PF6800 Ver. 6.0
Neutron NEC OpenFlow Plugin Configuration Guide for Red Hat Enterprise Linux OpenStack Platform 5.0

First Edition, September 2014

Legal Notices

Symbols

In this manual, the following two types of symbols are used. These symbols and their meanings are important for proper handling of the PFC.

CHECK:	Points that should be checked when operating devices or software.
NOTE:	Helpful, good-to-know information

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Contents

Preface

In this guide the example of how to configure Red Hat Enterprise Linux OpenStack Platform environment is given.

■CHECK:■ In this manual even though it is mentioned just OpenStack, it means Red Hat Enterprise Linux OpenStack Platform.

■CHECK:■ OpenStack and PFC coordinate using OpenStack function of WebAPI which is a component of PFC. Please read “PF6800 Ver. 6.0 WebAPI User’s Guide” before configuring the OpenStack environment.

Chapter 1 Summary of system configuration

Here the explanation about system configuration, software, hardware, and network is given.

1.1 System configuration and explanation of terminology

Example of system configuration of OpenStack environment explained in this chapter is shown in Figure 1.1-1.

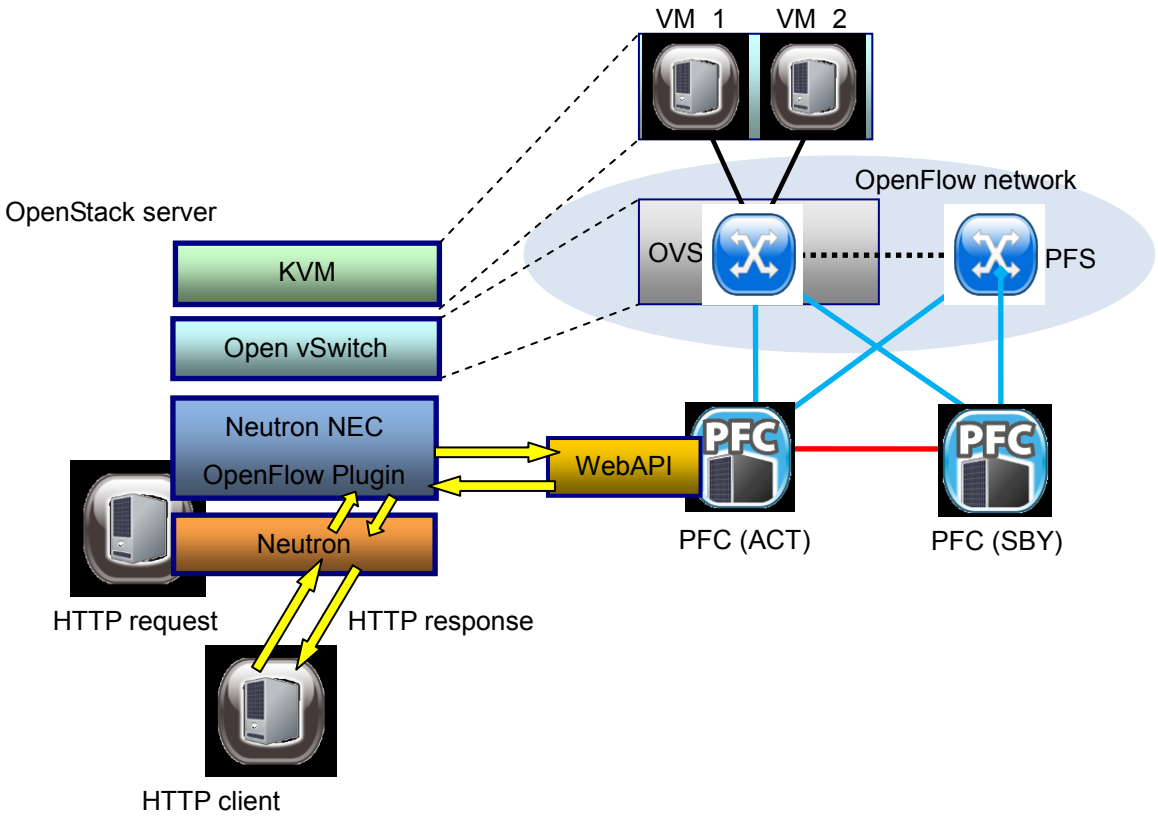


Figure 1.1-1 Example of OpenStack environment system configuration that uses WebAPI

The terminology used in the explanation of OpenStack environment is given in "Table 1.1-1 Terms used in OpenStack Environment".

Table 1.1-1 Terms used in OpenStack Environment

name of function	details
OpenStack (Red Hat Enterprise Linux OpenStack Platform)	It is the core component of commercial product " Red Hat Enterprise Linux OpenStack Platform" based on the open source cloud platform management software " OpenStack"
Neutron	It is a generic name of network connection function provided by OpenStack project.
Neutron NEC OpenFlow Plugin	It is a plug in provided by NEC for Neutron. Coordination between Neutron and PFC (WebAPI) is possible through this plug in. Hereafter described as "NEC Plugin".
Keystone	It is a generic name of authentication function provided by OpenStack project.
Open vSwitch	It is open source virtual software switch. In the OpenStack environment it is installed on OpenStack server.
KVM	It is virtualization function that runs on Linux. This function needs to be run on OpenStack server in order to run VM in the OpenStack environment.

1.2 Details of hardware and software

This section explains the hardware and software that configures OpenStack environment.

1.2.1 Details of hardware

The hardware required to configure OpenStack environment is described below.

Table 1.2-1 Hardware

Name	Model	Remarks
OpenStack server	Use the model equivalent to (or above) Express5800 R120a-2	Installation of OpenStack and Open vSwitch.
PFC	Refer "1.3 Preparation for Installing PFC" of installation guide.	2 Machines are required as server for running PFC and WebAPI (ACT and SBY)

PFS	Use model of PF5xxx (PF5200, PF5800 etc)	None

■CHECK:■ In the explanation of subsequent sections, the expressions used in "Name" column of above table are used.

1.2.2 Details of software

The software required to configure OpenStack environment is given below.

Table 1.2-2 Software

Name	version	Remarks
PFC	V6.0	None.
Red Hat Enterprise Linux Server	7.0 or 6.5	Install as OS of OpenStack server.
Red Hat Enterprise Linux OpenStack Platform	5.0 (Icehouse)	Includes Neutron.
NEC Plugin	2014.1	Install on OpenStack server.
Open vSwitch	2.0.0(Red Hat Enterprise Linux Server 7.0) 2.0.1(Red Hat Enterprise Linux Server 6.5)	Install on OpenStack server.

■CHECK:■ The versions mentioned in the above table may change because of version up of OpenStack and PFC.

1.3 Network planning

This section shows examples of network configuration.

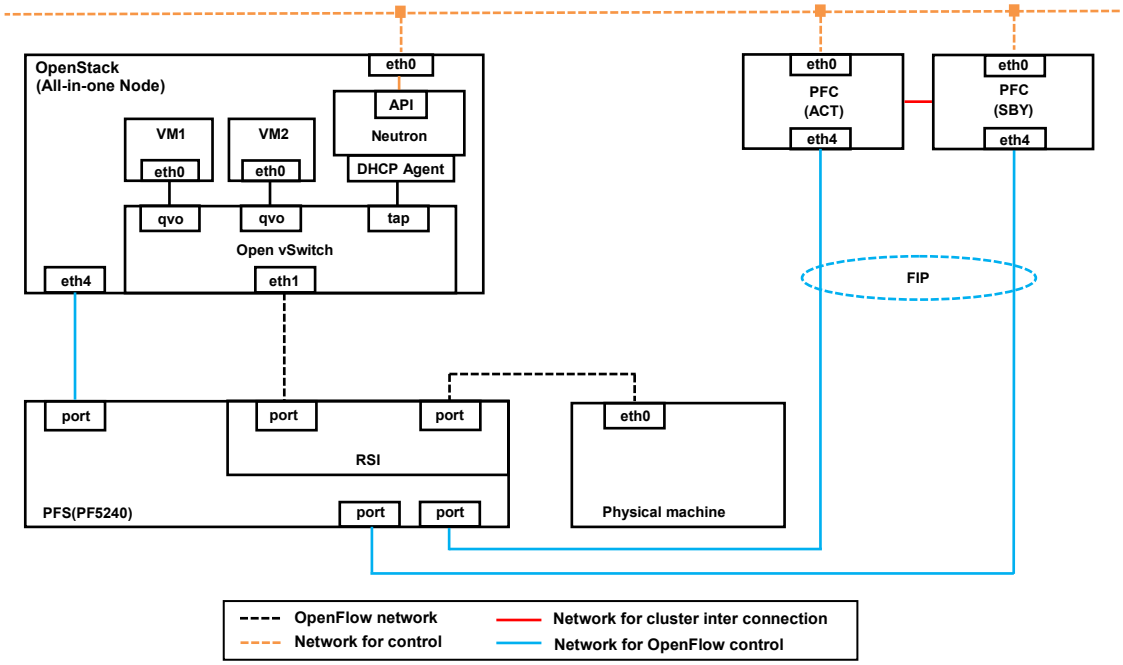


Figure 1.3-1 Single node deployment Diagram

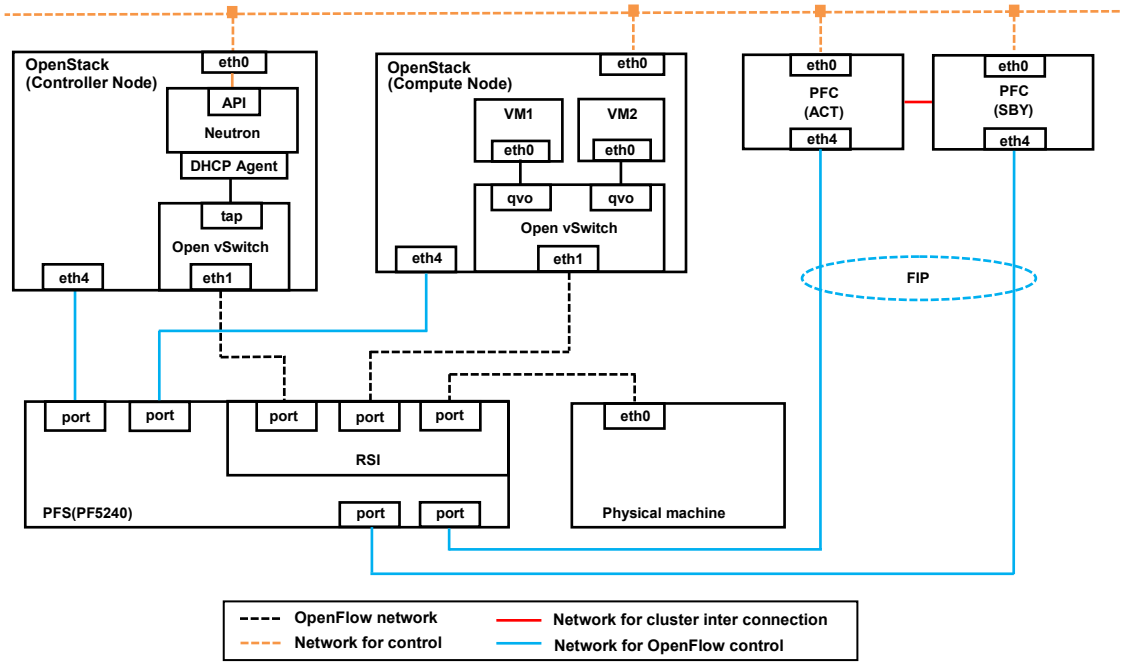


Figure 1.3-2 Multiple node deployment Diagram

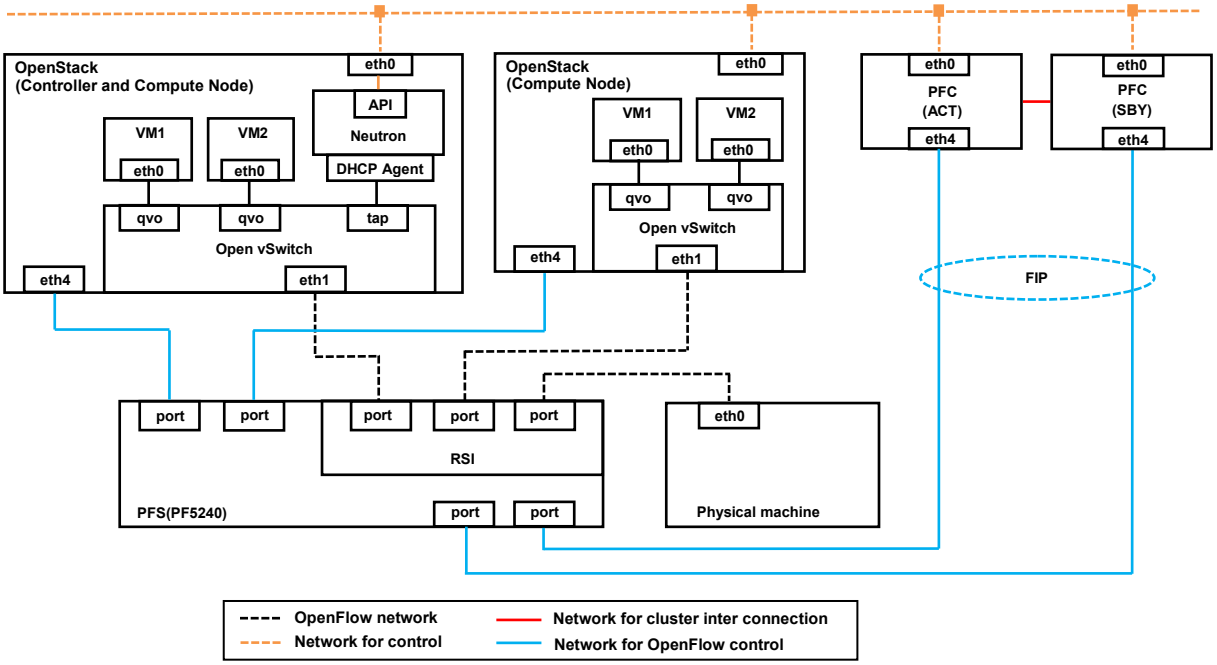


Figure 1.3-3 Another multiple node deployment Diagram

Chapter 2 Advance preparation

2.1 Setting PFC server

2.1.1 Installing PFC

For installation procedure of PFC, refer to "PF6800 Ver. 6.0 Installation Guide".

Table 2.1-1 Setting IP address of PFC

Where to set	Name of the device	IP address
PFC1 (ACT)	eth0	Any IP address of management network
	eth4	Refer to "1.3 Network planning" and specify the value that is adequate to configuration environment.
PFC2 (SBY)	eth0	Any IP address of management network
	eth4	Refer to "1.3 Network planning" and specify the value that is adequate to configuration environment.
Floating IP for SecureChannel	FIP	Refer to "1.3 Network planning" and specify the value that is adequate to configuration environment.

2.1.2 Setting WebAPI

■CHECK:■ The settings explained here need to be performed for ACT , as well as for SBY.

2.1.2.1 Setting auto start of WebAPI

■CHECK:■ For details of settings, refer "2.1.2 Specifying the WebAPI Startup Parameters" of " PF6800 Ver. 6.0 WebAPI User's Guide".

2.1.2.2 Setting port of OpenStack function

1. Editing listenport.properties

   Open the WebAPI configuration file /opt/nec/pfc/Agent/sg/webapi/listenport.properties by using an editor and set the WebAPI (OpenStack function) destination port to the quantum_port parameter.

```
# Define listen port between 0 and 65535.
#   0: Does not start the server.
#   1-65535: Start the server and listen on the defined port.
# If not defined any, listen on the default port.

# Basic Port
# (Default: 8080)
#
#webapi_port=8080

# QuantumAPI Port
# (Default: 8888)
#
quantum_port= 8888
```

■NOTE:■ The OpenStack functions in the WebAPI are disabled when 0 is set to quantum_port.

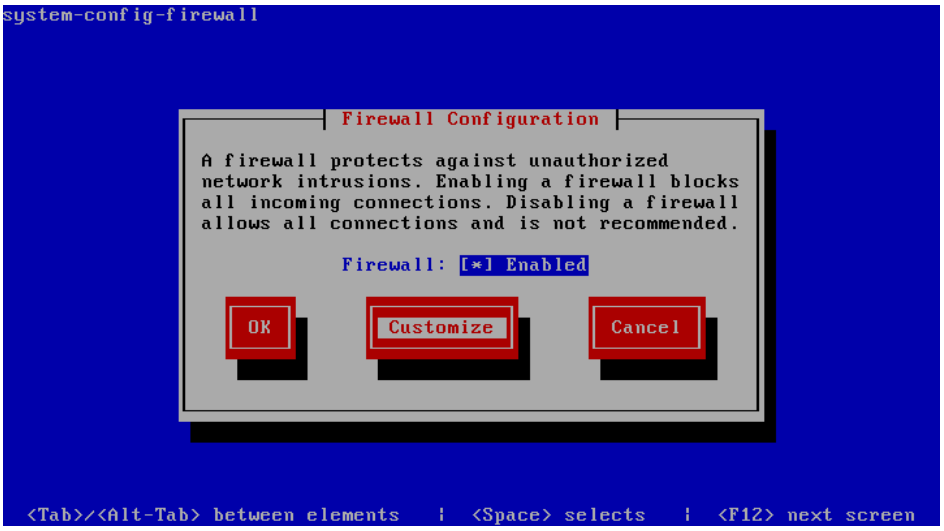
2. Saving listenport.properties

   Save listenport.properties.

3. Execute the command following.

```
# system-config-firewall-tui
```

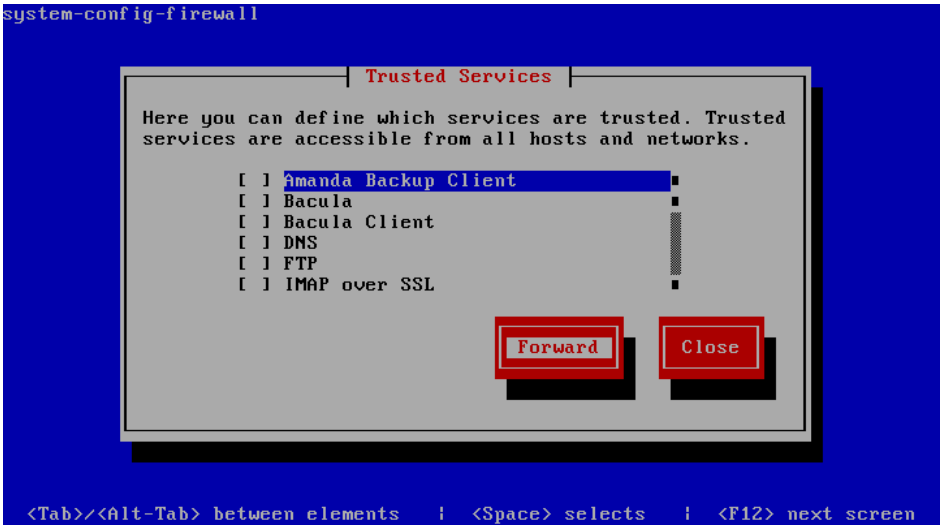
4. The Firewall Configuration screen is displayed.



Set the focus on [Customize], and then press the space key.

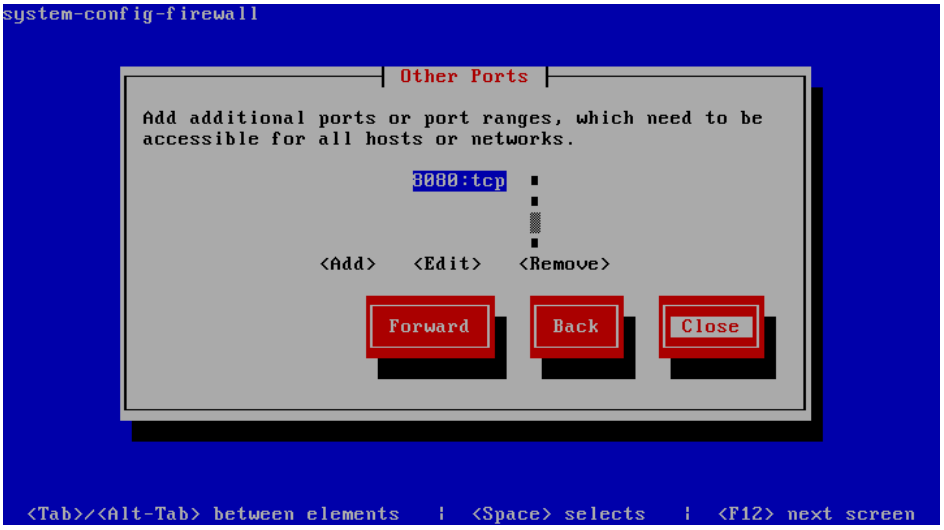
■NOTE:■ You can move the focus by pressing the Tab key.

5. The Trusted Services screen is displayed.



Set the focus on [Forward], and then press the space key.

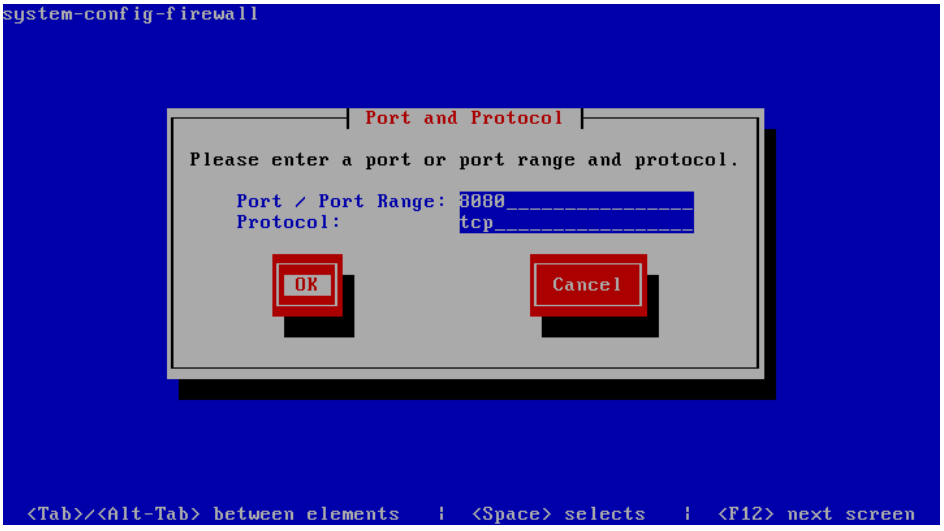
6. The Other Ports screen is displayed.



Check that the specified port number and protocol are displayed.

To use the WebAPI (OpenStack function) as well, set the focus on [<Add>] and then press the space key (Go to step 7). When not using the WebAPI (OpenStack function), set the focus on [Close] and then press the space key (Go to step 9).

7. The Port and Protocol screen is displayed again.

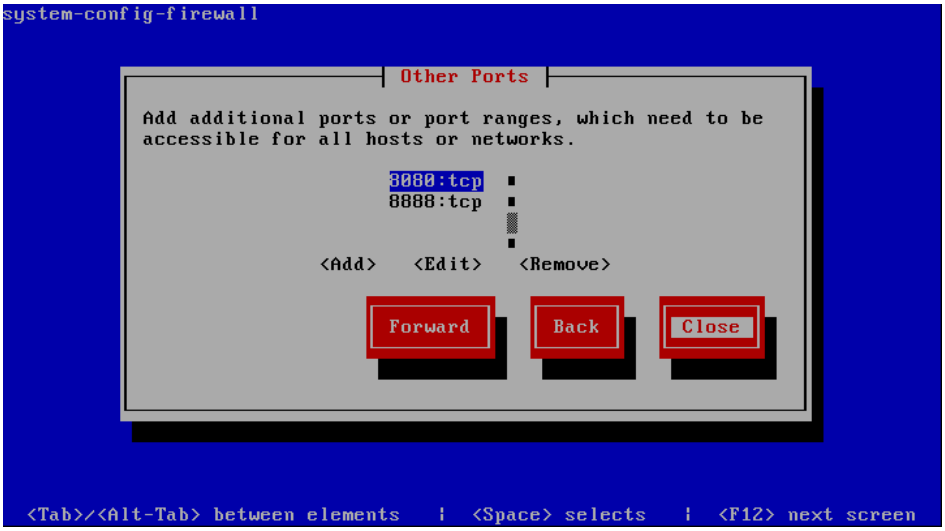


Input the following values.

Name	Value
Port / Port Range	The port number of WebAPI (OpenStack function) that has been specified in above procedure.
Protocol	tcp

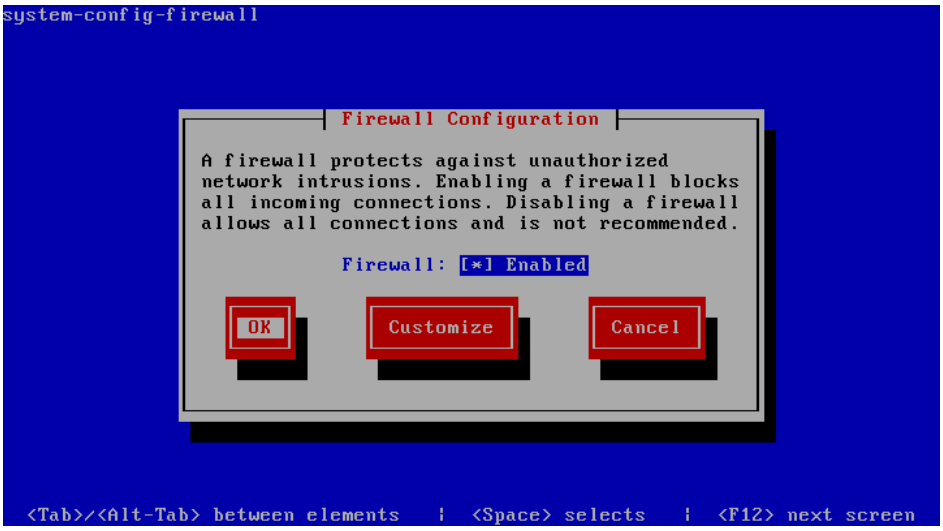
After input the values, set the focus on [OK] and then press the space key.

8. The Other Ports screen is displayed again.



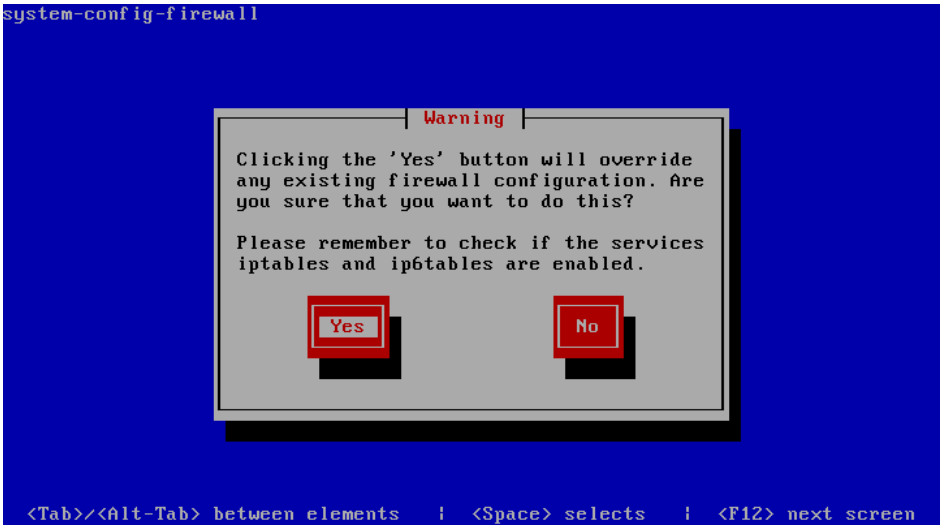
After checking that the specified port number and protocol are displayed, set the focus on [Close] and then press the space key.

9. The Firewall Configuration screen is displayed again.



Set the focus on [OK] and then press the space key.

10. The Warning screen is displayed.



Set the focus on [Yes] and then press the space key.

2.1.2.3 Restarting PFC

Restart both ACT and SBY PFC servers for the settings to become effective.

`# pfc_stop_cluster`	(stops cluster)
`# reboot`	(restarts)

2.1.3 Setting of auto saving startup-configuration

■CHECK:■ For setting details refer "1.2.7 Applying the Settings by WebAPI to startup-configuration" of "PF6800 Ver. 6.0 WebAPI User's Guide".

2.2 Settings for OpenStack server

2.2.1 BIOS settings

To operate OpenStack, enable the system Virtualization Technology on the server on which OpenStack will run.

1. Power On the server on which OpenStack server will run.
2. Press F2 key when the server is starting (when NEC logo is being displayed) and display BIOS menu.
3. Select [Main]→[Processor Settings].
4. Change [Virtualization Technology:] from [Disabled] to [Enabled].
5. Press F10, save the settings and exit BIOS.

2.2.2 Installing OS

Install Red Hat Enterprise Linux Server 7.0 or 6.5 on the machine on which OpenStack server will run.

2.2.3 Setting network

■CHECK:■	This section assumes that eth0 is used for management network, eth1 is used for OpenFlow network, and eth4 is used for Secure Channel. For details, refer to "1.3 Network planning".

2.2.3.1 Setting network interface

Configure the /etc/sysconfig/network-scripts/ifcfg-eth0 (Note that NIC name is not always eth0 in case of 7.0) of the server on which OpenStack server will run as shown below. (The items that are not described here should be kept as it is in its default state.)

```
ONBOOT=yes
BOOTPROTO=none
IPADDR=[IP address to be allocated to eth0 of corresponding server]
```

```
PREFIX=[ Network prefix length corresponding to above IP address]
GATEWAY=[Appropriate gateway address corresponding to above IP address]
DNS1=[IP address of DNS server]
```

Configure /etc/sysconfig/network-scripts/ifcfg-eth1 as shown below.

```
ONBOOT=yes
BOOTPROTO=none
```

Configure /etc/sysconfig/network-scripts/ifcfg-eth4 as shown below.

```
ONBOOT=yes
BOOTPROTO=none
IPADDR=[IP address to be allocated to eth4 of corresponding server]
NETMASK=[subnet mask corresponding to above IP address]
```

Configure /etc/sysconfig/network of server on which OpenStack server will run as shown below.

```
NETWORKING=yes
HOSTNAME=[host name of the server on which OpenStack server will run]
GATEWAY=[IP address of default gateway]
```

2.2.3.2 Restarting network connection

Restart the network setting for setting to be reflected.

```
$ /etc/init.d/network restart
```

2.2.4 Proxy server settings (only when required)

Perform the settings for the proxy server when internet is to be accessed through proxy server from the server that runs OpenStack server.

2.2.4.1 Setting environment variables

Set environment variables http_proxy, https_proxy, no_proxy.

```
http_proxy="http://[Address of proxy server]:[Port No of proxy server]/"
https_proxy="http://[Address of proxy server]:[Port No of proxy server]/"
```

```
no_proxy=[Address of server that will run keystone]
```

2.2.4.2 Settings of /etc/sudoers

To enable to inherit the settings of proxy server even at the time of execution of sudo, add following description in /etc/sudoers.

```
Defaults        env_keep = "http_proxy https_proxy no_proxy"
```

2.2.4.3 Settings of /etc/rhsm/rhsm.conf

Do the following settings to use subscription-manager.

/etc/rhsm/rhsm.conf

```
proxy_hostname = [Address of proxy server]
proxy_port = [Port No of proxy server]
```

2.2.4.4 Settings of yum

Do the following settings to install the package through yum command.

/etc/sysconfig/rhn/up2date

```
enableProxy=1
httpProxy=[Address of proxy server]:[Port No of proxy server]
```

/etc/yum.conf

```
proxy=http://[Address of proxy server]:[Port No of proxy server]/
```

2.2.5 Registration of subscription

Register the subscription using subscription-manager. For registration procedure, please refer the document of Red Hat Enterprise Linux.

Chapter 3 Installing software

3.1 Installing OpenStack

Do the installation as per the instructions given the “Red Hat OpenStack Getting Started Guide”

```
https://access.redhat.com/site/documentation/en-US/Red_Hat_Enterprise_Linux_OpenStack_Platform/5/html/Getting_Started_Guide/index.html
```

Use environment configuration support tool called as PackStack and perform consolidated installation and settings.
This guide assumes that you have run one of the following commands.

```
# packstack --allinone --provision-demo=n
```

```
# packstack --install-hosts=[IP Address of controller node],[Comma-separated IP Addresses of each compute node] --provision-demo=n
```

3.2 Installing NEC Plugin

Install the NEC Plugin using yum command.

```
# yum install -y openstack-neutron-nec
```

■CHECK:■ NEC Plugin has to be installed to both of controller node and compute node.

Chapter 4 Node settings

This chapter describes settings of OpenStack node.

■CHECK:■ The settings of all-in-one node are same as those of controller node.

4.1 Controller node settings

4.1.1 Stop services

Stop Open vSwitch Plugin and cancel auto start setting.

```
# service neutron-openvswitch-agent stop
# chkconfig neutron-openvswitch-agent off
```

Stop Neutron Server and DHCP Agent.

```
# service neutron-server stop
# service neutron-dhcp-agent stop
```

■NOTE:■ In case of Red Hat Enterprise Linux Server 7.0, execute the operation using systemctl command.

4.1.2 Initialize the database

Create the database that will be used by NEC Plugin.

```
# mysql -u [admin user name of MySQL] -p[admin user password of MySQL]
mysql> CREATE DATABASE neutron_nec;
mysql> GRANT ALL PRIVILEGES ON neutron_nec.* TO 'neutron'@'localhost' ¥
IDENTIFIED BY '[neutron user password of MySQL]';
mysql> GRANT ALL PRIVILEGES ON neutron_nec.* TO 'neutron'@'%' ¥
IDENTIFIED BY '[neutron user password of MySQL]';
```

■NOTE:■ Account settings of MySQL have been outputted to answer file of PackStack.
Item name of each setting is shown below.
CONFIG_MYSQL_USER … The name of admin user (Default: root)

CONFIG_MYSQL_PW	… The password of admin user
CONFIG_NEUTRON_DB_PW	… The password of neutron user

Initialize the database using neutron-db-manage command.

```
# neutron-db-manage --config-file /etc/neutron/neutron.conf ¥
  --config-file /etc/neutron/plugins/nec/nec.ini upgrade head
```

4.1.3 Configure Neutron

Edit the configuration file of Neutron (/etc/neutron/neutron.conf)

■CHECK:■ It is not necessary to change the setting that is not designated here.

Set the [DEFAULT] section core_plugin and api_extensions_path items as shown below.

```
core_plugin = neutron.plugins.nec.nec_plugin.NECPluginV2
api_extensions_path =
/usr/lib/python2.7/site-packages/neutron/plugins/nec/extensions/
service_plugins =firewall,lbaas
```

■CHECK:■ Items of api_extensions_path are displayed spreading over 2 rows but actually mention those on 1 row.

■CHECK:■ NEC OpenFlow plugin provides L3 router feature as part of the core plugin.
Thus L3 router service plugin should NOT be contained in service_plugin.
Therefore it is necessary to delete l3_router because it is specified by default.

Set the items of connection of [database] section as below.

```
connection = mysql://neutron:[neutron user password of MySQL]@[IP address of controller node]/neutron_nec
```

Edit the configuration file of Neutron DHCP Agent (/etc/neutron/dhcp_agent.ini)

■CHECK:■ It is not necessary to change the setting that is not designated here.

Set the ovs_use_veth item of [DEFAULT] section as below.

```
ovs_use_veth = True
```

4.1.4 Configure NEC Plugin

Edit the configuration file（/etc/neutron/plugins/nec/nec.ini）of NEC Plugin.

■CHECK:■ It is not necessary to change the setting that is not designated here.

Set the [ofc] section as below.

```
host = [IP address of PFC that provided the WebAPI service]
port = [TCP port number that the WebAPI is listening on (default: 8888)]
driver = pfc_v51
```

Set the [provider] section as below.

```
default_router_provider = openflow
```

■NOTE:■ openflow… vRouter function provided by PFC
l3-agent … L3 Agent function provided by Neutron

Replace already allocated configuration file of Open vSwitch Plugin with configuration file of NEC Plugin.

```
# rm -f /etc/neutron/plugin.ini
# ln -s /etc/neutron/plugins/nec/nec.ini /etc/neutron/plugin.ini
```

4.1.5 Configure Open vSwitch

If you install NEC Plugin in Allinone with Packstack, OVS is installed by the setting that OVS works with OVS Mechanical driver of ML2 plugin.
So, cancel the setting once, and then set up so that OVS can work with NEC plugin.

Clear br-int.

```
# ovs-vsctl del-br br-int
# ovs-vsctl add-br br-int
```

Connect Open vSwitch with PFC.

```
# ovs-vsctl set-controller br-int tcp:[IP address of PFC that is the connection destination of SecureChannel]
```

Add the port for OpenFlow network.

```
# ovs-vsctl add-port br-int eth1
```

Clear data flow of br-int.

```
# ovs-ofctl del-flows br-int
```

Sample (RHEL7)

```
# ovs-vsctl show
8eb7fedb-a2dd-441e-9c4e-77873186f62b
    Bridge br-int
        Controller "tcp:192.168.100.184"
            is_connected: true
        Port "ens2f1"
            Interface "ens2f1"
        Port br-int
            Interface br-int
                type: internal
    Bridge br-ex
        Port br-ex
            Interface br-ex
                type: internal
    ovs_version: "2.0.0"
```

4.1.6 Start services

Start the services of Neutron Server, NEC Plugin.

```
# service neutron-server start
# service neutron-dhcp-agent start
# service neutron-nec-agent start
# chkconfig neutron-nec-agent on
```

■NOTE:■ In case of Red Hat Enterprise Linux Server 7.0, execute the operation using systemctl command.

4.2 Compute node settings

4.2.1 Stop services

Stop Open vSwitch Plugin and cancel auto start setting.

```
# service neutron-openvswitch-agent stop
# chkconfig neutron-openvswitch-agent off
```

■NOTE:■ In case of Red Hat Enterprise Linux Server 7.0, execute the operation using systemctl command.

4.2.2 Configure Neutron

Edit the configuration file of Neutron (/etc/neutron/neutron.conf)

■CHECK:■ It is not necessary to change the setting that is not designated here.

Set the [DEFAULT] section core_plugin and api_extensions_path items as shown below.

```
core_plugin = neutron.plugins.nec.nec_plugin.NECPluginV2
```

4.2.3 Configure NEC Plugin

Edit the configuration file（/etc/neutron/plugins/nec/nec.ini）of NEC Plugin.

■CHECK:■ It is not necessary to change the setting that is not designated here.

Set the [ofc] section as below.

```
host = [IP address of PFC that provided the WebAPI service]
port = [TCP port number that the WebAPI is listening on (default: 8888)]
driver = pfc_v51
```

Set the [provider] section as below.

```
default_router_provider = openflow
```

Replace already allocated configuration file of Open vSwitch Plugin with configuration file of NEC Plugin.

```
# rm -f /etc/neutron/plugin.ini
# ln -s /etc/neutron/plugins/nec/nec.ini /etc/neutron/plugin.ini
```

4.2.4 Configure Open vSwitch

If you install NEC Plugin in Allinone with Packstack, OVS is installed by the setting that OVS works with OVS Mechanical driver of ML2 plugin.
So, cancel the setting once, and then set up so that OVS can work with NEC plugin.

Clear br-int.

```
# ovs-vsctl del-br br-int
# ovs-vsctl add-br br-int
```

Connect Open vSwitch with PFC.

```
# ovs-vsctl set-controller br-int tcp:[IP address of PFC that is the connection destination of SecureChannel]
```

Add the port for OpenFlow network.

```
# ovs-vsctl add-port br-int eth1
```

Clear data flow of br-int.

```
# ovs-ofctl del-flows br-int
```

Sample (RHEL7)

```
# ovs-vsctl show
8eb7fedb-a2dd-441e-9c4e-77873186f62b
    Bridge br-int
        Controller "tcp:192.168.100.184"
            is_connected: true
        Port "ens2f1"
            Interface "ens2f1"
        Port br-int
            Interface br-int
                type: internal
    ovs_version: "2.0.0"
```

4.2.5 Start services

Start the services of Neutron Server, NEC Plugin.

```
# service neutron-nec-agent start
# chkconfig neutron-nec-agent on
```

■NOTE:■ In case of Red Hat Enterprise Linux Server 7.0, execute the operation using systemctl command.

Chapter 5 Setting physical network

5.1 Setting PFS

Explanation regarding setting PFS is given.

5.1.1 Setting minicom

Explanation regarding installation and initial settings of minicom is given.

5.1.1.1 Installing minicom

Log in to the OpenStack server that is serially connected to PFS, and install minicom through apt-get command.

```
# yum install -y minicom
```

5.1.1.2 Settings display screen of minicom

Display the settings screen of minicom.

```
# minicom -s
```

5.1.1.3 Settings of minicom

Select "Serial port setup" of "configuration" menu, and do the settings as shown below.

```
A -    Serial Device      : /dev/ttyS0
B - Lockfile Location     : /var/lock
C -   Callin Program      :
D -  Callout Program      :
E -    Bps/Par/Bits       : 9600 8N1
F - Hardware Flow Control : Yes
G - Software Flow Control : No
```

■CHECK:■ Change the number at the end of /dev/ttyS0 to the value that corresponds to the port connected.

5.1.1.4 Saving the settings of minicom

Select "Exit" of [configuration] menu after selecting the "Save setup as dfl" of [configuration] menu.

5.1.2 Log in through serial

The method to log in to PFS through serial from OpenStack server serially connected to PFS is explained.

5.1.2.1 Starting minicom

Start minicom on the OpenStack server that is serially connected to PFS.

```
$ minicom
```

5.1.2.2 Log in

Use log in ID as "operator" and log in.

```
login: operator
```

5.1.3 RSI settings

Do the setting to run PFS as RSI (Real Switch Instance).
For details, refer to "3.2.2 Initial Configuration of PF52xx" of "PF6800 Ver. 6.0 Configuration Guide".

5.1.4 Interface settings

Do the setting of interfaces to connect nodes. Ports to connect OpenStack server have to be set for internal port. Ports to connect physical machine or legacy network have to be set for external port.
For details of internal port and external port, refer to "3.1.2.1 Port Types" of "PF6800 Ver. 6.0 Configuration Guide".
In the case of using current version of NEC Plugin, all data on OpenFlow network is communicated on native VLAN. Therefore, internal ports need only native VLAN, and external ports do not have to be set the access VLAN.
For details of interface settings, refer to "VLAN Configuration of Internal Ports" and "VLAN Configuration of External Ports" of the above guide.

Chapter 6 Setting virtual network

6.1 Creating user and tenant

6.1.1 Applying the administrator information into the operation environment

By the following command, make the operation environment read the administrator information file that is under home directory.

```
$ source ~/keystonerc_admin
```

6.1.2 Create general user

Create general user using the command given below. In the example the user name is taken as "UserA" and the password is taken as "secret".

```
$ keystone user-create --name UserA --pass secret
```

6.1.3 Create the role

Create the role using following command. The role name taken in the example is "user".

```
$ keystone role-create --name user
```

6.1.4 Create tenant

Create the tenant using following command. The tenant name taken in the example is "TenantA".

```
$ keystone tenant-create --name TenantA
```

6.1.5 Add the user to tenant

Add the user in tenant by specifying created general user, role, various IDs of tenant as arguments. The command is given below.

```
$ keystone user-role-add --user [ID displayed in user-create] ¥
                         --role [ID displayed in role-create] ¥
                         --tenant_id [ID displayed in tenant-create]
```

6.1.6 Setting user information

To make the authentication as user simple, create keystonerc_UserA file under home directory of user. Contents of the file are as below.

```
export OS_USERNAME=UserA
export OS_TENANT=NAME=TenantA
export OS_PASSWORD=secret
export OS_AUTH_URL=http://[IP address of the machine on which keystone is running]:35357/v2.0/
export PS1='[¥u@¥h ¥W(keystone_UserA)]¥$ '
```

6.2 Network settings

Explanation about the Neutron network settings in the server on which OpenStack server is running is given.

6.2.1 Checking the tenant ID

Check the tenant ID for which network is to be created. (In this explanation TenantA is taken as target)

```
$ keystone tenant-list
+----------------------------------+----------+---------+
|                id                |   name   | enabled |
+----------------------------------+----------+---------+
| 10974985dd9c44738ac8f256b989930e | TenantA  |   True  |
| 50c63157e3bd450d8878dbc02a65fdca |  admin   |   True  |
| 1982b7039f4a4b879f1e104144cb515e | services |   True  |
+----------------------------------+----------+---------+
```

6.2.2 Checking the user ID

Check the user ID to be associated with the VM to be created. (In this explanation UserA is taken as target)

```
$ keystone user-list
+----------------------------------+------------+---------+------------------
----+
|                id                |    name    | enabled |        email
    |
+----------------------------------+------------+---------+------------------
----+
| 8e2edaf3223b4ccdb11891b6d05bfb27 |   UserA    |   True  |
    |
| 8c31061dc567485fbfd2efd2ec261f48 |   admin    |   True  |   admin@localhost
    |
| b3882074c2c14288aafa561e5b26bd96 | ceilometer |   True  | ceilometer@localh
ost |
| 69d6648fe4c247c59df04860f3ccd155 |   cinder   |   True  |   cinder@localhos
t   |
| 9b58328e5a8140718e50f9f05d31d274 |   glance   |   True  |   glance@localhos
t   |
| 37540a28b74d41dcafe899390d4b3bb7 |  neutron   |   True  |  neutron@localhos
t   |
| b70fe08b2ddf4d3683e8ae30089abf6e |    nova    |   True  |    nova@localhost
    |
+----------------------------------+------------+---------+------------------
----+
```

6.2.3 Applying the user information into the operation environment

Apply the contents of file set in "6.1.6 Setting user information" into operation environment.

```
$ source ~/keystonerc_UserA
```

6.2.4 Creating network

Create network using neutron net-create command.

```
$ neutron net-create net1
Created a new network:
+-----------------+--------------------------------------+
| Field           | Value                                |
+-----------------+--------------------------------------+
| admin_state_up  | True                                 |
| id              | a027c020-03b6-4c3d-bbf7-7a1c51987341 |
| name            | net1                                 |
| shared          | False                                |
| status          | ACTIVE                               |
| subnets         |                                      |
| tenant_id       | 10974985dd9c44738ac8f256b989930e     |
+-----------------+--------------------------------------+
```

6.2.5 Creating subnet

Crate the subnet for the abovementioned network using neutron subnet-create command.

```
$ neutron subnet-create net1 192.168.1.0/24 --gateway 192.168.1.254
Created a new subnet:
+------------------+------------------------------------------------------+
| Field            | Value                                                |
+------------------+------------------------------------------------------+
| allocation_pools | {"start": "192.168.1.1", "end": "192.168.1.253"}     |
| cidr             | 192.168.1.0/24                                       |
| dns_nameservers  |                                                      |
| enable_dhcp      | True                                                 |
| gateway_ip       | 192.168.1.254                                        |
| host_routes      |                                                      |
| id               | e8ce652f-e9bb-4327-9607-f024f9f619dd                 |
| ip_version       | 4                                                    |
| name             |                                                      |
| network_id       | a027c020-03b6-4c3d-bbf7-7a1c51987341                 |
| tenant_id        | 10974985dd9c44738ac8f256b989930e                     |
+------------------+------------------------------------------------------+
```

6.3 Starting the VM

Here the procedure to connect created VM to Neutron network is explained.

6.3.1 Starting the VM and connecting to the Neutron Network

■CHECK:■ Before starting an instance, VM image has to be registered. Please prepare the VM image from which you want to start an instance. Then register it.
The following example assumes that you registered the VM image named RHEL6.5 which suit the flavor of m1.small.

Start an instance of the registered VM image by using the nova boot command (in the following example, the instance name is TenantA_VM1). At this time, the connection to the network specified by net-id of the --nic option is also performed at the same time.

```
$ nova boot --image RHEL6.5 --flavor m1.small ¥
  --nic net-id=a027c020-03b6-4c3d-bbf7-7a1c51987341 TenantA_VM1
```

6.3.2 Checking the Connection to the Network

Check that the VM and network are associated using nova list command.

```
$ nova list
+--------------------------------------+------------+--------+------------+-
-----------+------------------+
| ID                                   | Name       | Status | Task State |
Power State | Networks         |
+--------------------------------------+------------+--------+------------+-
-----------+------------------+
| 4504ad9c-6467-4fb5-8255-3f4550d9e150 | TenantA_VM1 | ACTIVE | None       |
Running     | net1=192.168.1.1 |
+--------------------------------------+------------+--------+------------+-
-----------+------------------+
```

6.4 Creating port for connecting physical machine

In order to connect a physical machine directly to OpenStack network, or to connect legacy network with OpenStack network, create a neutron port associated with PFS port which is for connecting physical machine or legacy network.

6.4.1 Checking the connection destination port

Check the datapath-id and port number of connection destination port by running show topology detail command of real-network mode on PFC shell.

6.4.2 Creating Neutron Port

■CHECK:■

For the following operation, Administrator privilege is necessary. Refer to "6.1.1 Applying the administrator information into the operation environment" and apply the user's information with administrator privilege to the operating environment. Then execute the operation.

Create Neutron port using neutron port-create command specifying datapath-id and port number of the connection destination port.

```
$ neutron port-create net1 --name PORT1 ¥
--binding:profile type=dict datapath_id=0x0000000000000004,port_no=7
Created a new port:
+-----------------------+--------------------------------------------------
--------------------------------+
| Field                 | Value
                                |
+-----------------------+--------------------------------------------------
--------------------------------+
| admin_state_up        | True
                                |
| allowed_address_pairs |
                                |
| binding:capabilities  | {"port_filter": true}
                                |
| binding:host_id       |
                                |
| binding:profile       | {"portinfo:datapath_id": "0x1", "portinfo:port_no":
 7}                             |
| binding:vif_type      | ovs
                                |
| device_id             |
                                |
| device_owner          |
                                |
| fixed_ips             | {"subnet_id": "e8ce652f-e9bb-4327-9607-f024f9f619dd
", "ip_address": "192.168.1.3"} |
| id                    | 148e3bd2-da1f-43fe-b80d-63476b5cf1a7
                                |
| mac_address           | 00:11:22:33:44:55
                                |
| name                  | PORT1
                                |
| network_id            | a027c020-03b6-4c3d-bbf7-7a1c51987341
                                |
| security_groups       | c71bbe1c-e001-4ea4-834e-262293a6ac5a
                                |
| status                | ACTIVE
                                |
| tenant_id             | 10974985dd9c44738ac8f256b989930e
                                |
+-----------------------+--------------------------------------------------
--------------------------------+
```

■CHECK:■	Because executing user was switched, specify the tenant to create the port on by using --tenant-id option.
■NOTE:■	In case of physical machine, --mac-address option is required. In case of legacy network, --mac-address option is not required.
■CHECK:■	After creating a port is completed by the procedure above, refer to "6.1.6 Setting user information", and apply the original user's information to the operating environment.

6.5 Setting router

6.5.1 Creating router

Router can be created using neutron router-create command.

```
$ neutron router-create router
Created a new router:
+-----------------------+--------------------------------------+
| Field                 | Value                                |
+-----------------------+--------------------------------------+
| admin_state_up        | True                                 |
| external_gateway_info |                                      |
| id                    | 2c80b50d-6ca4-4928-b5c4-4bfaad0c9d45 |
| name                  | router                               |
| provider              | openflow                             |
| status                | ACTIVE                               |
| tenant_id             | 10974985dd9c44738ac8f256b989930e     |
+-----------------------+--------------------------------------+
```

CHECK:	Specify the name of the router to be created just after router-create.
NOTE:	You can specify the provider of router by --provider option. About its parameter, refer to "4.1.4 Configure NEC Plugin".

6.5.2 Deleting router

Router can be deleted by using neutron router-delete command.

```
$ neutron router-delete 2c80b50d-6ca4-4928-b5c4-4bfaad0c9d45
```

CHECK:	Specify the ID of the router to be deleted just after router-delete. Router ID can be checked by neutron router-list command.

6.5.3 Adding router interface

Router interface can be added using neutron router-interface-add command.

```
$ neutron router-interface-add 2c80b50d-6ca4-4928-b5c4-4bfaad0c9d45 ¥
  e8ce652f-e9bb-4327-9607-f024f9f619dd
```

CHECK:	Specify in the sequence of ID of target router, ID of target subnet just after the router-interface-add. Router ID can be checked by neutron router-list command and sub

net ID can be checked by neutron subnet-list command.

6.5.4 Deleting router interface

Interface of router can be deleted using neutron router-interface-delete command.

```
$ neutron router-interface-delete 2c80b50d-6ca4-4928-b5c4-4bfaad0c9d45 ¥
  e8ce652f-e9bb-4327-9607-f024f9f619dd
```

■CHECK:■ Specify in the sequence of ID of target router, ID of target subnet just after the router-interface-delete. Router ID can be checked by neutron router-list command and subnet ID can be checked by neutron subnet-list command.

6.6 Setting static route of router

■CHECK:■ Static route can be set when the provider of router is openflow.

6.6.1 Adding static route of router

Static route can be added using neutron router-update command.

```
$ neutron router-update router --routes list=true type=dict ¥
  destination=192.168.0.0/24,nexthop=30.0.1.254
```

■CHECK:■ Specify the router name just after router-update. Set the network address of destination network to “destination”, and set the gateway IP address to “nexthop”.

When separate route information is to be added for the router for which route information is already added, it is required to specify already set route information once again. (the highlighted part in the below example is the information that was already set in the above example).

```
$ neutron router-update router --routes list=true type=dict ¥
  destination=192.168.0.0/24,nexthop=30.0.1.254 ¥
  destination=192.168.0.0/24,nexthop=30.0.2.254
```

6.6.2 Deletion of static route of router

Route of the router can be deleted using neutron router-update command.

Information of all the routes can be deleted by specifying --no-routes option.

```
$ neutron router-update router --routes action=clear
```

Information of some routes can be deleted by re specifying the router information that is not in scope of deletion using --route option. (In the below example, highlighted part of "6.6.1 Adding static route of router") is deleted.

```
$ neutron router-update router --routes list=true type=dict ¥
  destination=192.168.0.0/24,nexthop=30.0.2.254
```

6.7 Connecting to external network

■CHECK:■	This section describes the steps of connecting to external network by using routers the provider of which is openflow. For l3-agent, refer to documents of the OpenStack.
■CHECK:■	For the following operation, Administrator privilege is necessary. Refer to "6.1.1 Applying the administrator information into the operation environment" and apply the user's information with administrator privilege to the operating environment. Then execute the operation.
■CHECK:■	Because executing user is switched, specify the tenant to each command by using --tenant-id option.

6.7.1 Creating external network

Create external network using neutron net-create command.

```
$ neutron net-create --router:external=True ext_net ¥
  --tenant-id 10974985dd9c44738ac8f256b989930e
Created a new network:
+-----------------+--------------------------------------+
| Field           | Value                                |
+-----------------+--------------------------------------+
| admin_state_up  | True                                 |
| id              | d9d3b1d6-f4ca-4595-9513-f99dea8eb860 |
| name            | ext_net                              |
| router:external | True                                 |
| shared          | False                                |
| status          | ACTIVE                               |
| subnets         |                                      |
| tenant_id       | 10974985dd9c44738ac8f256b989930e     |
+-----------------+--------------------------------------+
```

■NOTE:■ --router:external=True option shows that is external network.

6.7.2 Creating subnet for external network

Create subnet for the external network using neutron subnet-create command.

```
$ neutron subnet-create ext_net 192.168.100.0/24 --gateway 192.168.100.254 ¥
  --disable-dhcp --allocation-pool start=192.168.100.200,end=192.168.100.201 ¥
  --tenant-id 10974985dd9c44738ac8f256b989930e
Created a new subnet:
+-------------------+------------------------------------------------------+
| Field             | Value                                                |
+-------------------+------------------------------------------------------+
| allocation_pools  | {"start": "192.168.100.200", "end": "192.168.100.201"} |
| cidr              | 192.168.100.0/24                                     |
| dns_nameservers   |                                                      |
| enable_dhcp       | False                                                |
| gateway_ip        | 192.168.100.254                                      |
| host_routes       |                                                      |
| id                | 791b5995-fab8-4585-91f7-36abb6544662                 |
| ip_version        | 4                                                    |
| name              |                                                      |
| network_id        | d9d3b1d6-f4ca-4595-9513-f99dea8eb860                 |
| tenant_id         | 10974985dd9c44738ac8f256b989930e                     |
+-------------------+------------------------------------------------------+
```

■NOTE:■ Specify a gateway address of a legacy network with --gateway option.
--disable-dhcp option disables DHCP of Neutron DHCP Agent to avoid overlapping with DHCP of the external network.
Specify a range of IP allocation pool of external network for OpenStack by using --allocation-pool option. At least, two IP addresses are necessary for OpenStack (One is for the port connecting to the external network, the others are for an interface of vRouters).

6.7.3 Setting gateway to router

Set the gateway to router using neutron router-gateway-set command.

```
$ neutron router-gateway-set 2c80b50d-6ca4-4928-b5c4-4bfaad0c9d45 ¥
  d9d3b1d6-f4ca-4595-9513-f99dea8eb860 ¥
  --tenant-id 10974985dd9c44738ac8f256b989930e
```

■CHECK:■ Specify in the sequence of target router ID, external network ID just after the route r-gateway-set. Router ID can be checked by neutron router-list command and exter nal network ID can be checked by neutron net-external-list command.

6.7.4 Creating port for connecting to external network

Following the procedure of "6.4 Creating port for connecting physical machine", create a Neutron port with specifying the external network as a target.

6.8 Setting the Security Group

■CHECK:■ The security group is prepared for OpenStack as a function for protecting the infor mation in the cloud from a range of security threats, such as wiretapping and illega l access. By adding rules to the security group, you can specify the communication t ype for which port passage is allowed on the virtual network, as well as the directio n of the communication.

6.8.1 Creating the Security Group

Create a security group using neutron security-group-create command.

```
$ neutron security-group-create group1
Created a new security_group:
+----------------------+-------------------------------------------------+
| Field                | Value                                           |
+----------------------+-------------------------------------------------+
| description          |                                                 |
| id                   | 57fef81b-da7a-453a-a9f0-a55410573dca            |
| name                 | group1                                          |
| security_group_rules | {"direction": "egress", "ethertype": "IPv4"}    |
|                      | {"direction": "egress", "ethertype": "IPv6"}    |
| tenant_id            | 10974985dd9c44738ac8f256b989930e                |
+----------------------+-------------------------------------------------+
```

■CHECK:■ In actual execution results, more detailed information is output to security_group_rules. However it is omitted here.

6.8.2 Creating the Security Group

Add a security rule group using neutron security-group-rule-create command.

```
$ neutron security-group-rule-create --direction ingress --remote-group-id
group1 group1
```

```
Created a new security_group_rule:
+-------------------+--------------------------------------+
| Field             | Value                                |
+-------------------+--------------------------------------+
| direction         | ingress                              |
| ethertype         | IPv4                                 |
| id                | d3f9b8e3-c692-49b6-b1a7-735b29676e13 |
| port_range_max    |                                      |
| port_range_min    |                                      |
| protocol          |                                      |
| remote_group_id   | 57fef81b-da7a-453a-a9f0-a55410573dca |
| remote_ip_prefix  |                                      |
| security_group_id | 57fef81b-da7a-453a-a9f0-a55410573dca |
| tenant_id         | 10974985dd9c44738ac8f256b989930e     |
+-------------------+--------------------------------------+
```

6.8.3 Deleting a Security Rule Group

Delete a security rule group using neutron security-group-rule-delete command.

```
$ neutron security-group-rule-delete d3f9b8e3-c692-49b6-b1a7-735b29676e13
Deleted security_group_rule: d3f9b8e3-c692-49b6-b1a7-735b29676e13
```

6.8.4 Deleting a Security Group

Delete a security rule group using neutron security-group-delete command.

```
$ neutron security-group-delete 57fef81b-da7a-453a-a9f0-a55410573dca
Deleted security_group: 57fef81b-da7a-453a-a9f0-a55410573dca
```

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