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# **Networking Generic Switch Documentation**

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**OpenStack Foundation**

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# CONTENTS

<b>1</b>	<b>Supported Devices</b>	<b>1</b>
<b>2</b>	<b>Installation</b>	<b>3</b>
2.1	Enable genericswitch mechanism driver in Neutron . . . . .	3
<b>3</b>	<b>Configuration</b>	<b>5</b>
3.1	Examples . . . . .	5
<b>4</b>	<b>Developer Quick-Start</b>	<b>11</b>
<b>5</b>	<b>Deploying Networking-generic-switch with DevStack</b>	<b>13</b>
5.1	Test with OVS . . . . .	14
5.2	Test with real hardware: . . . . .	14
<b>6</b>	<b>Contributing</b>	<b>17</b>
6.1	Contributing to Networking-generic-switch . . . . .	17
<b>7</b>	<b>networking_generic_switch</b>	<b>19</b>
7.1	networking_generic_switch package . . . . .	19
<b>8</b>	<b>Indices and tables</b>	<b>37</b>
	<b>Python Module Index</b>	<b>39</b>
	<b>Index</b>	<b>41</b>



## SUPPORTED DEVICES

The following devices are supported by this plugin:

- Arista EOS
- Brocade ICX (FastIron)
- Cisco 300-series switches
- Cisco IOS switches
- Cumulus Linux (via NCLU)
- Dell Force10
- Dell PowerConnect
- HPE 5900 Series switches
- Huawei switches
- Juniper Junos OS switches
- OpenVSwitch
- Ruijie switches

This Mechanism Driver architecture allows easily to add more devices of any type.

```
OpenStack Neutron v2.0 => ML2 plugin => Generic Mechanism Driver => Device_
↳plugin
```

These device plugins use [Netmiko](#) library, which in turn uses *Paramiko* library to access and configure the switches via SSH protocol.



## INSTALLATION

This sections describes how to install and configure networking-generic-switch plugin.

At the command line:

```
$ pip install networking-generic-switch
```

Or, if you have virtualenvwrapper installed:

```
$ mkvirtualenv networking-generic-switch  
$ pip install networking-generic-switch
```

### 2.1 Enable genericswitch mechanism driver in Neutron

To enable mechanism drivers in the ML2 plug-in, edit the `/etc/neutron/plugins/ml2/ml2_conf.ini` file on the neutron server:

```
[ml2]  
mechanism_drivers = ovs,genericswitch
```





## CONFIGURATION

In order to use this mechanism driver the Neutron configuration file needs to be created/updated with the appropriate configuration information.

Switch configuration format:

```
[genericswitch:<switch name>]
device_type = <netmiko device type>
ngs_mac_address = <switch mac address>
ip = <IP address of switch>
port = <ssh port>
username = <credential username>
password = <credential password>
key_file = <ssh key file>
secret = <enable secret>

# If set ngs_port_default_vlan to default_vlan, switch's
# interface will restore the default_vlan.
ngs_port_default_vlan = <port default vlan>
```

---

**Note:** Switch will be selected by local\_link\_connection/switch\_info or ngs\_mac\_address. So, you can use the switch MAC address to identify switches if local\_link\_connection/switch\_info is not set.

---

### 3.1 Examples

Here is an example of /etc/neutron/plugins/ml2/ml2\_conf\_genericswitch.ini for the Cisco 300 series device:

```
[genericswitch:sw-hostname]
device_type = netmiko_cisco_s300
ngs_mac_address = <switch mac address>
username = admin
password = password
ip = <switch mgmt ip address>
```

for the Cisco IOS device:

```
[genericswitch:sw-hostname]
device_type = netmiko_cisco_ios
ngs_mac_address = <switch mac address>
username = admin
password = password
secret = secret
ip = <switch mgmt ip address>
```

for the Huawei VRPV3 or VRPV5 device:

```
[genericswitch:sw-hostname]
device_type = netmiko_huawei
ngs_mac_address = <switch mac address>
username = admin
password = password
port = 8222
secret = secret
ip = <switch mgmt ip address>
```

for the Huawei VRPV8 device:

```
[genericswitch:sw-hostname]
device_type = netmiko_huawei_vrpv8
ngs_mac_address = <switch mac address>
username = admin
password = password
port = 8222
secret = secret
ip = <switch mgmt ip address>
```

for the Arista EOS device:

```
[genericswitch:arista-hostname]
device_type = netmiko_arista_eos
ngs_mac_address = <switch mac address>
ip = <switch mgmt ip address>
username = admin
key_file = /opt/data/arista_key
```

for the Dell Force10 device:

```
[genericswitch:dell-hostname]
device_type = netmiko_dell_force10
ngs_mac_address = <switch mac address>
ip = <switch mgmt ip address>
username = admin
password = password
secret = secret
```

for the Dell PowerConnect device:

```
[genericswitch:dell-hostname]
device_type = netmiko_dell_powerconnect
ip = <switch mgmt ip address>
username = admin
password = password
secret = secret

# You can set ngs_switchport_mode according to switchmode you have set on
# the switch. The following options are supported: general, access. It
# will default to access mode if left unset. In general mode, the port
# be set to transmit untagged packets.
ngs_switchport_mode = access
```

Dell PowerConnect devices have been seen to have issues with multiple concurrent configuration sessions. See *Synchronization* for details on how to limit the number of concurrent active connections to each device.

for the Brocade FastIron (ICX) device:

```
[genericswitch:hostname-for-fast-iron]
device_type = netmiko_brocade_fastiron
ngs_mac_address = <switch mac address>
ip = <switch mgmt ip address>
username = admin
password = password
```

for the Ruijie device:

```
[genericswitch:sw-hostname]
device_type = netmiko_ruijie
ngs_mac_address = <switch mac address>
username = admin
password = password
secret = secret
ip = <switch mgmt ip address>
```

for the HPE 5900 Series device:

```
[genericswitch:sw-hostname]
device_type = netmiko_hp_comware
username = admin
password = password
ip = <switch mgmt ip address>
```

for the Juniper Junos OS device:

```
[genericswitch:hostname-for-juniper]
device_type = netmiko_juniper
ip = <switch mgmt ip address>
username = admin
password = password
```

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```
ngs_commit_timeout = <optional commit timeout (seconds)>
ngs_commit_interval = <optional commit interval (seconds)>
```

for a Cumulus Linux device:

```
[genericswitch:hostname-for-cumulus]
device_type = netmiko_cumulus
ip = <switch mgmt_ip address>
username = admin
password = password
secret = secret
ngs_mac_address = <switch mac address>
```

for the Nokia SRL series device:

```
[genericswitch:sw-hostname]
device_type = netmiko_nokia_srl
username = admin
password = password
ip = <switch mgmt ip address>
```

for a Pluribus switch:

```
[genericswitch:sw-hostname]
device_type = netmiko_pluribus
username = admin
password = password
ip = <switch mgmt ip address>
```

Additionally the GenericSwitch mechanism driver needs to be enabled from the ml2 config file `/etc/neutron/plugins/ml2/ml2_conf.ini`:

```
[ml2]
tenant_network_types = vlan
type_drivers = local,flat,vlan,gre,vxlan
mechanism_drivers = openvswitch,genericswitch
...
...
```

(Re)start `neutron-server` specifying this additional configuration file:

```
neutron-server \
  --config-file /etc/neutron/neutron.conf \
  --config-file /etc/neutron/plugins/ml2/ml2_conf.ini \
  --config-file /etc/neutron/plugins/ml2/ml2_conf_genericswitch.ini
```

### 3.1.1 Synchronization

Some devices are limited in the number of concurrent SSH sessions that they can support, or do not support concurrent configuration database updates. In these cases it can be useful to use an external service to synchronize access to the managed devices. This synchronization is provided by the [Tooz library](#), which provides support for a number of different backends, including Etcd, ZooKeeper, and others. A connection URL for the backend should be configured as follows:

```
[ngs_coordination]
backend_url = <backend URL>
```

The default is to limit the number of concurrent active connections to each device to one, but the number may be configured per-device as follows:

```
[genericswitch:device-hostname]
ngs_max_connections = <max connections>
```

When synchronization is used, each Neutron thread executing the networking-generic-switch plugin will attempt to acquire a lock, with a default timeout of 60 seconds before failing. This timeout can be configured as follows (setting it to 0 means no timeout):

```
[ngs_coordination]
...
acquire_timeout = <timeout in seconds>
```

### 3.1.2 Disabling Inactive Ports

By default, switch interfaces remain administratively enabled when not in use, and the access VLAN association is removed. On most devices, this will cause the interface to be a member of the default VLAN, usually VLAN 1. This could be a security issue, with unallocated ports having access to a shared network.

To resolve this issue, it is possible to configure interfaces as administratively down when not in use. This is done on a per-device basis, using the `ngs_disable_inactive_ports` flag:

```
[genericswitch:device-hostname]
ngs_disable_inactive_ports = <optional boolean>
```

This is currently supported by the following devices:

- Juniper Junos OS

### 3.1.3 Network Name Format

By default, when a network is created on a switch, if the switch supports assigning names to VLANs, they are assigned a name of the neutron network UUID. For example:

```
8f60256e4b6343bf873026036606ce5e
```

It is possible to use a different format for the network name using the `ngs_network_name_format` option. This option uses Python string formatting syntax, and accepts the parameters `{network_id}` and `{segmentation_id}`. For example:

```
[genericswitch:device-hostname]
ngs_network_name_format = neutron-{network_id}-{segmentation_id}
```

Some switches have issues assigning VLANs a name that starts with a number, and this configuration option can be used to avoid this.

### 3.1.4 Manage VLANs

By default, on network creation VLANs are added to all switches. In a similar way, VLANs are removed when it seems they are no longer required. However, in some cases only a subset of the ports are managed by Neutron. In a similar way, when multiple switches are used, it is very common that the network administrator restricts the VLANs allowed. In these cases, there is little utility in adding and removing vlans on the switches. This process takes time, so not doing this can speed up a number of common operations. A particular case where this can cause problems is when a VLAN used for the switch management interface, or any other port not managed by Neutron, is removed by this Neutron driver.

To stop networking generic switch trying to add or remove VLANs on the switch administrator are expected to pre-add all enabled VLANs. Once those VLANs are preconfigured on the switch, you can use the following configuration to stop networking generic switch adding or removing any VLANs:

```
[genericswitch:device-hostname]
ngs_manage_vlans = False
```

## DEVELOPER QUICK-START

This is a quick walk through to get you started developing code for Networking-generic-switch. This assumes you are already familiar with submitting code reviews to an OpenStack project.





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## DEPLOYING NETWORKING-GENERIC-SWITCH WITH DEVSTACK

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DevStack may be configured to deploy Networking-generic-switch, setup Neutron to use the Networking-generic-switch ML2 driver. It is highly recommended to deploy on an expendable virtual machine and not on your personal work station. Deploying Networking-generic-switch with DevStack requires a machine running Ubuntu 14.04 (or later) or Fedora 20 (or later).

### See also:

<https://docs.openstack.org/devstack/latest/>

Devstack will no longer create the user stack with the desired permissions, but does provide a script to perform the task:

```
git clone https://github.com/openstack-dev/devstack.git devstack
sudo ./devstack/tools/create-stack-user.sh
```

Switch to the stack user and clone DevStack:

```
sudo su - stack
git clone https://github.com/openstack-dev/devstack.git devstack
```

Create devstack/local.conf with minimal settings required to enable Networking-generic-switch. Here is an example of local.conf:

```
[[local|localrc]]
# Set credentials
ADMIN_PASSWORD=secrete
DATABASE_PASSWORD=secrete
RABBIT_PASSWORD=secrete
SERVICE_PASSWORD=secrete
SERVICE_TOKEN=secrete

# Enable minimal required services
ENABLED_SERVICES="dstat,mysql,rabbit,key,q-svc,q-agt,q-dhcp"

# Enable networking-generic-switch plugin
enable_plugin networking-generic-switch https://review.openstack.org/
↔openstack/networking-generic-switch

# Configure Neutron
OVS_PHYSICAL_BRIDGE=brbm
PHYSICAL_NETWORK=mynetwork
```

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```
Q_PLUGIN=ml2
ENABLE_TENANT_VLANS=True
Q_ML2_TENANT_NETWORK_TYPE=vlan
TENANT_VLAN_RANGE=100:150

# Configure logging
LOGFILE=$HOME/devstack.log
LOGDIR=$HOME/logs
```

Run stack.sh:

```
./stack.sh
```

Source credentials:

```
source ~/devstack/openrc admin admin
```

## 5.1 Test with OVS

Launch `exercise.sh` from `networking-generic-switch`. This script creates port in Neutron/update it with `local_link_information` and verifies that ovs port has been assigned to correct VLAN:

```
bash ~/networking-generic-switch/devstack/exercise.sh
```

## 5.2 Test with real hardware:

Add information about hardware switch to `Networking-generic-switch config /etc/neutron/plugins/ml2/ml2_conf_genericswitch.ini` and restart Neutron server:

```
[genericswitch:cisco_switch_1]
device_type = netmiko_cisco_ios
ip = 1.2.3.4
username = cisco
password = cisco
secret = enable_password
```

Get current configuration of the port on the switch, for example for Cisco IOS device:

```
sh running-config int gig 0/12
Building configuration...

Current configuration : 283 bytes
!
interface GigabitEthernet0/12
  switchport mode access
end
```

Run `exercise.py` to create/update Neutron port. It will print VLAN id to be assigned:

```
$ neutron net-create test
$ python ~/networking-generic-switch/devstack/exercise.py --switch_name cisco_
↪switch_1 --port Gig0/12 --switch_id=06:58:1f:e7:b4:44 --network test
126
```

Verify that VLAN has been changed on the switch port, for example for Cisco IOS device:

```
sh running-config int gig 0/12
Building configuration...

Current configuration : 311 bytes
!
interface GigabitEthernet0/12
  switchport access vlan 126
  switchport mode access
end
```



**CONTRIBUTING**

## 6.1 Contributing to Networking-generic-switch

If you would like to contribute to the development of GenericSwitch project, you must follow the general OpenStack community procedures documented at:

<https://docs.openstack.org/infra/manual/developers.html#development-workflow>

Pull requests submitted through GitHub will be ignored.

### 6.1.1 Contributor License Agreement

In order to contribute to the GenericSwitch project, you need to have signed OpenStack's contributors agreement.

**See also:**

- <https://docs.openstack.org/infra/manual/developers.html>
- <https://wiki.openstack.org/CLA>

### 6.1.2 Related Projects

- <https://docs.openstack.org/neutron/latest>
- <https://docs.openstack.org/ironic/latest>

### 6.1.3 Project Hosting Details

**Bug tracker** <https://storyboard.openstack.org/#!/project/956>

**Code Hosting** <https://opendev.org/openstack/networking-generic-switch>

**Code Review** <https://review.opendev.org/#/q/status:open+project:openstack/networking-generic-switch,n,z>

## 6.1.4 Creating new device plugins

1. Subclass the abstract class `networking_generic_switch.devices.GenericSwitch` and implement all the abstract methods it defines.
  - **Your class must accept a single argument for instantiation** - a dictionary with all fields given in the device config section of the ML2 plugin config. This will be available as `self.config` in the instantiated object.
2. Register your class under `generic_switch.devices` entrypoint.
3. Add your device config to the plugin configuration file (`/etc/neutron/plugins/ml2/ml2_conf_genericswitch.ini` by default). The only required option is `device_type` that must be equal to the entrypoint you have registered your plugin under, as it is used for plugin lookup (see provided Netmiko-based plugins for example).

## NETWORKING\_GENERIC\_SWITCH

### 7.1 networking\_generic\_switch package

#### 7.1.1 Subpackages

networking\_generic\_switch.devices package

Subpackages

networking\_generic\_switch.devices.netmiko\_devices package

Submodules

networking\_generic\_switch.devices.netmiko\_devices.arista module

```
class networking_generic_switch.devices.netmiko_devices.arista.AristaEos(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch
    ADD_NETWORK = ('vlan {segmentation_id}', 'name {network_name}')
    DELETE_NETWORK = ('no vlan {segmentation_id}',)
    DELETE_PORT = ('interface {port}', 'no switchport access vlan
{segmentation_id}', 'no switchport mode trunk', 'switchport trunk allowed
vlan none')
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'switchport mode access',
'switchport access vlan {segmentation_id}')
```

networking\_generic\_switch.devices.netmiko\_devices.brocade module

```
class networking_generic_switch.devices.netmiko_devices.brocade.BrocadeFastIron(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch
    ADD_NETWORK = ('vlan {segmentation_id} by port', 'name {network_name}')
    DELETE_NETWORK = ('no vlan {segmentation_id}',)
```

```
DELETE_PORT = ('vlan {segmentation_id} by port', 'no untagged ether
{port}')

PLUG_PORT_TO_NETWORK = ('vlan {segmentation_id} by port', 'untagged ether
{port}')

QUERY_PORT = ('show interfaces ether {port} | include VLAN',)

clean_port_vlan_if_necessary(port)

get_wrong_vlan(port)

plug_port_to_network(port, segmentation_id)
```

### networking\_generic\_switch.devices.netmiko\_devices.cisco module

```
class networking_generic_switch.devices.netmiko_devices.cisco.CiscoIos(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch
    ADD_NETWORK = ('vlan {segmentation_id}', 'name {network_name}')
    DELETE_NETWORK = ('no vlan {segmentation_id}',)
    DELETE_PORT = ('interface {port}', 'no switchport access vlan
{segmentation_id}', 'no switchport mode trunk', 'switchport trunk allowed
vlan none')
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'switchport mode access',
'switchport access vlan {segmentation_id}')
```

### networking\_generic\_switch.devices.netmiko\_devices.cisco300 module

```
class networking_generic_switch.devices.netmiko_devices.cisco300.Cisco300(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch
    ADD_NETWORK = ('vlan {segmentation_id}',)
    DELETE_NETWORK = ('no vlan {segmentation_id}',)
    DELETE_PORT = ('interface {port}', 'no switchport access vlan',
'switchport trunk allowed vlan remove all')
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'switchport mode access',
'switchport access vlan {segmentation_id}')
```



**networking\_generic\_switch.devices.netmiko\_devices.cumulus module****class** networking\_generic\_switch.devices.netmiko\_devices.cumulus.**Cumulus**(*device\_cfg*)Bases: *networking\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch*

Built for Cumulus 4.x

Note for this switch you want config like this, where secret is the password needed for sudo su:

```
[genericswitch:<hostname>] device_type = netmiko_cumulus ip = <ip> username = <user-  
name> password = <password> secret = <password for sudo> ngs_physical_networks = physnet1  
ngs_max_connections = 1 ngs_port_default_vlan = 123 ngs_disable_inactive_ports = False
```

**ADD\_NETWORK** = ['net add vlan {segmentation\_id}']**DELETE\_NETWORK** = ['net del vlan {segmentation\_id}']**DELETE\_PORT** = ['net del interface {port} bridge access {segmentation\_id}']**DISABLE\_BOND** = ['net add bond {bond} link down']**DISABLE\_PORT** = ['net add interface {port} link down']**ENABLE\_BOND** = ['net del bond {bond} link down']**ENABLE\_PORT** = ['net del interface {port} link down']**ERROR\_MSG\_PATTERNS** = [re.compile('ERROR: Command not found.'),  
re.compile('command not found'), re.compile('is not a physical interface  
on this switch')]

Sequence of error message patterns.

Sequence of re.RegexObject objects representing patterns to check for in device output that indicate a failure to apply configuration.

**NETMIKO\_DEVICE\_TYPE** = 'linux'**PLUG\_BOND\_TO\_NETWORK** = ['net add bond {bond} bridge access  
{segmentation\_id}']**PLUG\_PORT\_TO\_NETWORK** = ['net add interface {port} bridge access  
{segmentation\_id}']**SAVE\_CONFIGURATION** = ['net commit']**UNPLUG\_BOND\_FROM\_NETWORK** = ['net del bond {bond} bridge access  
{segmentation\_id}']

**networking\_generic\_switch.devices.netmiko\_devices.dell module**

```
class networking_generic_switch.devices.netmiko_devices.dell.DellNos(device_cfg)
```

Bases: *networking\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch*

Netmiko device driver for Dell Force10 (OS9) switches.

```
ADD_NETWORK = ('interface vlan {segmentation_id}', 'description  
{network_name}', 'exit')
```

```
ADD_NETWORK_TO_TRUNK = ('interface vlan {segmentation_id}', 'tagged  
{port}', 'exit')
```

```
DELETE_NETWORK = ('no interface vlan {segmentation_id}', 'exit')
```

```
DELETE_PORT = ('interface vlan {segmentation_id}', 'no untagged {port}',  
'exit')
```

```
PLUG_PORT_TO_NETWORK = ('interface vlan {segmentation_id}', 'untagged  
{port}', 'exit')
```

```
REMOVE_NETWORK_FROM_TRUNK = ('interface vlan {segmentation_id}', 'no  
tagged {port}', 'exit')
```

```
class networking_generic_switch.devices.netmiko_devices.dell.DellPowerConnect(device_cfg)
```

Bases: *networking\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch*

Netmiko device driver for Dell PowerConnect switches.

```
ADD_NETWORK = ('vlan database', 'vlan {segmentation_id}', 'exit')
```

```
ADD_NETWORK_TO_TRUNK = ('interface {port}', 'switchport general allowed  
vlan add {segmentation_id} tagged', 'exit')
```

```
DELETE_NETWORK = ('vlan database', 'no vlan {segmentation_id}', 'exit')
```

```
DELETE_PORT = ('interface {port}', 'switchport access vlan none', 'exit')
```

```
DELETE_PORT_GENERAL = ('interface {port}', 'switchport general allowed  
vlan remove {segmentation_id}', 'no switchport general pvid', 'exit')
```

```
ERROR_MSG_PATTERNS = (re.compile('\\% Incomplete command'),  
re.compile('VLAN was not created by user'), re.compile('Configuration  
Database locked by another application \\- try later'))
```

Sequence of error message patterns.

Sequence of re.RegexObject objects representing patterns to check for in device output that indicate a failure to apply configuration.

```
PLUG_PORT_TO_NETWORK = ('interface {port}', 'switchport access vlan  
{segmentation_id}', 'exit')
```

```
PLUG_PORT_TO_NETWORK_GENERAL = ('interface {port}', 'switchport general  
allowed vlan add {segmentation_id} untagged', 'switchport general pvid  
{segmentation_id}', 'exit')
```

```
REMOVE_NETWORK_FROM_TRUNK = ('interface {port}', 'switchport general  
allowed vlan remove {segmentation_id}', 'exit')
```

### networking\_generic\_switch.devices.netmiko\_devices.hpe module

```
class networking_generic_switch.devices.netmiko_devices.hpe.HpeComware(device_cfg)  
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch  
    ADD_NETWORK = ('vlan {segmentation_id}',)  
    DELETE_NETWORK = ('undo vlan {segmentation_id}',)  
    DELETE_PORT = ('interface {port}', 'undo port access vlan')  
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'port link-type access', 'port  
access vlan {segmentation_id}')
```

### networking\_generic\_switch.devices.netmiko\_devices.huawei module

```
class networking_generic_switch.devices.netmiko_devices.huawei.Huawei(device_cfg)  
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch  
    For Huawei Network Operating System VRP V3 and V5.  
    ADD_NETWORK = ('vlan {segmentation_id}',)  
    DELETE_NETWORK = ('undo vlan {segmentation_id}',)  
    DELETE_PORT = ('interface {port}', 'undo port default vlan  
{segmentation_id}')
```

```
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'port link-type access', 'port  
default vlan {segmentation_id}')
```

### networking\_generic\_switch.devices.netmiko\_devices.huawei\_vrpv8 module

```
class networking_generic_switch.devices.netmiko_devices.huawei_vrpv8.Huawei(device_cfg)  
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch  
    For Huawei Next-Generation Network Operating System VRP V8.  
    ADD_NETWORK = ('vlan {segmentation_id}', 'commit')  
    DELETE_NETWORK = ('undo vlan {segmentation_id}', 'commit')  
    DELETE_PORT = ('interface {port}', 'undo port default vlan  
{segmentation_id}', 'commit')
```

```
    PLUG_PORT_TO_NETWORK = ('interface {port}', 'port link-type access', 'port  
default vlan {segmentation_id}', 'commit')
```

**networking\_generic\_switch.devices.netmiko\_devices.juniper module**

```
class networking_generic_switch.devices.netmiko_devices.juniper.Juniper(device_cfg)
```

Bases: *networking\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch*

```
ADD_NETWORK = ('set vlans {network_name} vlan-id {segmentation_id}',)
```

```
ADD_NETWORK_TO_TRUNK = ('set interfaces {port} unit 0 family ethernet-switching vlan members {segmentation_id}',)
```

```
DELETE_NETWORK = ('delete vlans {network_name}',)
```

```
DELETE_PORT = ('delete interfaces {port} unit 0 family ethernet-switching vlan members',)
```

```
DISABLE_PORT = ('set interfaces {port} disable',)
```

```
ENABLE_PORT = ('delete interfaces {port} disable',)
```

```
PLUG_PORT_TO_NETWORK = ('delete interfaces {port} unit 0 family ethernet-switching vlan members', 'set interfaces {port} unit 0 family ethernet-switching vlan members {segmentation_id}')
```

```
REMOVE_NETWORK_FROM_TRUNK = ('delete interfaces {port} unit 0 family ethernet-switching vlan members {segmentation_id}',)
```

```
save_configuration(net_connect)
```

Save the devices configuration.

**Parameters** `net_connect` a netmiko connection object.

**Raises** `GenericSwitchNetmikoConfigError` if saving the configuration fails.

```
send_config_set(net_connect, cmd_set)
```

Send a set of configuration lines to the device.

**Parameters**

- `net_connect` a netmiko connection object.
- `cmd_set` a list of configuration lines to send.

**Returns** The output of the configuration commands.

**networking\_generic\_switch.devices.netmiko\_devices.mellanox\_mlnxos module**

```
class networking_generic_switch.devices.netmiko_devices.mellanox_mlnxos.MellanoxMlnxOS(device_cfg)
```

Bases: *networking\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch*

```
ADD_NETWORK = ('vlan {segmentation_id}', 'name {network_id}')
```

```
DELETE_NETWORK = ('no vlan {segmentation_id}',)
```

```
DELETE_PORT = ('interface ethernet {port}', 'no switchport access vlan', 'no switchport mode')
```

```
PLUG_PORT_TO_NETWORK = ('interface ethernet {port}', 'switchport mode
access', 'switchport access vlan {segmentation_id}')
```

## networking\_generic\_switch.devices.netmiko\_devices.nokia module

```
class networking_generic_switch.devices.netmiko_devices.nokia.NokiaSRL(device_cfg)
```

```
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch
```

```
ADD_NETWORK = ('set tunnel-interface vxlan0 vxlan-interface
{segmentation_id} type bridged', 'set tunnel-interface vxlan0
vxlan-interface {segmentation_id} ingress vni {segmentation_id}', 'set
tunnel-interface vxlan0 vxlan-interface {segmentation_id} egress source-ip
use-system-ipv4-address', 'set network-instance mac-vrf-{segmentation_id}
type mac-vrf', 'set network-instance mac-vrf-{segmentation_id} description
OS-Network-ID-{network_name}', 'set network-instance
mac-vrf-{segmentation_id} vxlan-interface vxlan0.{segmentation_id}', 'set
network-instance mac-vrf-{segmentation_id} protocols bgp-evpn bgp-instance
1 vxlan-interface vxlan0.{segmentation_id}', 'set network-instance
mac-vrf-{segmentation_id} protocols bgp-evpn bgp-instance 1 evi
{segmentation_id}', 'set network-instance mac-vrf-{segmentation_id}
protocols bgp-evpn bgp-instance 1 ecmp 8', 'set network-instance
mac-vrf-{segmentation_id} protocols bgp-vpn bgp-instance 1 route-target
export-rt target:1:{segmentation_id}', 'set network-instance
mac-vrf-{segmentation_id} protocols bgp-vpn bgp-instance 1 route-target
import-rt target:1:{segmentation_id}')
```

```
DELETE_NETWORK = ('delete network-instance mac-vrf-{segmentation_id}',
'delete tunnel-interface vxlan0 vxlan-interface {segmentation_id}')
```

```
DELETE_PORT = ('delete network-instance mac-vrf-{segmentation_id}
interface {port}.{segmentation_id}', 'delete interface {port} subinterface
{segmentation_id}')
```

```
PLUG_PORT_TO_NETWORK = ('set interface {port} subinterface
{segmentation_id} type bridged', 'set network-instance
mac-vrf-{segmentation_id} interface {port}.{segmentation_id}')
```

```
commit(net_connect) → str
```

Try to commit the Nokia SRL configuration.

Parameters **net\_connect** a netmiko connection object.

```
send_commands_to_device(cmd_set)
```

### networking\_generic\_switch.devices.netmiko\_devices.ovs module

```
class networking_generic_switch.devices.netmiko_devices.ovs.OvsLinux(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch

    DELETE_PORT = ('ovs-vsctl clear port {port} tag', 'ovs-vsctl clear port
    {port} trunks', 'ovs-vsctl clear port {port} vlan_mode')

    PLUG_PORT_TO_NETWORK = ('ovs-vsctl set port {port} vlan_mode=access',
    'ovs-vsctl set port {port} tag={segmentation_id}')
```

### networking\_generic\_switch.devices.netmiko\_devices.pluribus module

```
class networking_generic_switch.devices.netmiko_devices.pluribus.Pluribus(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch

    ADD_NETWORK = ('vlan-create id {segmentation_id} scope fabric ports none
    description {network_name} auto-vxlan',)

    DELETE_NETWORK = ('vlan-delete id {segmentation_id}',)

    DELETE_PORT = ('vlan-port-remove vlan-range all ports {port}',)

    PLUG_PORT_TO_NETWORK = ('vlan-port-remove vlan-range all ports {port}',
    'port-vlan-add port {port} untagged-vlan {segmentation_id}')
```

### networking\_generic\_switch.devices.netmiko\_devices.ruijie module

```
class networking_generic_switch.devices.netmiko_devices.ruijie.Ruijie(device_cfg)
    Bases: networking_generic_switch.devices.netmiko_devices.NetmikoSwitch

    ADD_NETWORK = ('vlan {segmentation_id}', 'name {network_name}')

    DELETE_NETWORK = ('no vlan {segmentation_id}',)

    DELETE_PORT = ('interface {port}', 'no switchport access vlan
    {segmentation_id}', 'no switchport mode trunk', 'switchport trunk allowed
    vlan none')

    PLUG_PORT_TO_NETWORK = ('interface {port}', 'switchport mode access',
    'switchport access vlan {segmentation_id}')
```

**networking\_generic\_switch.devices.netmiko\_devices.sonic module**

**class** `networking_generic_switch.devices.netmiko_devices.sonic.Sonic(device_cfg)`

Bases: `networking_generic_switch.devices.netmiko_devices.NetmikoSwitch`

Built for SONiC 3.x

Note for this switch you want config like this, where secret is the password needed for sudo su:

```
[genericswitch:<hostname>] device_type = netmiko_sonic ip = <ip> username = <username>
password = <password> secret = <password for sudo> ngs_physical_networks = physnet1
ngs_max_connections = 1 ngs_port_default_vlan = 123 ngs_disable_inactive_ports = False
```

```
ADD_NETWORK = ['config vlan add {segmentation_id}']
```

```
ADD_NETWORK_TO_TRUNK = ['config vlan member add {segmentation_id} {port}']
```

```
DELETE_NETWORK = ['config vlan del {segmentation_id}']
```

```
DELETE_PORT = ['config vlan member del {segmentation_id} {port}']
```

```
ERROR_MSG_PATTERNS = [re.compile("VLAN[0-9]+ doesn\\\'t exist"),
re.compile('Invalid Vlan Id , Valid Range : 1 to 4094'),
re.compile('Interface name is invalid!!'), re.compile('No such command')]
```

Sequence of error message patterns.

Sequence of `re.RegexObject` objects representing patterns to check for in device output that indicate a failure to apply configuration.

```
NETMIKO_DEVICE_TYPE = 'linux'
```

```
PLUG_PORT_TO_NETWORK = ['config vlan member add -u {segmentation_id}
{port}']
```

```
REMOVE_NETWORK_FROM_TRUNK = ['config vlan member del {segmentation_id}
{port}']
```

```
SAVE_CONFIGURATION = ['config save -y']
```

`send_config_set(net_connect, cmd_set)`

Send a set of configuration lines to the device.

**Parameters**

- **net\_connect** a netmiko connection object.
- **cmd\_set** a list of configuration lines to send.

**Returns** The output of the configuration commands.

## Module contents

**class** `networking_generic_switch.devices.netmiko_devices.NetmikoSwitch`(*device\_cfg*)

Bases: `networking_generic_switch.devices.GenericSwitchDevice`

**ADD\_NETWORK** = None

**ADD\_NETWORK\_TO\_TRUNK** = None

**DELETE\_NETWORK** = None

**DELETE\_PORT** = None

**DISABLE\_BOND** = None

**DISABLE\_PORT** = None

**ENABLE\_BOND** = None

**ENABLE\_PORT** = None

**ERROR\_MSG\_PATTERNS** = ()

Sequence of error message patterns.

Sequence of `re.RegexObject` objects representing patterns to check for in device output that indicate a failure to apply configuration.

**NETMIKO\_DEVICE\_TYPE** = None

**PLUG\_BOND\_TO\_NETWORK** = None

**PLUG\_PORT\_TO\_NETWORK** = None

**REMOVE\_NETWORK\_FROM\_TRUNK** = None

**SAVE\_CONFIGURATION** = None

**UNPLUG\_BOND\_FROM\_NETWORK** = None

**add\_network**(*segmentation\_id, network\_id*)

**check\_output**(*output, operation*)

Check the output from the device following an operation.

Drivers should implement this method to handle output from devices and perform any checks necessary to validate that the configuration was applied successfully.

### Parameters

- **output** Output from the device.
- **operation** Operation being attempted. One of add network, delete network, plug port, unplug port.

**Raises** `GenericSwitchNetmikoConfigError` if the driver detects that an error has occurred.

**del\_network**(*segmentation\_id, network\_id*)



**delete\_port**(*port, segmentation\_id*)

**plug\_bond\_to\_network**(*bond, segmentation\_id*)

**plug\_port\_to\_network**(*port, segmentation\_id*)

**save\_configuration**(*net\_connect*)

Try to save the devices configuration.

**Parameters** **net\_connect** a netmiko connection object.

**send\_commands\_to\_device**(*cmd\_set*)

**send\_config\_set**(*net\_connect, cmd\_set*)

Send a set of configuration lines to the device.

**Parameters**

- **net\_connect** a netmiko connection object.
- **cmd\_set** a list of configuration lines to send.

**Returns** The output of the configuration commands.

**unplug\_bond\_from\_network**(*bond, segmentation\_id*)

`networking_generic_switch.devices.netmiko_devices.check_output`(*operation*)

Returns a decorator that checks the output of an operation.

**Parameters** **operation** Operation being attempted. One of add network, delete network, plug port, unplug port.

## Submodules

### `networking_generic_switch.devices.utils` module

`networking_generic_switch.devices.utils.get_hostname`()

Helper to allow isolation of CONF.host and plugin loading.

`networking_generic_switch.devices.utils.get_switch_device`(*switches,*  
*switch\_info=None,*  
*ngs\_mac\_address=None*)

Return switch device by specified identifier.

Returns switch device from switches array that matched with any of passed identifiers. `ngs_mac_address` takes precedence over `switch_info`, if didnt match any address based on mac fallback to `switch_info`.

**Parameters**

- **switch\_info** hostname of the switch or any other switch identifier.
- **ngs\_mac\_address** Normalized mac address of the switch.

**Returns** switch device matches by specified identifier or None.

`networking_generic_switch.devices.utils.sanitise_config(config)`

Return a sanitised configuration of a switch device.

**Parameters** `config` a configuration dict to sanitise.

**Returns** a copy of the configuration, with sensitive fields removed.

## Module contents

`class networking_generic_switch.devices.GenericSwitchDevice(device_cfg)`

Bases: `object`

**abstract** `add_network(segmentation_id, network_id)`

**abstract** `del_network(segmentation_id, network_id)`

**abstract** `delete_port(port_id, segmentation_id)`

`plug_bond_to_network(bond_id, segmentation_id)`

**abstract** `plug_port_to_network(port_id, segmentation_id)`

`unplug_bond_from_network(bond_id, segmentation_id)`

`networking_generic_switch.devices.device_manager(device_cfg)`

## 7.1.2 Submodules

### 7.1.3 `networking_generic_switch.config` module

`networking_generic_switch.config.get_devices()`

Parse supplied config files and fetch defined supported devices.

### 7.1.4 `networking_generic_switch.exceptions` module

**exception** `networking_generic_switch.exceptions.GenericSwitchConfigException(**kwards)`

Bases: `neutron_lib.exceptions.NeutronException`

`message = '%(option)s must be one of: %(allowed_options)s'`

**exception** `networking_generic_switch.exceptions.GenericSwitchEntrypointLoadError(**kwards)`

Bases: `networking_generic_switch.exceptions.GenericSwitchException`

`message = 'Failed to load endpoint %(ep)s: %(err)s'`

**exception** `networking_generic_switch.exceptions.GenericSwitchException(**kwards)`

Bases: `neutron_lib.exceptions.NeutronException`

`message = '%(method)s failed.'`

**exception** `networking_generic_switch.exceptions.GenericSwitchNetmikoConfigError(**kwards)`

Bases: `networking_generic_switch.exceptions.GenericSwitchException`

```
message = 'Netmiko configuration error: %(config)s, error: %(error)s'
```

```
exception networking_generic_switch.exceptions.GenericSwitchNetmikoConnectError(**kwargs)
```

```
Bases: networking_generic_switch.exceptions.GenericSwitchException
```

```
message = 'Netmiko connection error: %(config)s, error: %(error)s'
```

```
exception networking_generic_switch.exceptions.GenericSwitchNetmikoMethodError(**kwargs)
```

```
Bases: networking_generic_switch.exceptions.GenericSwitchException
```

```
message = 'Can not parse arguments: commands %(cmds)s, args %(args)s'
```

```
exception networking_generic_switch.exceptions.GenericSwitchNetmikoNotSupported(**kwargs)
```

```
Bases: networking_generic_switch.exceptions.GenericSwitchException
```

```
message = 'Netmiko does not support device type %(device_type)s'
```

```
exception networking_generic_switch.exceptions.GenericSwitchNetworkNameFormatInvalid(**kwargs)
```

```
Bases: networking_generic_switch.exceptions.GenericSwitchException
```

```
message = "Invalid value for 'ngs_network_name_format': %(name_format)s.  
Valid format options include 'network_id' and 'segmentation_id'"
```

### 7.1.5 networking\_generic\_switch.generic\_switch\_mech module

```
class networking_generic_switch.generic_switch_mech.GenericSwitchDriver
```

```
Bases: neutron_lib.plugins.ml2.api.MechanismDriver
```

```
bind_port(context)
```

Attempt to bind a port.

**Parameters context** PortContext instance describing the port

This method is called outside any transaction to attempt to establish a port binding using this mechanism driver. Bindings may be created at each of multiple levels of a hierarchical network, and are established from the top level downward. At each level, the mechanism driver determines whether it can bind to any of the network segments in the context.segments\_to\_bind property, based on the value of the context.host property, any relevant port or network attributes, and its own knowledge of the network topology. At the top level, context.segments\_to\_bind contains the static segments of the ports network. At each lower level of binding, it contains static or dynamic segments supplied by the driver that bound at the level above. If the driver is able to complete the binding of the port to any segment in context.segments\_to\_bind, it must call context.set\_binding with the binding details. If it can partially bind the port, it must call context.continue\_binding with the network segments to be used to bind at the next lower level.

If the binding results are committed after bind\_port returns, they will be seen by all mechanism drivers as update\_port\_precommit and update\_port\_postcommit calls. But if some other thread or process concurrently binds or updates the port, these binding results will not be committed, and update\_port\_precommit and update\_port\_postcommit will not be called on the mechanism drivers with these results. Because binding results can be discarded rather than committed, drivers should avoid making persistent state changes in bind\_port, or else must ensure that such state changes are eventually cleaned up.

Implementing this method explicitly declares the mechanism driver as having the intention to bind ports. This is inspected by the QoS service to identify the available QoS rules you can use with ports.

### **create\_network\_postcommit**(*context*)

Create a network.

**Parameters context** NetworkContext instance describing the new network.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will cause the deletion of the resource.

### **create\_network\_precommit**(*context*)

Allocate resources for a new network.

**Parameters context** NetworkContext instance describing the new network.

Create a new network, allocating resources as necessary in the database. Called inside transaction context on session. Call cannot block. Raising an exception will result in a rollback of the current transaction.

### **create\_port\_postcommit**(*context*)

Create a port.

**Parameters context** PortContext instance describing the port.

Called after the transaction completes. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will result in the deletion of the resource.

### **create\_port\_precommit**(*context*)

Allocate resources for a new port.

**Parameters context** PortContext instance describing the port.

Create a new port, allocating resources as necessary in the database. Called inside transaction context on session. Call cannot block. Raising an exception will result in a rollback of the current transaction.

### **create\_subnet\_postcommit**(*context*)

Create a subnet.

**Parameters context** SubnetContext instance describing the new subnet.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will cause the deletion of the resource.

### **create\_subnet\_precommit**(*context*)

Allocate resources for a new subnet.

**Parameters context** SubnetContext instance describing the new subnet.

`rt = context.current device_id = port[device_id] device_owner = port[device_owner]` Create a new subnet, allocating resources as necessary in the database. Called inside transaction context on session. Call cannot block. Raising an exception will result in a rollback of the current transaction.

**delete\_network\_postcommit**(*context*)

Delete a network.

**Parameters context** NetworkContext instance describing the current state of the network, prior to the call to delete it.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Runtime errors are not expected, and will not prevent the resource from being deleted.

**delete\_network\_precommit**(*context*)

Delete resources for a network.

**Parameters context** NetworkContext instance describing the current state of the network, prior to the call to delete it.

Delete network resources previously allocated by this mechanism driver for a network. Called inside transaction context on session. Runtime errors are not expected, but raising an exception will result in rollback of the transaction.

**delete\_port\_postcommit**(*context*)

Delete a port.

**Parameters context** PortContext instance describing the current state of the port, prior to the call to delete it.

Called after the transaction completes. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Runtime errors are not expected, and will not prevent the resource from being deleted.

**delete\_port\_precommit**(*context*)

Delete resources of a port.

**Parameters context** PortContext instance describing the current state of the port, prior to the call to delete it.

Called inside transaction context on session. Runtime errors are not expected, but raising an exception will result in rollback of the transaction.

**delete\_subnet\_postcommit**(*context*)

Delete a subnet.

**Parameters context** SubnetContext instance describing the current state of the subnet, prior to the call to delete it.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Runtime errors are not expected, and will not prevent the resource from being deleted.

**delete\_subnet\_precommit**(*context*)

Delete resources for a subnet.

**Parameters context** SubnetContext instance describing the current state of the subnet, prior to the call to delete it.

Delete subnet resources previously allocated by this mechanism driver for a subnet. Called inside transaction context on session. Runtime errors are not expected, but raising an exception will result in rollback of the transaction.

### **initialize()**

Perform driver initialization.

Called after all drivers have been loaded and the database has been initialized. No abstract methods defined below will be called prior to this method being called.

### **update\_network\_postcommit**(*context*)

Update a network.

**Parameters context** NetworkContext instance describing the new state of the network, as well as the original state prior to the `update_network` call.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will cause the deletion of the resource.

`update_network_postcommit` is called for all changes to the network state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

### **update\_network\_precommit**(*context*)

Update resources of a network.

**Parameters context** NetworkContext instance describing the new state of the network, as well as the original state prior to the `update_network` call.

Update values of a network, updating the associated resources in the database. Called inside transaction context on session. Raising an exception will result in rollback of the transaction.

`update_network_precommit` is called for all changes to the network state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

### **update\_port\_postcommit**(*context*)

Update a port.

**Parameters context** PortContext instance describing the new state of the port, as well as the original state prior to the `update_port` call.

Called after the transaction completes. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will result in the deletion of the resource.

`update_port_postcommit` is called for all changes to the port state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

### **update\_port\_precommit**(*context*)

Update resources of a port.

**Parameters context** PortContext instance describing the new state of the port, as well as the original state prior to the `update_port` call.

Called inside transaction context on session to complete a port update as defined by this mechanism driver. Raising an exception will result in rollback of the transaction.

`update_port_precommit` is called for all changes to the port state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

### **update\_subnet\_postcommit**(*context*)

Update a subnet.

**Parameters context** SubnetContext instance describing the new state of the subnet, as well as the original state prior to the `update_subnet` call.

Called after the transaction commits. Call can block, though will block the entire process so care should be taken to not drastically affect performance. Raising an exception will cause the deletion of the resource.

`update_subnet_postcommit` is called for all changes to the subnet state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

**update\_subnet\_precommit**(*context*)

Update resources of a subnet.

**Parameters context** SubnetContext instance describing the new state of the subnet, as well as the original state prior to the `update_subnet` call.

Update values of a subnet, updating the associated resources in the database. Called inside transaction context on session. Raising an exception will result in rollback of the transaction.

`update_subnet_precommit` is called for all changes to the subnet state. It is up to the mechanism driver to ignore state or state changes that it does not know or care about.

## 7.1.6 networking\_generic\_switch.locking module

```
class networking_generic_switch.locking.PoolLock(coordinator, locks_pool_size=1,  
                                                locks_prefix='ngs-', timeout=0)
```

Bases: `object`

TooZ lock wrapper for pools of locks

If tooZ coordinator is provided, it will attempt to grab any lock from a predefined set of names, with configurable set size (lock pool), and keep attempting for until given timeout is reached.

## 7.1.7 Module contents





## INDICES AND TABLES

- genindex
- modindex
- search



## PYTHON MODULE INDEX

n 30

networking\_generic\_switch, 35

networking\_generic\_switch.config, 30

networking\_generic\_switch.devices, 30

networking\_generic\_switch.devices.netmiko\_devices, 28

networking\_generic\_switch.devices.netmiko\_devices.arista, 19

networking\_generic\_switch.devices.netmiko\_devices.brocade, 19

networking\_generic\_switch.devices.netmiko\_devices.cisco, 20

networking\_generic\_switch.devices.netmiko\_devices.cisco300, 20

networking\_generic\_switch.devices.netmiko\_devices.cumulus, 21

networking\_generic\_switch.devices.netmiko\_devices.dell, 22

networking\_generic\_switch.devices.netmiko\_devices.hpe, 23

networking\_generic\_switch.devices.netmiko\_devices.huawei, 23

networking\_generic\_switch.devices.netmiko\_devices.huawei\_vrpv8, 23

networking\_generic\_switch.devices.netmiko\_devices.juniper, 24

networking\_generic\_switch.devices.netmiko\_devices.mellanox\_mlnxos, 24

networking\_generic\_switch.devices.netmiko\_devices.nokia, 25

networking\_generic\_switch.devices.netmiko\_devices.ovs, 26

networking\_generic\_switch.devices.netmiko\_devices.pluribus, 26

networking\_generic\_switch.devices.netmiko\_devices.ruijie, 26

networking\_generic\_switch.devices.netmiko\_devices.sonic, 27

networking\_generic\_switch.devices.utils, 29

networking\_generic\_switch.exceptions, 31

networking\_generic\_switch.generic\_switch\_mech, 31

networking\_generic\_switch.locking, 35



## INDEX

### A

- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*arista.AristaEos*  
attribute), 19
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*brocade.BrocadeFastIron*  
attribute), 19
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*cisco.Cisco*  
attribute), 20
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*cisco.Cisco300*  
attribute), 20
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*cumulus.Cumulus*  
attribute), 21
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*dell.DellNos*  
attribute), 22
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*dell.DellPowerConnect*  
attribute), 22
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*hp.HpComware*  
attribute), 23
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*huawei.Huawei*  
attribute), 23
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*huawei.Vpvs.Huawei*  
attribute), 23
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*juniper.Juniper*  
attribute), 24
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*mellanox\_mlnxos.MellanoxMlnxOS*  
attribute), 24
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*NetmikoSwitch*  
attribute), 28
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*nokia.NokiaS*  
attribute), 25
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*pluribus.Pluribus*  
attribute), 26
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*ruijie.Ruijie*  
attribute), 26
- ADD\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*sonic.Sonic*  
attribute), 27
- add\_network() (network-  
ing\_generic\_switch.devices.GenericSwitchDevice  
method), 30
- add\_network() (network-  
ing\_generic\_switch.devices.NetmikoSwitch  
method), 28
- ADD\_NETWORK\_TO\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*dell.DellNos*  
attribute), 22
- ADD\_NETWORK\_TO\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*dell.DellPowerConnect*  
attribute), 22
- ADD\_NETWORK\_TO\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*juniper.Juniper*  
attribute), 24
- ADD\_NETWORK\_TO\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*NetmikoSwitch*  
attribute), 28
- ADD\_NETWORK\_TO\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.*sonic.Sonic*  
attribute), 27
- AristaEos (class in network-  
ing\_generic\_switch.devices.netmiko\_devices.arista),  
19
- bind\_port() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchDevice  
method), 31
- BrocadeFastIron (class in network-

	<i>ing_generic_switch.devices.netmiko_devices</i>	DELETE_NETWORK	(network- 19
	<i>ing_generic_switch.devices.netmiko_devices.arista.Arista</i>		attribute), 19
<b>C</b>		DELETE_NETWORK	(network-
<code>check_output()</code>	(in module <i>network- ing_generic_switch.devices.netmiko_devices</i> ),	<i>ing_generic_switch.devices.netmiko_devices.brocade.Broca</i>	attribute), 19 29
<code>check_output()</code>	( <i>network- ing_generic_switch.devices.netmiko_devices.NetmikoSwitch</i>	<i>ing_generic_switch.devices.netmiko_devices.cisco.CiscoI</i>	attribute), 20 method), 28
<code>Cisco300</code>	(class in <i>network- ing_generic_switch.devices.netmiko_devices.cisco300.Cis</i>	<i>ing_generic_switch.devices.netmiko_devices.cisco300.Cis</i>	attribute), 20 20
<code>CiscoIos</code>	(class in <i>network- ing_generic_switch.devices.netmiko_devices.cisco</i> ),	<i>ing_generic_switch.devices.netmiko_devices.cumulus.Cum</i>	attribute), 21 20
<code>clean_port_vlan_if_necessary()</code>	( <i>network- ing_generic_switch.devices.netmiko_devices.brocade.AristaFos</i>	<i>ing_generic_switch.devices.netmiko_devices.dell.DellNos</i>	attribute), 20 method), 20
<code>commit()</code>	( <i>network- ing_generic_switch.devices.netmiko_devices.nokia.NokiaSR</i>	<i>ing_generic_switch.devices.netmiko_devices.dell.DellPow</i>	attribute), 22 method), 25
<code>create_network_postcommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.hpe.HpeCom</i>	attribute), 23 method), 32
<code>create_network_precommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.huawei.Huav</i>	attribute), 23 method), 32
<code>create_port_postcommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.huawei_vrpv</i>	attribute), 23 method), 32
<code>create_port_precommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.juniper.Junip</i>	attribute), 24 method), 32
<code>create_subnet_postcommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.mellanox_ml</i>	attribute), 24 method), 32
<code>create_subnet_precommit()</code>	( <i>network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice</i>	<i>ing_generic_switch.devices.netmiko_devices.NetmikoSwit</i>	attribute), 28 method), 32
<code>Cumulus</code>	(class in <i>network- ing_generic_switch.devices.netmiko_devices.cumulus.Cum</i>	<i>ing_generic_switch.devices.netmiko_devices.nokia.NokiaS</i>	attribute), 25 21
<b>D</b>		<i>ing_generic_switch.devices.netmiko_devices.pluribus.Plur</i>	attribute), 26
<code>del_network()</code>	( <i>network- ing_generic_switch.devices.GenericSwitchDevice</i>	DELETE_NETWORK	(network- ing_generic_switch.devices.netmiko_devices.ruijie.Ruijie
	method), 30		attribute), 26
<code>del_network()</code>	( <i>network- ing_generic_switch.devices.netmiko_devices.NetmikoSwitch</i>	DELETE_NETWORK	(network- ing_generic_switch.devices.netmiko_devices.sonic.Sonic
	method), 28		attribute), 27

delete_network_postcommit()	(network- DELETED_PORT (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice (network- ing_generic_switch.devices.netmiko_devices.pluribus.PluribusDevice attribute), 26
delete_network_precommit()	(network- DELETED_PORT (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice (network- ing_generic_switch.devices.netmiko_devices.ruijie.RuijieDevice attribute), 26
DELETED_PORT	(network- DELETED_PORT (network- ing_generic_switch.devices.netmiko_devices.arista.AristaDevice (network- ing_generic_switch.devices.netmiko_devices.sonic.SonicDevice attribute), 19
DELETED_PORT	(network- delete_port() (network- ing_generic_switch.devices.netmiko_devices.brocade.BrocadeDevice (network- ing_generic_switch.devices.GenericSwitchDevice attribute), 19
DELETED_PORT	(network- delete_port() (network- ing_generic_switch.devices.netmiko_devices.cisco.CiscoDevice (network- ing_generic_switch.devices.netmiko_devices.NetmikoSwitch attribute), 20
DELETED_PORT	(network- DELETED_PORT_GENERAL (network- ing_generic_switch.devices.netmiko_devices.cisco3000.Cisco3000Device (network- ing_generic_switch.devices.netmiko_devices.dell.DellPowerConnectDevice attribute), 22
DELETED_PORT	(network- delete_port_postcommit() (network- ing_generic_switch.devices.netmiko_devices.cumulus.CumulusDevice (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice attribute), 21
DELETED_PORT	(network- delete_port_precommit() (network- ing_generic_switch.devices.netmiko_devices.dell.DellDevice (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice attribute), 22
DELETED_PORT	(network- delete_subnet_postcommit() (network- ing_generic_switch.devices.netmiko_devices.dell.DellPowerConnectDevice (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice attribute), 22
DELETED_PORT	(network- delete_subnet_precommit() (network- ing_generic_switch.devices.netmiko_devices.hpe.HpeDevice (network- ing_generic_switch.generic_switch_mech.GenericSwitchDevice attribute), 23
DELETED_PORT	(network- DellNos (class in network- ing_generic_switch.devices.netmiko_devices.huawei.HuaweiDevice (network- ing_generic_switch.devices.netmiko_devices.dell), attribute), 23
DELETED_PORT	(network- DellPowerConnect (class in network- ing_generic_switch.devices.netmiko_devices.huawei.HuaweiDevice (network- ing_generic_switch.devices.netmiko_devices.dell), attribute), 23
DELETED_PORT	(network- device_manager() (in module network- ing_generic_switch.devices.netmiko_devices.juniper.JuniperDevice (network- ing_generic_switch.devices), 30
DELETED_PORT	(network- DISABLE_BOND (network- ing_generic_switch.devices.netmiko_devices.cumulus.CumulusDevice (network- ing_generic_switch.devices.netmiko_devices.mellanox.MellanoxMlnxOS attribute), 24
DELETED_PORT	(network- ing_generic_switch.devices.netmiko_devices.NetmikoSwitch (network- ing_generic_switch.devices.netmiko_devices.NetmikoSwitch attribute), 28
DELETED_PORT	(network- DISABLE_PORT (network- ing_generic_switch.devices.netmiko_devices.cumulus.CumulusDevice (network- ing_generic_switch.devices.netmiko_devices.nokia.NokiaDevice (network- ing_generic_switch.devices.netmiko_devices.nokia.NokiaDevice attribute), 25
DELETED_PORT	(network- ing_generic_switch.devices.netmiko_devices.juniper.JuniperDevice (network- ing_generic_switch.devices.netmiko_devices.ovs.OvsDevice (network- ing_generic_switch.devices.netmiko_devices.ovs.OvsDevice attribute), 26
	DISABLE_PORT (network-

*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_switch\_device()* (in module *network-  
ing\_generic\_switch.devices.utils*), 28

**E**

**ENABLE\_BOND** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus*  
attribute), 21

**ENABLE\_BOND** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_devices.hpe*),  
attribute), 28

**ENABLE\_PORT** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus*  
attribute), 21

**ENABLE\_PORT** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.juniper.Juniper*  
attribute), 24

**ENABLE\_PORT** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_devices.huawei\_vrpv*  
attribute), 24

**ENABLE\_PORT** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_devices.huawei\_vrpv*  
attribute), 24

**ENABLE\_PORT** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_devices.huawei\_vrpv*  
attribute), 24

**ERROR\_MSG\_PATTERNS** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus*  
attribute), 21

**ERROR\_MSG\_PATTERNS** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.juniper.Juniper*  
attribute), 22

**ERROR\_MSG\_PATTERNS** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.netmiko\_devices*  
attribute), 28

**ERROR\_MSG\_PATTERNS** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.some\_device*  
attribute), 27

**G**

**GenericSwitchConfigException**, 30

**GenericSwitchDevice** (class in *network-  
ing\_generic\_switch.devices*), 30

**GenericSwitchDriver** (class in *network-  
ing\_generic\_switch.generic\_switch\_mech*),  
31

**GenericSwitchEntrypointLoadError**, 30

**GenericSwitchException**, 30

**GenericSwitchNetmikoConfigError**, 30

**GenericSwitchNetmikoConnectError**, 31

**GenericSwitchNetmikoMethodError**, 31

**GenericSwitchNetmikoNotSupported**, 31

**GenericSwitchNetworkNameFormatInvalid**,  
31

**get\_devices()** (in module *network-  
ing\_generic\_switch.config*), 30

**get\_hostname()** (in module *network-  
ing\_generic\_switch.devices.utils*), 29

**get\_wrong\_vlan()** (network-  
*ing\_generic\_switch.devices.netmiko\_devices.brocade.Brocade*  
method), 20

**H**

**HpeComware** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.hpe*),  
23

**Huawei** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.huawei*),  
23

**Huawei** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.huawei\_vrpv*),  
23

**I**

**initialize()** (network-  
*ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD*  
method), 33

**J**

**JuniperAllPowerClass** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.juniper*),  
24

**Juniper** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.juniper*),  
24

**L**

**license**  
agreement, 17

**M**

**MellanoxMlnxOS** (class in *network-  
ing\_generic\_switch.devices.netmiko\_devices.mellanox\_ml*  
24

**message** (network-  
*ing\_generic\_switch.exceptions.GenericSwitchConfigExcep*  
attribute), 30

**message** (network-  
*ing\_generic\_switch.exceptions.GenericSwitchEntrypointL*  
attribute), 30

**message** (network-  
*ing\_generic\_switch.exceptions.GenericSwitchException*  
attribute), 30

**message** (network-  
*ing\_generic\_switch.exceptions.GenericSwitchNetmikoCon*  
attribute), 30

**message** (network-  
*ing\_generic\_switch.exceptions.GenericSwitchNetmikoCon*  
attribute), 31



message (network- 30  
*ing\_generic\_switch.exceptions.GenericSwitchNetmikoFormInvalid* (network-  
*attribute*), 31 *ing\_generic\_switch.generic\_switch\_mech,*  
 31

message (network- networking\_generic\_switch.locking,  
*ing\_generic\_switch.exceptions.GenericSwitchNetmikoNotSupported*  
*attribute*), 31

message (network- N  
*ing\_generic\_switch.exceptions.GenericSwitchNetmikoFormInvalid* (network-  
*attribute*), 31 *ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus,*  
 21

module NETMIKO\_DEVICE\_TYPE (network-  
 networking\_generic\_switch, 35 *ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch,*  
 networking\_generic\_switch.config, 30 *attribute*), 28  
 networking\_generic\_switch.devices, NETMIKO\_DEVICE\_TYPE (network-  
 30 *ing\_generic\_switch.devices.netmiko\_devices.sonic.Sonic*  
 28 *attribute*), 27  
 networking\_generic\_switch.devices.netmiko\_devices, *NetmikoSwitch* class in *network-*  
 19 *ing\_generic\_switch.devices.netmiko\_devices*),  
 38  
 networking\_generic\_switch.devices.netmiko\_devices.brocade,  
 19 networking\_generic\_switch  
 networking\_generic\_switch.devices.netmiko\_devices.cisco,  
 20 networking\_generic\_switch.config  
 networking\_generic\_switch.devices.netmiko\_devices.cisco300,  
 20 networking\_generic\_switch.devices  
 networking\_generic\_switch.devices.netmiko\_devices.cumulus,  
 21 networking\_generic\_switch.devices.netmiko\_devices  
 networking\_generic\_switch.devices.netmiko\_devices.dell,  
 22 networking\_generic\_switch.devices.netmiko\_devices.a  
 networking\_generic\_switch.devices.netmiko\_devices.hp,  
 23 networking\_generic\_switch.devices.netmiko\_devices.b  
 networking\_generic\_switch.devices.netmiko\_devices.huawei,  
 23 networking\_generic\_switch.devices.netmiko\_devices.c  
 networking\_generic\_switch.devices.netmiko\_devices.huawei\_vrpv8,  
 23 networking\_generic\_switch.devices.netmiko\_devices.c  
 networking\_generic\_switch.devices.netmiko\_devices.juniper,  
 24 networking\_generic\_switch.devices.netmiko\_devices.c  
 networking\_generic\_switch.devices.netmiko\_devices.mellanox\_mlnxos,  
 24 networking\_generic\_switch.devices.netmiko\_devices.d  
 networking\_generic\_switch.devices.netmiko\_devices.nokia,  
 25 networking\_generic\_switch.devices.netmiko\_devices.h  
 networking\_generic\_switch.devices.netmiko\_devices.ovs,  
 26 networking\_generic\_switch.devices.netmiko\_devices.h  
 networking\_generic\_switch.devices.netmiko\_devices.pluribus,  
 26 networking\_generic\_switch.devices.netmiko\_devices.h  
 networking\_generic\_switch.devices.netmiko\_devices.ruijie,  
 26 networking\_generic\_switch.devices.netmiko\_devices.j  
 networking\_generic\_switch.devices.netmiko\_devices.sonic,  
 27 networking\_generic\_switch.devices.netmiko\_devices.m  
 networking\_generic\_switch.devices.utils, module, 24  
 29 networking\_generic\_switch.devices.netmiko\_devices.n  
 networking\_generic\_switch.exceptions, module, 25

networking\_generic\_switch.devices.netmiko\_devices.ansible, 21  
 module, 26 PLUG\_PORT\_TO\_NETWORK (network-  
networking\_generic\_switch.devices.netmiko\_devices.pluribusswitch.devices.netmiko\_devices.dell.DellNos  
 module, 26 attribute), 22  
networking\_generic\_switch.devices.netmiko\_devices.PLUG\_PORT\_TO\_NETWORK (network-  
 module, 26 ing\_generic\_switch.devices.netmiko\_devices.dell.DellPow  
networking\_generic\_switch.devices.netmiko\_devices.ericsson, 22  
 module, 27 PLUG\_PORT\_TO\_NETWORK (network-  
networking\_generic\_switch.devices.utils ing\_generic\_switch.devices.netmiko\_devices.hp.HpCom  
 module, 29 attribute), 23  
networking\_generic\_switch.exceptions PLUG\_PORT\_TO\_NETWORK (network-  
 module, 30 ing\_generic\_switch.devices.netmiko\_devices.huawei.Huav  
networking\_generic\_switch.generic\_switch\_mech attribute), 23  
 module, 31 PLUG\_PORT\_TO\_NETWORK (network-  
networking\_generic\_switch.locking ing\_generic\_switch.devices.netmiko\_devices.huawei\_vrpv  
 module, 35 attribute), 23  
NokiaSRL (class in network- PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.nokia), ing\_generic\_switch.devices.netmiko\_devices.juniper.Junip  
 25 attribute), 24  
O PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.mellanox\_ml  
OvsLinux (class in network- attribute), 24  
 ing\_generic\_switch.devices.netmiko\_devices.PLUG\_PORT\_TO\_NETWORK (network-  
 26 ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwit  
 attribute), 28  
P PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.nokia.NokiaS  
 attribute), 25  
PLUG\_BOND\_TO\_NETWORK (network- PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus attribute), 21  
 attribute), 21 PLUG\_PORT\_TO\_NETWORK (network-  
PLUG\_BOND\_TO\_NETWORK (network- ing\_generic\_switch.devices.netmiko\_devices.ovs.OvsLinux  
 ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch attribute), 26  
 attribute), 28  
plug\_bond\_to\_network() (network- PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.GenericSwitchDevice attribute), 26  
 method), 30  
plug\_bond\_to\_network() (network- PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch attribute), 26  
 method), 29  
PLUG\_PORT\_TO\_NETWORK (network- PLUG\_PORT\_TO\_NETWORK (network-  
 ing\_generic\_switch.devices.netmiko\_devices.arista.AristaEos attribute), 27  
 attribute), 19  
PLUG\_PORT\_TO\_NETWORK (network- plug\_port\_to\_network() (network-  
 ing\_generic\_switch.devices.netmiko\_devices.brocade.BrocadeFastIron attribute), 20  
 attribute), 20  
PLUG\_PORT\_TO\_NETWORK (network- plug\_port\_to\_network() (network-  
 ing\_generic\_switch.devices.netmiko\_devices.cisco.CiscoIOS attribute), 20  
 attribute), 20  
PLUG\_PORT\_TO\_NETWORK (network- plug\_port\_to\_network() (network-  
 ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwit attribute), 29  
 attribute), 20  
PLUG\_PORT\_TO\_NETWORK (network- PLUG\_PORT\_TO\_NETWORK\_GENERAL (network-  
 ing\_generic\_switch.devices.netmiko\_devices.dell.DellPow attribute), 29  
 attribute), 20

- attribute), 22
- Pluribus (class in network-  
ing\_generic\_switch.devices.netmiko\_devices.pluribus), 26
- PoolLock (class in network-  
ing\_generic\_switch.locking), 35
- ## Q
- QUERY\_PORT (network-  
ing\_generic\_switch.devices.netmiko\_devices.brocade.BrocadeFastIron  
attribute), 20
- ## R
- REMOVE\_NETWORK\_FROM\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.dell.DellNos  
attribute), 22
- REMOVE\_NETWORK\_FROM\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.dell.DellPowerConnect  
attribute), 22
- REMOVE\_NETWORK\_FROM\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.juniper.Juniper  
attribute), 24
- REMOVE\_NETWORK\_FROM\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
attribute), 28
- REMOVE\_NETWORK\_FROM\_TRUNK (network-  
ing\_generic\_switch.devices.netmiko\_devices.sonic.Sonic  
attribute), 27
- Ruijie (class in network-  
ing\_generic\_switch.devices.netmiko\_devices.ruijie), 26
- ## S
- sanitise\_config() (in module network-  
ing\_generic\_switch.devices.utils), 29
- SAVE\_CONFIGURATION (network-  
ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus  
attribute), 21
- SAVE\_CONFIGURATION (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
attribute), 28
- SAVE\_CONFIGURATION (network-  
ing\_generic\_switch.devices.netmiko\_devices.sonic.Sonic  
attribute), 27
- save\_configuration() (network-  
ing\_generic\_switch.devices.netmiko\_devices.juniper.Juniper  
method), 24
- save\_configuration() (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
method), 29
- send\_commands\_to\_device() (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
method), 29
- send\_commands\_to\_device() (network-  
ing\_generic\_switch.devices.netmiko\_devices.nokia.NokiaS  
method), 25
- send\_config\_set() (network-  
ing\_generic\_switch.devices.netmiko\_devices.juniper.Juniper  
method), 24
- send\_config\_set() (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
method), 24
- send\_config\_set() (network-  
ing\_generic\_switch.devices.netmiko\_devices.sonic.Sonic  
method), 27
- Sonic (class in network-  
ing\_generic\_switch.devices.netmiko\_devices.sonic), 27
- ## U
- UNPLUG\_BOND\_FROM\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.cumulus.Cumulus  
attribute), 21
- UNPLUG\_BOND\_FROM\_NETWORK (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
attribute), 28
- unplug\_bond\_from\_network() (network-  
ing\_generic\_switch.devices.GenericSwitchDevice  
method), 30
- unplug\_bond\_from\_network() (network-  
ing\_generic\_switch.devices.netmiko\_devices.NetmikoSwitch  
method), 29
- update\_network\_postcommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 34
- update\_network\_precommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 34
- update\_port\_postcommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 34
- update\_port\_precommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 34
- update\_subnet\_postcommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 34
- update\_subnet\_precommit() (network-  
ing\_generic\_switch.generic\_switch\_mech.GenericSwitchD  
method), 35