Scenario: Classic with Open vSwitch

« (deploy.html) » (scenario-classic-lb.html) (https://bugs.launchpad.net/openstack-manuals/+filebug?field.title=Scenario%3A%20Classic%20with%20Open%20vSwitch%20in%20Networking%20Guide&field.comment=%0A%0A-----------------------------------%0ARelease:%200.9%20on%202016-11-24%2007:52%0ASHA:%20cc8b39934de4de69e5235ca8e5c4d4b567d0f418%0ASource:%20http://git.openstack.org/cgit/openstack/openstack-manuals/tree/doc/networking-guide/source/scenario-classic-ovs.rst%0AURL: https://docs.openstack.org/liberty/networking-guide/scenario-classic-ovs.html&field.tags=networking-guide)

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This scenario describes a classic implementation of the OpenStack Networking service using the ML2 plug-in with Open vSwitch (OVS).

The classic implementation contributes the networking portion of self-service virtual data center infrastructure by providing a method for regular (non-privileged) users to manage virtual networks within a project and includes the following components:

- Project (tenant) networks

  Project networks provide connectivity to instances for a particular project. Regular (non-privileged) users can manage project networks within the allocation that an administrator or operator defines for them. Project networks can use VLAN, GRE, or VXLAN transport methods depending on the allocation. Project networks generally use private IP address ranges (RFC1918) and lack connectivity to external networks such as the Internet. Networking refers to IP addresses on project networks as *fixed* IP addresses.

- External networks

  External networks provide connectivity to external networks such as the Internet. Only administrative (privileged) users can manage external networks because they interface with the physical network infrastructure. External networks can use flat or VLAN transport methods depending on the physical network infrastructure and generally use public IP address ranges.

  > **Note**
  >
  > A flat network essentially uses the untagged or native VLAN. Similar to layer-2 properties of physical networks, only one flat network can exist per external bridge. In most cases, production deployments should use VLAN transport for external networks.

- Routers

  Routers typically connect project and external networks. By default, they implement SNAT to provide outbound external connectivity for instances on project networks. Each router uses an IP address in the external network allocation for SNAT. Routers also use DNAT to provide inbound external connectivity for instances on project networks. Networking refers to IP addresses on routers that provide inbound external connectivity for instances on project networks as *floating* IP addresses. Routers can also connect project networks that belong to the same project.

- Supporting services

  Other supporting services include DHCP and metadata. The DHCP service manages IP addresses for instances on project networks. The metadata service provides an API for instances on project networks to obtain metadata such as SSH keys.

The example configuration creates one flat external network and one VXLAN project (tenant) network. However, this configuration also supports VLAN external networks, VLAN project networks, and GRE project networks.

Prerequisites¶

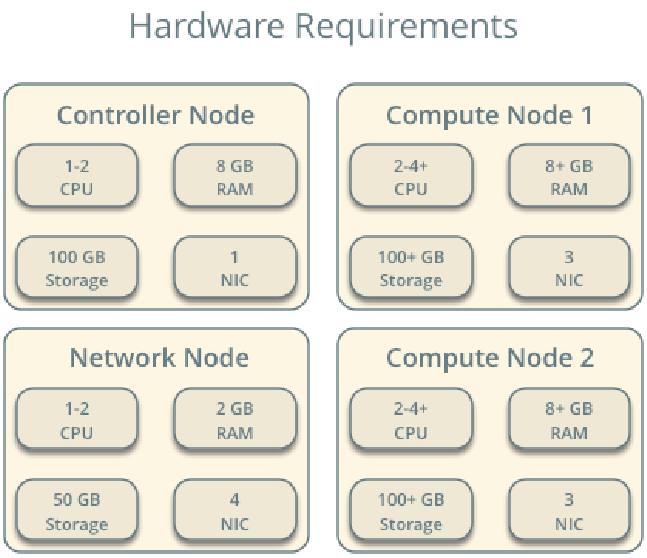
These prerequisites define the minimal physical infrastructure and immediate OpenStack service dependencies necessary to deploy this scenario. For example, the Networking service immediately depends on the Identity service and the Compute service immediately depends on the Networking service. These dependencies lack services such as the Image service because the Networking service does not immediately depend on it. However, the Compute service depends on the Image service to launch an instance. The example configuration in this scenario assumes basic configuration knowledge of Networking service components.

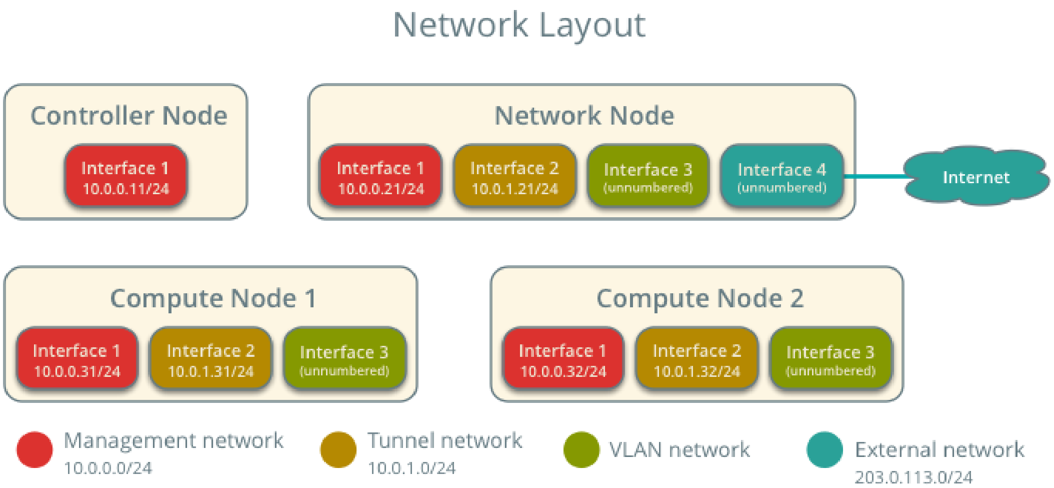
Infrastructure¶

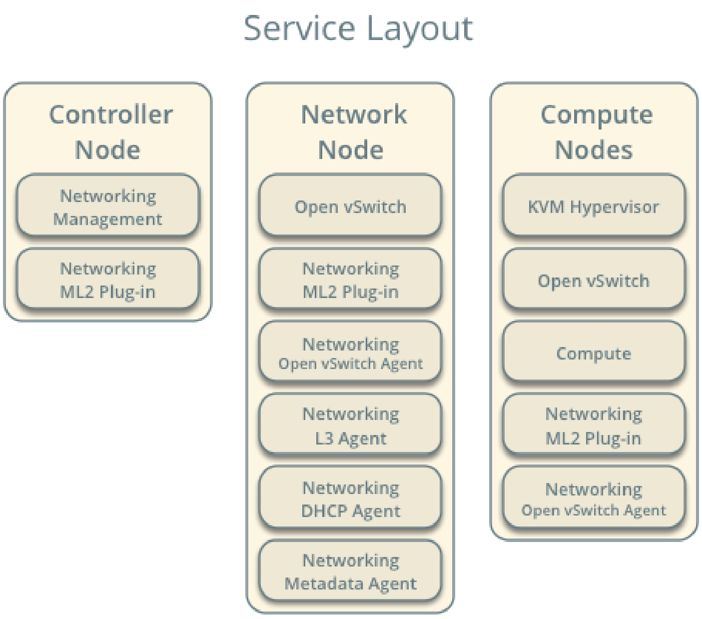
1. One controller node with one network interface: management.
2. One network node with four network interfaces: management, project tunnel networks, VLAN project networks, and external (typically the Internet). The Open vSwitch bridge `br-vlan` must contain a port on the VLAN interface and Open vSwitch bridge `br-ex` must contain a port on the external interface.
3. At least one compute node with three network interfaces: management, project tunnel networks, and VLAN project networks. The Open vSwitch bridge `br-vlan` must contain a port on the VLAN interface.

To improve understanding of network traffic flow, the network and compute nodes contain a separate network interface for VLAN project networks. In production environments, VLAN project networks can use any Open vSwitch bridge with access to a network interface. For example, the `br-tun` bridge.

In the example configuration, the management network uses 10.0.0.0/24, the tunnel network uses 10.0.1.0/24, and the external network uses 203.0.113.0/24. The VLAN network does not require an IP address range because it only handles layer-2 connectivity.







Note

For VLAN external and project networks, the physical network infrastructure must support VLAN tagging. For best performance with VXLAN and GRE project networks, the network infrastructure should support jumbo frames.

Warning

Linux distributions often package older releases of Open vSwitch that can introduce issues during operation with the Networking service. We recommend using at least the latest long-term stable (LTS) release of Open vSwitch for the best experience and support from Open vSwitch. See http://www.openvswitch.org (http://www.openvswitch.org) for available releases and the installation instructions (https://github.com/openvswitch/ovs/blob/master/INSTALL.md) for building newer releases from source on various distributions.

Implementing VXLAN networks requires Linux kernel 3.13 or newer.

OpenStack services - controller node¶

1. Operational SQL server with `neutron` database and appropriate configuration in the `neutron.conf` file.
2. Operational message queue service with appropriate configuration in the `neutron.conf` file.
3. Operational OpenStack Identity service with appropriate configuration in the `neutron.conf` file.
4. Operational OpenStack Compute controller/management service with appropriate configuration to use neutron in the `nova.conf` file.
5. Neutron server service, ML2 plug-in, and any dependencies.

OpenStack services - network node¶

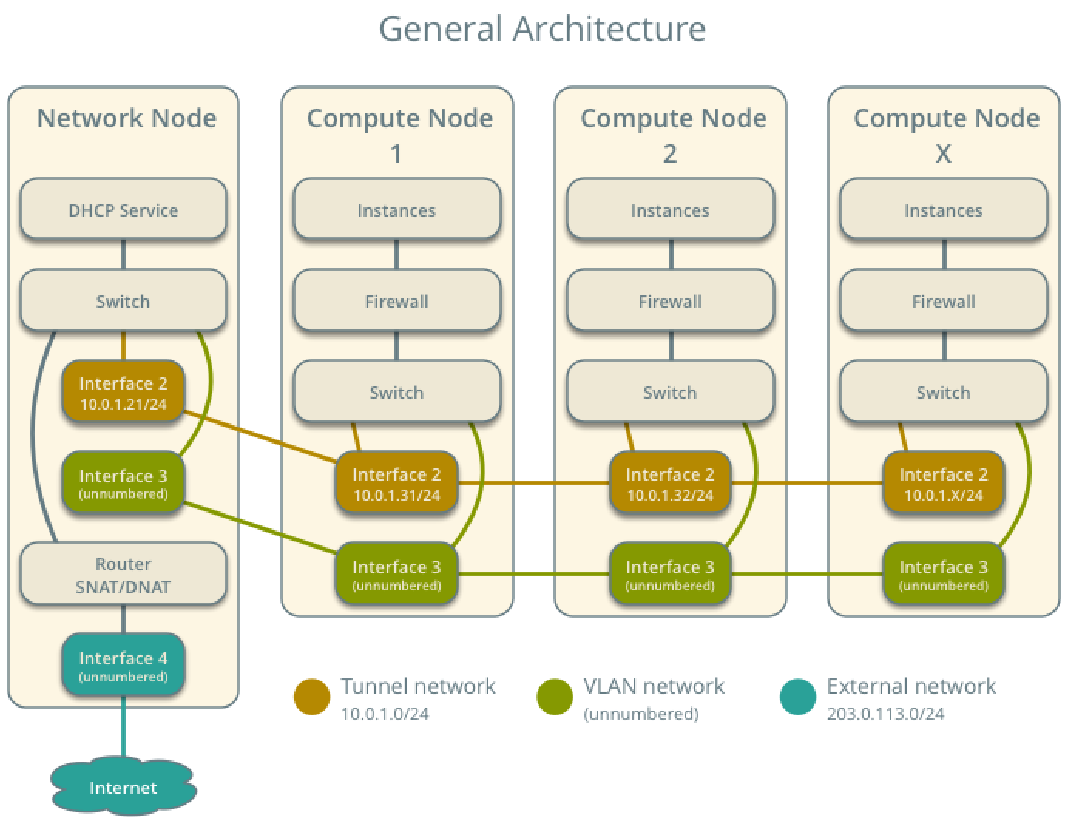
1. Operational OpenStack Identity service with appropriate configuration in the `neutron.conf` file.
2. Open vSwitch service, Open vSwitch agent, L3 agent, DHCP agent, metadata agent, and any dependencies.

OpenStack services - compute nodes¶

1. Operational OpenStack Identity service with appropriate configuration in the `neutron.conf` file.
2. Operational OpenStack Compute controller/management service with appropriate configuration to use neutron in the `nova.conf` file.
3. Open vSwitch service, Open vSwitch agent, and any dependencies.

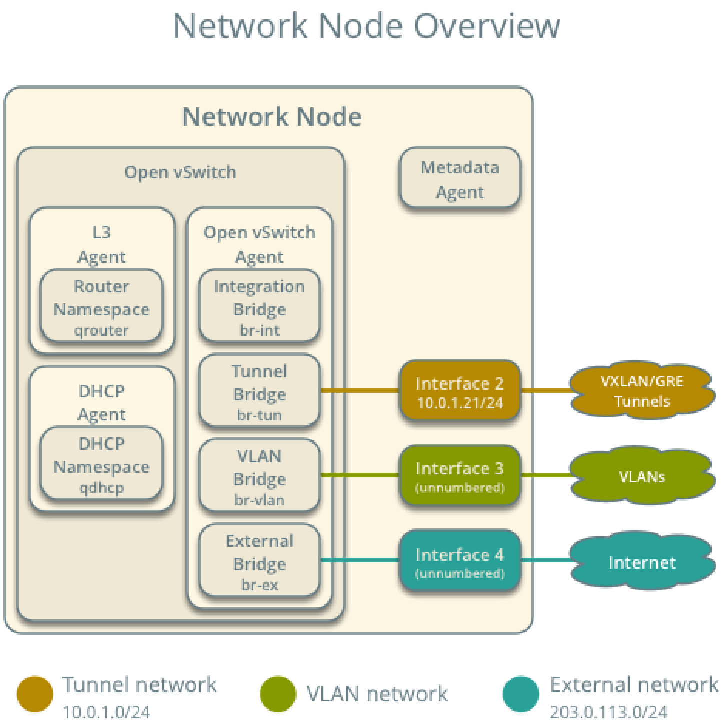
Architecture¶

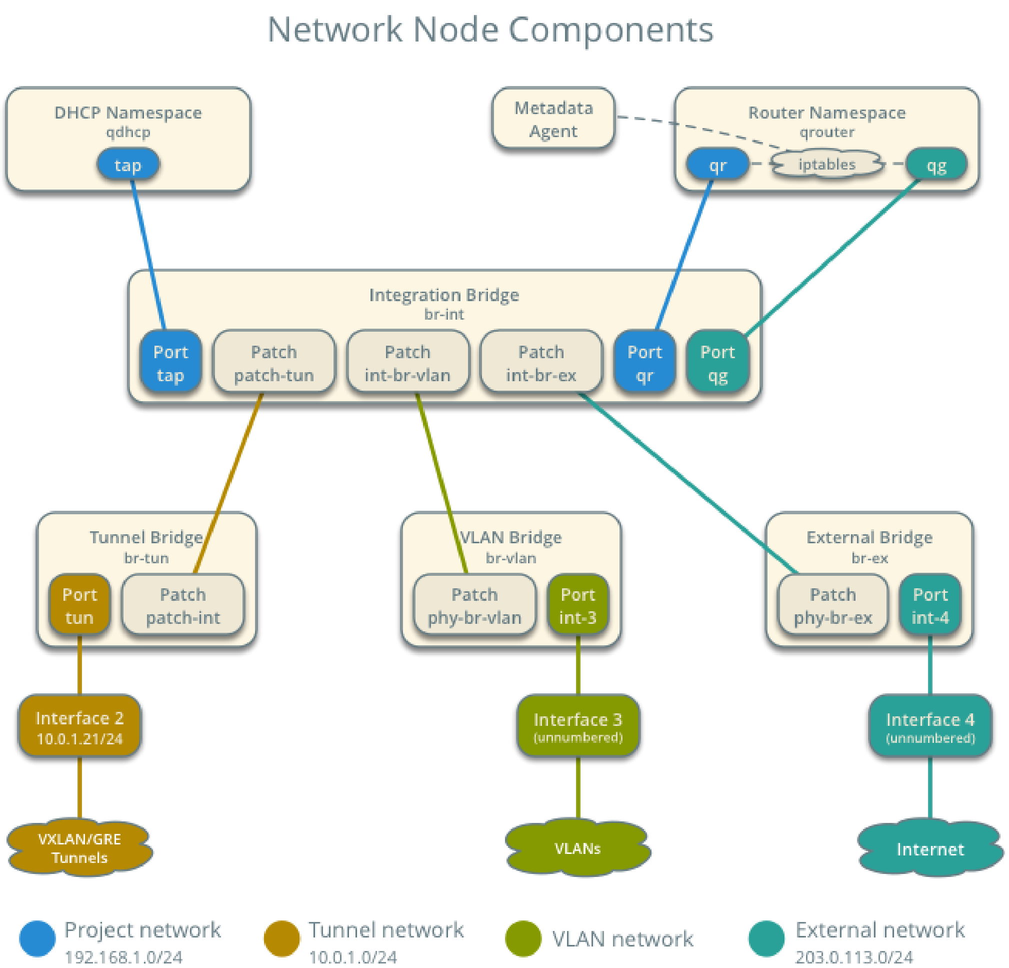
The classic architecture provides basic virtual networking components in your environment. Routing among project and external networks resides completely on the network node. Although more simple to deploy than other architectures, performing all functions on the network node creates a single point of failure and potential performance issues. Consider deploying DVR or L3 HA architectures in production environments to provide redundancy and increase performance.



The network node contains the following network components:

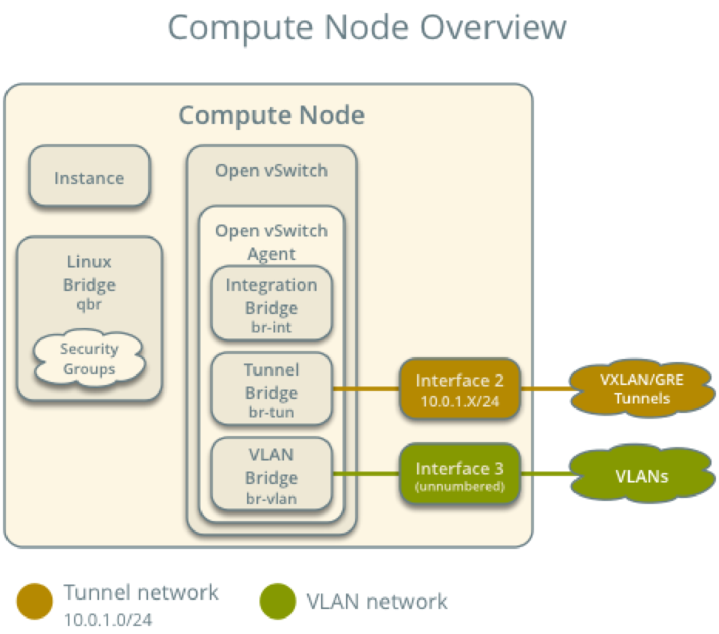
1. Open vSwitch agent managing virtual switches, connectivity among them, and interaction via virtual ports with other network components such as namespaces, Linux bridges, and underlying interfaces.
2. DHCP agent managing the `qdhcp` namespaces. The `qdhcp` namespaces provide DHCP services for instances using project networks.
3. L3 agent managing the `qrouter` namespaces. The `qrouter` namespaces provide routing between project and external networks and among project networks. They also route metadata traffic between instances and the metadata agent.
4. Metadata agent handling metadata operations for instances.

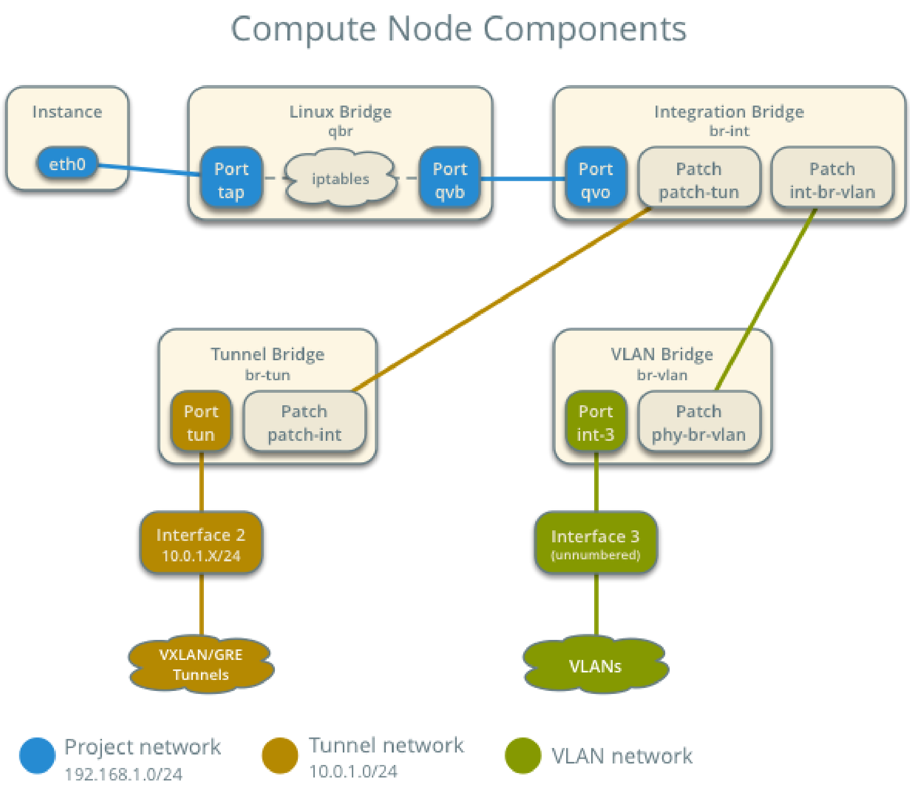




The compute nodes contain the following network components:

1. Open vSwitch agent managing virtual switches, connectivity among them, and interaction via virtual ports with other network components such as namespaces, Linux bridges, and underlying interfaces.
2. Linux bridges handling security groups. Due to limitations with Open vSwitch and *iptables*, the Networking service uses a Linux bridge to manage security groups for instances.





Packet flow¶

> **Note**
>
> *North-south* network traffic travels between an instance and external network, typically the Internet. *East-west* network traffic travels between instances.

Case 1: North-south for instances with a fixed IP address¶

For instances with a fixed IP address, the network node routes *north-south* network traffic between project and external networks.

- External network
  - Network 203.0.113.0/24
  - IP address allocation from 203.0.113.101 to 203.0.113.200
  - Project network router interface 203.0.113.101 *TR*
- Project network
  - Network 192.168.1.0/24
  - Gateway 192.168.1.1 with MAC address *TG*
- Compute node 1
  - Instance 1 192.168.1.11 with MAC address *I1*
- Instance 1 resides on compute node 1 and uses a project network.
- The instance sends a packet to a host on the external network.

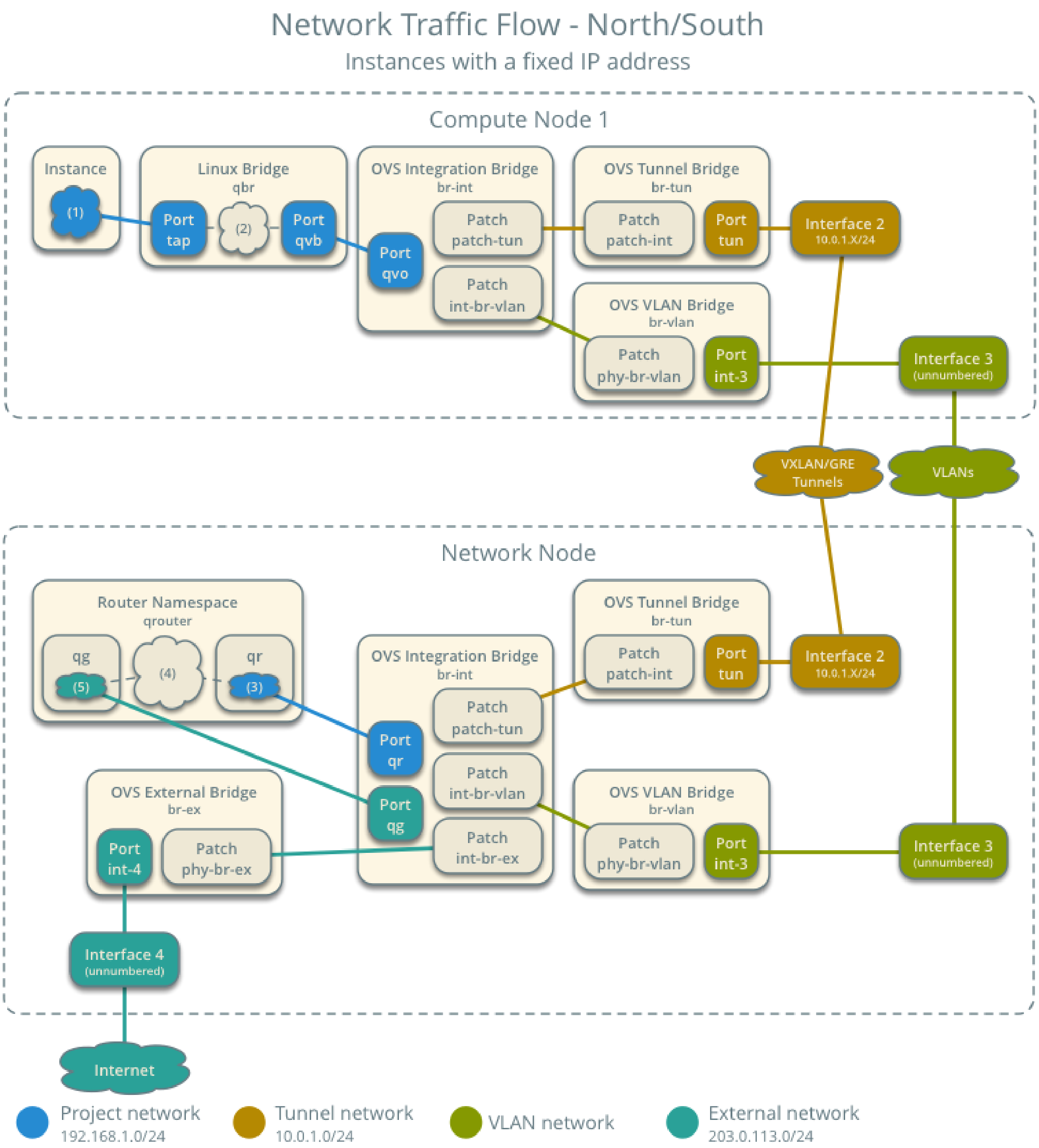
The following steps involve compute node 1:

1. The instance 1 `tap` interface (1) forwards the packet to the Linux bridge `qbr`. The packet contains destination MAC address *TG* because the destination resides on another network.
2. Security group rules (2) on the Linux bridge `qbr` handle state tracking for the packet.
3. The Linux bridge `qbr` forwards the packet to the Open vSwitch integration bridge `br-int`.
4. The Open vSwitch integration bridge `br-int` adds the internal tag for the project network.
5. For VLAN project networks:
   a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
   b. The Open vSwitch VLAN bridge `br-vlan` replaces the internal tag with the actual VLAN tag of the project network.
   c. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the network node via the VLAN interface.
6. For VXLAN and GRE project networks:
   a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
   b. The Open vSwitch tunnel bridge `br-tun` wraps the packet in a VXLAN or GRE tunnel and adds a tag to identify the project network.
   c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the network node via the tunnel interface.

The following steps involve the network node:

1. For VLAN project networks:
   a. The VLAN interface forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
   b. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the Open vSwitch integration bridge `br-int`.
   c. The Open vSwitch integration bridge `br-int` replaces the actual VLAN tag of the project network with the internal tag.
2. For VXLAN and GRE project networks:
   a. The tunnel interface forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
   b. The Open vSwitch tunnel bridge `br-tun` unwraps the packet and adds the internal tag for the project network.
   c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge `br-int` forwards the packet to the `qr` interface (3) in the router namespace `qrouter`. The `qr` interface contains the project network gateway IP address *TG*.
4. The *iptables* service (4) performs SNAT on the packet using the `qg` interface (5) as the source IP address. The `qg` interface contains the project network router interface IP address *TR*.
5. The router namespace `qrouter` forwards the packet to the Open vSwitch integration bridge `br-int` via the `qg` interface.
6. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch external bridge `br-ex`.
7. The Open vSwitch external bridge `br-ex` forwards the packet to the external network via the external interface.

> **Note**
>
> Return traffic follows similar steps in reverse.



Case 2: North-south for instances with a floating IP address¶

For instances with a floating IP address, the network node routes *north-south* network traffic between project and external networks.

- External network
  - Network 203.0.113.0/24
  - IP address allocation from 203.0.113.101 to 203.0.113.200
  - Project network router interface 203.0.113.101 *TR*
- Project network
  - Network 192.168.1.0/24
  - Gateway 192.168.1.1 with MAC address *TG*
- Compute node 1
  - Instance 1 192.168.1.11 with MAC address *I1* and floating IP address 203.0.113.102 *F1*
- Instance 1 resides on compute node 1 and uses a project network.
- The instance receives a packet from a host on the external network.

The following steps involve the network node:

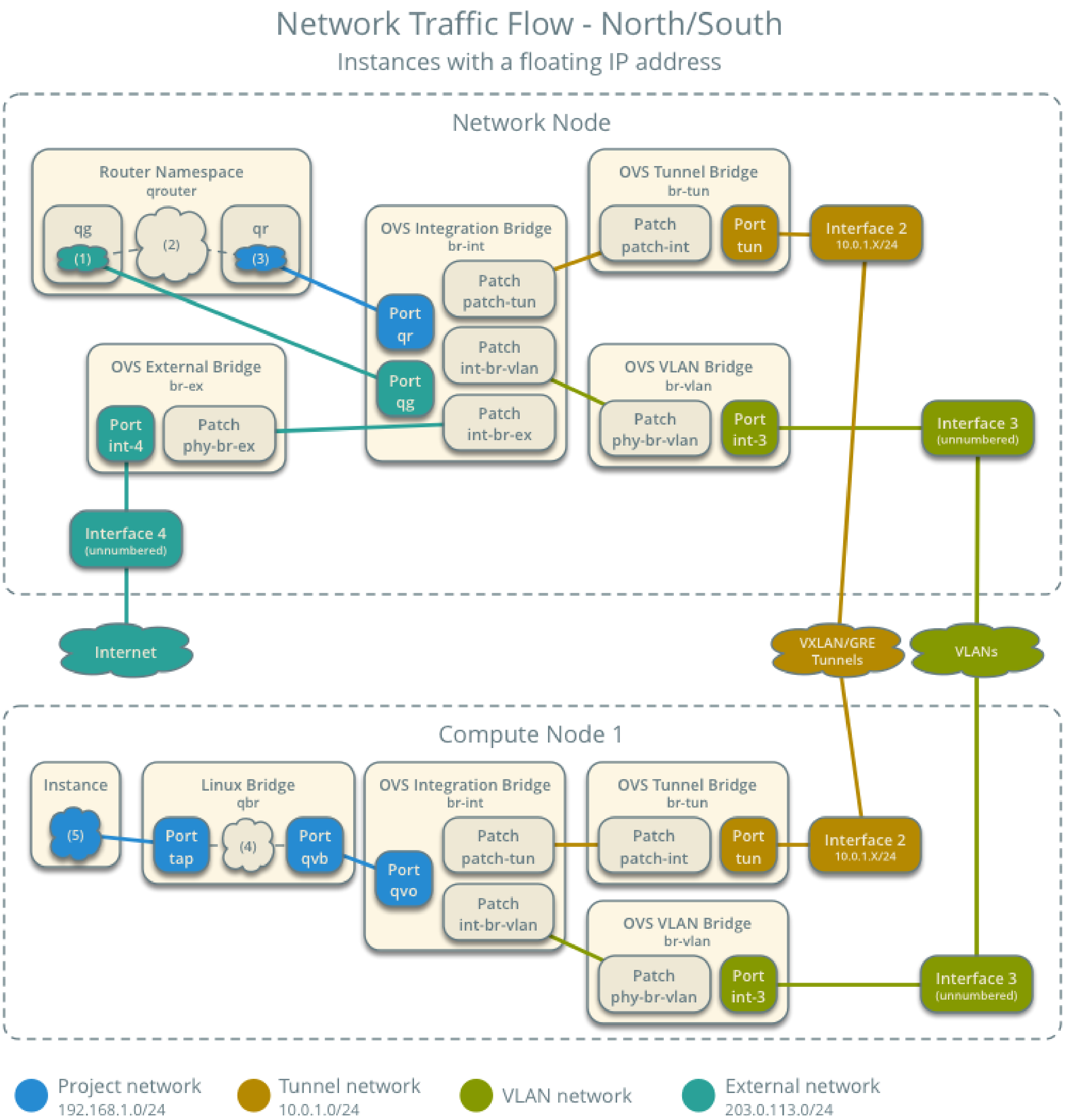
1. The external interface forwards the packet to the Open vSwitch external bridge `br-ex`.
2. The Open vSwitch external bridge `br-ex` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge forwards the packet to the `qg` interface (1) in the router namespace `qrouter`. The `qg` interface contains the instance 1 floating IP address *F1*.
4. The *iptables* service (2) performs DNAT on the packet using the `qr` interface (3) as the source IP address. The `qr` interface contains the project network router interface IP address *TR1*.
5. The router namespace `qrouter` forwards the packet to the Open vSwitch integration bridge `br-int`.

6. The Open vSwitch integration bridge `br-int` adds the internal tag for the project network.
7. For VLAN project networks:
   a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
   b. The Open vSwitch VLAN bridge `br-vlan` replaces the internal tag with the actual VLAN tag of the project network.
   c. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the compute node via the VLAN interface.
8. For VXLAN and GRE project networks:
   a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
   b. The Open vSwitch tunnel bridge `br-tun` wraps the packet in a VXLAN or GRE tunnel and adds a tag to identify the project network.
   c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the compute node via the tunnel interface.

The following steps involve compute node 1:

1. For VLAN project networks:
   a. The VLAN interface forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
   b. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the Open vSwitch integration bridge `br-int`.
   c. The Open vSwitch integration bridge `br-int` replaces the actual VLAN tag the project network with the internal tag.
2. For VXLAN and GRE project networks:
   a. The tunnel interface forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
   b. The Open vSwitch tunnel bridge `br-tun` unwraps the packet and adds the internal tag for the project network.
   c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge `br-int` forwards the packet to the Linux bridge `qbr`.
4. Security group rules (4) on the Linux bridge `qbr` handle firewalling and state tracking for the packet.
5. The Linux bridge `qbr` forwards the packet to the `tap` interface (5) on instance 1.

> **Note**
>
> Return traffic follows similar steps in reverse.



Case 3: East-west for instances on different networks¶

For instances with a fixed or floating IP address, the network node routes *east-west* network traffic among project networks using the same project router.

- Project network 1
  - Network: 192.168.1.0/24
  - Gateway: 192.168.1.1 with MAC address *TG1*
- Project network 2
  - Network: 192.168.2.0/24
  - Gateway: 192.168.2.1 with MAC address *TG2*
- Compute node 1
  - Instance 1: 192.168.1.11 with MAC address *I1*
- Compute node 2
  - Instance 2: 192.168.2.11 with MAC address *I2*
- Instance 1 resides on compute node 1 and uses project network 1.
- Instance 2 resides on compute node 2 and uses project network 2.
- Both project networks reside on the same router.
- Instance 1 sends a packet to instance 2.

The following steps involve compute node 1:

1. The instance 1 `tap` interface (1) forwards the packet to the Linux bridge `qbr`. The packet contains destination MAC address *TG1* because the destination resides on another network.
2. Security group rules (2) on the Linux bridge `qbr` handle state tracking for the packet.
3. The Linux bridge `qbr` forwards the packet to the Open vSwitch integration bridge `br-int`.
4. The Open vSwitch integration bridge `br-int` adds the internal tag for project network 1.

5. For VLAN project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` replaces the internal tag with the actual VLAN tag of project network 1.
    c. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the network node via the VLAN interface.
6. For VXLAN and GRE project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` wraps the packet in a VXLAN or GRE tunnel and adds a tag to identify project network 1.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the network node via the tunnel interface.

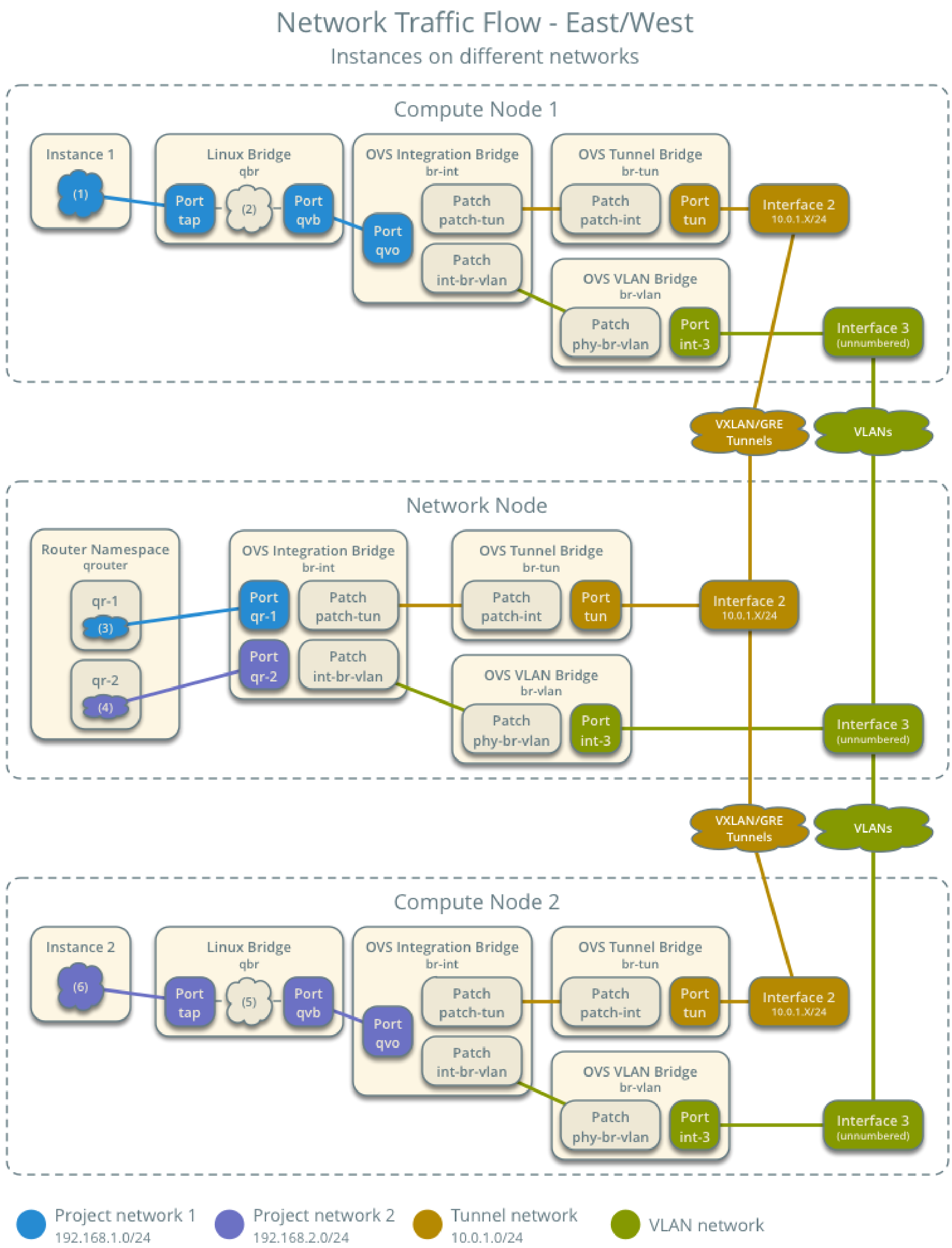
The following steps involve the network node:

1. For VLAN project networks:
    a. The VLAN interface forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the Open vSwitch integration bridge `br-int`.
    c. The Open vSwitch integration bridge `br-int` replaces the actual VLAN tag of project network 1 with the internal tag.
2. For VXLAN and GRE project networks:
    a. The tunnel interface forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` unwraps the packet and adds the internal tag for project network 1.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge `br-int` forwards the packet to the `qr-1` interface (3) in the router namespace `qrouter`. The `qr-1` interface contains the project network 1 gateway IP address *TG1*.
4. The router namespace `qrouter` routes the packet to the `qr-2` interface (4). The `qr-2` interface contains the project network 2 gateway IP address *TG2*.
5. The router namespace `qrouter` forwards the packet to the Open vSwitch integration bridge `br-int`.
6. The Open vSwitch integration bridge `br-int` adds the internal tag for project network 2.
7. For VLAN project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` replaces the internal tag with the actual VLAN tag of project network 2.
    c. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to compute node 2 via the VLAN interface.
8. For VXLAN and GRE project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` wraps the packet in a VXLAN or GRE tunnel and adds a tag to identify project network 2.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to compute node 2 via the tunnel interface.

The following steps involve compute node 2:

1. For VLAN project networks:
    a. The VLAN interface forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the Open vSwitch integration bridge `br-int`.
    c. The Open vSwitch integration bridge `br-int` replaces the actual VLAN tag of project network 2 with the internal tag.
2. For VXLAN and GRE project networks:
    a. The tunnel interface forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` unwraps the packet and adds the internal tag for project network 2.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge `br-int` forwards the packet to the Linux bridge `qbr`.
4. Security group rules (5) on the Linux bridge `qbr` handle firewalling and state tracking for the packet.
5. The Linux bridge `qbr` forwards the packet to the `tap` interface (6) on instance 2.

> **Note**
>
> Return traffic follows similar steps in reverse.



Case 4: East-west for instances on the same network¶

For instances with a fixed or floating IP address, the project network switches *east-west* network traffic among instances without using a project router on the network node.

- Project network
  - Network: 192.168.1.0/24
- Compute node 1
  - Instance 1: 192.168.1.11 with MAC address *I1*
- Compute node 2
  - Instance 2: 192.168.1.12 with MAC address *I2*
- Instance 1 resides on compute node 1.
- Instance 2 resides on compute node 2.
- Both instances use the same project network.
- Instance 1 sends a packet to instance 2.
- The Open vSwitch agent handles switching within the project network.

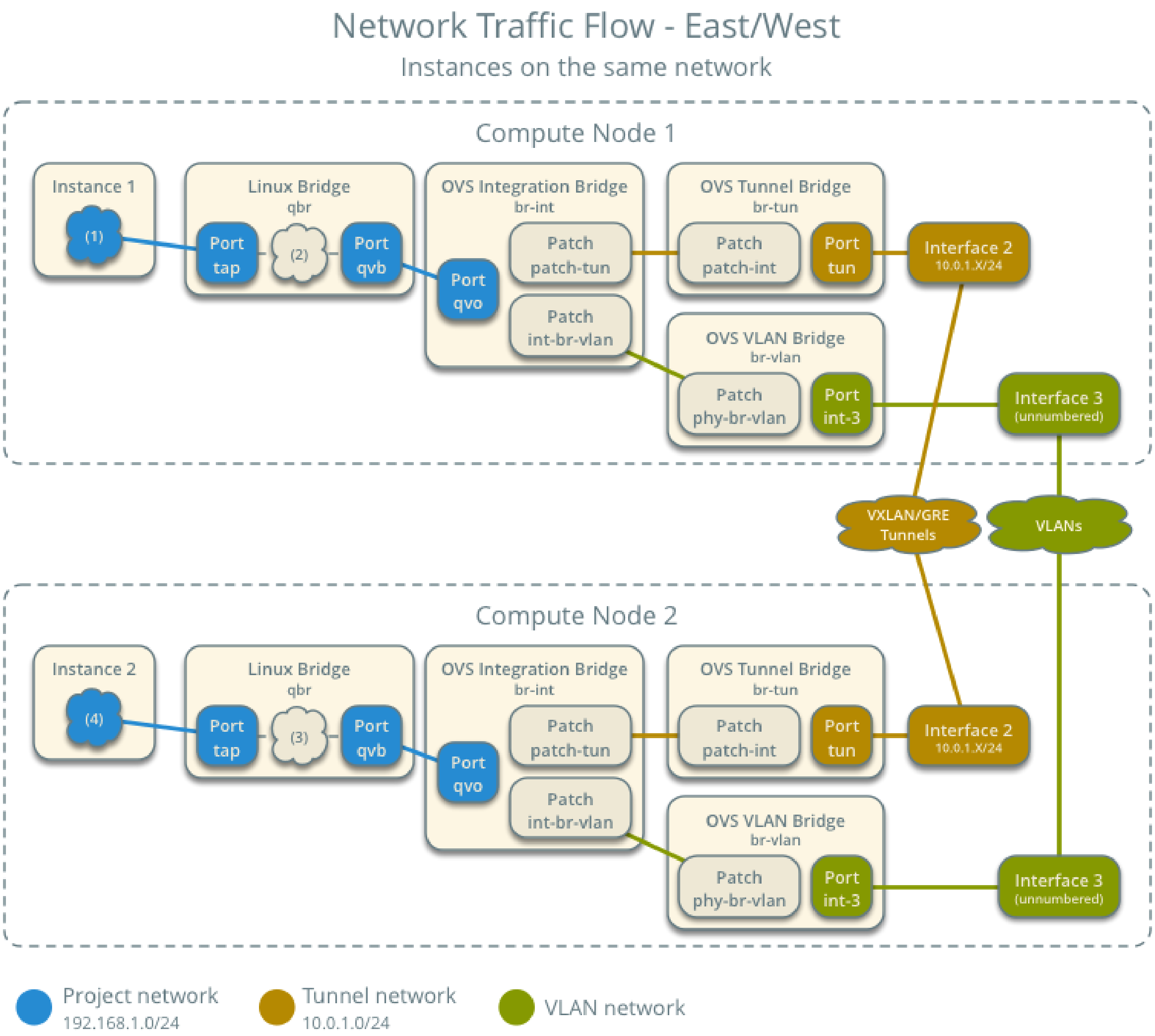
The following steps involve compute node 1:

1. The instance 1 `tap` interface (1) forwards the packet to the VLAN bridge `qbr`. The packet contains destination MAC address *I2* because the destination resides on the same network.
2. Security group rules (2) on the provider bridge `qbr` handle state tracking for the packet.
3. The Linux bridge `qbr` forwards the packet to the Open vSwitch integration bridge `br-int`.
4. The Open vSwitch integration bridge `br-int` adds the internal tag for provider network 1.
5. For VLAN project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` replaces the internal tag with the actual VLAN tag of project network 1.
    c. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the compute node 2 via the VLAN interface.
6. For VXLAN and GRE project networks:
    a. The Open vSwitch integration bridge `br-int` forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` wraps the packet in a VXLAN or GRE tunnel and adds a tag to identify project network 1.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the compute node 2 via the tunnel interface.

The following steps involve compute node 2:

1. For VLAN project networks:
    a. The VLAN interface forwards the packet to the Open vSwitch VLAN bridge `br-vlan`.
    b. The Open vSwitch VLAN bridge `br-vlan` forwards the packet to the Open vSwitch integration bridge `br-int`.
    c. The Open vSwitch integration bridge `br-int` replaces the actual VLAN tag of project network 2 with the internal tag.
2. For VXLAN and GRE project networks:
    a. The tunnel interface forwards the packet to the Open vSwitch tunnel bridge `br-tun`.
    b. The Open vSwitch tunnel bridge `br-tun` unwraps the packet and adds the internal tag for project network 2.
    c. The Open vSwitch tunnel bridge `br-tun` forwards the packet to the Open vSwitch integration bridge `br-int`.
3. The Open vSwitch integration bridge `br-int` forwards the packet to the Linux bridge `qbr`.
4. Security group rules (3) on the Linux bridge `qbr` handle firewalling and state tracking for the packet.
5. The Linux bridge `qbr` forwards the packet to the `tap` interface (4) on instance 2.

> **Note**
>
> Return traffic follows similar steps in reverse.



Example configuration¶

Use the following example configuration as a template to deploy this scenario in your environment.

Controller node¶

1. Configure common options. Edit the `/etc/neutron/neutron.conf` file:

```
[DEFAULT]
verbose = True
core_plugin = ml2
service_plugins = router
allow_overlapping_ips = True
```

2. Configure the ML2 plug-in. Edit the `/etc/neutron/plugins/ml2/ml2_conf.ini` file:

```
[ml2]
type_drivers = flat,vlan,gre,vxlan
tenant_network_types = vlan,gre,vxlan
mechanism_drivers = openvswitch,l2population
extension_drivers = port_security

[ml2_type_flat]
flat_networks = external

[ml2_type_vlan]
network_vlan_ranges = external,vlan:MIN_VLAN_ID:MAX_VLAN_ID

[ml2_type_gre]
tunnel_id_ranges = MIN_GRE_ID:MAX_GRE_ID

[ml2_type_vxlan]
vni_ranges = MIN_VXLAN_ID:MAX_VXLAN_ID

[securitygroup]
enable_ipset = True
```

Replace `MIN_VLAN_ID`, `MAX_VLAN_ID`, `MIN_GRE_ID`, `MAX_GRE_ID`, `MIN_VXLAN_ID`, and `MAX_VXLAN_ID` with VLAN, GRE, and VXLAN ID minimum and maximum values suitable for your environment.

> **Note**
>
> The first value in the `tenant_network_types` option becomes the default project network type when a regular user creates a network.

> **Note**
>
> The `external` value in the `network_vlan_ranges` option lacks VLAN ID ranges to support use of arbitrary VLAN IDs by administrative users.

3. Start the following services:
   - Server

Network node¶

1. Configure common options. Edit the `/etc/neutron/neutron.conf` file:

```
[DEFAULT]
verbose = True
```

2. Configure the Open vSwitch agent. Edit the `/etc/neutron/plugins/ml2/openvswitch_agent.ini` file:

```
[ovs]
local_ip = TUNNEL_INTERFACE_IP_ADDRESS
bridge_mappings = vlan:br-vlan,external:br-ex

[agent]
tunnel_types = gre,vxlan
l2_population = True
prevent_arp_spoofing = True

[securitygroup]
firewall_driver = neutron.agent.linux.iptables_firewall.OVSHybridIptablesFirewallDriver
enable_security_group = True
```

Replace `TUNNEL_INTERFACE_IP_ADDRESS` with the IP address of the interface that handles GRE/VXLAN project networks.

3. Configure the L3 agent. Edit the `/etc/neutron/l3_agent.ini` file:

```
[DEFAULT]
verbose = True
interface_driver = neutron.agent.linux.interface.OVSInterfaceDriver
use_namespaces = True
external_network_bridge =
```

> **Note**
>
> The `external_network_bridge` option intentionally contains no value.

4. Configure the DHCP agent. Edit the `/etc/neutron/dhcp_agent.ini` file:

```
[DEFAULT]
verbose = True
interface_driver = neutron.agent.linux.interface.OVSInterfaceDriver
dhcp_driver = neutron.agent.linux.dhcp.Dnsmasq
enable_isolated_metadata = True
```

5. (Optional) Reduce MTU for VXLAN/GRE project networks.
   a. Edit the `/etc/neutron/dhcp_agent.ini` file:

   ```
   [DEFAULT]
   dnsmasq_config_file = /etc/neutron/dnsmasq-neutron.conf
   ```

   b. Edit the `/etc/neutron/dnsmasq-neutron.conf` file:

   ```
   dhcp-option-force=26,1450
   ```

6. Configure the metadata agent. Edit the `/etc/neutron/metadata_agent.ini` file:

```
[DEFAULT]
verbose = True
nova_metadata_ip = controller
metadata_proxy_shared_secret = METADATA_SECRET
```

Replace `METADATA_SECRET` with a suitable value for your environment.

7. Start the following services:
   - Open vSwitch
   - Open vSwitch agent
   - L3 agent
   - DHCP agent
   - Metadata agent

Compute nodes¶

1. Configure common options. Edit the `/etc/neutron/neutron.conf` file:

```
[DEFAULT]
verbose = True
```

2. Configure the Open vSwitch agent. Edit the `/etc/neutron/plugins/ml2/openvswitch_agent.ini` file:

```
[ovs]
local_ip = TUNNEL_INTERFACE_IP_ADDRESS
bridge_mappings = vlan:br-vlan

[agent]
tunnel_types = gre,vxlan
l2_population = True
prevent_arp_spoofing = True

[securitygroup]
firewall_driver = neutron.agent.linux.iptables_firewall.OVSHybridIptablesFirewallDriver
enable_security_group = True
```

Replace `TUNNEL_INTERFACE_IP_ADDRESS` with the IP address of the interface that handles GRE/VXLAN project networks.

3. Start the following services:
   - Open vSwitch
   - Open vSwitch agent

Verify service operation¶

1. Source the administrative project credentials.
2. Verify presence and operation of the agents:

```
$ neutron agent-list
+--------------------------------------+--------------------+----------+-------+----------------+--------------------
| id                                   | agent_type         | host     | alive | admin_state_up | binary
+--------------------------------------+--------------------+----------+-------+----------------+--------------------
| 1eaf6079-41c8-4b5b-876f-73b02753ff57 | Open vSwitch agent | compute1 | :-)   | True           | neutron-openvswitc
| 511c27b3-8317-4e27-8a0f-b158e4fb8368 | Metadata agent     | network1 | :-)   | True           | neutron-metadata-a
| 7eae11ef-8157-4fd4-a352-bc841cf709f6 | Open vSwitch agent | network1 | :-)   | True           | neutron-openvswitc
| a9110ce6-22cc-4f78-9b2e-57f83aac68a3 | Open vSwitch agent | compute2 | :-)   | True           | neutron-openvswitc
| c41f3200-8eda-43ab-8135-573e826776d9 | DHCP agent         | network1 | :-)   | True           | neutron-dhcp-agent
| f897648e-7623-486c-8043-1b219eb2895a | L3 agent           | network1 | :-)   | True           | neutron-l3-agent
+--------------------------------------+--------------------+----------+-------+----------------+--------------------
```

Create initial networks¶

This example creates a flat external network and a VXLAN project network.

1. Source the administrative project credentials.
2. Create the external network:

```
$ neutron net-create ext-net --router:external True \
  --provider:physical_network external --provider:network_type flat
  Created a new network:
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | e5f9be2f-3332-4f2d-9f4d-7f87a5a7692e |
| name                      | ext-net                              |
| provider:network_type     | flat                                 |
| provider:physical_network | external                             |
| provider:segmentation_id  |                                      |
| router:external           | True                                 |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tenant_id                 | 96393622940e47728b6dcdb2ef405f50     |
+---------------------------+--------------------------------------+
```

3. Create a subnet on the external network:

```
$ neutron subnet-create ext-net --name ext-subnet --allocation-pool \
  start=203.0.113.101,end=203.0.113.200 --disable-dhcp \
  --gateway 203.0.113.1 203.0.113.0/24
Created a new subnet:
+-------------------+---------------------------------------------------+
| Field             | Value                                             |
+-------------------+---------------------------------------------------+
| allocation_pools  | {"start": "203.0.113.101", "end": "203.0.113.200"} |
| cidr              | 203.0.113.0/24                                    |
| dns_nameservers   |                                                   |
| enable_dhcp       | False                                             |
| gateway_ip        | 203.0.113.1                                       |
| host_routes       |                                                   |
| id                | cd9c15a1-0a66-4bbe-b1b4-4b7edd936f7a              |
| ip_version        | 4                                                 |
| ipv6_address_mode |                                                   |
| ipv6_ra_mode      |                                                   |
| name              | ext-subnet                                        |
| network_id        | e5f9be2f-3332-4f2d-9f4d-7f87a5a7692e              |
| tenant_id         | 96393622940e47728b6dcdb2ef405f50                  |
+-------------------+---------------------------------------------------+
```

Note

The example configuration contains `vlan` as the first project network type. Only an administrative user can create other types of networks such as GRE or VXLAN. The following commands use the `admin` project credentials to create a VXLAN project network.

1. Obtain the ID of a regular project. For example, using the `demo` project:

```
$ openstack project show demo
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description | Demo Project                     |
| enabled     | True                             |
| id          | 443cd1596b2e46d49965750771ebbfe1 |
| name        | demo                             |
+-------------+----------------------------------+
```

2. Create the project network:

```
$ neutron net-create demo-net --tenant-id 443cd1596b2e46d49965750771ebbfe1 \
  --provider:network_type vxlan
Created a new network:
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | 6e9c5324-68d1-47a8-98d5-8268db955475 |
| name                      | demo-net                             |
| provider:network_type     | vxlan                                |
| provider:physical_network |                                      |
| provider:segmentation_id  | 1                                    |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tenant_id                 | 443cd1596b2e46d49965750771ebbfe1     |
+---------------------------+--------------------------------------+
```

3. Source the regular project credentials. The following steps use the `demo` project.

4. Create a subnet on the project network:

```
$ neutron subnet-create demo-net --name demo-subnet --gateway 192.168.1.1 \
  192.168.1.0/24
Created a new subnet:
+-------------------+------------------------------------------------+
| Field             | Value                                          |
+-------------------+------------------------------------------------+
| allocation_pools  | {"start": "192.168.1.2", "end": "192.168.1.254"} |
| cidr              | 192.168.1.0/24                                 |
| dns_nameservers   |                                                |
| enable_dhcp       | True                                           |
| gateway_ip        | 192.168.1.1                                    |
| host_routes       |                                                |
| id                | c7b42e58-a2f4-4d63-b199-d266504c03c9           |
| ip_version        | 4                                              |
| ipv6_address_mode |                                                |
| ipv6_ra_mode      |                                                |
| name              | demo-subnet                                    |
| network_id        | 6e9c5324-68d1-47a8-98d5-8268db955475           |
| tenant_id         | 443cd1596b2e46d49965750771ebbfe1               |
+-------------------+------------------------------------------------+
```

5. Create a project router:

```
$ neutron router-create demo-router
Created a new router:
+-----------------------+--------------------------------------+
| Field                 | Value                                |
+-----------------------+--------------------------------------+
| admin_state_up        | True                                 |
| external_gateway_info |                                      |
| id                    | 474a5b1f-d64c-4db9-b3b2-8ae9bb1b5970 |
| name                  | demo-router                          |
| routes                |                                      |
| status                | ACTIVE                               |
| tenant_id             | 443cd1596b2e46d49965750771ebbfe1     |
+-----------------------+--------------------------------------+
```

6. Add the project subnet as an interface on the router:

```
$ neutron router-interface-add demo-router demo-subnet
Added interface 0fa57069-29fd-4795-87b7-c123829137e9 to router demo-router.
```

7. Add a gateway to the external network on the router:

```
$ neutron router-gateway-set demo-router ext-net
Set gateway for router demo-router
```

Verify network operation¶

1. On the network node, verify creation of the `qrouter` and `qdhcp` namespaces:

```
$ ip netns
qrouter-4d7928a0-4a3c-4b99-b01b-97da2f97e279
qdhcp-353f5937-a2d3-41ba-8225-fa1af2538141
```

> **Note**
>
> The `qdhcp` namespace might not exist until launching an instance.

2. Determine the external network gateway IP address for the project network on the router, typically the lowest IP address in the external subnet IP allocation range:

```
+------+-------------------+-----------------------------------------------------------------------------------------+
| name | mac_address       | fixed_ips                                                                               |
+------+-------------------+-----------------------------------------------------------------------------------------+
|      | fa:16:3e:c1:20:55 | {"subnet_id": "c7b42e58-a2f4-4d63-b199-d266504c03c9", "ip_address": "192.168.1.1"}   |
|      | fa:16:3e:54:d7:8c | {"subnet_id": "cd9c15a1-0a66-4bbe-b1b4-4b7edd936f7a", "ip_address": "203.0.113.101"} |
+------+-------------------+-----------------------------------------------------------------------------------------+
```

3. On the controller node or any host with access to the external network, ping the external network gateway IP address on the project router:

```
$ ping -c 4 203.0.113.101
PING 203.0.113.101 (203.0.113.101) 56(84) bytes of data.
64 bytes from 203.0.113.101: icmp_req=1 ttl=64 time=0.619 ms
64 bytes from 203.0.113.101: icmp_req=2 ttl=64 time=0.189 ms
64 bytes from 203.0.113.101: icmp_req=3 ttl=64 time=0.165 ms
64 bytes from 203.0.113.101: icmp_req=4 ttl=64 time=0.216 ms

--- 203.0.113.101 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 2999ms
rtt min/avg/max/mdev = 0.165/0.297/0.619/0.187 ms
```

4. Source the regular project credentials. The following steps use the `demo` project.
5. Launch an instance with an interface on the project network.
6. Obtain console access to the instance.
   a. Test connectivity to the project router:

```
$ ping -c 4 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_req=1 ttl=64 time=0.357 ms
64 bytes from 192.168.1.1: icmp_req=2 ttl=64 time=0.473 ms
64 bytes from 192.168.1.1: icmp_req=3 ttl=64 time=0.504 ms
64 bytes from 192.168.1.1: icmp_req=4 ttl=64 time=0.470 ms

--- 192.168.1.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 2998ms
rtt min/avg/max/mdev = 0.357/0.451/0.504/0.055 ms
```

   b. Test connectivity to the Internet:

```
$ ping -c 4 openstack.org
PING openstack.org (174.143.194.225) 56(84) bytes of data.
64 bytes from 174.143.194.225: icmp_req=1 ttl=53 time=17.4 ms
64 bytes from 174.143.194.225: icmp_req=2 ttl=53 time=17.5 ms
64 bytes from 174.143.194.225: icmp_req=3 ttl=53 time=17.7 ms
64 bytes from 174.143.194.225: icmp_req=4 ttl=53 time=17.5 ms

--- openstack.org ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 17.431/17.575/17.734/0.143 ms
```

7. Create the appropriate security group rules to allow ping and SSH access to the instance. For example:

```
$ nova secgroup-add-rule default icmp -1 -1 0.0.0.0/0
+-------------+-----------+---------+-----------+--------------+
| IP Protocol | From Port | To Port | IP Range  | Source Group |
+-------------+-----------+---------+-----------+--------------+
| icmp        | -1        | -1      | 0.0.0.0/0 |              |
+-------------+-----------+---------+-----------+--------------+

$ nova secgroup-add-rule default tcp 22 22 0.0.0.0/0
+-------------+-----------+---------+-----------+--------------+
| IP Protocol | From Port | To Port | IP Range  | Source Group |
+-------------+-----------+---------+-----------+--------------+
| tcp         | 22        | 22      | 0.0.0.0/0 |              |
+-------------+-----------+---------+-----------+--------------+
```

8. Create a floating IP address on the external network:

```
$ neutron floatingip-create ext-net
+---------------------+--------------------------------------+
| Field               | Value                                |
+---------------------+--------------------------------------+
| fixed_ip_address    |                                      |
| floating_ip_address | 203.0.113.102                        |
| floating_network_id | e5f9be2f-3332-4f2d-9f4d-7f87a5a7692e |
| id                  | 77cf2a36-6c90-4941-8e62-d48a585de050 |
| port_id             |                                      |
| router_id           |                                      |
| status              | DOWN                                 |
| tenant_id           | 443cd1596b2e46d49965750771ebbfe1     |
+---------------------+--------------------------------------+
```

9. Associate the floating IP address with the instance:

```
$ nova floating-ip-associate demo-instance1 203.0.113.102
```

10. Verify addition of the floating IP address to the instance:

```
-------------------+----------------+--------+------------+-------------+-----------------------------------------+
                   | Name           | Status | Task State | Power State | Networks                                |
-------------------+----------------+--------+------------+-------------+-----------------------------------------+
c-8f40-8b3da7ee92c5 | demo-instance1 | ACTIVE | -          | Running     | demo-net=192.168.1.3, 203.0.113.102     |
-------------------+----------------+--------+------------+-------------+-----------------------------------------+
```

11. On the controller node or any host with access to the external network, ping the floating IP address associated with the instance:

```
$ ping -c 4 203.0.113.102
PING 203.0.113.102 (203.0.113.112) 56(84) bytes of data.
64 bytes from 203.0.113.102: icmp_req=1 ttl=63 time=3.18 ms
64 bytes from 203.0.113.102: icmp_req=2 ttl=63 time=0.981 ms
64 bytes from 203.0.113.102: icmp_req=3 ttl=63 time=1.06 ms
64 bytes from 203.0.113.102: icmp_req=4 ttl=63 time=0.929 ms

--- 203.0.113.102 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3002ms
rtt min/avg/max/mdev = 0.929/1.539/3.183/0.951 ms
```

« (deploy.html) » (scenario-classic-lb.html) (https://bugs.launchpad.net/openstack-manuals/+filebug?field.title=Scenario%3A%20Classic%20with%20Open%20vSwitch%20in%20Networking%20Guide&field.comment=%0A%0A-----------------------------------%0ARelease:%200.9%20on%202016-11-24%2007:52%0ASHA:%20cc8b39934de4de69e5235ca8e5c4d4b567d0f418%0ASource:%20http://git.openstack.org/cgit/openstack/openstack-manuals/tree/doc/networking-guide/source/scenario-classic-ovs.rst%0AURL: https://docs.openstack.org/liberty/networking-guide/scenario-classic-ovs.html&field.tags=networking-guide)

UPDATED: 2016-11-24 07:52

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