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S3IT: Service and Support for Science IT

OpenStack networking Neutron

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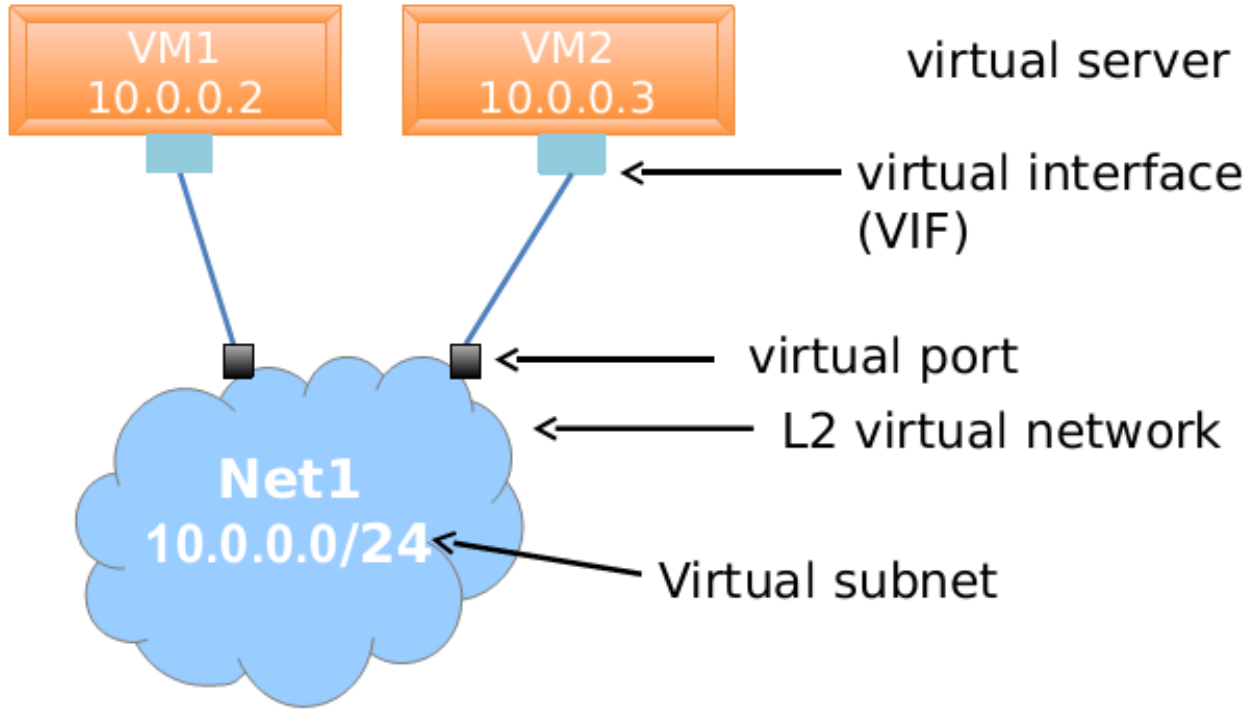
Why neutron?

- Allow tenants to define the network topology
- Support very rich network topologies.
  - including existing topologies
- Allow easy integration with network infrastructure.
- Allow creation of advanced network services, like:
  - load balancing
  - VPN
  - firewall

https://wiki.openstack.org/wiki/Neutron

main building blocks



network A L2 network

subnet An IPv4 or IPv6 network, living inside a `network`

port a virtual switch port on a given `network`.

virt. interface instance interface, connected to a `port`

Neutron architecture

neutron server rest API, talks to DB and AMQP

plugin agent runs on each compute node, manage virtual switches and ports

DHCP agent provides DHCP services to tenant networks

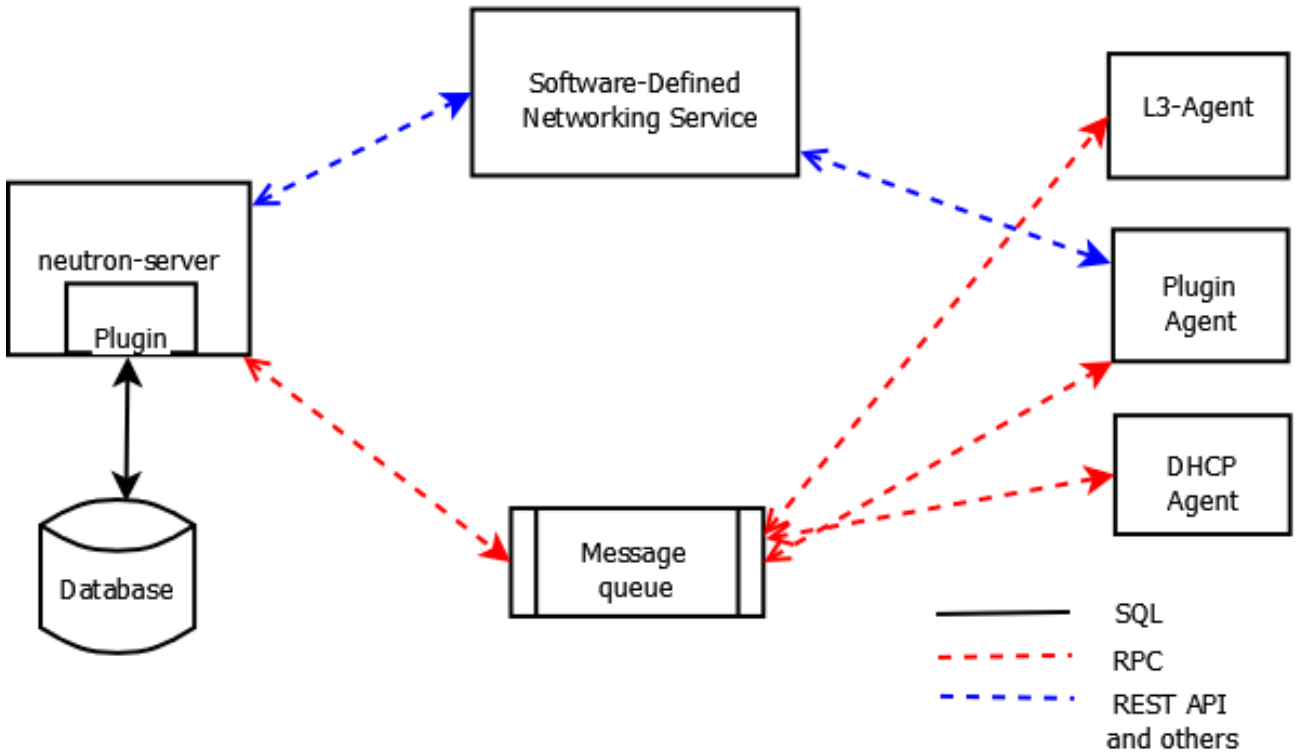
L3 agent provides routing and NAT capabilities

SDN services additional network services

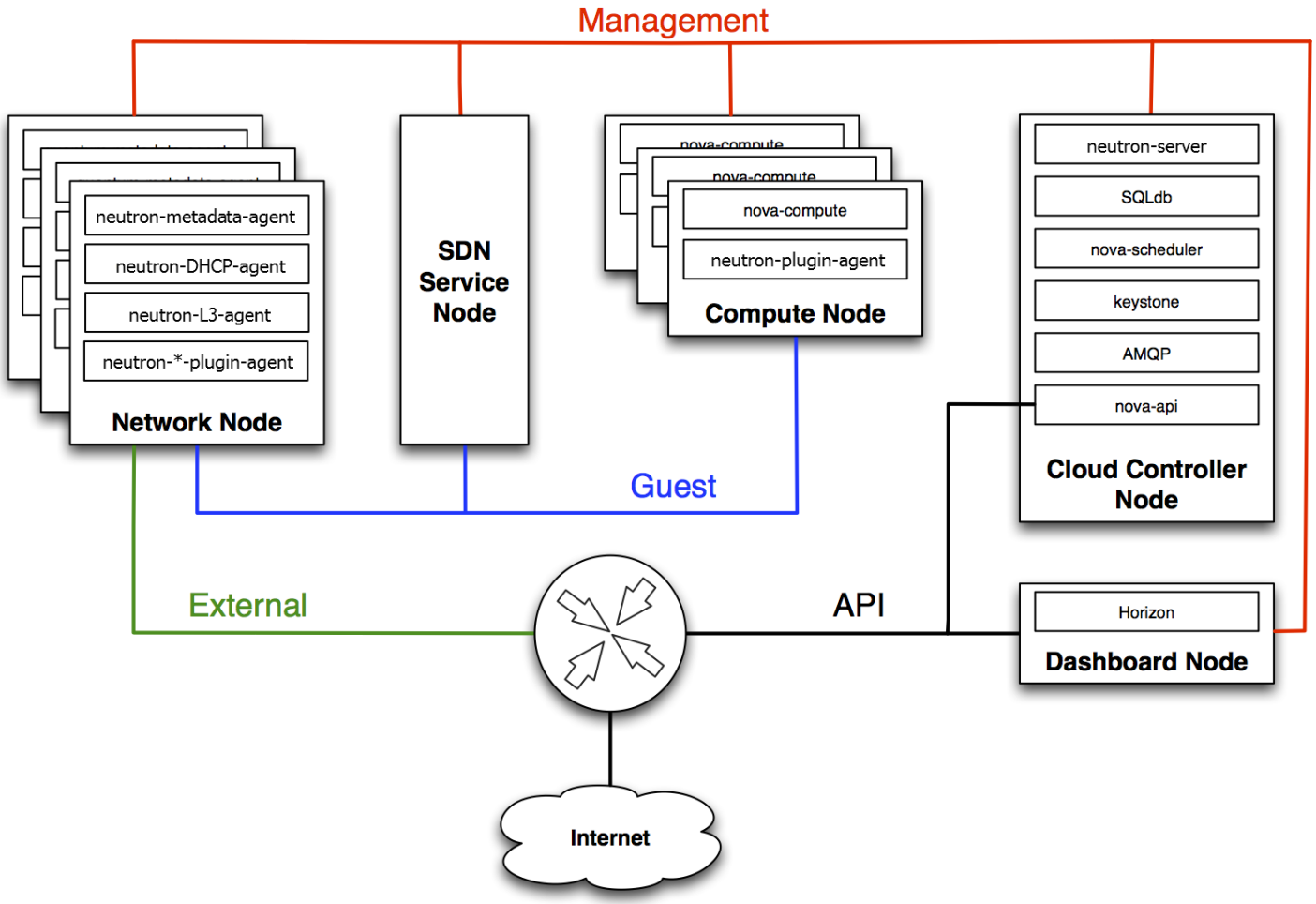
Neutron services integrations

Neutron server, plugins and agents talk to each other via:

- rest API
- RPC (RabbitMQ in our case)
- SQL (MySQL in our case)



Neutron architecture - physical servers



- In our case, the **Network Node** is **neutron-node**
- We will install `neutron-server` on **neutron-node**

ML2 plugin (since Havana/Icehouse)

- Only one plugin is active in neutron at a time.
- ML2 plugin allow to use multiple L2 networking technologies at the same time.
- Being modular, reduce duplication of code, and makes easier create plugins for Neutron.
- Decouple the *type* of network and its *implementation*:

  type driver (GRE, VLAN, VXLAN, Flat)
  mechanism driver specific implementation for a specific network technology (OpenVSwitch, cisco, brocade . . .)

https://wiki.openstack.org/wiki/Neutron/ML2

L2 agent

- usually runs on the hypervisor
- talks to server via RPC
- watch and notify when devices are added/removed
- wires new devices ensuring:
  - they are in the proper network segment (L2 network)
  - security group rules are applied

We will deploy `neutron-openvswitch-agent`

http://openvswitch.org/

Linux Network Namespaces

A namespace is an *isolated copy* of the network stack

- Each namespace has its own private loopback.
- Routing is local to the namespace.
- Addressing scope limited to the namespace
  - ⇒ different namespaces can have overlapping IP addresses
- Interfaces **do not have** direct connectivity to the network: you must connect them to a bridge in the default namespace
- You can spawn processes within a namespace (e.g. `dnsmasq` for DHCP)

```
ip netns help
```

LWN.net: Namespaces in operation

DHCP configuration agent

- RPC based notifications
- uses `dnsmasq` (one per network)
- uses namespaces (`qdhcp-<uuid-of-neutron-subnet>`)
- typically runs on the network node
- tap interface `tap-XXX` with *private IP*, wired to `br-int`
- you can have multiple copies to achieve HA (part of DHCP: multiple servers cun run on the same network segment, the client gets the first response)[1]

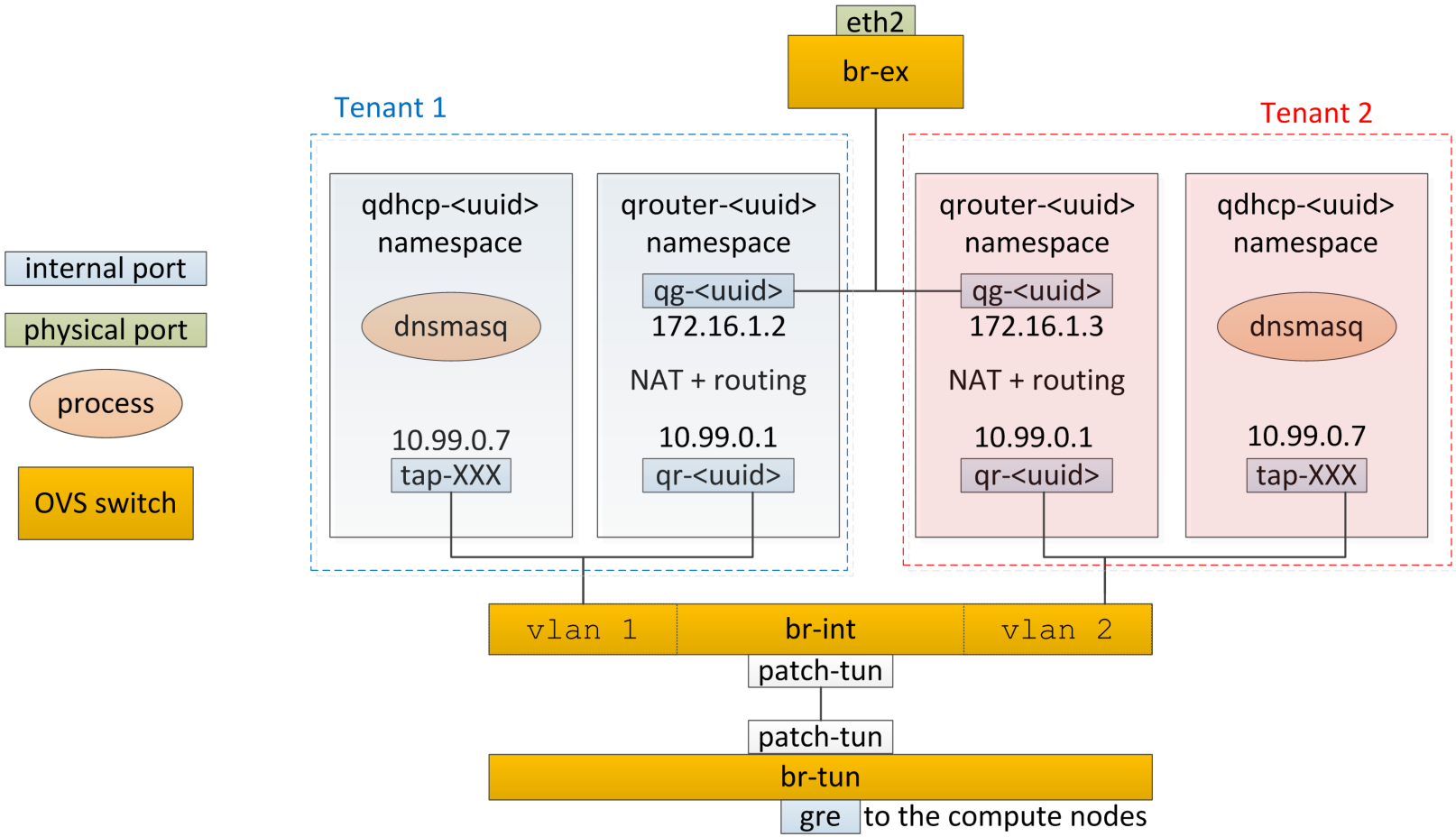
[1] as long as the conf is the same

L3 agent

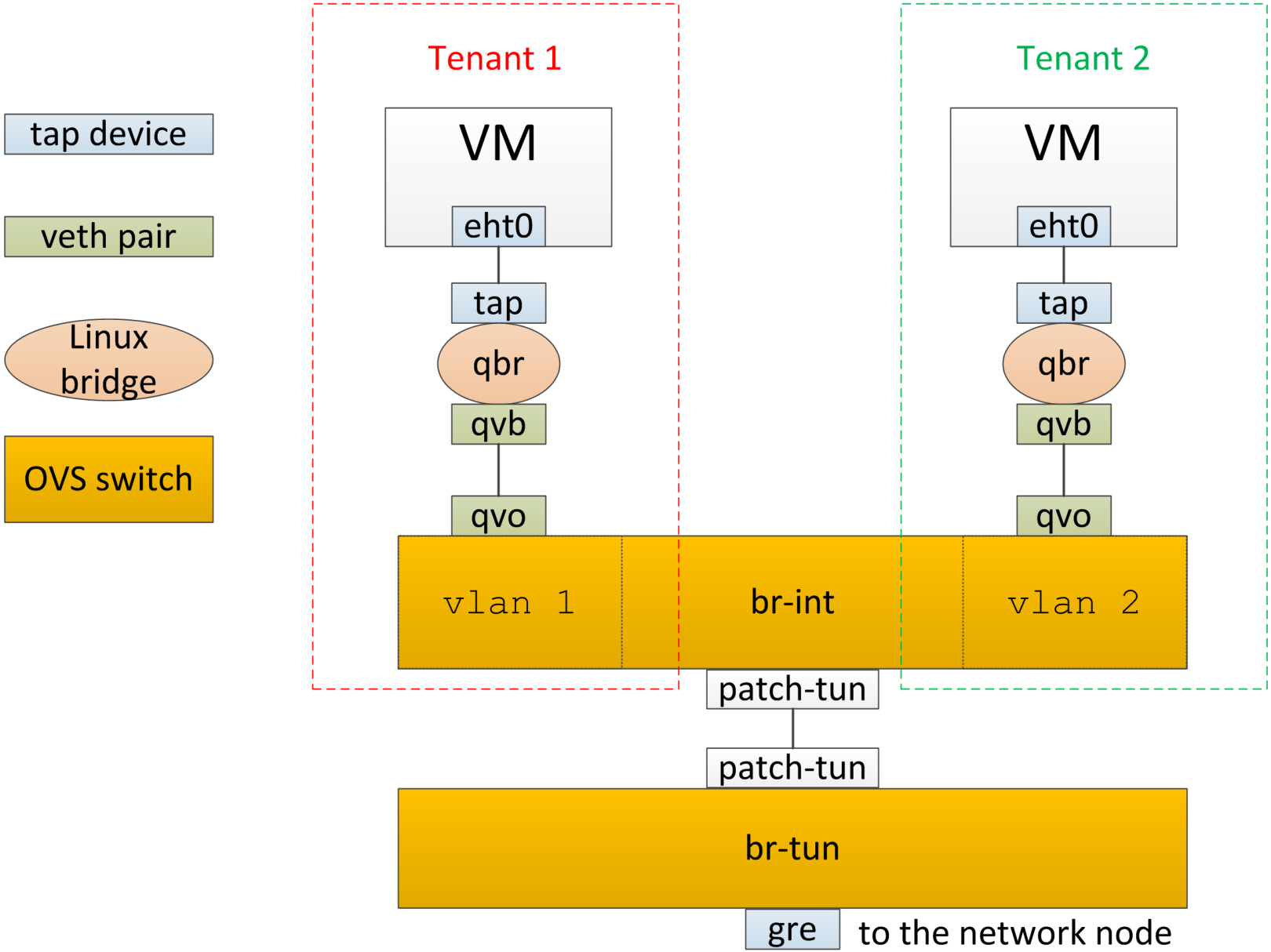
Responsible for routing and floating IPs.

- Runs on the network node (typically).
- Uses namespaces (`qrouter-<uuid-of-neutron-router>`)
- Also provides metadata agent.
- Routing is done with static routes.
  - $\Rightarrow$ linux forwarding must be enabled
- tap interface `qg-X` with *public* IP, wired to `br-ex` external bridge
- tap interface `qr-X` with *private* IP, wired to `br-int`.
- IP on `qr-X` is the gateway for the tenant network.
- When using floating IPs, the L3 agent will assign the floating ip to `qg-X` and set in place a 1:1 NAT between public and private IPs.
- Otherwise, the L3 agent simply use NAT (MASQUERADE) to allow external connectivity (using the IP of `qg-X` interface)

Under the hood - network node



Under the hood - compute node



Metadata proxy

- usually embededd in the L3 agent
- gets the request from the client, and redirect to the api node

References

- Cloud Administrator Guide - Chapter 7 - Networking
- https://wiki.openstack.org/wiki/Neutron
- OpenStack Summit Atlanta 2014 - Inside the Architecture of Neutron