

Lenovo Networking

OpenStack Neutron Plugin User Guide

for Newton and Ocata

LenovoTM

Note: Before using this information and the product it supports, read the general information in the *Safety information and Environmental Notices* and *User Guide* documents on the *Lenovo Documentation CD*, and the *Warranty Information* document that comes with the product.

First Edition (June 2018)

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Preface

The *Lenovo Networking OpenStack Neutron Plugin User Guide* describes how to install, configure, and use the OpenStack Neutron Plugin.

Who Should Use This Guide

This guide is intended for network installers and system administrators engaged in configuring and maintaining a network. The administrator should be familiar with Ethernet concepts, IP addressing, Spanning Tree Protocol, and SNMP configuration parameters.

Typographic Conventions

The following table describes the typographic styles used in this book.

Table 1. *Typographic Conventions*

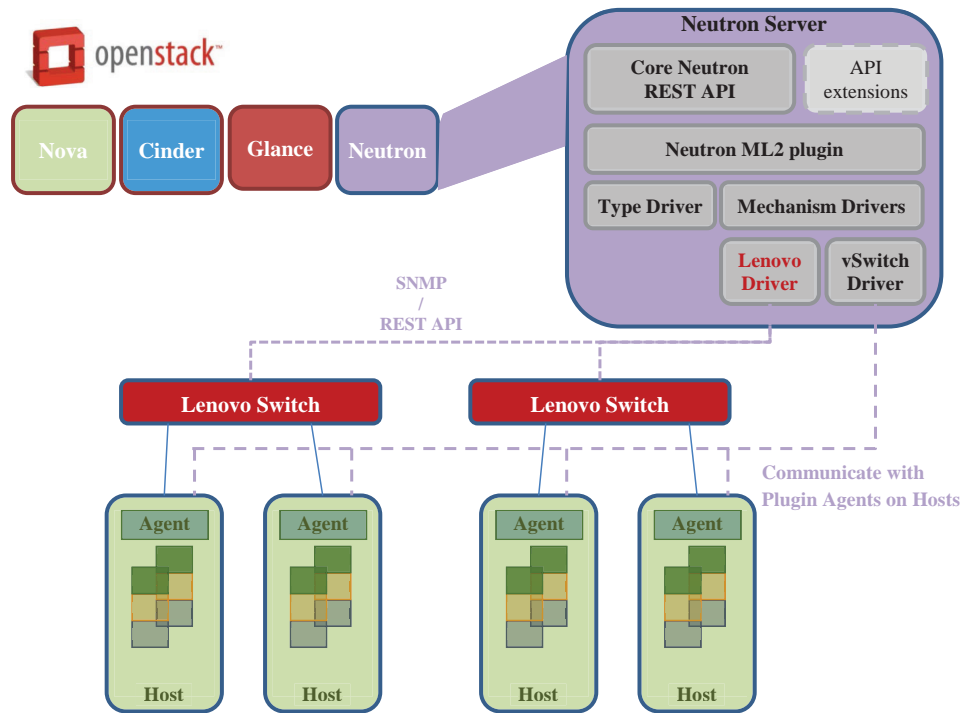
Typeface or Symbol	Meaning	Example
ABC123	This type is used for names of commands, files, and directories used within the text. It also depicts on-screen computer output and prompts.	View the <code>readme.txt</code> file. Switch#
ABC123	This bold type appears in command Example. It shows text that must be typed in exactly as shown.	Switch# sys
<ABC123>	This italicized type appears in command Example as a parameter placeholder. Replace the indicated text with the appropriate real name or value when using the command. Do not type the brackets. This also shows book titles, special terms, or words to be emphasized.	To establish a Telnet session, enter: Switch# telnet <i><IP address></i> Read your <i>User's Guide</i> thoroughly.
{ }	Command items shown inside brackets are mandatory and cannot be excluded. Do not type the brackets.	Switch# ls {-a}
[]	Command items shown inside brackets are optional and can be used or excluded as the situation demands. Do not type the brackets.	Switch# ls [-a]
	The vertical bar () is used in command Example to separate choices where multiple options exist. Select only one of the listed options. Do not type the vertical bar.	Switch# set {left right}
AaBbCc123	This block type depicts menus, buttons, and other controls that appear in Web browsers and other graphical interfaces.	Click the Save button.

Overview

OpenStack is an open source infrastructure initiative for creating and managing large groups of virtual private servers in a cloud computing environment. Lenovo's OpenStack Neutron Plugin provides a means to orchestrate VLANs on Lenovo's physical switches.

In cloud environments where virtual machines (VMs) are hosted by physical servers, the VMs see a new virtual access layer provided by the host machine. This new access layer can be typically created through many mechanisms, such as Linux Bridges or Virtual Switches. The policies of the virtual access layer (virtual network), when set must be coordinated with the policies set in the hardware switches. Lenovo's Neutron Plugin helps coordinate this behavior automatically without any intervention from the administrator. [Figure 1](#) provides an architectural overview of how Lenovo's ML2 Plugin and switches fits into an OpenStack deployment.

Figure 1. Lenovo Neutron Plugin Architecture



Support Matrix

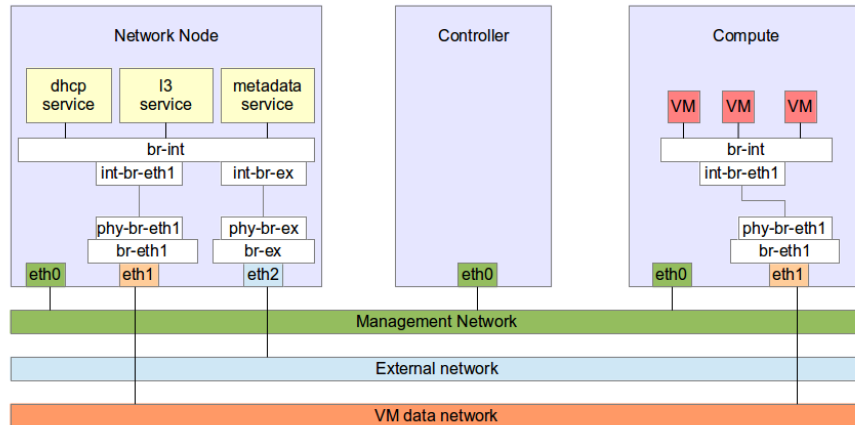
The following provides details on supported switches, Operating Systems and environments.

OpenStack Version	Lenovo NOS Version	Supported Switches	Linux Distribution	Orchestration Platform
Newton	ENOS 8.4.6 or later	Lenovo RackSwitch: G7028, G7052, G8052, G8124-E, G8264, G8264CS, G8272, G8296, G8332 Lenovo Flex System: CN4093, EN4093R, SI4091, SI4093 (non-SPAR mode) Lenovo ThinkSystem Flex Switch: NE2552E	Red Hat RHEL 7.5 Ubuntu 16.04 LTS	RHOSP10 (Red Hat Certified) Juju 2.3
	CNOS 10.5.1 or later	Lenovo ThinkSystem: NE1032, NE1032T, NE1072T, NE10032, NE2572 Lenovo RackSwitch: G8272, G8296, G8332		
Ocata	ENOS 8.4.6 or later	Lenovo RackSwitch: G7028, G7052, G8052, G8124-E, G8264, G8264CS, G8272, G8296, G8332 Lenovo Flex System: CN4093, EN4093R, SI4091, SI4093 (non-SPAR mode) Lenovo ThinkSystem Flex Switch: NE2552E	Red Hat RHEL 7.5 Ubuntu 16.04 LTS	RHOSP11 Juju 2.3
	CNOS 10.5.1 or later	Lenovo ThinkSystem: NE1032, NE1032T, NE1072T, NE10032, NE2572 Lenovo RackSwitch: G8272, G8296, G8332		

Recommended Network Topologies

Openstack has specific requirements for providing network connectivity to all nodes while allowing flexibility for using Vendor specific technologies.

Figure 2. Openstack Network Connections



As shown in [Figure 2](#), there are three physical networks in the typical Openstack deployment:

- Management
- Internal Data Networks
- External Networks

Lenovo supports both single NIC attached servers as well as dual NIC using our vLAG technology. The following is an example deployment with single NIC attached Servers.

Figure 3. Single Port Connections

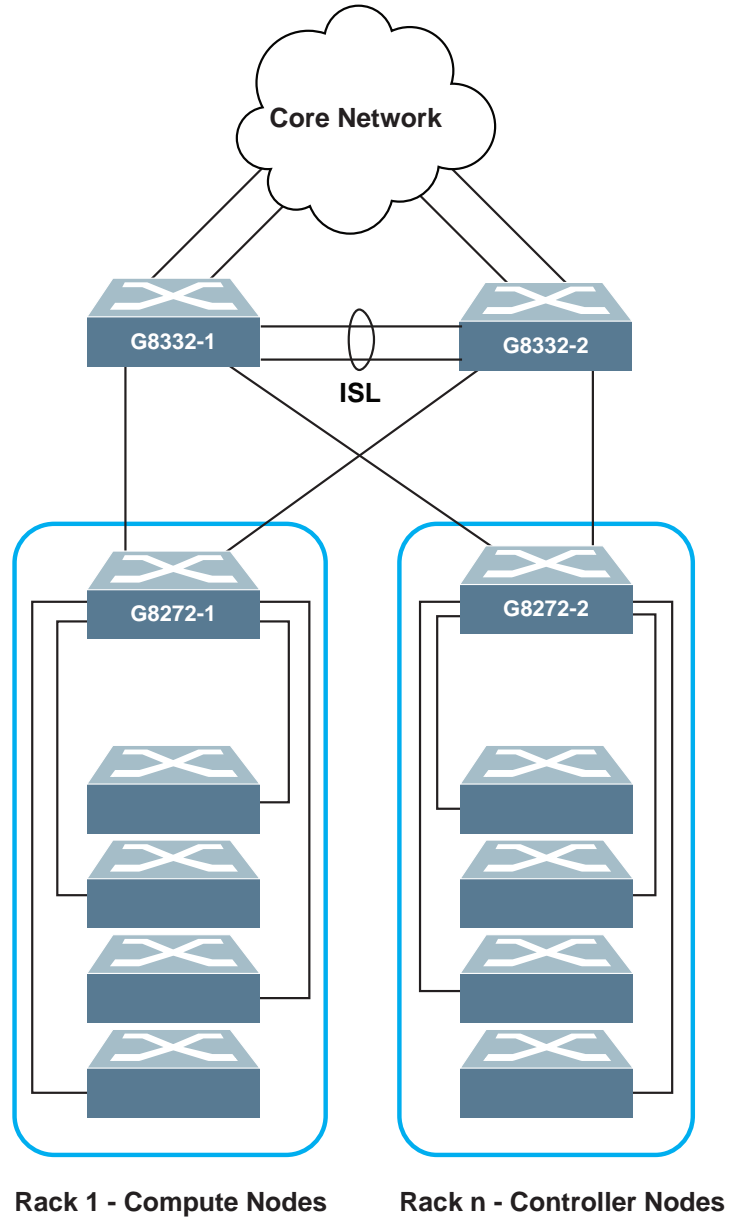


Figure 4 illustrates Lenovo Servers connecting to the Rack switches using the vLAG protocol which includes NIC Bonding on the server side.

Figure 4. Servers with vLAG Connectivity

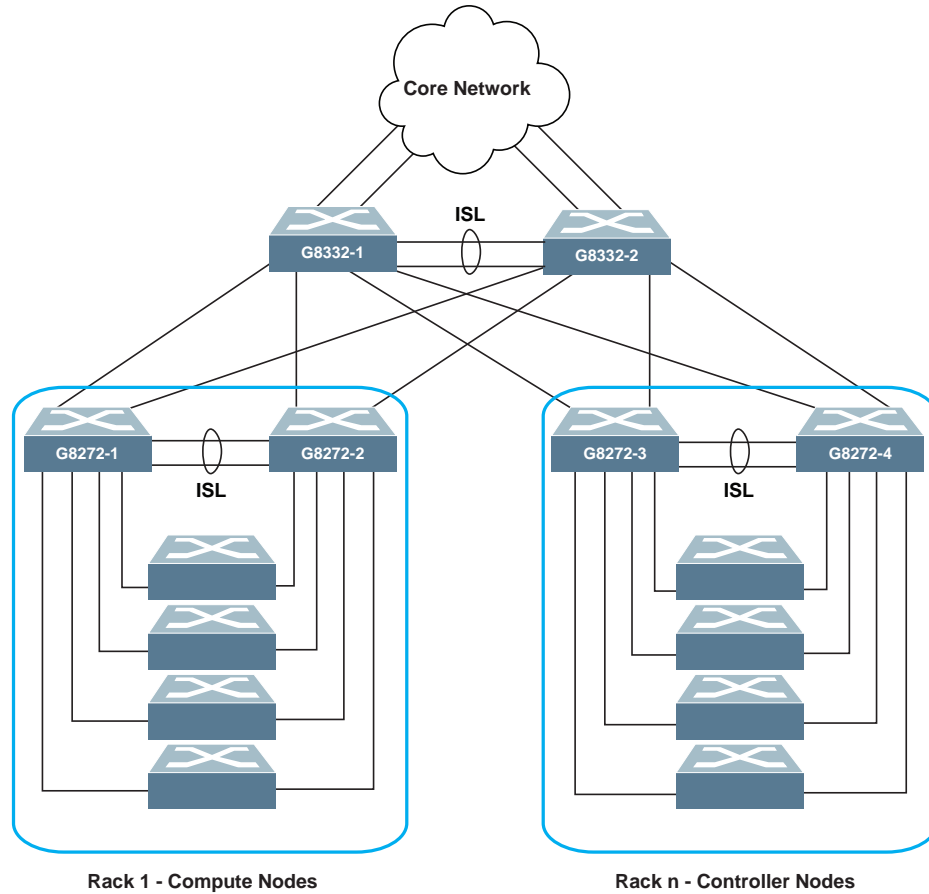
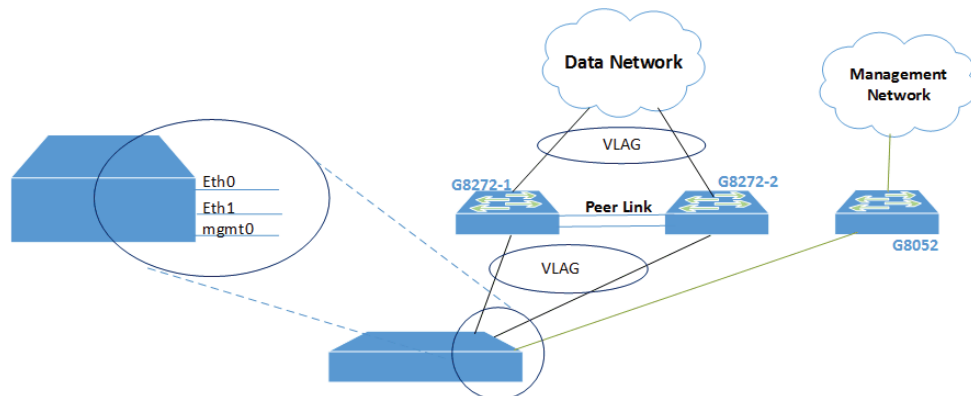


Figure 4 only shows the data path, but each device does have a management connection for communication with the OpenStack controller Node. Figure 5 provides more details on how this is done.

Figure 5. Data and Management Network



API Services Description

The ML2 Plugin exposes several APIs that allows Openstack Neutron to make configuration changes on Lenovo Switches.

Create_Network: Using this API, the OpenStack Neutron Plugin creates a VLAN on a Lenovo device whenever a Virtual Machine is associated on the connected Compute Node.

Create_Port: Using this API, the OpenStack Neutron Plugin creates a VLAN on the Lenovo Switch on the physical port connected to the compute node on which a Virtual Machine is created and added to a specified network.

Delete_Network: Using this API, the OpenStack Neutron Plugin deletes the VLAN on the Lenovo Switch corresponding to that Network. This occurs if the associated virtual Machine is migrated off the Compute node or the administrator manually deletes the network.

Delete_Port: Using this API, the OpenStack Neutron Plugin deletes a VLAN on the port connected to a compute node where the virtual machine was deleted or migrated to another port or Node.

Installing the OpenStack Neutron Plugin

Following are the detailed steps to set up your OpenStack deployment with the OpenStack Neutron Plugin managing Lenovo switches.

Prerequisites

The Lenovo OpenStack Neutron Plugin provides dynamic VLAN configuration on access layer switches server facing ports that maps OpenStack networks into the physical infrastructure.

The following are pre-requisites for using the plugin:

- For Lenovo switches running CNOS 10.5.1 or later, enable RestAPI on the switches using the following switch CLI command:

```
Switch(config)# feature restApi
```

- Install python *pip* and *git* to allow the downloading of files from Github.
 - For Redhat use the following command:

```
% sudo yum install python-pip git
```

- For Ubuntu, use the following command:

```
% sudo apt-get install python-pip git
```

- Install with the *ncclient* library by using the *pip* package manager at your shell prompt:

```
% sudo pip install ncclient==0.4.2
```

- If you are using SNMP to configure the switch, you also need to install the *pysnmp* package:

```
% sudo pip install pysnmp
```

- Determine the VLAN pool for your Openstack Deployment, for example 1001-2001. This is required for configuring the uplink ports and the plugin.
- Configure physical network topology; add the assigned VLAN pool to uplink ports and aggregation switches as required. Other protocols such as ACLs, switch access credential should be configured as needed.
- In vLAG mode, the ISL and Portchannel/LACP trunk should be created on the relevant switches as the plugin does not configure these attributes.
- Server NICs connected to vLAG Switches needs to have NIC bonding configured (see Network topology section for examples).
- Install Openstack Controller and Network nodes. Openstack needs to be running before installing the Lenovo Neutron driver.

ML2 Installation Procedure

This section covers installing the Lenovo Networking Openstack ML2 Driver plugin in a Multi Node environment with Redhat Enterprise Linux Openstack or Ubuntu LTS.

Download the Lenovo ML2 Driver

The ML2 installation files can be downloaded from Lenovo Stackforge Github site with “git clone” as shown here:

```
% sudo git clone https://github.com/lenovo/networking-lenovo.git -b newton-ocata
```

Setup the Lenovo ML2 Plugin

Next, install the plugin:

```
% cd networking-lenovo
% sudo python setup.py install
```

Redhat Openstack Setup

Follow the steps below to set up OpenStack on Redhat.

Update the ML2 Configuration

Edit the ml2 configuration files with some basic information on the use of VLANs for networking and add local switch information.

```
% cd /etc/neutron/plugins/ml2
```

Change the file `ml2_conf.ini` as follows:

```
% sudo vi ml2_conf.ini,
- change tenant_network_types = vlan
- change mechanism_drivers = openvswitch, lenovo
- copy everything in ml2_conf_lenovo.ini, and concatenate to ml2_conf.ini

*** change this section according to network setup requirements, add the
IP address of switch(es), connection details, and change the hostname for
servers
```

If you encounter any problems, see [Troubleshooting the Installation](#).

Neutron Database Migration

Migrate the neutron database:

```
% sudo neutron-db-manage --config-file /etc/neutron/neutron.conf  
--config-file /etc/neutron/plugins/ml2/ml2_conf.ini upgrade head
```

Restart the Neutron server:

```
% sudo systemctl restart neutron-server.service
```

Note: Exiting MySQL is required for this step.

If you encounter any problems, see [tblshint](#).

Ubuntu Openstack Setup

Follow the steps below to set up OpenStack on Ubuntu.

Update the ML2 Configuration

Edit the ml2 configuration files with some basic information on the use of VLANs for networking and add local switch information.

```
% cd /etc/neutron/plugins/ml2
```

Change the file `ml2_conf.ini` as follows:

```
% sudo vi ml2_conf.ini,  
- change tenant_network_types = vlan  
- change mechanism_drivers = openvswitch, lenovo  
- copy everything in ml2_conf_lenovo.ino, and concatenate to ml2_conf.ini  
  
*** change this section according to network setup requirements, add the  
IP address of switch(es), connection details, and change the hostname for  
servers
```

Neutron Database Migration

Migrate the neutron database:

```
% sudo neutron-db-manage -config-file /etc/neutron/neutron.conf  
-config-file /etc/neutron/plugins/ml2/ml2_conf.ini upgrade head
```

Start the neutron server:

```
% sudo service neutron-server restart
```

Note: Exiting MySQL is required for this step.

If you encounter any problems, see [“Troubleshooting the Installation.”](#)

Troubleshooting the Installation

If the server Neutron server does not start:

- Check the Neutron log file, located at `/var/log/neutron/server.log`.
- Verify that the OpenStack Neutron Plugin User Guide details are in the MySQL database:

```
% sudo mysql -u root -p -h [your IP address]
mysql> use neutron;
mysql> show tables;
```

Verify that the table `lenovo_ml2_nosport_bindings` is present.

Configuring the OpenStack Neutron Plugin

You need to modify two sections of the file:
`/etc/neutron/plugins/ml2/ml2_conf.ini`

1. In the sections listed in the following table, include *lenovo* in `mechanism_drivers`, and define `network_vlan_ranges` in the `ml2_type_vlan`.

```
[ml2]
tenant_network_types = vlan
type_drivers = local,flat,vlan,gre,vxlan
mechanism_drivers = openvswitch,lenovo
# (ListOpt) List of network type driver entrypoints to be loaded from
# the neutron.ml2.type_drivers namespace.
# type_drivers = local,flat,vlan,gre,vxlan
# Example: type_drivers = flat,vlan,gre,vxlan

# (ListOpt) Ordered list of network_types to allocate as tenant
# networks. The default value 'local' is useful for single-box testing
# But provides no connectivity between hosts.
# tenant_network_types = local
# Example: tenant_network_types = vlan,gre,vxlan

# (ListOpt) Ordered list of networking mechanism driver entrypoints
# to be loaded from the neutron.ml2.mechanism_drivers namespace.
# mechanism_drivers =
# Example: mechanism_drivers = openvswitch,mlnx
# Example: mechanism_drivers = arista
# Example: mechanism_drivers = cisco,logger
# Example: mechanism_drivers = openvswitch,brocade
# Example: mechanism_drivers = linuxbridge,brocade

# (ListOpt) Ordered list of extension driver entrypoints
# to be loaded from the neutron.ml2.extension_drivers namespace.
# extension_drivers =
# Example: extension_drivers = anewextensiondriver

[ml2_type_vlan]
# (ListOpt) List of <physical_network>[:<vlan_min>:<vlan_max>] tuples
# specifying physical_network names usable for VLAN provider and
# tenant networks, as well as ranges of VLAN tags on each
# physical_network available for allocation as tenant networks.
#
# Define the VLAN ranges (network_vlan_ranges).
# Example: network_vlan_ranges = physnet1:1000:2999,physnet2
network_vlan_ranges = default:1000:1999
```

2. Add the Lenovo switch information to the section `ml2_mech_lenovo` of this configuration file. Include the following information:
 - the hostname/IP address of the Switch
 - the hostname and port of any servers connected to the switch
 - the Lenovo switch credential username and password
 - the Portchannel or LACP number for Host connected with vLAG
 - `plugin_mode` option: Leave this option with no value or uncomment this option if a switch uses CNOS 10.5.1 or later, or ENOS 8.4.6 or later. Otherwise configure like this: `plugin_mode=compatible`

If SNMP is used to communicate with the switch, the information below is also required:

- SNMP port number
- SNMP version 3 is supported
- Community name
- SNMP user
- SNMP authentication and privacy keys (if they don't exist, assume the following values: NO_AUTH for the authentication key and NO_PRIV for the privacy key)
- SNMPv3 authentication option: SHA-96
- SNMPv3 privacy option: AES-128

Note: To ensure maximum security, only SNMP version 3 is supported. Also, the only available SNMPv3 authentication option is SHA-96 and the only available SNMPv3 privacy option is AES-128.

```
[m12_mech_lenovo:1.1.1.1]
# This is to let driver know SNMP protocol will be used to communicate
# with this switch.
protocol = SNMP

# Hostname and port used on the switch for this compute host.
compute01 = 10
compute02 = portchannel:64

# Port number where the SSH will be running at the Switch. Default is 22
# so this variable only needs to be configured if different.
ssh_port = 830

# Provide the login information to the switch.
username = user1
password = passwOrd

# Port number for SNMP.
snmp_port = 161

# SNMP version: 3.
snmp_version = 3

# SNMP community name.
snmp_community = private

# SNMP username.
snmp_user = adminshaaes

# SNMP Auth key and Priv key, if not exist, assume NO_AUTH and NO_PRIV.
snmp_authkey = key1
snmp_privkey = key2

# SNMP v3 auth option: SHA-96.
snmp_auth = SHA

# SNMP v2 priv option: AES-128.
snmp_priv = AES-128

# Uncomment plugin_mode option if a switch uses following image version:
#CNOS version 10.5.1 or later, or ENOS version 8.4.6 or later
#plugin_mode =compatible
```

Note: To ensure that the communication between the OpenStack Neutron Plugin and the switch is working properly, you may need to configure the SNMP feature on the switch. To do this, consult the *Lenovo Network Command Reference* and the *Lenovo Network Application Guide* associated with the switch and its Lenovo network operating system.

If RestAPI is used to communicate with the switch, the information below must be added to the `m12_conf.ini` configuration file:

- the Lenovo NOS version (`os = cnos`)
- the name of the protocol used to communicate (`protocol = rest`)
- the restAPI port number (`rest_tcp_port` - the default value is 8090; or port 443 when using HTTPS)

```
[m12_mech_lenovo:2.2.2.2]
# Lenovo NOS for switches running version 10.5.1.
os = cnos

# This is to let the driver know the RestApi protocol will be used to
# communicate with this switch running Lenovo NOS 10.1.
protocol = rest

# Port number for RestApi.
rest_tcp_port = 8090

# Hostname and port used on the switch for this compute host.
compute1 = port:1/20
compute2 = portchannel:300

# Provide the login information to the switch.
username = admin
password = admin

#Uncomment plugin_mode option if a switch uses following image version:
#CNOS version 10.5.1 or later, or ENOS version 8.4.6 or later
#plugin_mode =compatible
```

There may be several servers to switch port mapping per switch; this is only limited by the number of available ports.

As more switches and servers are added to the network, you need to update this file with those details.

Once this configuration is done, you can create networks from the Horizon dashboard or the OpenStack command line.

Removing the OpenStack Neutron Plugin

Follow the steps below to restore the network for OpenStack installation to the default state:

1. Uninstall Neutron:

```
% sudo pip uninstall neutron
```

2. Uninstall Lenovo vendor driver:

```
% sudo pip uninstall networking-lenovo
```

3. Re-install the default ML2 driver.

- On Redhat:

```
% sudo yum install openstack-neutron openstack-neutron-m12
```

- On Ubuntu or Debian:

```
% sudo apt-get install neutron-server neutron-plugin-m12
```

Your system is now running with the default Neutron configuration.

Product Support

This is a free and open source product from Lenovo. There are no support entitlements available for this plugin. Alternatively, customers can file an issue or request in the Openstack community with Launchpad.

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Contaminant	Limits
Gaseous	<ul style="list-style-type: none"> • Copper: Class G1 as per ANSI/ISA 71.04-1985³ • Silver: Corrosion rate of less than 300 Å in 30 days
<p>¹ ASHRAE 52.2-2008 - <i>Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size</i>. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.</p> <p>² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>³ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p>	

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Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU (früher 2004/108/EC) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der Klasse A der Norm gemäß Richtlinie.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmitteln

Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU (früher 2004/108/EC) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EU Richtlinie 2014/30/EU (früher 2004/108/EC), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die Lenovo (Deutschland) GmbH, Meitnerstr. 9, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.“

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.“ (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Japan VCCI Class A Statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Japan Electronics and Information Technology Industries Association (JEITA) Statement

高調波ガイドライン適合品

Japan Electronics and Information Technology Industries Association (JEITA)
Confirmed Harmonics Guidelines (products less than or equal to 20 A per phase)

高調波ガイドライン準用品

Japan Electronics and Information Technology Industries Association (JEITA)
Confirmed Harmonics Guidelines with Modifications (products greater than 20 A per phase).

Korea Communications Commission (KCC) Statement

이 기기는 업무용(A급)으로 전자파적합기기로
서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목
적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A).
Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для
снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，
可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者：
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

