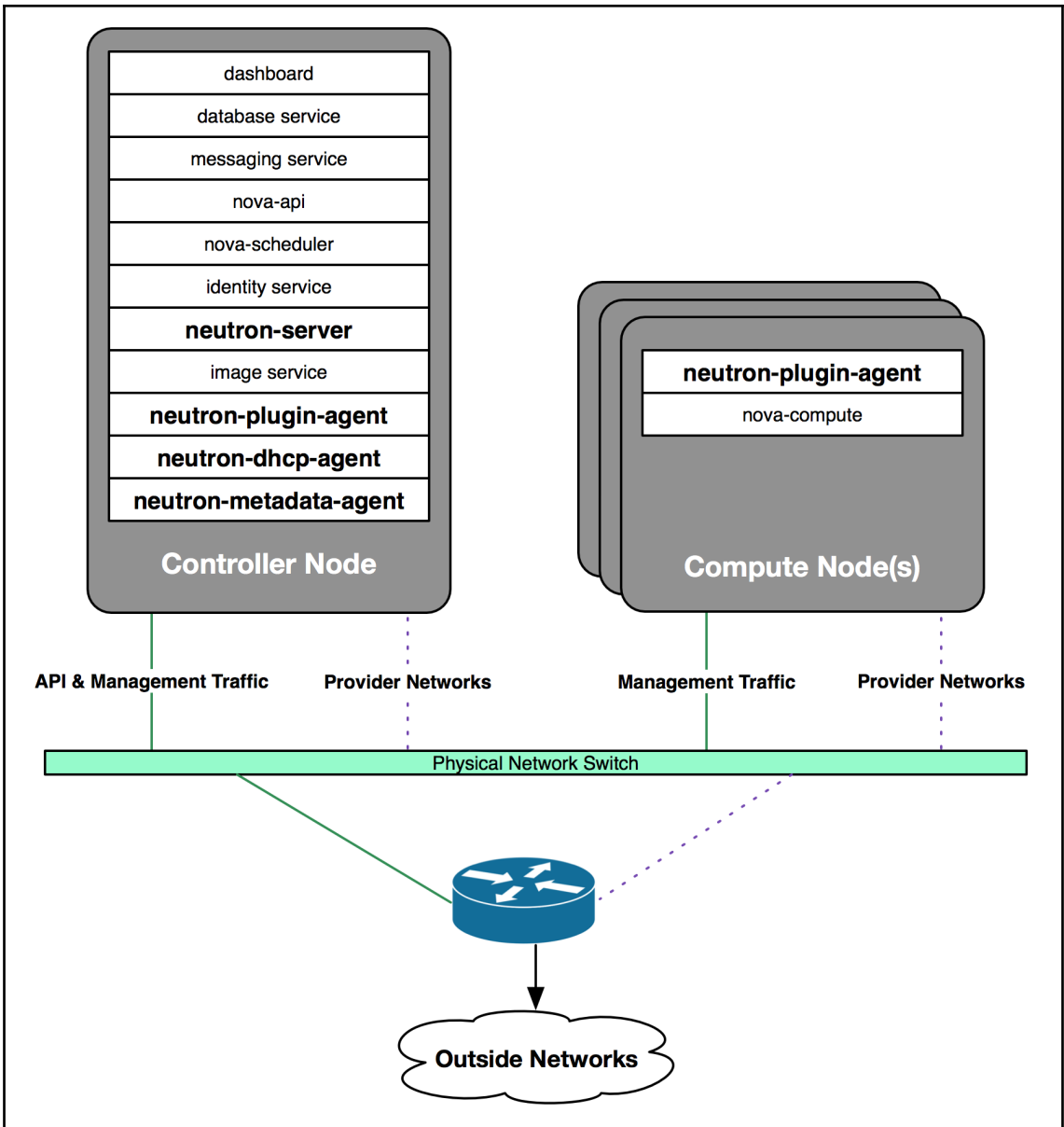
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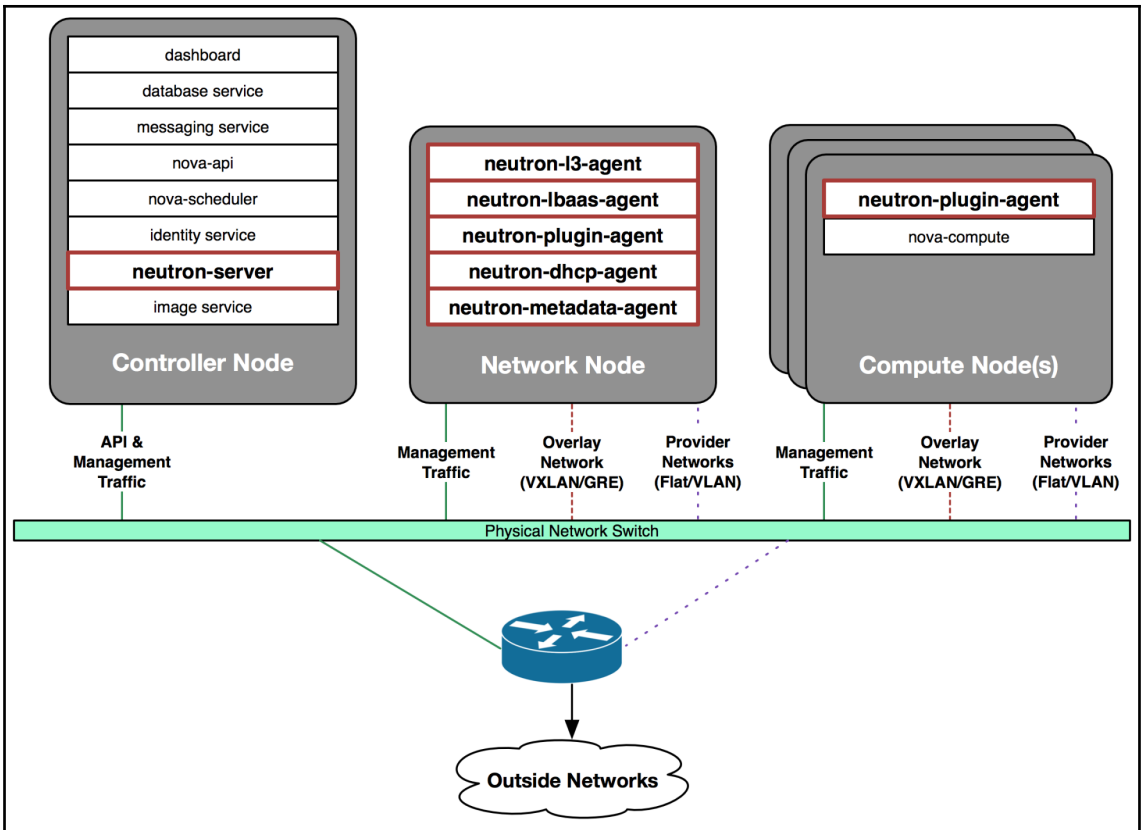
# 1 color images

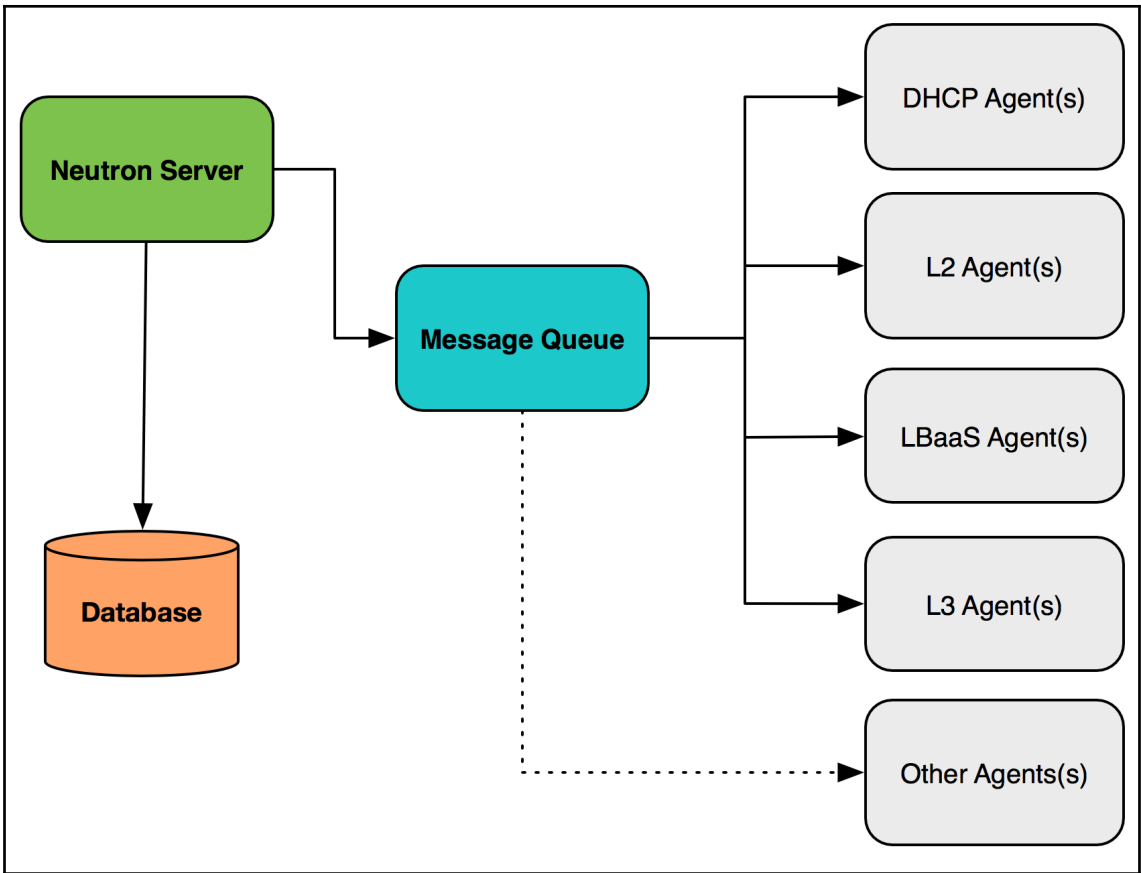
## **Chapter 01: Introduction to OpenStack Networking**



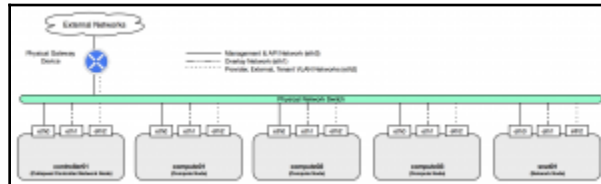








## Chapter 02: Installing OpenStack



```
root@controller01:~# openstack service list
```

ID	Name	Type
cafd0b7e8f824b5c994c10cb93d489fc	keystone	identity

```
root@controller01:~# openstack endpoint list
```

ID	Region	Service Name	Service Type	Enabled	Interface	URL
5e8cd154da40450aa0de80e1fdce59b0	RegionOne	keystone	identity	True	internal	<a href="http://controller01:5000/v3/">http://controller01:5000/v3/</a>
bfb2527b3b44d98b2214fc32d1cad2f	RegionOne	keystone	identity	True	public	<a href="http://controller01:5000/v3/">http://controller01:5000/v3/</a>
f99b6392c5da4d0e93f5b18daa1522bc	RegionOne	keystone	identity	True	admin	<a href="http://controller01:35357/v3/">http://controller01:35357/v3/</a>

```
root@controller01:~# openstack image list
```

ID	Name	Status
60346ac7-542c-47c2-aac3-7031dfc03fcd	cirros-0.4.0	active

```
root@controller01:~# openstack image list
```

ID	Name	Status
60346ac7-542c-47c2-aac3-7031dfc03fcd	cirros-0.4.0	active
ffdb76f0-6cce-4d79-99a5-ccc6e76d530a	ubuntu-xenial-16.04	active



```
root@controller01:~# openstack compute service list
```

ID	Binary	Host	Zone	Status	State	Updated At
1	nova-consoleauth	controller01	internal	enabled	up	2018-06-21T01:47:33.000000
2	nova-scheduler	controller01	internal	enabled	up	2018-06-21T01:47:34.000000
3	nova-conductor	controller01	internal	enabled	up	2018-06-21T01:47:34.000000
8	nova-compute	compute01	nova	enabled	up	2018-06-21T01:47:26.000000
9	nova-compute	compute02	nova	enabled	up	2018-06-21T01:47:35.000000
10	nova-compute	compute03	nova	enabled	up	2018-06-21T01:47:32.000000

openstack. Default • admin

Project Identity / Projects

## Projects

Project Name =  Filter [+ Create Project](#) [Delete Projects](#)

Displaying 3 items

<input type="checkbox"/>	Name	Description	Project ID	Domain Name	Enabled	Actions
<input type="checkbox"/>	admin	Bootstrap project for initializing the cloud.	9233b6b4f6a54386af63c0a7b8f043c2	Default	Yes	<a href="#">Manage Members</a>
<input type="checkbox"/>	demo	Demo Project	d2aefac55d5040e3b7d32a469f110cd50	Default	Yes	<a href="#">Manage Members</a>
<input type="checkbox"/>	service	Service Project	fdcf005cb8b854dad90aaf8c861c9598	Default	Yes	<a href="#">Manage Members</a>

Displaying 3 items

openstack. Default • admin

Project Admin / System / System Information

## System Information

Services [Compute Services](#)

Filter

Displaying 5 items

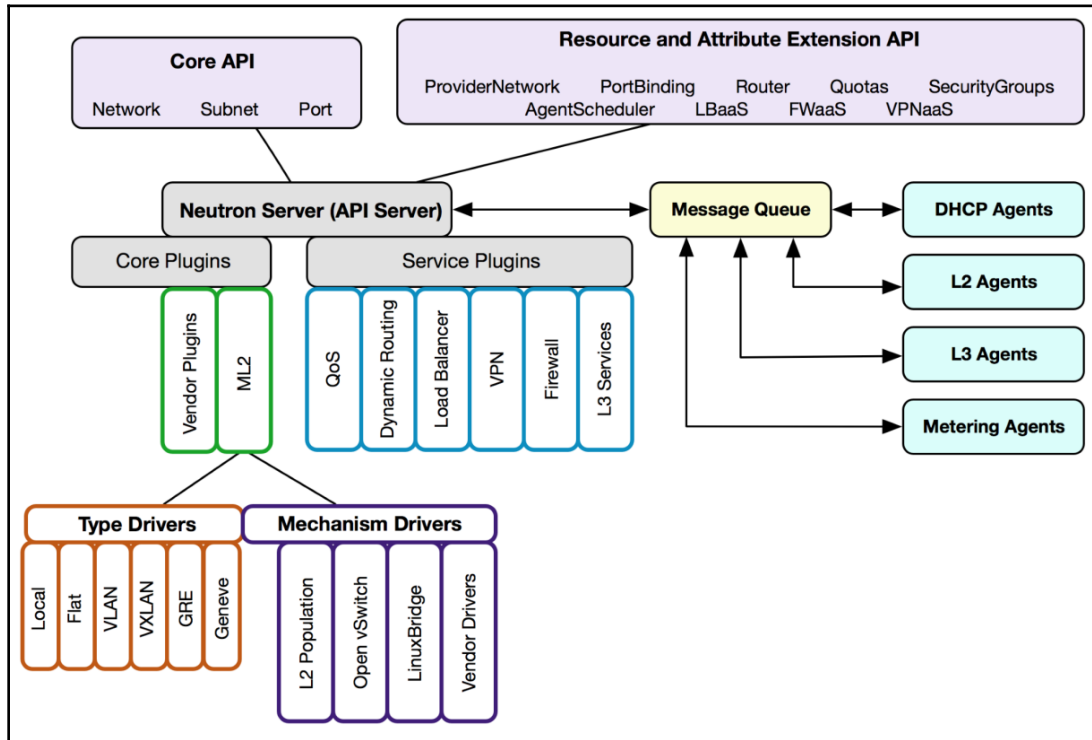
Name	Host	Zone	Status	State	Last Updated
nova-scheduler	controller01	internal	Enabled	Up	0 minutes
nova-consoleauth	controller01	internal	Enabled	Up	0 minutes
nova-conductor	controller01	internal	Enabled	Up	0 minutes
nova-compute	compute02	nova	Enabled	Up	0 minutes
nova-compute	compute01	nova	Enabled	Up	0 minutes

Displaying 5 items

Version: 12.0.1



# Chapter 03: Installing Neutron

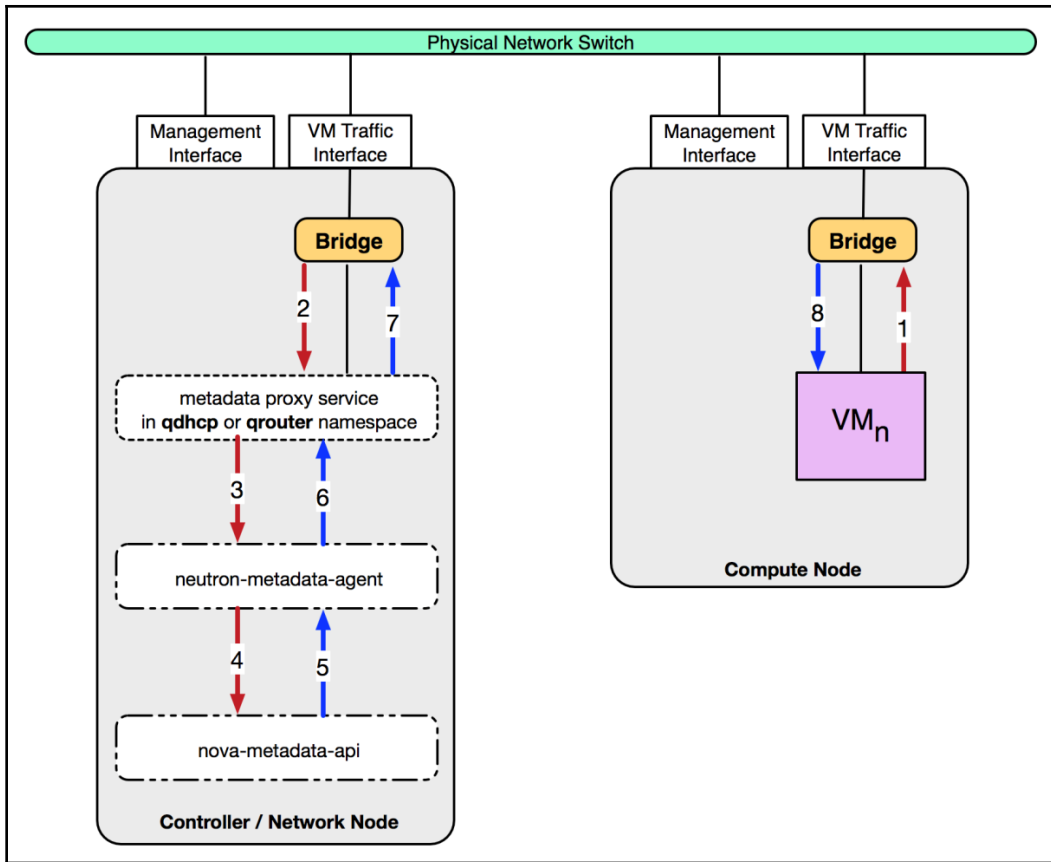


```

root@controller01:~# systemctl status neutron-dhcp-agent
● neutron-dhcp-agent.service - OpenStack Neutron DHCP agent
   Loaded: loaded (/lib/systemd/system/neutron-dhcp-agent.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2018-02-08 14:14:34 UTC; 1min 29s ago
     Process: 968 ExecStartPre=/bin/chown neutron:adm /var/log/neutron (code=exited, status=0/SUCCESS)
     Process: 960 ExecStartPre=/bin/chown neutron:neutron /var/lock/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
     Process: 953 ExecStartPre=/bin/mkdir -p /var/lock/neutron /var/log/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
  Main PID: 972 (neutron-dhcp-ag)
    Tasks: 1
   Memory: 108.2M
     CPU: 5.067s
   CGroup: /system.slice/neutron-dhcp-agent.service
           └─972 /usr/bin/python /usr/bin/neutron-dhcp-agent --config-file=/etc/neutron/neutron.conf
             --config-file=/etc/neutron/dhcp_agent.ini --log-file=/var/log/neutron/neutron-dhcp-agent.log
  
```

```

root@controller01:~# openstack network agent list --agent-type=dhcp
+-----+-----+-----+-----+-----+-----+-----+
| ID | Agent Type | Host | Availability Zone | Alive | State | Binary |
+-----+-----+-----+-----+-----+-----+-----+
| 75c095d1-df2a-491e-bd87-9b8b9ba4f9d4 | DHCP agent | controller01 | nova | :- ) | UP | neutron-dhcp-agent |
+-----+-----+-----+-----+-----+-----+-----+
  
```



```

root@controller01:~# systemctl status neutron-metadata-agent
● neutron-metadata-agent.service - OpenStack Neutron Metadata Agent
   Loaded: loaded (/lib/systemd/system/neutron-metadata-agent.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2018-02-08 14:30:52 UTC; 1min 58s ago
   Process: 1269 ExecStartPre=/bin/chown neutron:adm /var/log/neutron (code=exited, status=0/SUCCESS)
   Process: 1264 ExecStartPre=/bin/chown neutron:neutron /var/lock/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
   Process: 1258 ExecStartPre=/bin/mkdir -p /var/lock/neutron /var/log/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
 Main PID: 1278 (neutron-metadat)
   Tasks: 2
  Memory: 108.9M
    CPU: 4.153s
   CGroup: /system.slice/neutron-metadata-agent.service
           └─1278 /usr/bin/python /usr/bin/neutron-metadata-agent --config-file=/etc/neutron/neutron.conf
             └─1301 /usr/bin/python /usr/bin/neutron-metadata-agent --config-file=/etc/neutron/neutron.conf
               └─1301 /usr/bin/python /usr/bin/neutron-metadata-agent --config-file=/etc/neutron/neutron.conf
                 └─1301 /usr/bin/python /usr/bin/neutron-metadata-agent --config-file=/etc/neutron/neutron.conf

```

```

root@controller01:~# openstack network agent list --agent-type=metadata

```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
bf8b2e8c-4633-4b8d-939a-06663aa88708	Metadata agent	controller01	None	:~)	UP	neutron-metadata-agent

```
root@controller01:~# openstack
(openstack)
```

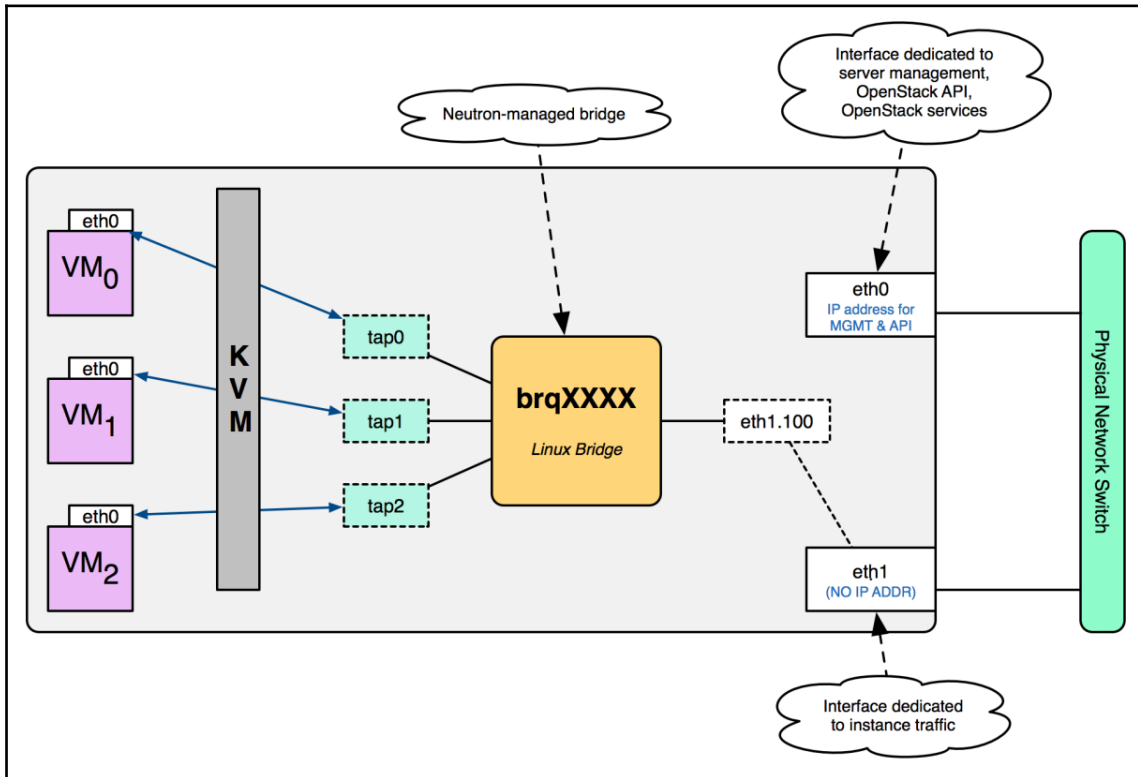
```
root@controller01:~# neutron
neutron CLI is deprecated and will be removed in the future. Use openstack CLI instead.
(neutron)
```

```
root@controller01:~# openstack token issue --fit-width
```

Field	Value
expires	2018-02-08T14:34:52+0000
id	gAAAAABafFH8Tfw0aM8NoFFXuS3sEBm3NnU6a5f1kRGSoYAxk9v1Aj-SEEUt9su8rwQvJ7jLu5LcX_8rdf0iuPo_WhcjL5LQd-hVo4GGLTC2snqASwxf-h7HDHkgtmLUJsnI02PQtPrDH9tCL6fdCxnDzGRoq4sGeY4FJqhYD55P0cDG6PMjHQU
project_id	9233b6b4f6a54386af63c0a7b8f043c2
user_id	8a679d8b7b574e54a5cfe02c422bbe68

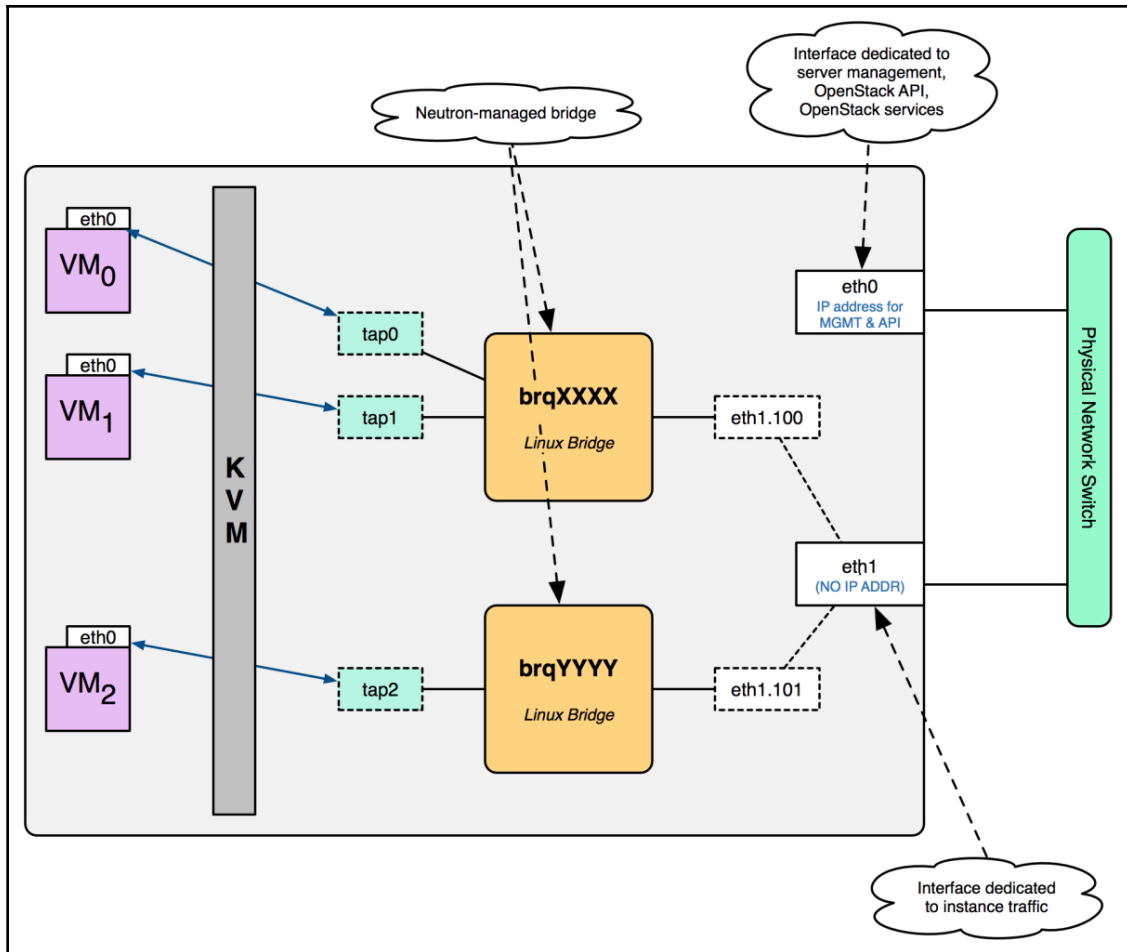
```
root@controller01:~# curl -v -X GET \
> -H 'X-Auth-Token: gAAAAABafFF48g13m5lKB-<snip>_nGVdRhZrir8' \
> http://controller01:9696/v2.0/networks
* Trying 10.10.0.100...
* Connected to controller01 (10.10.0.100) port 9696 (#0)
> GET /v2.0/networks HTTP/1.1
> Host: controller01:9696
> User-Agent: curl/7.47.0
> Accept: */*
> X-Auth-Token: gAAAAABafFF48g13m5lKB-<snip>_nGVdRhZrir8
>
< HTTP/1.1 200 OK
< Content-Type: application/json
< Content-Length: 15
< X-Openstack-Request-Id: req-2437f4ff-866f-4054-a49d-58ebacf336f0
< Date: Thu, 08 Feb 2018 13:39:48 GMT
<
* Connection #0 to host controller01 left intact
{"networks": []}
```

# Chapter 04: Virtual Network Infrastructure Using Linux Bridges



```
# brctl show
```

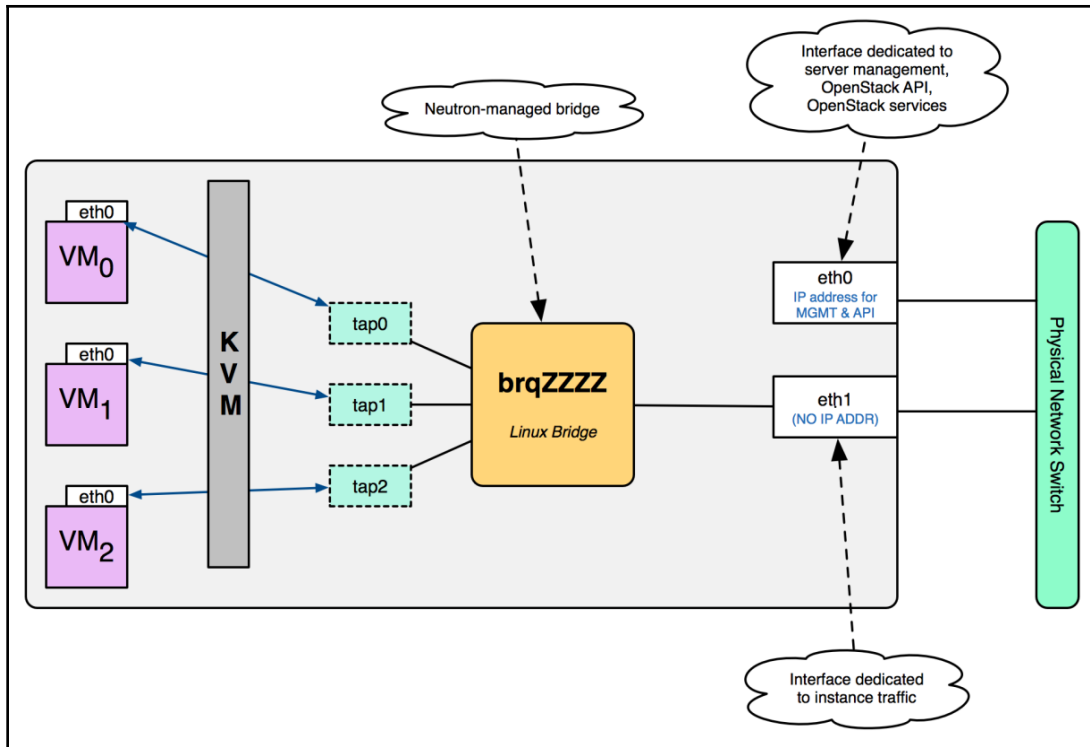
bridge name	bridge id	STP enabled	interfaces
brqXXXX	<based on NIC>	no	eth1.100 tap0 tap1 tap2



```
# brctl show

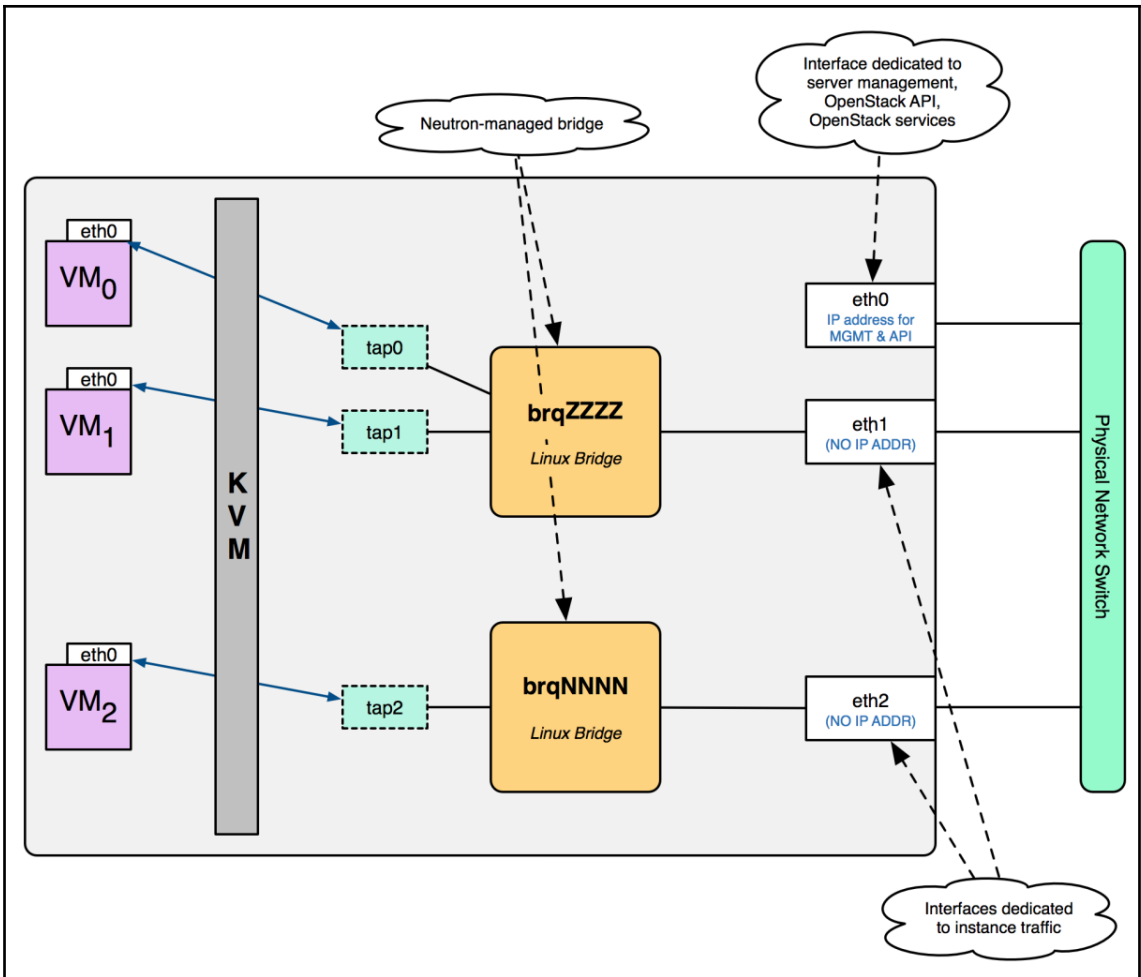
bridge name      bridge id      STP enabled    interfaces
brqXXXX          <based on NIC> no             eth1.100
                 tap0
                 tap1

bridge name      bridge id      STP enabled    interfaces
brqYYYY          <based on NIC> no             eth1.101
                 tap2
```



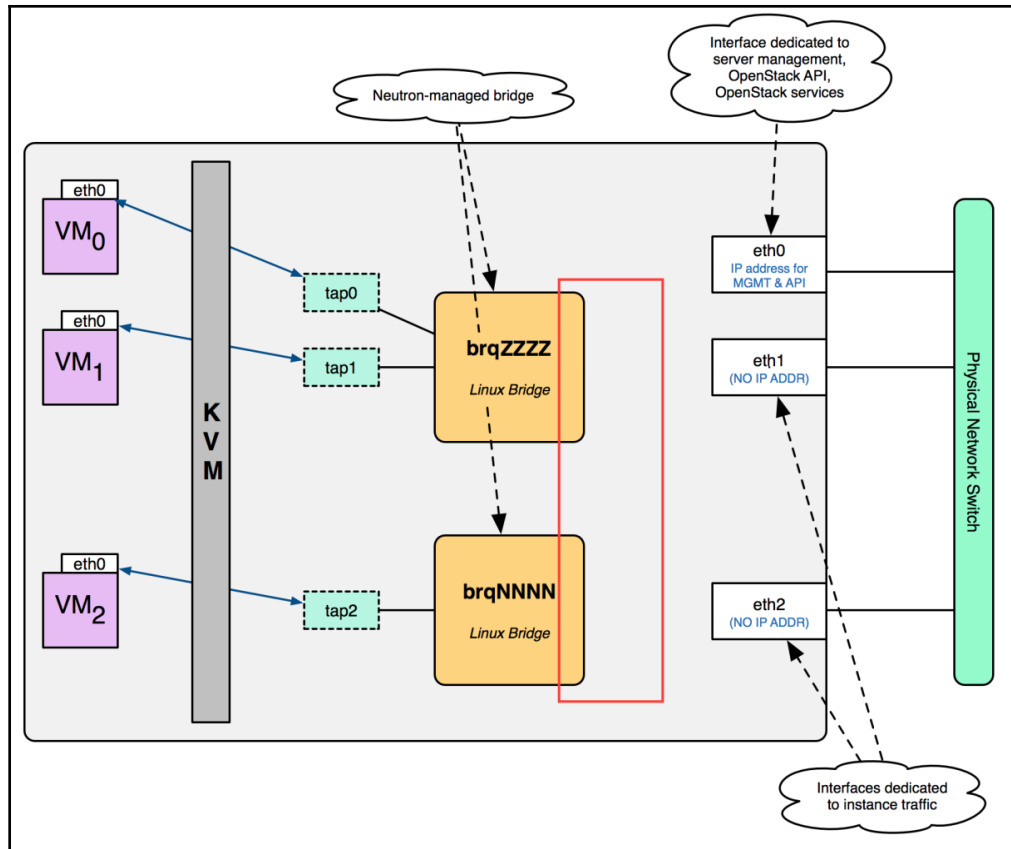
```
# brctl show
bridge name      bridge id      STP enabled    interfaces
brqZZZZ          <based on NIC> no              eth1
                                                         tap0
                                                         tap1
                                                         tap2
```





```
# brctl show
bridge name      bridge id      STP enabled    interfaces
brqZZZZ          <based on NIC> no             eth1
                 <based on NIC> no             tap0
                 <based on NIC> no             tap1

bridge name      bridge id      STP enabled    interfaces
brqNNNN          <based on NIC> no             eth2
                 <based on NIC> no             tap2
```



```

root@controller01:~# ping -c 5 10.20.0.101
PING 10.20.0.101 (10.20.0.101) 56(84) bytes of data:
64 bytes from 10.20.0.101: icmp_seq=1 ttl=64 time=0.448 ms
64 bytes from 10.20.0.101: icmp_seq=2 ttl=64 time=0.522 ms
64 bytes from 10.20.0.101: icmp_seq=3 ttl=64 time=0.624 ms
64 bytes from 10.20.0.101: icmp_seq=4 ttl=64 time=0.524 ms
64 bytes from 10.20.0.101: icmp_seq=5 ttl=64 time=0.545 ms

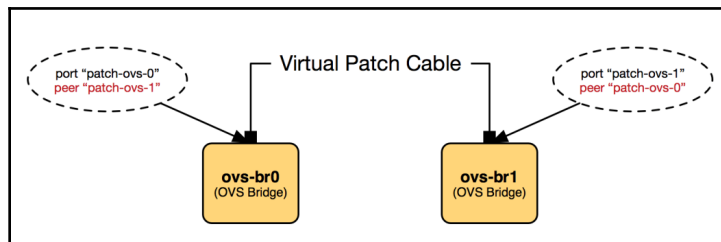
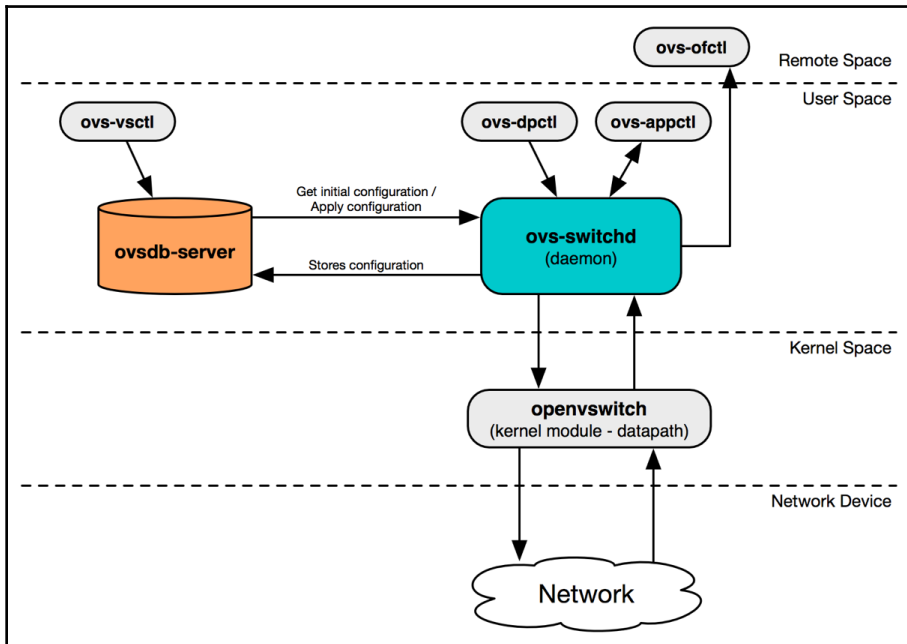
--- 10.20.0.101 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4083ms
rtt min/avg/max/mdev = 0.448/0.532/0.624/0.061 ms

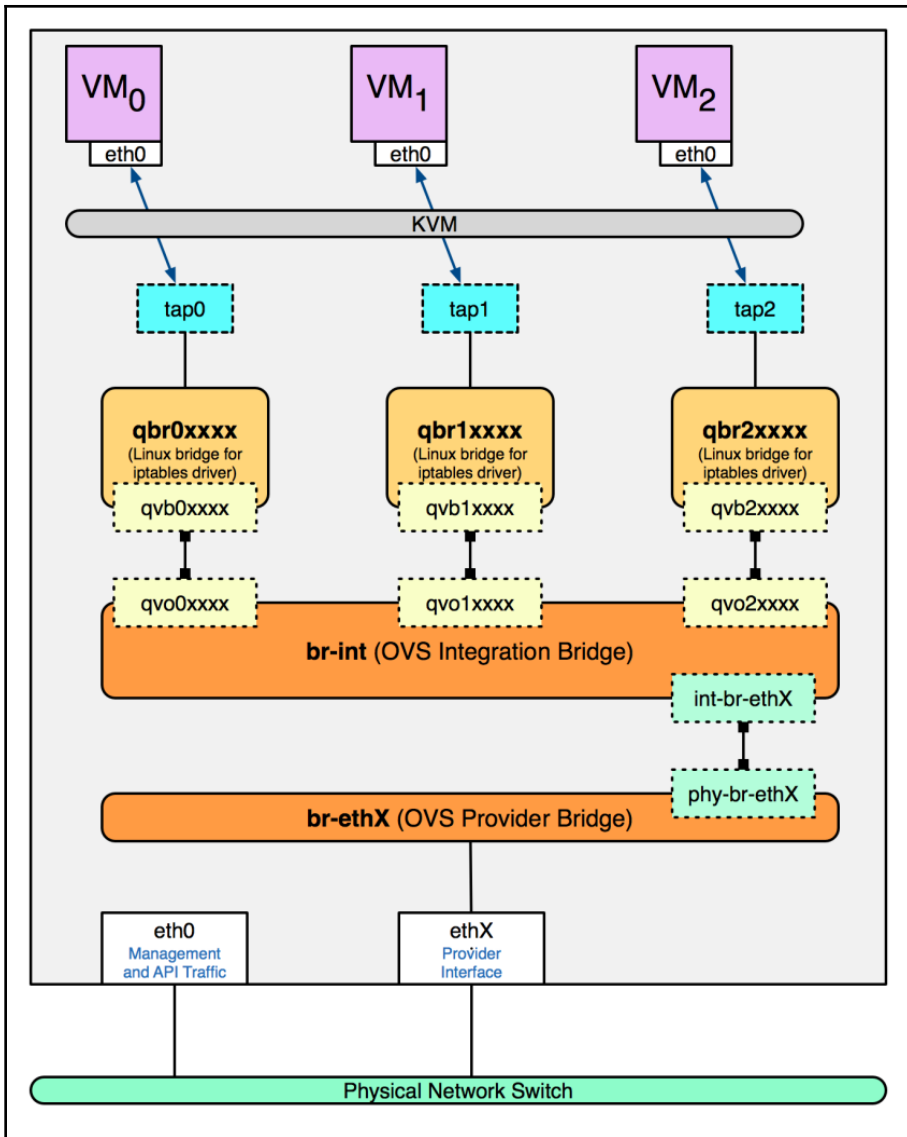
```

```
root@controller01:~# openstack network agent list
```

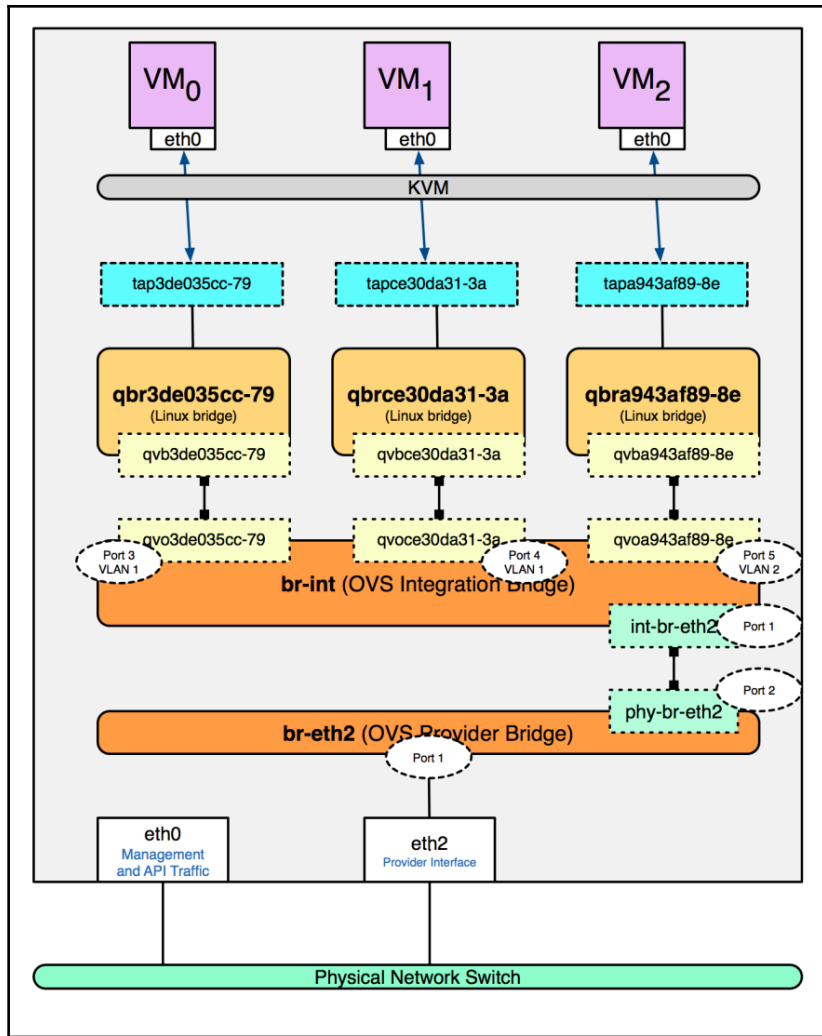
ID	Agent Type	Host	Availability Zone	Alive	State	Binary
75c095d1-df2a-491e-bd87-9b8b9ba4f9d4	DHCP agent	controller01	nova	:~)	UP	neutron-dhcp-agent
b0a0156d-1199-4324-8bff-c6c5f7eea1f2	Linux bridge agent	compute01	None	:~)	UP	neutron-linuxbridge-agent
bf8b2e8c-4633-4b8d-939a-06663aa88708	Metadata agent	controller01	None	:~)	UP	neutron-metadata-agent
dc2ba98c-7304-411f-9dc7-15956177f7c3	Linux bridge agent	controller01	None	:~)	UP	neutron-linuxbridge-agent

# Chapter 05: Building a Virtual Switching Infrastructure Using Open vSwitch





```
root@compute02:~# ovs-ofctl show br-int
OFPT_FEATURES_REPLY (xid=0x2): dpid:0000da053b9e154b
n_tables:254, n_buffers:0
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP
actions: output enqueue set_vlan_vid set_vlan_pcp strip_vlan mod_dl_src mod_dl_dst mod_nw
1(int-br-eth2): addr:0a:21:8b:2b:7d:dd
  config: 0
  state: 0
  speed: 0 Mbps now, 0 Mbps max
2(patch-tun): addr:9e:71:de:c8:c9:cf
  config: 0
  state: 0
  speed: 0 Mbps now, 0 Mbps max
3(qvo3de035cc-79): addr:4a:8c:e8:f8:69:fd
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
4(qvoce30da31-3a): addr:ee:c8:17:d9:12:97
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
5(qvoa943af89-8e): addr:6e:55:54:3a:ad:8b
  config: 0
  state: 0
  current: 10GB-FD COPPER
  speed: 10000 Mbps now, 0 Mbps max
LOCAL(br-int): addr:da:05:3b:9e:15:4b
  config: PORT_DOWN
  state: LINK_DOWN
  speed: 0 Mbps now, 0 Mbps max
OFPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0
```



```

root@compute02:~# ovs-vsctl show
5a68f2c6-318e-4d46-b549-4696f6f53cf5
  Manager "ptcp:6640:127.0.0.1"
    is_connected: true
  Bridge br-tun
    Controller "tcp:127.0.0.1:6633"
      is_connected: true
      fail_mode: secure
    Port patch-int
      Interface patch-int
        type: patch
        options: {peer=patch-tun}
    Port br-tun
      Interface br-tun
        type: internal
  Bridge "br-eth2"
    Controller "tcp:127.0.0.1:6633"
      is_connected: true
      fail_mode: secure
    Port "phy-br-eth2"
      Interface "phy-br-eth2"
        type: patch
        options: {peer="int-br-eth2"}
    Port "ens224"
      Interface "ens224"
    Port "br-eth2"
      Interface "br-eth2"
        type: internal
  Bridge br-int
    Controller "tcp:127.0.0.1:6633"
      is_connected: true
      fail_mode: secure
    Port patch-tun
      Interface patch-tun
        type: patch
        options: {peer=patch-int}
    Port br-int
      Interface br-int
        type: internal
    Port "qvoce30da31-3a"
      tag: 1
      Interface "qvoce30da31-3a"
    Port "qvoa943af89-8e"
      tag: 2
      Interface "qvoa943af89-8e"
    Port "int-br-eth2"
      Interface "int-br-eth2"
        type: patch
        options: {peer="phy-br-eth2"}
    Port "qvo3de035cc-79"
      tag: 1
      Interface "qvo3de035cc-79"
  ovs_version: "2.8.0"

```

```

root@compute02:~# ovs-ofctl dump-flows br-eth2 --rsort
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=1 actions=mod_vlan_vid:42,NORMAL
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=2 actions=mod_vlan_vid:40,NORMAL
table=0, n_packets=12, n_bytes=1016, priority=2,in_port="phy-br-eth2" actions=drop
table=0, n_packets=256769, n_bytes=41302038, priority=0 actions=NORMAL

```

```

root@compute02:~# ovs-ofctl dump-flows br-eth2 --rsort
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=1 actions=mod_vlan_vid:42,NORMAL
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=2 actions=mod_vlan_vid:40,NORMAL
table=0, n_packets=12, n_bytes=1016, priority=2,in_port="phy-br-eth2" actions=drop
table=0, n_packets=256769, n_bytes=41302038, priority=0 actions=NORMAL

```



```

root@compute02:~# ovs-ofctl dump-flows br-int --rsort
table=0, n_packets=0, n_bytes=0, priority=10,icmp6,in_port="qvo3de035cc-79",icmp_type=136 actions=resubmit(,24)
table=0, n_packets=0, n_bytes=0, priority=10,icmp6,in_port="qvoce30da31-3a",icmp_type=136 actions=resubmit(,24)
table=0, n_packets=0, n_bytes=0, priority=10,icmp6,in_port="qvoa943af89-8e",icmp_type=136 actions=resubmit(,24)
table=0, n_packets=0, n_bytes=0, priority=10,arp,in_port="qvo3de035cc-79" actions=resubmit(,24)
table=0, n_packets=0, n_bytes=0, priority=10,arp,in_port="qvoce30da31-3a" actions=resubmit(,24)
table=0, n_packets=0, n_bytes=0, priority=10,arp,in_port="qvoa943af89-8e" actions=resubmit(,24)
table=0, n_packets=8, n_bytes=560, priority=9,in_port="qvo3de035cc-79" actions=resubmit(,25)
table=0, n_packets=9, n_bytes=630, priority=9,in_port="qvoce30da31-3a" actions=resubmit(,25)
table=0, n_packets=8, n_bytes=560, priority=9,in_port="qvoa943af89-8e" actions=resubmit(,25)
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=42 actions=mod_vlan_vid:1,resubmit(,60)
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=40 actions=mod_vlan_vid:2,resubmit(,60)
table=60, n_packets=12, n_bytes=1016, priority=3 actions=NORMAL
table=0, n_packets=12650, n_bytes=1136948, priority=2,in_port="int-br-eth2" actions=drop
table=24, n_packets=0, n_bytes=0, priority=2,icmp6,in_port="qvo3de035cc-79",icmp_type=136,nd_target=fe80::f816:3eff:fe77:60c5 actions=resubmit(,60)
table=24, n_packets=0, n_bytes=0, priority=2,icmp6,in_port="qvoce30da31-3a",icmp_type=136,nd_target=fe80::f816:3eff:fe80:230b actions=resubmit(,60)
table=24, n_packets=0, n_bytes=0, priority=2,icmp6,in_port="qvoa943af89-8e",icmp_type=136,nd_target=fe80::f816:3eff:fe80:9edc actions=resubmit(,60)
table=24, n_packets=0, n_bytes=0, priority=2,arp,in_port="qvo3de035cc-79",arp_spa=192.168.0.6 actions=resubmit(,25)
table=24, n_packets=0, n_bytes=0, priority=2,arp,in_port="qvoce30da31-3a",arp_spa=192.168.0.10 actions=resubmit(,25)
table=24, n_packets=0, n_bytes=0, priority=2,arp,in_port="qvoa943af89-8e",arp_spa=192.168.1.3 actions=resubmit(,25)
table=25, n_packets=0, n_bytes=0, priority=2,arp,in_port="qvo3de035cc-79",dl_src=fa:16:3e:77:60:c5 actions=resubmit(,60)
table=25, n_packets=0, n_bytes=0, priority=2,in_port="qvoce30da31-3a",dl_src=fa:16:3e:d8:23:0b actions=resubmit(,60)
table=25, n_packets=0, n_bytes=0, priority=2,in_port="qvoa943af89-8e",dl_src=fa:16:3e:de:9e:dc actions=resubmit(,60)
table=0, n_packets=12, n_bytes=1016, priority=0 actions=resubmit(,60)
table=23, n_packets=0, n_bytes=0, priority=0 actions=drop
table=24, n_packets=0, n_bytes=0, priority=0 actions=drop

```

```

root@compute02:~# ovs-ofctl dump-flows br-int --rsort
...
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=42 actions=mod_vlan_vid:1,resubmit(,60)
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=40 actions=mod_vlan_vid:2,resubmit(,60)
table=60, n_packets=12, n_bytes=1016, priority=3 actions=NORMAL
table=0, n_packets=12650, n_bytes=1136948, priority=2,in_port="int-br-eth2" actions=drop
...
table=0, n_packets=12, n_bytes=1016, priority=0 actions=resubmit(,60)
...

```

```

root@compute02:~# ovs-ofctl dump-flows br-int --rsort
...
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=42 actions=mod_vlan_vid:1,resubmit(,60)
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=40 actions=mod_vlan_vid:2,resubmit(,60)
table=60, n_packets=12, n_bytes=1016, priority=3 actions=NORMAL
table=0, n_packets=12650, n_bytes=1136948, priority=2,in_port="int-br-eth2" actions=drop
...
table=0, n_packets=12, n_bytes=1016, priority=0 actions=resubmit(,60)
...

```

```

root@compute02:~# ovs-ofctl dump-flows br-int --rsort
table=0, n_packets=0, n_bytes=0, priority=10,icmp6,in_port="qvo3de035cc-79",icmp_type=136 actions=resubmit(,24)
...
table=0, n_packets=0, n_bytes=0, priority=10,arp,in_port="qvo3de035cc-79" actions=resubmit(,24)
...
table=0, n_packets=8, n_bytes=560, priority=9,in_port="qvo3de035cc-79" actions=resubmit(,25)
...
table=60, n_packets=12, n_bytes=1016, priority=3 actions=NORMAL
...
table=24, n_packets=0, n_bytes=0, priority=2,icmp6,in_port="qvo3de035cc-79",icmp_type=136,
nd_target=fe80::f816:3eff:fe77:60c5 actions=resubmit(,60)
...
table=24, n_packets=0, n_bytes=0, priority=2,arp,in_port="qvo3de035cc-79",arp_spa=192.168.0.6 actions=resubmit(,25)
...
table=25, n_packets=0, n_bytes=0, priority=2,in_port="qvo3de035cc-79",dl_src=fa:16:3e:77:60:c5 actions=resubmit(,60)
...
table=0, n_packets=12, n_bytes=1016, priority=0 actions=resubmit(,60)
table=23, n_packets=0, n_bytes=0, priority=0 actions=drop
table=24, n_packets=0, n_bytes=0, priority=0 actions=drop

```

```

root@compute02:~# ovs-ofctl dump-flows br-eth2 --rsort
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=1 actions=mod_vlan_vid:42,NORMAL
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=2 actions=mod_vlan_vid:40,NORMAL
table=0, n_packets=12, n_bytes=1016, priority=2,in_port="phy-br-eth2" actions=drop
table=0, n_packets=2704987, n_bytes=673083387, priority=0 actions=NORMAL

```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-02-27T21:53:13Z
description	
dns_domain	None
id	97aa85e6-1d88-414e-bed2-bb610fd5c03c
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	MyFlatNetwork
port_security_enabled	False
project_id	9233b6b4f6a54386af63c0a7b8f043c2
provider:network_type	flat
provider:physical_network	physnet1
provider:segmentation_id	None
qos_policy_id	None
revision_number	1
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-02-27T21:53:13Z

```

Bridge br-int
  Controller "tcp:127.0.0.1:6633"
    is_connected: true
  fail_mode: secure
  Port patch-tun
    Interface patch-tun
      type: patch
      options: {peer=patch-int}
  Port br-int
    Interface br-int
      type: internal
  Port "qvo4655b19f-85"
    tag: 3
    Interface "qvo4655b19f-85"
  Port "qvoce30da31-3a"
    tag: 1
    Interface "qvoce30da31-3a"
  Port "qvoa943af89-8e"
    tag: 2
    Interface "qvoa943af89-8e"
  Port "int-br-eth2"
    Interface "int-br-eth2"
      type: patch
      options: {peer="phy-br-eth2"}
  Port "qvo3de035cc-79"
    tag: 1
    Interface "qvo3de035cc-79"
  ovs_version: "2.8.0"

```

```

root@compute02:~# ovs-ofctl dump-flows br-int --rsort
...
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=42 actions=mod_vlan_vid:1,resubmit(,60)
table=0, n_packets=0, n_bytes=0, priority=3,in_port="int-br-eth2",dl_vlan=40 actions=mod_vlan_vid:2,resubmit(,60)
table=0, n_packets=26, n_bytes=1580, priority=3,in_port="int-br-eth2",vlan_tci=0x0000/0x1fff actions=mod_vlan_vid:3,resubmit(,60)
table=60, n_packets=43, n_bytes=3022, priority=3 actions=NORMAL
...

```

```

root@compute02:~# ovs-ofctl dump-flows br-eth2 --rsort
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=1 actions=mod_vlan_vid:42,NORMAL
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=2 actions=mod_vlan_vid:40,NORMAL
table=0, n_packets=0, n_bytes=0, priority=4,in_port="phy-br-eth2",dl_vlan=3 actions=strip_vlan,NORMAL
table=0, n_packets=17, n_bytes=1442, priority=2,in_port="phy-br-eth2" actions=drop
table=0, n_packets=3104979, n_bytes=729425517, priority=0 actions=NORMAL

```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-03-02T13:20:57Z
description	
dns_domain	None
id	06952b48-1cf1-48b9-be60-78ad4e97fec4
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1450
name	MyOverlayNetwork
port_security_enabled	False
project_id	9233b6b4f6a54386af63c0a7b8f043c2
provider:network_type	vlan
provider:physical_network	None
provider:segmentation_id	39
qos_policy_id	None
revision_number	1
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-03-02T13:20:57Z

```

Bridge br-int
  Controller "tcp:127.0.0.1:6633"
    is_connected: true
  fail_mode: secure
  Port patch-tun
    Interface patch-tun
      type: patch
      options: {peer=patch-int}
  Port "qvo2bc7251b-07"
    tag: 4
    Interface "qvo2bc7251b-07"
  Port br-int
    Interface br-int
      type: internal
  Port "qvo4655b19f-85"
    tag: 3
    Interface "qvo4655b19f-85"
  Port "qvoce30da31-3a"
    tag: 1
    Interface "qvoce30da31-3a"
  Port "qvoa943af89-8e"
    tag: 2
    Interface "qvoa943af89-8e"
  Port "int-br-eth2"
    Interface "int-br-eth2"
      type: patch
      options: {peer="phy-br-eth2"}
  Port "qvo3de035cc-79"
    tag: 1
    Interface "qvo3de035cc-79"

```

```

root@compute02:/home/jdenton# ovs-ofctl dump-flows br-tun --rsort
table=20, n_packets=0, n_bytes=0, priority=2,d_l_vlan=4,d_dst=fa:16:3e:f1:b0:49 actions=strip_vlan,
  load:0x27->NXM_NX_TUN_ID[],output:"vxlan-0a140064"
table=0, n_packets=24415, n_bytes=1476920, priority=1,in_port="patch-int" actions=resubmit(,2)
table=0, n_packets=0, n_bytes=0, priority=1,in_port="vxlan-0a140064" actions=resubmit(,4)
table=2, n_packets=23247, n_bytes=1394820, priority=1,arp,d_l_dst=ff:ff:ff:ff:ff:ff actions=resubmit(,21)
table=4, n_packets=0, n_bytes=0, priority=1,tun_id=0x27 actions=mod_vlan_vid:4,resubmit(,10)
table=10, n_packets=0, n_bytes=0, priority=1
  actions=learn(table=20,hard_timeout=300,priority=1,cookie=0x4959e8e689bdd36,NXM_OF_VLAN_TCI[0..11],
  NXM_OF_ETH_DST[]=NXM_OF_ETH_SRC[],load:0->NXM_OF_VLAN_TCI[],load:NXM_NX_TUN_ID[]->NXM_NX_TUN_ID[],
  output:0XM_OF_IN_PORT[]),output:"patch-int"
table=21, n_packets=0, n_bytes=0, priority=1,arp,d_l_vlan=4,arp_tpa=172.18.90.2
  actions=load:0x2->NXM_OF_ARP_OP[],move:NXM_NX_ARP_SHA[]->NXM_NX_ARP_THA[],move:NXM_OF_ARP_SPA[]->NXM_OF_ARP_TPA[],
  load:0xfa163ef1b049->NXM_NX_ARP_SHA[],load:0xac125a02->NXM_OF_ARP_SPA[],move:NXM_OF_ETH_SRC[]->NXM_OF_ETH_DST[],
  mod_d_l_src:fa:16:3e:f1:b0:49,IN_PORT
table=22, n_packets=0, n_bytes=0, priority=1,d_l_vlan=4 actions=strip_vlan,load:0x27->NXM_NX_TUN_ID[],output:"vxlan-0a140064"
table=0, n_packets=0, n_bytes=0, priority=0 actions=drop
table=2, n_packets=0, n_bytes=0, priority=0,d_l_dst=00:00:00:00:00:00/01:00:00:00:00:00 actions=resubmit(,20)
table=2, n_packets=1168, n_bytes=82100, priority=0,d_l_dst=01:00:00:00:00:00/01:00:00:00:00:00 actions=resubmit(,22)
table=3, n_packets=0, n_bytes=0, priority=0 actions=drop
table=4, n_packets=0, n_bytes=0, priority=0 actions=drop
table=6, n_packets=0, n_bytes=0, priority=0 actions=drop
table=20, n_packets=0, n_bytes=0, priority=0 actions=resubmit(,22)
table=21, n_packets=23247, n_bytes=1394820, priority=0 actions=resubmit(,22)
table=22, n_packets=24415, n_bytes=1476920, priority=0 actions=drop

```

```

Bridge br-tun
  Controller "tcp:127.0.0.1:6633"
  is_connected: true
  fail_mode: secure
  Port patch-int
    Interface patch-int
      type: patch
      options: {peer=patch-tun}
  Port br-tun
    Interface br-tun
      type: internal
  Port "vxlan-0a140064"
    Interface "vxlan-0a140064"
      type: vxlan
      options: {df_default="true", in_key=flow, local_ip="10.20.0.102", out_key=flow, remote_ip="10.20.0.100"}

```

```

root@controller01:~# openstack network agent list

```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
12bd7389-3b23-478d-9467-ebb6be4920b0	Linux bridge agent	controller01	None	:-)	UP	neutron-linuxbridge-agent
4c2f803c-a7ed-43e4-9625-2d2409f8571a	DHCP agent	controller01	nova	:-)	UP	neutron-dhcp-agent
54dd16aa-f0d4-41a7-b2ca-e1aae6959657	Open vSwitch agent	snat01	None	:-)	UP	neutron-openvswitch-agent
69eedd18-4079-45ba-9517-cc7785bc8599	Linux bridge agent	compute01	None	:-)	UP	neutron-linuxbridge-agent
a19d0599-4306-4f53-bd44-aa549b6d028d	Metadata agent	controller01	None	:-)	UP	neutron-metadata-agent
ace32522-1261-4814-b635-622329a019a9	Open vSwitch agent	compute03	None	:-)	UP	neutron-openvswitch-agent
fcbad2eb-f964-4434-9125-67162e1a1be7	Open vSwitch agent	compute02	None	:-)	UP	neutron-openvswitch-agent

## Chapter 06: Building Networks with Neutron

```
(openstack) network create -h
usage: network create [-h] [-f {json,shell,table,value,yaml}] [-c COLUMN]
                    [--max-width <integer>] [--fit-width] [--print-empty]
                    [--noindent] [--prefix PREFIX] [--share | --no-share]
                    [--enable | --disable] [--project <project>]
                    [--description <description>]
                    [--project-domain <project-domain>]
                    [--availability-zone-hint <availability-zone>]
                    [--enable-port-security | --disable-port-security]
                    [--external | --internal] [--default | --no-default]
                    [--qos-policy <qos-policy>]
                    [--transparent-vlan | --no-transparent-vlan]
                    [--provider-network-type <provider-network-type>]
                    [--provider-physical-network <provider-physical-network>]
                    [--provider-segment <provider-segment>]
                    [--tag <tag> | --no-tag]
                    <name>
```

```

root@controller01:~# openstack network create --provider-network-type
> --provider-physical-network physnet1 \
> --share \
> MyFlatNetwork

```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-01-08T19:04:53Z
description	
dns_domain	None
id	d51943ef-8061-4bdb-b684-8a7d2b7ce73b
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	MyFlatNetwork
port_security_enabled	False
project_id	877f949397ad428cbeaac4e5123bad83
provider:network_type	flat
provider:physical_network	physnet1
provider:segmentation_id	None
qos_policy_id	None
revision_number	1
router:external	Internal
segments	None
shared	True
status	ACTIVE
subnets	
tags	
updated_at	2018-01-08T19:04:53Z

```

root@controller01:~# openstack network create --provider-network-type flat \
> --provider-physical-network physnet1 \
> MyFlatNetwork2
Error while executing command: Conflict (HTTP 409) (Request-ID: req-47d76ebf-fd4c-48e4-90c1-21498199d761)

```



```

root@controller01:~# openstack network create \
> --provider-network-type vlan \
> --provider-physical-network physnet1 \
> --provider-segment 301 \
> MyVLANNetwork2

```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-01-09T13:34:39Z
description	
dns_domain	None
id	9cd264e9-d3b7-415e-bf49-5efe3463c18d
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	MyVLANNetwork2
port_security_enabled	False
project_id	877f949397ad428cbeaac4e5123bad83
provider:network_type	vlan
provider:physical_network	physnet1
provider:segmentation_id	301
qos_policy_id	None
revision_number	1
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-01-09T13:34:40Z

```

root@controller01:~# openstack network list

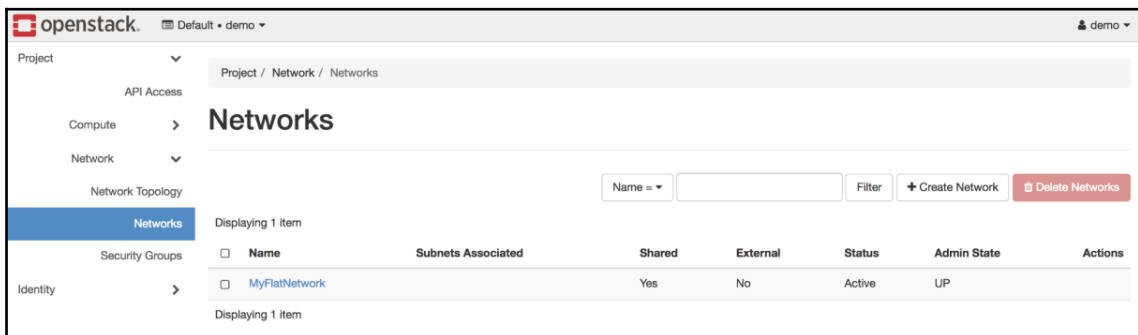
```

ID	Name	Subnets
9cd264e9-d3b7-415e-bf49-5efe3463c18d	MyVLANNetwork2	
b2ca3d41-c79c-416a-8e86-0bb01060ddec	MyVLANNetwork	
d51943ef-8061-4bdb-b684-8a7d2b7ce73b	MyFlatNetwork	

```

root@controller01:~# openstack network show MyVLANNetwork
+-----+-----+
| Field                | Value                |
+-----+-----+
| admin_state_up       | UP                   |
| availability_zone_hints |                      |
| availability_zones    |                      |
| created_at           | 2018-01-09T13:32:28Z |
| description          |                      |
| dns_domain           | None                 |
| id                   | b2ca3d41-c79c-416a-8e86-0bb01060ddec |
| ipv4_address_scope   | None                 |
| ipv6_address_scope   | None                 |
| is_default           | None                 |
| is_vlan_transparent  | None                 |
| mtu                  | 1500                 |
| name                 | MyVLANNetwork       |
| port_security_enabled | False                |
| project_id           | 877f949397ad428cbeaac4e5123bad83 |
| provider:network_type | vlan                 |
| provider:physical_network | physnet1            |
| provider:segmentation_id | 300                  |
| qos_policy_id        | None                 |
| revision_number      | 1                    |
| router:external      | Internal             |
| segments            | None                 |
| shared               | False                |
| status               | ACTIVE               |
| subnets             |                      |
| tags                 |                      |
| updated_at           | 2018-01-09T13:32:28Z |
+-----+-----+

```



### Create Network

Network Subnet Subnet Details

**Network Name**

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.

**Enable Admin State** ⓘ

**Create Subnet**

Cancel « Back Next »

openstack Default • admin

Admin / Network / Networks

## Networks

Project = [ ] Filter + Create Network Delete Networks

Displaying 4 items

Project	Network Name	Subnets Associated	DHCP Agents	Shared	External	Status	Admin State	Actions
demo	MyUserNetwork	0	0	No	No	Active	UP	Edit Network
admin	MyVLANNetwork2	0	0	No	No	Active	UP	Edit Network
admin	MyVLANNetwork	0	0	No	No	Active	UP	Edit Network
admin	MyFlatNetwork	0	0	Yes	No	Active	UP	Edit Network

Displaying 4 items

## Create Network ✕

Network \*

Subnet

Subnet Details

**Name**

**Project \***

Select a project

**Provider Network Type \* ⓘ**

Local

**Enable Admin State**

**Shared**

**External Network**

**Create Subnet**

Cancel

« Back

Next »

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.

```
(openstack) subnet create -h
usage: subnet create [-h] [-f {json,shell,table,value,yaml}] [-c COLUMN]
                    [--max-width <integer>] [--fit-width] [--print-empty]
                    [--noindent] [--prefix PREFIX] [--project <project>]
                    [--project-domain <project-domain>]
                    [--subnet-pool <subnet-pool> | --use-default-subnet-pool]
                    [--prefix-length <prefix-length>]
                    [--subnet-range <subnet-range>] [--dhcp | --no-dhcp]
                    [--gateway <gateway>] [--ip-version {4,6}]
                    [--ipv6-ra-mode {dhcpv6-stateful,dhcpv6-stateless,slaac}]
                    [--ipv6-address-mode {dhcpv6-stateful,dhcpv6-stateless,slaac}]
                    [--network-segment <network-segment>] --network <network>
                    [--description <description>]
                    [--allocation-pool start=<ip-address>,end=<ip-address>]
                    [--dns-nameserver <dns-nameserver>]
                    [--host-route destination=<subnet>,gateway=<ip-address>]
                    [--service-type <service-type>] [--tag <tag> | --no-tag]
                    name
```

```

root@controller01:~# openstack subnet create \
> --subnet-range 192.168.100.0/24 \
> --gateway 192.168.100.1 \
> --ip-version 4 \
> --network MyFlatNetwork \
> --dns-nameserver 8.8.8.8 \
> --dns-nameserver 8.8.4.4 \
> MyFlatSubnet
+-----+-----+
| Field                | Value                |
+-----+-----+
| allocation_pools     | 192.168.100.2-192.168.100.254 |
| cidr                 | 192.168.100.0/24    |
| created_at          | 2018-01-15T01:22:50Z |
| description         |                      |
| dns_nameservers     | 8.8.4.4, 8.8.8.8   |
| enable_dhcp         | True                 |
| gateway_ip          | 192.168.100.1      |
| host_routes         |                      |
| id                  | 63eaa79b-8129-4fc4-a783-cc7ba917d462 |
| ip_version          | 4                    |
| ipv6_address_mode   | None                 |
| ipv6_ra_mode        | None                 |
| name                 | MyFlatSubnet        |
| network_id          | d51943ef-8061-4bdb-b684-8a7d2b7ce73b |
| project_id          | 877f949397ad428cbeaac4e5123bad83 |
| revision_number     | 0                    |
| segment_id          | None                 |
| service_types       |                      |
| subnetpool_id       | None                 |
| tags                 |                      |
| updated_at          | 2018-01-15T01:22:50Z |
| use_default_subnet_pool | None                 |
+-----+-----+

```

```

root@controller01:~# openstack subnet list
+-----+-----+-----+-----+
| ID                | Name                | Network                | Subnet                |
+-----+-----+-----+-----+
| 63eaa79b-8129-4fc4-a783-cc7ba917d462 | MyFlatSubnet       | d51943ef-8061-4bdb-b684-8a7d2b7ce73b | 192.168.100.0/24    |
+-----+-----+-----+-----+

```

```

root@controller01:~# openstack subnet show MyFlatSubnet
+-----+-----+
| Field | Value |
+-----+-----+
| allocation_pools | 192.168.100.2-192.168.100.254 |
| cidr | 192.168.100.0/24 |
| created_at | 2018-01-15T01:22:50Z |
| description | |
| dns_nameservers | 8.8.4.4, 8.8.8.8 |
| enable_dhcp | True |
| gateway_ip | 192.168.100.1 |
| host_routes | |
| id | 63eaa79b-8129-4fc4-a783-cc7ba917d462 |
| ip_version | 4 |
| ipv6_address_mode | None |
| ipv6_ra_mode | None |
| name | MyFlatSubnet |
| network_id | d51943ef-8061-4bdb-b684-8a7d2b7ce73b |
| project_id | 877f949397ad428cbeaac4e5123bad83 |
| revision_number | 0 |
| segment_id | None |
| service_types | |
| subnetpool_id | None |
| tags | |
| updated_at | 2018-01-15T01:22:50Z |
| use_default_subnet_pool | None |
+-----+-----+

```


The screenshot shows the OpenStack dashboard interface. The top navigation bar includes the OpenStack logo, a dropdown menu for 'Default • demo', and a user profile icon labeled 'demo'. The left sidebar contains a navigation menu with categories: Project, API Access, Compute, Network, Network Topology, Networks (highlighted), Security Groups, and Identity. The main content area is titled 'Networks' and includes a search filter (Name =), a 'Filter' button, and two action buttons: '+ Create Network' and 'Delete Networks'. Below the search area, a table displays two network items:

Name	Subnets Associated	Shared	External	Status	Admin State	Actions
<a href="#">MyUserNetwork</a>		No	No	Active	UP	<a href="#">Edit Network</a>
<a href="#">MyFlatSubnet</a>	192.168.100.0/24	Yes	No	Active	UP	


Each row in the table is preceded by a checkbox. The table also indicates 'Displaying 2 Items' at the top and bottom.

### Create Network ✕

**Network** Subnet Subnet Details

**Network Name**  
 

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.


**Enable Admin State** 


**Create Subnet**

### Create Network ✕

Network **Subnet** Subnet Details

**Subnet Name**

**Network Address** 

**Gateway IP** 

**Disable Gateway**

Creates a subnet associated with the network. You need to enter a valid "Network Address" and "Gateway IP". If you did not enter the "Gateway IP", the first value of a network will be assigned by default. If you do not want gateway please check the "Disable Gateway" checkbox. Advanced configuration is available by clicking on the "Subnet Details" tab.

## Create Network ✕

Network Subnet **Subnet Details**

**Enable DHCP** Specify additional attributes for the subnet.

**Allocation Pools** ⓘ

192.168.204.50,192.168.204.99  
192.168.204.200,192.168.204.253

**DNS Name Servers** ⓘ

8.8.8.8  
8.8.4.4

**Host Routes** ⓘ

Cancel « Back **Create**



Project / Network / Networks

## Networks

Name =  Filter [+ Create Network](#) [Delete Networks](#)

Displaying 3 items

<input type="checkbox"/>	Name	Subnets Associated	Shared	External	Status	Admin State	Actions
<input type="checkbox"/>	<a href="#">MyOtherUserNetwork</a>	<b>MyOtherUserSubnet</b> 192.168.204.0/24	No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	<a href="#">MyUserNetwork</a>		No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	<a href="#">MyFlatNetwork</a>	<b>MyFlatSubnet</b> 192.168.100.0/24	Yes	No	Active	UP	<a href="#">Create Subnet</a> <a href="#">Delete Network</a>

Displaying 3 items

openstack Default • admin

Project Admin Overview Compute Network **Networks**

Admin / Network / Networks

## Networks

Project =  Filter [+ Create Network](#) [Delete Networks](#)

Displaying 5 items

<input type="checkbox"/>	Project	Network Name	Subnets Associated	DHCP Agents	Shared	External	Status	Admin State	Actions
<input type="checkbox"/>	demo	<a href="#">MyOtherUserNetwork</a>	<b>MyOtherUserSubnet</b> 192.168.204.0/24	1	No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	demo	<a href="#">MyUserNetwork</a>		0	No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	admin	<a href="#">MyVLANNetwork2</a>		0	No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	admin	<a href="#">MyVLANNetwork</a>		0	No	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>
<input type="checkbox"/>	admin	<a href="#">MyFlatNetwork</a>	<b>MyFlatSubnet</b> 192.168.100.0/24	1	Yes	No	Active	UP	<a href="#">Edit Network</a> <input type="button" value="v"/>

Displaying 5 items

Admin / Network / Networks / MyVLANNetwork

# MyVLANNetwork

Edit Network ▾

Overview Subnets Ports DHCP Agents

**Name** MyVLANNetwork  
**ID** b2ca3d41-c79c-416a-8e86-0bb01060ddec  
**Project ID** 877f949397ad428cbeaac4e5123bad83  
**Status** Active  
**Admin State** UP  
**Shared** No  
**External Network** No  
**MTU** 1500  
**Provider Network** Network Type: vlan  
Physical Network: physnet1  
Segmentation ID: 300

Admin / Network / Networks / MyVLANNetwork

# MyVLANNetwork

Edit Network ▾

Overview Subnets Ports DHCP Agents

## Subnets

Filter

Name	CIDR	IP Version	Gateway IP	Used IPs	Free IPs	Actions
No items to display.						

## Create Subnet ✕

**Subnet**   Subnet Details

**Subnet Name**

Create a subnet associated with the network. Advanced configuration is available by clicking on the "Subnet Details" tab.

**Network Address** ⓘ

**Gateway IP** ⓘ

**Disable Gateway**

## Create Subnet ✕

Subnet **Subnet Details**

**Enable DHCP** Specify additional attributes for the subnet.

**Allocation Pools** ⓘ

**DNS Name Servers** ⓘ

8.8.8.8  
8.8.4.4

**Host Routes** ⓘ

Cancel « Back Create

Admin / Network / Networks / MyVLANNetwork

## MyVLANNetwork Edit Network ▾

Overview **Subnets** Ports DHCP Agents

Subnets Filter

Displaying 1 item

<input type="checkbox"/>	Name	CIDR	IP Version	Gateway IP	Used IPs	Free IPs	Actions
<input type="checkbox"/>	MyVLANSubnet	192.168.206.0/24	IPv4	192.168.206.1	1	252	Edit Subnet ▾

Displaying 1 item

```
root@controller01:~# openstack subnet pool create \  
> --pool-prefix 172.31.0.0/16 MySubnetPool
```

Field	Value
address_scope_id	None
created_at	2018-03-07T13:18:22Z
default_prefixlen	8
default_quota	None
description	
id	e49703d8-27f4-4a16-9bf4-91a6cf00fff3
ip_version	4
is_default	False
max_prefixlen	32
min_prefixlen	8
name	MySubnetPool
prefixes	172.31.0.0/16
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	0
shared	False
tags	
updated_at	2018-03-07T13:18:22Z

```
root@controller01:~# openstack subnet create \  
> --subnet-pool MySubnetPool \  
> --prefix-length 28 \  
> --network MyVLANNetwork2 \  
> MySubnetFromPool
```

Field	Value
allocation_pools	172.31.0.50-172.31.0.62
cidr	172.31.0.48/28
created_at	2018-03-07T15:20:03Z
description	
dns_nameservers	
enable_dhcp	True
gateway_ip	172.31.0.49
host_routes	
id	da20b588-f663-4c8a-a32a-07fd8f336b5a
ip_version	4
ipv6_address_mode	None
ipv6_ra_mode	None
name	MySubnetFromPool
network_id	e01ca743-607c-4a94-9176-b572a46fba84
prefixlen	28
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	0
segment_id	None
service_types	
subnetpool_id	e49703d8-27f4-4a16-9bf4-91a6cf00fff3
tags	
updated_at	2018-03-07T15:20:03Z
use_default_subnet_pool	None

```

root@controller01:~# openstack subnet create \
> --use-default-subnet-pool \
> --network MyVLANNetwork2 \
> MySubnetFromDefaultPool

```

Field	Value
allocation_pools	172.31.0.66-172.31.0.78
cidr	172.31.0.64/28
created_at	2018-03-07T15:46:41Z
description	
dns_nameservers	
enable_dhcp	True
gateway_ip	172.31.0.65
host_routes	
id	918d11df-aad8-4234-9f7f-1e927a6b9238
ip_version	4
ipv6_address_mode	None
ipv6_ra_mode	None
name	MySubnetFromDefaultPool
network_id	e01ca743-607c-4a94-9176-b572a46fba84
prefixlen	None
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	0
segment_id	None
service_types	
subnetpool_id	e49703d8-27f4-4a16-9bf4-91a6cf00fff3
tags	
updated_at	2018-03-07T15:46:41Z
use_default_subnet_pool	True

```

root@controller01:~# openstack port list

```

ID	Name	MAC Address	Fixed IP Addresses	Status
1f48a8f5-<snip>-91fd82cce7c1		fa:16:3e:00:95:55	ip_address='192.168.100.2', subnet_id='63eaa79b-8129-4fc4-a783-cc7ba917d462'	ACTIVE
5a962785-<snip>-377415cbfdcf		fa:16:3e:85:64:17	ip_address='192.168.206.2', subnet_id='9cb3e07c-cc91-44c4-b8be-082043720db1'	ACTIVE
603d3937-<snip>-ca2af1dea42e		fa:16:3e:be:12:f4	ip_address='192.168.204.200', subnet_id='6cffff42-0366-447f-89ef-5bad385322ff'	ACTIVE

```

root@controller01:~# openstack port show 1f48a8f5-10d5-4985-9ff2-91fd82cce7c1
+-----+-----+
| Field                | Value                |
+-----+-----+
| admin_state_up       | UP                   |
| allowed_address_pairs |                      |
| binding_host_id      | book-controller01   |
| binding_profile       |                      |
| binding_vif_details  | port_filter='True'  |
| binding_vif_type     | bridge              |
| binding_vnic_type    | normal              |
| created_at           | 2018-01-15T01:22:51Z |
| data_plane_status    | None                 |
| description          |                      |
| device_id            | dhcpa6f16a08-9242-5c9a-85e6-61f4c10cded7-d51943ef-8061-4bdb-b684-8a7d2b7ce73b |
| device_owner         | network:dhcp        |
| dns_assignment       | None                 |
| dns_name             | None                 |
| extra_dhcp_opts      |                      |
| fixed_ips            | ip_address='192.168.100.2', subnet_id='63eaa79b-8129-4fc4-a783-cc7ba917d462' |
| id                   | 1f48a8f5-10d5-4985-9ff2-91fd82cce7c1 |
| ip_address           | None                 |
| mac_address          | fa:16:3e:d0:95:55   |
| name                 |                      |
| network_id           | d51943ef-8061-4bdb-b684-8a7d2b7ce73b |
| option_name          | None                 |
| option_value         | None                 |
| port_security_enabled | False                |
| project_id           | 877f949397ad428cbeaac4e5123bad83 |
| qos_policy_id        | None                 |
| revision_number      | 5                    |
| security_group_ids   |                      |
| status               | ACTIVE               |
| subnet_id            | None                 |
| tags                 |                      |
| trunk_details        | None                 |
| updated_at           | 2018-01-15T01:23:00Z |
+-----+-----+

```

```

root@controller01:~# ip netns exec qdhcp-d51943ef-8061-4bdb-b684-8a7d2b7ce73b ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: ns-1f48a8f5-10@if8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:d0:95:55 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.100.2/24 brd 192.168.100.255 scope global ns-1f48a8f5-10
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fed0:9555/64 scope link
        valid_lft forever preferred_lft forever

```



```
root@controller01:~# openstack port show 1f48a8f5-10d5-4985-9ff2-91fd82cce7c1 -c id -c mac_address
```

Field	Value
id	1f48a8f5-10d5-4985-9ff2-91fd82cce7c1
mac_address	fa:16:3e:d0:95:55

# Chapter 07: Attaching Instances to Networks

```
root@controller01:~# ip netns list
qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 (id: 1)
qdhcp-7745a4a9-68a4-444e-a5ff-f9439e3aac6c (id: 0)
```

```
root@controller01:~# openstack network list
```

ID	Name	Subnets
03327707-c369-4bd7-bd71-a42d9bcf49b8	MyVLANNetwork	02013907-1a5f-493f-8ece-ee1ee9e44afb
7745a4a9-68a4-444e-a5ff-f9439e3aac6c	MyFlatNetwork	c43179e1-8bbb-48d1-a486-63d048e78367

```
root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: ns-6c15d7b8-87@if74: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:ad:59:b9 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.206.2/24 brd 192.168.206.255 scope global ns-6c15d7b8-87
        valid_lft forever preferred_lft forever
    inet 169.254.169.254/16 brd 169.254.255.255 scope global ns-6c15d7b8-87
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fead:59b9/64 scope link
        valid_lft forever preferred_lft forever
```

```
root@controller01:~# brctl show
bridge name      bridge id        STP enabled  interfaces
brq03327707-c3   8000.000c291124cb  no          eth2.300
                                                         tap6c15d7b8-87
brq7745a4a9-68   8000.000c291124cb  no          eth2
                                                         tapd1848f67-2e
```

```
root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 tcpdump -i any -ne port 67 or port 68
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type LINUX_SLL (Linux cooked), capture size 262144 bytes
12:04:40.466828 B fa:16:3e:27:c5:d2 ethertype IPv4 (0x0800), length 344: 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from fa:16:3e:27:c5:d2, length 380
12:04:40.467624 Out fa:16:3e:ad:59:b9 ethertype IPv4 (0x0800), length 377: 192.168.206.2.67 > 192.168.206.12.68: BOOTP/DHCP, Reply, length 333
12:04:40.473332 B fa:16:3e:27:c5:d2 ethertype IPv4 (0x0800), length 346: 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from fa:16:3e:27:c5:d2, length 382
12:04:40.558296 Out fa:16:3e:ad:59:b9 ethertype IPv4 (0x0800), length 398: 192.168.206.2.67 > 192.168.206.12.68: BOOTP/DHCP, Reply, length 354
```

```
root@compute01:~# tcpdump -i tap6c15d7b8-87 -ne port 67 or port 68
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on tap6c15d7b8-87, link-type EN10MB (Ethernet), capture size 262144 bytes
12:04:40.466317 fa:16:3e:27:c5:d2 > ff:ff:ff:ff:ff:ff, ethertype IPv4 (0x0800), length 342: 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from fa:16:3e:27:c5:d2, length 380
12:04:40.468062 fa:16:3e:ad:59:b9 > fa:16:3e:27:c5:d2, ethertype IPv4 (0x0800), length 375: 192.168.206.2.67 > 192.168.206.12.68: BOOTP/DHCP, Reply, length 333
12:04:40.473176 fa:16:3e:27:c5:d2 > ff:ff:ff:ff:ff:ff, ethertype IPv4 (0x0800), length 344: 0.0.0.0.68 > 255.255.255.255.67: BOOTP/DHCP, Request from fa:16:3e:27:c5:d2, length 382
12:04:40.558776 fa:16:3e:ad:59:b9 > fa:16:3e:27:c5:d2, ethertype IPv4 (0x0800), length 396: 192.168.206.2.67 > 192.168.206.12.68: BOOTP/DHCP, Reply, length 354
```

```
TIME: 2018-03-16 12:08:28.250
IP: 0.0.0.0 (fa:16:3e:27:c5:d2) > 255.255.255.255 (ff:ff:ff:ff:ff:ff)
OP: 1 (BOOTPREQUEST)
HTYPE: 1 (Ethernet)
HLEN: 6
HOPS: 0
XID: 1af16110
SECS: 0
FLAGS: 0
CIADDR: 0.0.0.0
YIADDR: 0.0.0.0
SIADDR: 0.0.0.0
GIADDR: 0.0.0.0
CHADDR: fa:16:3e:27:c5:d2:00:00:00:00:00:00:00:00:00:00
SNAME: .
FNAME: .
OPTION: 53 ( 1) DHCP message type      1 (DHCPDISCOVER)
OPTION: 61 ( 7) Client-identifier      01:fa:16:3e:27:c5:d2
OPTION: 57 ( 2) Maximum DHCP message size 576
OPTION: 55 ( 9) Parameter Request List  1 (Subnet mask)
           3 (Routers)
           6 (DNS server)
           12 (Host name)
           15 (Domainname)
           26 (Interface MTU)
           28 (Broadcast address)
           42 (NTP servers)
           121 (Classless Static Route)

OPTION: 60 ( 12) Vendor class identifier  udhcp 1.23.2
OPTION: 12 ( 13) Host name               testinstance1
-----
```

```
TIME: 2018-03-16 12:08:28.251
  IP: 192.168.206.2 (fa:16:3e:ad:59:b9) > 192.168.206.12 (fa:16:3e:27:c5:d2)
  OP: 2 (BOOTPREPLY)
HTYPE: 1 (Ethernet)
  HLEN: 6
  HOPS: 0
  XID: 1af16110
  SECS: 0
  FLAGS: 0
CIADDR: 0.0.0.0
YIADDR: 192.168.206.12
SIADDR: 192.168.206.2
GIADDR: 0.0.0.0
CHADDR: fa:16:3e:27:c5:d2:00:00:00:00:00:00:00:00:00:00:00
  SNAME: .
  FNAME: .
OPTION: 53 ( 1) DHCP message type      2 (DHCP OFFER)
OPTION: 54 ( 4) Server identifier      192.168.206.2
OPTION: 51 ( 4) IP address leasetime  86400 (24h)
OPTION: 58 ( 4) T1                     43200 (12h)
OPTION: 59 ( 4) T2                     75600 (21h)
OPTION:  1 ( 4) Subnet mask             255.255.255.0
OPTION: 28 ( 4) Broadcast address      192.168.206.255
OPTION:  6 ( 4) DNS server              192.168.206.2
OPTION: 15 (19) Domainname              learningneutron.com
OPTION:  3 ( 4) Routers                  192.168.206.1
OPTION: 121 (14) Classless Static Route 20a9fea9fec0a8ce .....
                                0200c0a8ce01 .....
OPTION: 26 ( 2) Interface MTU          1500
-----
```

```
TIME: 2018-03-16 12:08:28.251
  IP: 0.0.0.0 (fa:16:3e:27:c5:d2) > 255.255.255.255 (ff:ff:ff:ff:ff:ff)
  OP: 1 (BOOTPREQUEST)
HTYPE: 1 (Ethernet)
HLEN: 6
HOPS: 0
  XID: 1af16110
  SECS: 0
  FLAGS: 0
CIADDR: 0.0.0.0
YIADDR: 0.0.0.0
SIADDR: 0.0.0.0
GIADDR: 0.0.0.0
CHADDR: fa:16:3e:27:c5:d2:00:00:00:00:00:00:00:00:00:00:00
  SNAME: .
  FNAME: .
OPTION: 53 ( 1) DHCP message type          3 (DHCPREQUEST)
OPTION: 61 ( 7) Client-identifier          01:fa:16:3e:27:c5:d2
OPTION: 50 ( 4) Request IP address         192.168.206.12
OPTION: 54 ( 4) Server identifier          192.168.206.2
OPTION: 57 ( 2) Maximum DHCP message size 576
OPTION: 55 ( 9) Parameter Request List    1 (Subnet mask)
                                           3 (Routers)
                                           6 (DNS server)
                                           12 (Host name)
                                           15 (Domainname)
                                           26 (Interface MTU)
                                           28 (Broadcast address)
                                           42 (NTP servers)
                                           121 (Classless Static Route)

OPTION: 60 (12) Vendor class identifier    udhcp 1.23.2
OPTION: 12 (13) Host name                  testinstance1
-----
```

```

TIME: 2018-03-16 12:08:28.251
IP: 192.168.206.2 (fa:16:3e:ad:59:b9) > 192.168.206.12 (fa:16:3e:27:c5:d2)
OP: 2 (BOOTPREPLY)
HTYPE: 1 (Ethernet)
HLEN: 6
HOPS: 0
XID: 1af16110
SECS: 0
FLAGS: 0
CIADDR: 0.0.0.0
YIADDR: 192.168.206.12
SIADDR: 192.168.206.2
GIADDR: 0.0.0.0
CHADDR: fa:16:3e:27:c5:d2:00:00:00:00:00:00:00:00:00:00
SNAME: .
FNAME: .
OPTION: 53 ( 1) DHCP message type      5 (DHCPACK)
OPTION: 54 ( 4) Server identifier      192.168.206.2
OPTION: 51 ( 4) IP address leasetime   86400 (24h)
OPTION: 58 ( 4) T1                      43200 (12h)
OPTION: 59 ( 4) T2                      75600 (21h)
OPTION: 1 ( 4) Subnet mask              255.255.255.0
OPTION: 28 ( 4) Broadcast address      192.168.206.255
OPTION: 6 ( 4) DNS server               192.168.206.2
OPTION: 15 ( 19) Domainname             learningneutron.com
OPTION: 12 ( 19) Host name              host-192-168-206-12
OPTION: 3 ( 4) Routers                  192.168.206.1
OPTION: 121 ( 14) Classless Static Route 20a9fea9fec0a8ce .....
                                0200c0a8ce01 .....
OPTION: 26 ( 2) Interface MTU           1500
-----

```

```

root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 netstat -ntlp
Active Internet connections (only servers)

```

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State	PID/Program name
tcp	0	0	0.0.0.0:80	0.0.0.0:*	LISTEN	3555/haproxy
tcp	0	0	192.168.206.2:53	0.0.0.0:*	LISTEN	3793/dnsmasq
tcp	0	0	169.254.169.254:53	0.0.0.0:*	LISTEN	3793/dnsmasq
tcp6	0	0	fe80::f816:3eff:fead:53 ::*		LISTEN	3793/dnsmasq

```

root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 ps 3555

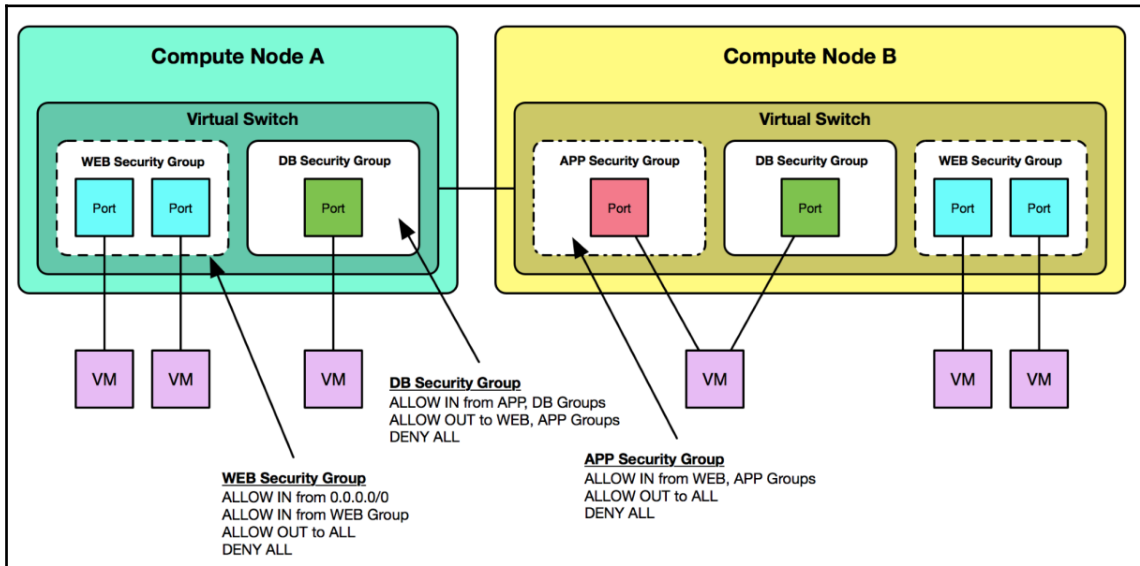
```

PID	TTY	STAT	TIME	COMMAND
3555	?	Ss	0:01	haproxy -f /var/lib/neutron/ns-metadata-proxy/03327707-c369-4bd7-bd71-a42d9bcf49b8.conf

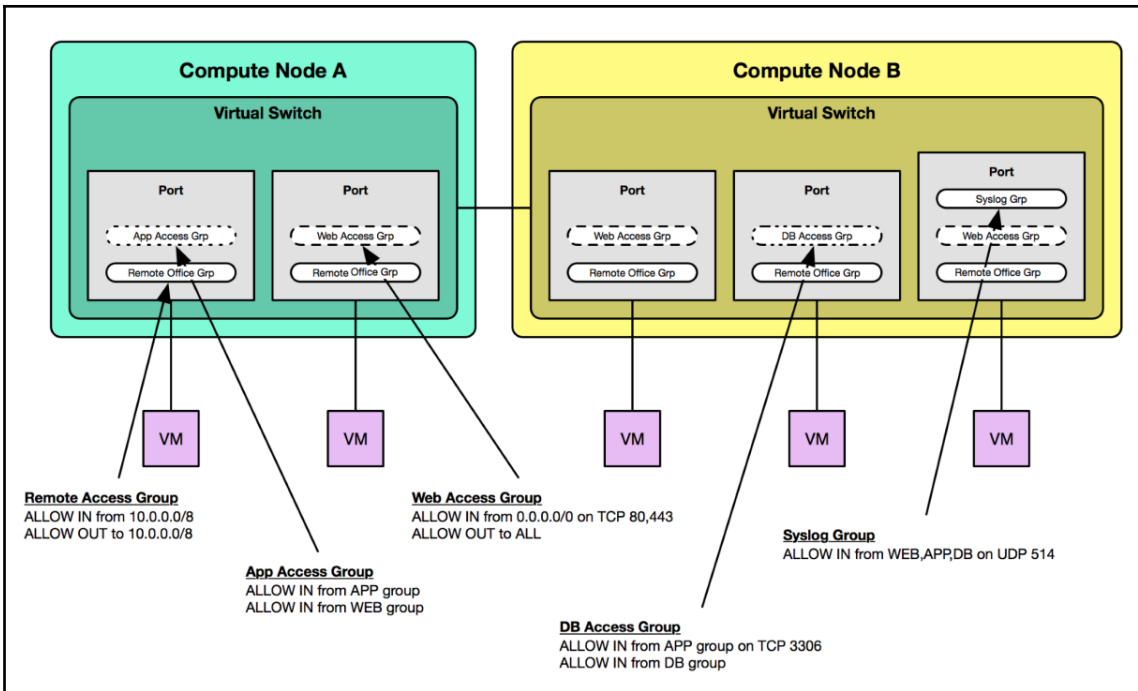
```
root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ns-6c15d7b8-87@if7: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:ad:59:b9 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.206.2/24 brd 192.168.206.255 scope global ns-6c15d7b8-87
        valid_lft forever preferred_lft forever
    inet 169.254.169.254/16 brd 169.254.255.255 scope global ns-6c15d7b8-87
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fead:59b9/64 scope link
        valid_lft forever preferred_lft forever
```

```
$ ip r
169.254.169.254 via 192.168.206.2 dev eth0
192.168.206.0/24 dev eth0 src 192.168.206.12
```

# Chapter 08: Managing Security Groups







```
root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 curl http://192.168.206.6/ --connect-timeout 5
curl: (28) Connection timed out after 5001 milliseconds
```

```
root@controller01:~# openstack security group list
```

ID	Name	Description	Project
1e82757a-848b-47de-a528-e8f8fb001df9	default	Default security group	fddf005c8b854dad90aaf8cf861c9598
25094e89-69e1-46af-9af4-588885714da9	default	Default security group	d2aefac55d5040e3b7d32a469f110d50
d8f1b1ec-bc06-4474-be55-436dce9797ea	WEB_SERVERS	WEB_SERVERS	9233b6b4f6a54386af63c0a7b8f043c2
fae5da02-5d96-43df-aebf-bf0210d353bc	default	Default security group	9233b6b4f6a54386af63c0a7b8f043c2

```

root@controller01:~# openstack security group rule create --protocol tcp --dst-port 80 --remote-ip 0.0.0.0/0 WEB_SERVERS
+-----+-----+
| Field          | Value                               |
+-----+-----+
| created_at     | 2018-03-23T14:54:27Z               |
| description    |                                       |
| direction      | ingress                             |
| ether_type     | IPv4                                 |
| id             | 9240f5af-e55b-4e5d-bef4-735eb583575c |
| name           | None                                 |
| port_range_max | 80                                   |
| port_range_min | 80                                   |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2   |
| protocol       | tcp                                  |
| remote_group_id | None                                 |
| remote_ip_prefix | 0.0.0.0/0                           |
| revision_number | 0                                    |
| security_group_id | d8f1b1ec-bc06-4474-be55-436dce9797ea |
| updated_at     | 2018-03-23T14:54:27Z               |
+-----+-----+

root@controller01:~# openstack security group rule create --protocol tcp --dst-port 443 --remote-ip 0.0.0.0/0 WEB_SERVERS
+-----+-----+
| Field          | Value                               |
+-----+-----+
| created_at     | 2018-03-23T14:54:46Z               |
| description    |                                       |
| direction      | ingress                             |
| ether_type     | IPv4                                 |
| id             | 37abc0fb-4340-46e8-880e-a9e6de5b01fd |
| name           | None                                 |
| port_range_max | 443                                  |
| port_range_min | 443                                  |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2   |
| protocol       | tcp                                  |
| remote_group_id | None                                 |
| remote_ip_prefix | 0.0.0.0/0                           |
| revision_number | 0                                    |
| security_group_id | d8f1b1ec-bc06-4474-be55-436dce9797ea |
| updated_at     | 2018-03-23T14:54:46Z               |
+-----+-----+

```

```

root@controller01:~# openstack server add security group WEB1 WEB_SERVERS
root@controller01:~# openstack server show WEB1

```

Field	Value
OS-DCF:diskConfig	MANUAL
OS-EXT-AZ:availability_zone	nova
OS-EXT-SRV-ATTR:host	compute01
OS-EXT-SRV-ATTR:hypervisor_hostname	compute01.learningneutron.com
OS-EXT-SRV-ATTR:instance_name	instance-00000014
OS-EXT-STS:power_state	Running
OS-EXT-STS:task_state	None
OS-EXT-STS:vm_state	active
OS-SRV-USG:launched_at	2018-03-23T15:06:40.000000
OS-SRV-USG:terminated_at	None
accessIPv4	
accessIPv6	
addresses	MyVLANNetwork=192.168.206.6
config_drive	
created	2018-03-23T15:06:10Z
flavor	small (280d07fb-b932-464a-9e26-817522286be7)
hostId	e1e220df487a0b933fb3ec56bef96d6b8ca8b3240f56ca76435b733d
id	e890bc04-0b6b-42ba-bc8c-1d4288ac86ed
image	ubuntu-xenial-16.04 (ffdb76f0-6cce-4d79-99a5-ccc6e76d530a)
key_name	james
name	WEB1
progress	0
project_id	9233b6b4f6a54386af63c0a7b8f043c2
properties	
security_groups	name='WEB_SERVERS' name='default'
status	ACTIVE
updated	2018-03-23T15:06:40Z
user_id	8a679d8b7b574e54a5cfe02c422bbe68
volumes_attached	

```

root@controller01:~# ip netns exec qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 curl http://192.168.206.6/ --connect-timeout 5
Hello World! I am WEB1!

```

```

root@compute01:~# iptables-save
# Generated by iptables-save v1.6.0 on Fri Mar 23 15:36:48 2018
*raw
:PREROUTING ACCEPT [62:16623]
:OUTPUT ACCEPT [57:36069]
:neutron-linuxbri-OUTPUT - [0:0]
:neutron-linuxbri-PREROUTING - [0:0]
-A PREROUTING -j neutron-linuxbri-PREROUTING
-A OUTPUT -j neutron-linuxbri-OUTPUT
-A neutron-linuxbri-PREROUTING -m physdev --physdev-in brq03327707-c3 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
-A neutron-linuxbri-PREROUTING -i brq03327707-c3 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
-A neutron-linuxbri-PREROUTING -m physdev --physdev-in tapadcc4b66-c1 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
COMMIT
# Completed on Fri Mar 23 15:36:48 2018
# Generated by iptables-save v1.6.0 on Fri Mar 23 15:36:48 2018
*filter
:INPUT ACCEPT [63:16675]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [64:38153]
:neutron-filter-top - [0:0]
:neutron-linuxbri-FORWARD - [0:0]
:neutron-linuxbri-INPUT - [0:0]
:neutron-linuxbri-OUTPUT - [0:0]
:neutron-linuxbri-iadcc4b66-c - [0:0]
:neutron-linuxbri-local - [0:0]
:neutron-linuxbri-oadcc4b66-c - [0:0]
:neutron-linuxbri-sadcc4b66-c - [0:0]
:neutron-linuxbri-sg-chain - [0:0]
:neutron-linuxbri-sg-fallback - [0:0]
-A INPUT -j neutron-linuxbri-INPUT
-A FORWARD -j neutron-filter-top
-A FORWARD -j neutron-linuxbri-FORWARD
-A OUTPUT -j neutron-filter-top
-A OUTPUT -j neutron-linuxbri-OUTPUT
-A neutron-filter-top -j neutron-linuxbri-local
-A neutron-linuxbri-FORWARD -m physdev --physdev-out tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
-A neutron-linuxbri-FORWARD -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
-A neutron-linuxbri-INPUT -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-oadcc4b66-c
-A neutron-linuxbri-iadcc4b66-c -m state --state RELATED,ESTABLISHED -j RETURN
-A neutron-linuxbri-iadcc4b66-c -d 192.168.206.6/32 -p udp -m udp --sport 67 --dport 68 -j RETURN
-A neutron-linuxbri-iadcc4b66-c -d 255.255.255.255/32 -p udp -m udp --sport 67 --dport 68 -j RETURN
-A neutron-linuxbri-iadcc4b66-c -p tcp -m tcp --dport 443 -j RETURN
-A neutron-linuxbri-iadcc4b66-c -p tcp -m tcp --dport 80 -j RETURN
-A neutron-linuxbri-iadcc4b66-c -m set --match-set NIPv4fae5da02-5d96-43df-aebf- src -j RETURN
-A neutron-linuxbri-iadcc4b66-c -p icmp -j RETURN
-A neutron-linuxbri-iadcc4b66-c -p tcp -m tcp --dport 22 -j RETURN
-A neutron-linuxbri-iadcc4b66-c -m state --state INVALID -j DROP
-A neutron-linuxbri-iadcc4b66-c -j neutron-linuxbri-sg-fallback
-A neutron-linuxbri-oadcc4b66-c -s 0.0.0.0/32 -d 255.255.255.255/32 -p udp -m udp --sport 68 --dport 67 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j neutron-linuxbri-sadcc4b66-c
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 68 --dport 67 -m comment --comment "Allow DHCP client traffic." -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 67 --dport 68 -m comment --comment "Prevent DHCP Spoofing by VM." -j DROP
-A neutron-linuxbri-oadcc4b66-c -m state --state RELATED,ESTABLISHED -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j RETURN
-A neutron-linuxbri-oadcc4b66-c -m state --state INVALID -j DROP
-A neutron-linuxbri-oadcc4b66-c -m comment --comment "Send unmatched traffic to the fallback chain." -j neutron-linuxbri-sg-fallback
-A neutron-linuxbri-sadcc4b66-c -s 192.168.206.6/32 -m mac --mac-source FA:16:3E:DC:D2:AB -j RETURN
-A neutron-linuxbri-sadcc4b66-c -m comment --comment "Drop traffic without an IP/MAC allow rule." -j DROP
-A neutron-linuxbri-sg-chain -m physdev --physdev-out tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-iadcc4b66-c
-A neutron-linuxbri-sg-chain -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-oadcc4b66-c
-A neutron-linuxbri-sg-chain -j ACCEPT
-A neutron-linuxbri-sg-fallback -m comment --comment "Default drop rule for unmatched traffic." -j DROP
COMMIT
# Completed on Fri Mar 23 15:36:48 2018

```

```
*raw
:PREROUTING ACCEPT [62:16623]
:OUTPUT ACCEPT [57:36069]
:neutron-linuxbri-OUTPUT - [0:0]
:neutron-linuxbri-PREROUTING - [0:0]
-A PREROUTING -j neutron-linuxbri-PREROUTING
-A OUTPUT -j neutron-linuxbri-OUTPUT
-A neutron-linuxbri-PREROUTING -m physdev --physdev-in brq03327707-c3 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
-A neutron-linuxbri-PREROUTING -i brq03327707-c3 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
-A neutron-linuxbri-PREROUTING -m physdev --physdev-in tapadcc4b66-c1 -m comment --comment "Set zone for dcc4b66-c1" -j CT --zone 1
```

```
-A neutron-linuxbri-oadcc4b66-c -s 0.0.0.0/32 -d 255.255.255.255/32 -p udp -m udp --sport 68 --dport 67 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j neutron-linuxbri-sadcc4b66-c
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 68 --dport 67 -m comment --comment "Allow DHCP client traffic." -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 67 --dport 68 -m comment --comment "Prevent DHCP Spoofing by VM." -j DROP
-A neutron-linuxbri-oadcc4b66-c -m state --state RELATED,ESTABLISHED -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j RETURN
-A neutron-linuxbri-oadcc4b66-c -m state --state INVALID -j DROP
-A neutron-linuxbri-oadcc4b66-c -m comment --comment "Send unmatched traffic to the fallback chain." -j neutron-linuxbri-sg-fallback
```

```
-A FORWARD -j neutron-filter-top
-A FORWARD -j neutron-linuxbri-FORWARD
...
-A neutron-filter-top -j neutron-linuxbri-local
-A neutron-linuxbri-FORWARD -m physdev --physdev-out tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
-A neutron-linuxbri-FORWARD -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
```

```
-A neutron-linuxbri-FORWARD -m physdev --physdev-out tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
-A neutron-linuxbri-FORWARD -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-sg-chain
```

```
-A neutron-linuxbri-sg-chain -m physdev --physdev-out tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-oadcc4b66-c
-A neutron-linuxbri-sg-chain -m physdev --physdev-in tapadcc4b66-c1 --physdev-is-bridged -j neutron-linuxbri-oadcc4b66-c
-A neutron-linuxbri-sg-chain -j ACCEPT
```

```
-A neutron-linuxbri-oadcc4b66-c -m state --state RELATED,ESTABLISHED -j RETURN
-A neutron-linuxbri-oadcc4b66-c -d 192.168.206.6/32 -p udp -m udp --sport 67 --dport 68 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -d 255.255.255.255/32 -p udp -m udp --sport 67 --dport 68 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p tcp -m tcp --dport 443 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p tcp -m tcp --dport 80 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -m set --match-set NIPv4fae5da02-5d96-43df-aebf- src -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p icmp -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p tcp -m tcp --dport 22 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -m state --state INVALID -j DROP
-A neutron-linuxbri-oadcc4b66-c -j neutron-linuxbri-sg-fallback
```

```
-A neutron-linuxbri-oadcc4b66-c -s 0.0.0.0/32 -d 255.255.255.255/32 -p udp -m udp --sport 68 --dport 67 -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j neutron-linuxbri-sadcc4b66-c
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 68 --dport 67 -m comment --comment "Allow DHCP client traffic." -j RETURN
-A neutron-linuxbri-oadcc4b66-c -p udp -m udp --sport 67 --dport 68 -m comment --comment "Prevent DHCP Spoofing by VM." -j DROP
-A neutron-linuxbri-oadcc4b66-c -m state --state RELATED,ESTABLISHED -j RETURN
-A neutron-linuxbri-oadcc4b66-c -j RETURN
-A neutron-linuxbri-oadcc4b66-c -m state --state INVALID -j DROP
-A neutron-linuxbri-oadcc4b66-c -m comment --comment "Send unmatched traffic to the fallback chain." -j neutron-linuxbri-sg-fallback
```

```
-A neutron-linuxbri-sadcc4b66-c -s 192.168.206.6/32 -m mac --mac-source FA:16:3E:DC:D2:AB -j RETURN  
-A neutron-linuxbri-sadcc4b66-c -m comment --comment "Drop traffic without an IP/MAC allow rule." -j DROP
```

The screenshot shows the OpenStack dashboard interface. The left sidebar has a 'Network' menu item highlighted with a red box. The main content area is titled 'Security Groups' and shows a table with two items. The table has columns for Name, Security Group ID, Description, and Actions.

Name	Security Group ID	Description	Actions
WEB_SERVERS	d8f1b1ec-bc06-4474-be55-436dce9797ea	WEB_SERVERS	Manage Rules
default	fae5da02-5d96-43df-aebf-bf0210d353bc	Default security group	Manage Rules

The 'Create Security Group' dialog box is shown. It has a 'Name' field with the value 'SQL\_SERVER' and an empty 'Description' text area. To the right, there is a 'Description:' section with explanatory text. At the bottom, there are 'Cancel' and 'Create Security Group' buttons.

**Name \***  
SQL\_SERVER

**Description**

**Description:**  
Security groups are sets of IP filter rules that are applied to network interfaces of a VM. After the security group is created, you can add rules to the security group.

Cancel Create Security Group

Project / Network / Security Groups

## Security Groups

Filter

Displaying 3 items

<input type="checkbox"/>	Name	Security Group ID	Description	Actions
<input type="checkbox"/>	SQL_SERVER	f0f0657a-6e2c-4e51-86fc-e03163529a4e		<input type="button" value="Manage Rules"/> ▾
<input type="checkbox"/>	WEB_SERVERS	d8f1b1ec-bc06-4474-be55-436dce9797ea	WEB_SERVERS	<input type="button" value="Manage Rules"/> ▾
<input type="checkbox"/>	default	fae5da02-5d96-43df-aebf-bf0210d353bc	Default security group	<input type="button" value="Manage Rules"/>

Displaying 3 items

Project / Network / Security Groups / Manage Security Group Rul...

## Manage Security Group Rules: SQL\_SERVER (f0f0657a-6e2c-4e51-86fc-e03163529a4e)

Displaying 2 items

<input type="checkbox"/>	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
<input type="checkbox"/>	Egress	IPv4	Any	Any	0.0.0.0/0	-	<input type="button" value="Delete Rule"/>
<input type="checkbox"/>	Egress	IPv6	Any	Any	:::0	-	<input type="button" value="Delete Rule"/>

Displaying 2 items

## Add Rule ✕

**Rule \***

Custom TCP Rule ▼

**Direction**

Ingress ▼

**Open Port \***

Port ▼

**Port ⓘ**

3306

**Remote \* ⓘ**

CIDR ▼

**CIDR ⓘ**

0.0.0.0/0

**Ether Type**

IPv4

**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



Project / Compute / Instances

## Instances

Instance ID =  Filter Launch Instance Delete Instances More Actions ▾

Displaying 1 item

<input type="checkbox"/>	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/>	WEB1	ubuntu-xenial-16.04	192.168.206.6	small	james	Active	nova	None	Running	2 days, 8 hours	Create Snapshot ▾ Attach Interface Detach Interface Edit Instance Update Metadata <b>Edit Security Groups</b> Console

Displaying 1 item

## Edit Instance

Information \* **Security Groups**

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

All Security Groups	Filter	Q	Instance Security Groups	Filter	Q
SQL_SERVER			WEB_SERVERS		
			default		

Cancel Save

## Edit Instance ✕

Information \* **Security Groups**

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

### All Security Groups

Filter

No security groups found.

### Instance Security Groups

Filter

WEB_SERVERS	-
default	-
SQL_SERVER	-

```
root@controller01:~# openstack extension list --network
```

Name	Alias	Description
Default Subnetpools	default-subnetpools	Provides ability to mark and use a subnetpool
Network IP Availability	network-ip-availability	Provides IP availability data for each network
Network Availability Zone	network_availability_zone	Availability zone support for network.
Network MTU (writable)	net-mtu-writable	Provides a writable MTU attribute for a network
Port Binding	binding	Expose port bindings of a virtual port to external
agent	agent	The agent management extension.
Subnet Allocation	subnet_allocation	Enables allocation of subnets from a subnet pool
DHCP Agent Scheduler	dhcp_agent_scheduler	Schedule networks among dhcp agents
Tag support	tag	Enables to set tag on resources.
Neutron external network	external-net	Adds external network attribute to network resource
Neutron Service Flavors	flavors	Flavor specification for Neutron advanced services
Network MTU	net-mtu	Provides MTU attribute for a network resource
Availability Zone	availability_zone	The availability zone extension.
Quota management support	quotas	Expose functions for quotas management per tenant
Tag support for: trunk, policy, security_group, floatingip	standard-attr-tag	Enables to set tag on resources with standard attributes
If-Match constraints based on revision_number	revision-if-match	Extension indicating that If-Match based on revision number
Provider Network	provider	Expose mapping of virtual networks to physical networks
Multi Provider Network	multi-provider	Expose mapping of virtual networks to multiple physical networks
Quota details management support	quota_details	Expose functions for quotas usage statistics
Address scope	address-scope	Address scopes extension.
Subnet service types	subnet-service-types	Provides ability to set the subnet service type
Resource timestamps	standard-attr-timestamp	Adds created_at and updated_at fields to all resources
Neutron Service Type Management	service-type	API for retrieving service providers for Neutron
Tag support for resources: subnet, subnetpool, port, router	tag-ext	Extends tag support to more L2 and L3 resources
Neutron Extra DHCP options	extra_dhcp_opt	Extra options configuration for DHCP. For example, domain-name
Resource revision numbers	standard-attr-revisions	This extension will display the revision number in the response
Pagination support	pagination	Extension that indicates that pagination is enabled
Sorting support	sorting	Extension that indicates that sorting is enabled
security-group	security-group	The security groups extension.
RBAC Policies	rbac-policies	Allows creation and modification of policies
standard-attr-description	standard-attr-description	Extension to add descriptions to standard attributes
Port Security	port-security	Provides port security
Allowed Address Pairs	allowed-address-pairs	Provides allowed address pairs
project_id field enabled	project-id	Extension that indicates that project_id field is enabled

```
root@controller01:~# openstack network create --disable-port-security NetworkWithoutPortSecurity
```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-03-26T01:14:33Z
description	
dns_domain	None
id	eaf4b54e-fe28-42a4-8cb5-e44f4e5ef452
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1450
name	NetworkWithoutPortSecurity
port_security_enabled	False
project_id	9233b6b4f6a54386af63c0a7b8f043c2
provider:network_type	vxlan
provider:physical_network	None
provider:segmentation_id	72
qos_policy_id	None
revision_number	2
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-03-26T01:14:33Z

```
root@controller01:~# openstack port create --network NetworkWithoutPortSecurity TestPort
```

Field	Value
admin_state_up	UP
allowed_address_pairs	
binding_host_id	
binding_profile	
binding_vif_details	
binding_vif_type	unbound
binding_vnic_type	normal
created_at	2018-03-26T01:16:42Z
data_plane_status	None
description	
device_id	
device_owner	
dns_assignment	None
dns_name	None
extra_dhcp_opts	
fixed_ips	
id	1848fbc7-3124-403c-b283-4db41a30f6a2
ip_address	None
mac_address	fa:16:3e:64:e5:ea
name	TestPort
network_id	eaf4b54e-fe28-42a4-8cb5-e44f4e5ef452
option_name	None
option_value	None
port_security_enabled	False
project_id	9233b6b4f6a54386af63c0a7b8f043c2
qos_policy_id	None
revision_number	2
security_group_ids	
status	DOWN
subnet_id	None
tags	
trunk_details	None
updated_at	2018-03-26T01:16:42Z

```
root@controller01:~# openstack port show TestPort -c port_security_enabled
+-----+-----+
| Field                | Value |
+-----+-----+
| port_security_enabled | False |
+-----+-----+

root@controller01:~# openstack port set --enable-port-security TestPort
root@controller01:~# openstack port show TestPort -c port_security_enabled
+-----+-----+
| Field                | Value |
+-----+-----+
| port_security_enabled | True  |
+-----+-----+
```

## Chapter 09: Role-Based Access Control

```
root@controller01:~# openstack project create --description "Project A RBAC Demo" ProjectA
+-----+-----+
| Field      | Value                               |
+-----+-----+
| description | Project A RBAC Demo                 |
| domain_id  | default                             |
| enabled    | True                                |
| id         | b013329775694d5d884fd2ce31c4e22f  |
| is_domain  | False                               |
| name       | ProjectA                            |
| parent_id  | default                             |
+-----+-----+
root@controller01:~# openstack project create --description "Project B RBAC Demo" ProjectB
+-----+-----+
| Field      | Value                               |
+-----+-----+
| description | Project B RBAC Demo                 |
| domain_id  | default                             |
| enabled    | True                                |
| id         | a228b048632140e2a9f610884fd9e27e  |
| is_domain  | False                               |
| name       | ProjectB                            |
| parent_id  | default                             |
+-----+-----+
root@controller01:~# openstack project create --description "Project C RBAC Demo" ProjectC
+-----+-----+
| Field      | Value                               |
+-----+-----+
| description | Project C RBAC Demo                 |
| domain_id  | default                             |
| enabled    | True                                |
| id         | e9cd39dc02ea470fb89ed78929fbfe4d  |
| is_domain  | False                               |
| name       | ProjectC                            |
| parent_id  | default                             |
+-----+-----+
```

```

root@controller01:~# openstack role create rbacdemo
+-----+-----+
| Field | Value |
+-----+-----+
| domain_id | None |
| id | a13e045e9d1a42f08086ced1ddd0a16a |
| name | rbacdemo |
+-----+-----+
root@controller01:~# openstack user create UserA --password secret
+-----+-----+
| Field | Value |
+-----+-----+
| domain_id | default |
| enabled | True |
| id | 50373e07321b4233bd74bfba75ab0717 |
| name | UserA |
| options | {} |
| password_expires_at | None |
+-----+-----+
root@controller01:~# openstack role add --project ProjectA --user UserA rbacdemo
root@controller01:~# openstack user create UserB --password secret
+-----+-----+
| Field | Value |
+-----+-----+
| domain_id | default |
| enabled | True |
| id | 468372bdd067435d88daf30b7e570a57 |
| name | UserB |
| options | {} |
| password_expires_at | None |
+-----+-----+
root@controller01:~# openstack role add --project ProjectB --user UserB rbacdemo
root@controller01:~# openstack user create UserC --password secret
+-----+-----+
| Field | Value |
+-----+-----+
| domain_id | default |
| enabled | True |
| id | 9153a96cdb814d91b25a227fa0aada0a |
| name | UserC |
| options | {} |
| password_expires_at | None |
+-----+-----+
root@controller01:~# openstack role add --project ProjectC --user UserC rbacdemo

```



```

root@controller01:~# source adminrc
root@controller01:~# openstack network create MySemiSharedNetwork
+-----+
| Field                | Value                                     |
+-----+-----+
| admin_state_up       | UP                                       |
| availability_zone_hints |                                           |
| availability_zones   |                                           |
| created_at           | 2018-04-05T13:04:50Z                   |
| description          |                                           |
| dns_domain           | None                                    |
| id                   | ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50 |
| ipv4_address_scope   | None                                    |
| ipv6_address_scope   | None                                    |
| is_default           | None                                    |
| is_vlan_transparent  | None                                    |
| mtu                  | 1450                                    |
| name                 | MySemiSharedNetwork                   |
| port_security_enabled | True                                    |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2     |
| provider:network_type | vxlan                                   |
| provider:physical_network | None                                  |
| provider:segmentation_id | 36                                    |
| qos_policy_id        | None                                    |
| revision_number      | 2                                       |
| router:external     | Internal                               |
| segments            | None                                    |
| shared               | False                                  |
| status               | ACTIVE                                 |
| subnets            |                                           |
| tags                 |                                           |
| updated_at          | 2018-04-05T13:04:50Z                   |
+-----+-----+

root@controller01:~# openstack --debug subnet create --subnet-range 192.168.99.0/24 --network MySemiSharedNetwork MySemiSharedSubnet
+-----+
| Field                | Value                                     |
+-----+-----+
| allocation_pools     | 192.168.99.2-192.168.99.254           |
| cidr                 | 192.168.99.0/24                       |
| created_at           | 2018-04-05T15:13:19Z                   |
| description          |                                           |
| dns_nameservers     |                                           |
| enable_dhcp          | True                                    |
| gateway_ip          | 192.168.99.1                           |
| host_routes          |                                           |
| id                   | f31a8c48-ccе7-475f-8287-0366ca74af2d |
| ip_version           | 4                                       |
| ipv6_address_mode    | None                                    |
| ipv6_ra_mode        | None                                    |
| name                 | MySemiSharedSubnet                     |
| network_id           | ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50 |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2     |
| revision_number      | 0                                       |
| segment_id          | None                                    |
| service_types        |                                           |
| subnetpool_id       | None                                    |
| tags                 |                                           |
| updated_at          | 2018-04-05T15:13:19Z                   |
| use_default_subnet_pool | None                                    |
+-----+-----+

```

```

root@controller01:~# openstack network rbac create \
> --type network \
> --action access_as_shared \
> --target-project ProjectA \
> MySemiSharedNetwork

```

Field	Value
action	access_as_shared
id	ce451cdc-abd6-41e8-973d-74b31d8e8ed4
name	None
object_id	ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50
object_type	network
project_id	9233b6b4f6a54386af63c0a7b8f043c2
target_project_id	b013329775694d5d884fd2ce31c4e22f

```

root@controller01:~# openstack network rbac list

```

ID	Object Type	Object ID
ce451cdc-abd6-41e8-973d-74b31d8e8ed4	network	ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50

```

root@controller01:~# openstack network rbac show ce451cdc-abd6-41e8-973d-74b31d8e8ed4

```

Field	Value
action	access_as_shared
id	ce451cdc-abd6-41e8-973d-74b31d8e8ed4
name	None
object_id	ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50
object_type	network
project_id	9233b6b4f6a54386af63c0a7b8f043c2
target_project_id	b013329775694d5d884fd2ce31c4e22f

```

root@controller01:~# openstack --os-project-name ProjectA --os-username UserA --os-password secreta network list

```

ID	Name	Subnets
ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50	MySemiSharedNetwork	f31a8c48-cc57-475f-8287-0366ca74af2d

```

root@controller01:~# openstack --os-project-name ProjectB --os-username UserB --os-password secreta network list
root@controller01:~# openstack --os-project-name ProjectC --os-username UserC --os-password secreta network list

```

```

openstack network create \
--provider-network-type vlan \
--provider-physical-network physnet1 \
--provider-segment 31 \
MySemiSharedExternalNetwork
+-----+
| Field                | Value                                |
+-----+-----+
| admin_state_up       | UP                                    |
| availability_zone_hints |                                       |
| availability_zones   |                                       |
| created_at           | 2018-04-09T13:32:10Z                |
| description          |                                       |
| dns_domain           | None                                  |
| id                   | b41d0d64-9c32-48c3-aa05-604697c7d38f |
| ipv4_address_scope   | None                                  |
| ipv6_address_scope   | None                                  |
| is_default           | None                                  |
| is_vlan_transparent  | None                                  |
| mtu                  | 1500                                  |
| name                 | MySemiSharedExternalNetwork        |
| port_security_enabled | True                                  |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2    |
| provider:network_type | vlan                                  |
| provider:physical_network | physnet1                             |
| provider:segmentation_id | 31                                    |
| qos_policy_id        | None                                  |
| revision_number      | 2                                     |
| router:external      | Internal                              |
| segments             | None                                  |
| shared               | False                                 |
| status               | ACTIVE                                |
| subnets             |                                       |
| tags                 |                                       |
| updated_at          | 2018-04-09T13:32:11Z                |
+-----+-----+

```

```

root@controller01:~# openstack network list --external
root@controller01:~#

```

```

root@controller01:~# openstack network rbac create \
> --type network \
> --action access_as_external \
> --target-project ProjectB \
> MySemiSharedExternalNetwork

```

Field	Value
action	access_as_external
id	a4c124b3-4210-4a6f-9fc4-2baf6ae6e372
name	None
object_id	b41d0d64-9c32-48c3-aa05-604697c7d38f
object_type	network
project_id	9233b6b4f6a54386af63c0a7b8f043c2
target_project_id	a228b048632140e2a9f610884fd9e27e

```

root@controller01:~# openstack --os-project-name ProjectB --os-username UserB --os-password secreta network list --external

```

ID	Name	Subnets
b41d0d64-9c32-48c3-aa05-604697c7d38f	MySemiSharedExternalNetwork	

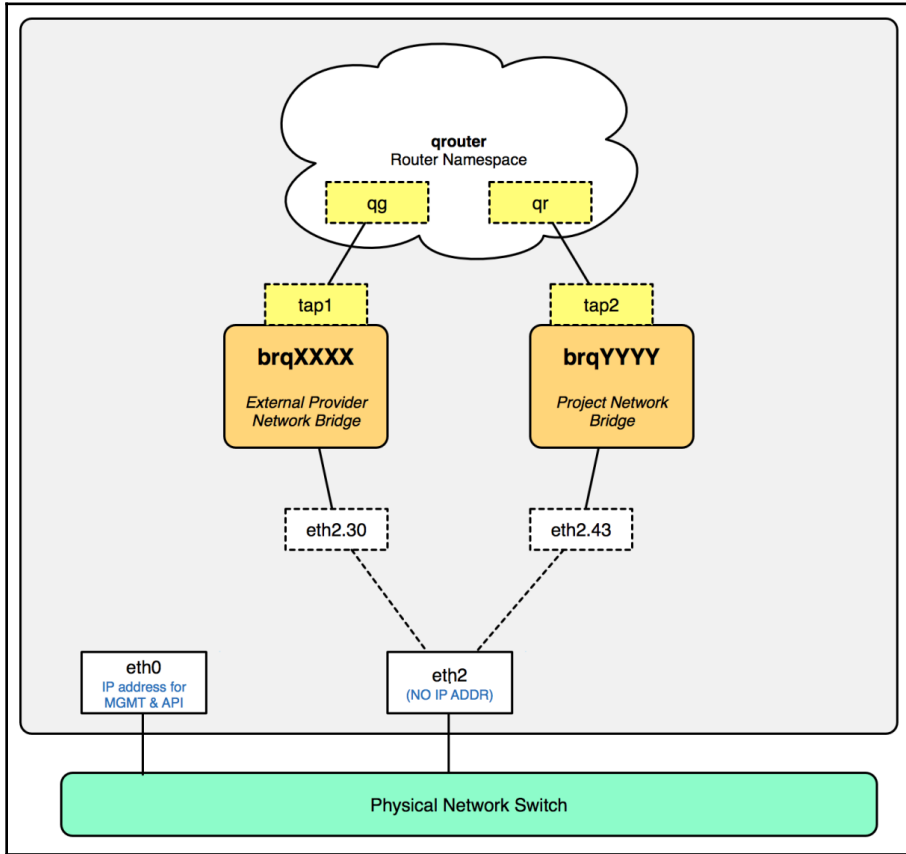
```

root@controller01:~# openstack --os-project-name ProjectB --os-username UserB --os-password secreta network show MySemiSharedExternalNetwork

```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-04-09T13:32:10Z
description	
dns_domain	None
id	b41d0d64-9c32-48c3-aa05-604697c7d38f
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	MySemiSharedExternalNetwork
port_security_enabled	True
project_id	9233b6b4f6a54386af63c0a7b8f043c2
provider:network_type	None
provider:physical_network	None
provider:segmentation_id	None
qos_policy_id	None
revision_number	4
router:external	External
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-04-09T13:39:55Z

# Chapter 10: Creating Standalone Routers with Neutron



```

OPENSTACK_NEUTRON_NETWORK = {
    'enable_router': True,
    'enable_quotas': False,
    'enable_ipv6': False,
    'enable_distributed_router': False,
    'enable_ha_router': False,
    'enable_lb': False,
    'enable_firewall': False,
    'enable_vpn': False,
    'enable_fip_topology_check': False,
}

```

```

root@controller01:~# systemctl status neutron-l3-agent
● neutron-l3-agent.service - OpenStack Neutron L3 agent
   Loaded: loaded (/lib/systemd/system/neutron-l3-agent.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2018-07-16 16:17:40 UTC; 18s ago
     Process: 21902 ExecStartPre=/bin/chown neutron:adm /var/log/neutron (code=exited, status=0/SUCCESS)
     Process: 21897 ExecStartPre=/bin/chown neutron:neutron /var/lock/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
     Process: 21886 ExecStartPre=/bin/mkdir -p /var/lock/neutron /var/log/neutron /var/lib/neutron (code=exited, status=0/SUCCESS)
  Main PID: 21915 (neutron-l3-agen)
    Tasks: 1
   Memory: 106.8M
     CPU: 1.880s
   CGroup: /system.slice/neutron-l3-agent.service
           └─21915 /usr/bin/python /usr/bin/neutron-l3-agent --config-file=/etc/neutron/neutron.conf
             --config-file=/etc/neutron/l3_agent.ini
             --config-file=/etc/neutron/fwaas_driver.ini --log-file=/var/log/neutron/neutron-l3-agent

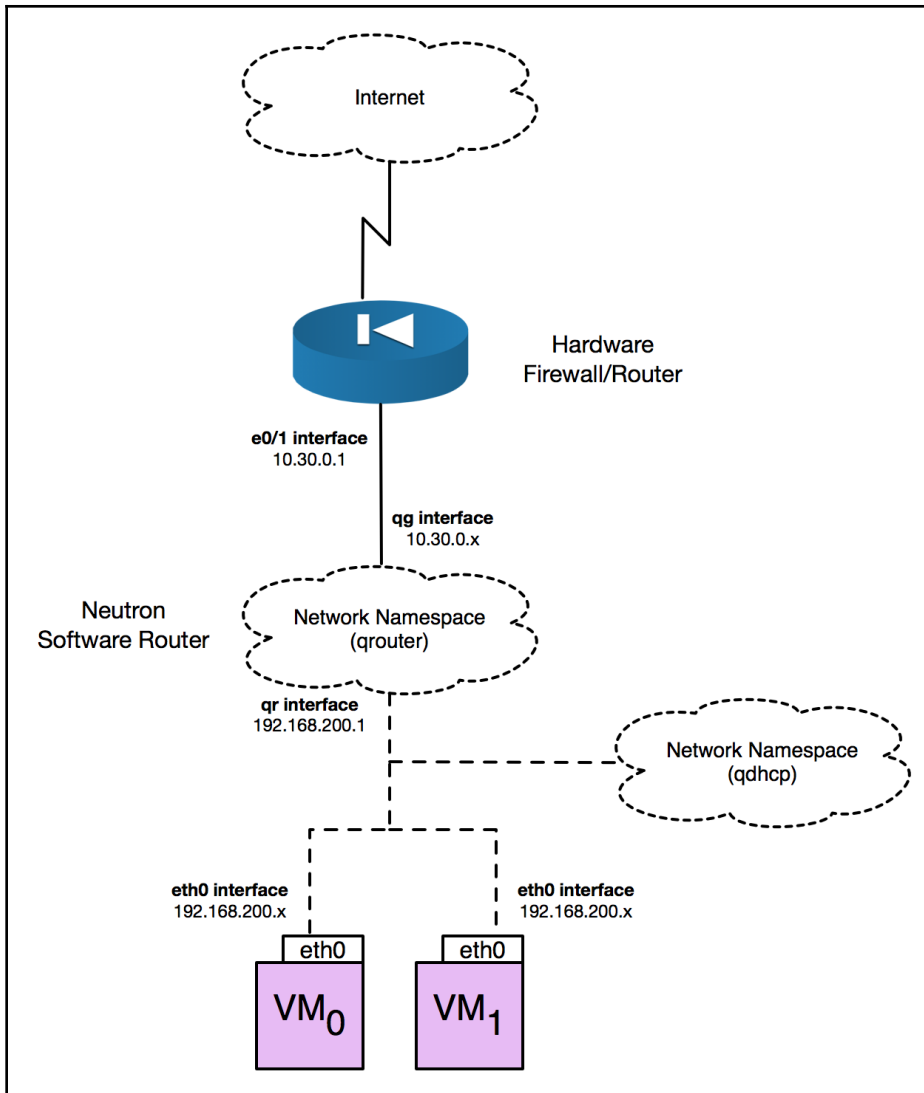
```

```

root@controller01:~# openstack port list --server 3d577137-9658-4226-906e-88d3117e497e

```

ID	Name	MAC Address	Fixed IP Addresses	Status
be0df271-2892-49a1-899e-ef95c03bd0dd		fa:16:3e:e2:13:56	ip_address='192.168.206.11', subnet_id='02013907-1a5f-493f-8ece-ee1ee9e44afb'	ACTIVE



```
root@controller01:~# openstack network create \  
> --external \  
> --provider-network-type vlan \  
> --provider-physical-network physnet1 \  
> --provider-segment 30 \  
> GATEWAY_NET
```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	
created_at	2018-04-12T13:40:36Z
description	
dns_domain	None
id	758070f9-ecaf-4d2a-aa49-e119ce7943f6
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	GATEWAY_NET
port_security_enabled	True
project_id	9233b6b4f6a54386af63c0a7b8f043c2
provider:network_type	vlan
provider:physical_network	physnet1
provider:segmentation_id	30
qos_policy_id	None
revision_number	3
router:external	External
segments	None
shared	False
status	ACTIVE
subnets	
tags	
updated_at	2018-04-12T13:40:36Z



```
root@controller01:~# openstack subnet create \  
> --subnet-range 10.30.0.0/24 \  
> --no-dhcp \  
> --network GATEWAY_NET \  
> --allocation-pool start=10.30.0.100,end=10.30.0.254 \  
> GATEWAY_SUBNET
```

Field	Value
allocation_pools	10.30.0.100-10.30.0.254
cidr	10.30.0.0/24
created_at	2018-04-12T13:44:44Z
description	
dns_nameservers	
enable_dhcp	False
gateway_ip	10.30.0.1
host_routes	
id	0af5a767-fce0-4c4d-9df2-1aedbd259405
ip_version	4
ipv6_address_mode	None
ipv6_ra_mode	None
name	GATEWAY_SUBNET
network_id	758070f9-ecaf-4d2a-aa49-e119ce7943f6
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	0
segment_id	None
service_types	
subnetpool_id	None
tags	
updated_at	2018-04-12T13:44:44Z
use_default_subnet_pool	None

```

root@controller01:~# openstack router create MyLegacyRouter
+-----+-----+
| Field                | Value                |
+-----+-----+
| admin_state_up       | UP                   |
| availability_zone_hints |                      |
| availability_zones    |                      |
| created_at           | 2018-04-12T13:57:14Z |
| description          |                      |
| distributed           | False                |
| external_gateway_info | None                 |
| flavor_id            | None                 |
| ha                    | False                |
| id                    | 9ef2eed-4a55-4f64-b8be-4b07a43ec373 |
| name                  | MyLegacyRouter      |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2 |
| revision_number       | None                 |
| routes                |                      |
| status                | ACTIVE               |
| tags                  |                      |
| updated_at           | 2018-04-12T13:57:15Z |
+-----+-----+

```

```

root@controller01:~# openstack port list --router MyLegacyRouter
+-----+-----+-----+-----+-----+
| ID                | Name                | MAC Address | Fixed IP Addresses | Status |
+-----+-----+-----+-----+-----+
| 73e65609-f0ea-4f4b-9581-42fe4b7df8d8 |                    | fa:16:3e:8c:a0:3f | ip_address='10.30.0.106', subnet_id='0af5a767-fce0-4c4d-9df2-1aedbd259405' | ACTIVE |
+-----+-----+-----+-----+-----+

```

```

root@controller01:~# openstack network agent list --router MyLegacyRouter
+-----+-----+-----+-----+-----+-----+-----+
| ID                | Agent Type | Host        | Availability Zone | Alive | State | Binary |
+-----+-----+-----+-----+-----+-----+-----+
| 9c75984a-2cfa-4db6-afc6-b7e1e4901bbd | L3 agent   | controller01 | nova              | :- ) | UP    | neutron-l3-agent |
+-----+-----+-----+-----+-----+-----+-----+

```

```

root@controller01:~# ip netns
qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 (id: 3)
qdhcp-ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50 (id: 2)
qdhcp-7745a4a9-68a4-444e-a5ff-f9439e3aac6c (id: 1)
qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 (id: 0)

```

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: qg-73e65609-f0@if16: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:8c:a0:3f brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 10.30.0.106/24 brd 10.30.0.255 scope global qg-73e65609-f0
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe8c:a03f/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ethtool -S qg-73e65609-f0
NIC statistics:
    peer_ifindex: 16

```

```

root@controller01:~# ip link show | grep 16: -A1
16: tap73e65609-f0@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master brq758070f9-ec state UP mode DEFAULT group default qlen 1000
    link/ether d2:47:a1:98:1a:24 brd ff:ff:ff:ff:ff:ff link-netnsid 3

```

```

root@controller01:~# brctl show

```

bridge name	bridge id	STP enabled	interfaces
brq3f05db4d-c4	8000.000c291124cb	no	eth2.42 tapcfa2b6a1-d2
brq758070f9-ec	8000.000c291124cb	no	eth2.30 tap73e65609-f0
			Neutron External Network ID Router External Port ID
brqd8428f56-ba	8000.000c291124cb	no	eth2.41 tap9d3d1ae5-8c
brqdb527151-20	8000.000c291124cb	no	eth2.40 tapd5a55dff-9e

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ip route show
default via 10.30.0.1 dev qg-73e65609-f0
10.30.0.0/24 dev qg-73e65609-f0 proto kernel scope link src 10.30.0.106

```

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ping 10.30.0.1 -c 5
PING 10.30.0.1 (10.30.0.1) 56(84) bytes of data.
64 bytes from 10.30.0.1: icmp_seq=1 ttl=255 time=0.582 ms
64 bytes from 10.30.0.1: icmp_seq=2 ttl=255 time=0.738 ms
64 bytes from 10.30.0.1: icmp_seq=3 ttl=255 time=0.604 ms
64 bytes from 10.30.0.1: icmp_seq=4 ttl=255 time=0.623 ms
64 bytes from 10.30.0.1: icmp_seq=5 ttl=255 time=0.687 ms

--- 10.30.0.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4072ms
rtt min/avg/max/mdev = 0.582/0.646/0.738/0.065 ms

```

```

root@controller01:~# openstack network create PROJECT_NET
+-----+
| Field                | Value                                     |
+-----+-----+
| admin_state_up       | UP                                       |
| availability_zone_hints |                                           |
| availability_zones   |                                           |
| created_at           | 2018-04-13T16:02:38Z                   |
| description          |                                           |
| dns_domain           | None                                    |
| id                   | ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2   |
| ipv4_address_scope   | None                                    |
| ipv6_address_scope   | None                                    |
| is_default           | False                                  |
| is_vlan_transparent  | None                                    |
| mtu                  | 1500                                    |
| name                 | PROJECT_NET                             |
| port_security_enabled | True                                    |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2     |
| provider:network_type | vlan                                    |
| provider:physical_network | physnet1                               |
| provider:segmentation_id | 43                                      |
| qos_policy_id        | None                                    |
| revision_number      | 2                                       |
| router:external      | Internal                                |
| segments             | None                                    |
| shared               | False                                  |
| status               | ACTIVE                                  |
| subnets             |                                           |
| tags                 |                                           |
| updated_at          | 2018-04-13T16:02:39Z                   |
+-----+-----+

```

```

root@controller01:~# openstack subnet create \
> --subnet-range 192.168.200.0/24 \
> --network PROJECT_NET \
> --dns-nameserver 8.8.8.8 \
> PROJECT_SUBNET

```

Field	Value
allocation_pools	192.168.200.2-192.168.200.254
cidr	192.168.200.0/24
created_at	2018-04-13T16:04:56Z
description	
dns_nameservers	8.8.8.8
enable_dhcp	True
gateway_ip	192.168.200.1
host_routes	
id	f29a2257-1283-4047-a835-b207480aa6f3
ip_version	4
ipv6_address_mode	None
ipv6_ra_mode	None
name	PROJECT_SUBNET
network_id	ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	0
segment_id	None
service_types	
subnetpool_id	None
tags	
updated_at	2018-04-13T16:04:56Z
use_default_subnet_pool	None

```

root@controller01:~# openstack port list --router MyLegacyRouter

```

ID	Name	MAC Address	Fixed IP Addresses	Status
73e65609-f0ea-4f4b-9581-42fe4b7df8d8		fa:16:3e:8c:a0:3f	ip_address='10.30.0.106', subnet_id='0af5a767-fce0-4c4d-9df2-1aedbd259405'	ACTIVE
a9327c59-a654-479f-9a0f-b706e81cd1ba		fa:16:3e:86:4e:53	ip_address='192.168.200.1', subnet_id='f29a2257-1283-4047-a835-b207480aa6f3'	ACTIVE

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: qg-73e65609-f0@if16: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:8c:a0:3f brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 10.30.0.106/24 brd 10.30.0.255 scope global qg-73e65609-f0
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe8c:a03f/64 scope link
        valid_lft forever preferred_lft forever
3: qr-a9327c59-a6@if22: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:86:4e:53 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.200.1/24 brd 192.168.200.255 scope global qr-a9327c59-a6
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe86:4e53/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@controller01:~# brctl show
bridge name      bridge id      STP enabled    interfaces
brq3f05db4d-c4   8000.000c291124cb  no            eth2.42
                tapcfa2b6a1-d2

brq758070f9-ec   8000.000c291124cb  no            eth2.30
                tap73e65609-f0

brqce1fe7cd-7b   8000.000c291124cb  no            eth2.43
                tapddbe596d-d6 DHCP Server Port ID
                tap9327c59-a6 Router Internal Port ID

brqd8428f56-ba   8000.000c291124cb  no            eth2.41
                tap9d3d1ae5-8c

brqdb527151-20   8000.000c291124cb  no            eth2.40
                tapd5a55dff-9e

```

```

root@controller01:~# openstack server list
+-----+-----+-----+-----+-----+-----+
| ID | Name | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+-----+
| bbfc2f0c-7e9f-46ea-aa30-4b80b39dcde | MyInstance2 | ACTIVE | PROJECT_NET=192.168.200.10 | cirros-0.4.0 | tiny |
| b35a1be3-d330-44ae-a027-6ca072e575be | MyInstance1 | ACTIVE | PROJECT_NET=192.168.200.6 | cirros-0.4.0 | tiny |
+-----+-----+-----+-----+-----+-----+

```

```

root@compute01:~# brctl show
bridge name      bridge id      STP enabled    interfaces
brqce1fe7cd-7b   8000.000c29fa3f25  no            eth2.43
                tap7ae20af9-e3

```

```

root@compute02:~# brctl show
bridge name      bridge id      STP enabled    interfaces
qbr7e18b92b-ed   8000.76bb40c6d802  no            qvb7e18b92b-ed
                tap7e18b92b-ed

```

```

root@controller01:~# ip netns list
qdhcp-ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 (id: 4) ← DHCP Namespace
qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 (id: 3) for PROJECT_NET
qdhcp-ec7e4e1e-cc54-4e1a-9e57-5b3e2f752c50 (id: 2) network
qdhcp-7745a4a9-68a4-444e-a5ff-f9439e3aac6c (id: 1)
qdhcp-03327707-c369-4bd7-bd71-a42d9bcf49b8 (id: 0)

```

```

root@controller01:~# ip netns exec qdhcp-ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 ip addr list
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: ns-ddbe596d-d6@if19: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:0d:49:68 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 169.254.169.254/16 brd 169.254.255.255 scope global ns-ddbe596d-d6
        valid_lft forever preferred_lft forever
    inet 192.168.200.2/24 brd 192.168.200.255 scope global ns-ddbe596d-d6
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe0d:4968/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@controller01:~# ip netns exec qdhcp-ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 ip neigh show
192.168.200.6 dev ns-ddbe596d-d6 lladdr fa:16:3e:b5:60:b5 REACHABLE ← MyInstance1
192.168.200.10 dev ns-ddbe596d-d6 lladdr fa:16:3e:ef:7f:1b REACHABLE ← MyInstance2

```

```

root@controller01:~# openstack port list --server MyInstance1 --long -c 'Security Groups'
+-----+
| Security Groups |
+-----+
| fae5da02-5d96-43df-aebf-bf0210d353bc |
+-----+

root@controller01:~# openstack port list --server MyInstance2 --long -c 'Security Groups'
+-----+
| Security Groups |
+-----+
| fae5da02-5d96-43df-aebf-bf0210d353bc |
+-----+

```

```

root@controller01:~# openstack security group rule create \
> --protocol icmp \
> fae5da02-5d96-43df-aebf-bf0210d353bc
+-----+
| Field          | Value                                     |
+-----+-----+
| created_at     | 2018-04-16T16:50:17Z                    |
| description    |                                           |
| direction      | ingress                                  |
| ether_type     | IPv4                                     |
| id             | ff8cf830-1596-4c12-8f15-3d74c35e82da    |
| name           | None                                     |
| port_range_max | None                                     |
| port_range_min | None                                     |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2       |
| protocol       | icmp                                     |
| remote_group_id | None                                    |
| remote_ip_prefix | 0.0.0.0/0                               |
| revision_number | 0                                       |
| security_group_id | fae5da02-5d96-43df-aebf-bf0210d353bc  |
| updated_at     | 2018-04-16T16:50:17Z                    |
+-----+-----+

root@controller01:~# openstack security group rule create \
> --protocol tcp \
> --dst-port 22 \
> fae5da02-5d96-43df-aebf-bf0210d353bc
+-----+
| Field          | Value                                     |
+-----+-----+
| created_at     | 2018-04-16T16:50:55Z                    |
| description    |                                           |
| direction      | ingress                                  |
| ether_type     | IPv4                                     |
| id             | 1224a3f0-7af5-4e63-942e-36ec25a19e4e    |
| name           | None                                     |
| port_range_max | 22                                       |
| port_range_min | 22                                       |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2       |
| protocol       | tcp                                     |
| remote_group_id | None                                    |
| remote_ip_prefix | 0.0.0.0/0                               |
| revision_number | 0                                       |
| security_group_id | fae5da02-5d96-43df-aebf-bf0210d353bc  |
| updated_at     | 2018-04-16T16:50:55Z                    |
+-----+-----+

```



```
root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ssh cirros@192.168.200.6
The authenticity of host '192.168.200.6 (192.168.200.6)' can't be established.
ECDSA key fingerprint is SHA256:S7S5nf1XRi5ZErVMqBRHlf8LrzAeyEaL9MAhKVHWEWY.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.200.6' (ECDSA) to the list of known hosts.
cirros@192.168.200.6's password:
$ hostname
myinstance1
$ ip route
default via 192.168.200.1 dev eth0
169.254.169.254 via 192.168.200.1 dev eth0
192.168.200.0/24 dev eth0 src 192.168.200.6
$ exit
Connection to 192.168.200.6 closed.
```

```
root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ssh cirros@192.168.200.6
cirros@192.168.200.6's password:
$ ping 8.8.8.8 -c5
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=55 time=30.296 ms
64 bytes from 8.8.8.8: seq=1 ttl=55 time=29.988 ms
64 bytes from 8.8.8.8: seq=2 ttl=55 time=29.158 ms
64 bytes from 8.8.8.8: seq=3 ttl=55 time=28.948 ms
64 bytes from 8.8.8.8: seq=4 ttl=55 time=28.524 ms

--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 28.524/29.382/30.296 ms
```

```
root@controller01:~# tcpdump -i eth2.43 -n icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth2.43, link-type EN10MB (Ethernet), capture size 262144 bytes
17:01:54.349267 IP 192.168.200.6 > 8.8.8.8: ICMP echo request, id 34049, seq 0, length 64
17:01:54.377051 IP 8.8.8.8 > 192.168.200.6: ICMP echo reply, id 34049, seq 0, length 64
```

```
root@controller01:~# tcpdump -i eth2.30 -n icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth2.30, link-type EN10MB (Ethernet), capture size 262144 bytes
17:00:47.436765 IP 10.30.0.106 > 8.8.8.8: ICMP echo request, id 33793, seq 0, length 64
17:00:47.464786 IP 8.8.8.8 > 10.30.0.106: ICMP echo reply, id 33793, seq 0, length 64
```

```

root@controller01:~# ip netns exec qrouter-9ef2eeed-4a55-4f64-b8be-4b07a43ec373 iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target prot opt source destination
neutron-l3-agent-PREROUTING all -- anywhere anywhere

Chain INPUT (policy ACCEPT)
target prot opt source destination

Chain OUTPUT (policy ACCEPT)
target prot opt source destination
neutron-l3-agent-OUTPUT all -- anywhere anywhere

Chain POSTROUTING (policy ACCEPT)
target prot opt source destination
neutron-l3-agent-POSTROUTING all -- anywhere anywhere
neutron-postrouting-bottom all -- anywhere anywhere

Chain neutron-l3-agent-OUTPUT (1 references)
target prot opt source destination

Chain neutron-l3-agent-POSTROUTING (1 references)
target prot opt source destination
ACCEPT all -- anywhere anywhere ! ctstate DNAT

Chain neutron-l3-agent-PREROUTING (1 references)
target prot opt source destination
REDIRECT tcp -- anywhere 169.254.169.254 tcp dpt:http redir ports 9697

Chain neutron-l3-agent-float-snat (1 references)
target prot opt source destination

Chain neutron-l3-agent-snat (1 references)
target prot opt source destination
neutron-l3-agent-float-snat all -- anywhere anywhere
SNAT all -- anywhere anywhere to:10.30.0.106
SNAT all -- anywhere anywhere mark match ! 0x2/0xffff ctstate DNAT to:10.30.0.106

Chain neutron-postrouting-bottom (1 references)
target prot opt source destination
neutron-l3-agent-snat all -- anywhere anywhere /* Perform source NAT on outgoing traffic. */

```

```

root@controller01:~# openstack port list --server MyInstance1
+-----+-----+-----+-----+-----+
| ID | Name | MAC Address | Fixed IP Addresses | Status |
+-----+-----+-----+-----+-----+
| 7ae20af9-e3d3-41ce-b74a-57cfaf41fe59 | | fa:16:3e:b5:60:b5 | ip_address='192.168.200.6', subnet_id='f29a2257-1283-4047-a835-b207480aa6f3' | ACTIVE |
+-----+-----+-----+-----+-----+
root@controller01:~# openstack port list --server MyInstance2
+-----+-----+-----+-----+-----+
| ID | Name | MAC Address | Fixed IP Addresses | Status |
+-----+-----+-----+-----+-----+
| 7e18b92b-ed27-42d5-ad05-f58e2b0f5705 | | fa:16:3e:ef:7f:1b | ip_address='192.168.200.10', subnet_id='f29a2257-1283-4047-a835-b207480aa6f3' | ACTIVE |
+-----+-----+-----+-----+-----+

```

```

root@controller01:~# openstack floating ip create --port 7ae20af9-e3d3-41ce-b74a-57cfaf41fe59 GATEWAY_NET
+-----+-----+
| Field                | Value                |
+-----+-----+
| created_at           | 2018-04-18T13:15:35Z |
| description          |                      |
| fixed_ip_address     | 192.168.200.6        |
| floating_ip_address  | 10.30.0.101          |
| floating_network_id  | 758070f9-ecaf-4d2a-aa49-e119ce7943f6 |
| id                   | 9e08a332-5128-4e3c-a201-ee3e6d8d1b75 |
| name                 | 10.30.0.101         |
| port_id              | 7ae20af9-e3d3-41ce-b74a-57cfaf41fe59 |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2 |
| revision_number      | 0                    |
| router_id            | 9ef2eeed-4a55-4f64-b8be-4b07a43ec373 |
| status               | DOWN                 |
| updated_at           | 2018-04-18T13:15:35Z |
+-----+-----+

```

```

$ ping 8.8.8.8 -c 2
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=55 time=28.491 ms
64 bytes from 8.8.8.8: seq=1 ttl=55 time=28.590 ms

--- 8.8.8.8 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 28.491/28.540/28.590 ms

```

```

root@controller01:~# tcpdump -i eth2.30 -n icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on ens224.30, link-type EN10MB (Ethernet), capture size 262144 bytes
13:19:00.598980 IP 10.30.0.101 > 8.8.8.8: ICMP echo request, id 40705, seq 0, length 64
13:19:00.626593 IP 8.8.8.8 > 10.30.0.101: ICMP echo reply, id 40705, seq 0, length 64
13:19:01.599335 IP 10.30.0.101 > 8.8.8.8: ICMP echo request, id 40705, seq 1, length 64
13:19:01.627029 IP 8.8.8.8 > 10.30.0.101: ICMP echo reply, id 40705, seq 1, length 64
^C
4 packets captured
4 packets received by filter
0 packets dropped by kernel

```

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 ip addr list
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   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
2: qg-73e65609-f0@if16: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether fa:16:3e:8c:a0:3f brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 10.30.0.106/24 brd 10.30.0.255 scope global qg-73e65609-f0
       valid_lft forever preferred_lft forever
   inet 10.30.0.101/32 brd 10.30.0.101 scope global qg-73e65609-f0
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe8c:a03f/64 scope link
       valid_lft forever preferred_lft forever
3: qr-a9327c59-a6@if22: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether fa:16:3e:86:4e:53 brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 192.168.200.1/24 brd 192.168.200.255 scope global qr-a9327c59-a6
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe86:4e53/64 scope link
       valid_lft forever preferred_lft forever

```

Floating IPs are configured with a /32 netmask

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 iptables -t nat -L
...
Chain neutron-l3-agent-OUTPUT (1 references)
target prot opt source destination
DNAT all -- anywhere 10.30.0.101 to:192.168.200.6

Chain neutron-l3-agent-POSTROUTING (1 references)
target prot opt source destination
ACCEPT all -- anywhere anywhere ! ctstate DNAT

Chain neutron-l3-agent-PREROUTING (1 references)
target prot opt source destination
REDIRECT tcp -- anywhere 169.254.169.254 tcp dpt:http redir ports 9697
DNAT all -- anywhere 10.30.0.101 to:192.168.200.6

Chain neutron-l3-agent-float-snat (1 references)
target prot opt source destination
SNAT all -- 192.168.200.6 anywhere to:10.30.0.101

Chain neutron-l3-agent-snat (1 references)
target prot opt source destination
neutron-l3-agent-float-snat all -- anywhere anywhere
SNAT all -- anywhere anywhere to:10.30.0.106
SNAT all -- anywhere anywhere mark match ! 0x2/0xffff ctstate DNAT to:10.30.0.106

Chain neutron-postrouting-bottom (1 references)
target prot opt source destination
neutron-l3-agent-snat all -- anywhere anywhere /* Perform source NAT on outgoing traffic. */

```

```

workstation:~ jdenton$ ssh cirros@10.30.0.101
The authenticity of host '10.30.0.101 (10.30.0.101)' can't be established.
ECDSA key fingerprint is SHA256:S7S5nf1XRI5ZErVMqBRHlf8LrzAeyEaL9MAhKVHWEWY.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.30.0.101' (ECDSA) to the list of known hosts.
cirros@10.30.0.101's password:
$ who
cirros          pts/0          00:06  Apr 18 14:16:52  192.168.200.1
cirros          pts/1          00:00  Apr 18 14:25:45  192.168.1.75
$ ip route show
default via 192.168.200.1 dev eth0
169.254.169.254 via 192.168.200.1 dev eth0
192.168.200.0/24 dev eth0  src 192.168.200.6
$ exit
Connection to 10.30.0.101 closed.

```

```

root@controller01:~# openstack floating ip list

```

ID	Floating IP Address	Fixed IP Address	Port	Floating Network
9e08a332-5128-4e3c-a201-ee3e6d8d1b75	10.30.0.101	192.168.200.6	7ae20af9-e3d3-41ce-b74a-57cfaf41fe59	758070f9-ecaf-4d2a-aa49-e119ce7943f6

```

root@controller01:~# openstack floating ip list

```

ID	Floating IP Address	Fixed IP Address	Port	Floating Network
9e08a332-5128-4e3c-a201-ee3e6d8d1b75	10.30.0.101	None	None	758070f9-ecaf-4d2a-aa49-e119ce7943f6

```

root@controller01:~# openstack port list --server MyInstance2

```

ID	Name	MAC Address	Fixed IP Addresses	Status
7e18b92b-ed27-42d5-ad05-f58e2b0f5705		fa:16:3e:ef:7f:1b	ip_address='192.168.200.10', subnet_id='f29a2257-1283-4047-a835-b207480aa6f3'	ACTIVE

```

root@controller01:~# openstack floating ip set --port 7e18b92b-ed27-42d5-ad05-f58e2b0f5705 9e08a332-5128-4e3c-a201-ee3e6d8d1b75
root@controller01:~#

```

Port of MyInstance2                      Floating IP ID

```

root@controller01:~# ip netns exec qrouter-9ef2eed-4a55-4f64-b8be-4b07a43ec373 iptables -t nat -L
...
Chain neutron-l3-agent-OUTPUT (1 references)
target     prot opt source                destination            to:192.168.200.10
DNAT       all  -- anywhere             10.30.0.101

Chain neutron-l3-agent-POSTROUTING (1 references)
target     prot opt source                destination            ! ctstate DNAT
ACCEPT    all  -- anywhere             anywhere

Chain neutron-l3-agent-PREROUTING (1 references)
target     prot opt source                destination            tcp dpt:http redir ports 9697
REDIRECT  tcp  -- anywhere             169.254.169.254       to:192.168.200.10
DNAT       all  -- anywhere             10.30.0.101

Chain neutron-l3-agent-float-snat (1 references)
target     prot opt source                destination            to:10.30.0.101
SNAT       all  -- 192.168.200.10       anywhere

Chain neutron-l3-agent-snat (1 references)
target     prot opt source                destination            anywhere
neutron-l3-agent-float-snat all  -- anywhere             anywhere
SNAT       all  -- anywhere             anywhere             to:10.30.0.106
SNAT       all  -- anywhere             anywhere             mark match ! 0x2/0xffff ctstate DNAT to:10.30.0.106

Chain neutron-postrouting-bottom (1 references)
target     prot opt source                destination            anywhere
neutron-l3-agent-snat all  -- anywhere             anywhere             /* Perform source NAT on outgoing traffic. */

```

```

workstation:~ jdenton$ ssh cirros@10.30.0.101
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@    WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!    @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that a host key has just been changed.
The fingerprint for the ECDSA key sent by the remote host is
SHA256:DHBSR4jrZAu3IBHoLBF+gy7czdqv3gHzBdystllfslg.
Please contact your system administrator.
Add correct host key in /Users/jdenton/.ssh/known_hosts to get rid of this message.
Offending ECDSA key in /Users/jdenton/.ssh/known_hosts:9
ECDSA host key for 10.30.0.101 has changed and you have requested strict checking.
Host key verification failed.

```

```

workstation:~ jdenton$ ssh-keygen -R 10.30.0.101
# Host 10.30.0.101 found: line 9
/Users/jdenton/.ssh/known_hosts updated.
Original contents retained as /Users/jdenton/.ssh/known_hosts.old

workstation:~ jdenton$ ssh cirros@10.30.0.101
The authenticity of host '10.30.0.101 (10.30.0.101)' can't be established.
ECDSA key fingerprint is SHA256:DHBsR4jrZAU3IBHoLBF+gy7czdqv3gHzBdystlLfsIq.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.30.0.101' (ECDSA) to the list of known hosts.
cirros@10.30.0.101's password:
$ hostname
myinstance2
$ ip addr list
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue qlen 1
    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
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast qlen 1000
    link/ether fa:16:3e:ef:7f:1b brd ff:ff:ff:ff:ff:ff
    inet 192.168.200.10/24 brd 192.168.200.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:feef:7f1b/64 scope link
        valid_lft forever preferred_lft forever
$ exit
Connection to 10.30.0.101 closed.

```

The screenshot shows the OpenStack dashboard interface. The breadcrumb navigation is 'Project / Network / Routers'. The main heading is 'Routers'. Below the heading, there is a search bar for 'Router Name', a 'Filter' button, and two action buttons: '+ Create Router' and 'Delete Routers'. A table displays the router information:

Name	Status	External Network	Admin State	Actions
MyLegacyRouter	Active	GATEWAY_NET	UP	Clear Gateway

### Create Router

**Router Name**  
MyLegacyDashboardRouter

**Description:**  
Creates a router with specified parameters.

**Enable Admin State**

**External Network**  
Select network

- Select network
- GATEWAY\_NET**
- MySemiSharedExternalNetwork

Cancel Create Router

Project / Network / Routers / MyLegacyDashboardRouter

## MyLegacyDashboardRouter

Clear Gateway

Overview **Interfaces** Static Routes

<b>Name</b>	MyLegacyDashboardRouter
<b>ID</b>	acda1cab-2e4c-48e7-83db-13f516d499fd
<b>Description</b>	758070f9-ecaf-4d2a-aa49-e119ce7943f6
<b>Project ID</b>	9233b6b4f6a54386af63c0a7b8f043c2
<b>Status</b>	Active
<b>Admin State</b>	UP
<b>Availability Zones</b>	<ul style="list-style-type: none"><li>nova</li></ul>

**External Gateway**

<b>Network Name</b>	GATEWAY_NET
<b>Network ID</b>	758070f9-ecaf-4d2a-aa49-e119ce7943f6
<b>External Fixed IPs</b>	<ul style="list-style-type: none"><li><b>Subnet ID</b> 0af5a767-fce0-4c4d-9df2-1aebd259405</li><li><b>IP Address</b> 10.30.0.100</li></ul>
<b>SNAT</b>	Enabled



Project / Network / Routers / MyLegacyDashboardRouter

# MyLegacyDashboardRouter

Clear Gateway ▾

Overview Interfaces Static Routes

+ Add Interface Delete Interfaces

Displaying 1 item

<input type="checkbox"/>	Name	Fixed IPs	Status	Type	Admin State	Actions
<input type="checkbox"/>	(9296f277-b2b3)	• 10.30.0.100	Down	External Gateway	UP	Delete Interface

Displaying 1 item

## Add Interface

Subnet \*  
Select Subnet ▾

IP Address (optional) ⓘ

**Description:**  
You can connect a specified subnet to the router.  
If you don't specify an IP address here, the gateway's IP address of the selected subnet will be used as the IP address of the newly created interface of the router. If the gateway's IP address is in use, you must use a different address which belongs to the selected subnet.

Cancel Submit

Project / Network / Routers / MyLegacyDashboardRouter

# MyLegacyDashboardRouter

Clear Gateway

Overview Interfaces Static Routes

+ Add Interface Delete Interfaces

Displaying 2 items

<input type="checkbox"/>	Name	Fixed IPs	Status	Type	Admin State	Actions
<input type="checkbox"/>	(9296f277-b2b3)	• 10.30.0.100	Active	External Gateway	UP	Delete Interface
<input type="checkbox"/>	(cecf02e-5ea6)	• 192.168.1.1	Down	Internal Interface	UP	Delete Interface

Displaying 2 items

Project / Network / Network Topology

# Network Topology

Launch Instance Create Network Create Router

Topology Graph

Small Normal

The diagram illustrates a network topology with six vertical network segments: GATEWAY\_NET (blue, 10.30.0.0/24), MySemiSharedExternalNetwork (orange, 192.168.99.0/24), MyVLANNetwork (green, 192.168.206.0/24), MyFlatNetwork (red, 192.168.1.0/24), PROJECT\_NET (purple, 192.168.200.0/24), and MySemiSharedNetwork (brown, 192.168.99.0/24). Connections include: GATEWAY\_NET to MySemiSharedExternalNetwork; MySemiSharedExternalNetwork to MyVLANNetwork; MyVLANNetwork to MyFlatNetwork; MyFlatNetwork to PROJECT\_NET; PROJECT\_NET to MySemiSharedNetwork; and MySemiSharedNetwork to MyVLANNetwork. There are also small server icons connected to MyFlatNetwork and PROJECT\_NET.

<input type="checkbox"/>	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/>	MyInstance2	cirros-0.4.0	192.168.200.10 Floating IPs: 10.30.0.101	tiny	-	Active	nova	None	Running	1 day, 21 hours	Create Snapshot
<input type="checkbox"/>	MyInstance1	cirros-0.4.0	192.168.200.6	tiny	-	Active	nova	None	Running	1 day, 21 hours	Create Snapshot
<input type="checkbox"/>	TestInstance1	cirros-0.4.0	192.168.206.11	tiny	-	Active	nova	None	Running	1 week	Associate Floating IP Attach Interface Detach Interface Edit Instance Update Metadata Edit Security Groups

Displaying 3 items

### Manage Floating IP Associations

**IP Address \***

No floating IP addresses allocated +

Select the IP address you wish to associate with the selected instance or port.

**Port to be associated \***

MyInstance1: 192.168.200.6

Cancel Associate

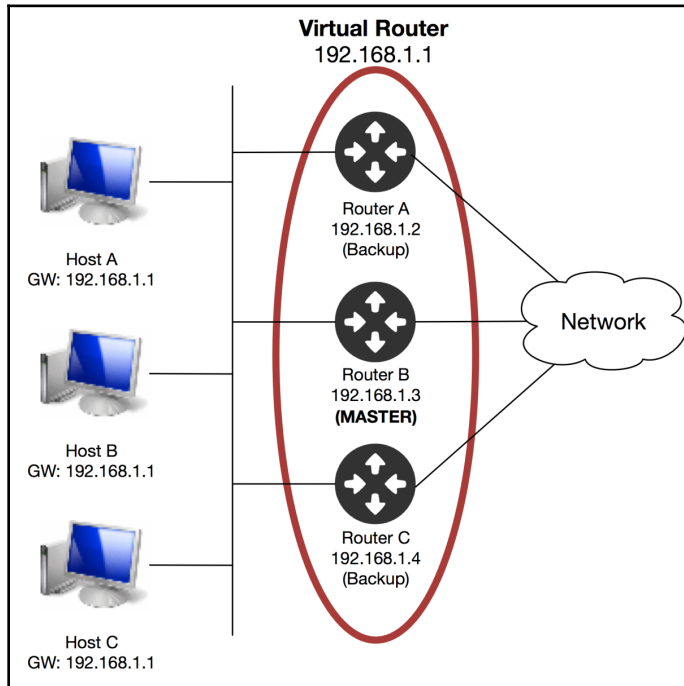
<input type="checkbox"/>	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/>	MyInstance2	cirros-0.4.0	192.168.200.10 Floating IPs: 10.30.0.101	tiny	-	Active	nova	None	Running	3 days, 1 hour	Create Snapshot
<input type="checkbox"/>	MyInstance1	cirros-0.4.0	192.168.200.6	tiny	-	Active	nova	None	Running	3 days, 1 hour	Disassociate Floating IP Attach Interface Detach Interface

### Confirm Disassociate Floating IP

You have selected: "MyInstance2". Please confirm your selection.

Cancel Disassociate Floating IP

# Chapter 11: Router Redundancy Using VRRP



```
vrrp_instance VR_1 {
    state BACKUP
    interface ha-4d66b09f-3b
    virtual_router_id 1
    priority 50
    garp_master_delay 60
    nopreempt
    advert_int 2
    track_interface {
        ha-4d66b09f-3b
    }
    virtual_ipaddress {
        169.254.0.1/24 dev ha-4d66b09f-3b
    }
    virtual_ipaddress_excluded {
        10.30.0.104/24 dev qg-3edbff06-35
        192.168.200.1/24 dev qr-1eace53f-69
        fe80::f816:3eff:fe12:140c/64 dev qr-1eace53f-69 scope link
        fe80::f816:3eff:fe17:4f8/64 dev qg-3edbff06-35 scope link
    }
    virtual_routes {
        0.0.0.0/0 via 10.30.0.1 dev qg-3edbff06-35
    }
}
```

```

root@controller01:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
..
2: ha-a4a3ef03-4a@if17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether fa:16:3e:1c:0c:09 brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.192.6/18 brd 169.254.255.255 scope global ha-a4a3ef03-4a
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe1c:c09/64 scope link
       valid_lft forever preferred_lft forever
..

```

BACKUP

```

root@compute01:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
..
2: ha-4d66b09f-3b@if17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether fa:16:3e:f9:de:12 brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.192.9/18 brd 169.254.255.255 scope global ha-4d66b09f-3b
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fef9:de12/64 scope link
       valid_lft forever preferred_lft forever
..

```

BACKUP

```

root@compute02:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
..
16: ha-80d242d7-b3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
   link/ether fa:16:3e:79:e2:33 brd ff:ff:ff:ff:ff:ff
   inet 169.254.192.2/18 brd 169.254.255.255 scope global ha-80d242d7-b3
       valid_lft forever preferred_lft forever
   inet 169.254.0.1/24 scope global ha-80d242d7-b3 ← Virtual IP Address
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe79:e233/64 scope link
       valid_lft forever preferred_lft forever
..

```

MASTER

```

root@controller01:~# openstack network agent list --agent-type l3
+-----+-----+-----+-----+-----+-----+-----+
| ID | Agent Type | Host | Availability Zone | Alive | State | Binary |
+-----+-----+-----+-----+-----+-----+-----+
| ee380688-0ea7-4e54-9889-c44ddd933678 | L3 agent | compute01 | nova | :- ) | UP | neutron-l3-agent |
| f9f8e9a3-4332-4693-a652-40837ffdbd51 | L3 agent | compute02 | nova | :- ) | UP | neutron-l3-agent |
| 7cecebfb-a1da-479b-ab72-d4a18582f424 | L3 agent | compute03 | nova | :- ) | UP | neutron-l3-agent |
| 9c75984a-2cfa-4db6-afc6-b7e1e4901bbd | L3 agent | controller01 | nova | :- ) | UP | neutron-l3-agent |
+-----+-----+-----+-----+-----+-----+-----+

```

```

root@controller01:~# openstack network list
+-----+-----+-----+
| ID | Name | Subnets |
+-----+-----+-----+
| 758070f9-ecaf-4d2a-aa49-e119ce7943f6 | GATEWAY_NET | 0af5a767-fce0-4c4d-9df2-1aedbd259405 |
| ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 | PROJECT_NET | f29a2257-1283-4047-a835-b207480aa6f3 |
+-----+-----+-----+

```

```

root@controller01:~# openstack router create --ha MyHighlyAvailableRouter
+-----+-----+
| Field                | Value                |
+-----+-----+
| admin_state_up       | UP                   |
| availability_zone_hints |                      |
| availability_zones    |                      |
| created_at           | 2018-04-27T13:39:23Z |
| description          |                      |
| distributed           | False                |
| external_gateway_info | None                 |
| flavor_id            | None                 |
| ha                    | True                 |
| id                    | 44e8f6a5-c9c6-44c1-854c-c503efccc1b2 |
| name                  | MyHighlyAvailableRouter |
| project_id           | 9233b6b4f6a54386af63c0a7b8f043c2 |
| revision_number      | None                 |
| routes               |                      |
| status                | ACTIVE               |
| tags                  |                      |
| updated_at           | 2018-04-27T13:39:23Z |
+-----+-----+

```

```

root@controller01:~# ip netns
qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 (id: 0)
qdhcp-ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 (id: 4)
qrouter-9ef2eeed-4a55-4f64-b8be-4b07a43ec373 (id: 3)

root@compute01:~# ip netns
qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 (id: 0)

root@compute02:~# ip netns
qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2

```

```

root@controller01:~# openstack network list
+-----+-----+-----+
| ID                | Name                | Subnets |
+-----+-----+-----+
| 471ba196-e74e-412f-9a4f-390e0ed710c2 | HA network tenant 9233b6b4f6a54386af63c0a7b8f043c2 | 4efc3fb0-645c-4372-8886-290c2398c458 |
| 758070f9-ecaf-4d2a-aa49-e119ce7943f6 | GATEWAY_NET        | 0af5a767-fce0-4c4d-9df2-1aedbd259405 |
| ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 | PROJECT_NET        | f29a2257-1283-4047-a835-b207480aa6f3 |
+-----+-----+-----+

```

```
root@controller01:~# openstack network show 471ba196-e74e-412f-9a4f-390e0ed710c2
```

Field	Value
admin_state_up	UP
availability_zone_hints	
availability_zones	nova
created_at	2018-04-27T13:39:22Z
description	
dns_domain	None
id	471ba196-e74e-412f-9a4f-390e0ed710c2
ipv4_address_scope	None
ipv6_address_scope	None
is_default	None
is_vlan_transparent	None
mtu	1500
name	HA network tenant <b>9233b6b4f6a54386af63c0a7b8f043c2</b>
port_security_enabled	True
project_id	Not Used
provider:network_type	vlan
provider:physical_network	physnet1
provider:segmentation_id	40
qos_policy_id	None
revision_number	3
router:external	Internal
segments	None
shared	False
status	ACTIVE
subnets	4efc3fb0-645c-4372-8886-290c2398c458
tags	
updated_at	2018-04-27T13:39:23Z

```
root@controller01:~# openstack network list
```

ID	Name	Subnets
471ba196-e74e-412f-9a4f-390e0ed710c2	HA network tenant 9233b6b4f6a54386af63c0a7b8f043c2	4efc3fb0-645c-4372-8886-290c2398c458
758070f9-ecaf-4d2a-aa49-e119ce7943f6	GATEWAY_NET	0af5a767-fce0-4c4d-9df2-1aedbd259405
ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2	PROJECT_NET	f29a2257-1283-4047-a835-b207480aa6f3

```
root@controller01:~# openstack port list --router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2
```

ID	Name	MAC Address	Fixed IP Addresses	Status
1eace53f-69ab-4ccd-991d-...	Internal Network Interface	fa:16:3e:12:14:0c	ip_address='192.168.200.1', subnet_id='f29a2257-1283-4047-a835-b207480aa6f3'	ACTIVE
3e6dff06-351e-4ed1-8153-...	External Network Interface	fa:16:3e:17:04:f8	ip_address='10.30.0.104', subnet_id='0af5a767-fce0-4c4d-9df2-1aedbd259405'	ACTIVE
4d66b09f-3b4a-4808-8dfe-...	HA port tenant 9233b6b4f6a54386af63c0a7b8f043c2	fa:16:3e:f9:de:12	ip_address='169.254.192.9', subnet_id='4efc3fb0-645c-4372-8886-290c2398c458'	ACTIVE
80a242d7-b3d7-4348-95e8-...	HA port tenant 9233b6b4f6a54386af63c0a7b8f043c2	fa:16:3e:79:e2:33	ip_address='169.254.192.2', subnet_id='4efc3fb0-645c-4372-8886-290c2398c458'	ACTIVE
a4a3ef03-4a58-42c7-a65a-...	HA port tenant 9233b6b4f6a54386af63c0a7b8f043c2	fa:16:3e:1c:8c:09	ip_address='169.254.192.6', subnet_id='4efc3fb0-645c-4372-8886-290c2398c458'	ACTIVE



```

root@controller01:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: ha-a4a3ef03-4a@if28: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:1c:0c:09 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 169.254.192.6/18 brd 169.254.255.255 scope global ha-a4a3ef03-4a
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe1c:c09/64 scope link
        valid_lft forever preferred_lft forever
3: qr-1eace53f-69@if31: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:12:14:0c brd ff:ff:ff:ff:ff:ff link-netnsid 0
4: qg-3edbfff06-35@if32: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:17:04:f8 brd ff:ff:ff:ff:ff:ff link-netnsid 0

```

```

root@compute01:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
2: ha-4d66b09f-3b@if17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:f9:de:12 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 169.254.192.9/18 brd 169.254.255.255 scope global ha-4d66b09f-3b
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fef9:de12/64 scope link
        valid_lft forever preferred_lft forever
3: qr-1eace53f-69@if20: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:12:14:0c brd ff:ff:ff:ff:ff:ff link-netnsid 0
4: qg-3edbfff06-35@if21: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:17:04:f8 brd ff:ff:ff:ff:ff:ff link-netnsid 0

```

```

root@compute02:~# ip netns exec qrouter-44e8f6a5-c9c6-44c1-854c-c503efccc1b2 ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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
16: ha-80d242d7-b3 <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:79:e2:33 brd ff:ff:ff:ff:ff:ff
    inet 169.254.192.2/18 brd 169.254.255.255 scope global ha-80d242d7-b3
        valid_lft forever preferred_lft forever
    inet 169.254.0.1/24 scope global ha-80d242d7-b3 ← VRRP
                                                Virtual IP
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe79:e233/64 scope link
        valid_lft forever preferred_lft forever
17: qr-1eace53f-69: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:12:14:0c brd ff:ff:ff:ff:ff:ff
    inet 192.168.200.1/24 scope global qr-1eace53f-69 ← Active qr
                                                    interface
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe12:140c/64 scope link
        valid_lft forever preferred_lft forever
18: qg-3edbfff06-35: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:17:04:f8 brd ff:ff:ff:ff:ff:ff
    inet 10.30.0.104/24 scope global qg-3edbfff06-35 ← Active qg
                                                    interface
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe17:4f8/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@controller01:~# openstack network agent list --router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2 --long
+-----+-----+-----+-----+-----+-----+-----+-----+
| ID | Agent Type | Host | Availability Zone | Alive | State | Binary | HA State |
+-----+-----+-----+-----+-----+-----+-----+-----+
| ee380688-0ea7-4e54-9889-c44ddd933678 | L3 agent | compute01 | nova | :- ) | UP | neutron-l3-agent | standby |
| f9f8e9a3-4332-4693-a652-40837ffdbd51 | L3 agent | compute02 | nova | :- ) | UP | neutron-l3-agent | active |
| 9c75984a-2cfa-4db6-afc6-b7e1e4901bbd | L3 agent | controller01 | nova | :- ) | UP | neutron-l3-agent | standby |
+-----+-----+-----+-----+-----+-----+-----+-----+

```

```

root@compute02:~# cat /var/lib/neutron/ha_confs/44e8f6a5-c9c6-44c1-854c-c503efccc1b2/keepalived.conf
global_defs {
    notification_email_from neutron@openstack.local
    router_id neutron
}
vrrp_instance VR_1 {
    state BACKUP
    interface ha-80d242d7-b3
    virtual_router_id 1 ← Virtual Router ID (VRID)
    priority 50 ← Router priority
    garp_master_delay 60
    nopreempt ← Preempt mode
    advert_int 2 ← Advertisement interval
    track_interface {
        ha-80d242d7-b3
    }
    virtual_ipaddress {
        169.254.0.1/24 dev ha-80d242d7-b3 ← Virtual IP address
    }
    virtual_ipaddress_excluded {
        10.30.0.104/24 dev qg-3edbfff06-35 ← External IP to be configured when master
        192.168.200.1/24 dev qr-1eace53f-69 ← Internal IP to be configured when master
        fe80::f816:3eff:fe12:140c/64 dev qr-1eace53f-69 scope link
        fe80::f816:3eff:fe17:4f8/64 dev qg-3edbfff06-35 scope link
    }
    virtual_routes {
        0.0.0.0/0 via 10.30.0.1 dev qg-3edbfff06-35 ← Route to be configured when master
    }
}

```

```

root@controller01:~# tail -f /var/lib/neutron/ha_confs/44e8f6a5-c9c6-44c1-854c-c503efccc1b2/neutron-keepalived-state-change.log
2018-04-27 13:39:46.177 12167 INFO neutron.common.config [-] Logging enabled!
2018-04-27 13:39:46.179 12167 INFO neutron.common.config [-] /usr/bin/neutron-keepalived-state-change version 11.0.3
...
root@compute01:~# tail -f /var/lib/neutron/ha_confs/44e8f6a5-c9c6-44c1-854c-c503efccc1b2/neutron-keepalived-state-change.log
2018-04-27 13:39:42.983 18938 INFO neutron.common.config [-] Logging enabled!
2018-04-27 13:39:42.984 18938 INFO neutron.common.config [-] /usr/bin/neutron-keepalived-state-change version 11.0.3
...
2018-04-27 16:38:59.585 18986 DEBUG neutron.agent.l3.keepalived_state_change [-] Wrote router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2 state master write_state_change ...
2018-04-27 16:39:00.497 18986 DEBUG neutron.agent.l3.keepalived_state_change [-] Notified agent router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2, state master notify_agent ...

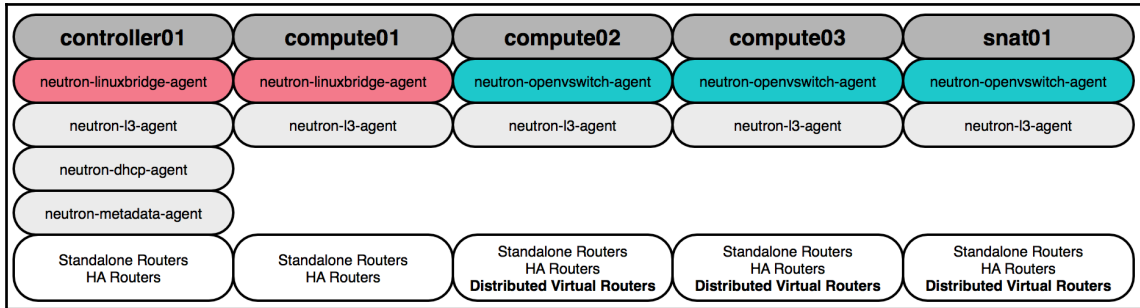
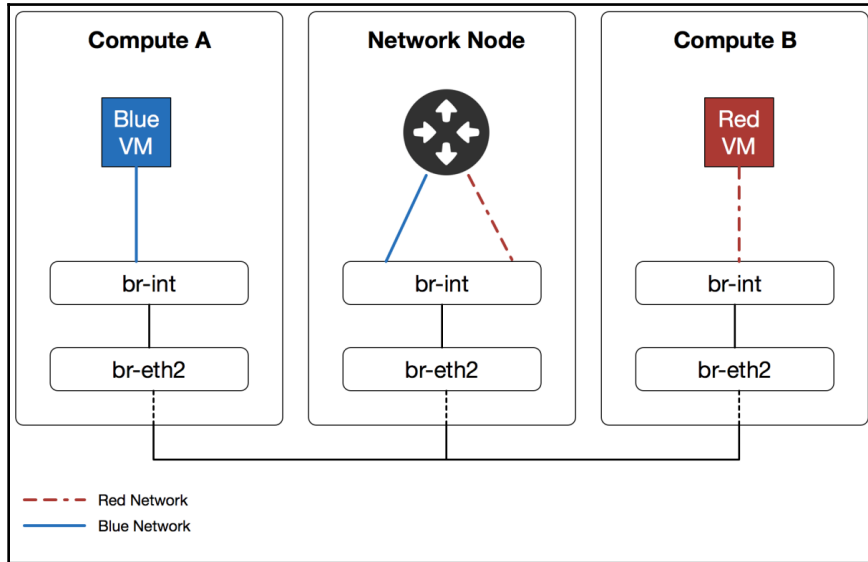
```

```

root@compute02:~# tail -f /var/lib/neutron/ha_confs/44e8f6a5-c9c6-44c1-854c-c503efccc1b2/neutron-keepalived-state-change.log
2018-04-27 18:21:44.485 27028 DEBUG neutron.agent.l3.keepalived_state_change [-] Wrote router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2 state backup write_state_change ...
2018-04-27 18:21:45.526 27028 DEBUG neutron.agent.l3.keepalived_state_change [-] Notified agent router 44e8f6a5-c9c6-44c1-854c-c503efccc1b2, state backup notify_agent ...

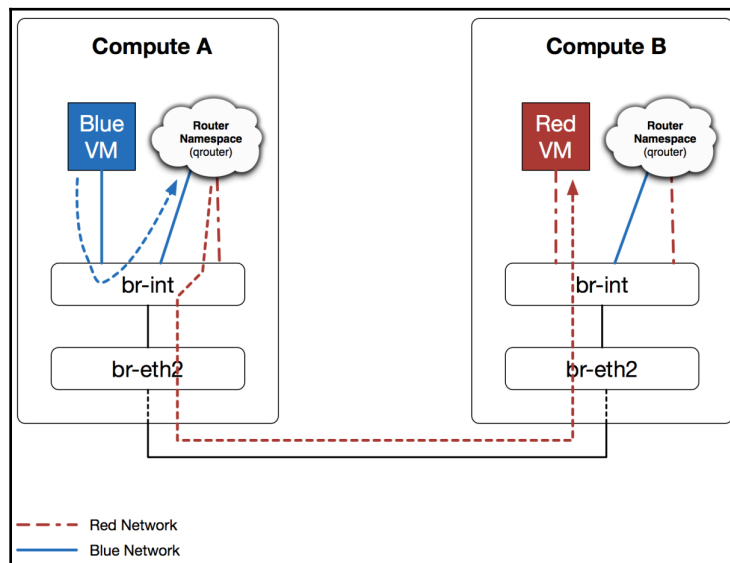
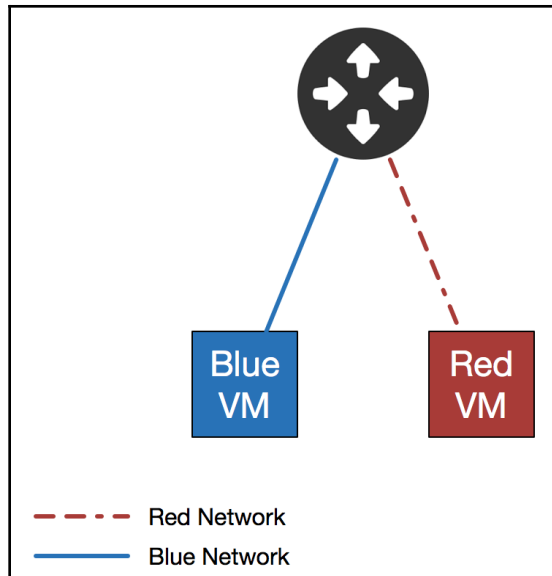
```

# Chapter 12: Distributed Virtual Routers



```
root@controller01:~# openstack network agent list --agent-type="l3"
```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
ee380688-0ea7-4e54-9889-c44ddd933678	L3 agent	compute01	nova	(-)	UP	neutron-l3-agent
f9f8e9a3-4332-4693-a652-40837ffdbd51	L3 agent	compute02	nova	(-)	UP	neutron-l3-agent
7cdeb762-ab03-41a3-b924-9e64dde50621	L3 agent	compute03	nova	(-)	UP	neutron-l3-agent
9c75984a-2cfa-4db6-afc6-b7e1e4901bbd	L3 agent	controller01	nova	(-)	UP	neutron-l3-agent
63214965-cd41-4aa1-a98f-a3e202929106	L3 agent	snat01	nova	(-)	UP	neutron-l3-agent



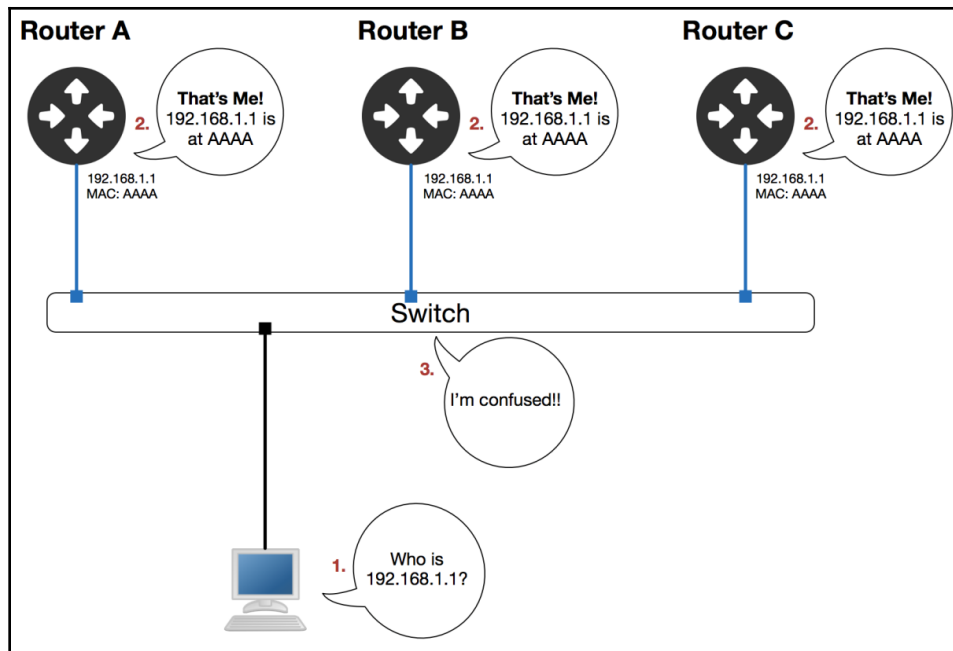
```

root@controller01:~# openstack router list
+-----+-----+-----+-----+-----+-----+-----+
| ID          | Name                | Status | State | Distributed | HA   | Project |
+-----+-----+-----+-----+-----+-----+-----+
| 9822b80c-7548-43f7-8a03-70c5baf6c9c0 | MyDistributedRouter | ACTIVE | UP    | True        | False | 9233b6b4f6a54386af63c0a7b8f043c2 |
+-----+-----+-----+-----+-----+-----+-----+
    
```

```
root@compute02:~# ip netns exec qrouter-9822b80c-7548-43f7-8a03-70c5baf6c9c0 ip a
...
30: qr-841d9818-bf: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:73:ce:50 brd ff:ff:ff:ff:ff:ff
    inet 192.168.150.1/24 brd 192.168.150.255 scope global qr-841d9818-bf
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe73:ce50/64 scope link
        valid_lft forever preferred_lft forever
31: qr-d2ce8f82-d8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:56:50:10 brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.1/24 brd 172.16.0.255 scope global qr-d2ce8f82-d8
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe56:5010/64 scope link
        valid_lft forever preferred_lft forever

root@compute03:~# ip netns exec qrouter-9822b80c-7548-43f7-8a03-70c5baf6c9c0 ip a
...
18: qr-841d9818-bf: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:73:ce:50 brd ff:ff:ff:ff:ff:ff
    inet 192.168.150.1/24 brd 192.168.150.255 scope global qr-841d9818-bf
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe73:ce50/64 scope link
        valid_lft forever preferred_lft forever
19: qr-d2ce8f82-d8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:56:50:10 brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.1/24 brd 172.16.0.255 scope global qr-d2ce8f82-d8
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe56:5010/64 scope link
        valid_lft forever preferred_lft forever

root@snat01:~# ip netns exec qrouter-9822b80c-7548-43f7-8a03-70c5baf6c9c0 ip a
...
17: qr-841d9818-bf: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:73:ce:50 brd ff:ff:ff:ff:ff:ff
    inet 192.168.150.1/24 brd 192.168.150.255 scope global qr-841d9818-bf
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe73:ce50/64 scope link
        valid_lft forever preferred_lft forever
19: qr-d2ce8f82-d8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:56:50:10 brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.1/24 brd 172.16.0.255 scope global qr-d2ce8f82-d8
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe56:5010/64 scope link
        valid_lft forever preferred_lft forever
```



```
root@controller01:~# mysql -e 'use neutron; select * from dvr_host_macs;'
```

host	mac_address
snat01	FA-16-3F-75-10-80
compute03	FA-16-3F-8B-A5-69
compute02	FA-16-3F-C9-6D-0F

```
root@compute02:~# ovs-ofctl dump-flows br-eth2
```

```
...
table=1, n_packets=2, n_bytes=260, priority=1,d_l_vlan=2,d_l_src=fa:16:3e:56:50:10 actions=mod_d_l_src:fa:16:3f:c9:6d:0f, resubmit(,2)
table=1, n_packets=2, n_bytes=260, priority=1,d_l_vlan=1,d_l_src=fa:16:3e:73:ce:50 actions=mod_d_l_src:fa:16:3f:c9:6d:0f, resubmit(,2)
table=1, n_packets=8, n_bytes=512, priority=0 actions=resubmit(,2)
table=2, n_packets=2, n_bytes=260, priority=4, in_port="phy-br-eth2",d_l_vlan=2 actions=mod_vlan_vid:42,NORMAL
table=2, n_packets=2, n_bytes=260, priority=4, in_port="phy-br-eth2",d_l_vlan=1 actions=mod_vlan_vid:41,NORMAL
table=2, n_packets=8, n_bytes=512, priority=4, in_port="phy-br-eth2",d_l_vlan=3 actions=mod_vlan_vid:30,NORMAL
table=2, n_packets=0, n_bytes=0, priority=2, in_port="phy-br-eth2" actions=drop
table=3, n_packets=4, n_bytes=536, priority=2,d_l_src=fa:16:3f:75:10:80 actions=output:"phy-br-eth2"
table=3, n_packets=4, n_bytes=456, priority=2,d_l_src=fa:16:3f:8b:a5:69 actions=output:"phy-br-eth2"
table=3, n_packets=16444, n_bytes=2558076, priority=1 actions=NORMAL
...
```

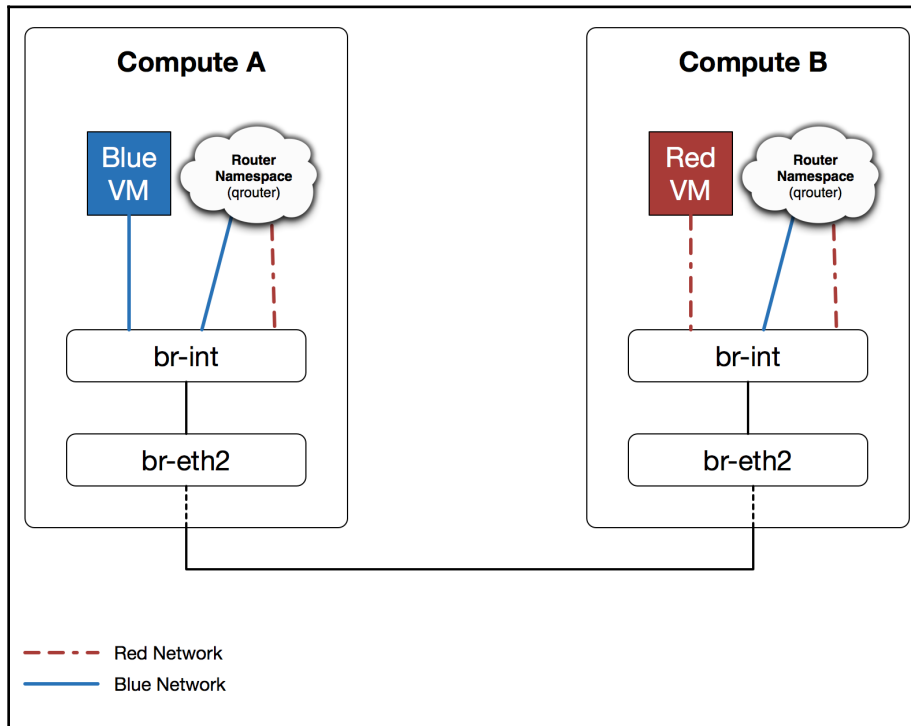
```

root@compute02:~# ovs-ofctl dump-flows br-int
...
table=0, n_packets=4, n_bytes=536, priority=4, in_port="int-br-eth2", d_l_src=fa:16:3f:75:10:80 actions=resubmit(,2)
table=0, n_packets=0, n_bytes=0, priority=2, in_port="patch-tun", d_l_src=fa:16:3f:75:10:80 actions=resubmit(,1)
table=0, n_packets=4, n_bytes=456, priority=4, in_port="int-br-eth2", d_l_src=fa:16:3f:8b:a5:69 actions=resubmit(,2)
table=0, n_packets=0, n_bytes=0, priority=2, in_port="patch-tun", d_l_src=fa:16:3f:8b:a5:69 actions=resubmit(,1)
table=0, n_packets=16, n_bytes=1304, priority=3, in_port="int-br-eth2", d_l_vlan=42 actions=mod_vlan_vid:2, resubmit(,60)
table=0, n_packets=16, n_bytes=1304, priority=3, in_port="int-br-eth2", d_l_vlan=41 actions=mod_vlan_vid:1, resubmit(,60)
table=0, n_packets=69, n_bytes=6186, priority=3, in_port="int-br-eth2", d_l_vlan=30 actions=mod_vlan_vid:3, resubmit(,60)
table=0, n_packets=24, n_bytes=1536, priority=0 actions=resubmit(,60)
table=1, n_packets=0, n_bytes=0, priority=1 actions=drop
table=2, n_packets=0, n_bytes=0, priority=4, d_l_vlan=41, d_l_dst=fa:16:3e:3b:c9:4b actions=mod_d_l_src:fa:16:3e:73:ce:50, resubmit(,60)
table=2, n_packets=8, n_bytes=992, priority=1 actions=drop
...

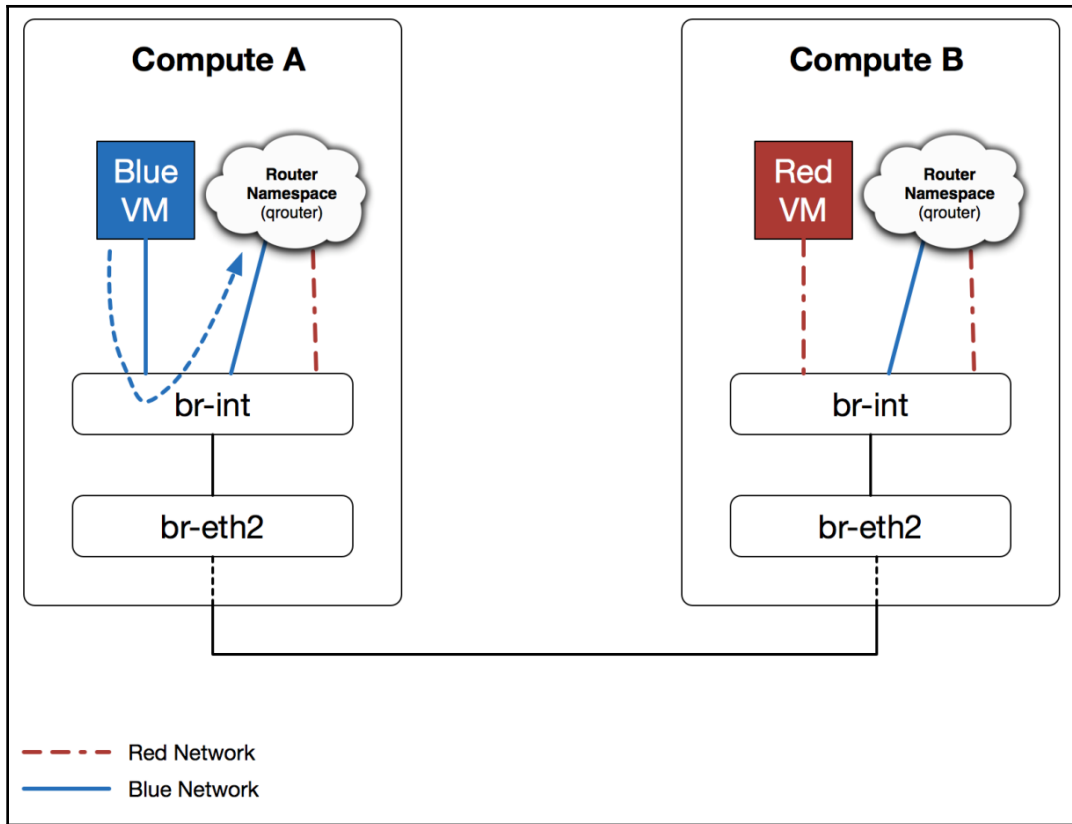
```

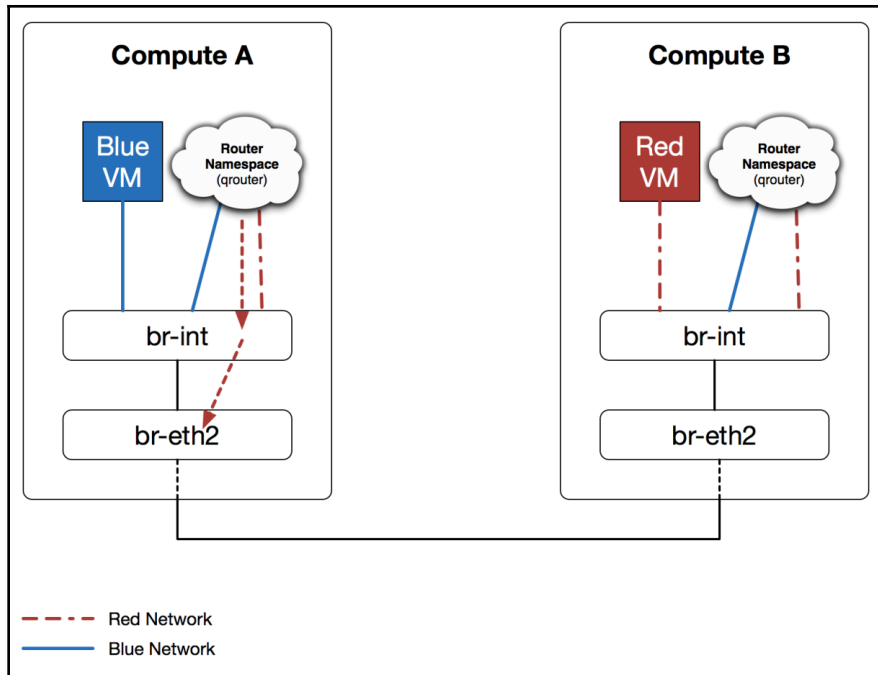
When traffic arrives from provider bridge from a unique host MAC, go to table 2

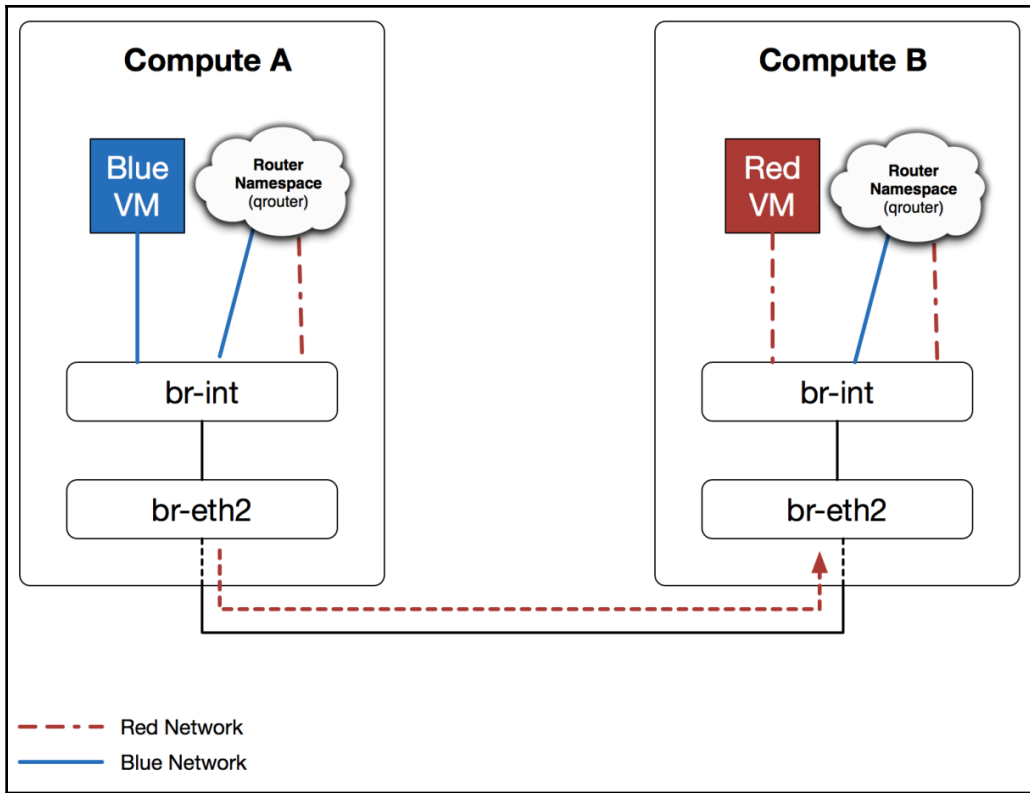
If the dest MAC is that of BLUE\_VM, modify the src MAC to that of the qr interface of the router interface on compute02

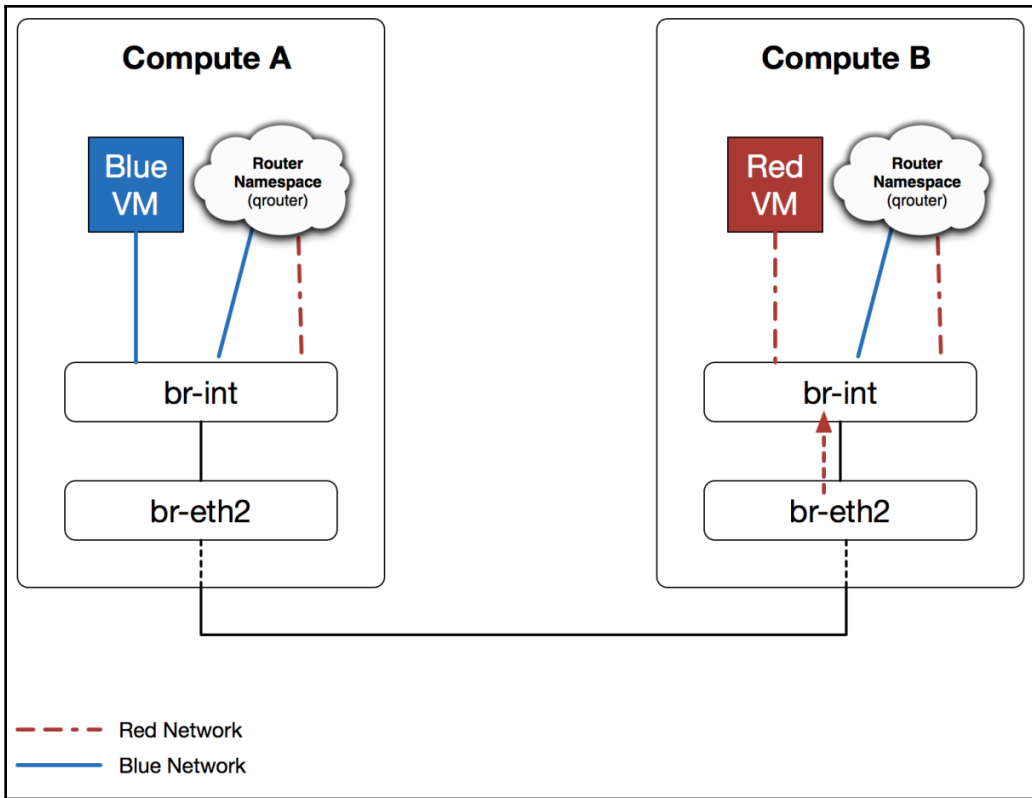


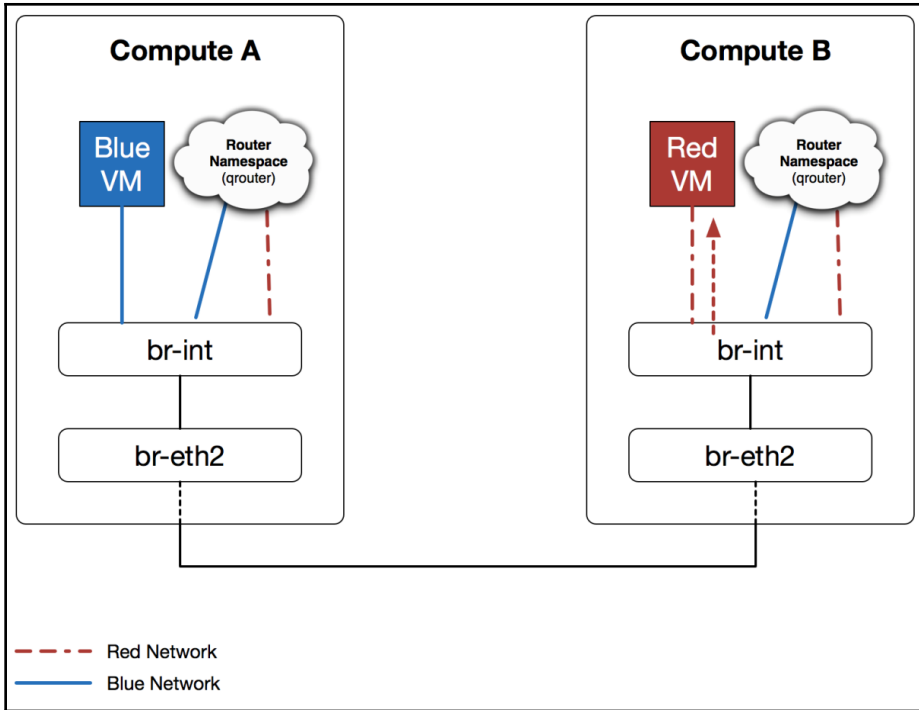












```

root@controller01:~# openstack router create --distributed MyOtherDistributedRouter
+-----+-----+
| Field                | Value                |
+-----+-----+
| admin_state_up       | UP                   |
| availability_zone_hints |                      |
| availability_zones    |                      |
| created_at           | 2018-05-07T14:32:51Z |
| description          |                      |
| distributed           | True                 |
| external_gateway_info | None                 |
| flavor_id            | None                 |
| ha                    | False                |
| id                    | d932cc76-4227-4c87-a24d-9736826e525d |
| name                  | MyOtherDistributedRouter |
| project_id            | 9233b6b4f6a54386af63c0a7b8f043c2 |
| revision_number       | None                 |
| routes                |                      |
| status                | ACTIVE               |
| tags                  |                      |
| updated_at           | 2018-05-07T14:32:51Z |
+-----+-----+

```

```

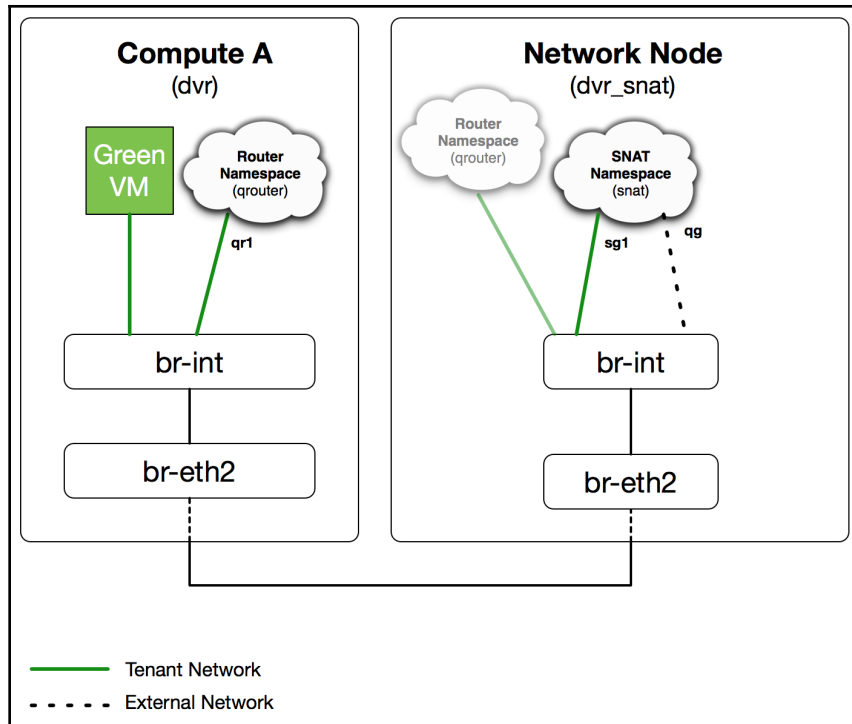
root@controller01:~# openstack router set --external GATEWAY_NET MyOtherDistributedRouter
root@controller01:~#
root@controller01:~# openstack network agent list --router=MyOtherDistributedRouter
+-----+-----+-----+-----+-----+-----+-----+
| ID                | Agent Type | Host   | Availability Zone | Alive | State | Binary          |
+-----+-----+-----+-----+-----+-----+-----+
| 63214965-cd41-4aa1-a98f-a3e202929106 | L3 agent  | snat01 | nova              | :- ) | UP    | neutron-l3-agent |
+-----+-----+-----+-----+-----+-----+-----+

```

```

root@snat01:~# ip netns
snat-d932cc76-4227-4c87-a24d-9736826e525d
qrouter-d932cc76-4227-4c87-a24d-9736826e525d
...

```



```

root@snat01:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   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
2: rfp-d932cc76-4@if4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether 8a:f2:78:41:ed:5b brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.106.114/31 scope global rfp-d932cc76-4
       valid_lft forever preferred_lft forever
   inet6 fe80::88f2:78ff:fe41:ed5b/64 scope link
       valid_lft forever preferred_lft forever
22: qr-13222cba-eb: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
   link/ether fa:16:3e:be:8c:e9 brd ff:ff:ff:ff:ff:ff
   inet 172.24.100.1/24 brd 172.24.100.255 scope global qr-13222cba-eb
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:febe:8ce9/64 scope link
       valid_lft forever preferred_lft forever

```

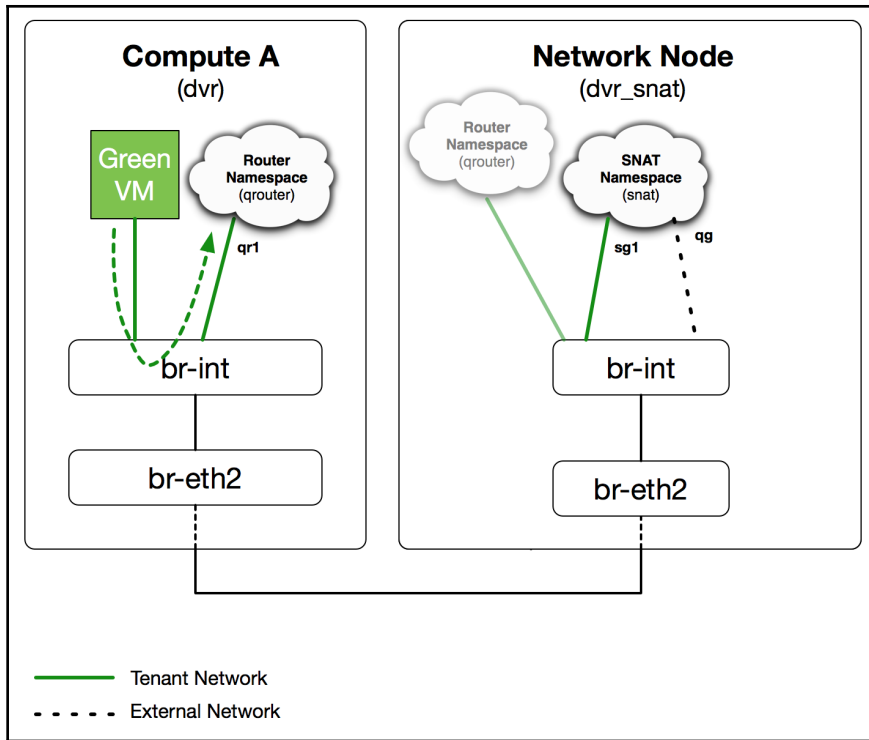
```
root@snat01:~# ip netns exec snat-d932cc76-4227-4c87-a24d-9736826e525d ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
21: qg-b752de9c-a3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:be:e2:7d brd ff:ff:ff:ff:ff:ff
    inet 10.30.0.104/24 brd 10.30.0.255 scope global qg-b752de9c-a3
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:febe:e27d/64 scope link
        valid_lft forever preferred_lft forever
23: sg-ea07f243-be: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fa:16:3e:04:a6:08 brd ff:ff:ff:ff:ff:ff
    inet 172.24.100.11/24 brd 172.24.100.255 scope global sg-ea07f243-be
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe04:a608/64 scope link
        valid_lft forever preferred_lft forever
```

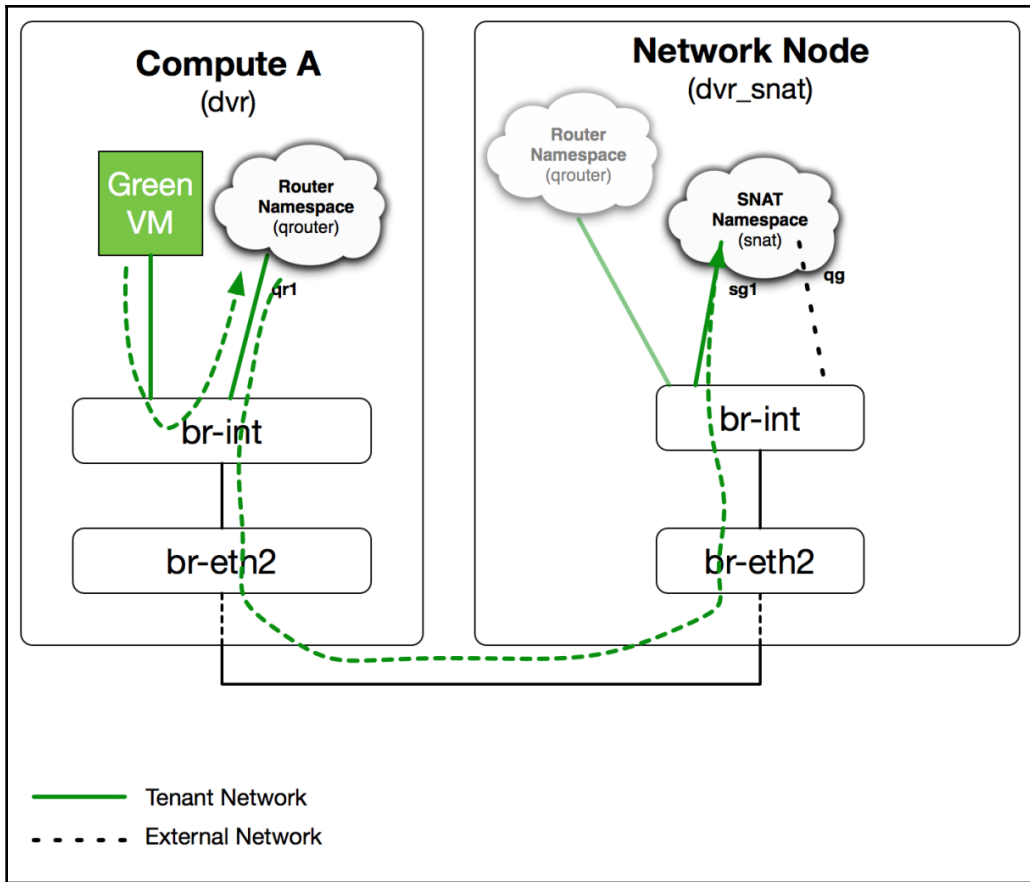
```
root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip route
169.254.106.114/31 dev rfp-d932cc76-4 proto kernel scope link src 169.254.106.114
172.24.100.0/24 dev qr-13222cba-eb proto kernel scope link src 172.24.100.1
```

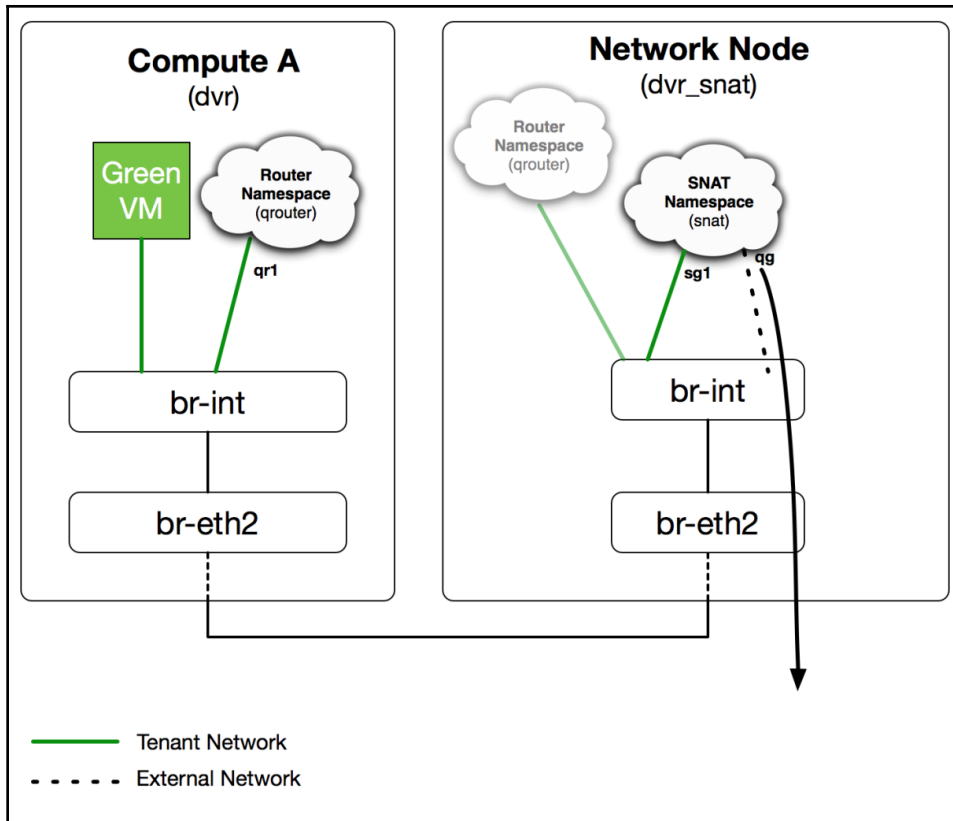
```
root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip rule
0: from all lookup local
32766: from all lookup main
32767: from all lookup default
2887279617: from 172.24.100.1/24 lookup 2887279617
```

```
root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip route show table 2887279617
default via 172.24.100.11 dev qr-13222cba-eb
```









```
root@compute03:~# ip netns
```

```
...
```

```
qrouter-d932cc76-4227-4c87-a24d-9736826e525d
```

```
fip-758070f9-ecaf-4d2a-aa49-e119ce7943f6 External Network ID
```

```

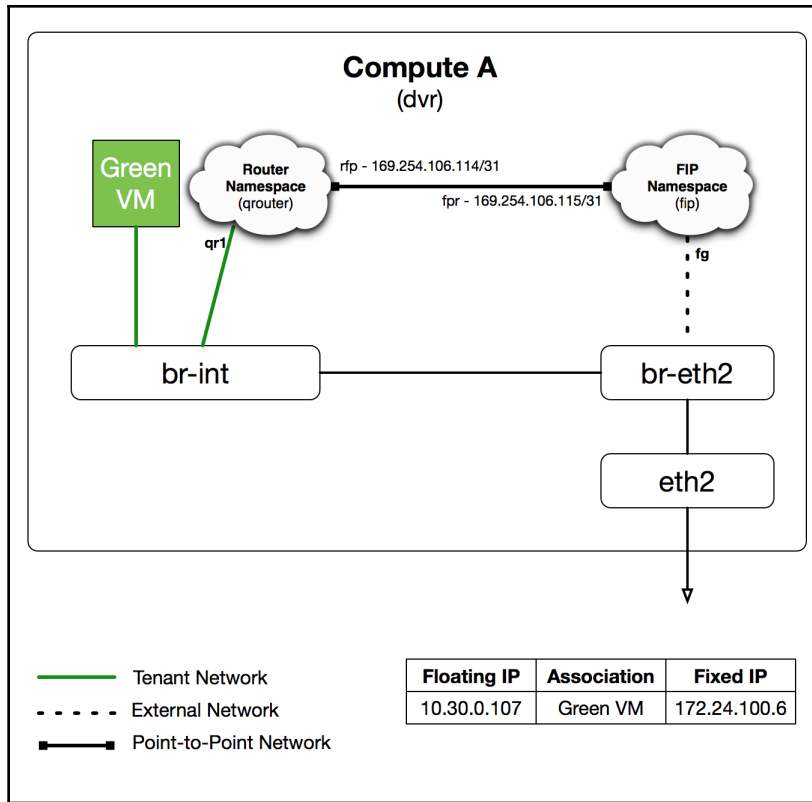
root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
   inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
   inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: rfp-d932cc76-4@if5: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether ce:00:bb:db:0b:a1 brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.106.114/31 scope global rfp-d932cc76-4
       valid_lft forever preferred_lft forever
   inet6 fe80::cc00:bbff:fedb:ba1/64 scope link
       valid_lft forever preferred_lft forever
21: qr-13222cba-eb: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
   link/ether fa:16:3e:be:8c:e9 brd ff:ff:ff:ff:ff:ff
   inet 172.24.100.1/24 brd 172.24.100.255 scope global qr-13222cba-eb
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:febe:8ce9/64 scope link
       valid_lft forever preferred_lft forever

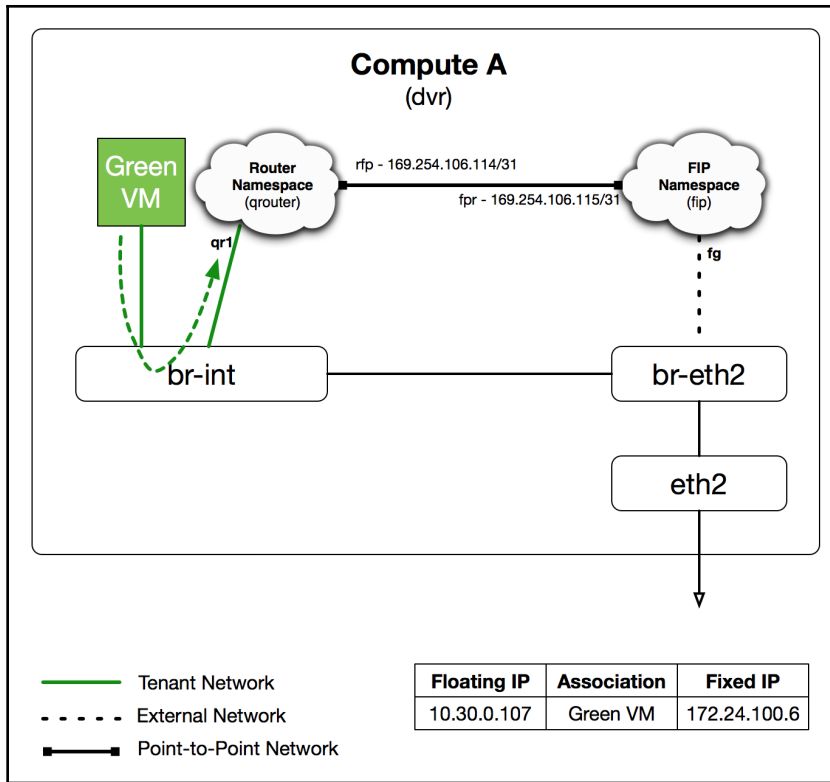
```

```

root@compute03:~# ip netns exec fip-758070f9-ecaf-4d2a-aa49-e119ce7943f6 ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   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
4: fpr-9822b80c-7@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether e6:62:fd:b7:96:2a brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.109.47/31 scope global fpr-9822b80c-7
       valid_lft forever preferred_lft forever
   inet6 fe80::e462:fdff:feb7:962a/64 scope link
       valid_lft forever preferred_lft forever
5: fpr-d932cc76-4@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether a6:62:ea:86:6c:1d brd ff:ff:ff:ff:ff:ff link-netnsid 1
   inet 169.254.106.115/31 scope global fpr-d932cc76-4
       valid_lft forever preferred_lft forever
   inet6 fe80::a462:eaff:fe86:6c1d/64 scope link
       valid_lft forever preferred_lft forever
14: fg-9f3f75e4-cd: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
   link/ether fa:16:3e:19:fa:9f brd ff:ff:ff:ff:ff:ff
   inet 10.30.0.113/24 brd 10.30.0.255 scope global fg-9f3f75e4-cd
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe19:fa9f/64 scope link
       valid_lft forever preferred_lft forever

```



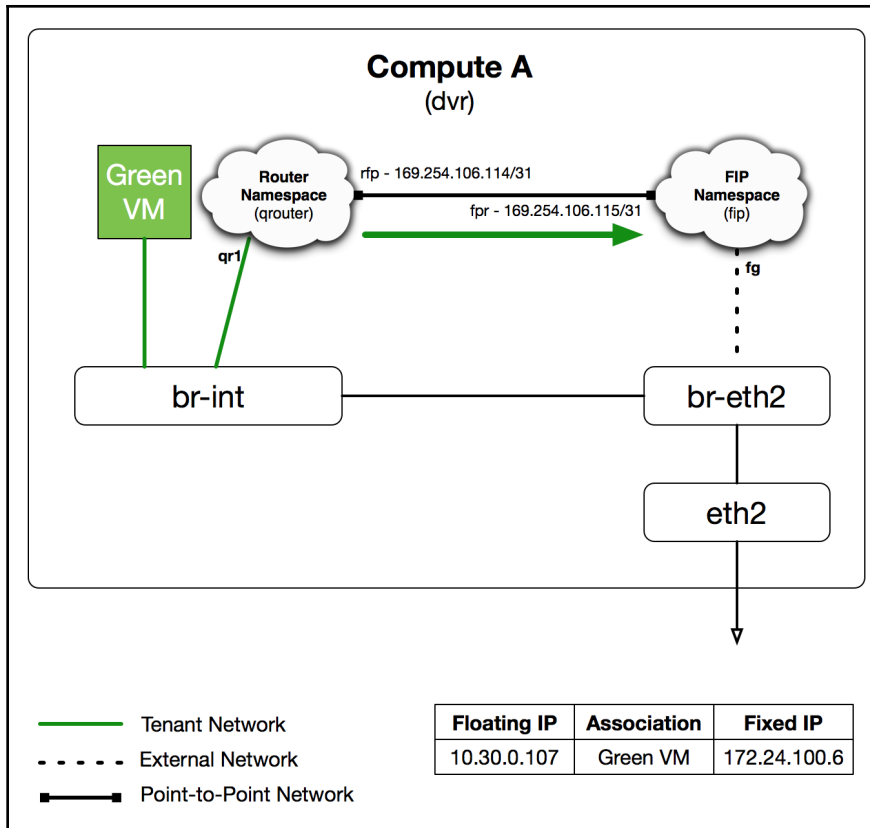


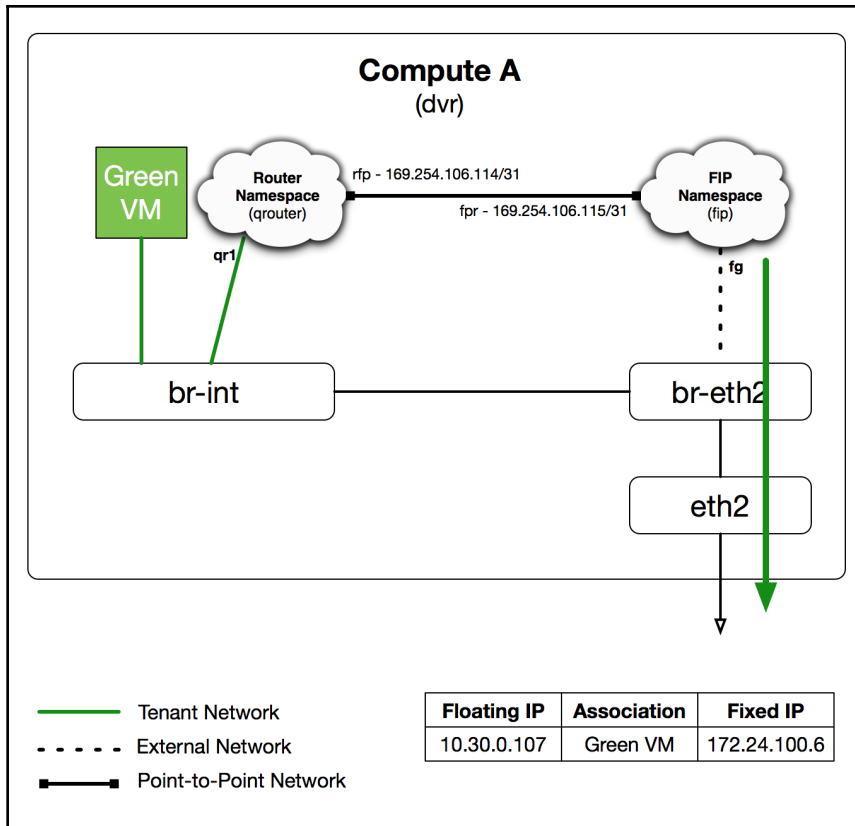
```

root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip rule
0: from all lookup local
32766: from all lookup main
32767: from all lookup default
57481: from 172.24.100.6 lookup 16 ←
2887279617: from 172.24.100.1/24 lookup 2887279617
    
```

```

root@compute03:~# ip netns exec qrouter-d932cc76-4227-4c87-a24d-9736826e525d ip route show table 16
default via 169.254.106.115 dev rfp-d932cc76-4
    
```







```

root@compute03:~# ip netns exec fip-758070f9-ecaf-4d2a-aa49-e119ce7943f6 ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
   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
4: fpr-9822b80c-7@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether e6:62:fd:b7:96:2a brd ff:ff:ff:ff:ff:ff link-netnsid 0
   inet 169.254.109.47/31 scope global fpr-9822b80c-7
       valid_lft forever preferred_lft forever
   inet6 fe80::e462:fdff:feb7:962a/64 scope link
       valid_lft forever preferred_lft forever
5: fpr-d932cc76-4@if2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether a6:62:ea:86:6c:1d brd ff:ff:ff:ff:ff:ff link-netnsid 1
   inet 169.254.106.115/31 scope global fpr-d932cc76-4
       valid_lft forever preferred_lft forever
   inet6 fe80::a462:eaff:fe86:6c1d/64 scope link
       valid_lft forever preferred_lft forever
14: fg-9f3f75e4-cd: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
   link/ether fa:16:3e:19:fa:9f brd ff:ff:ff:ff:ff:ff
   inet 10.30.0.113/24 brd 10.30.0.255 scope global fg-9f3f75e4-cd
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe19:fa9f/64 scope link
       valid_lft forever preferred_lft forever

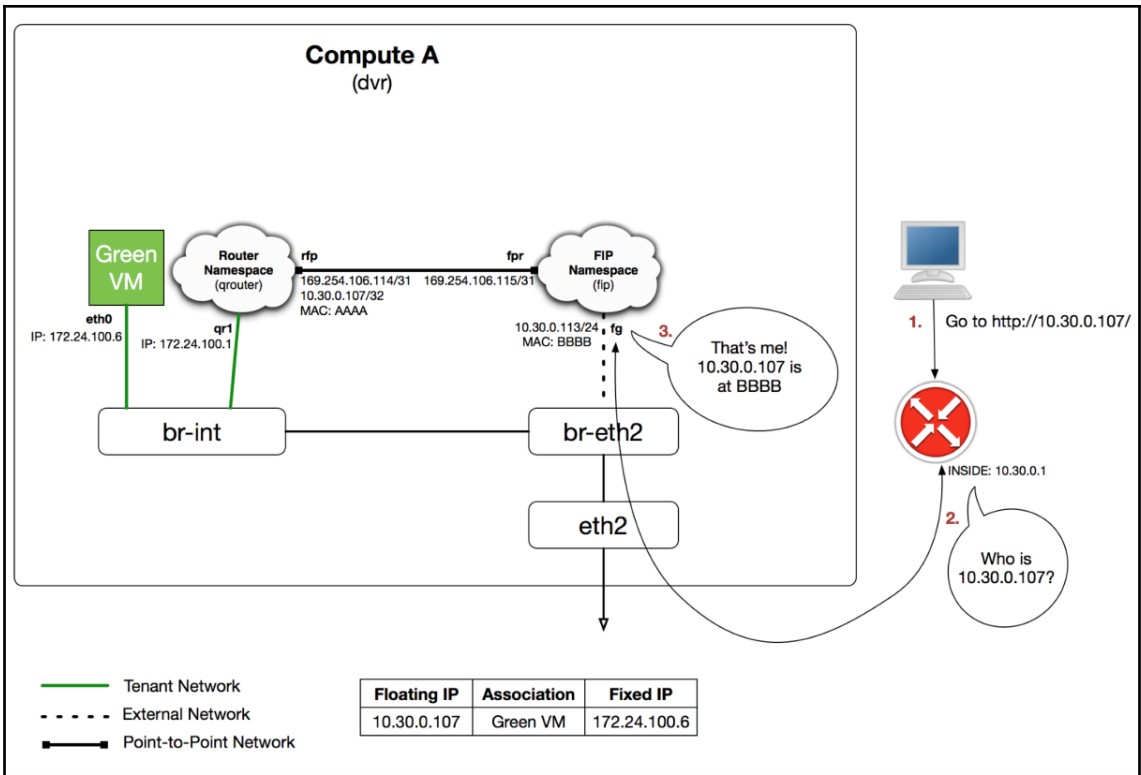
```

```

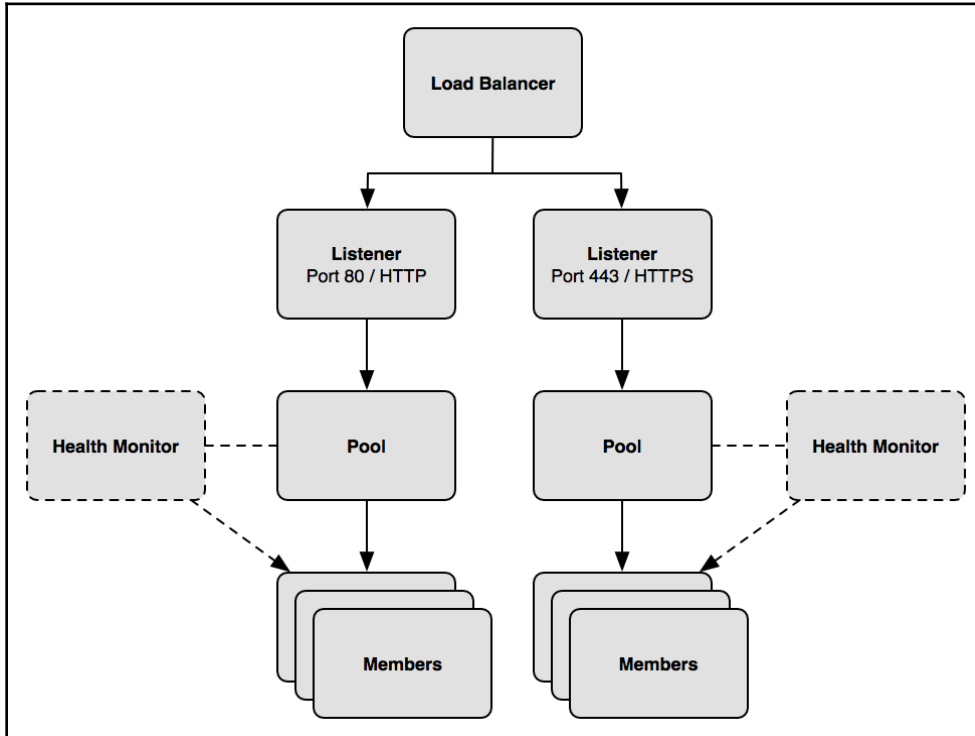
root@compute03:~# ip netns exec fip-758070f9-ecaf-4d2a-aa49-e119ce7943f6 ip route
10.30.0.0/24 dev fg-9f3f75e4-cd proto kernel scope link src 10.30.0.113
10.30.0.107 via 169.254.106.114 dev fpr-d932cc76-4
169.254.106.114/31 dev fpr-d932cc76-4 proto kernel scope link src 169.254.106.115
169.254.109.46/31 dev fpr-9822b80c-7 proto kernel scope link src 169.254.109.47

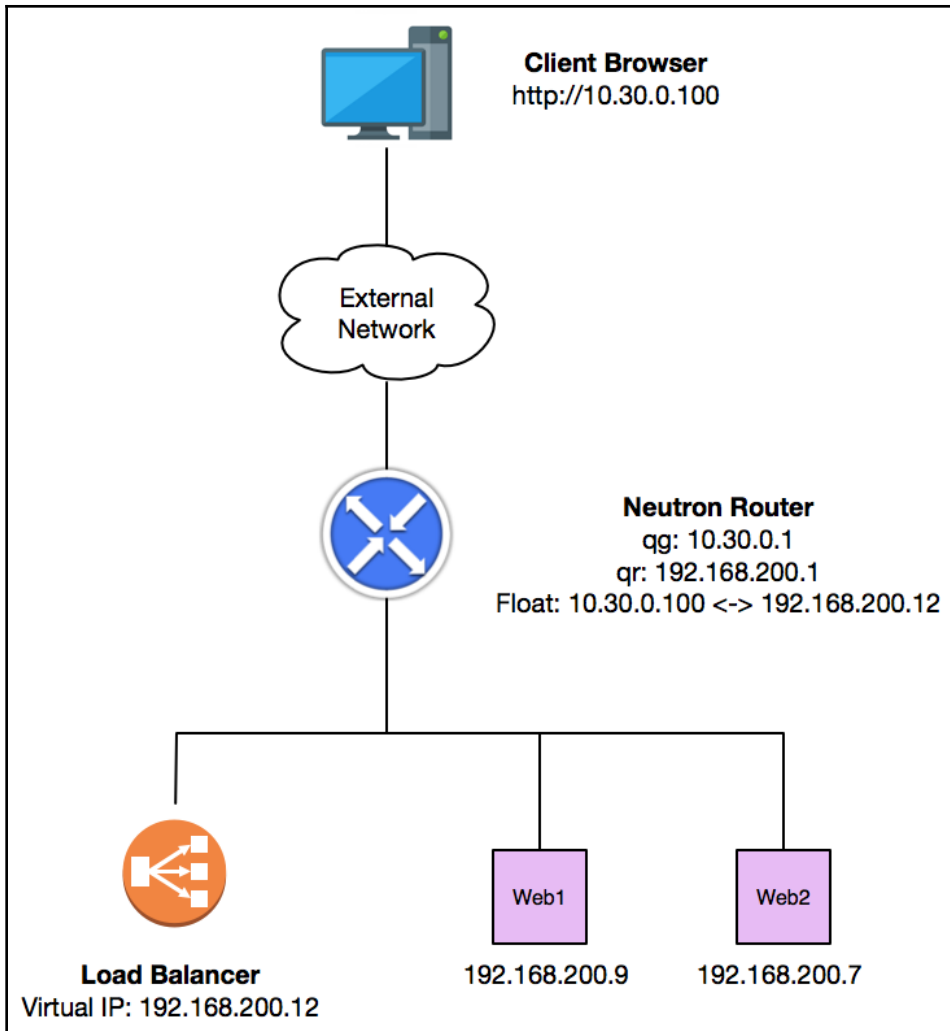
```

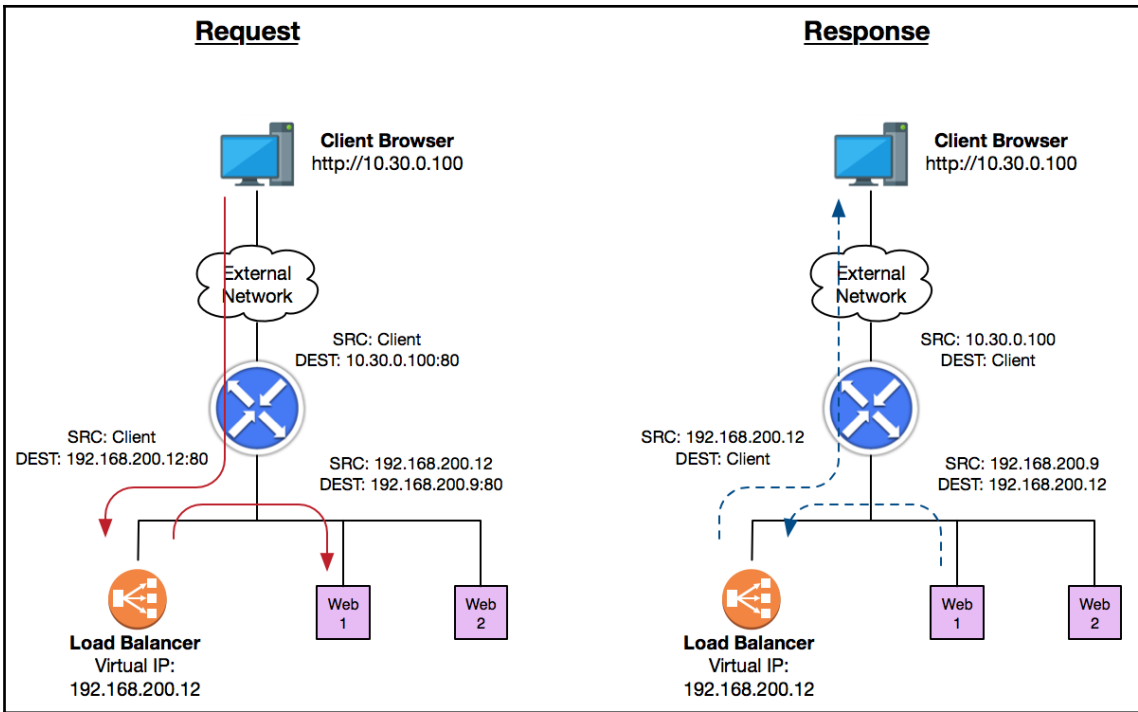
← Route to fpr interface of grouter namespace



# Chapter 13: Load Balancing Traffic to instances

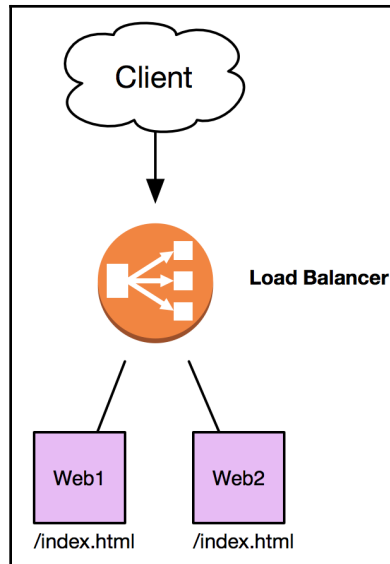






```

root@controller01:~# openstack network agent list
+-----+-----+-----+-----+-----+-----+-----+
| ID | Agent Type | Host | Availability Zone | Alive | State | Binary |
+-----+-----+-----+-----+-----+-----+-----+
...
| 93ae43ad-e419-47ba-9671-26e417aea960 | Loadbalancerv2 agent | controller01 | None | :- ) | UP | neutron-lbaasv2-agent |
...
+-----+-----+-----+-----+-----+-----+-----+
    
```



```

root@controller01:~# neutron lbaas-loadbalancer-create PROJECT_SUBNET --name LB_WEB
Created a new loadbalancer:
  
```

Field	Value
admin_state_up	True
description	
id	137292b2-79cf-447a-8259-39ac9aef6575
listeners	
name	LB_WEB
operating_status	OFFLINE
pools	
provider	haproxy
provisioning_status	PENDING_CREATE
tenant_id	9233b6b4f6a54386af63c0a7b8f043c2
vip_address	192.168.200.12
vip_port_id	28d1e4f9-c81a-4c82-90b5-20bf1eb5aa3d
vip_subnet_id	f29a2257-1283-4047-a835-b207480aa6f3

```

root@controller01:~# neutron lbaas-pool-create \
> --lb-algorithm ROUND_ROBIN \
> --protocol HTTP \
> --loadbalancer LB_WEB \
> --name POOL_WEB
neutron CLI is deprecated and will be removed in the future. Use openstack CLI instead.
Created a new pool:
+-----+
| Field          | Value                                     |
+-----+-----+
| admin_state_up | True                                     |
| description    |                                           |
| healthmonitor_id |                                           |
| id             | 05762f48-64e8-4e5a-a972-ddc2516c0153   |
| lb_algorithm   | ROUND_ROBIN                             |
| listeners      |                                           |
| loadbalancers  | {"id": "137292b2-79cf-447a-8259-39ac9aef6575"} |
| members        |                                           |
| name           | POOL_WEB                                 |
| protocol       | HTTP                                     |
| session_persistence |                                           |
| tenant_id      | 9233b6b4f6a54386af63c0a7b8f043c2     |
+-----+-----+

```

```

root@controller01:~# openstack server list
+-----+-----+-----+-----+-----+-----+
| ID          | Name  | Status | Networks          | Image          | Flavor |
+-----+-----+-----+-----+-----+-----+
| d0ce5716-f1dc-4d5f-a0c9-0f0db7721556 | web2  | ACTIVE | PROJECT_NET=192.168.200.7 | ubuntu-xenial-16.04 | small |
| 6157572c-2b6d-4f66-a66e-b0beaae0e0bf | web1  | ACTIVE | PROJECT_NET=192.168.200.9 | ubuntu-xenial-16.04 | small |
+-----+-----+-----+-----+-----+-----+

```

```
root@controller01:~# neutron lbaas-member-create --name web1 \  
> --subnet PROJECT_SUBNET \  
> --address 192.168.200.9 \  
> --protocol-port 80 \  
> POOL_WEB  
Created a new member:
```

Field	Value
address	192.168.200.9
admin_state_up	True
id	9554ae8b-8ced-4074-ab5f-037f0ef440cc
name	web1
protocol_port	80
subnet_id	f29a2257-1283-4047-a835-b207480aa6f3
tenant_id	9233b6b4f6a54386af63c0a7b8f043c2
weight	1

```
root@controller01:~# neutron lbaas-member-create --name web2 \  
> --subnet PROJECT_SUBNET \  
> --address 192.168.200.7 \  
> --protocol-port 80 \  
> POOL_WEB  
Created a new member:
```

Field	Value
address	192.168.200.7
admin_state_up	True
id	0ec91151-6ef1-4289-ad53-db9e46dc9d60
name	web2
protocol_port	80
subnet_id	f29a2257-1283-4047-a835-b207480aa6f3
tenant_id	9233b6b4f6a54386af63c0a7b8f043c2
weight	1



```
root@controller01:~# neutron lbaas-member-list POOL_WEB
```

id	name	address	protocol_port	weight	admin_state_up
0ec91151-6ef1-4289-ad53-db9e46dc9d60	web2	192.168.200.7	80	1	True
9554ae8b-8ced-4074-ab5f-037f0ef440cc	web1	192.168.200.9	80	1	True

```
root@controller01:~# neutron lbaas-healthmonitor-create \
> --name MONITOR_WEB \
> --delay 5 \
> --max-retries 3 \
> --timeout 4 \
> --type HTTP \
> --pool POOL_WEB
Created a new healthmonitor:
```

Field	Value
admin_state_up	True
delay	5
expected_codes	200
http_method	GET
id	98cc9c87-d001-4d0a-b317-3e77d21c0689
max_retries	3
max_retries_down	3
name	MONITOR_WEB
pools	{"id": "05762f48-64e8-4e5a-a972-ddc2516c0153"}
tenant_id	9233b6b4f6a54386af63c0a7b8f043c2
timeout	4
type	HTTP
url_path	/

```

root@controller01:~# neutron lbaas-listener-create \
> --name LISTENER_WEB \
> --loadbalancer LB_WEB \
> --protocol HTTP \
> --protocol-port 80 \
> --default-pool POOL_WEB
Created a new listener:

```

Field	Value
admin_state_up	True
connection_limit	-1
default_pool_id	05762f48-64e8-4e5a-a972-ddc2516c0153
default_tls_container_ref	
description	
id	d416b3cb-612f-4a68-a77e-e14cf8bda245
loadbalancers	{"id": "137292b2-79cf-447a-8259-39ac9aef6575"}
name	LISTENER_WEB
protocol	HTTP
protocol_port	80
sni_container_refs	
tenant_id	9233b6b4f6a54386af63c0a7b8f043c2

```

root@controller01:~# ip netns
qrouter-f94e2ec9-1c18-49ab-82bd-2fbcd5608cc4 (id: 5)
qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 (id: 3)
qdhcp-db527151-2088-491b-80f3-b06b10715527 (id: 2)
qdhcp-d8428f56-ba13-4aa7-97bb-76a6feb308bf (id: 1)
qdhcp-3f05db4d-c4ec-4cee-a616-2cfffbbd296e (id: 0)
qdhcp-ce1fe7cd-7b01-4d58-b1c8-414886b7d8f2 (id: 4)

```

```

root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 ip addr list
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
  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
2: ns-28d1e4f9-c8@if42: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
  link/ether fa:16:3e:9a:46:69 brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 192.168.200.12/24 brd 192.168.200.255 scope global ns-28d1e4f9-c8
    valid_lft forever preferred_lft forever
  inet6 fe80::f816:3eff:fe9a:4669/64 scope link
    valid_lft forever preferred_lft forever

```

```
root@controller01:~# cat /var/lib/neutron/lbaas/v2/137292b2-79cf-447a-8259-39ac9aef6575/haproxy.conf
# Configuration for LB_WEB
global
    daemon
    user nobody
    group haproxy
    log /dev/log local0
    log /dev/log local1 notice
    maxconn 2000
    stats socket /var/lib/neutron/lbaas/v2/137292b2-79cf-447a-8259-39ac9aef6575/haproxy_stats.sock mode 0666 level user

defaults
    log global
    retries 3
    option redispatch
    timeout connect 5000
    timeout client 50000
    timeout server 50000

frontend d416b3cb-612f-4a68-a77e-e14cf8bda245
    option tcplog
    option forwardfor
    bind 192.168.200.12:80
    mode http
    default_backend 05762f48-64e8-4e5a-a972-ddc2516c0153

backend 05762f48-64e8-4e5a-a972-ddc2516c0153
    mode http
    balance roundrobin
    timeout check 4s
    option httpchk GET /
    http-check expect rstatus 200
    server 0ec91151-6ef1-4289-ad53-db9e46dc9d60 192.168.200.7:80 weight 1 check inter 5s fall 3
    server 9554ae8b-8ced-4074-ab5f-037f0ef440cc 192.168.200.9:80 weight 1 check inter 5s fall 3
```

```
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.9
This is web1

root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.7
This is web2
```

```
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web1
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web1
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2
```

```

ubuntu@web1:~$ sudo tcpdump -i any port 80
sudo: unable to resolve host web1
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type LINUX_SLL (Linux cooked), capture size 262144 bytes
20:33:27 562511 IP 192.168.200.12.51200 > 192.168.200.9.http: Flags [S], seq 3
20:33:27 562568 IP 192.168.200.9.http > 192.168.200.12.51200: Flags [S.], seq 3
20:33:27 563384 IP 192.168.200.12.51200 > 192.168.200.9.http: Flags [L], ack 1
20:33:27 563425 IP 192.168.200.12.51200 > 192.168.200.9.http: Flags [P.], seq 3
20:33:27 563440 IP 192.168.200.9.http > 192.168.200.12.51200: Flags [L], ack 3
20:33:27 564620 IP 192.168.200.9.http > 192.168.200.12.51200: Flags [P.], seq 3
20:33:27 565113 IP 192.168.200.12.51200 > 192.168.200.9.http: Flags [L], ack 1

20:33:32 567675 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [S], seq 4
20:33:32 567733 IP 192.168.200.9.http > 192.168.200.12.51204: Flags [S.], seq 4
20:33:32 569304 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [L], ack 1
20:33:32 570146 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [P.], seq 4
20:33:32 570271 IP 192.168.200.9.http > 192.168.200.12.51204: Flags [L], ack 3
20:33:32 570970 IP 192.168.200.9.http > 192.168.200.12.51204: Flags [P.], seq 4
20:33:32 571436 IP 192.168.200.9.http > 192.168.200.12.51204: Flags [FP.], seq 4
20:33:32 571892 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [L], ack 1
20:33:32 571908 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [R.], seq 4
20:33:32 571919 IP 192.168.200.12.51204 > 192.168.200.9.http: Flags [R], seq 4

20:33:37 573026 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [S], seq 2
20:33:37 573085 IP 192.168.200.9.http > 192.168.200.12.51208: Flags [S.], seq 2
20:33:37 574143 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [L], ack 1
20:33:37 574740 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [P.], seq 2
20:33:37 574762 IP 192.168.200.9.http > 192.168.200.12.51208: Flags [L], ack 3
20:33:37 576198 IP 192.168.200.9.http > 192.168.200.12.51208: Flags [P.], seq 2
20:33:37 576834 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [L], ack 1
20:33:37 576860 IP 192.168.200.9.http > 192.168.200.12.51208: Flags [P.], seq 2
20:33:37 576940 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [R.], seq 2
20:33:37 577335 IP 192.168.200.12.51208 > 192.168.200.9.http: Flags [R], seq 2

```

```

root@controller01:~# tail -f /var/log/haproxy.log
May 18 20:05:18 controller01 haproxy[27950]: Server 05762f48-64e8-4e5a-a972-ddc2516c0153/9554ae8b-8ced-4074-ab5f-037f0ef440cc is DOWN, reason: Layer4 connection problem, info: "Connection refused", check duration: 1ms. 1 active and 0 backup servers left. 0 sessions active, 0

```

```

root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2
root@controller01:~# ip netns exec qlbaas-137292b2-79cf-447a-8259-39ac9aef6575 curl http://192.168.200.12
This is web2

```

```

May 18 20:16:49 controller01 haproxy[27950]: Server 05762f48-64e8-4e5a-a972-ddc2516c0153/9554ae8b-8ced-4074-ab5f-037f0ef440cc is UP,
reason: Layer7 check passed, code: 200, info: "HTTP status check returned code <3C>200<3E>", check duration: 2ms. 2 active and 0 backup
servers online. 0 sessions requested, 0 total in queue.

```

```

root@controller01:~# openstack floating ip create --port 28d1e4f9-c81a-4c82-90b5-20bf1eb5aa3d GATEWAY_NET
+-----+-----+
| Field          | Value                               |
+-----+-----+
| created_at     | 2018-05-18T20:25:03Z               |
| description    |                                     |
| fixed_ip_address | 192.168.200.12                     |
| floating_ip_address | 10.30.0.100                         |
| floating_network_id | 758070f9-ecaf-4d2a-aa49-e119ce7943f6 |
| id             | b3b729d5-e36a-4c4a-bcc7-ab05c69ea8d7 |
| name           | 10.30.0.100                         |
| port_id        | 28d1e4f9-c81a-4c82-90b5-20bf1eb5aa3d |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2   |
| revision_number | 0                                    |
| router_id      | 9822b80c-7548-43f7-8a03-70c5baf6c9c0 |
| status         | DOWN                                 |
| updated_at     | 2018-05-18T20:25:03Z               |
+-----+-----+

```

```

workstation:~ jdenton$ curl http://10.30.0.100
This is web2
workstation:~ jdenton$ curl http://10.30.0.100
This is web1
workstation:~ jdenton$ curl http://10.30.0.100
This is web2
workstation:~ jdenton$ curl http://10.30.0.100
This is web1

```

The screenshot shows the OpenStack Horizon interface. The left sidebar has a navigation menu with 'Project', 'API Access', 'Compute', 'Network', 'Network Topology', 'Networks', 'Routers', 'Security Groups', 'Load Balancers', 'Floating IPs', 'Admin', and 'Identity'. The 'Network' and 'Load Balancers' items are highlighted with red boxes. The main content area shows the 'Load Balancers' page with a breadcrumb 'Project / Network / Load Balancers'. There is a search filter, a 'Create Load Balancer' button, and a 'Delete Load Balancers' button. A table lists the load balancers:

Name	Description	Operating Status	Provisioning Status	IP Address	Listeners	Actions
LB_WEB	-	Online	Active	192.168.200.12	1	Edit

Below the table, there is a detailed view of the selected load balancer:

Provider	Floating IP Address	Admin State Up	ID	Subnet ID	Port ID
haproxy	10.30.0.100	Yes	137292b2-79cf-447a-8259-39ac9aef6575	f29a2257-1283-4047-a835-b207480aa6f3	28d1e4f9-c81a-4c82-90b5-20bf1eb5aa3d

The page also indicates 'Displaying 1 item'.

### Create Load Balancer

Provide the details for the load balancer.

**Load Balancer Details \***

Listener Details \*  
Pool Details \*  
Pool Members  
Monitor Details \*

**Name**  
Load Balancer 2

**Description**

**IP address**

**Subnet \***

### Create Load Balancer

Provide the details for the listener.

Load Balancer Details  
**Listener Details**  
Pool Details \*  
Pool Members  
Monitor Details \*

**Name**  
Listener 1

**Description**  
Created in Horizon

**Protocol \***  
HTTP

**Port \***  
80

### Create Load Balancer

Provide the details for the pool.

Load Balancer Details  
Listener Details  
**Pool Details**  
Pool Members  
Monitor Details \*

**Name**  
Pool 1

**Description**  
Created in Horizon

**Method \***  
ROUND\_ROBIN

▼ Available Instances

Q Filter

Name	IP Address	
web2	192.168.200.7	Add
web1	192.168.200.9	Add
GREEN_VM	172.24.100.6	Add
RED_VM	172.16.0.4	Add
BLUE_VM	192.168.150.13	Add

### Create Load Balancer

Load Balancer Details

Listener Details

Pool Details

**Pool Members**

Monitor Details \*

Add members to the load balancer pool.

▼ Allocated Members 2

IP Address *	Subnet *	Port *	Weight	
192.168.200.9	PROJECT_SUBNET	80	1	Remove
192.168.200.7	PROJECT_SUBNET	80	1	Remove

Add external member

▼ Available Instances

Q Filter

Name	IP Address	
web2	192.168.200.7	Add
web1	192.168.200.9	Add
GREEN_VM	172.24.100.6	Add
RED_VM	172.16.0.4	Add
BLUE_VM	192.168.150.13	Add

✕ Cancel < Back Next > Create Load Balancer

### Create Load Balancer ✕

[Load Balancer Details](#)

[Listener Details](#)

[Pool Details](#)

[Pool Members](#)

Monitor Details

Provide the details for the health monitor. ?

**Monitor type \***

TCP

**Interval (sec) \***

5

**Retries \***

3

**Timeout (sec) \***

5

✕ Cancel

< Back

Next >

+ Create Load Balancer

Project / Network / Load Balancers

## Load Balancers

Q Filter

+ Create Load Balancer

- Delete Load Balancers

<input type="checkbox"/>	Name ^	Description	Operating Status	Provisioning Status	IP Address	Listeners	Actions
<input type="checkbox"/>	> LB_WEB	-	Online	Active	192.168.200.12	1	Edit <span style="font-size: 0.8em;">▼</span>
<input type="checkbox"/>	▼ Load Balancer 2	Created in Horizon	Online	Active	192.168.200.3	1	Edit <span style="font-size: 0.8em;">▼</span>
<b>Provider</b>	<b>Floating IP Address</b>	<b>Admin State Up</b>	<b>ID</b>	<b>Subnet ID</b>	<b>Port ID</b>		
haproxy	None	Yes	f1792f8b-1c9c-438e-a432-91c927212e44	f29a2257-1283-4047-a835-b207480aa6f3	c3210bdc-688b-4df2-a4bf-c803e9445c41		

Displaying 2 items



Project / Network / Load Balancers

## Load Balancers

Q Filter + Create Load Balancer Delete Load Balancers

<input type="checkbox"/>	Name ^	Description	Operating Status	Provisioning Status	IP Address	Listeners	Actions
<input type="checkbox"/>	> LB_WEB	-	Online	Active	192.168.200.12	1	Edit ▾
<input type="checkbox"/>	▼ Load Balancer 2	Created in Horizon	Online	Active	192.168.200.3	1	Edit ▾

Provider	Floating IP Address	Admin State Up	ID	Subnet ID	Actions
haproxy	None	Yes	f1792f8b-1c9c-438e-a432-91c927212e44	f29a2257-1283-4041-a835-b207480aa6f3	<span>Associate Floating IP</span> <span>Delete Load Balancer</span>

Displaying 2 items

## Associate Floating IP Address

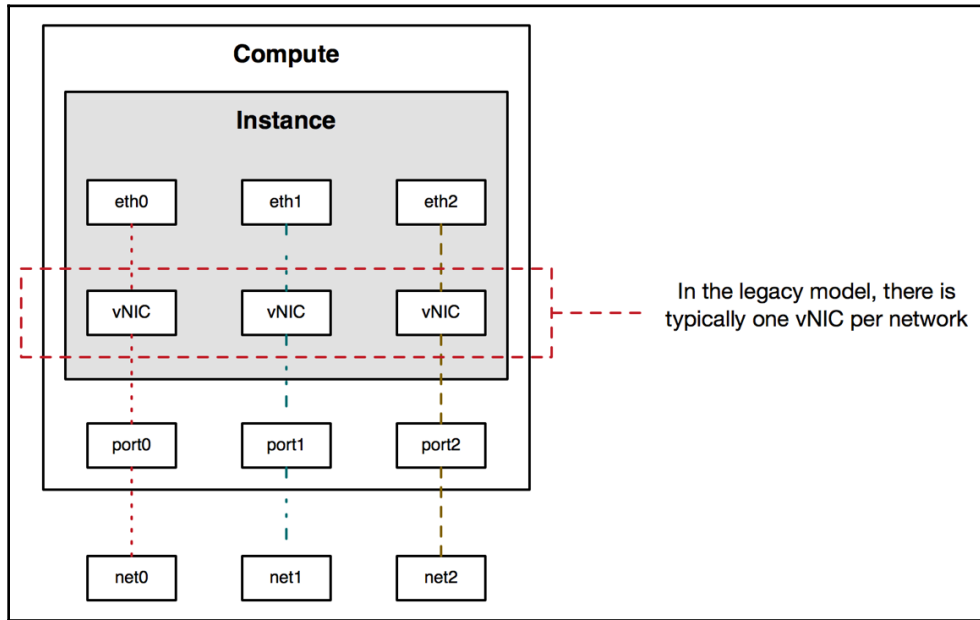
Select a floating IP address to associate with the load balancer or a floating IP pool in which to allocate a new floating IP address.

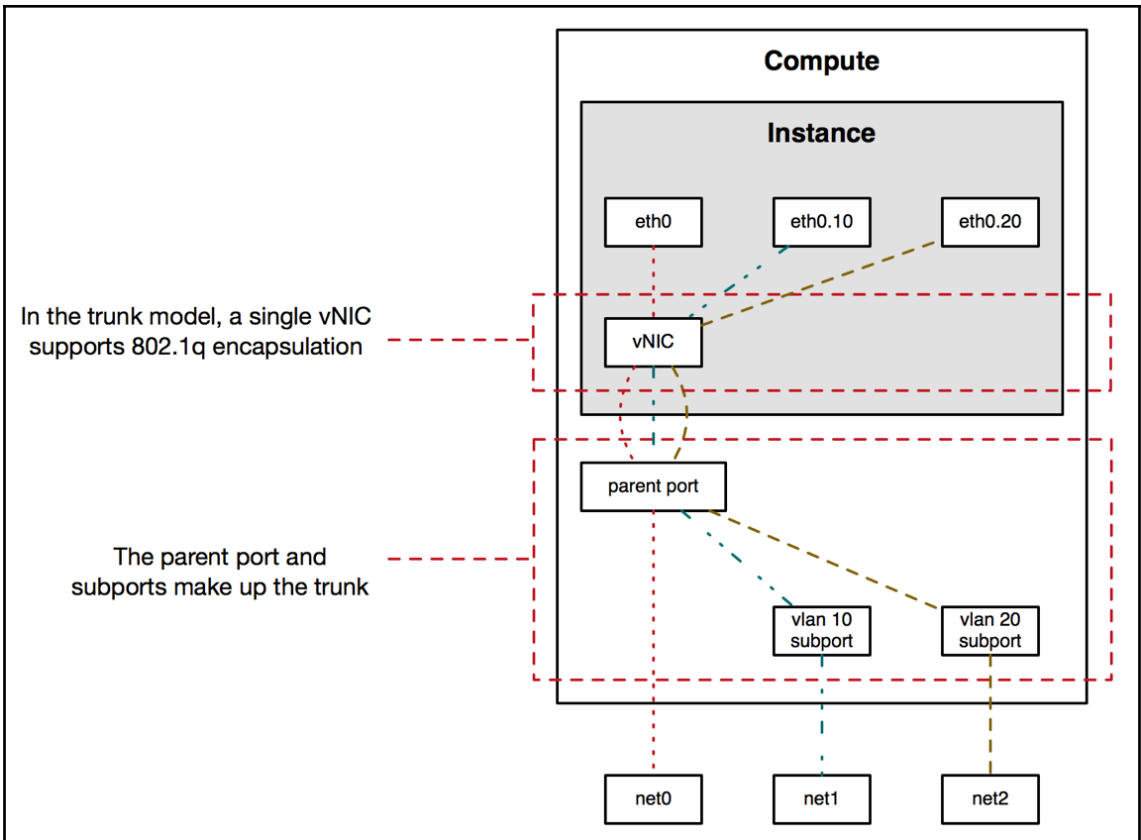
Floating IP address or pool \*

- ✓ Floating IP addresses
  - 10.30.0.105
  - 10.30.0.101
- Floating IP pools
  - GATEWAY\_NET

✕ Cancel ✓ Associate

# Chapter 14: Advance Networking Topics





ID	Name	Status	Subnets	Network Type	Segmentation ID
3f05db4d-c4ec-4cee-a616-2cfffbbd296e	RED_NET	ACTIVE	172.16.0.0/24	vlan	42
d8428f56-ba13-4aa7-97bb-76a6feb308bf	BLUE_NET	ACTIVE	192.168.150.0/24	vlan	41
db527151-2088-491b-80f3-b06b10715527	GREEN_NET	ACTIVE	172.24.100.0/24	vlan	40

```
root@controller01:~# openstack port create --network GREEN_NET parent0
```

Field	Value
admin_state_up	UP
allowed_address_pairs	
binding_host_id	
binding_profile	
binding_vif_details	
binding_vif_type	unbound
binding_vnic_type	normal
created_at	2018-06-04T15:38:09Z
data_plane_status	None
description	
device_id	
device_owner	
dns_assignment	None
dns_name	None
extra_dhcp_opts	
fixed_ips	ip_address='172.24.100.7', subnet_id='4a2b4fcc-07b3-45ae-a5e2-dfec3a8ec2e6'
id	a6546d52-bc8b-4ca0-bd3a-bda1afcde6bb
ip_address	None
mac_address	fa:16:3e:1c:3d:d3
name	parent0
network_id	db527151-2088-491b-80f3-b06b10715527
option_name	None
option_value	None
port_security_enabled	True
project_id	9233b6b4f6a54386af63c0a7b8f043c2
qos_policy_id	None
revision_number	3
security_group_ids	fae5da02-5d96-43df-aebf-bf0210d353bc
status	DOWN
subnet_id	None
tags	
trunk_details	None
updated_at	2018-06-04T15:38:09Z

```

root@controller01:~# openstack port create --network RED_NET child-p0c1
+-----+-----+
| Field          | Value                                     |
+-----+-----+
| admin_state_up | UP                                       |
| allowed_address_pairs |                                           |
| binding_host_id |                                           |
| binding_profile |                                           |
| binding_vif_details |                                           |
| binding_vif_type | unbound                                 |
| binding_vnic_type | normal                                  |
| created_at      | 2018-06-04T15:41:50Z                    |
| data_plane_status | None                                    |
| description     |                                           |
| device_id      |                                           |
| device_owner   |                                           |
| dns_assignment | None                                    |
| dns_name       | None                                    |
| extra_dhcp_opts |                                           |
| fixed_ips      | ip_address='172.16.0.11', subnet_id='bfe04cde-2c80-413e-9d69-b10a1aabb2f7' |
| id             | cd6850a0-186d-47ac-8981-6fa52088088e   |
| ip_address     | None                                    |
| mac_address    | fa:16:3e:a9:48:cc                       |
| name           | child-p0c1                              |
| network_id     | 3f05db4d-c4ec-4cee-a616-2cfffbbd296e   |
| option_name    | None                                    |
| option_value   | None                                    |
| port_security_enabled | True                                  |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2      |
| qos_policy_id  | None                                    |
| revision_number | 3                                       |
| security_group_ids | fae5da02-5d96-43df-aebf-bf0210d353bc  |
| status        | DOWN                                    |
| subnet_id     | None                                    |
| tags          |                                           |
| trunk_details  | None                                    |
| updated_at    | 2018-06-04T15:41:51Z                    |
+-----+-----+

```

```

root@controller01:~# openstack network trunk create \
> --parent-port parent0 \
> --subport port=child-p0c1,segmentation-type=vlan,segmentation-id=42 \
> trunk0
+-----+-----+
| Field          | Value                                     |
+-----+-----+
| admin_state_up | UP                                       |
| created_at      | 2018-06-04T15:58:08Z                    |
| description     |                                           |
| id             | 82597947-6e0a-40f3-b4ff-ccedd8c74ff8   |
| name           | trunk0                                  |
| port_id        | a6546d52-bc8b-4ca0-bd3a-bda1afcde6bb   |
| project_id     | 9233b6b4f6a54386af63c0a7b8f043c2      |
| revision_number | 0                                       |
| status        | DOWN                                    |
| sub_ports     | port_id='cd6850a0-186d-47ac-8981-6fa52088088e', segmentation_id='42', segmentation_type='vlan' |
| tags          | []                                       |
| tenant_id     | 9233b6b4f6a54386af63c0a7b8f043c2      |
| updated_at    | 2018-06-04T15:58:08Z                    |
+-----+-----+

```

```

root@controller01:~# openstack server create \
> --image 'ubuntu-xenial-16.04' \
> --flavor small \
> --key-name james \
> --nic port-id=parent0 \
> ServerWithTrunk

```

Field	Value
OS-DCF:diskConfig	MANUAL
OS-EXT-AZ:availability_zone	
OS-EXT-SRV-ATTR:host	None
OS-EXT-SRV-ATTR:hypervisor_hostname	None
OS-EXT-SRV-ATTR:instance_name	
OS-EXT-STS:power_state	NOSTATE
OS-EXT-STS:task_state	scheduling
OS-EXT-STS:vm_state	building
OS-SRV-USG:launched_at	None
OS-SRV-USG:terminated_at	None
accessIPv4	
accessIPv6	
addresses	
adminPass	Gh9zhNumek47
config_drive	
created	2018-06-04T16:06:59Z
flavor	small (280d07fb-b932-464a-9e26-817522286be7)
hostId	
id	09c21c1f-1b0e-4794-a0a6-ae37d0fd243a
image	ubuntu-xenial-16.04 (ffdb76f0-6cce-4d79-99a5-ccc6e76d530a)
key_name	james
name	ServerWithTrunk
progress	0
project_id	9233b6b4f6a54386af63c0a7b8f043c2
properties	
security_groups	name='default'
status	BUILD
updated	2018-06-04T16:07:01Z
user_id	8a679d8b7b574e54a5cfe02c422bbe68
volumes_attached	

```

root@serverwithtrunk:~# ip addr list
...
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether fa:16:3e:1c:3d:d3 brd ff:ff:ff:ff:ff:ff
   inet 172.24.100.7/24 brd 172.24.100.255 scope global ens3
       valid_lft forever preferred_lft forever
   inet6 fe80::f816:3eff:fe1c:3dd3/64 scope link
       valid_lft forever preferred_lft forever
3: ens3.42@ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
   link/ether fa:16:3e:a9:48:cc brd ff:ff:ff:ff:ff:ff
   inet6 fe80::f816:3eff:fea9:48cc/64 scope link
       valid_lft forever preferred_lft forever

```

```

root@controller01:~# ip netns exec qdhcp-db527151-2088-491b-80f3-b06b10715527 ssh -i james.key ubuntu@172.24.100.7
The authenticity of host '172.24.100.7 (172.24.100.7)' can't be established.
ECDSA key fingerprint is SHA256:WJ1h0Xdboy8iaz5t4lsjm2ves9eYStYsvU3Lqmx6eyk.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.24.100.7' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-112-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
  http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.

ubuntu@serverwithtrunk:~$ sudo su
root@serverwithtrunk:~#
root@serverwithtrunk:~# ip addr list
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    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
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether fa:16:3e:1c:3d:d3 brd ff:ff:ff:ff:ff:ff
    inet 172.24.100.7/24 brd 172.24.100.255 scope global ens3
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe1c:3dd3/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@serverwithtrunk:~# ip a
...
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether fa:16:3e:1c:3d:d3 brd ff:ff:ff:ff:ff:ff
    inet 172.24.100.7/24 brd 172.24.100.255 scope global ens3
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe1c:3dd3/64 scope link
        valid_lft forever preferred_lft forever
3: ens3.42@ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether fa:16:3e:a9:48:cc brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.11/24 brd 172.16.0.255 scope global ens3.42
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fea9:48cc/64 scope link
        valid_lft forever preferred_lft forever

```

```

root@serverwithtrunk:~# ping 172.16.0.2 -c 2
PING 172.16.0.2 (172.16.0.2) 56(84) bytes of data.
64 bytes from 172.16.0.2: icmp_seq=1 ttl=64 time=0.567 ms
64 bytes from 172.16.0.2: icmp_seq=2 ttl=64 time=1.29 ms

--- 172.16.0.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.567/0.933/1.299/0.366 ms

```

bridge name	bridge id	STP enabled	interfaces	
brq3f05db4d-c4	8000.000c29fa3f25	no	ens224.42	
			<u>tapcd6850a0-18</u>	Child Port
brq471ba196-e7	8000.000000000000	no		
brq758070f9-ec	8000.000c29fa3f25	no	ens224.30	
brqce1fe7cd-7b	8000.000c29fa3f25	no	ens224.43	
brqdb527151-20	8000.000c29fa3f25	no	ens224.40	
			<u>tapa6546d52-bc</u>	Parent Port

```

root@compute01:~# ip -d link show tapcd6850a0-18
33: tapcd6850a0-18@tapa6546d52-bc: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master brq3f05db4d-c4
    link/ether fe:16:3e:1c:3d:d3 brd ff:ff:ff:ff:ff:ff promiscuity 1
    vlan protocol 802.1Q id 42 <REORDER_HDR>
    bridge_slave state forwarding priority 32 cost 100 hairpin off guard off root_block off fastleave off learning

```

```

root@compute01:~# tcpdump -i tapa6546d52-bc -ne icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on tapa6546d52-bc, link-type EN10MB (Ethernet), capture size 262144 bytes
18:06:08.085655 fa:16:3e:a9:48:cc > fa:16:3e:2d:cc:46, ethertype 802.1Q (0x8100), length 102: vlan 42 p 0, ethertype IPv4, 172.16.0.11 > 172.16.0.2:
18:06:08.086188 fa:16:3e:2d:cc:46 > fa:16:3e:a9:48:cc, ethertype 802.1Q (0x8100), length 102: vlan 42 p 0, ethertype IPv4, 172.16.0.2 > 172.16.0.11:
18:06:09.087545 fa:16:3e:a9:48:cc > fa:16:3e:2d:cc:46, ethertype 802.1Q (0x8100), length 102: vlan 42 p 0, ethertype IPv4, 172.16.0.11 > 172.16.0.2:
18:06:09.088131 fa:16:3e:2d:cc:46 > fa:16:3e:a9:48:cc, ethertype 802.1Q (0x8100), length 102: vlan 42 p 0, ethertype IPv4, 172.16.0.2 > 172.16.0.11:
^C
4 packets captured
4 packets received by filter
0 packets dropped by kernel

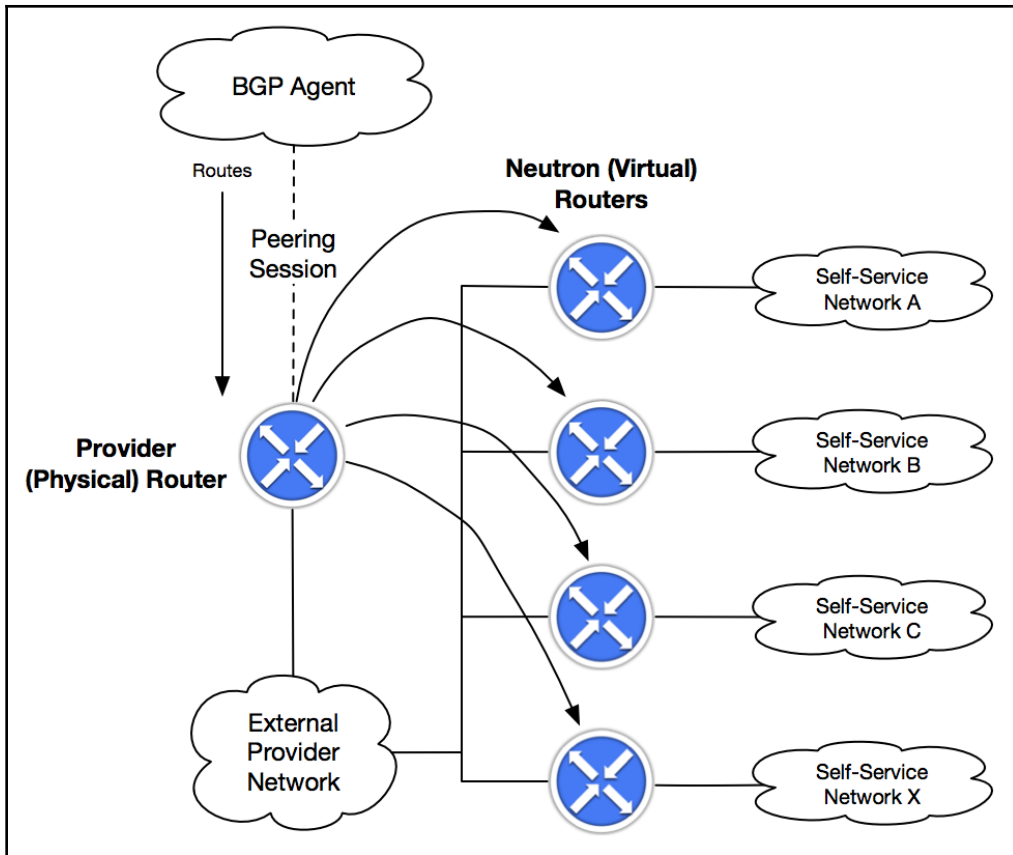
```

```

root@compute01:~# tcpdump -i tapcd6850a0-18 -ne icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on tapcd6850a0-18, link-type EN10MB (Ethernet), capture size 262144 bytes
18:06:08.085673 fa:16:3e:a9:48:cc > fa:16:3e:2d:cc:46, ethertype IPv4 (0x0800), length 98: 172.16.0.11 > 172.16.0.2: ICMP echo request
18:06:08.086182 fa:16:3e:2d:cc:46 > fa:16:3e:a9:48:cc, ethertype IPv4 (0x0800), length 98: 172.16.0.2 > 172.16.0.11: ICMP echo reply
18:06:09.087566 fa:16:3e:a9:48:cc > fa:16:3e:2d:cc:46, ethertype IPv4 (0x0800), length 98: 172.16.0.11 > 172.16.0.2: ICMP echo request
18:06:09.088122 fa:16:3e:2d:cc:46 > fa:16:3e:a9:48:cc, ethertype IPv4 (0x0800), length 98: 172.16.0.2 > 172.16.0.11: ICMP echo reply
^C
4 packets captured
4 packets received by filter
0 packets dropped by kernel

```





```
root@controller01:~# openstack network agent list --agent-type bgp
```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
c5f503bd-7ad4-42c6-ab67-303ffad75cb8	BGP dynamic routing agent	controller01	None	:-)	UP	neutron-bgp-dragent

```
root@controller01:~# openstack network agent list --agent-type='l3'
```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
ee380688-0ea7-4e54-9889-c44ddd933678	L3 agent	compute01	nova	:-)	UP	neutron-l3-agent
f9f8e9a3-4332-4693-a652-40837ffdbd51	L3 agent	compute02	nova	:-)	UP	neutron-l3-agent
7cdeb762-ab03-41a3-b924-9e64dde50621	L3 agent	compute03	nova	:-)	UP	neutron-l3-agent
9c75984a-2cfa-4db6-afc6-b7e1e4901bbd	L3 agent	controller01	nova	:-)	UP	neutron-l3-agent
63214965-cd41-4aa1-a98f-a3e202929106	L3 agent	snat01	nova	:-)	UP	neutron-l3-agent

```
root@controller01:~# openstack router create Router01 --availability-zone-hint AZ1
```

Field	Value
admin_state_up	UP
availability_zone_hints	AZ1
availability_zones	
created_at	2018-06-05T12:56:12Z
description	
distributed	False
external_gateway_info	None
flavor_id	None
ha	False
id	608c793a-0d18-4244-87e9-7a548a605fb1
name	Router01
project_id	9233b6b4f6a54386af63c0a7b8f043c2
revision_number	None
routes	
status	ACTIVE
tags	
updated_at	2018-06-05T12:56:12Z

```
root@controller01:~# openstack network agent list --agent-type='L3'
```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
ee380688-0ea7-4e54-9889-c44ddd933678	L3 agent	compute01	AZ1	:-)	UP	neutron-l3-agent
f9f8e9a3-4332-4693-a652-40837ffdbd51	L3 agent	compute02	nova	:-)	UP	neutron-l3-agent
7cdeb762-ab03-41a3-b924-9e64dde50621	L3 agent	compute03	nova	:-)	UP	neutron-l3-agent
9c75984a-2cfa-4db6-afc6-b7e1e4901bbd	L3 agent	controller01	nova	:-)	UP	neutron-l3-agent
63214965-cd41-4aa1-a98f-a3e202929106	L3 agent	snat01	nova	:-)	UP	neutron-l3-agent

```
root@controller01:~# openstack network agent list --router Router01
```

ID	Agent Type	Host	Availability Zone	Alive	State	Binary
ee380688-0ea7-4e54-9889-c44ddd933678	L3 agent	compute01	AZ1	:-)	UP	neutron-l3-agent

# Index