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FloatingIP Enhancement For Public Cloud Infrastructure

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Fujitsu Limited

Who am I ?

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- Yushiro Furukawa (Speaker)
  - Software Engineer of Fujitsu from 2011
    - Developer of OpenStack Neutron
  - Characteristics
    - Red glasses frame

Please remember me

Agenda

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1. OpenStack Neutron Overview
2. FloatingIP allocation with public cloud infrastructure
3. Legacy Router and DVR

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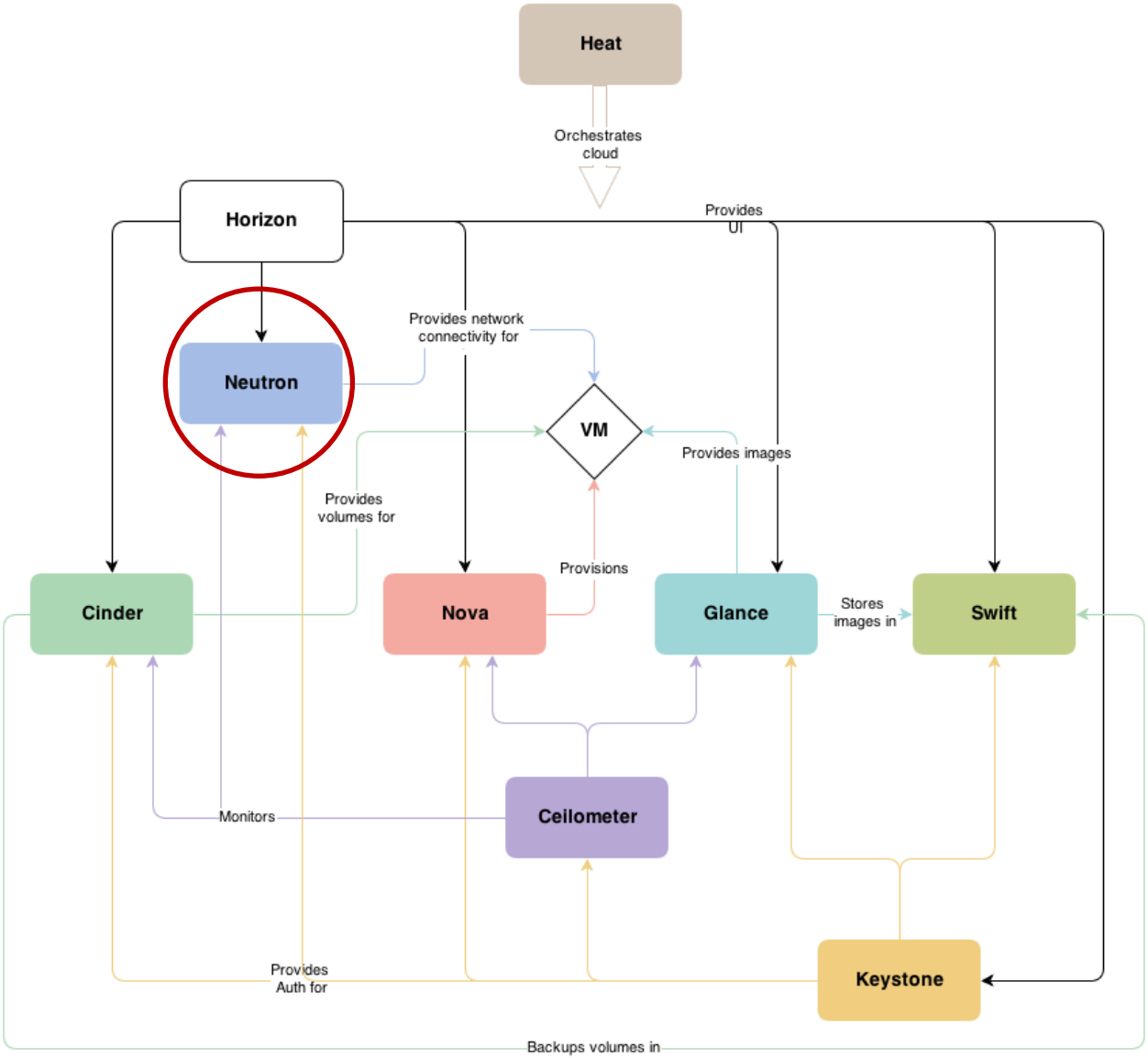
OpenStack Neutron Overview

OpenStack Neutron



OpenStack Neutron

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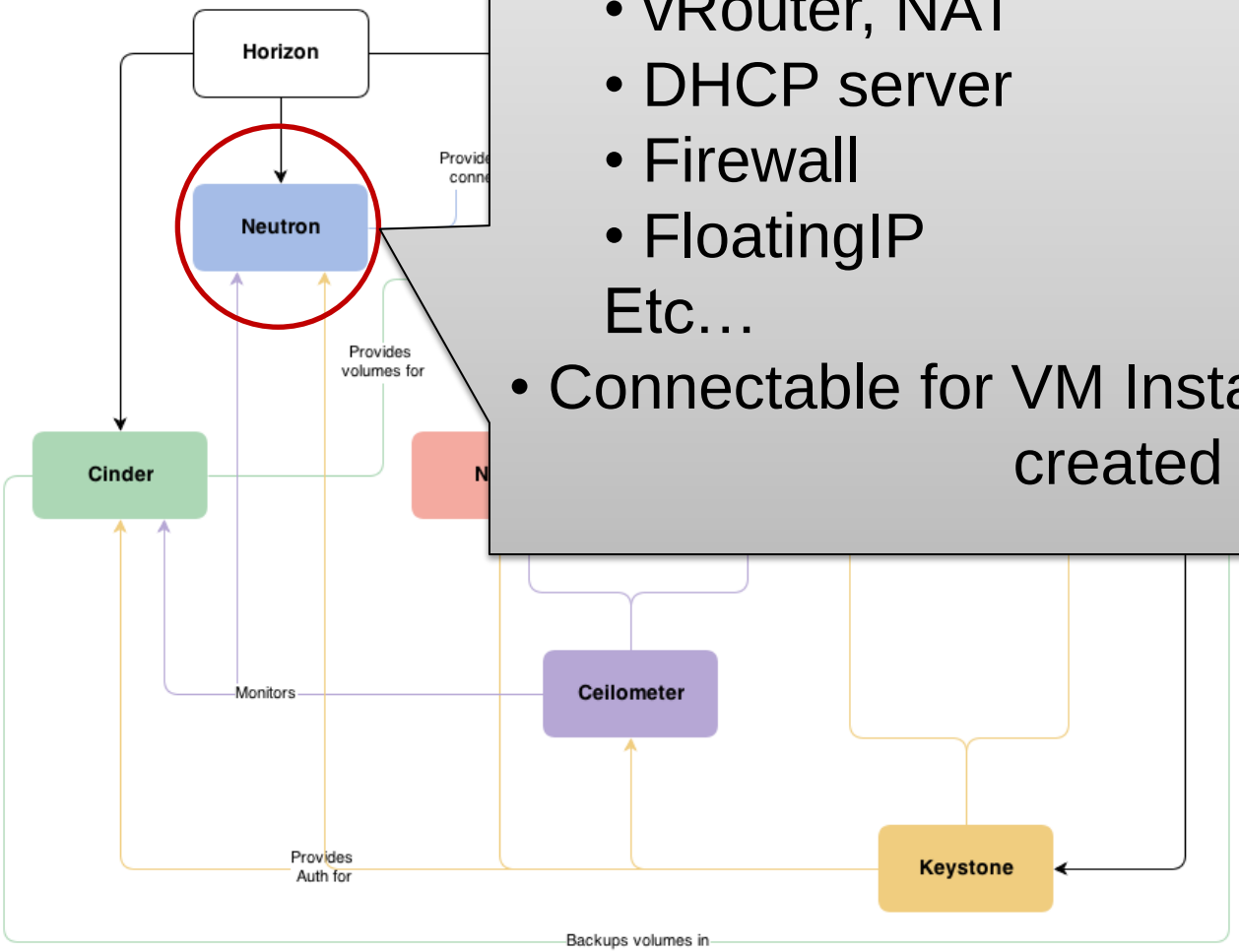

- Provide L2 / L3 networking
- Network isolation between tenants
  - vRouter, NAT
  - DHCP server
  - Firewall
  - FloatingIP

  Etc…
- Connectable for VM Instances created by Nova.

Neutron Components (Legacy Router)

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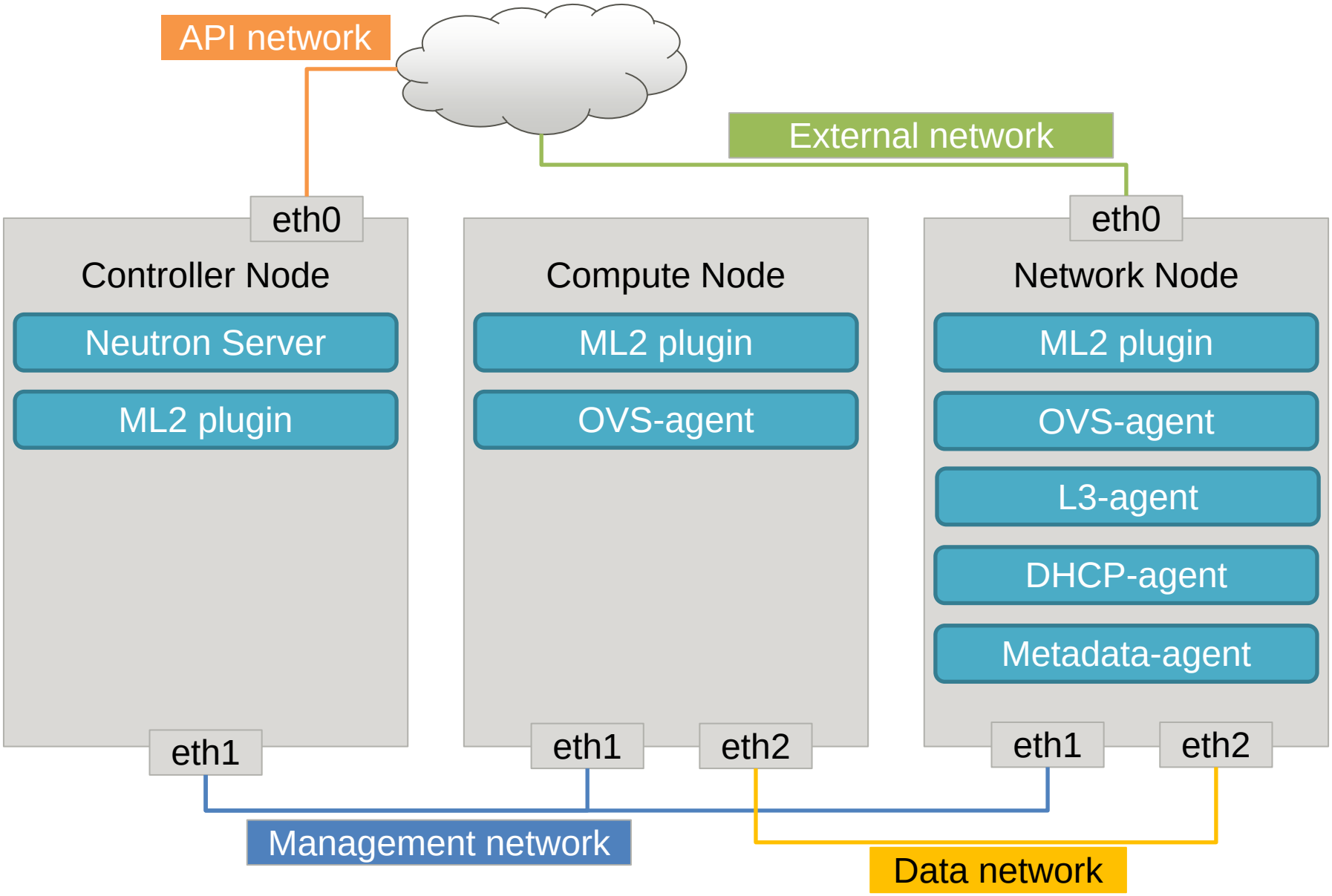
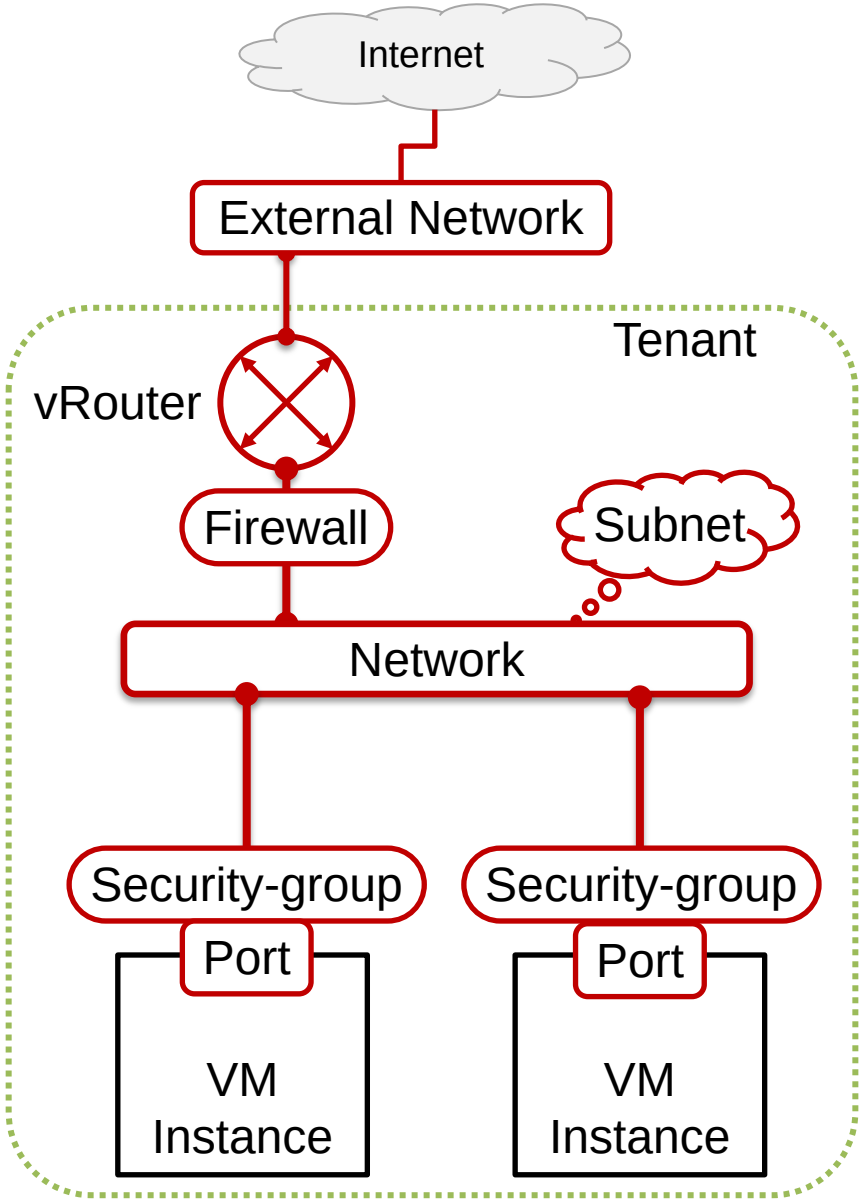


Neutron services



Neutron virtual networking services

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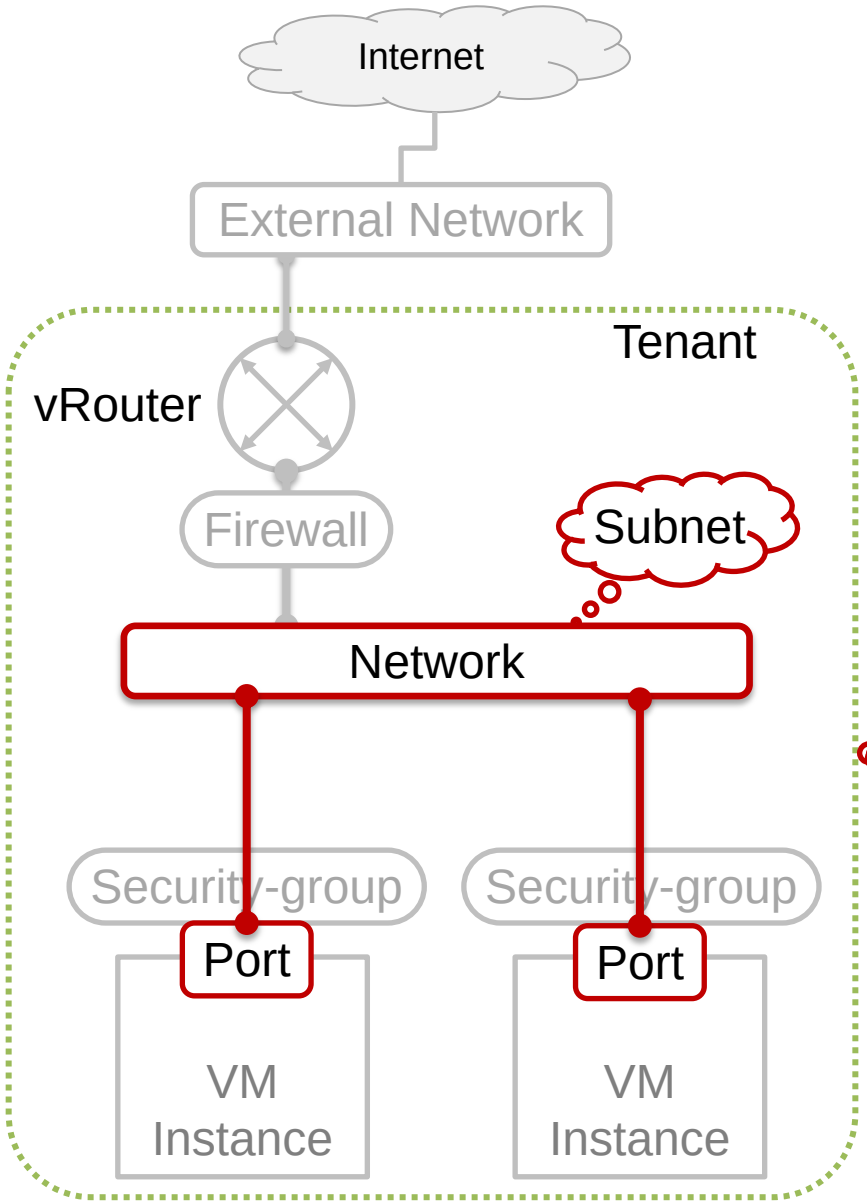


Network

- Virtual L2 network

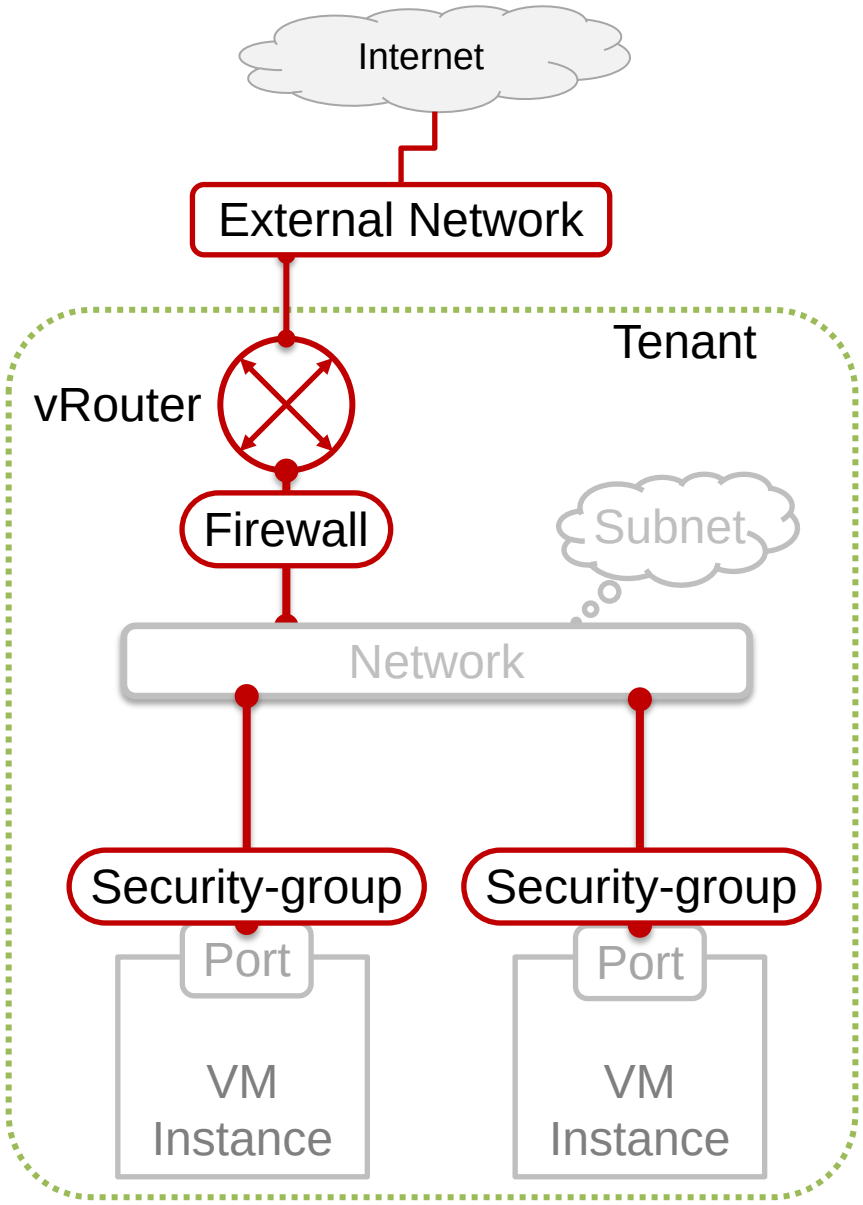
Port

- Connects a VM instance and Network
- Able to attach Security-Group

Subnet

- IP address pool
- Provides an IP address for Port

Neutron extension services



vRouter

- Connects Networks, also Network and External network.

External Network

- Virtual L2 network between the Internet and tenants

FloatingIP

- Will be explained later

Security-group

- Works on Port
- Filters ingress/egress packets
- Uses a White-list for filtering

Firewall

- Works on vRouter
- Filters packets

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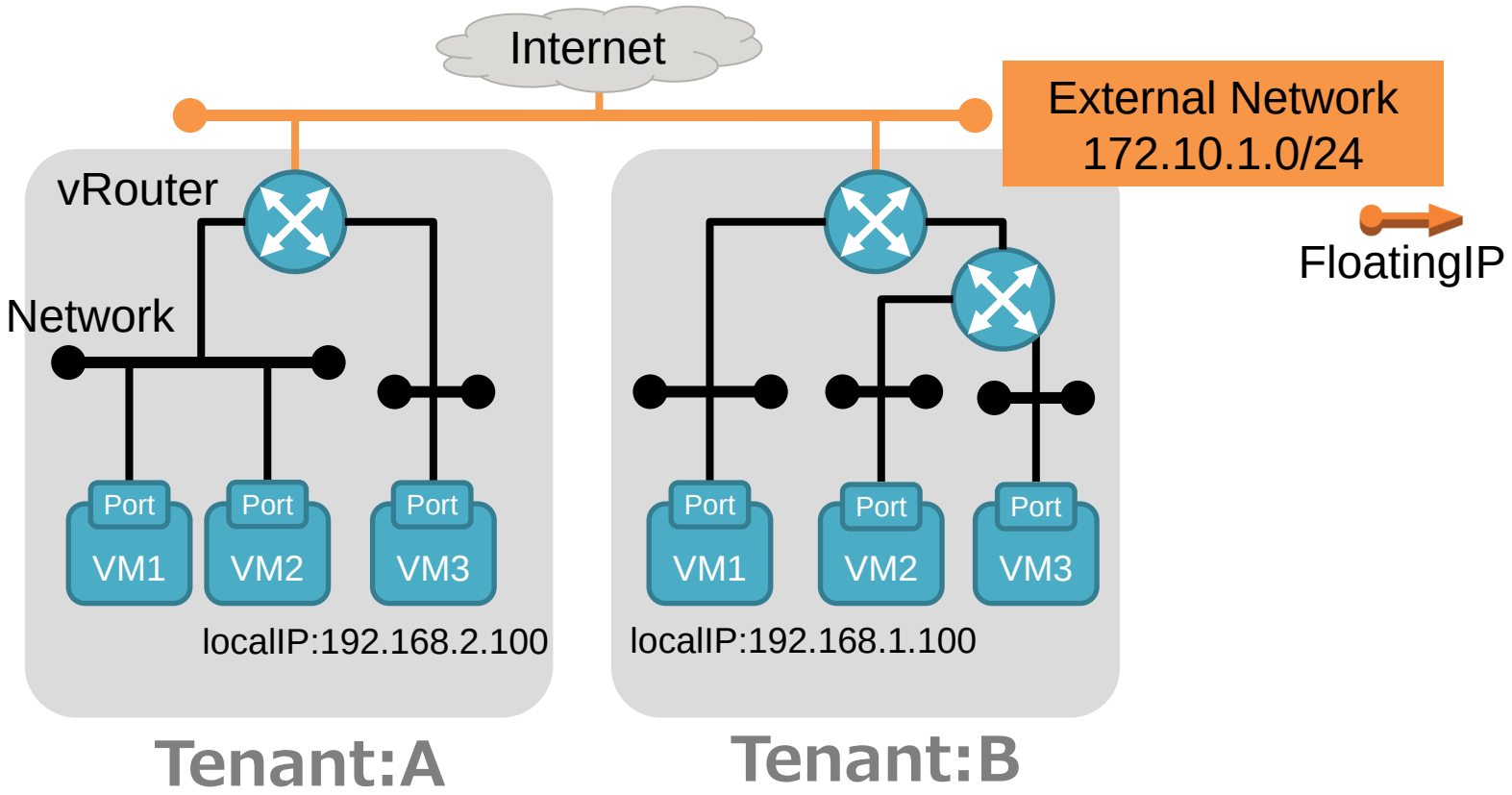
FloatingIP Allocation For Public Cloud Infrastructure

What is FloatingIP?

- In public cloud, GlobalIP is usually used as FloatingIP.
- We can associate a FloatingIP with a specific Port.



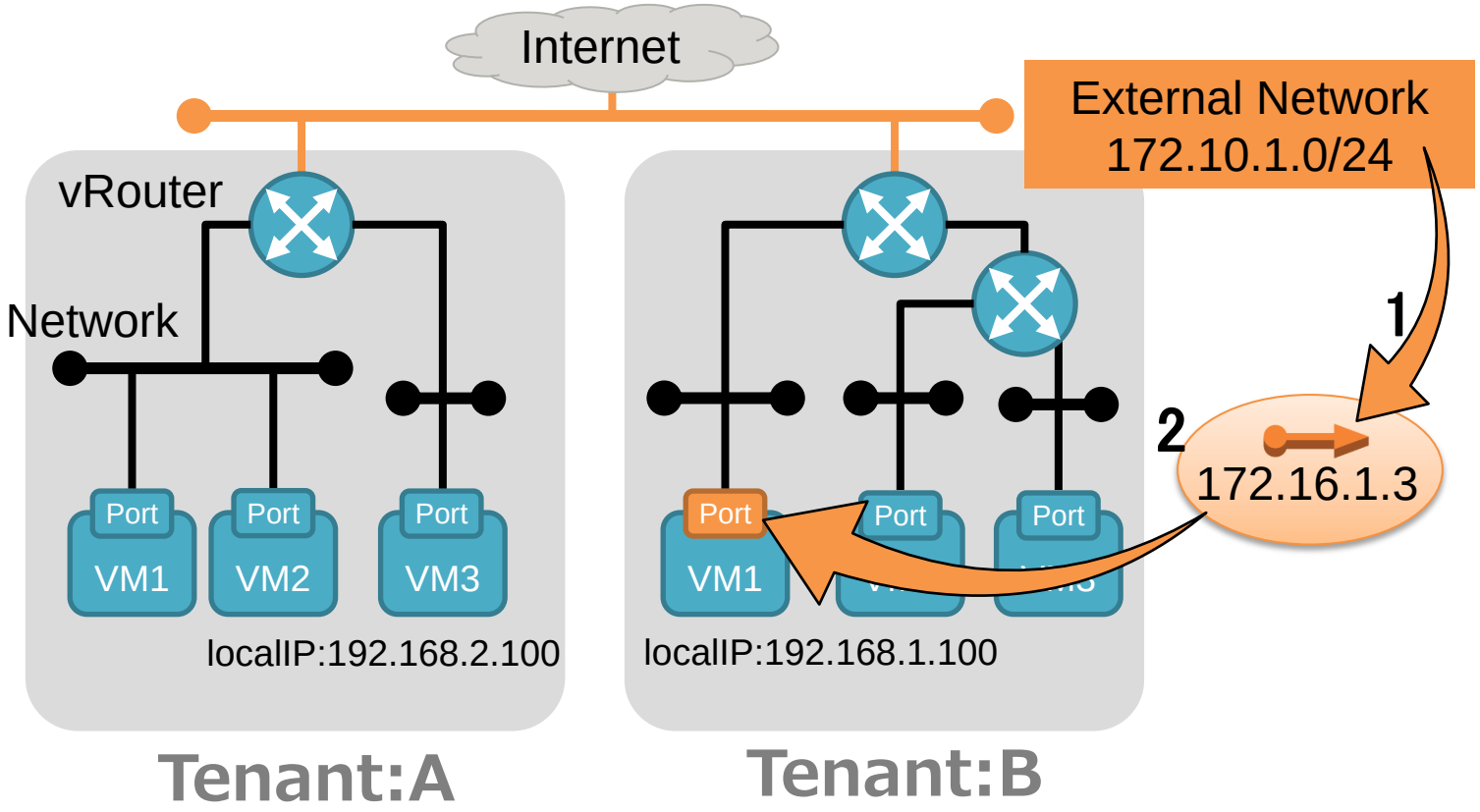
Setup steps

1. Create a FloatingIP

   $ neutron floatingip-create *FLOATING_NETWORK*

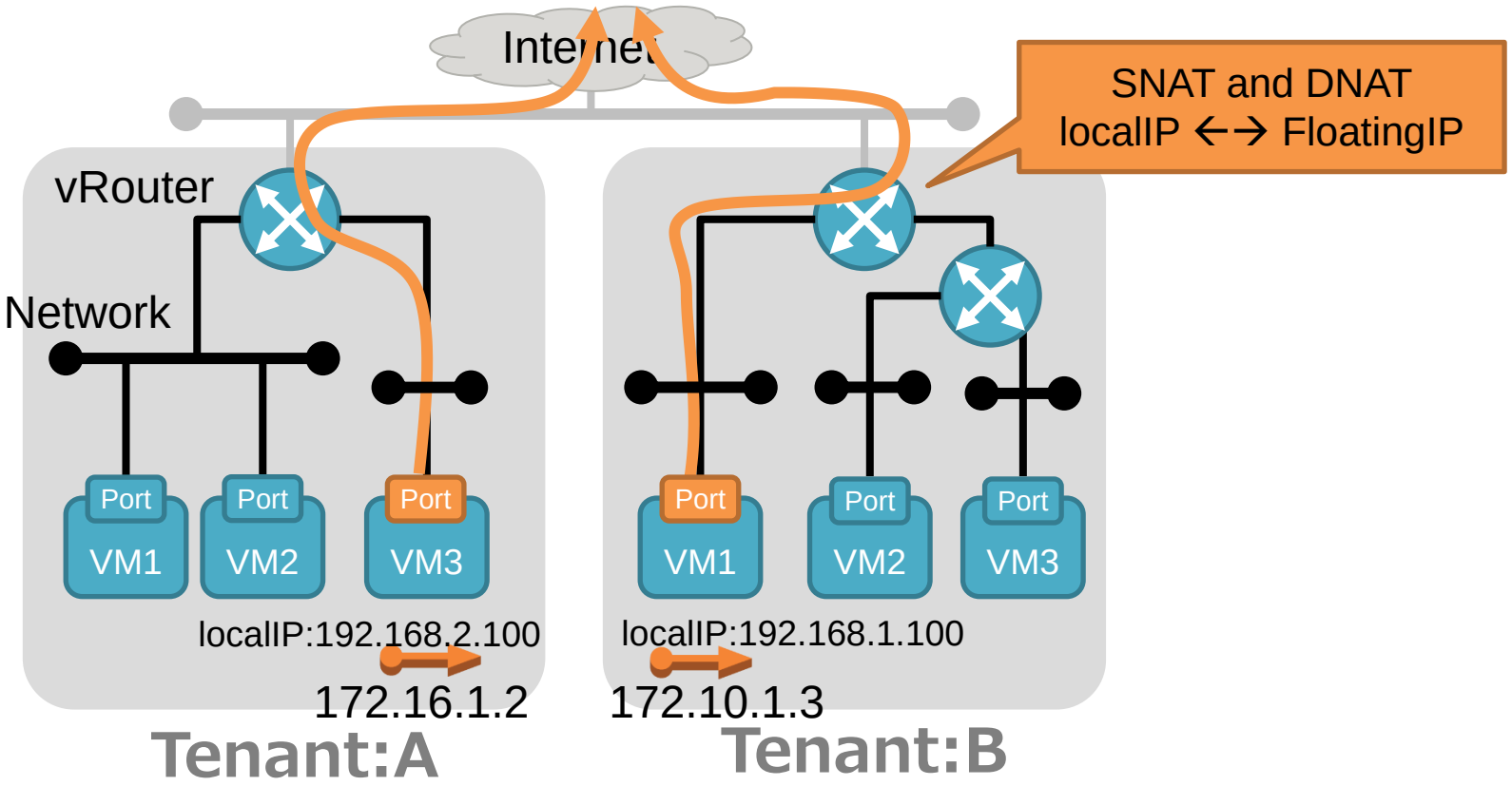
2. Associate the FloatingIP with a Port of a VM instance.

   $ neutron floatingip-associate *FLOATINGIP_ID PORT*



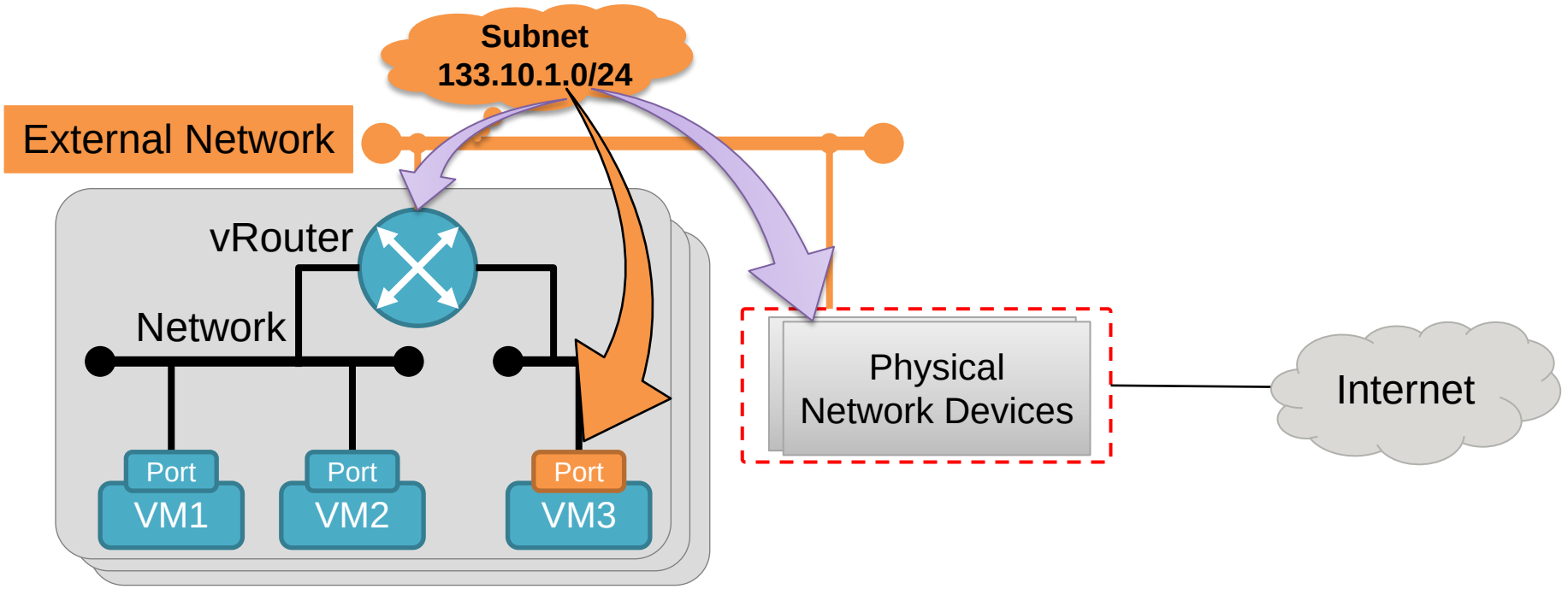
How FloatingIP works?

- SNAT and DNAT rule are added into vRouters.



Case-1: Single External Network

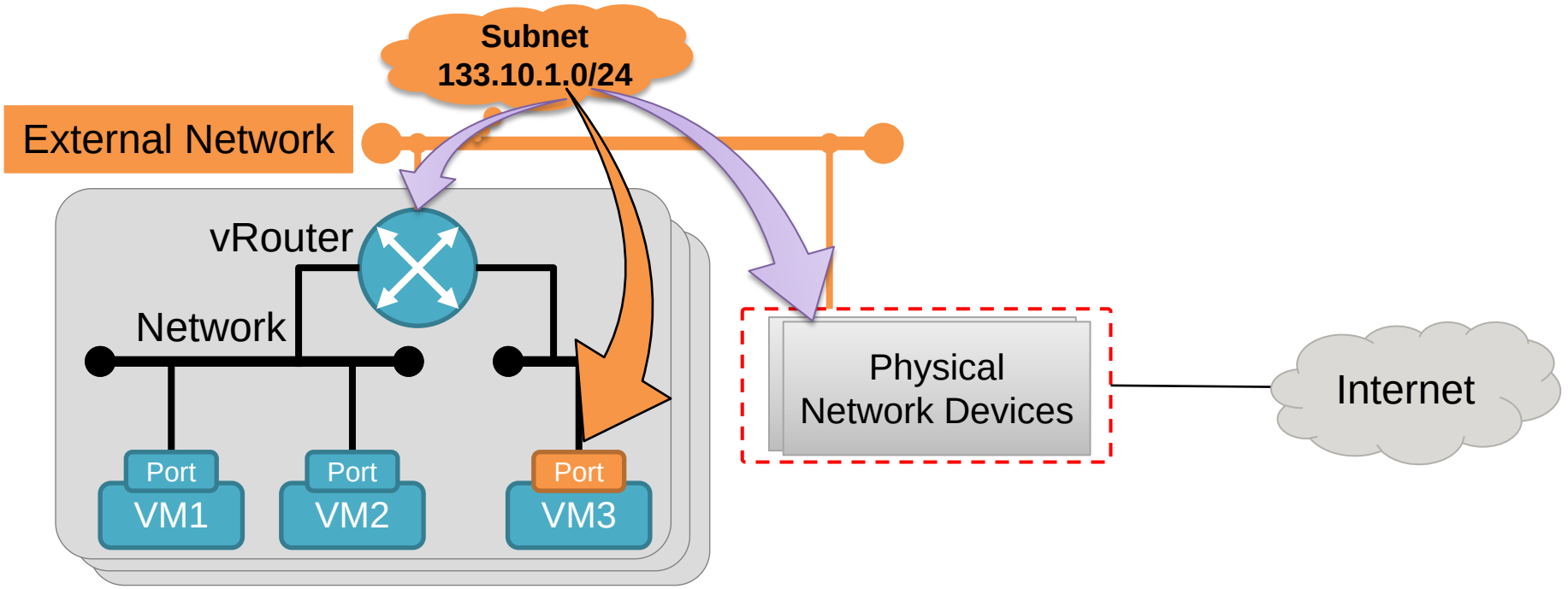
- GlobalIP is used as FloatingIP.
- FloatingIP address is allocated from the Subnet.
- IP address for physical network devices is manually picked up from the IP addresses in the Subnet.
  - Meaning the cloud provider has to make sure to avoid overlapping



Case-1: Single External Network

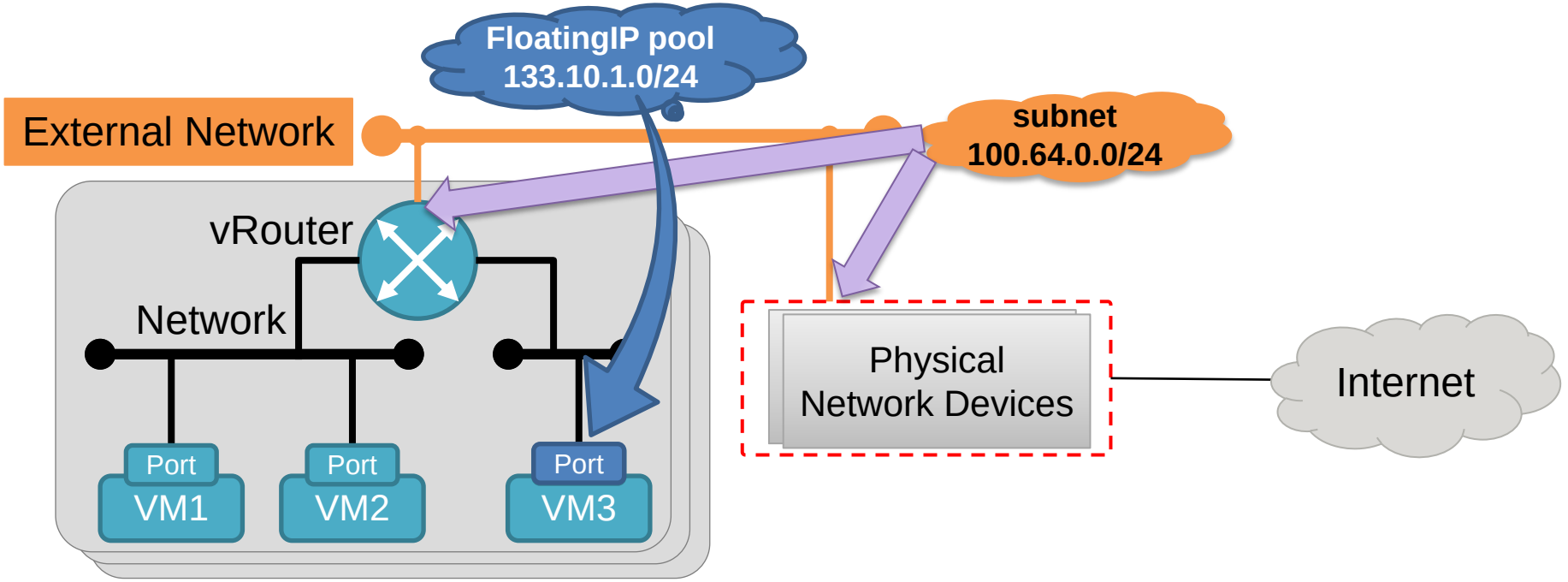
- GlobalIP is used as FloatingIP.
- FloatingIP address is allocated from the Subnet.
- IP address for physical network devices is manually picked up from the IP addresses in the Subnet.

This increases complexity of address allocation algorithm



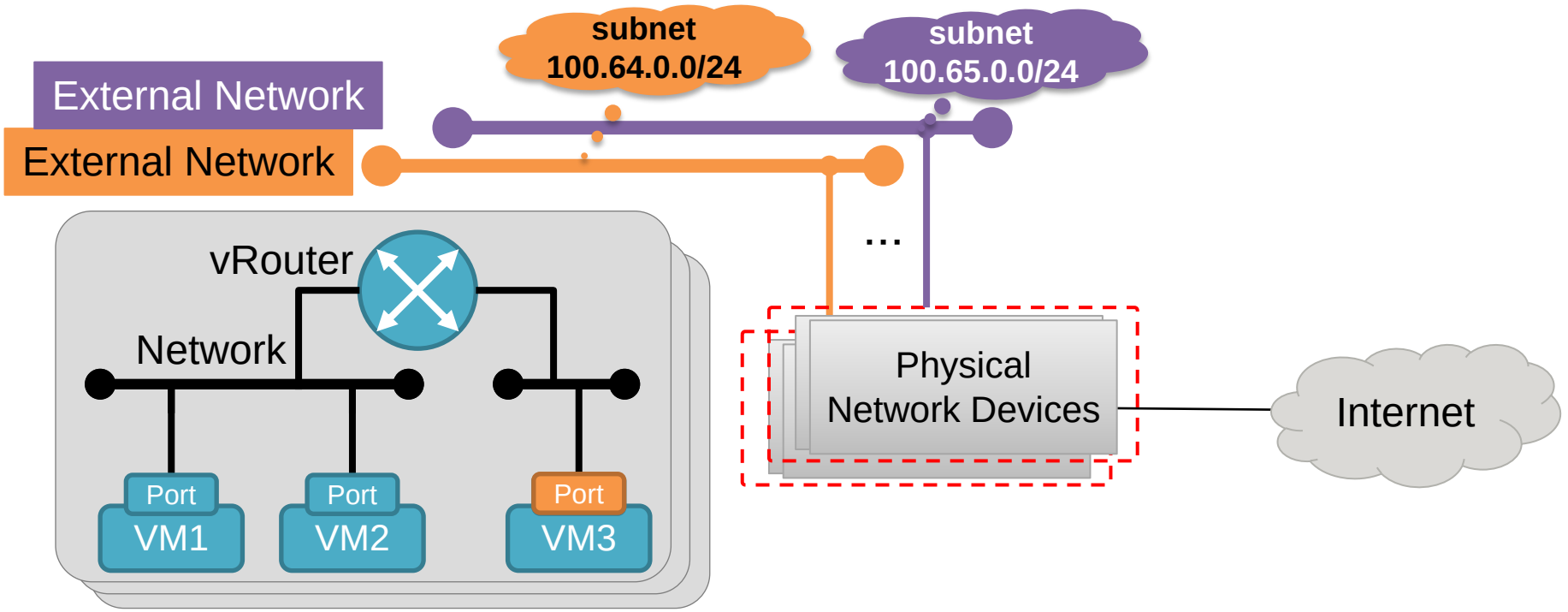
Proposal of Case-1

- GlobalIP is used as FloatingIP.
- Use PrivateIP for vRouters and physical routers.
- Create “FloatingIP Pool” for FloatingIP allocation.
  - The cloud provider no longer has to be worried about overlapping



Case-2: Multiple External Networks

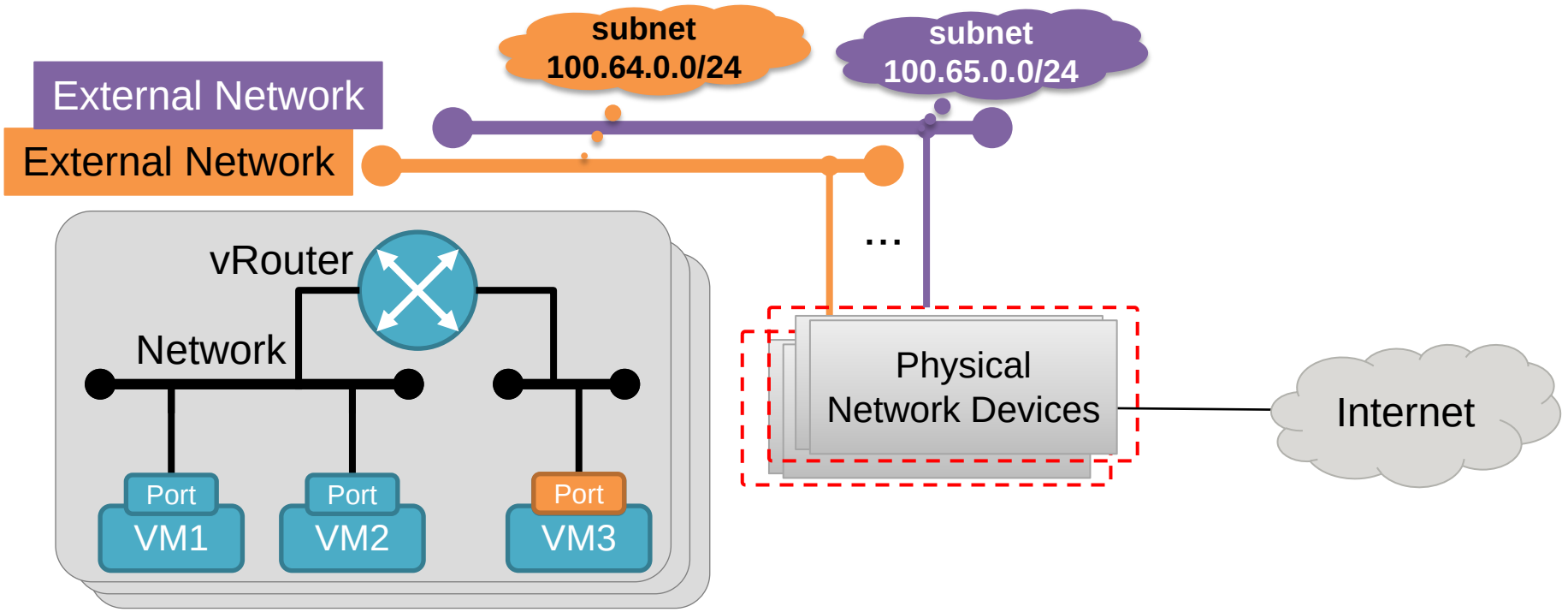
- GlobalIP is used as FloatingIP.
- There can be a case where several external networks exist in the infrastructure for some reasons



Case-2: Multiple External Networks

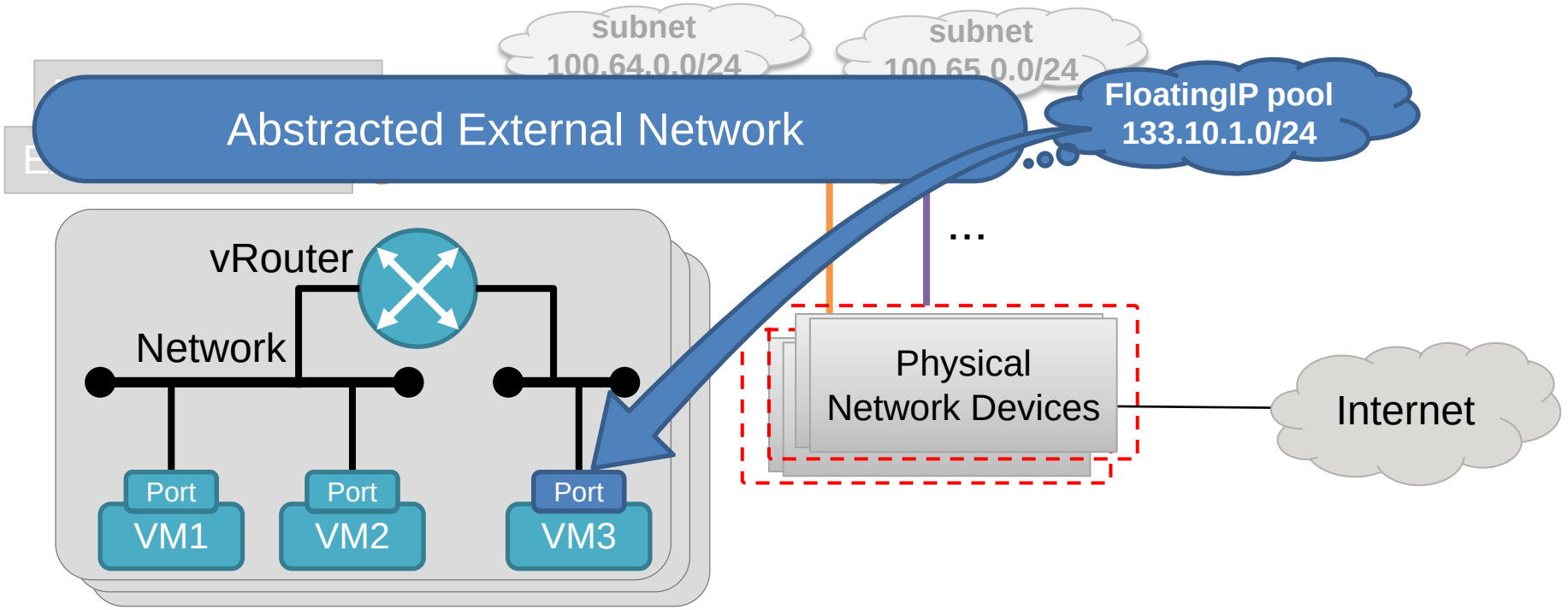
- GlobalIP is used as FloatingIP.
- There can be a case where several external networks exist in the infrastructure for some reasons

Tenant-user have to select which external network to connect to, but it's just a burden tenant users shouldn't be take



Proposal of Case-2

- Abstract the External Network
  - Tenant-users can see only one abstracted external network
- FloatingIP pool simplifies the mechanism of the Abstracted External Network.
  - Without FloatingIP pool, each External network has a Subnet, and the Abstracted External Network needs to select which Subnet to use...



However….

- I have been thinking about FloatingIP enhancement for legacy router configuration.
- DVR is becoming the de facto standard configuration, and now I also should consider to develop the enhancement on DVR.

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DVR (**D**istributed **V**irtual **R**outer) Enhancement

Neutron Components (Legacy-Router)

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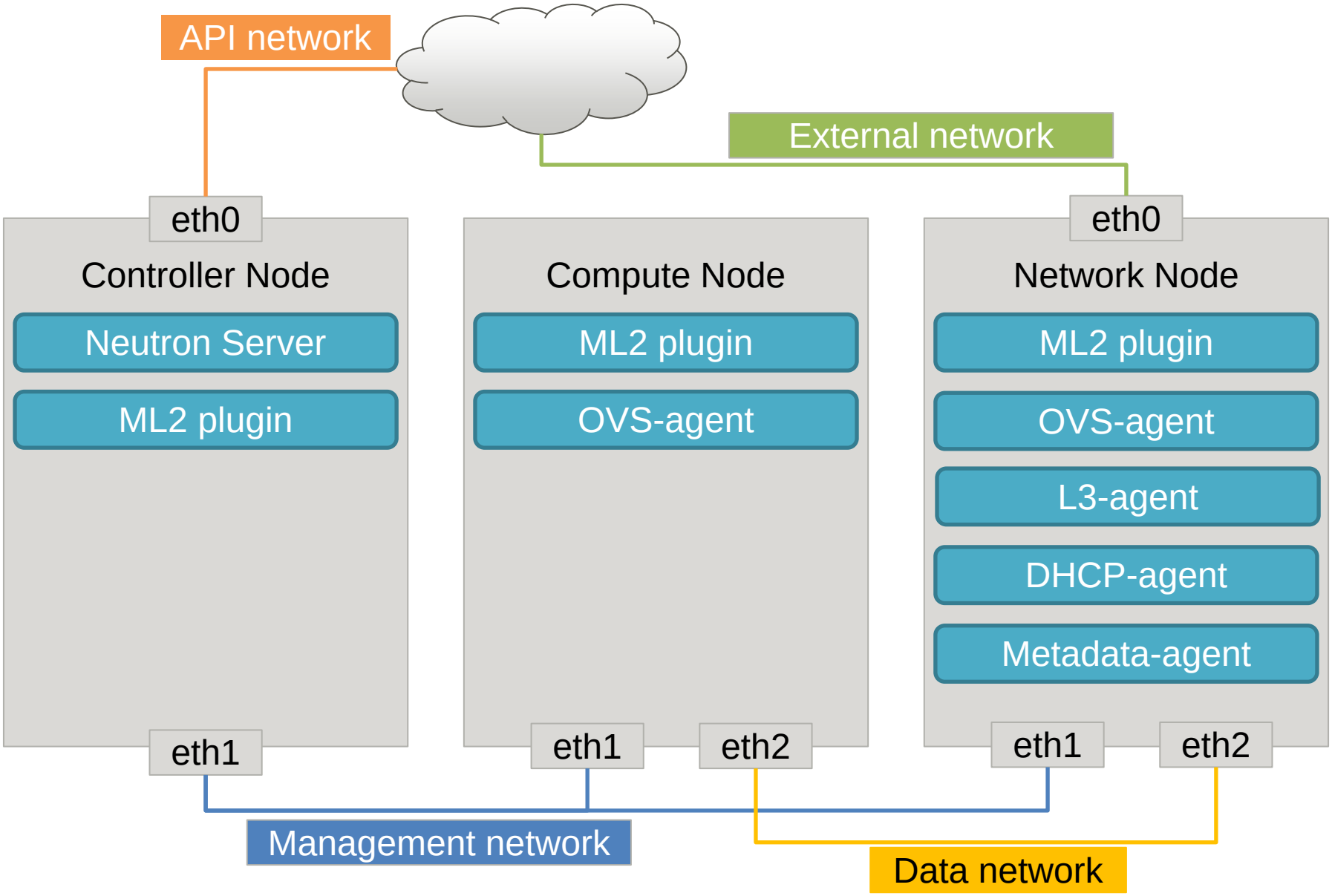

Neutron Components (DVR)

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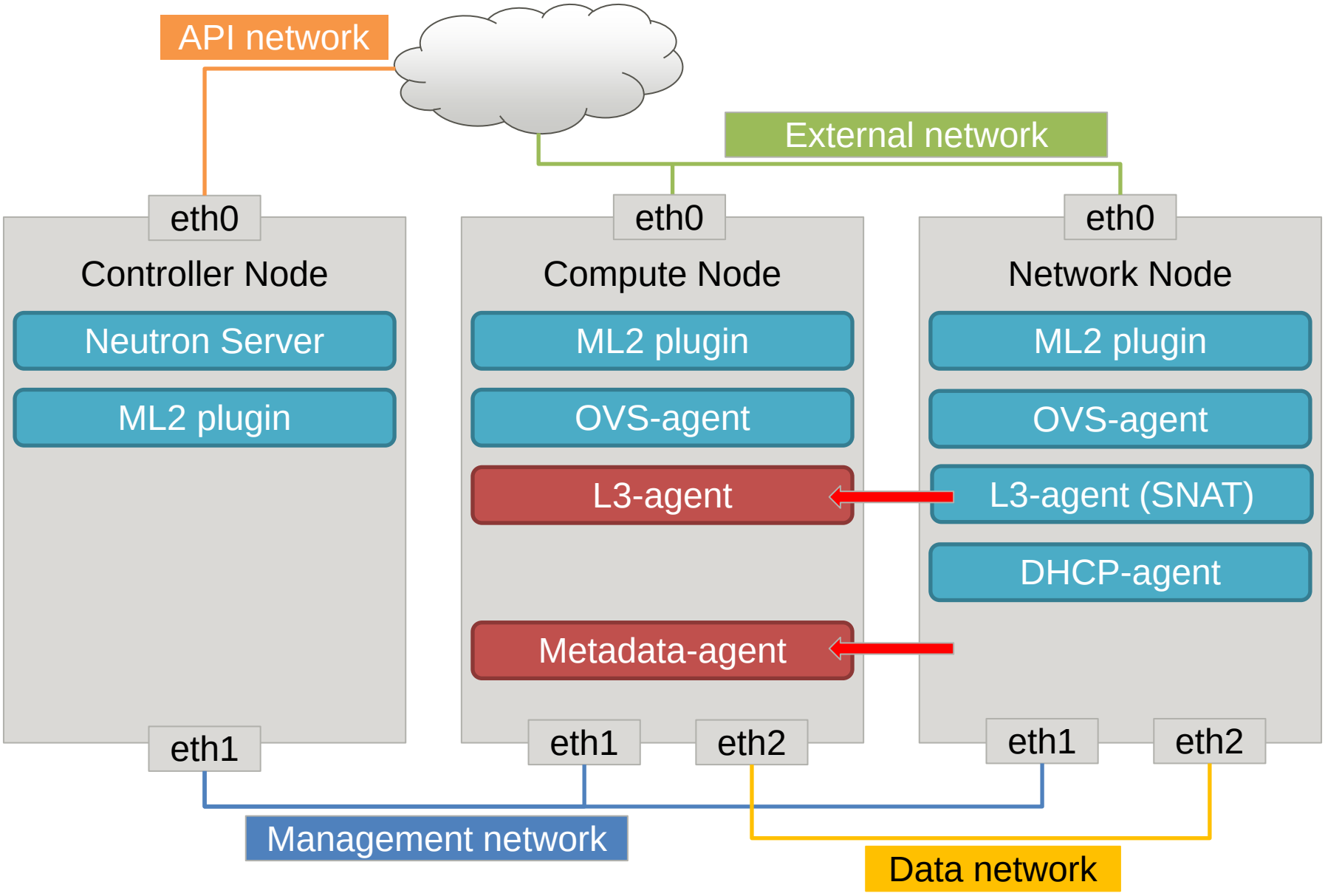
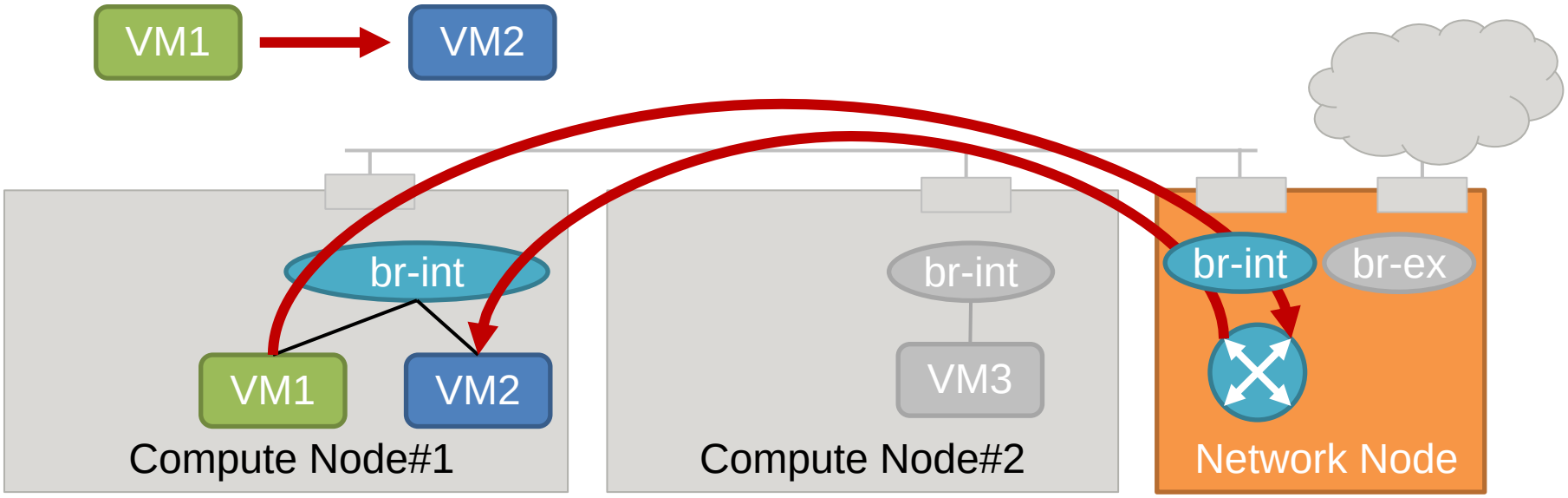


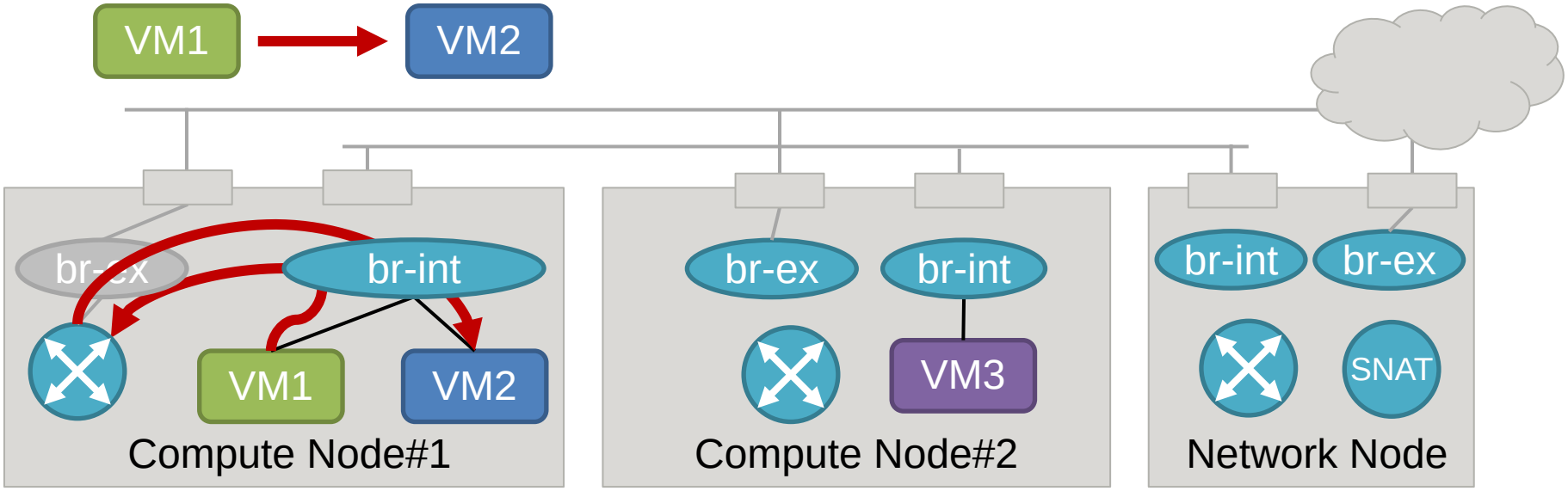
Network Traffic on Legacy Router



- Main characteristic:
  - vRouter only exists on Network Node.
  - All network traffic must go through Network Node.
    - East-West (between different Subnets)
    - North-South (between the Internet and tenants using FloatingIP or SNAT)

    => Can be a performance bottle neck.
  - Network Node is also Single-Point-of-Failure.

Network Traffic on DVR



- Main characteristic:
  - vRouter exists on all Compute Nodes.
  - Basically, Network traffic only has to go through Network Node when the traffic goes to the Internet using SNAT

    => Performance can scale more.

Network Traffic Case#1

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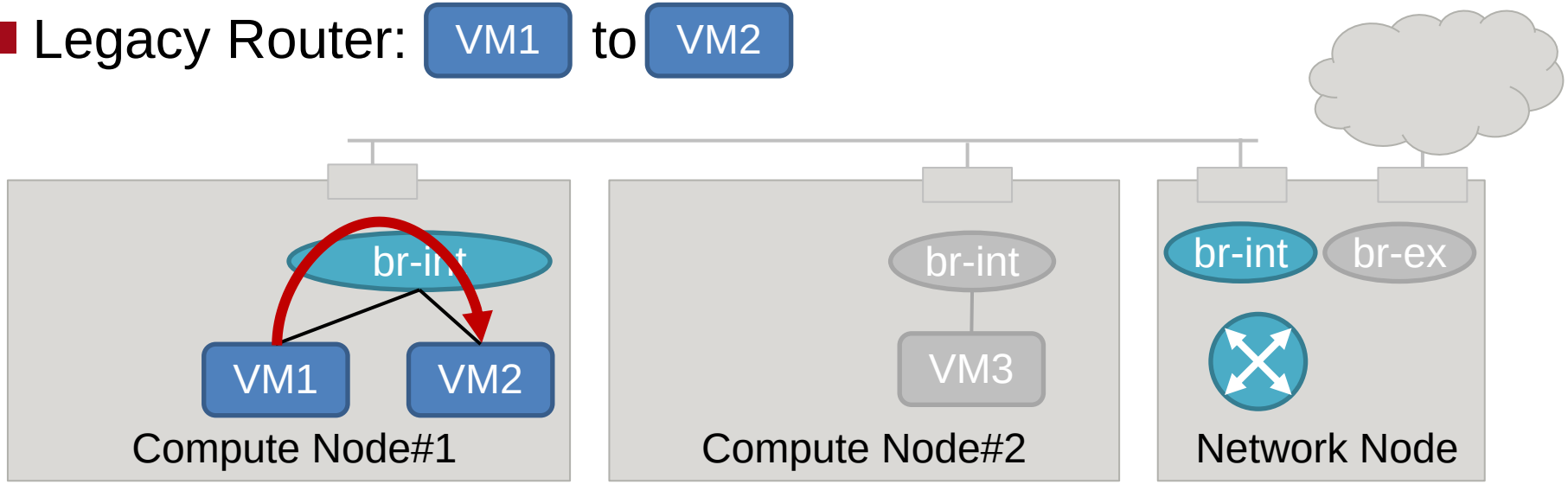
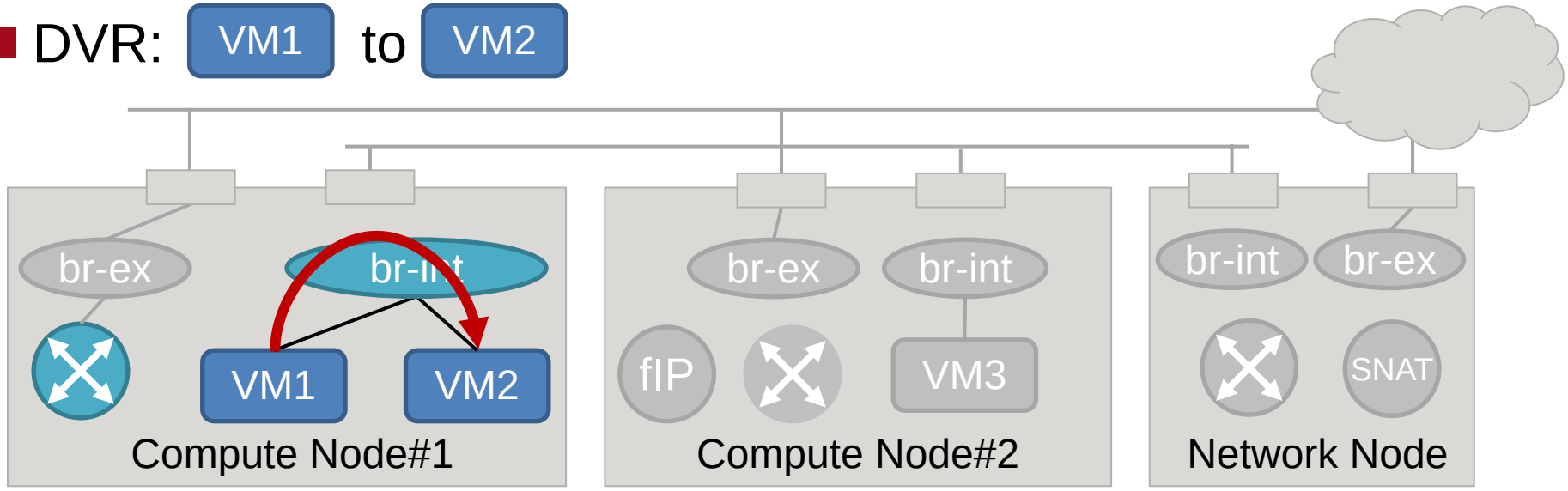
Between VMs in the same Subnet and host

- Legacy Router: VM1 to VM2



- DVR: VM1 to VM2



Network Traffic Case#2

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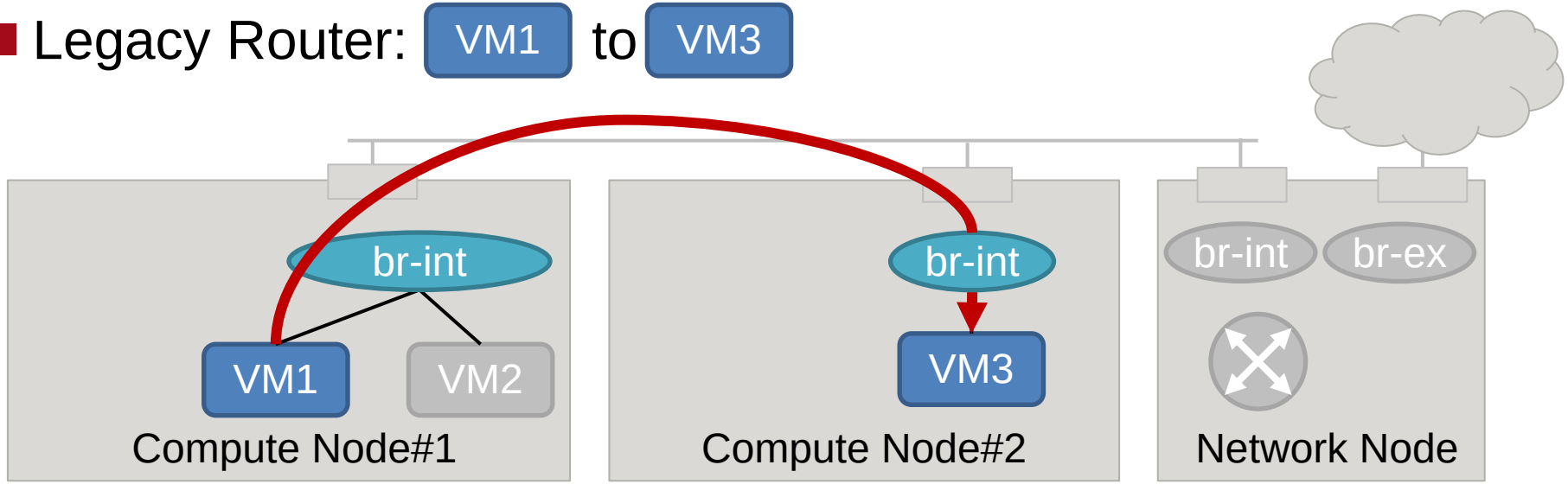
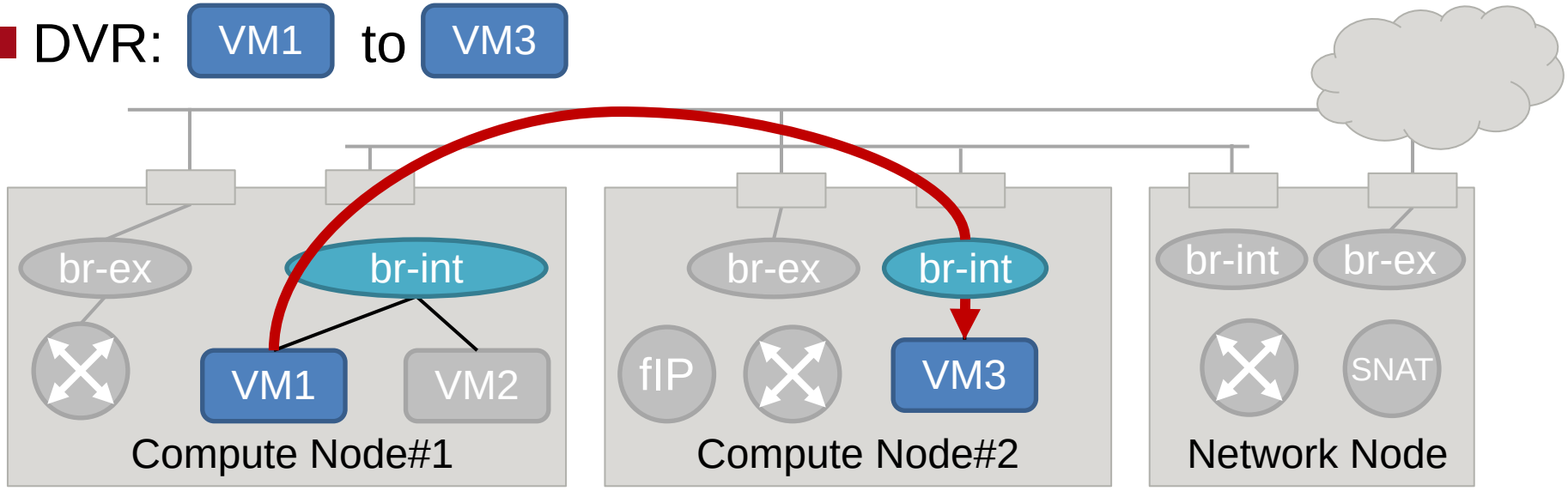
Between VMs in the same Subnet, but in Different hosts

- Legacy Router: VM1 to VM3



- DVR: VM1 to VM3



Network Traffic Case#3

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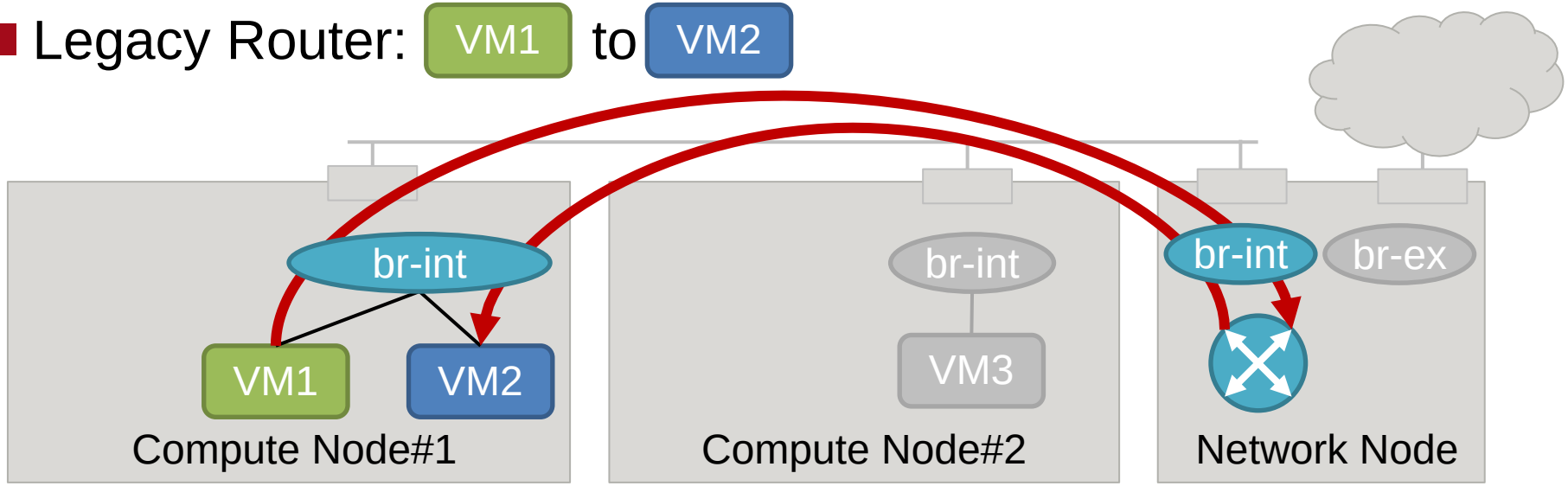
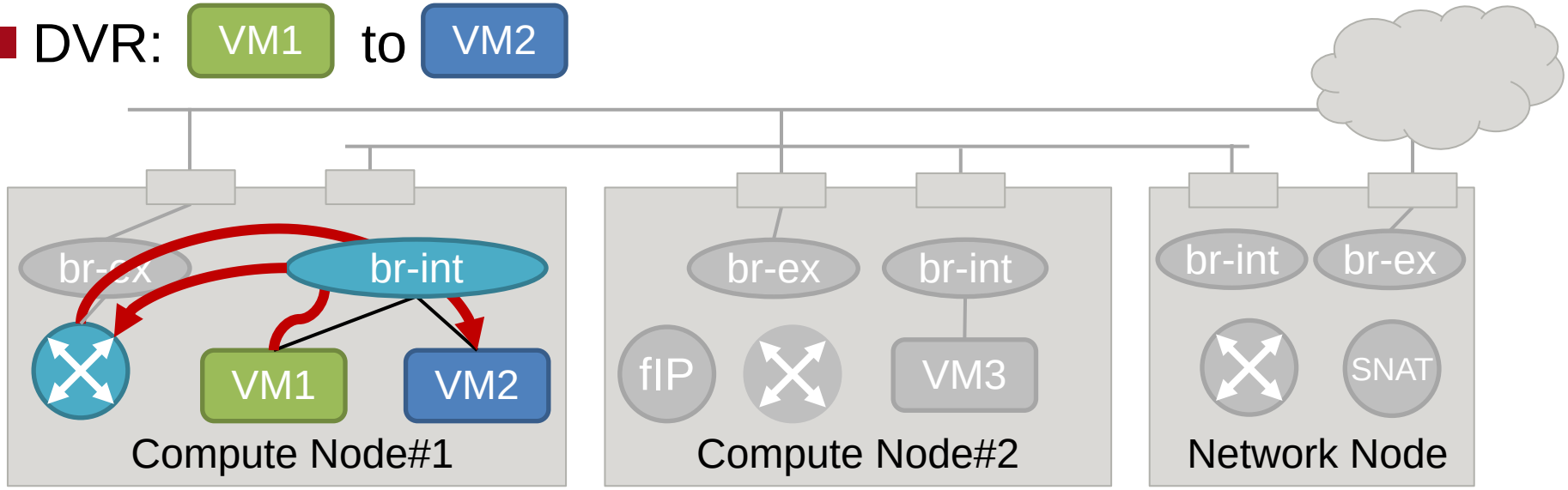
Between VMs in the same hosts, but in different Subnets

- Legacy Router: VM1 to VM2



- DVR: VM1 to VM2



Network Traffic Case#4

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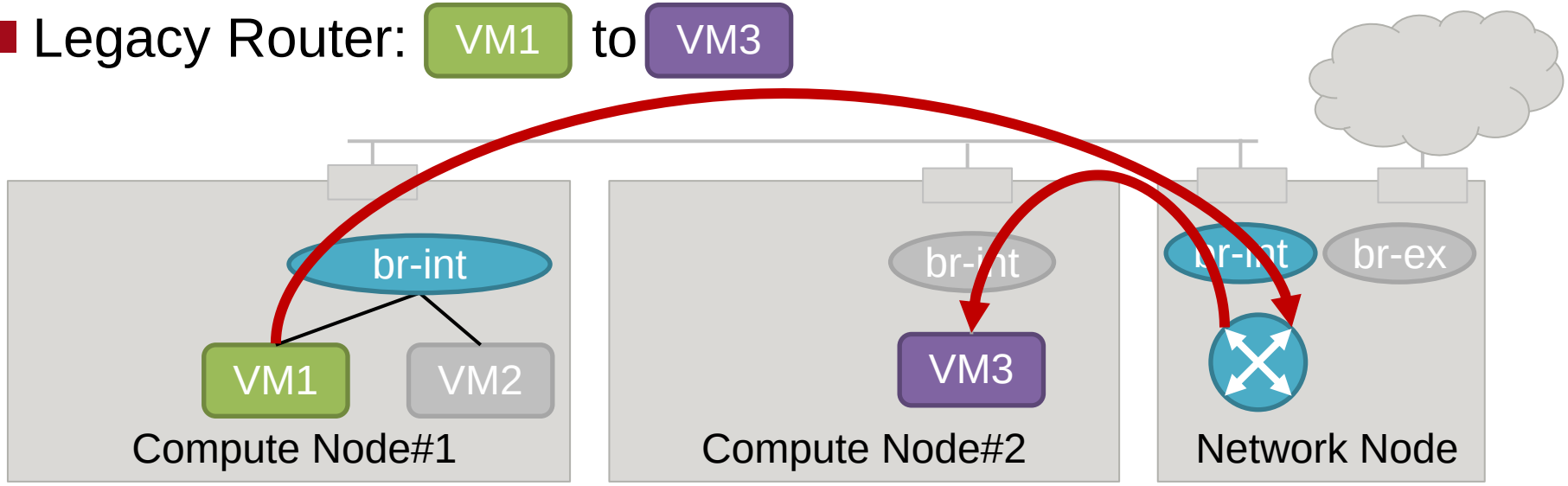
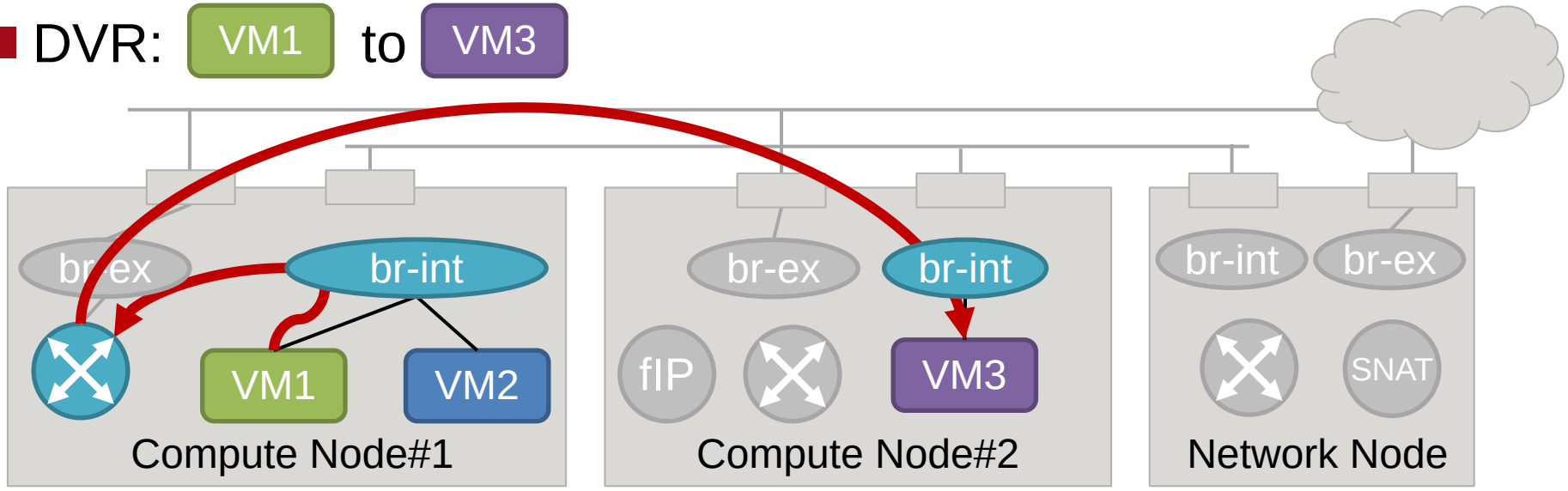
Between VMs in different Subnets and hosts

- Legacy Router: VM1 to VM3



- DVR: VM1 to VM3



Network Traffic Case#5

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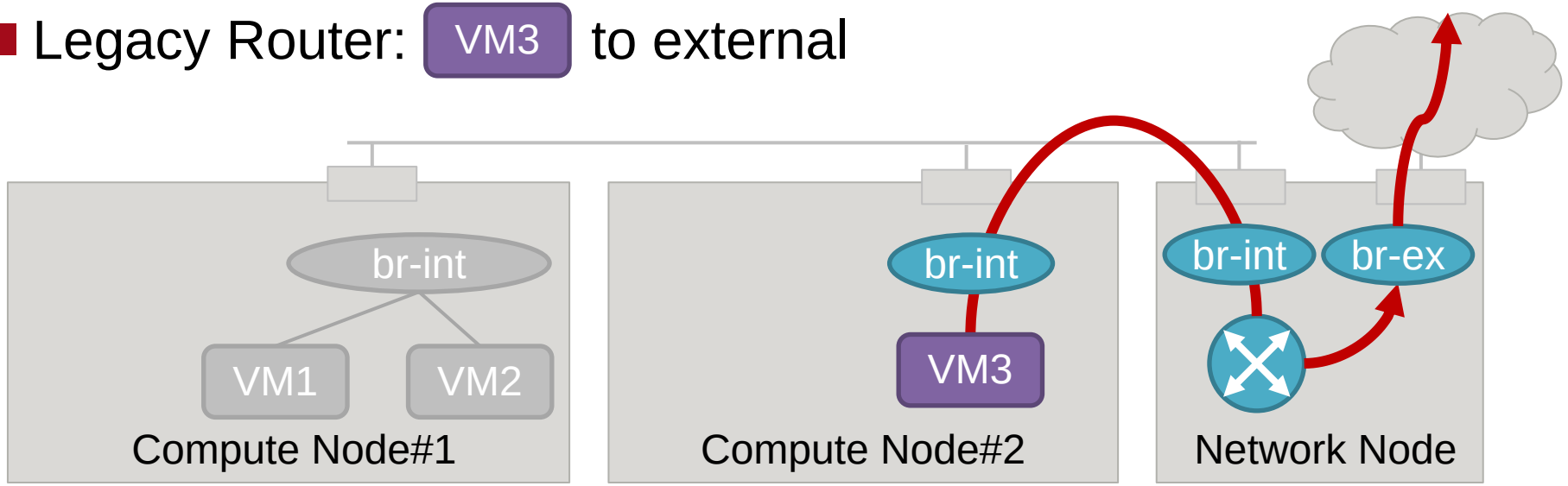
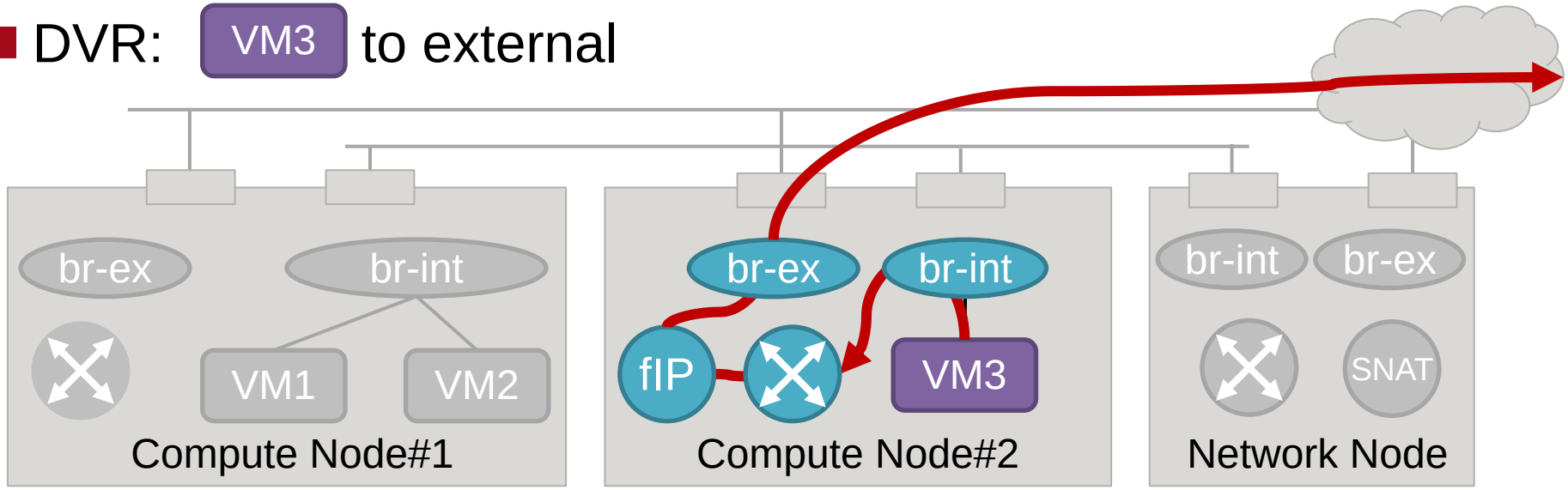
Between the External Network and a VM using FloatingIP

- Legacy Router: VM3 to external



- DVR: VM3 to external



Network Traffic Case#6

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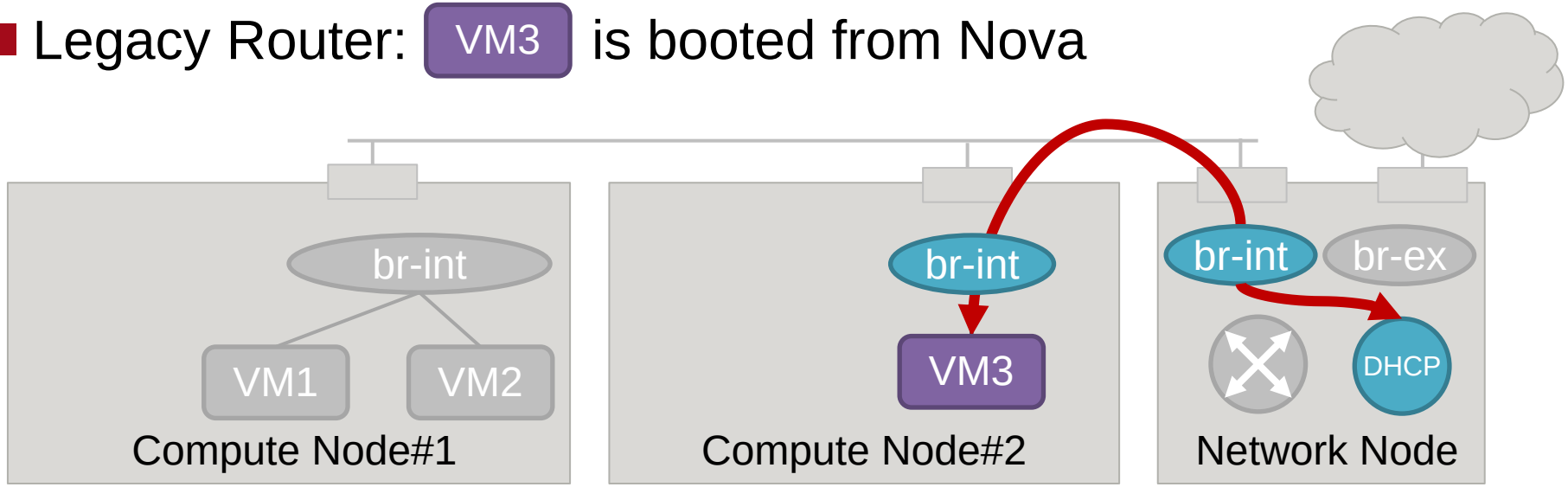
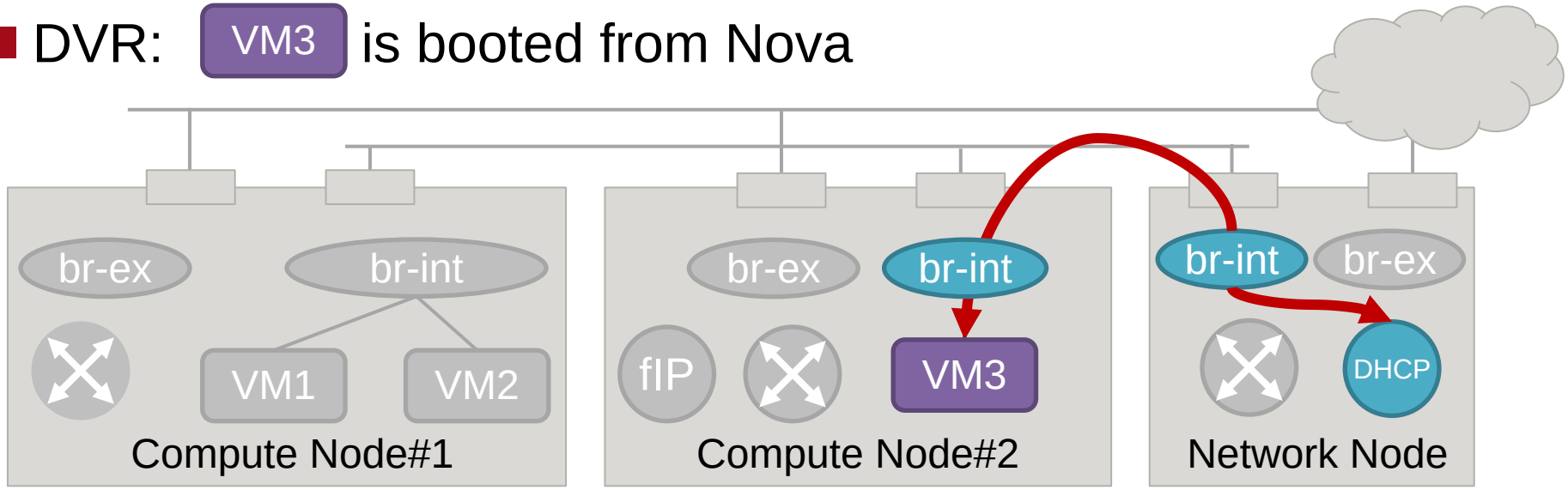
VM booting: a VM accesses to DHCP server

- Legacy Router: VM3 is booted from Nova



- DVR: VM3 is booted from Nova



Network Traffic Case#7

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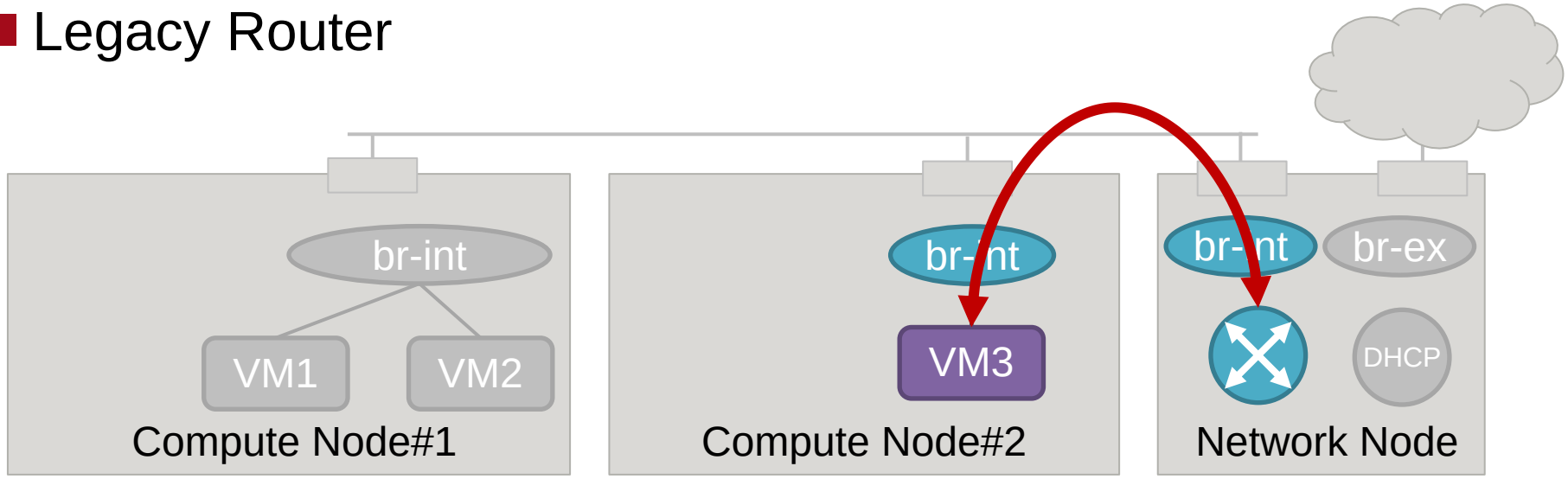
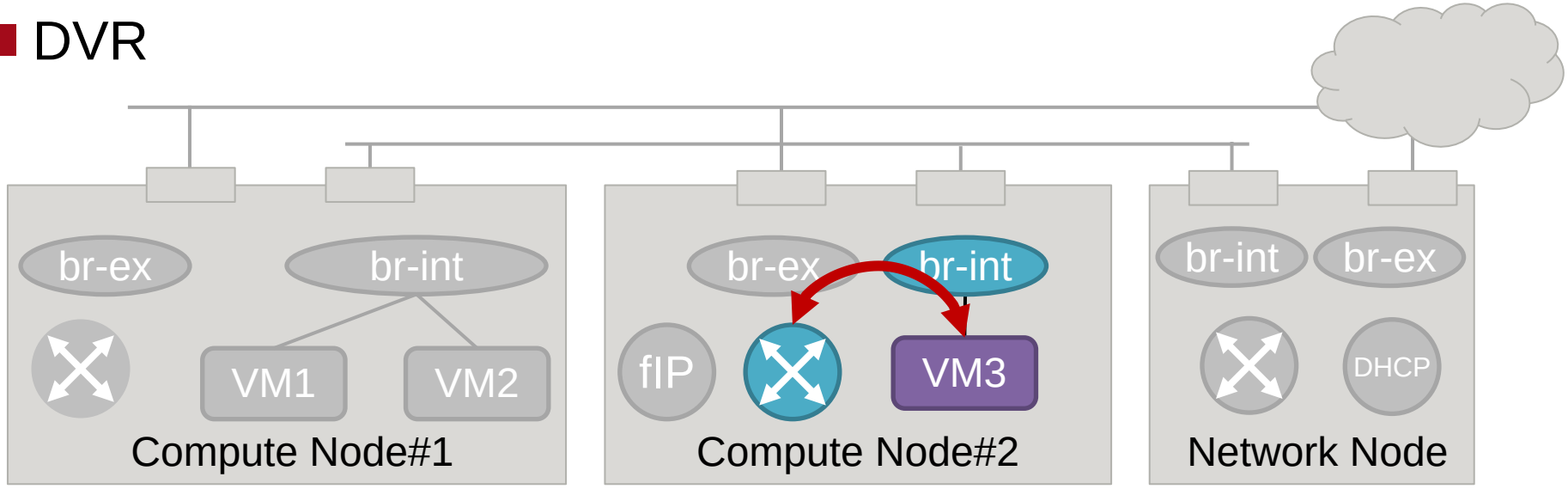
VM booting: a VM gets metadata from the vRouter

- Legacy Router



- DVR



Proposal: Distributed DHCP agent and L3-agent

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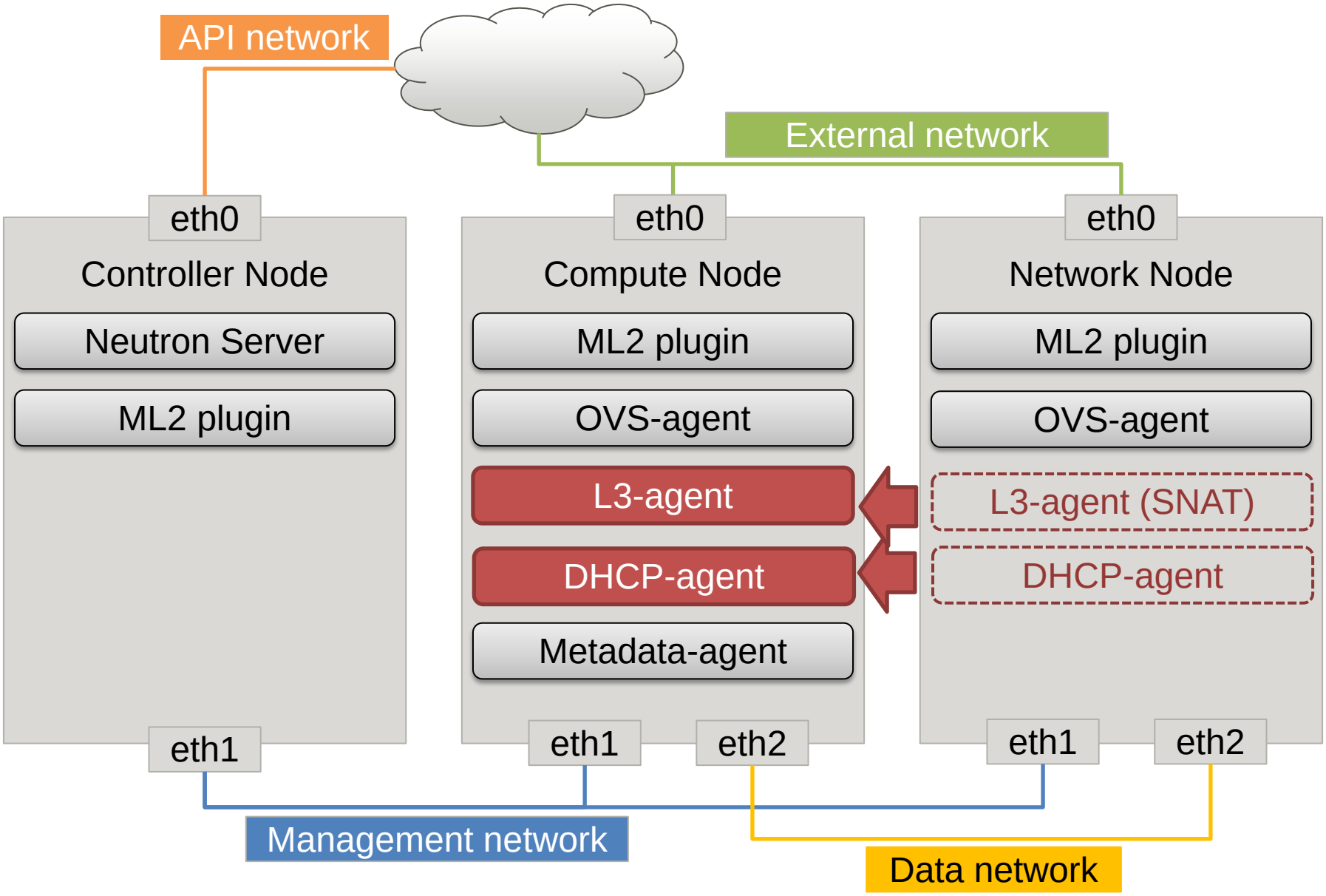
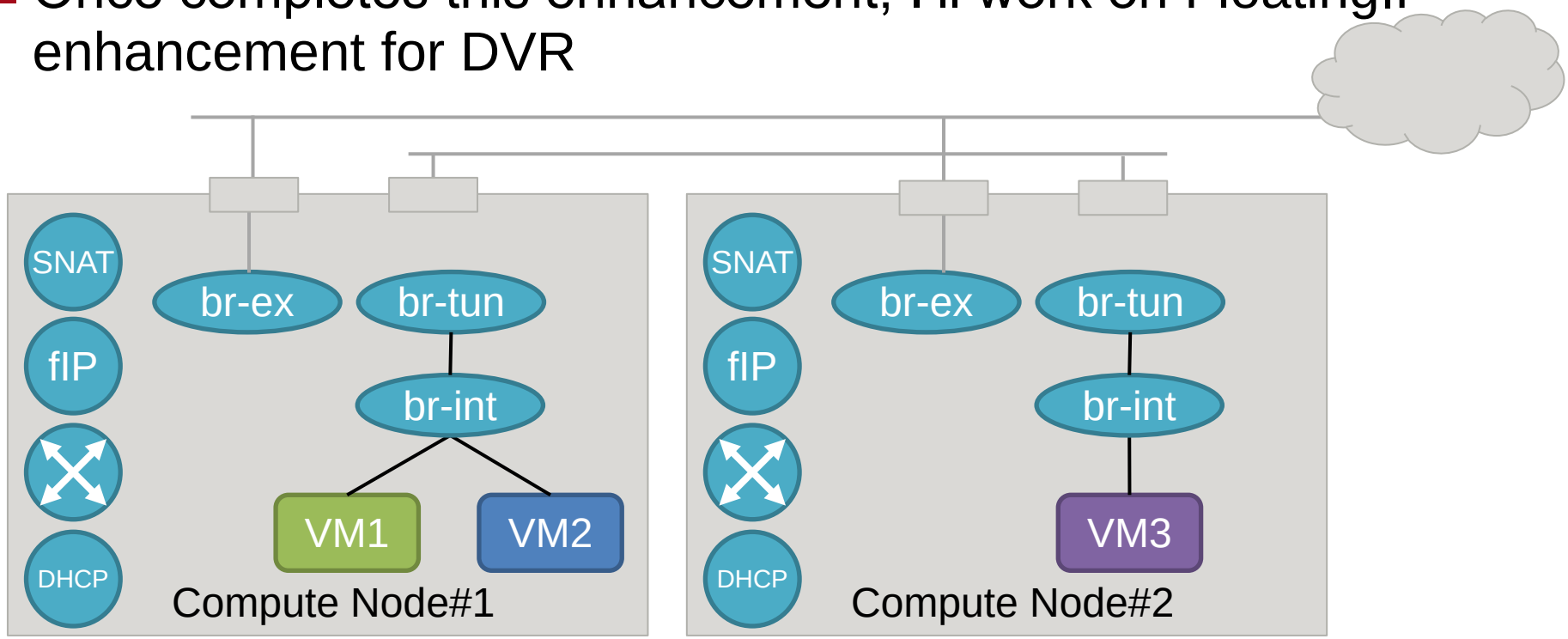
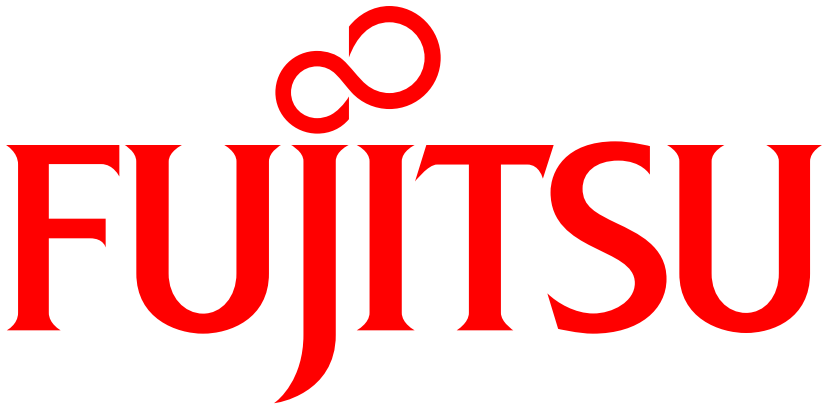


Elimination of Network Node

- Distribute DHCP-agent to each Compute Node.
  => Reduce DHCP broadcast in Data Network
- Move SNAT function to Compute Node.
  => Can eliminate Single-point-of-failure
- Once completes this enhancement, I'll work on FloatingIP enhancement for DVR





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