



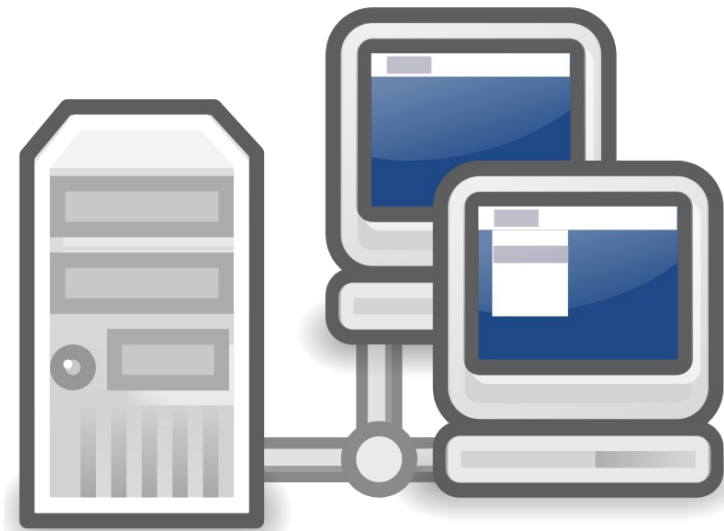
# oVirt – Neutron Integration

July 2013  
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# Agenda

- ◆ oVirt network configuration
- ◆ Neutron overview
  - ◆ Integration benefits
  - ◆ External providers
  - ◆ Neutron as an external provider
- ◆ Under the hook
- ◆ Future work

# oVirt Network Configuration



# Network View



- ▶ Network - a logical entity that represents a layer 2 broadcast domain
- ▶ Defined within the scope of a data center

oVirt Open Virtualization Manager

Logged in user: admin@internal | Configure | Guide | About | Sign Out

Search: Network: datacenter = Default

**Networks**

New Import Edit Remove

| Name      | Data Center | Description        | Role | VLAN tag | Provider             |
|-----------|-------------|--------------------|------|----------|----------------------|
| ext_blue  | Default     |                    | ✔    | 101      | <a href="#">Lior</a> |
| ext_red   | Default     |                    | ✔    | -        | <a href="#">Lior</a> |
| ovirtmgmt | Default     | Management Network | ✔    | -        |                      |

System

Expand All Collapse All

- System
  - Data Centers
    - Default
      - Storage
      - Networks
      - Templates
      - Clusters
    - External Providers
      - Lior

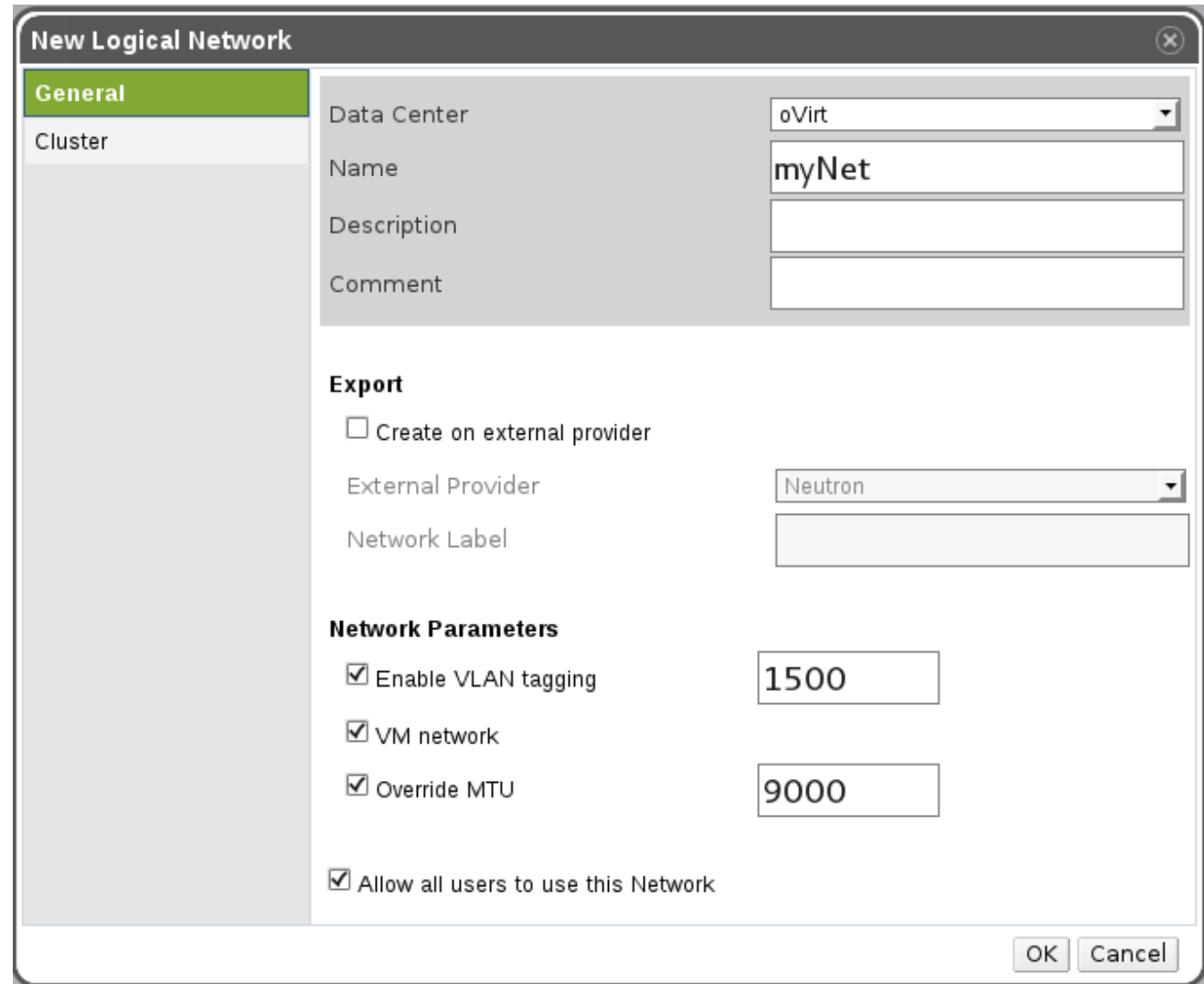
Bookmarks

Tags

Last Message: 2013-Jul-14, 07:33 Network ext\_blue was updated on Data Center: Default Alerts (0) Events Tasks (0)

# Adding a New Network

- ▶ Give it a name
- ▶ Define the network properties (VLAN, MTU, VM/Non-VM)



**New Logical Network**

**General**

Cluster

Data Center: oVirt

Name: myNet

Description:

Comment:

**Export**

Create on external provider

External Provider: Neutron

Network Label:

**Network Parameters**

Enable VLAN tagging: 1500

VM network

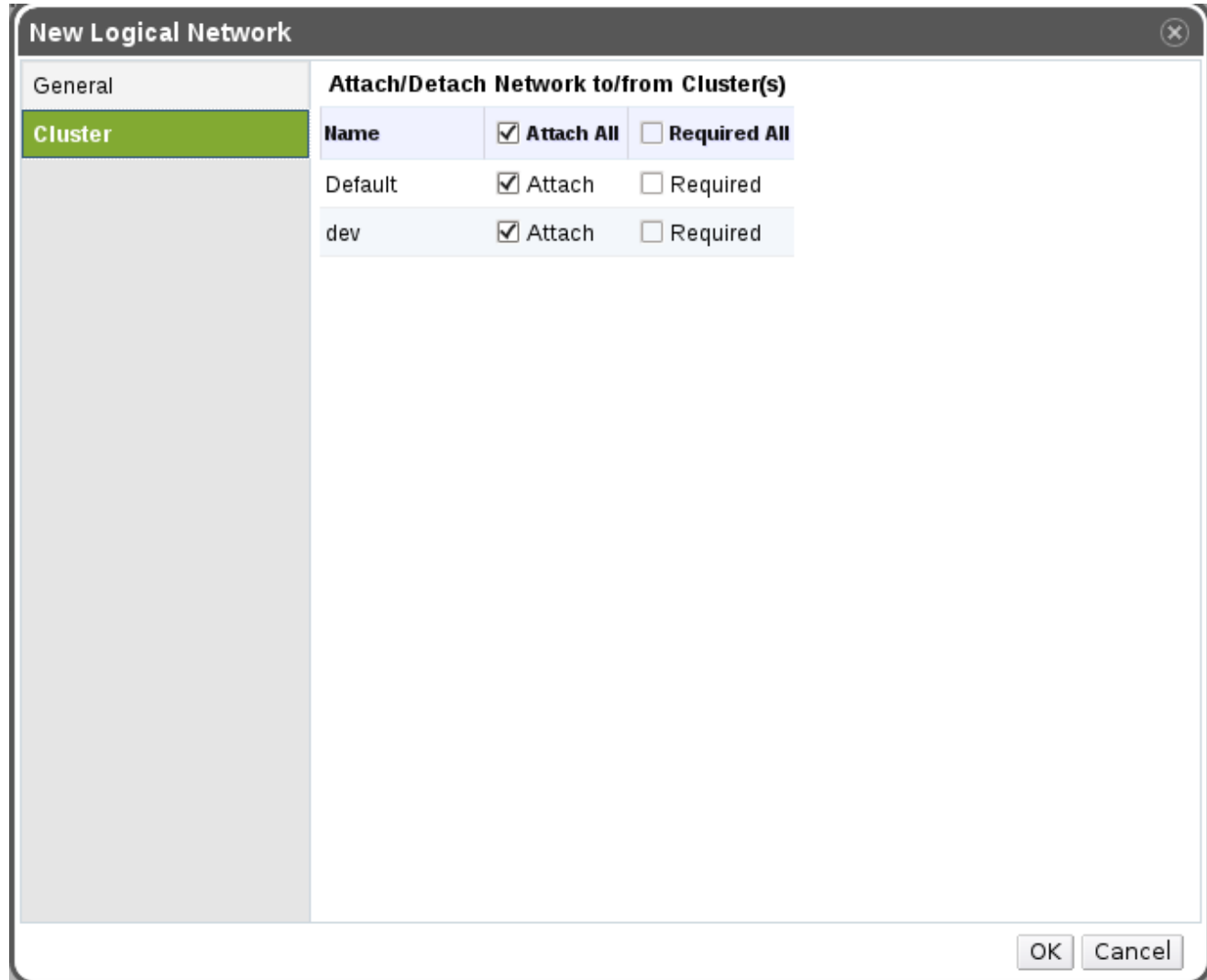
Override MTU: 9000

Allow all users to use this Network

OK Cancel

# Adding a New Network

- ▶ Make the network available in the selected clusters.



| Attach/Detach Network to/from Cluster(s) |  |                                       |
|--|--|---------------------------------------|
| Name                                     | <input checked="" type="checkbox"/> Attach All | <input type="checkbox"/> Required All |
| Default                                  | <input checked="" type="checkbox"/> Attach     | <input type="checkbox"/> Required     |
| dev                                      | <input checked="" type="checkbox"/> Attach     | <input type="checkbox"/> Required     |

OK Cancel

# Host Level Configuration

- ▶ Optional vs. required networks
- ▶ Host level configuration:

**Setup Host Networks**

Drag to make changes

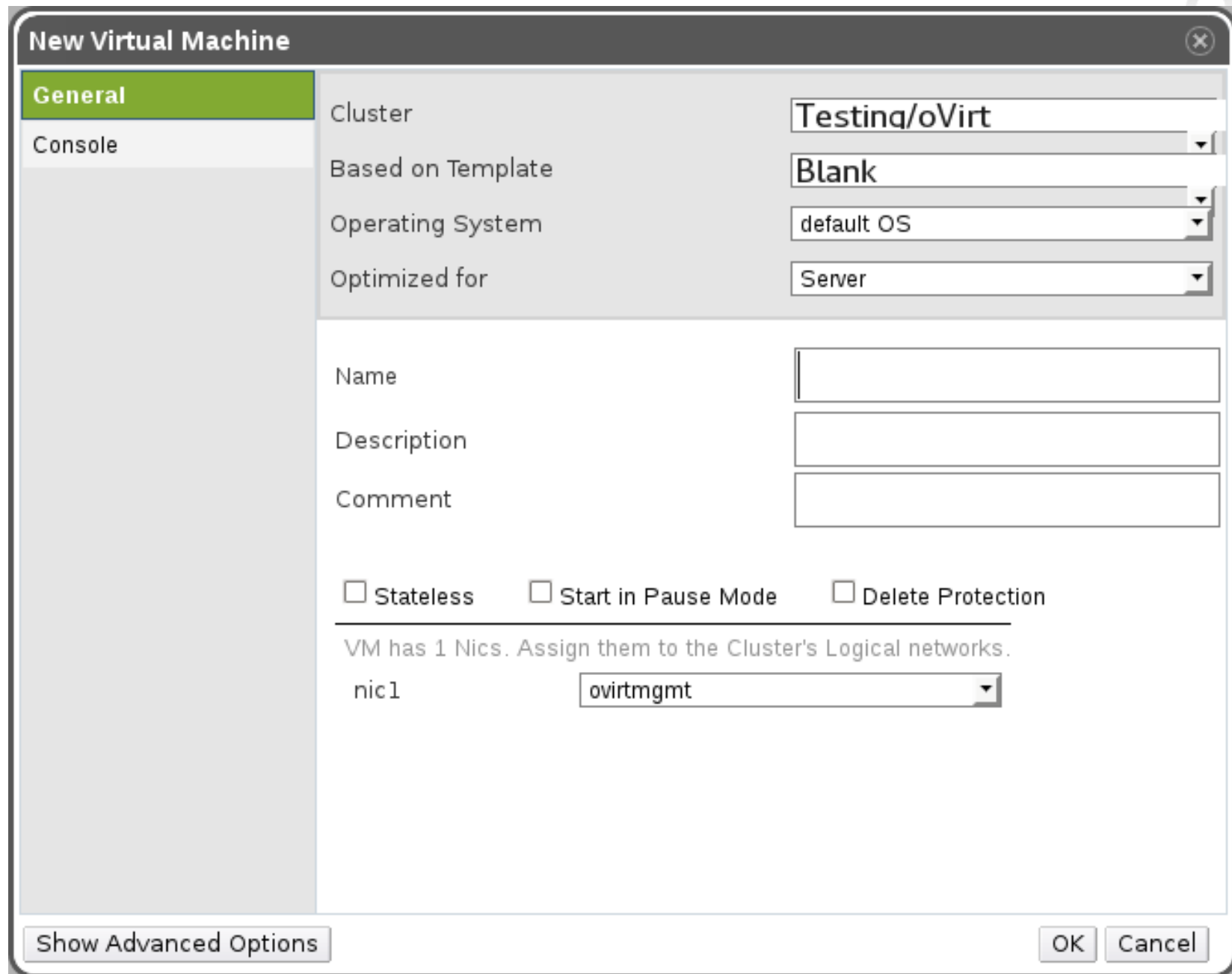
| Interfaces   | Assigned Logical Networks   | Unassigned Logical Networks   |
|--------------|---|---|
| <b>bond0</b> | <ul style="list-style-type: none"><li>NOVM_VLAN_MTU_5 (VLAN 500)</li><li>VLAN_MTU_5000 (VLAN 222)</li><li>VLAN_MTU_5000_2 (VLAN 52)</li></ul> | <b>Required</b> <ul style="list-style-type: none"><li>NON_VM_MTU_5000</li></ul> <b>Non Required</b> <ul style="list-style-type: none"><li>NON_VM_MTU_9000</li><li>NOVM_VLAN_MTU_9 (VLAN 900)</li><li>VLAN_MTU_9000 (VLAN 9)</li><li>VLAN_MTU_9000_2 (VLAN 92)</li></ul> |
| <b>bond1</b> | no network assigned   |   |
| <b>eth0</b>  | ovirtmgmt   |   |

Verify connectivity between Host and Engine

Save network configuration

OK Cancel

# Adding Network to a vNIC



**New Virtual Machine**

**General**

Cluster: Testing/oVirt

Based on Template: Blank

Operating System: default OS

Optimized for: Server

Name:

Description:

Comment:

Stateless     Start in Pause Mode     Delete Protection

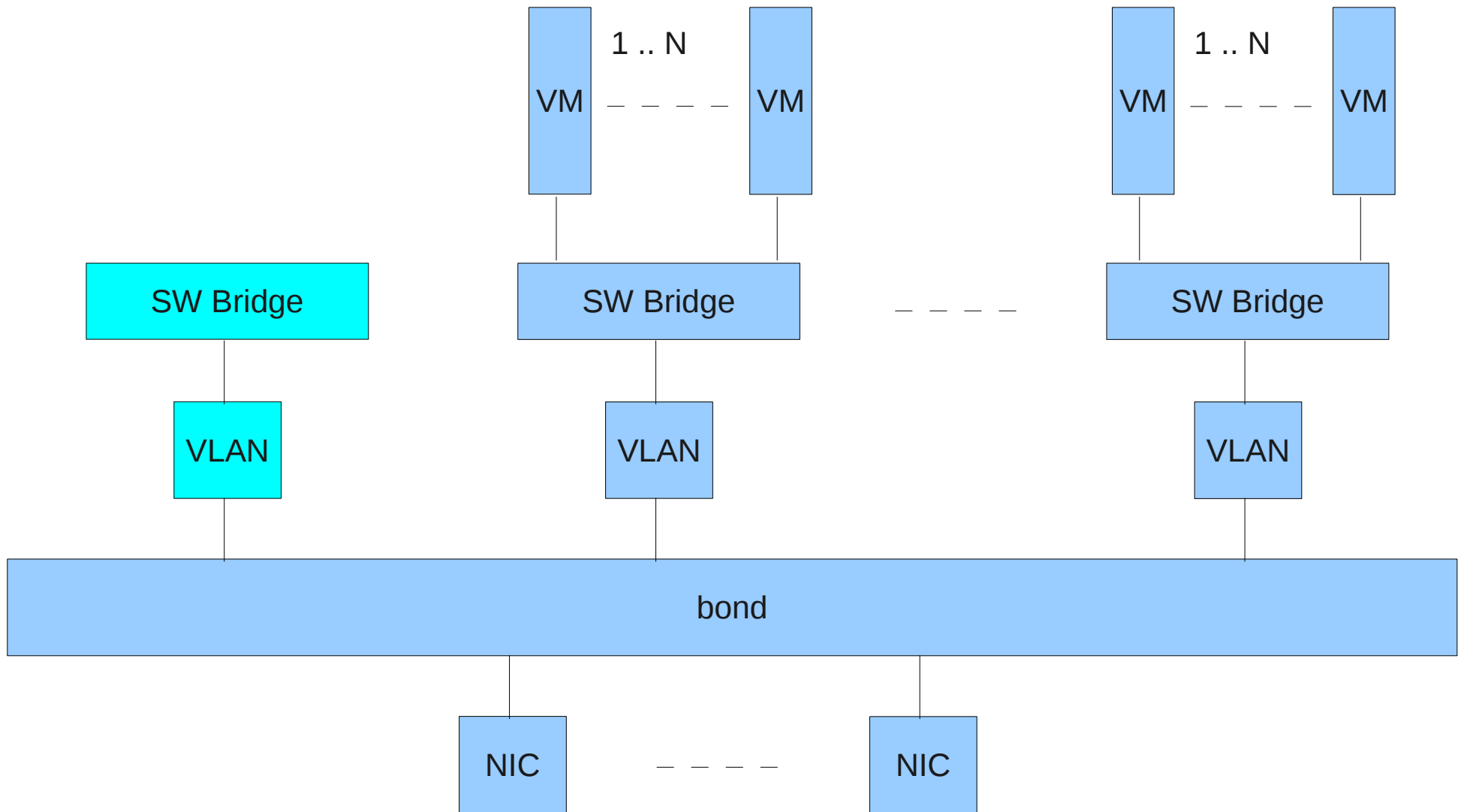
VM has 1 Nics. Assign them to the Cluster's Logical networks.

|      |           |
|------|-----------|
| nic1 | ovirtmgmt |
|------|-----------|

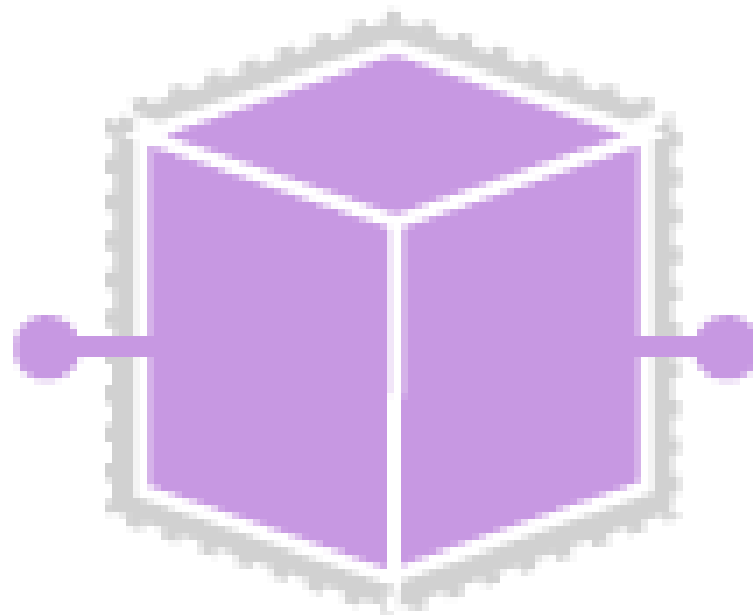
Show Advanced Options    OK    Cancel



# Supported Configuration - Linux Bridge



# Neutron Overview

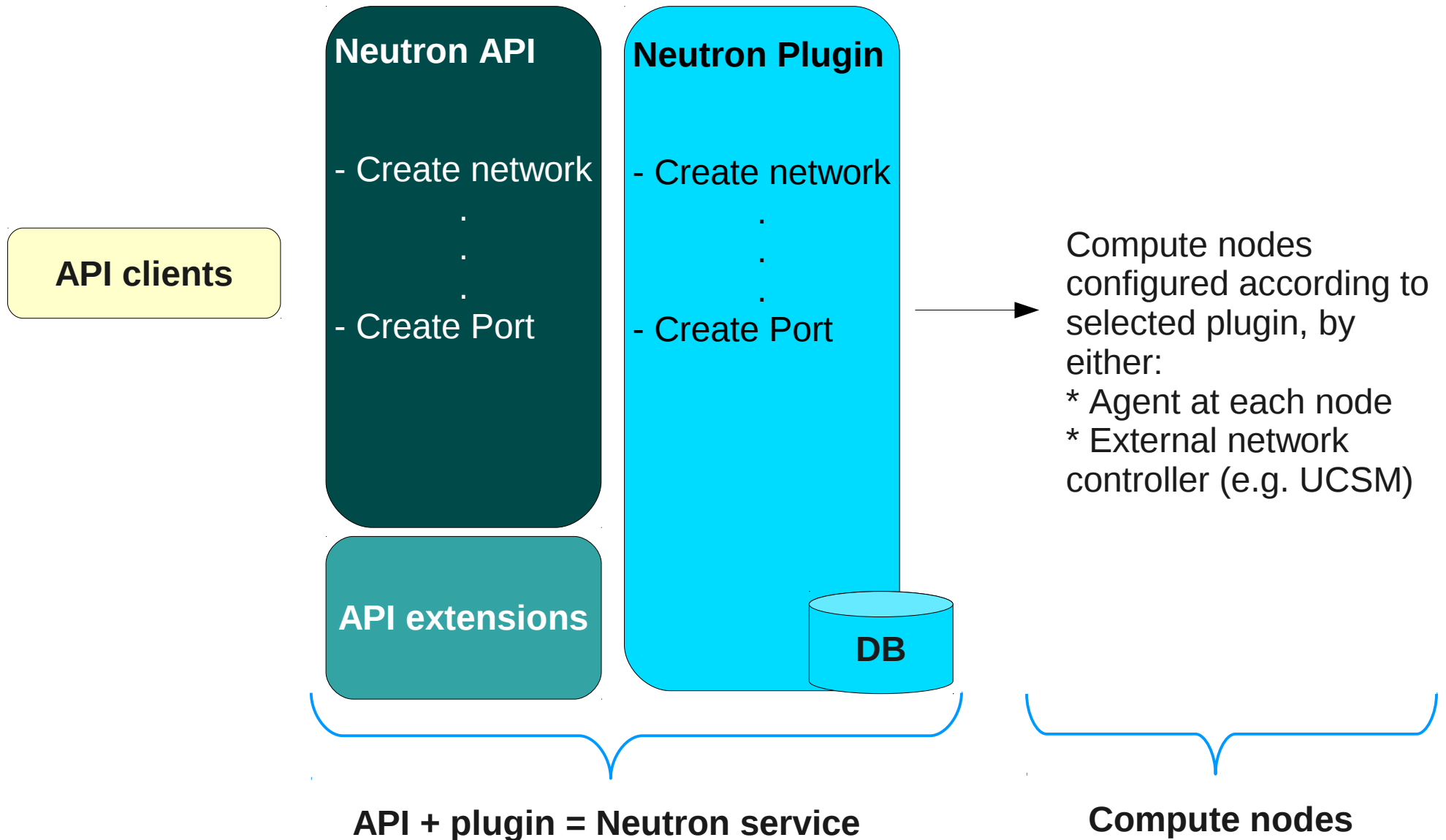


# OpenStack Networking - Neutron



- ▶ Neutron provides network connectivity-as-a-service
- ▶ It offers a plug-in architecture designed to support various network technologies through vendor specific plug-ins and API extensions
- ▶ Exposes REST API for accessing the service
- ▶ Available plugins: Linux Bridge, OVS, Cisco Nexus, NVP, Ryu, NEC, etc...

# Neutron high level architecture



# Integration Benefits

- ◆ Add support in oVirt for the various network technologies provided via Neutron plugins
- ◆ Leverage L3 services modeled in Neutron
- ◆ Enjoy both worlds:
  - ◆ Neutron for managing VM networks
  - ◆ oVirt for managing infrastructure networks (Migration network, storage network etc.)
- ◆ Neutron networks are exposed side by side with oVirt networks which allows the user to use oVirt mature implementation for network configuration

# Integration bits



# External Providers



- ▶ An external product that can be used to provide resources for oVirt
- ▶ Resources that can be provided: hosts, networks, etc..
- ▶ Configure once, use everywhere

The screenshot shows the oVirt Open Virtualization Manager interface. The top navigation bar includes the oVirt logo, the text "Open Virtualization Manager", and the user information "Logged in user: admin@internal | Configure | Guide | About | Sign Out". Below the navigation bar is a search bar with the text "Search: Provider:". The main content area is titled "Providers" and contains a table with the following data:

| Name | Type              | Description | Provider URL            |
|------|-------------------|-------------|-------------------------|
| Boss | Foreman           | Like a boss | http://the.boss         |
| Lior | Openstack Network |             | http://10.35.0.192:9696 |

The interface also includes a left sidebar with a "System" menu, a "Data Centers" section, and an "External Providers" section containing "Boss" and "Lior". At the bottom, there is a status bar with a message: "Last Message: 2013-Jul-14, 08:45 Network ext\_blue was updated on Data Center: Default" and notification icons for "Alerts (0)", "Events", and "Tasks (0)".

# External Network Provider



- ◆ ***External network provider*** - an independent network manager which collaborates with oVirt by implementing a predefined API
- ◆ ***Internal network*** – provisioned in oVirt
- ◆ ***External network*** – provisioned by an external network provider and consumed within oVirt
  - ◆ External networks can be discovered in oVirt and then can be used within oVirt (currently in VMs)
  - ◆ User can configure permissions on external networks once they are imported, like they do for internal networks.



# The Neutron External Provider



- ◆ Created as an external network provider
- ◆ Can be deployed with the user choice of plug-in
- ◆ Can be used in either of the flavors:
  - ◆ Neutron centric – Existing Neutron installation, oVirt is just a “user” of some of the networks.
  - ◆ oVirt centric – Neutron is an implementation detail, the networks are actually managed in oVirt.

# How to Use Neutron in oVirt?

- ▶ It's simple! Just follow these few steps:
  1. Install a Neutron instance
  2. Add the instance as an external provider
  3. Add networks on the provider:
    - 3.1. Import networks
    - 3.2. Add a new network on the provider
  4. Install host with the provider's agent
  5. Use the network in a VM's NIC
  6. Run the VM

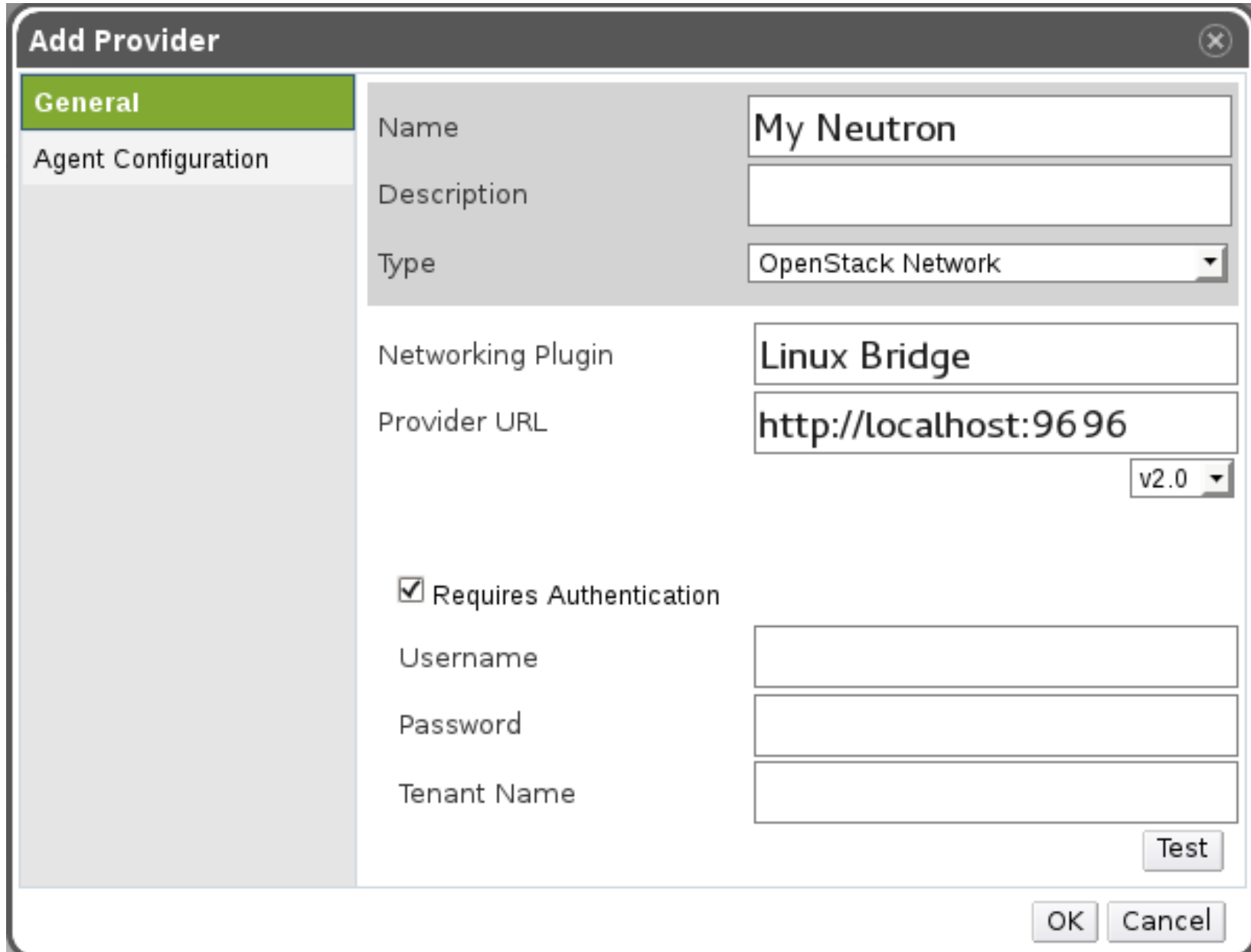
# Step 1: Installing Neutron

- ◆ Install Neutron service and configure your choice of plugin
- ◆ Install Keystone
  - ◆ Configure Keystone for the Neutron service

# Step 1: Installing Neutron

- ◆ Install Neutron service
- ◆ Install Keystone (configure for the Neutron instance)
- ◆ Configure Neutron:
  - ◆ Configure authentication for keystone
  - ◆ Configure qpid messaging bus
- ◆ Install one of the supported plug-ins:
  - ◆ Linux Bridge
  - ◆ Open vSwitch
- ◆ Configure the plugin

# Step 2: Adding a Neutron Provider



**Add Provider**

**General**

Agent Configuration

Name: My Neutron

Description:

Type: OpenStack Network

Networking Plugin: Linux Bridge

Provider URL: http://localhost:9696

v2.0

Requires Authentication

Username:

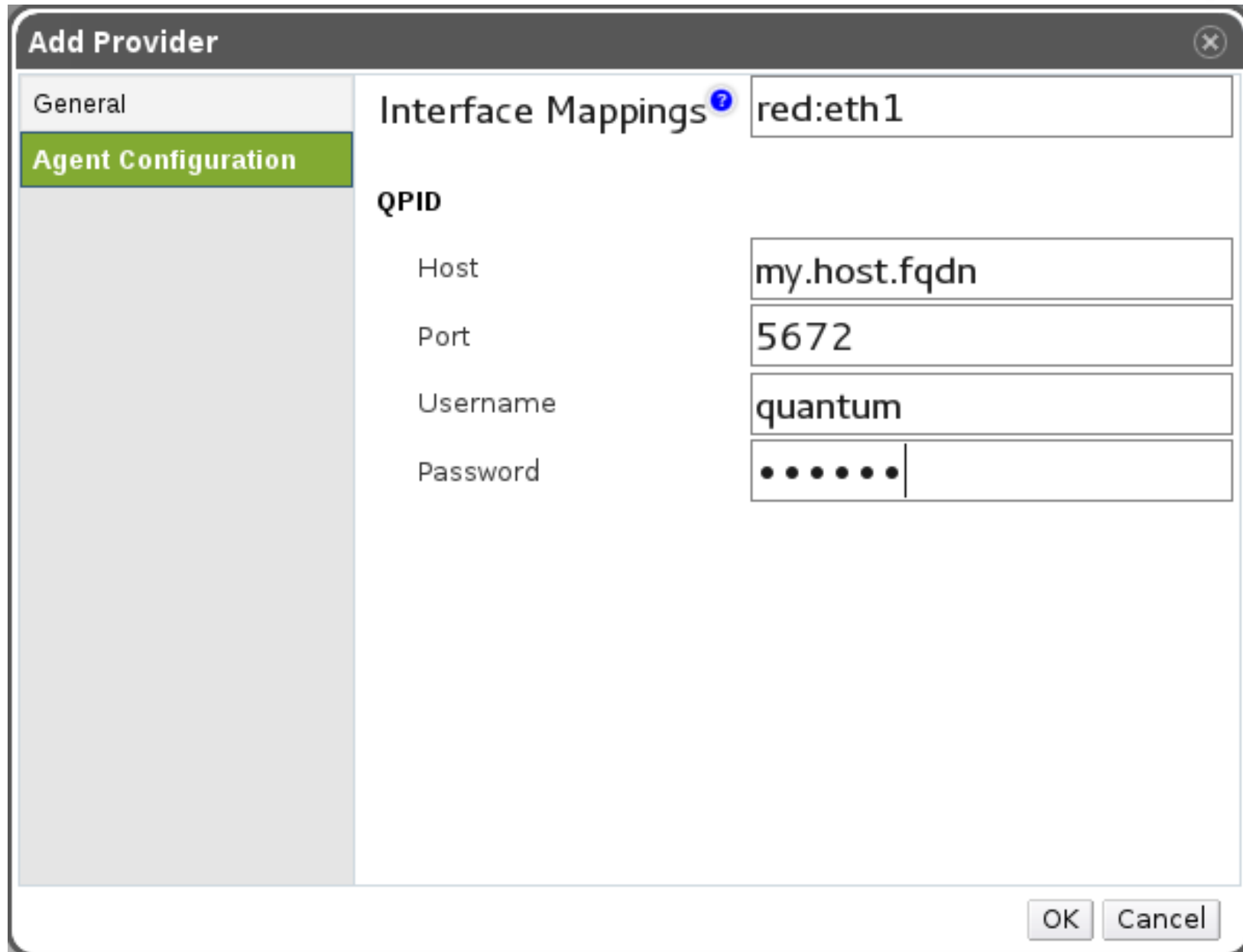
Password:

Tenant Name:

Test

OK Cancel

# Step 2: Adding a Neutron Provider



**Add Provider** [X]

General

**Agent Configuration**

Interface Mappings <sup>?</sup> red:eth1

**QPID**

Host my.host.fqdn

Port 5672

Username quantum

Password ●●●●●●

OK Cancel

# Step 3.1: Importing Networks

### Import Networks

Network Provider: Neutron

**Provider Networks**

| <input type="checkbox"/> | Name         | Provider Network ID                  |
|--------------------------|--------------|--------------------------------------|
| <input type="checkbox"/> | external_red | 91680074-3299-401b-bde4-228bbe09e67c |
| <input type="checkbox"/> | nicless      | cd3e23fa-ca33-4d74-ae1a-b1c58987614d |
| <input type="checkbox"/> | test         | 54b37199-203b-48fd-897a-edc74a56188e |
| <input type="checkbox"/> | test2        | da4e6bf0-848f-4551-8234-87d97e0aabe5 |
| <input type="checkbox"/> | test3        | af5efdca-a9d9-4cec-8562-a75447108618 |

▼ ▲

**Networks to Import**

| <input type="checkbox"/> | Name   | Provider Network ID                  | Data Center            | <input checked="" type="checkbox"/> Allow All ⓘ |
|--------------------------|--------|--------------------------------------|------------------------|---|
| <input type="checkbox"/> | newnet | 7a75f104-7c08-4e3b-bb82-5d68e5c9def8 | <span>oVirt</span> ⌵   | <input checked="" type="checkbox"/>             |
| <input type="checkbox"/> | foo    | a072f05d-0ab6-4205-a406-c4aed41238bc | <span>Default</span> ⌵ | <input checked="" type="checkbox"/>             |

Import Cancel

# Step 3.2: Adding a New Network

**New Logical Network** [Close]

**General**

Cluster

Data Center: Default

Name: exported\_red

Description:

Comment:

**Export**

Create on external provider

External Provider: Neutron

Network Label: red

**Network Parameters**

Enable VLAN tagging: 150

VM network

Override MTU:

Allow all users to use this Network

OK Cancel



# Step 4: Installing Host With Agent

**New Host** [X]

General  
Power Management  
SPM  
Console  
**Network Provider**

External Provider: Neutron  
Type: OpenStack Network  
Networking Plugin: Open vSwitch

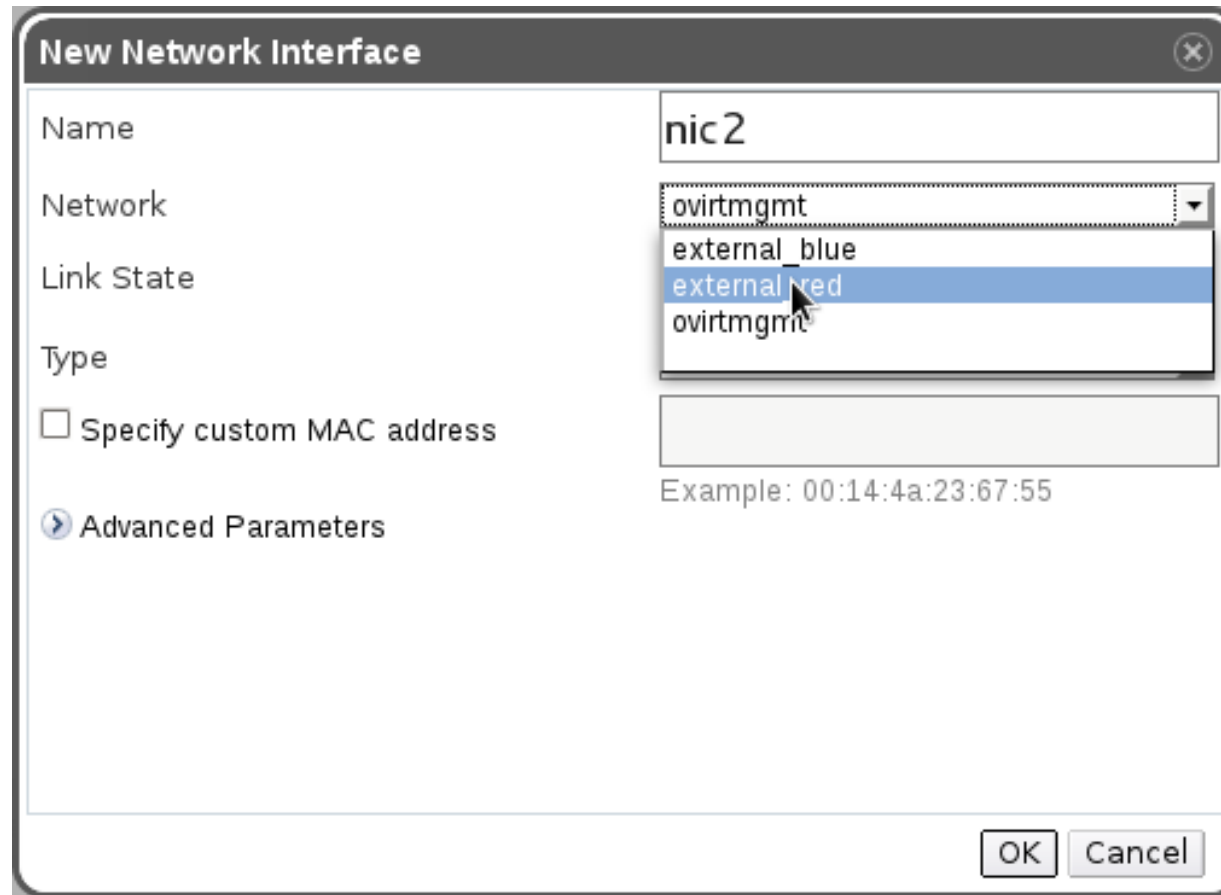
Bridge Mappings: red:eth1

**QPID**

Host: quantum.example.com  
Port: 5672  
Username: quantum  
Password: .....

OK Cancel

# Step 5: Adding Network to a vNIC



# Step 6: Running the VM



oVirt Open Virtualization Manager

Logged in user: admin@internal | Configure | Guide | About | Sign Out

Search: Vms: cluster = cl3\_3-dc3\_0

### Virtual Machines

New VM Edit Remove Run Once Migrate Cancel Migration Make Template Export Create Snapshot Change CD

| Name | Host | Run | IP Address | Cluster     | Data Center | Memory | CP |
|------|------|-----|------------|-------------|-------------|--------|----|
| vm1  |      |     |            | cl3_3-dc3_0 | dc3_0       | 0%     |    |

### Network Interfaces

New Edit Remove

| Name | Plugged                             | Network Name | Li |
|------|-------------------------------------|--------------|----|
| nic1 | <input checked="" type="checkbox"/> | ovirtmgmt    |    |
| nic2 | <input checked="" type="checkbox"/> | external_red |    |

### Statistics Guest Agent Data

| Rx (Mbps) | Tx (Mbps) | Dro |
|-----------|-----------|-----|
| < 1       | < 1       | 0   |

Last Message: 2013-Jul-14, 20:06 VM vm1 was powered off ungracefully by admin@internal (Host: saturn-vd: Alerts (6) Events Tasks (0)

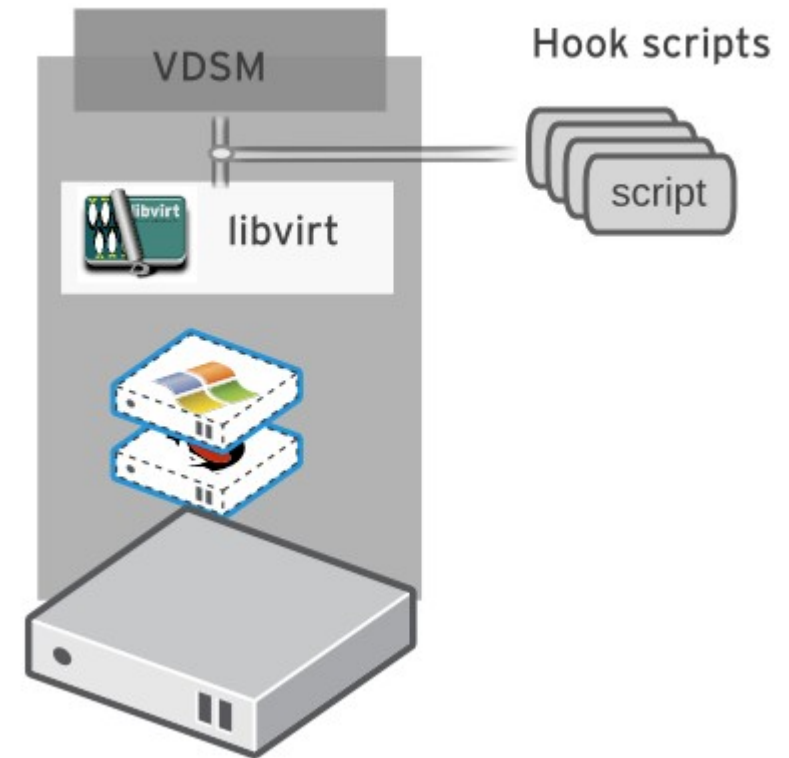
# Under the Hooks:

A deep dive to the hook internals



# Hooks Overview

- ◆ VDSM is the oVirt “Compute agent”
  - ◆ Responsible for VM life cycle
  - ◆ Connects networking & storage resources
- ◆ Hooking mechanism in VDSM allows the administrator to define scripts that extend VM operation



# Under the Hook: Hooks Overview



- ◆ VDSM is the oVirt “Compute agent”
  - ◆ Responsible for VM life cycle
  - ◆ Connects networking & storage resources
- ◆ Hooking mechanism in VDSM allows flexible extension
- ◆ Hook needs to be installed separately
- ◆ Hook failure can cause the VM to fail to start
- ◆ Post-hooks XML is copied on VM migration

# Neutron Usage

- ▶ We're utilizing hooks to connect the Neutron vNIC correctly
  - ▶ The hook takes care of the vNIC XML sent to libvirt
  - ▶ Local agent takes care of the connectivity on the host
- ▶ Current hook has support for:
  - ▶ Open vSwitch
  - ▶ Linux Bridge
  - ▶ Anything else can be added by a 3<sup>rd</sup> party vendor

# Under the Hook: Open vSwitch Agent





# Open vSwitch: How Does it Work?



- ◆ Required:
  - ◆ Integration bridge & physical connections are preset on the host
- ◆ Once a vNIC exists on the integration bridge:
  - ◆ The agent sets the flows of information for the vNIC
- ◆ Henceforth, the agent monitors the port status:
  - ◆ If port admin state is changed it will be updated accordingly
  - ◆ If port is deleted, it's flows will be removed

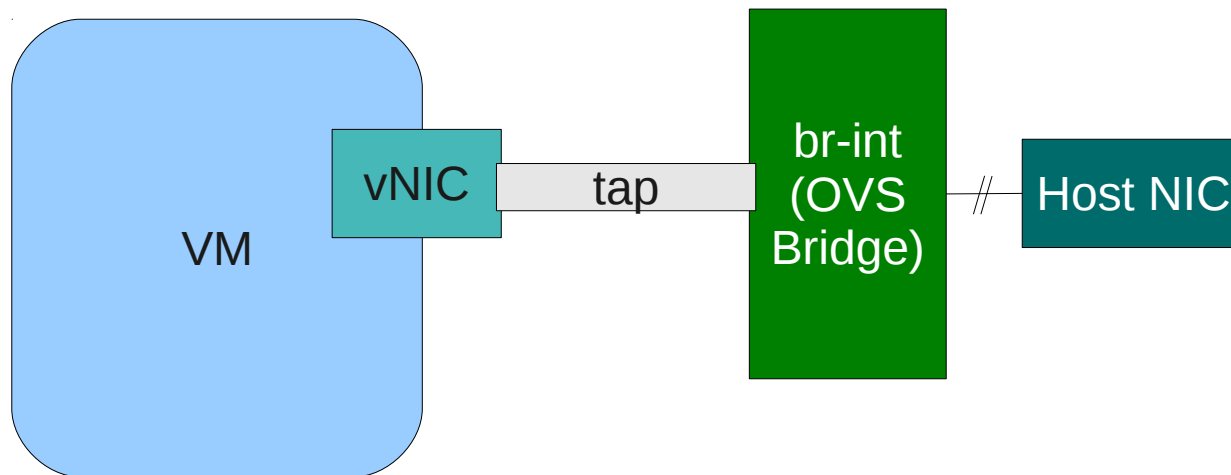
# Open vSwitch in Action

Step 1:

A VM with a vNIC is started by libvirt

The tap device is connected to br-int

The port id is sent in the metadata of OVS

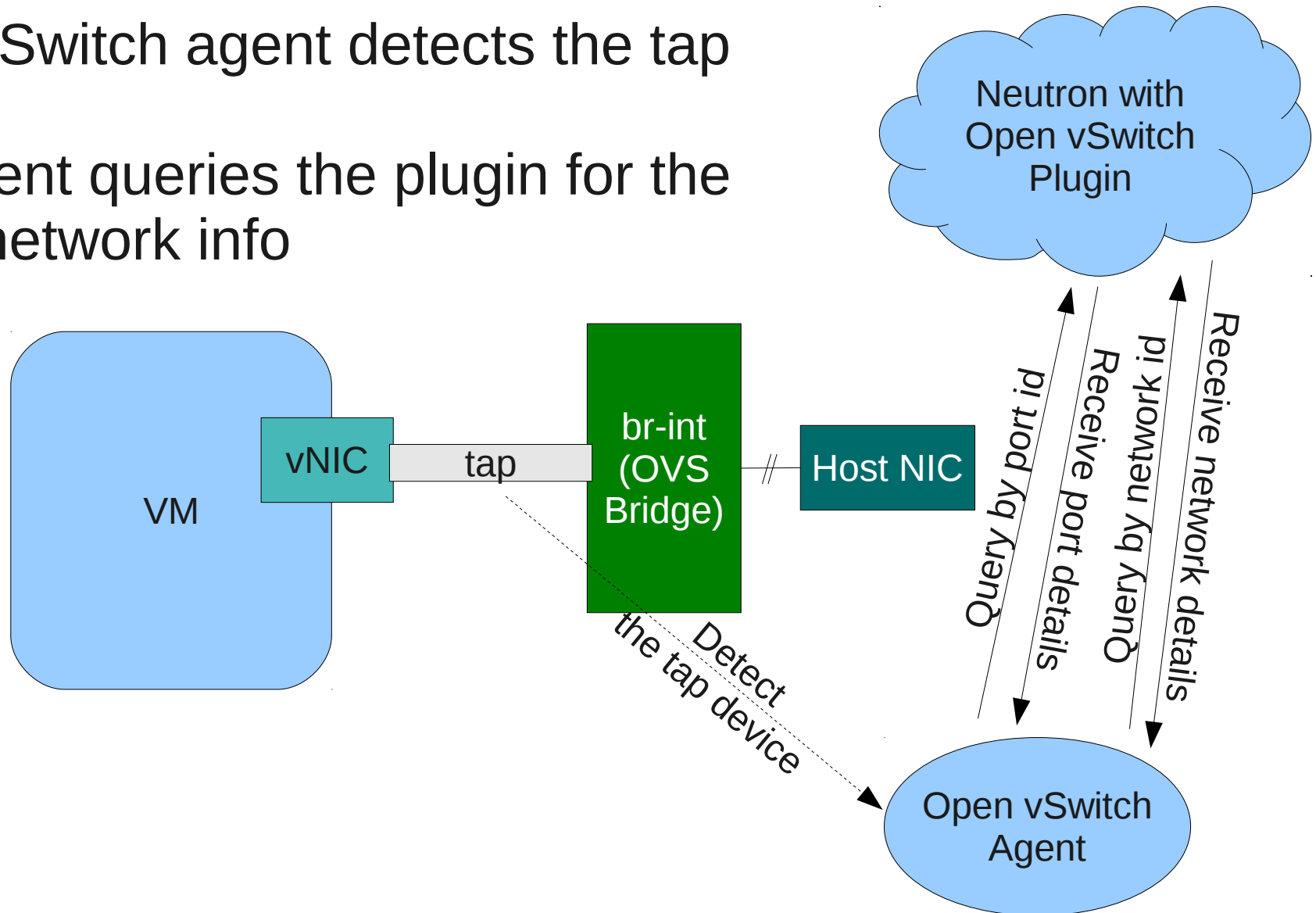


# Open vSwitch in Action

Step 2:

Open vSwitch agent detects the tap

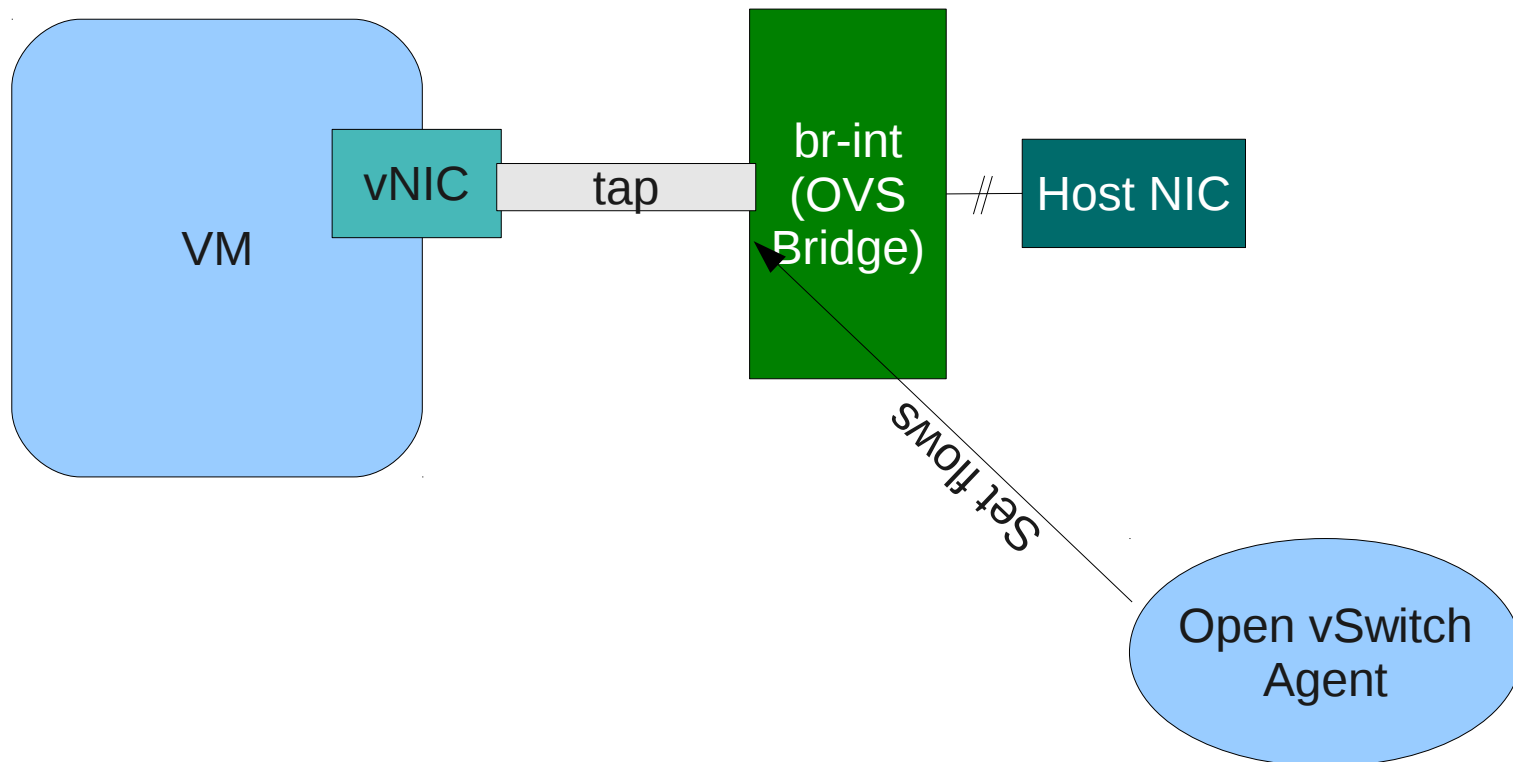
The agent queries the plugin for the port + network info



# Open vSwitch in Action

Step 3:

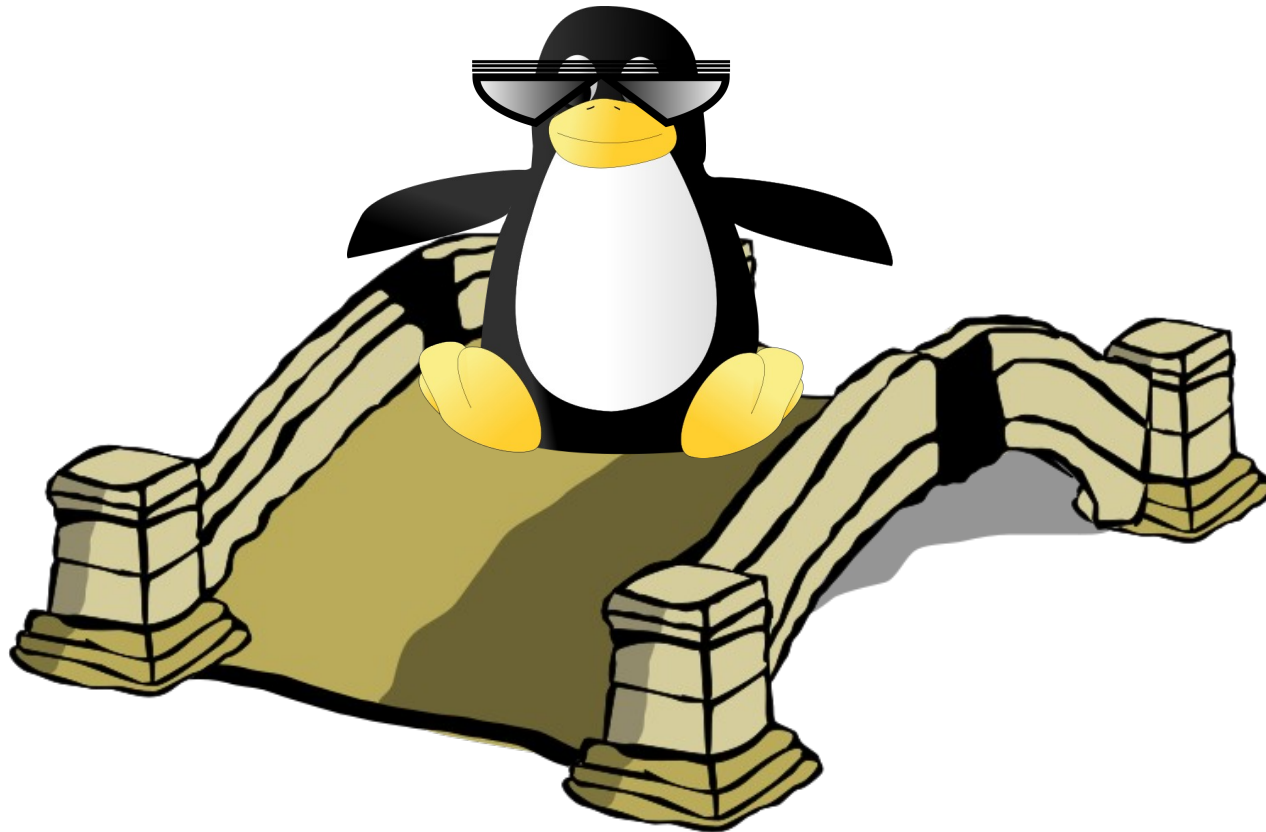
Open vSwitch agent sets the necessary flows for the tap



# Under the Hook: Open vSwitch

- ◆ On engine, a port is created on the Neutron network
- ◆ Pre-start (VM/hot plug):
  - ◆ Bridge is changed to br-int
  - ◆ A new element “<virtualport type='openvswitch'>” is added
  - ◆ Port id is set as a child of the new element
- ◆ Agent takes care of the host connectivity

# Under the Hook: Linux Bridge Agent



# Linux Bridge: How Does it Work?



- ◆ Once a vNIC exists on the host:
  - ◆ The agent ensures the bridge/VLAN exist
  - ◆ The agent connects the tap device to the bridge
- ◆ Henceforth, the agent monitors the port status:
  - ◆ If port admin state is changed it will be connected or disconnected accordingly
  - ◆ If port is deleted, it will be disconnected

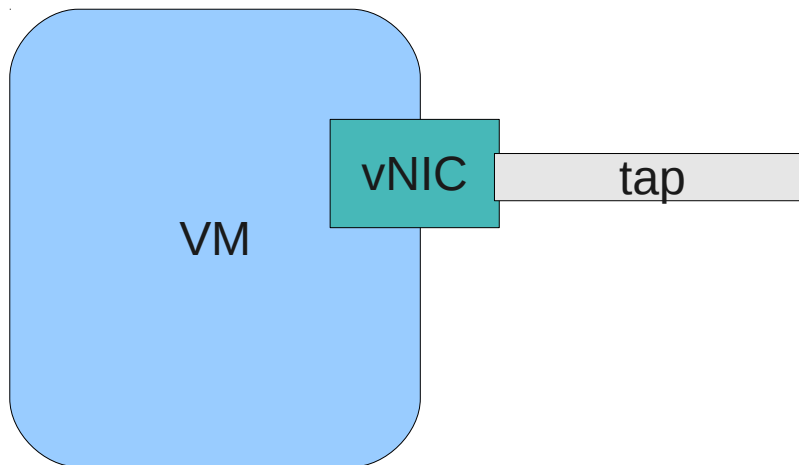
# Linux Bridge in Action

Step 1:

A VM with a vNIC is started by libvirt

The tap device is not connected to a bridge

The name of the device is “tap” + port id[:11]



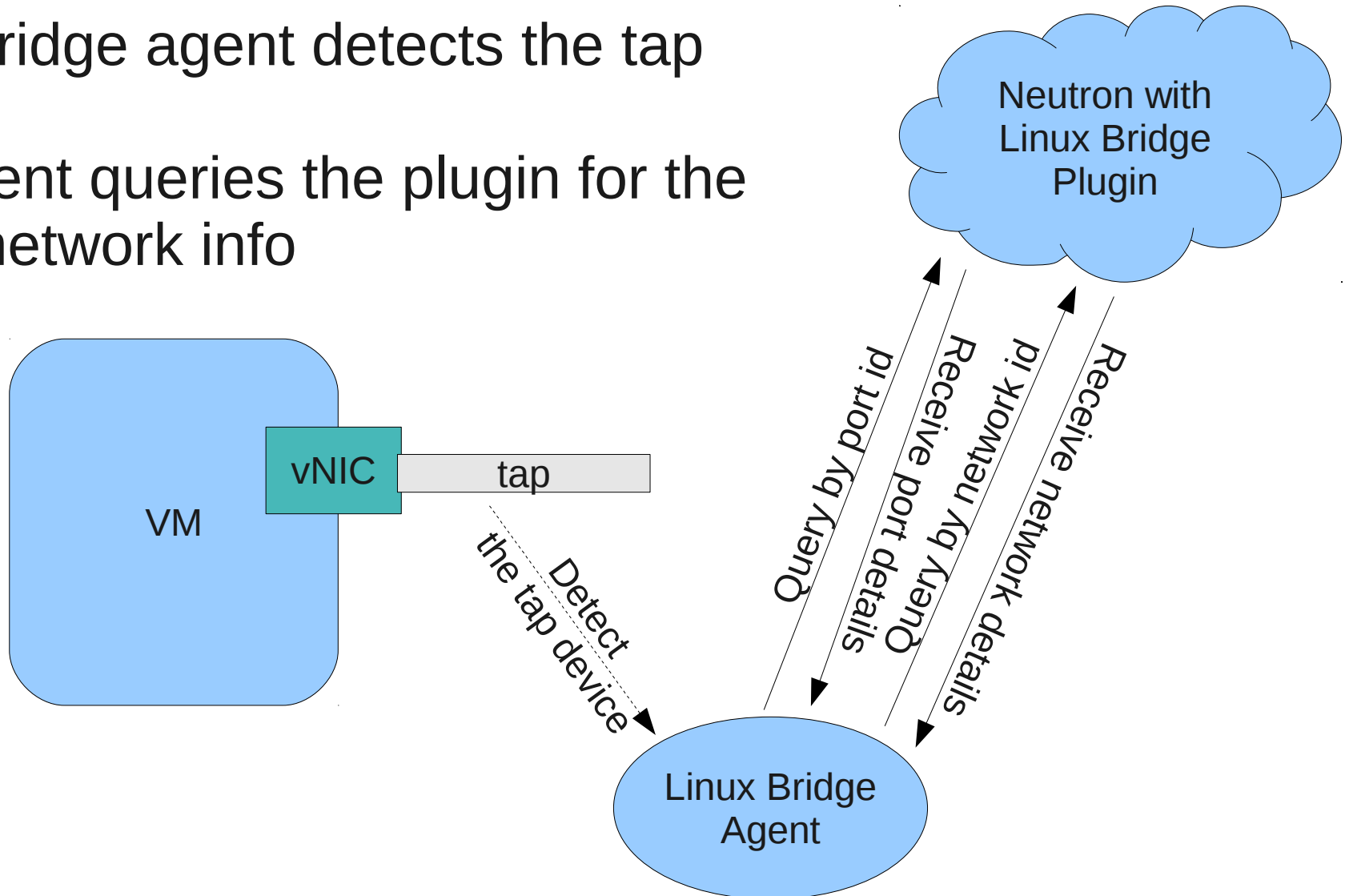


# Linux Bridge in Action

Step 2:

Linux bridge agent detects the tap

The agent queries the plugin for the port + network info

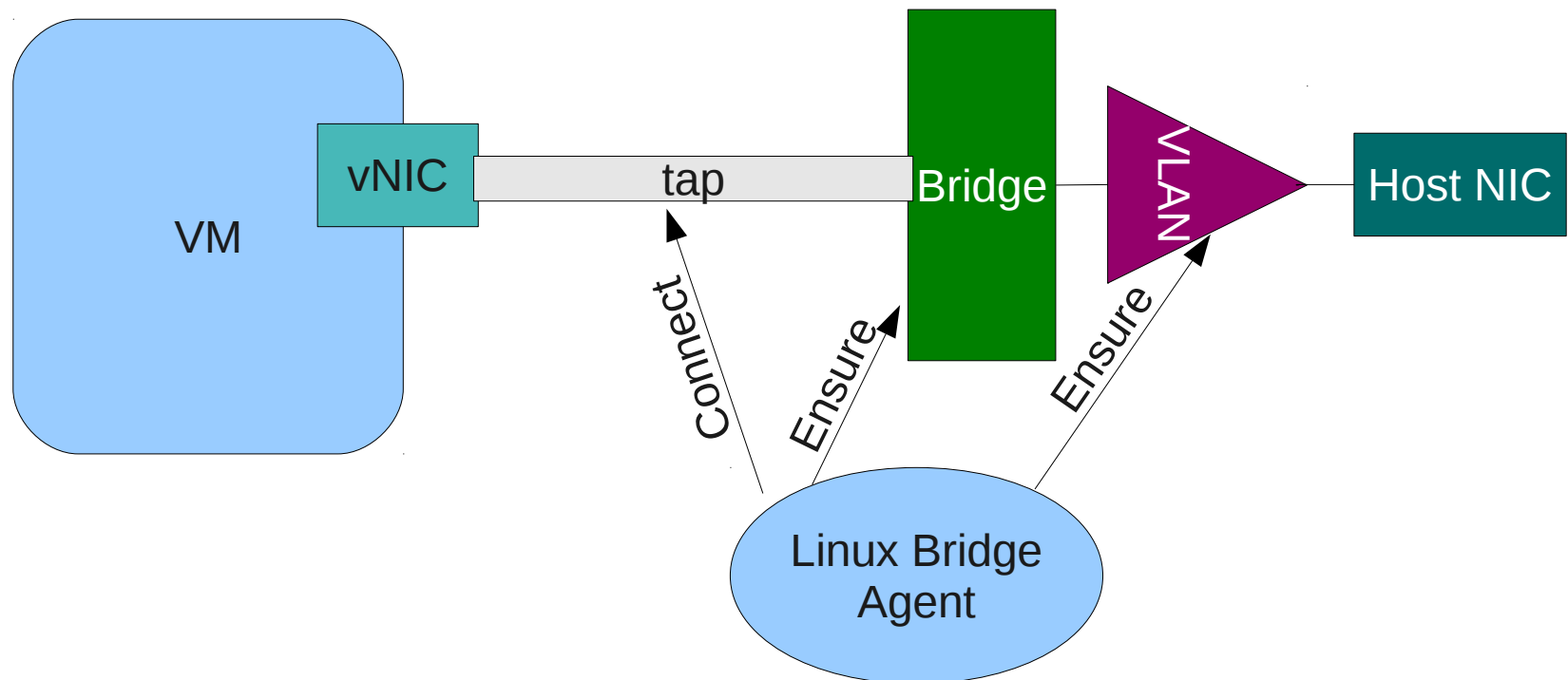


# Linux Bridge in Action

Step 3:

Linux bridge agent ensures VLAN + bridge on the host

Once the bridge exists, connects the tap device to the bridge



# Under the Hook: Linux Bridge



- ◆ On engine, a port is created on the Neutron network
- ◆ Pre-start (VM/hot plug):
  - ◆ Bridge is changed to dummy bridge
  - ◆ Tap name is set to “tap” + port id[:11]
- ◆ Post-start (VM/hot-plug/migrate):
  - ◆ Disconnect the tap from the dummy bridge
- ◆ Agent takes care of the host connectivity

# Future Work



# Future Work

- ◆ Improve VM scheduling, taking into account the networks availability on the host
  - ◆ Which host has access to which network
- ◆ Monitor vNIC connectivity after VM/vNIC started
- ◆ Integrate the tenant concept into oVirt
- ◆ Manipulate external networks from within oVirt
- ◆ Integrate L3 functionality into oVirt
- ◆ Support more Plugin types

# Future Work and Open Questions



- ◆ Auto-discovery mechanism
  - ◆ Open issues - Which Data Center? Which permissions?
- ◆ Import a network multiple times? With different properties, different SLA, etc.
- ◆ Multiple providers associated with a single oVirt network, enables support of multiple technologies for the same network on different physical segments

# In Conclusion

- ◆ oVirt network configuration
- ◆ Neutron overview
  - ◆ Integration benefits
  - ◆ External providers
  - ◆ Neutron as an external provider
- ◆ Under the hook
- ◆ Future Work

# More info

- ◆ Neutron
  - ◆ <https://wiki.openstack.org/Neutron>
- ◆ oVirt
  - ◆ [http://www.ovirt.org/Network\\_Provider](http://www.ovirt.org/Network_Provider)
- ◆ Mailing lists
  - ◆ [users@ovirt.org](mailto:users@ovirt.org)
  - ◆ [arch@ovirt.org](mailto:arch@ovirt.org)
  - ◆ [engine-devel@ovirt.org](mailto:engine-devel@ovirt.org)
  - ◆ [vdsm-devel@lists.fedorahosted.org](mailto:vdsm-devel@lists.fedorahosted.org)
- ◆ IRC Channel
  - ◆ [#ovirt](https://irc.OFTC.net) channel on irc.OFTC.net



oVirt

**Thank You for Listening!**

**Questions ?**