Techconnect Matrix

Network Switch selection and setup

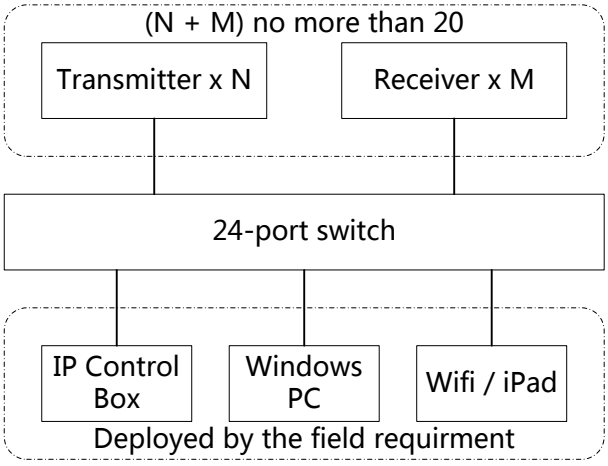
Contents

1 Networking Strategy

OVERVIEW

Tx/Rx Requirement		Networking Strategy	
Distribution	Total Quantity	Network Topology	Recommended Switches
Centralized	Up to 20 Tx/Rx	Single Switch	Cisco or HUAWEI 24-port 1000 Mbps
	Up to 44 Tx/Rx		Cisco or HUAWEI 48-port 1000 Mbps
	More than 44 Tx/Rx	Cascading Switch	Cisco 1000 Mbps
Distributed	No requirement		

24-port Single Switch



Above is a topology of a single 24-port 1000Mbps Ethernet switch. We recommend:

CISCO

Non-PoE: SG300-28, WS-C2960X-24TS-L

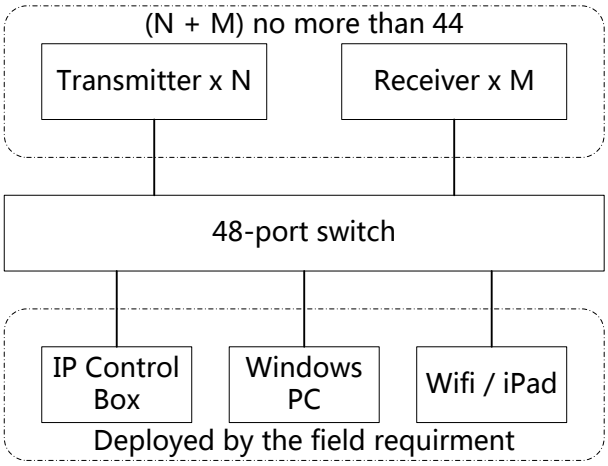
PoE: SG300-28P, WS-C2960S-24PS-L, WS-C2960X-24PS-L

HUAWEI

Non-PoE: S5700-28P-LI-AC

PoE: S5700-28P-PWR-LI-AC

48-port Single Switch



Above is a topology of a single 48-port 1000Mbps Ethernet switch. We recommend:

CISCO

Non PoE: WS-C2960X-48TS-L

PoE: WS-C2960X-48FPS-L

HUAWEI

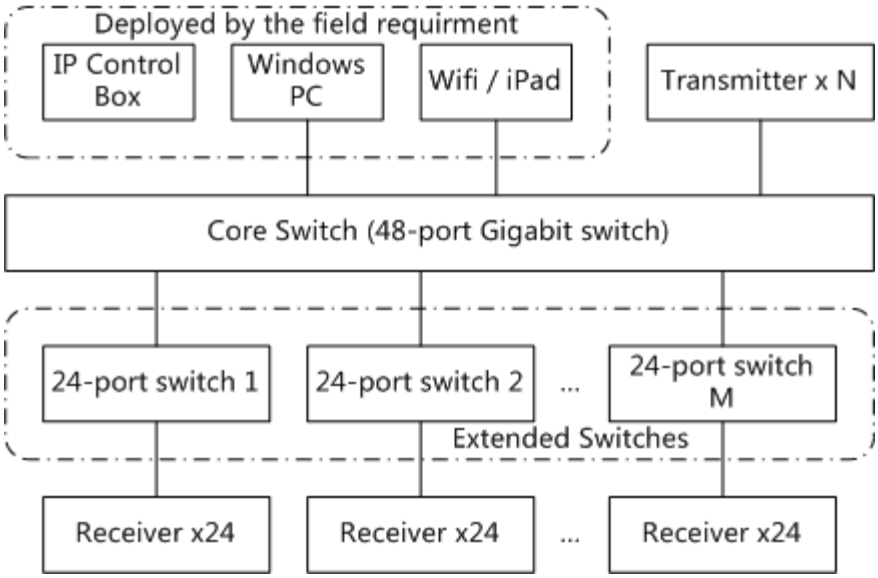
Non PoE: S5700-48TP-SI-AC

PoE: S5700-48TP-PWR-SI

CASCADING SWITCH NETWORKING

Simple Cascading Switch (up to 44 x Tx deployed centrally)

Most cases require fewer Tx than Rx so they can often be centrally deployed. If so the topology will look like this:



- Use a 48-port 1000Mbps switch as the core switch
- Use 24-port 1000Mbps switches as the extended switches
- Connect core switch to all TX, IP controllers, wireless access points and third party control devices
- Connect all Rx to extended switches

E.g. if you have 40 x TX, this network can support 96 Rx (4x24) to create a 40 x 96 matrix. We recommend **Cisco 2960 series** switches for cascading:

CORE Switch

- Non-PoE: WS-C2960X-48TS-L
- Poe: WS-C2960X-48FPS-L

EXTENDED Switches

- Non-PoE: 24-port 1000Mbps Ethernet switch: WS-C2960X-24TS-L
- PoE: WS-C2960S-24PS-L, WS-C2960X-24PS-L

Complex Cascading Switch (more than 44 x Tx or Tx not centrally deployed)

If Tx cannot be centrally deployed for example due to long distance or its number exceeds 44 there are many complexities. Consult installers, distributors or equipment manufacturers.

2 Recommended Switches

Cisco

Ports	Model	Port Configuration
24-port switch	SG300-28	26 10/100/1000BASE-T Ethernet ports 2 Combo ports(10/100/1000Base-T+Gigabit mini-GBIC/SFP)
24-port PoE switch	SG300-28P	26 10/100/1000BASE-T Ethernet PoE+ ports 2 Combo ports(10/100/1000Base-T+Gigabit mini-GBIC/SFP) Available PoE power: 180W
24-port switch	WS-C2960X-24TS-L	24 10/100/1000BASE-T Ethernet ports 4 SFPs
24-port PoE switch	WS-C2960S-24PS-L	24 10/100/1000BASE-T Ethernet PoE+ ports 4 SFPs Available PoE power: 370W
24-port PoE switch	WS-C2960X-24PS-L	24 10/100/1000BASE-T Ethernet PoE+ ports 4 SFPs Available PoE power: 370W
48-port switch	WS-C2960X-48TS-L	48 10/100/1000BASE-T Ethernet ports 4 SFPs
48-port PoE switch	WS-C2960X-48FPS-L	48 10/100/1000BASE-T Ethernet PoE+ ports 4 SFPs Available PoE power: 740W

Only use SG300 in single switch networks where high multi-screen synchronization is not required. If you require a cascaded network, multi-view or video wall, use C2960 series switches.

Detail on SG300 issues:

1. Multicast request ability insufficient. Switch takes too long to start forwarding multicast packets to the corresponding ports after receiving IGMP Join messages. Use as extended switches there are more issues. If they receive more multicast requests in a short period, some of the requests will be discarded because switches are unable to deal with them in time, resulting in Rx switch failure.
2. Multicast forwarding synchronization is poor. There is a long delay when copying and forwarding the same multicast packet to the multiple host ports. The time for each port to receive multicast packets may have a difference of 20ms or more. As a result, the same source on different Rx may be out of sync.

HUAWEI

Ports	Model	Port Configuration
24-port switch	S5700-28P-LI-AC	24 10/100/1000BASE-T Ethernet ports 4 1000BASE-X Ethernet fiber ports
24-port PoE switch	S5700-28P-PWR-LI-AC	24 10/100/1000BASE-T Ethernet PoE+ ports 4 1000BASE-X Ethernet fiber ports Available PoE power: 740W
48-port switch	S5700-48TP-SI-AC	44 10/100/1000BASE-T Ethernet ports 4 Gigabit Combo ports(10/100/1000Base-T + 100/1000Base-X)
48-port PoE switch	S5700-48TP-PWR-SI	44 10/100/1000BASE-T Ethernet PoE+ ports 4 Gigabit Combo ports(10/100/1000Base-T + 100/1000Base-X) Available PoE power: 740W

3 Configuring Switches

Different brands and models are configured differently. For more information about these switches, see their user guides.

For each switch, we provide both manual and import configuration. Manual configuration is more complex but has wide application range. If you want to use import configuration, the switch must first be prepared and configured properly.

Switches have a large number of configuration settings which you should avoid. If you make a mistake so a factory reset.

Cisco SG300 Series Switches

We recommend you use models SG300-28 and SG300-28P. They can only be used in single switch networking due to their multicast problems.

3.1.1 Basic Operations

3.1.1.1 Logging In to the Switches

If you want to configure switches, you need to use special cables and connect them to the switches' dedicated ports.

1. Connect your PC to a switch.

Use a matching serial cable to connect between switch's **Console** port and PC's serial port. If your PC has no serial ports, use a USB-to-serial converter and install correct drivers.

2. Configure serial communication parameters

Run terminal emulation software on your PC. Create a session and configure serial communication parameters according to the following table.

Parameters	Value
Com Port	If your PC is equipped with serial ports in factory defaults, usually choose COM1 port. If your PC's multiple serial ports are configured or PC is connected with a USB-to-serial converter, see the related user guides.
Baud Rate	115200 bps
Flow Control	None
Parity	None
Stop Bits	1
Data Bits	8 bits

3. Create communication connection

In terminal emulation software select the previous created session and start the connection. When connection is successful, switch will not give any prompt. At this moment, press **Enter**. Switch will give the following prompt.

```
Detected speed: 115200
```

Press **Enter** again. Switch will ask you to input user name.

```
User Name:
```

Input **cisco** (for example default user name **cisco** is used). Switch will ask you to input password.

```
Password:
```

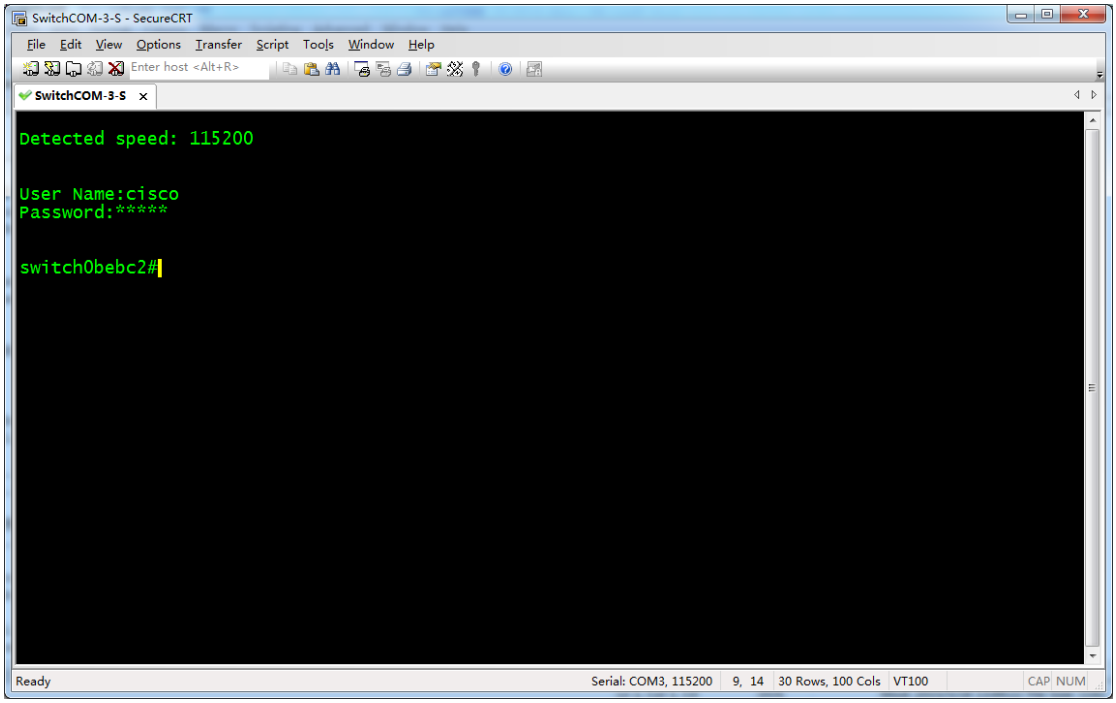
After inputting correct password, switch will display prompt in normal mode.

```
switch0bebc2#
```

Please note:

1. In factory defaults of SG300 series switches, user mode and privileged mode have the same commend-line prompt and the highest privilege level. In this case, we call it "normal mode".
2. SG300 series switches use the combination of "switch" and the last six characters of MAC address as the default names. In the prompt examples of this manual, "0bebc2" are the last six characters of MAC address of a SG300 series switch in our test. They may vary with actual switches.

The following screen capture describes the previous steps. It means that you have successfully logged in to the switch and entered normal mode.



3.1.1.2 Resetting to Factory Defaults

1. In user mode input **delete startup-config** to delete startup configuration. Switch will give the following prompt.

```
switch0bebc2#delete startup-config
Delete startup-config? (Y/N)[N]
```

Enter **Y** (not case sensitive) to confirm. Switch will give the following prompt which means that startup

configuration is deleted.

Note:

In this manual, "Y", "Yes", "N" and "No" are not case sensitive.

```
switch0bebc2#02-May-2013 14:59:54 %FILE-I-DELETE: File Delete - file URL flash://startup-config
```

2. Input **reload** to reboot switch. Switch will give the following prompt.

```
switch0bebc2#reload
You haven't saved your changes. Are you sure you want to continue ? (Y/N)[N]
```

Input **Y** to confirm. Switch will give the following prompt.

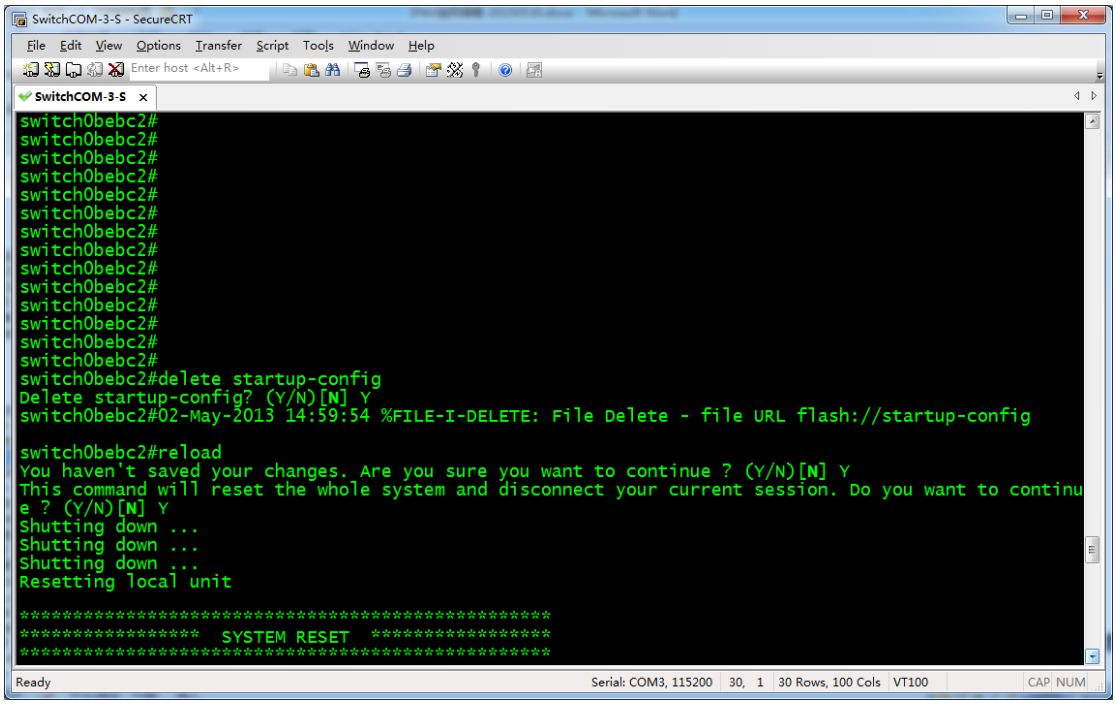
```
This command will reset the whole system and disconnect your current session. Do you want to continue ? (Y/N)[N]
```

Input **Y** to confirm. Switch will give the following prompt.

```
Shutting down ...
Shutting down ...
Shutting down ...
Resetting local unit

************************************************
*****************  SYSTEM RESET  *****************
************************************************
```

The following screen capture describes the previous steps.



3. Switch reboots. When the following prompt appears, quickly press **Enter** twice to complete the baud-rate detection process.

```
Console baud-rate auto detection is enabled, press Enter twice to complete the detection process
```

If you do it slowly and exceed the time limit, switch will continue to ask you to input user name. Switch will give the following prompt.

```
Console baud-rate auto detection is enabled, press Enter twice to complete the detection process

User Name:
```

In summary, press **Enter** twice before any effective input to work with switch for baud-rate auto detection. Switch will give the following prompt.

```
Detected speed: 115200
```

User Name:

Input default name **cisco**. Switch will ask you to input password.

Password:

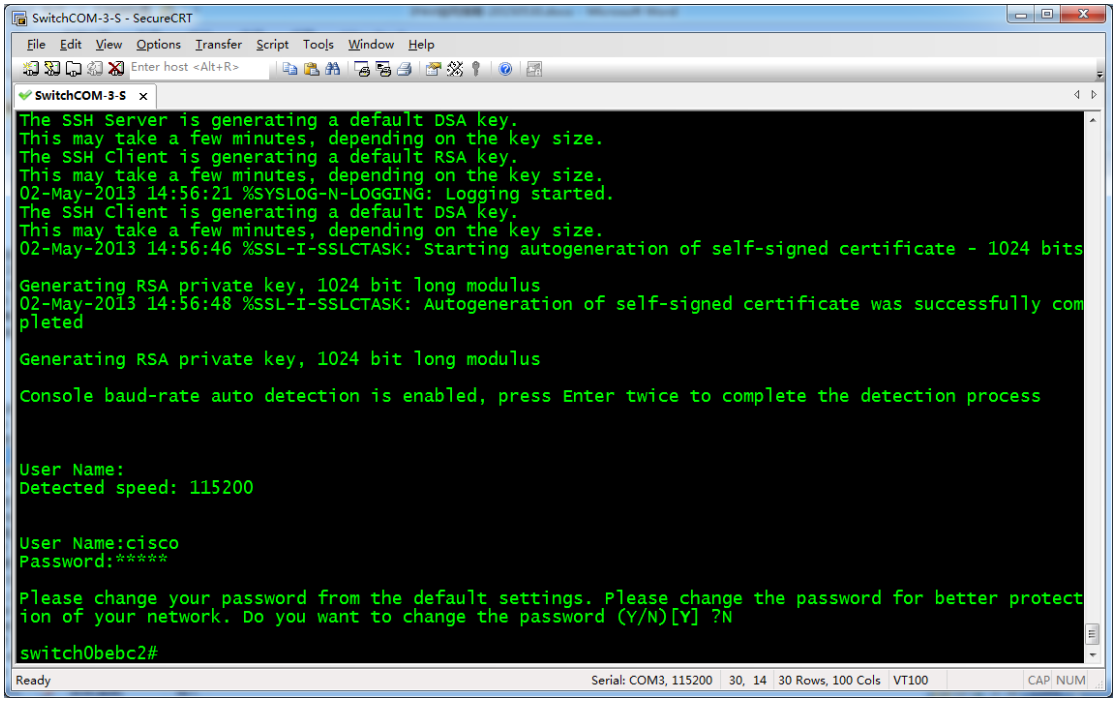
Input default password **cisco**. Switch will ask if you want to change your password.

Please change your password from the default settings. Please change the password for better protection of your network. Do you want to change the password (Y/N)[Y] ?

Now, input **N** to skip the password change process. Switch will give the following prompt.

switch0bebc2#

The screen capture is as follows.



At this moment, you have successfully reset switch to factory defaults and entered normal mode.

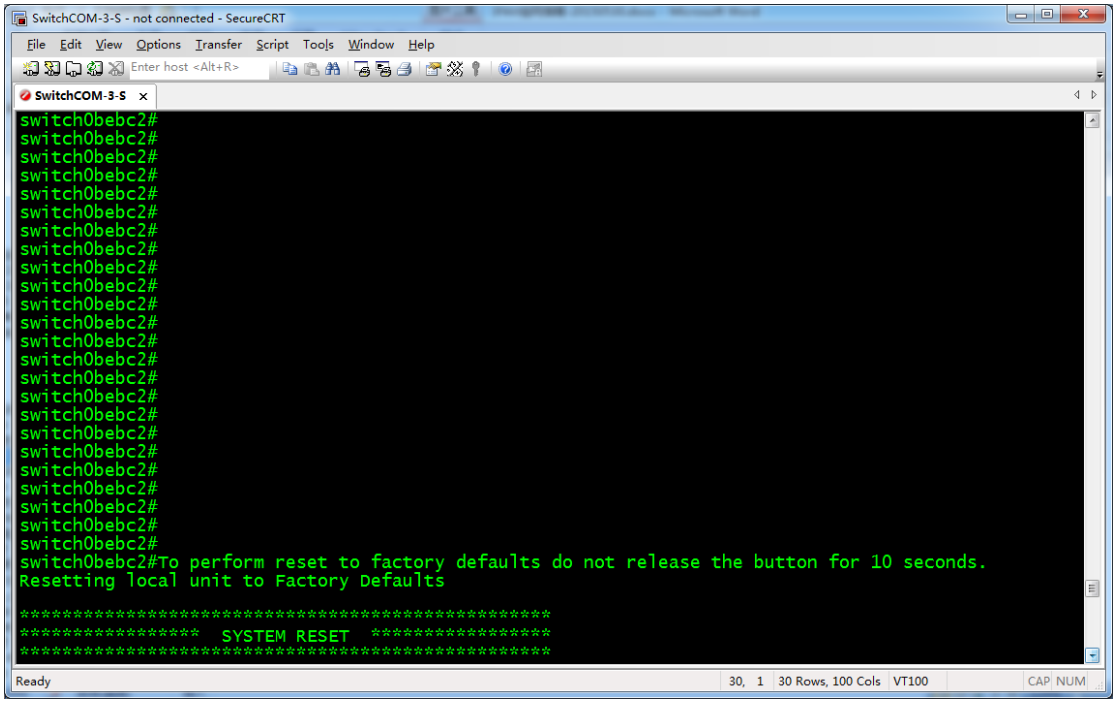
If you forgot switch's password and cannot access its command-line interface, you can perform reset to factory defaults by using a

stylus to press and hold Reset button until the following prompt appears.

switch0bebc2#To perform reset to factory defaults do not release the button for 10 seconds.
Resetting local unit to Factory Defaults

****
********** SYSTEM RESET **********
****

The screen capture is as follows.



The prompt above means that switch is reset to factory defaults and starts rebooting. Now you can release Reset button and wait until switch finishes rebooting and then operate based on step 3 above.

3.1.2 Manual Configuration

3.1.2.1 Global Configuration

1. In normal mode input **config** to enter global configuration mode. Switch will give the following prompt.

```
switch0bebc2#config
switch0bebc2(config)#
```

2. Input **no eee enable** to disable energy saving function. Switch will give the following prompt. (The following prompt is related to network devices connected to switch)

```
switch0bebc2(config)#no eee enable
switch0bebc2(config)#02-May-2013 15:02:16 %LINK-W-Down:  gi1
02-May-2013 15:02:16 %LINK-W-Down:  gi9
02-May-2013 15:02:16 %LINK-W-Down:  gi11
02-May-2013 15:02:16 %LINK-W-Down:  Vlan 1
02-May-2013 15:02:18 %LINK-I-Up:  gi1
02-May-2013 15:02:18 %LINK-I-Up:  Vlan 1
02-May-2013 15:02:19 %LINK-I-Up:  gi9
02-May-2013 15:02:19 %LINK-I-Up:  gi11
02-May-2013 15:02:22 %STP-W-PORTSTATUS: gi1: STP status Forwarding
02-May-2013 15:02:23 %STP-W-PORTSTATUS: gi9: STP status Forwarding
02-May-2013 15:02:24 %STP-W-PORTSTATUS: gi11: STP status Forwarding
```

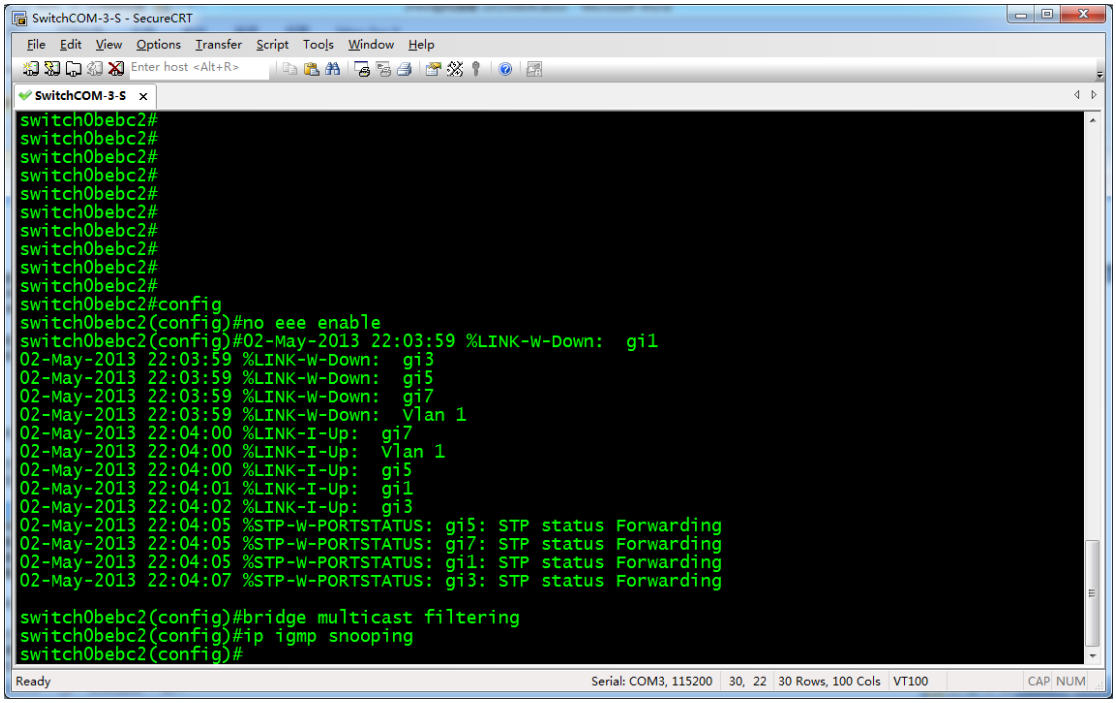
3. Input **bridge multicast filtering** to enable multicast filtering function.

```
switch0bebc2(config)#bridge multicast filtering
switch0bebc2(config)#
```

4. Input **ip igmp snooping** to enable global IGMP Snooping function.

```
switch0bebc2(config)#ip igmp snooping
switch0bebc2(config)#
```

The following screen capture describes the previous steps.



3.1.2.2 VLAN Configuration

1. In global configuration mode, input **ip igmp snooping vlan 1** to enable IGMP Snooping function for VLAN 1.

```
switch0bebc2(config)#ip igmp snooping vlan 1
switch0bebc2(config)#
```

2. Input **ip igmp snooping vlan 1 querier address 192.168.22.222** to assign IP address for IGMP Querier.

```
switch0bebc2(config)#ip igmp snooping vlan 1 querier address 192.168.22.222
switch0bebc2(config)#
```

3. Input **ip igmp snooping vlan 1 querier** to enable IGMP Querier function for VLAN 1.

```
switch0bebc2(config)#ip igmp snooping vlan 1 querier
switch0bebc2(config)#
```

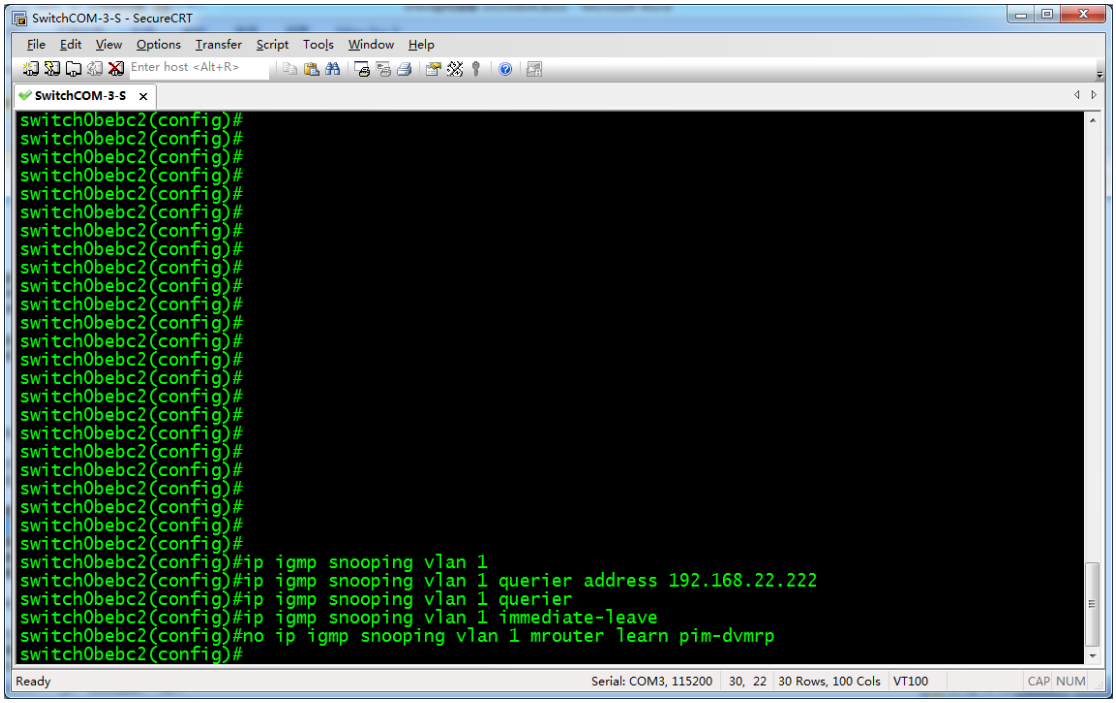
4. Input **ip igmp snooping vlan 1 immediate-leave** to enable multicast fast leave function for VLAN 1.

```
switch0bebc2(config)# ip igmp snooping vlan 1 immediate-leave
switch0bebc2(config)#
```

5. Input **no ip igmp snooping vlan 1 mrouter learn pim-dvmrp** to disable dynamic multicast router ports for VLAN 1.

```
switch0bebc2(config)#no ip igmp snooping vlan 1 mrouter learn pim-dvmrp
switch0bebc2(config)#
```

The following screen capture describes the previous steps.



3.1.2.3 Port Configuration

1. In global configuration mode input **interface range gi1-28** to enter all Gigabit Ethernet port bulk operation mode.

```
switch0bebc2(config)#interface range gi1-28
switch0bebc2(config-if-range)#
```

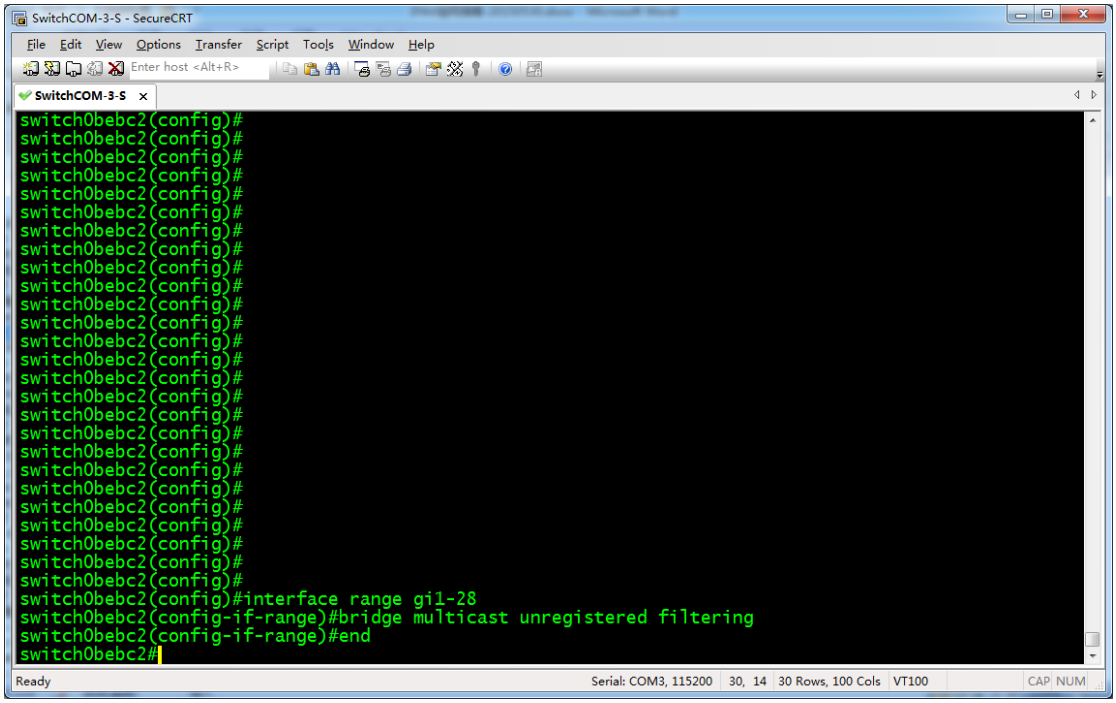
2. Input **bridge multicast unregistered filtering** to drop unknown multicast messages in all Gigabit Ethernet ports.

```
switch0bebc2(config-if-range)#bridge multicast unregistered filtering
switch0bebc2(config-if-range)#
```

3. Input **end** to return normal mode.

```
switch0bebc2(config-if-range)#end
switch0bebc2#
```

The following screen capture describes the previous steps.



Please note that you need to perform the operations above on all the Ethernet ports connected in the network. If other ports are used, configure them according to the example above.

3.1.2.4 Confirming Configuration

After configuration, input **show running-config** in normal mode. Switch will give feedback about the current detailed configuration.

```
switch0bebc2#show running-config
config-file-header
…
bridge multicast filtering
…
ip igmp snooping
ip igmp snooping vlan 1
no ip igmp snooping vlan 1 mrouter learn pim-dvmrp
ip igmp snooping vlan 1 immediate-leave
ip igmp snooping querier address 192.168.22.222
ip igmp snooping vlan 1 querier
no eee enablehostname switch0bebc2
!
interface gigabitethernet1
 bridge multicast unregistered filtering
!
interface gigabitethernet2
 bridge multicast unregistered filtering
…
!
interface gigabitethernet28
 bridge multicast unregistered filtering
!
exit
switch0bebc2#
```

The information above includes the eight configuration commands we input.

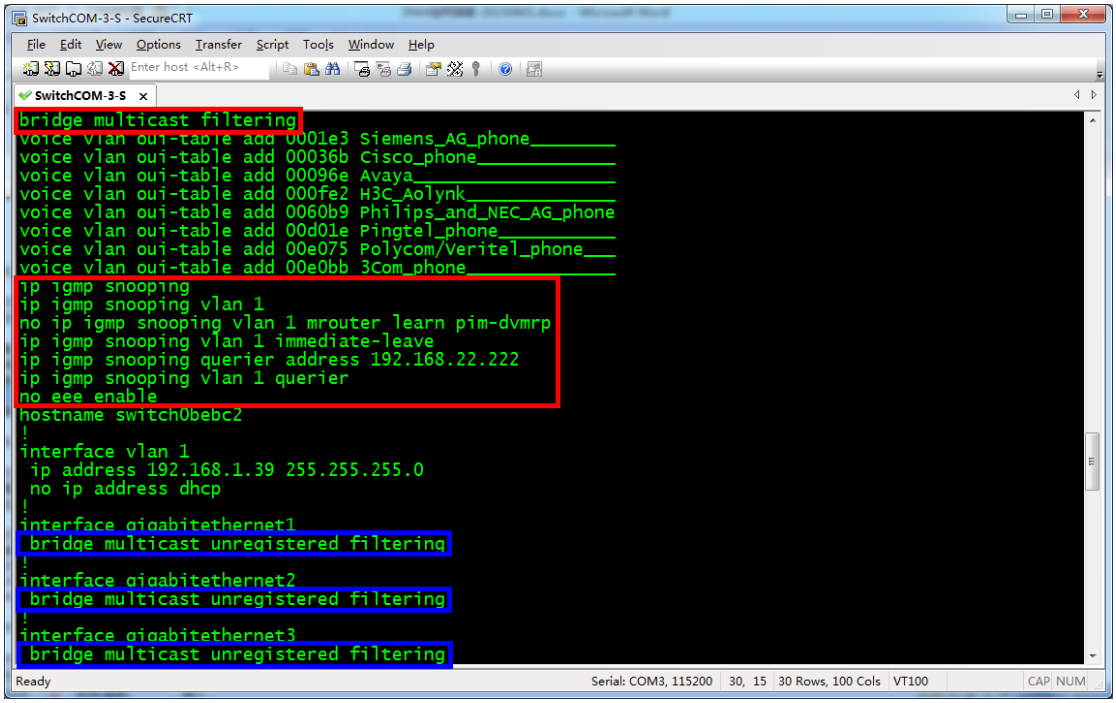
```
bridge multicast filtering
…
ip igmp snooping
```

```
ip igmp snooping vlan 1
no ip igmp snooping vlan 1 mrouter learn pim-dvmrp
ip igmp snooping vlan 1 immediate-leave
ip igmp snooping querier address 192.168.22.222
ip igmp snooping vlan 1 querier
no eee enable
```

And the following configuration is set on each Ethernet port.

```
bridge multicast unregistered filtering
```

The screen capture is as follows.



Eight configuration commands are marked in red boxes. The commands marked in blue boxes are set on each port configuration.

If your confirmation result is the same as above, it indicates that SG300 series switches are correctly configured.

3.1.2.5 Saving Configuration

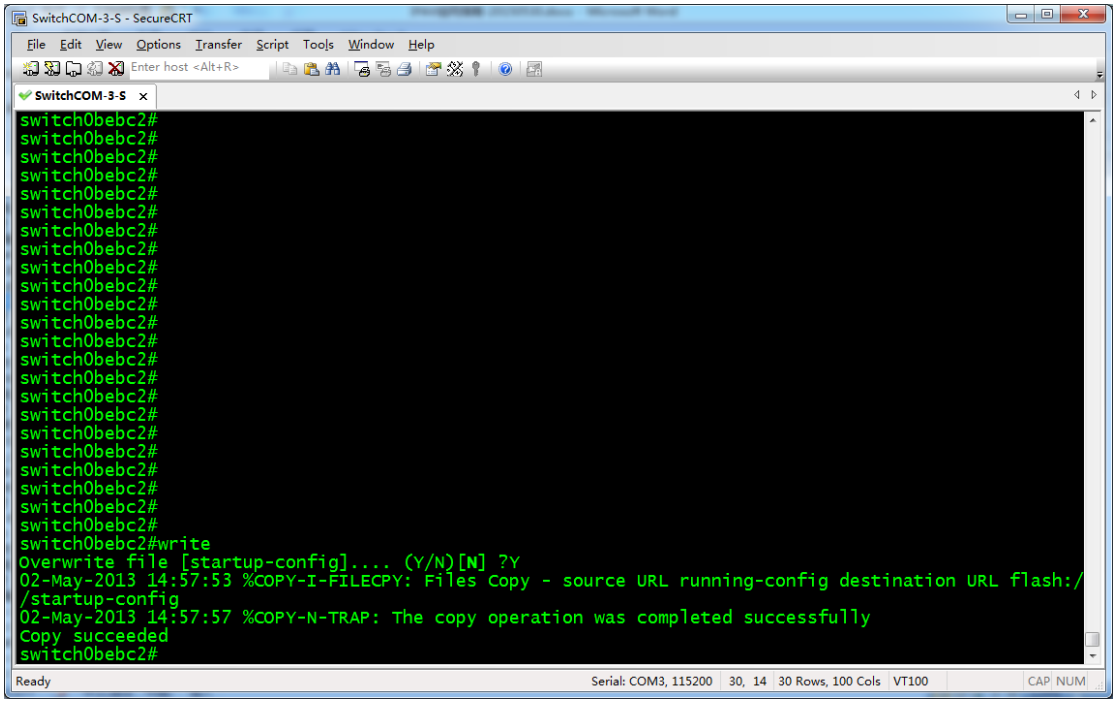
1. In normal mode, input **write** to save configuration. Switch will give the following prompt.

```
switch0bebc2#write
Overwrite file [startup-config].... (Y/N)[N] ?
```

Enter **Y** to confirm. Switch will give the following prompt.

```
02-May-2013 15:01:12 %COPY-I-FILECPY: Files Copy - source URL running-config destination URL flash://startup-config
02-May-2013 15:01:16 %COPY-N-TRAP: The copy operation was completed successfully
Copy succeeded
switch0bebc2#
```

The screen capture is as follows.



Now, the confirmed configuration is saved. Switch will continue to run the configuration for the next startup.

3.1.3 Importing Configuration

Before importing configuration for switches, complete related preparations by referring to "Reference Information" section, and then operate based on the following steps.

1. After logging in to a switch, in normal mode input **config** to enter global configuration mode.

```
switch0bebc2#
switch0bebc2#configure
```

2. Input **interface vlan 1** to enter configuration view of VLAN 1.

```
switch0bebc2(config)#interface vlan 1
switch0bebc2(config-if)#
```

3. Input **ip address 192.168.1.39 255.255.255.0** to configure management IP address for VLAN 1. Switch will give the following prompt.

```
switch0bebc2(config-if)#ip address 192.168.1.39 255.255.255.0
Please ensure that the port through which the device is managed has the proper
settings and is a member of the new management interface.
Would you like to apply this new configuration? (Y/N)[N]
```

Input **Y** to confirm. After execution, switch will return command prompt.

```
switch0bebc2(config-if)#
```

4. Input **end** to return normal mode.

```
switch0bebc2(config-if)#end
switch0bebc2#
```

5. Input **copy tftp://192.168.1.73/SG300.CFG startup-config** to obtain configuration file **SG300.CFG** from a PC whose IP address is 192.168.1.73. (IP address and configuration file name are examples only. Please use actual information) Switch will give the following prompt.

```
switch0bebc2#copy tftp://192.168.1.73/SG300.CFG startup-config
```

```
Overwrite file [startup-config].... (Y/N)[N] ?
```

Input **Y** to confirm. Switch will give the following prompt.

```
02-May-2013 15:04:09 %COPY-I-FILECPY: Files Copy - source URL tftp://192.168.1.73/SG300.CFG destination URL flash://startup-
config
!!..02-May-2013 15:04:15 %COPY-N-TRAP: The copy operation was completed successfully
!
Copy: 14103 bytes copied in 00:00:06 [hh:mm:ss]

switch0bebc2#
```

6. Input **reload**. Switch will give the following prompt.

```
switch0bebc2#reload
You haven't saved your changes. Are you sure you want to continue ? (Y/N)[N]
```

Input **Y** to confirm. Switch will give the following prompt.

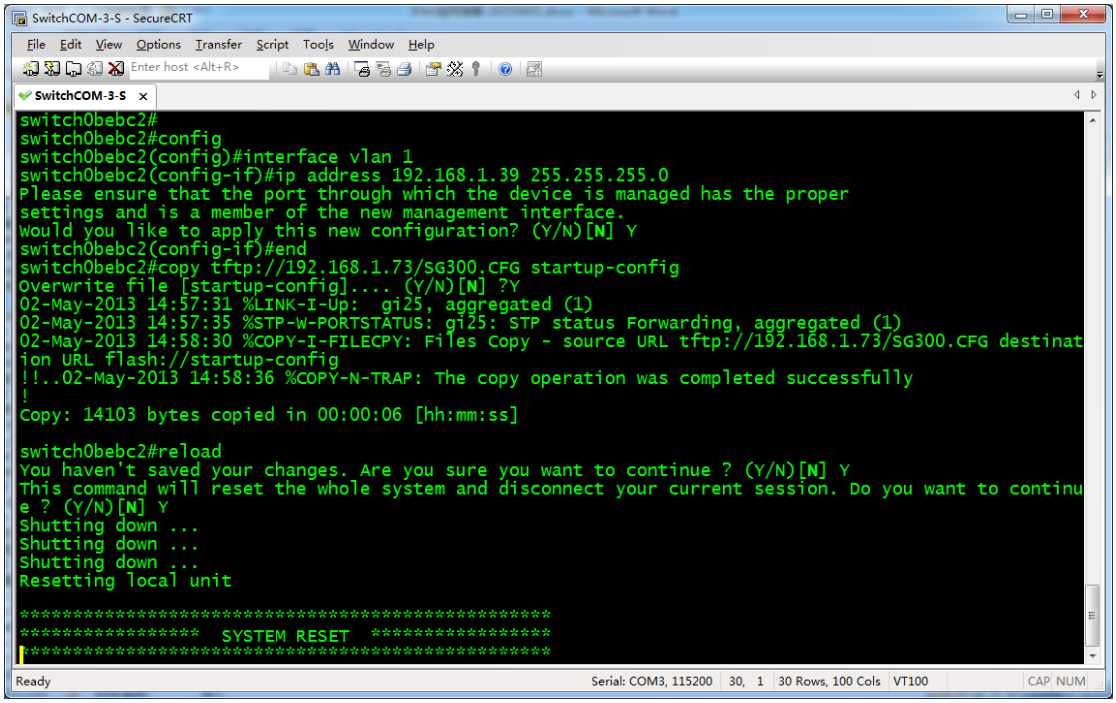
```
This command will reset the whole system and disconnect your current session. Do you want to continue ? (Y/N)[N]
```

Input **Y** again to confirm. Switch will give the following prompt.

```
Shutting down ...
Shutting down ...
Shutting down ...
Resetting local unit

************************************************
*****************  SYSTEM RESET  *****************
************************************************
```

The following screen capture describes the previous steps.



After rebooting, switch runs configuration file **SG300.CFG**.

3.2 Cisco C2960 Series Switches

We recommend WS-C2960-24TC-L, WS-C2960-48TC-L, WS-C2960S-24PS-L, WS-C2960X-24PSQ-L and WS-C2960X-48FPS-L. They can all be used for both single switch networking and cascading switch networking.

3.2.1 Basic Operation

3.2.1.1 Logging In to the Switches

If you want to configure switches, you need to use special cables and connect them to the switches' dedicated ports.

1. Connect your PC to a switch

Use a matching Console cable to connect between switch's **Console** port and PC's serial port. If your PC has no serial ports, use a USB-to-serial converter and install correct drivers.

2. Configure serial communication parameters

Run terminal emulation software on your PC. Create a session and configure serial communication parameters according to the following table.

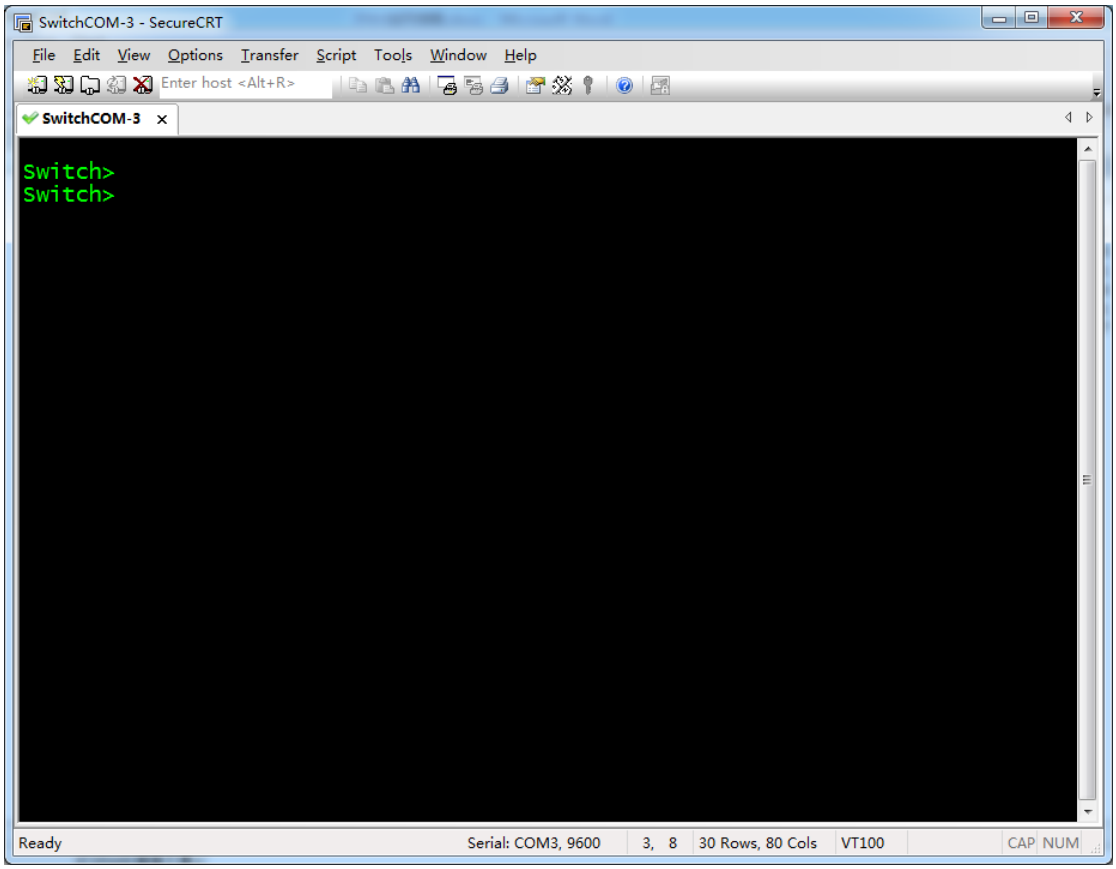
Parameters	Value
Communication Port	If your PC is equipped with serial ports in factory defaults, COM1 port is usually enabled. If your PC's multiple serial ports are configured or PC is connected with a USB-to-serial converter, see the related user guides.
Baud Rate	9600 bps
Flow Control	None
Parity	None
Stop Bits	1
Data Bits	8 bits

3. Create communication connection

In terminal emulation software select the previous created session and start the connection. When connection is successful, switch will not give any prompt. At this moment, press **Enter**. Switch will give the following prompt.

```
Switch>
Switch>
```

The screen capture is as follows. It means that you have successfully logged in to the switch and entered user mode.



3.2.1.2 Switching Operation Mode

The command-line interface of C2960 series switches has many different operation modes. This section describes several modes mentioned in this manual.

1. User mode is the default mode after logging in to the switch. In this mode, only some query operations can be performed. The prompt is as follows.

```
Switch>
```

Enter **enable** to enter privileged mode. Password may be needed.

2. Privileged mode allows you to perform some maintenance operations. The prompt is as follows.

```
Switch#
```

You can perform the following mode switching operations.

- ✧ Input **disable** to return user mode.
- ✧ Input **config terminal** to enter global configuration mode.

3. Global configuration mode allows you to change some global configuration. The prompt is as follows.

```
Switch(config)#
```

You can perform the following mode switching operations.

- ✧ Input **end** to return privileged mode
- ✧ Use **interface** command to enter port configuration mode
- ✧ Use **interface range** command to enter port bulk configuration mode

4. Port configuration mode allows you to change the settings of a single port. The prompt is as follows.

```
Switch(config-if)#
```

Input **end** to return global configuration mode.

5. Port bulk configuration mode allows bulk changes to multiple ports. The prompt is as follows.

```
Switch(config-if-range)#
```

Input **end** to return global configuration mode.

For more information about operation modes, see the user guides of switches.

3.2.1.3 Resetting to Factory Defaults

1. In user mode input **enable** to enter privileged mode.

```
Switch>enable
Switch#
```

2. Input **erase startup-config** to remove startup configuration. Switch will give the following prompt.

```
Switch#erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
```

Press **Enter** to confirm. Switch will give the following prompt.

```
[OK]
Erase of nvram: complete
Switch#
*Mar  1 02:02:50.549: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
```

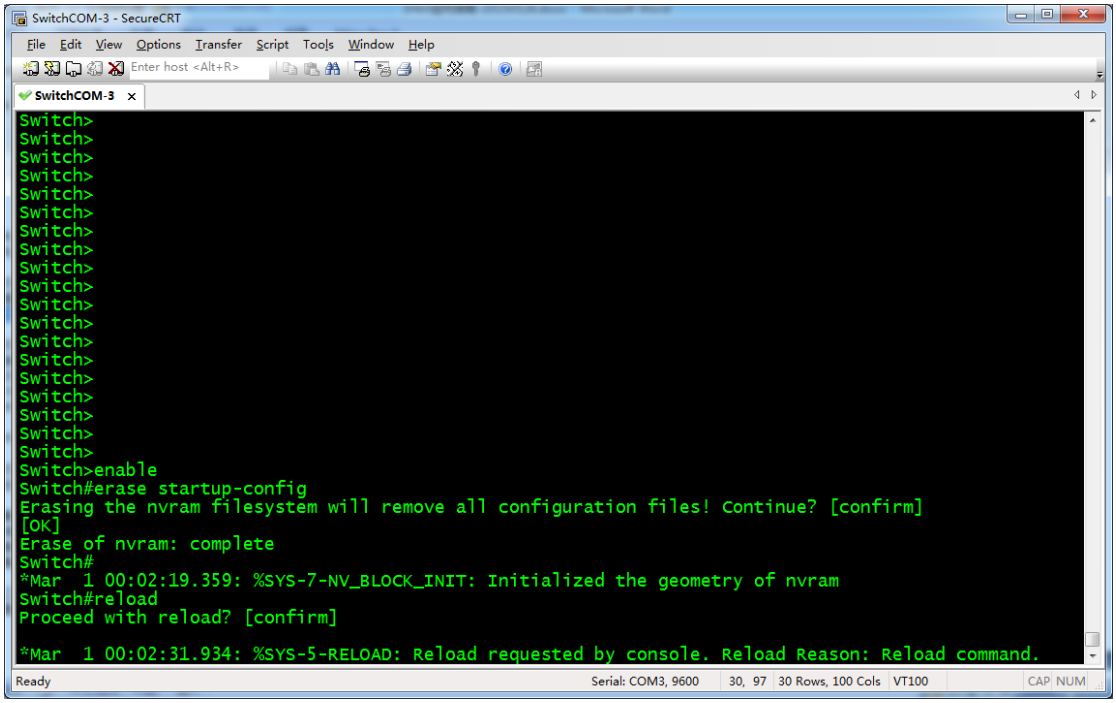
3. Input **reload** to reboot switch. Switch will give the following prompt.

```
Switch#reload
Proceed with reload? [confirm]
```

Press **Enter** to confirm. Switch will give the following prompt.

```
*Mar  1 02:05:18.700: %SYS-5-RELOAD: Reload requested by console. Reload Reason: Reload command.
```

The following screen capture describes the previous steps.



4. Switch reboots. When the following prompt appears,

```
Press RETURN to get started!
```

Press **Enter**. Switch will give the following prompt.

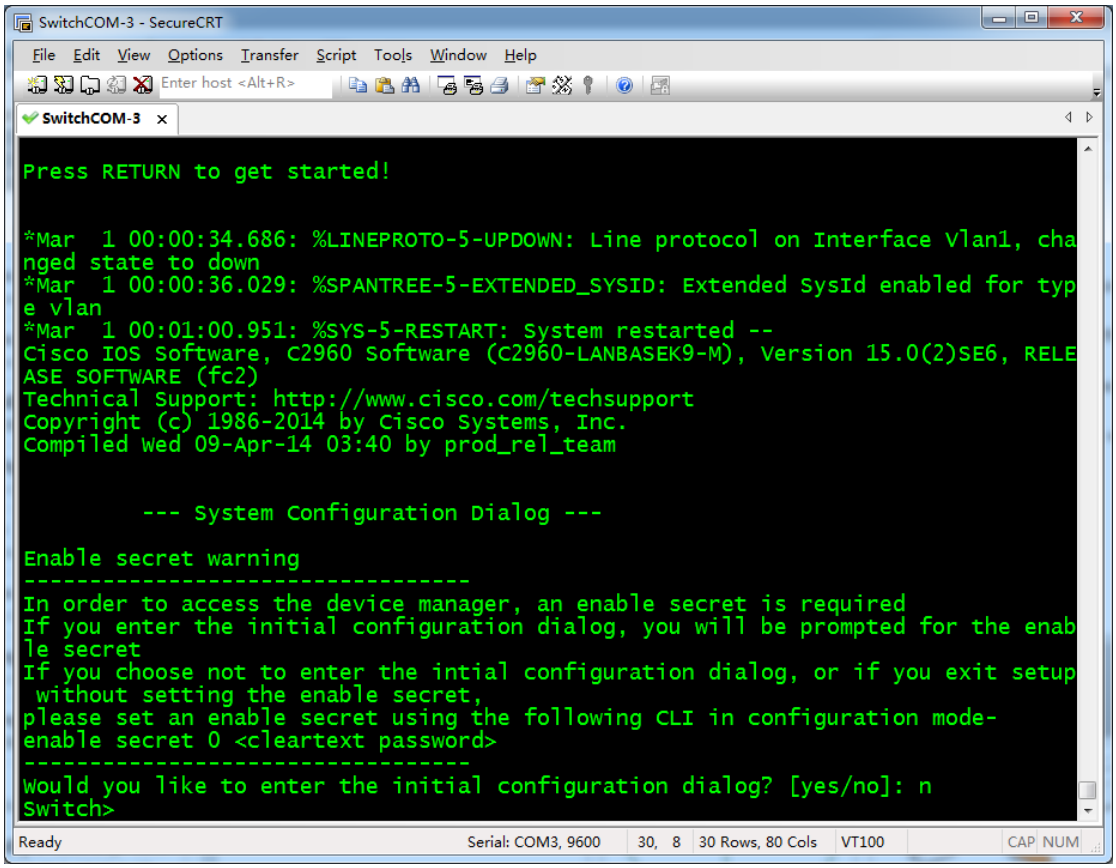
```
        --- System Configuration Dialog ---

Enable secret warning
----------------------------------
In order to access the device manager, an enable secret is required
If you enter the initial configuration dialog, you will be prompted for the enable secret
If you choose not to enter the intial configuration dialog, or if you exit setup without setting the enable secret,
please set an enable secret using the following CLI in configuration mode-
enable secret 0 <cleartext password>
----------------------------------
Would you like to enter the initial configuration dialog? [yes/no]:
```

If entering **Yes** or **Y**, switch will start an initial configuration process where you can manage some basic configuration such as password configuration. If entering **No** or **N**, switch will run in factory defaults. Now, we enter **N** to make switch run in factory defaults. Switch will give the following prompt.

```
Switch>
```

The screen capture is as follows.



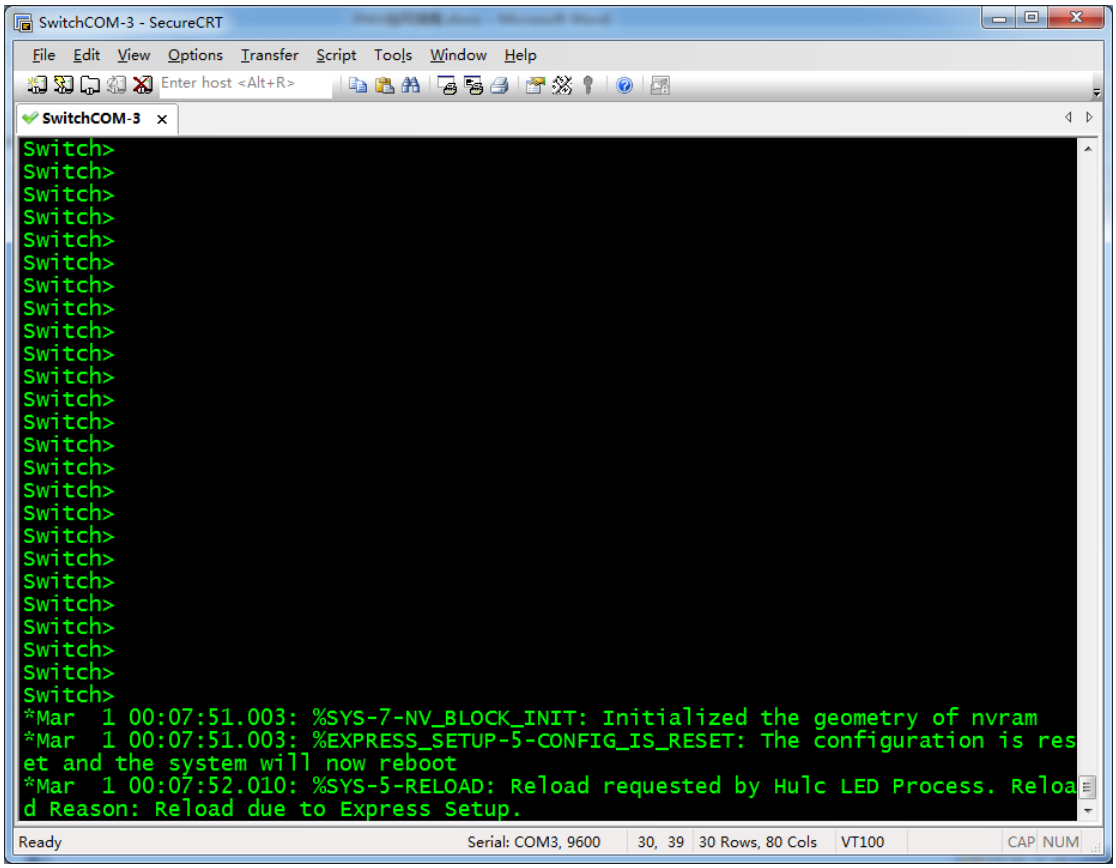
Now, we have successfully reset switch to factory defaults.

If some of switch's Ethernet ports are connected to devices using network cables, switch may display their status information during the previous process. You can ignore it.

If you forgot password and cannot access privileged mode, you can press and hold **MODE** button until screen displays the following prompt.

```
Switch>
*Mar   1 00:02:15.366: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
*Mar   1 00:02:15.375: %EXPRESS_SETUP-5-CONFIG_IS_RESET: The configuration is reset and the system will now reboot
*Mar   1 00:02:16.381: %SYS-5-RELOAD: Reload requested by Hulc LED Process. Reload Reason: Reload due to Express Setup.
```

The screen capture is as follows.



The prompt above means that switch is reset and starts rebooting. Now, you can release **MODE** button. Wait until switch finishes rebooting and follow the instructions in step 4.

3.2.2 Manual Configuration

3.2.2.1 Configuring Single Switch Networking

Based on C2960 series switches' factory defaults, when they are used in single switch networking, IGMP Querier and multicast fast leave functions must be enabled. Perform the following operations after switches are reset.

1. Enter privileged mode

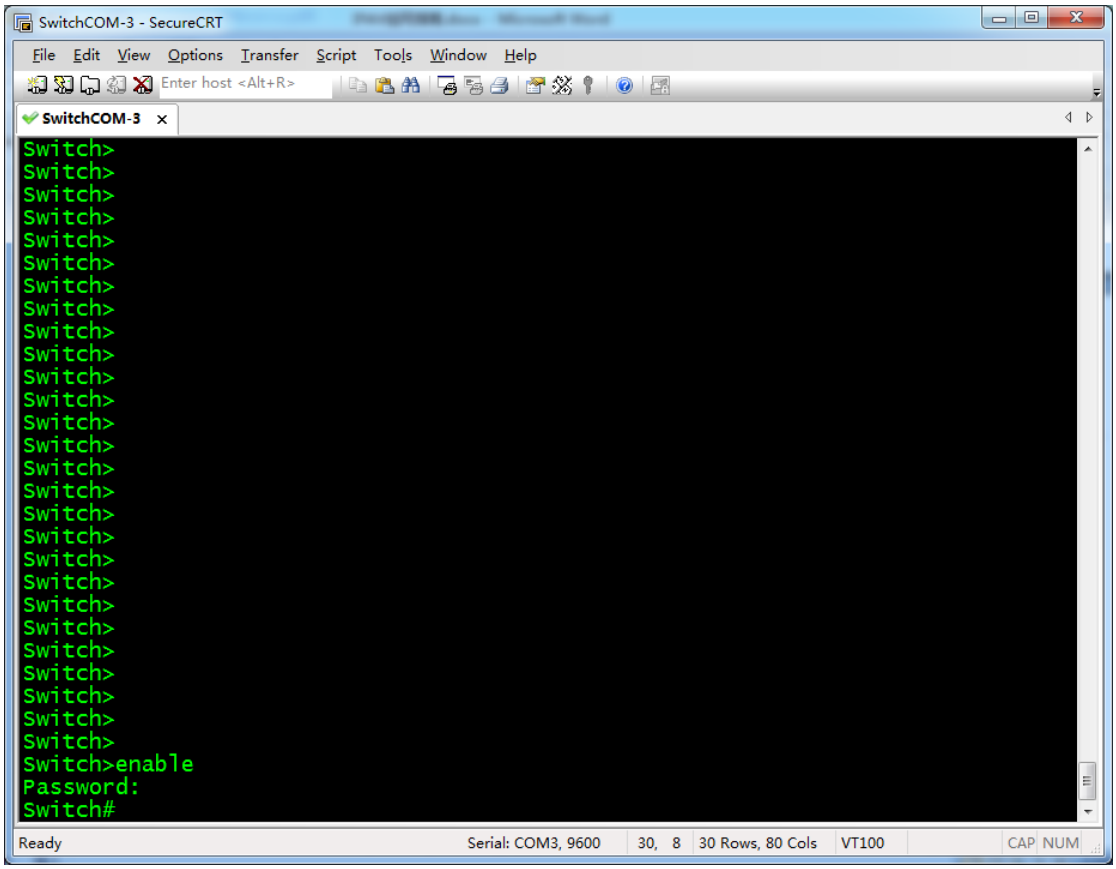
In user mode input **enable**. If password is required, switch will give the following prompt.

```
Switch>enable
Password:
```

After inputting the password, switch will give the following prompt.

```
Switch#
```

It means that you have successfully entered privileged mode. The screen capture is as follows.



If no password is required, switch will not ask you to enter password but will directly enter the privileged mode.

2. Enter global configuration mode

Enter **config terminal**. Switch will give the following prompt.

```
Switch#config terminal
Enter configuration commands, one per line.   End with CNTL/Z.
Switch(config)#
```

It means that you have successfully entered global configuration mode.

3. Input **ip igmp snooping vlan 1 immediate-leave** to enable multicast fast leave for VLAN 1.

```
Switch(config)#ip igmp snooping vlan 1 immediate-leave
Switch(config)#
```

4. Enable IGMP Querier

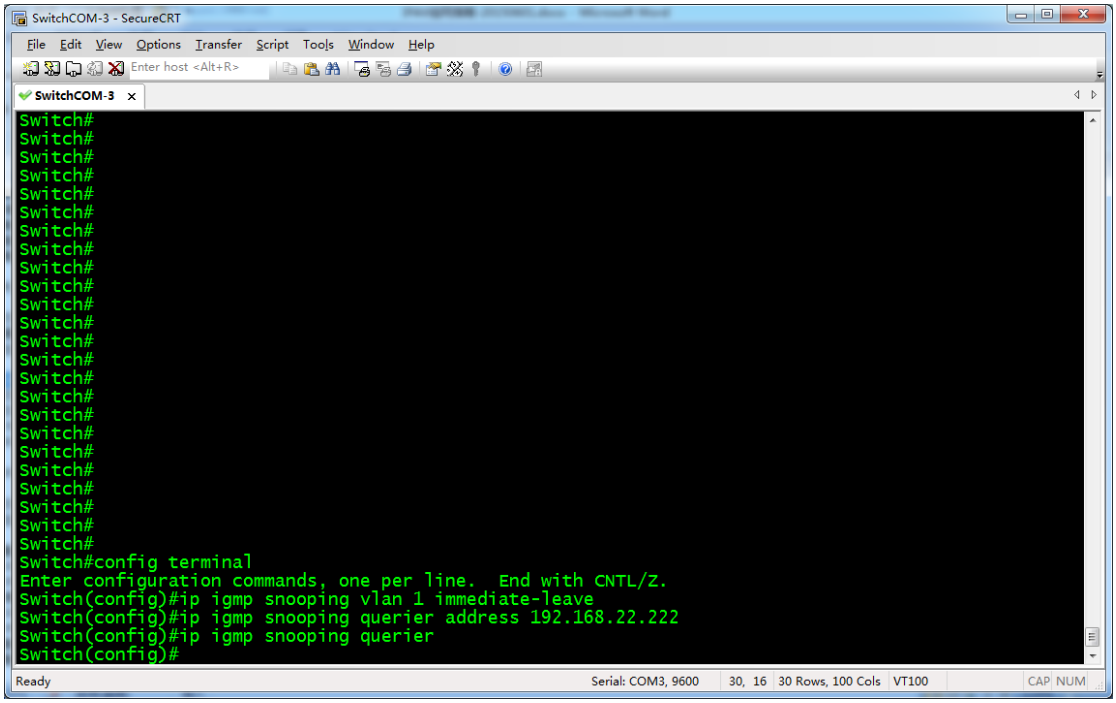
Input **ip igmp snooping querier address 192.168.22.222** to assign an IP address for IGMP Querier. Switch will give the following prompt.

```
Switch(config)#ip igmp snooping querier address 192.168.22.222
Switch(config)#
```

Enter **ip igmp snooping querier** to enable IGMP Querier. Switch will give the following prompt.

```
Switch(config)#ip igmp snooping querier
Switch(config)#
```

The following screen capture describes steps 2-4.



5. Confirm configuration

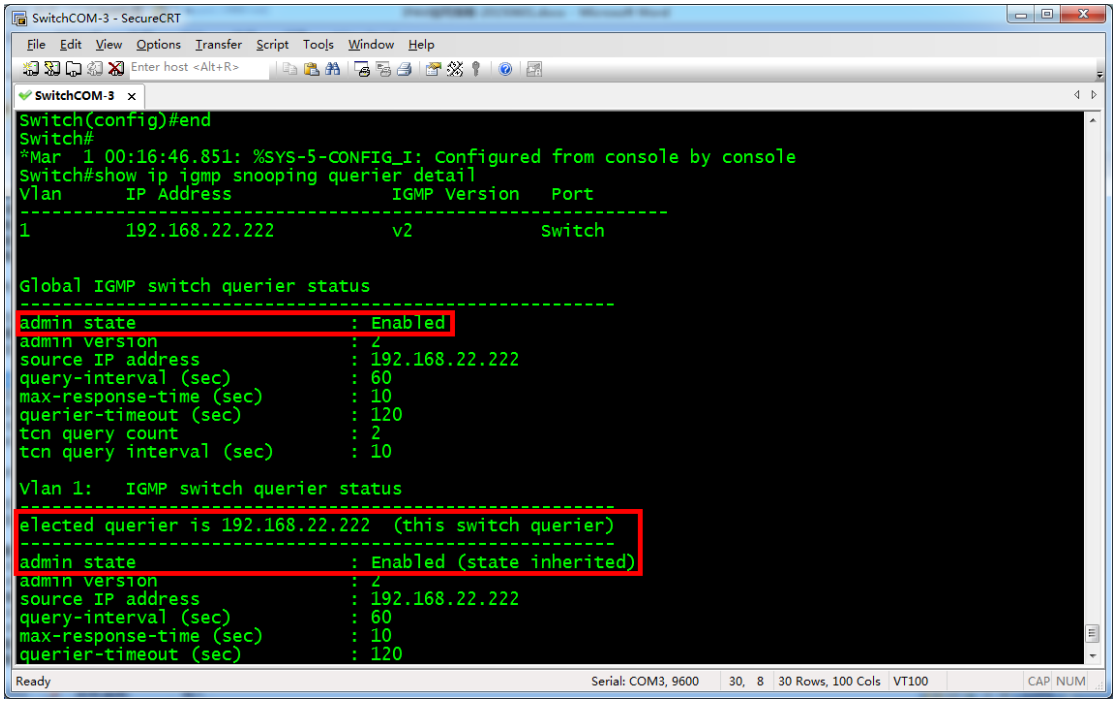
Enter **end** to return privileged mode. Switch will give the following prompt.

```
Switch(config)#end
Switch#
*Mar  1 00:39:20.646: %SYS-5-CONFIG_I: Configured from console by console
Switch#
```

Input **show ip igmp snooping querier detail**. Switch will give the following prompt.

```
Switch#show ip igmp snooping querier detail
...
Global IGMP switch querier status
------------------------------------------------------------
admin state                          : Enabled
...
Vlan 1:     IGMP switch querier status
------------------------------------------------------------
elected querier is 192.168.22.222     (this switch querier)
------------------------------------------------------------
admin state                          : Enabled (state inherited)
...
```

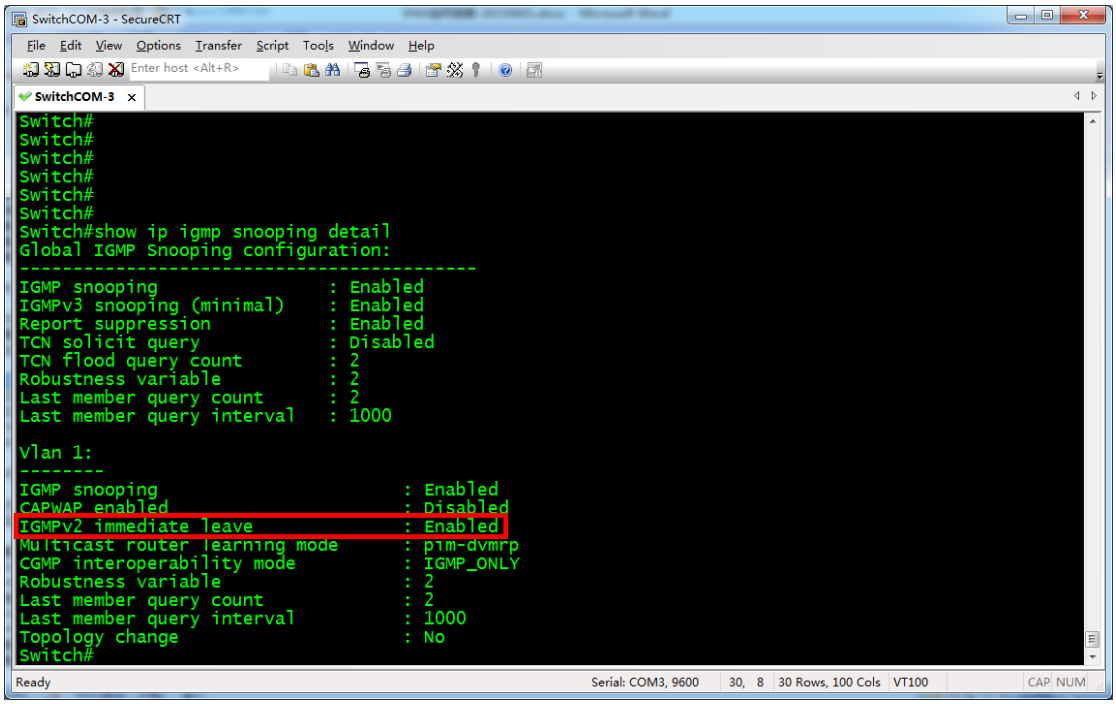
The related screen capture is as follows. The information in red boxes means that IGMP Querier is correctly enabled.



Continue to input **show ip igmp snooping detail** to view IGMP Snooping detail.

```
Switch#show ip igmp snooping detail
Global IGMP Snooping configuration:
----------------------------------------
IGMP snooping                 : Enabled
...
Vlan 1:
--------
IGMP snooping                       : Enabled
...
IGMPv2 immediate leave              : Enabled
...
```

The screen capture is as follows. The information in red box means that multicast fast leave is enabled for VLAN 1.

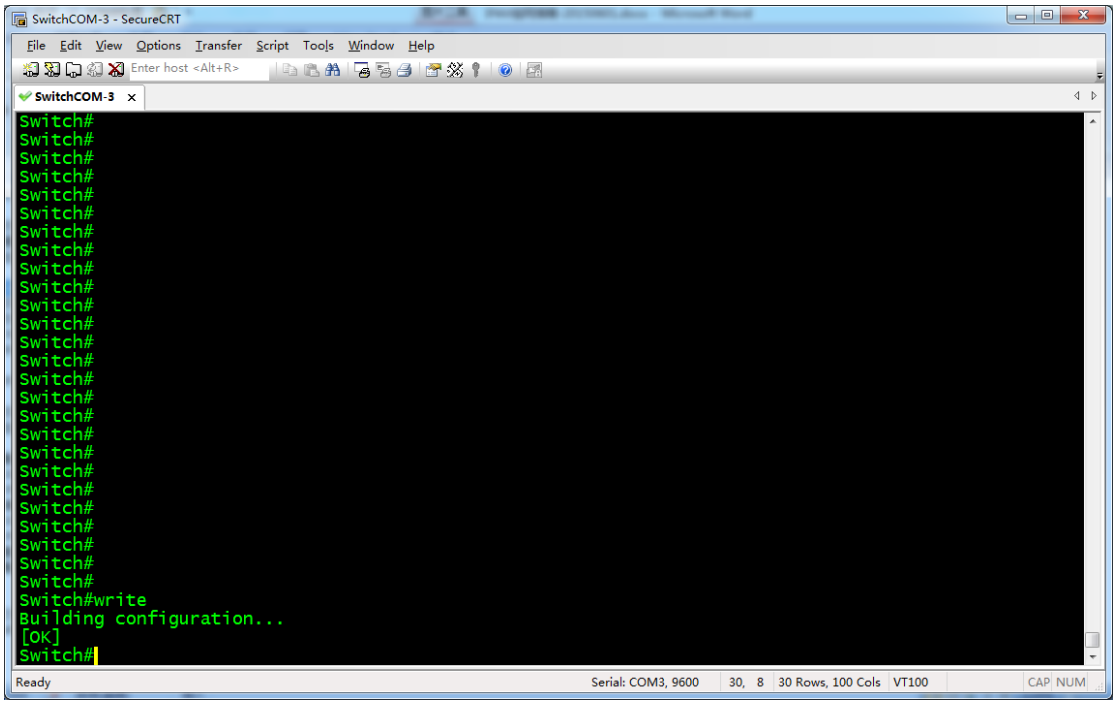


6. Save configuration

After confirming correct configuration, input **write** to save the current configuration. Switch will display the following prompt.

```
Switch#write
Building configuration...
[OK]
```

The screen capture is as follows.



Now, it has successfully saved configuration used in single switch networking. Switch will run this configuration for the next startup.

3.2.2.2 Configuring Core Switches

Based on C2960 series switches' factory defaults, when they are used as core switches, only IGMP Querier function needs to be enabled. Perform the following operations after they are reset.

1. Enter privileged mode

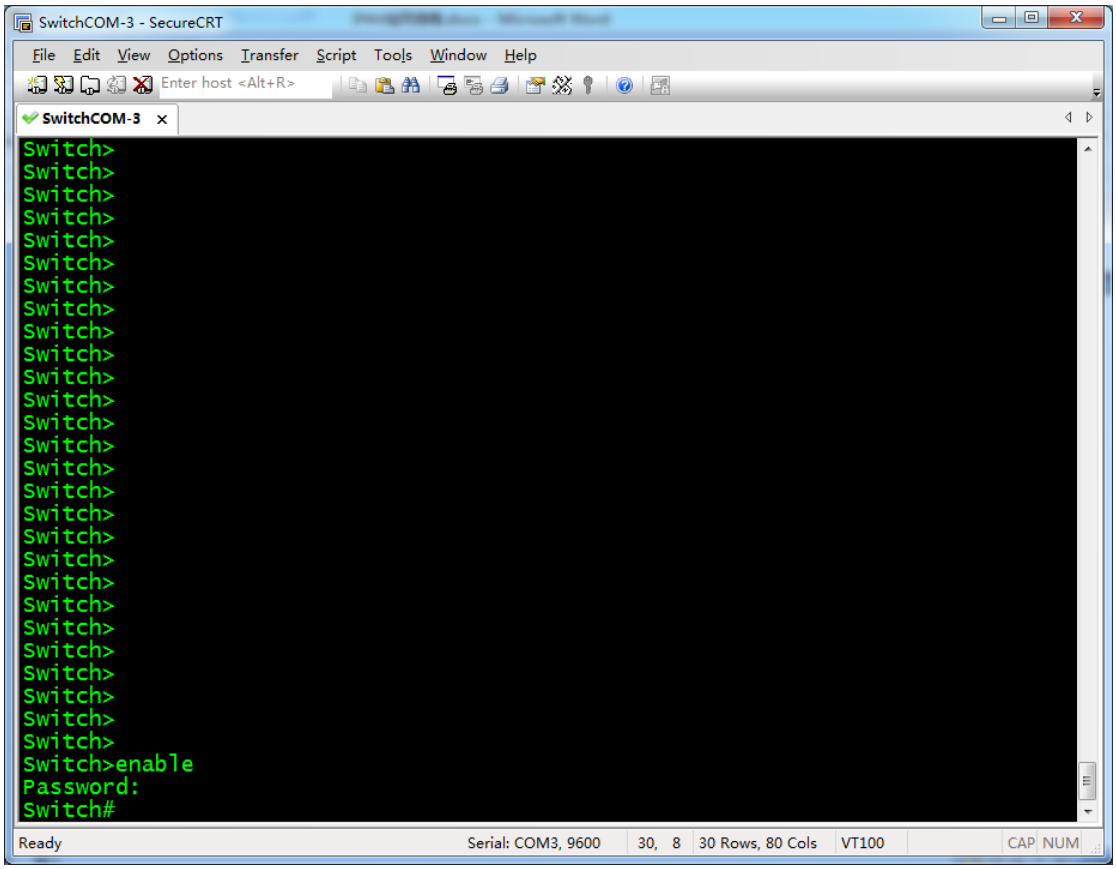
In user mode input **enable**. If password is required, switch will give the following prompt.

```
Switch>enable
Password:
```

After inputting the password, switch will give the following prompt.

```
Switch#
```

It means that you have successfully entered privileged mode. The screen capture is as follows.



If no password is required, switch will not ask you to input password but will directly enter privileged mode.

2. Enter global configuration mode

Input **config terminal**. Switch will give the following prompt.

```
Switch#config terminal
Enter configuration commands, one per line.   End with CNTL/Z.
Switch(config)#
```

It means that you have successfully entered global configuration mode.

3. Enable IGMP Querier

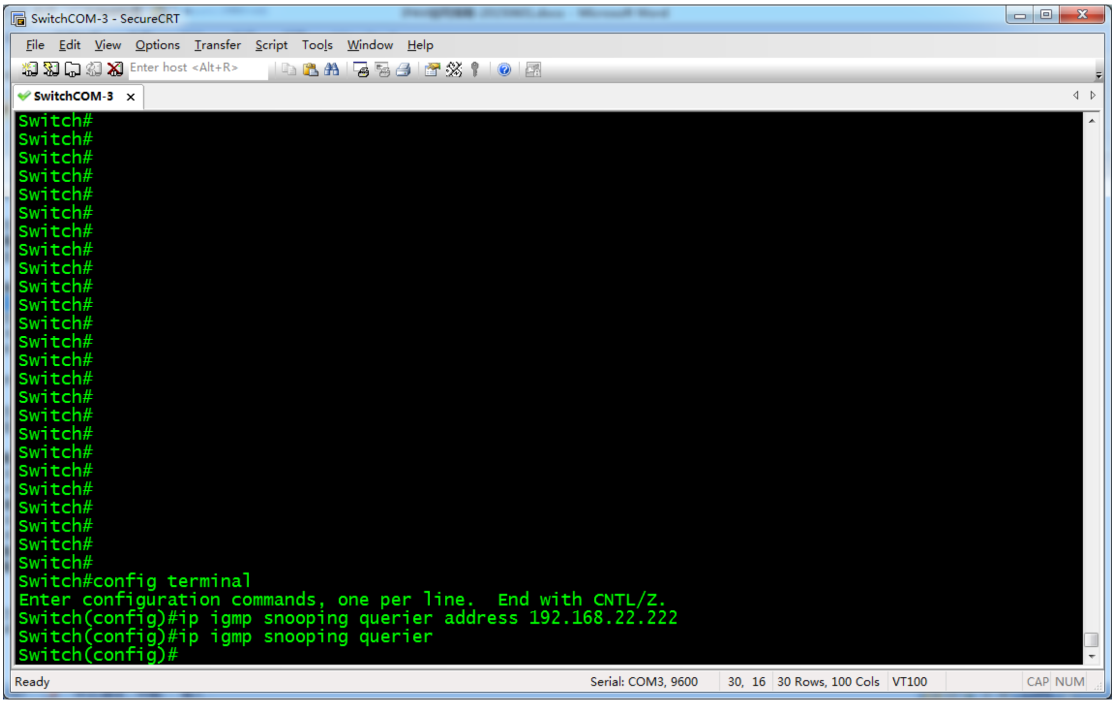
Input **ip igmp snooping querier address 192.168.22.222** to assign an IP address for IGMP Querier. Switch will give the following prompt.

```
Switch(config)#ip igmp snooping querier address 192.168.22.222
Switch(config)#
```

Input **ip igmp snooping querier** to enable IGMP Querier. Switch will give the following prompt.

```
Switch(config)#ip igmp snooping querier
Switch(config)#
```

The following screen capture describes steps 2-3.



4. Confirm configuration

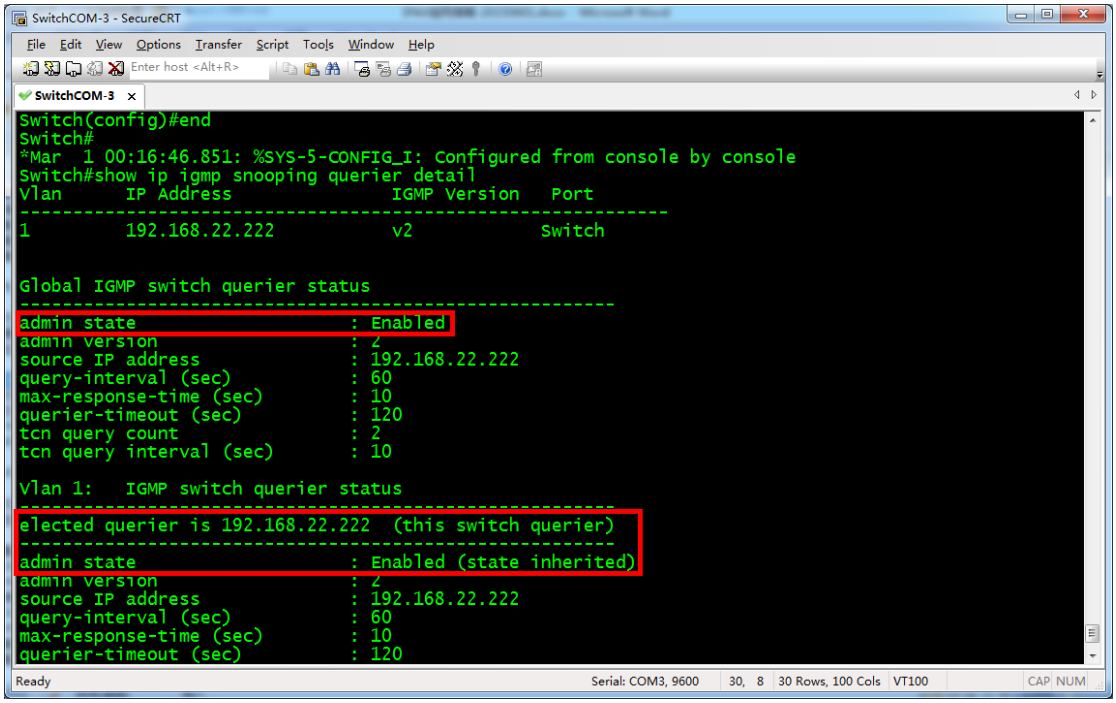
Input **end** to return privileged mode. Switch will give the following prompt.

```
Switch(config)#end
Switch#
*Mar  1 00:39:20.646: %SYS-5-CONFIG_I: Configured from console by console
Switch#
```

Input **show ip igmp snooping querier detail**. Switch will give the following prompt.

```
Switch#show ip igmp snooping querier detail
...
Global IGMP switch querier status
--------------------------------------------------------
admin state                          : Enabled
...
Vlan 1:    IGMP switch querier status
--------------------------------------------------------
elected querier is 192.168.22.222     (this switch querier)
--------------------------------------------------------
admin state                          : Enabled (state inherited)
...
```

The related screen capture is as follows. The information in red boxes means that IGMP Querier is enabled correctly.

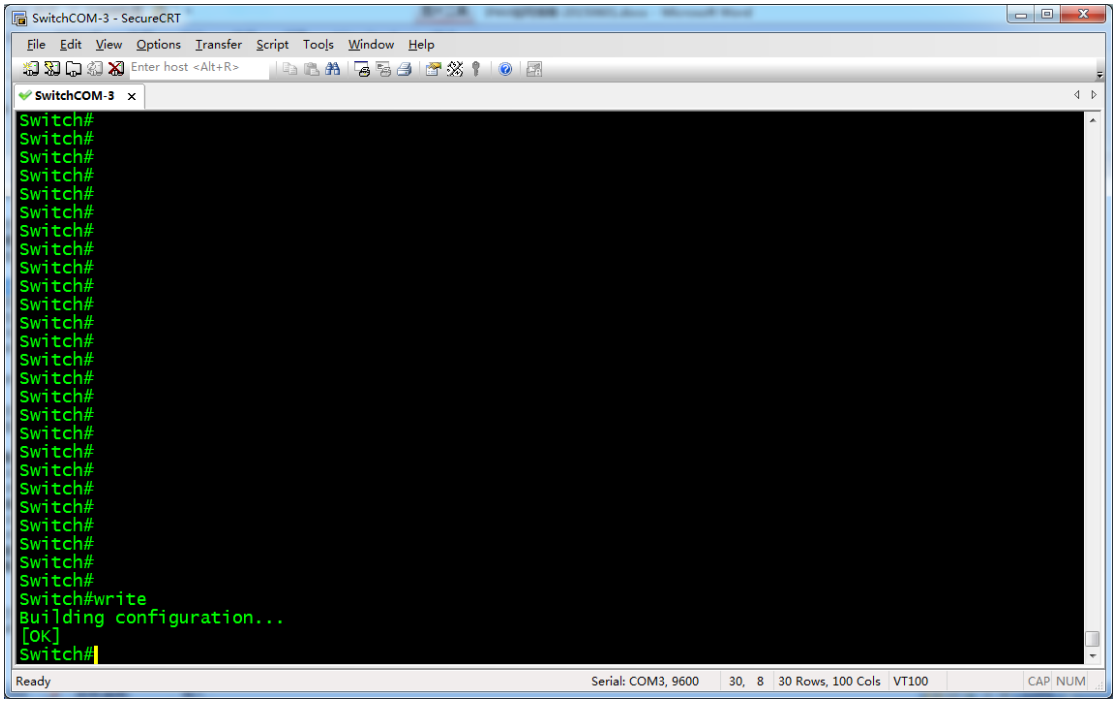


5. Save configuration

After confirming correct configuration, input **write** to save the current configuration. Switch will display the following prompt.

```
Switch#write
Building configuration...
[OK]
```

The screen capture is as follows.



Now, it has successfully saved the current configuration. Core switch will run this configuration for the next startup.

3.2.2.3 Configuring Extended Switches

In factory defaults of C2960 series switches, IGMP Snooping is enabled but IGMP Querier is disabled. When they are used as extended switches, only multicast fast leave needs to be enabled.

1. In user mode input **enable** to enter privileged mode.

```
Switch>enable
Switch#
```

2. Input **config terminal** to enter global configuration mode.

```
Switch#config terminal
Enter configuration commands, one per line.   End with CNTL/Z.
Switch(config)#
```

3. Input **ip igmp snooping vlan 1 immediate-leave** to enable multicast fast leave for VLAN 1.

```
Switch(config)#ip igmp snooping vlan 1 immediate-leave
Switch(config)#
```

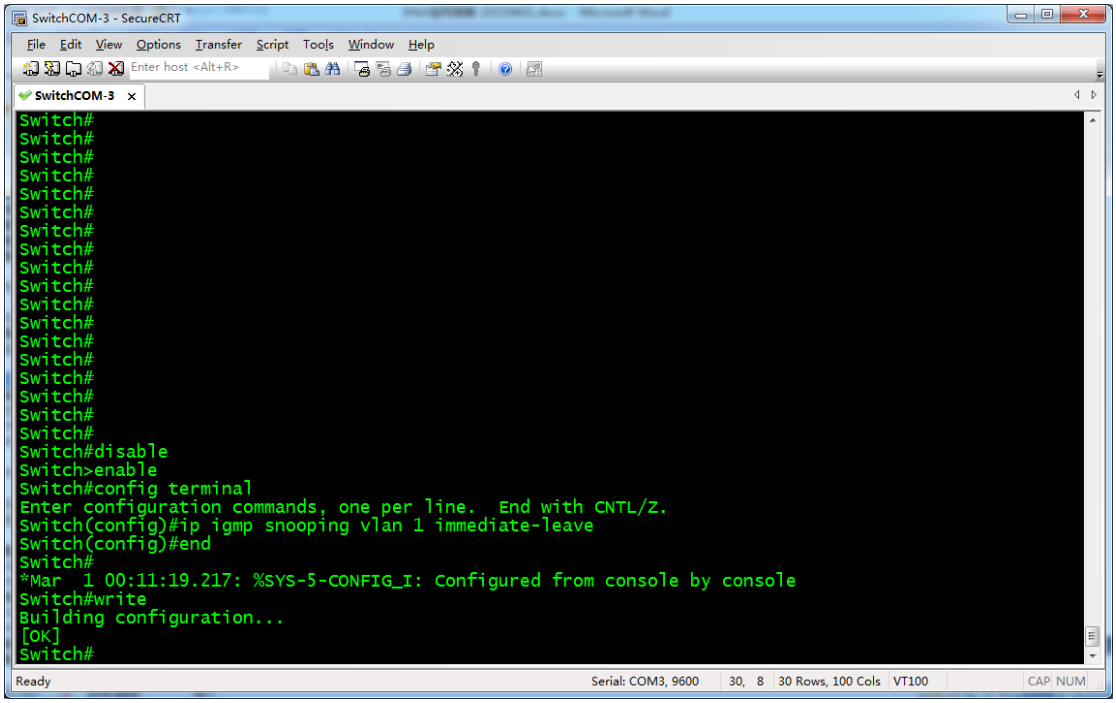
4. Input **end** to return privileged mode.

```
Switch(config)#end
Switch#
```

5. Input **write** to save the current configuration.

```
Switch#write
Building configuration...
[OK]
```

The following screen capture describes the previous steps.



Now, C2960 series switches have been successfully configured to be extended switches.

3.2.2.4 Preventing Multicast Flood Caused by TCN

C2960 series switches will forward multicast packets to all the ports when network topology changes. In Cisco's documentation, network topology change is abbreviated as TCN (Topology Change Notification). The most common TCN event is connection or disconnection of network cables. In a network environment with C2960 series switches for networking, if you plug or unplug a network device's network cable, multicast flood may happen. Although this situation rarely happens when the system works properly, we would recommend that you manually disable this function. Now let's take a WS-C2960-24TC-L switch for example to show how to do:

1. Obtain port configuration information

C2960 series switches' each Ethernet port can be set not to be affected by multicast flood caused by TCN. So first you need to obtain the switch's port configuration.

In user mode input **show interface description** to obtain the switch's port configuration.

WS-C2960-24TC-L will give the following prompt.

```
Switch>show interface description
Interface                      Status         Protocol Description
Vl1                            admin down     down
Fa0/1                          down           down
Fa0/2                          down           down
Fa0/3                          up             up
Fa0/4                          down           down
...
Fa0/23                         down           down
Fa0/24                         down           down
Gi0/1                          up             up
Gi0/2                          up             up
```

From the list above, we can see that this switch has 24 100Mbps Ethernet ports ranging from Fa0/1 to Fa0/24. Other models of

switches will give different prompt due to different port configuration.

2. Assign host port range

After obtaining port configuration, it needs to assign related Ethernet ports as the next operated objects.

In user mode input **enable** to enter privileged mode. Switch will give the following prompt.

```
Switch>enable
Switch#
```

Input **config terminal** to enter global configuration mode. Switch will give the following prompt.

```
Switch#config terminal
Enter configuration commands, one per line.   End with CNTL/Z.
Switch(config)#
```

Use **interface range** command to enter port bulk configuration mode. Switch will give the following prompt.

```
Switch(config)#interface range fa 0/1-24
Switch(config-if-range)#
```

The prompt above is the operation result on WS-C2960-24TC-L. Its argument **Fa0/1-24** is port configuration information from the previous step. For different switches, arguments behind **interface range** may be different. For example port range of WS-C2960S-24PS-L should be assigned like this:

```
Switch(config)#interface range Gi 1/0/1-28
Switch(config-if-range)#
```

Subsequent operations will be performed on these ports.

3. Ban TCN Multicast Flood

Input **no ip igmp snooping tcn flood** to ban these ports from multicast flood due to TCN. Switch will give the following prompt.

```
Switch(config-if-range)#no ip igmp snooping tcn flood
Switch(config-if-range)#
```

4. Save the current configuration.

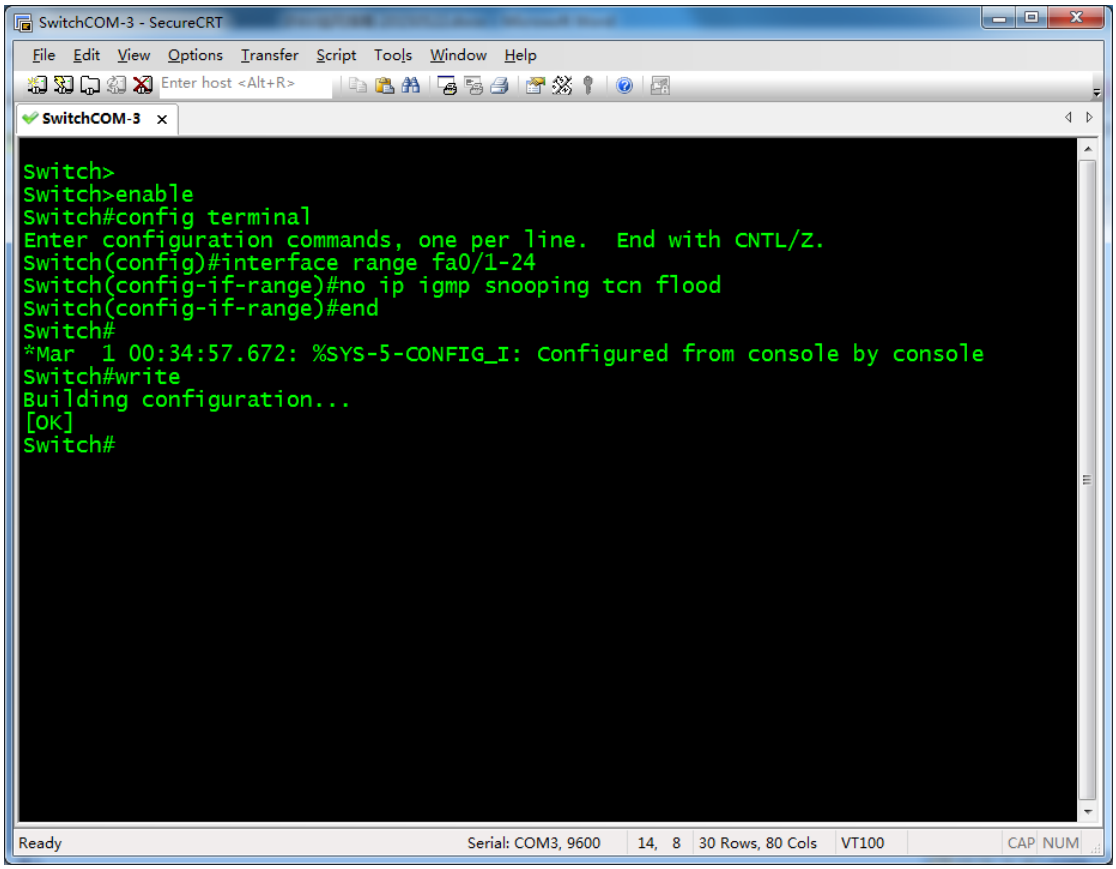
Input **end** to return privileged mode. Switch will give the following prompt.

```
Switch(config-if-range)#end
Switch#
*Mar  1 00:58:18.292: %SYS-5-CONFIG_I: Configured from console by console
Switch#
```

Input **write** to save the configuration so that the settings will take effect for the next startup. Switch will give the following prompt.

```
Switch#write
Building configuration...
[OK]
Switch#
```

The following screen capture describes the previous steps 2-4 operated on WS-C2960-24TC-L.



Now, multicast flooding caused by TCN has been successfully prevented from all host ports. Please note that in the previous example we only configure main ports of switches except a few ports such as WS-C2960-24TC-L's two Gi ports. You can configure these undone ports according to the example above.

3.2.3 Importing Configuration

Before importing configuration for switches, complete related preparations by referring to "Reference Information" section, and then operate based on the following steps.

1. In user mode input **enable** to enter privileged mode. Switch will give the following prompt.

```
Switch>enable
Switch#
```

2. Input **config terminal** to enter global configuration mode. Switch will give the following prompt.

```
Switch#config terminal
Enter configuration commands, one per line.   End with CNTL/Z.
Switch(config)#
```

3. Input **interface vlan 1** to enter port configuration mode.

```
Switch(config)#interface vlan 1
Switch(config-if)#
```

4. Input **ip address 192.168.1.39 255.255.255.0** to configure management IP address for VLAN 1.

```
Switch(config-if)#ip address 192.168.1.39 255.255.255.0
Switch(config-if)#
```

5. Input **no shutdown** to ensure that ports are always open. Switches may give some additional prompt.

```
Switch(config-if)#no shutdown
Switch(config-if)#
```

```
*Mar  1 00:06:06.506: %LINK-3-UPDOWN: Interface Vlan1, changed state to up
*Mar  1 00:06:06.515: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up
Switch(config-if)#
```

6. Input **end** to return privileged mode.

```
Switch(config-if)#end
Switch#
*Mar  1 00:06:19.022: %SYS-5-CONFIG_I: Configured from console by console

Switch#
```

7. Input **copy tftp: startup-config** to download configuration file from PC. Switch will give the following prompt.

```
Switch#copy tftp: startup-config
Address or name of remote host []?
```

Enter PC's IP address such as **192.168.1.73**. Switch will continue to prompt configuration file name.

```
Source filename []?
```

Input configuration file name in TFTP directory such as **C2960-IPAV.cfg**. Switch will continue to give prompt.

```
Destination filename [startup-config]?
```

Press **Enter** to confirm. Switch will download configuration data from PC via TFTP.

```
Accessing tftp://192.168.1.73/C2960-IPAV.cfg...
Loading C2960-IPAV.cfg from 192.168.1.73 (via Vlan1): !
[OK - 2365 bytes]
2365 bytes copied in 17.138 secs (138 bytes/sec)
Switch#
*Mar  1 00:08:41.989: %SYS-5-CONFIG_NV_I: Nonvolatile storage configured from tftp://192.168.1.73/C2960-IPAV.cfg by console
Switch#
```

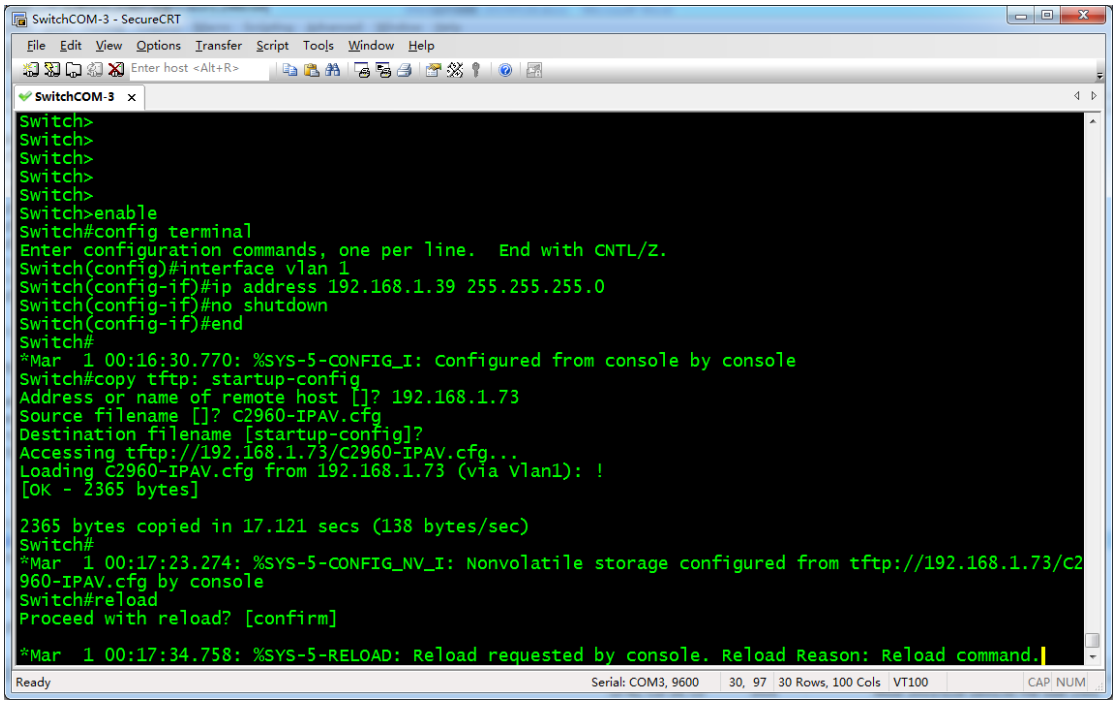
8. Input **reload** to reboot switch. Switch will give the following prompt.

```
Switch#reload
Proceed with reload? [confirm]
```

Press **Enter** to confirm. Switch will give the following prompt.

```
*Mar  1 02:05:18.700: %SYS-5-RELOAD: Reload requested by console. Reload Reason: Reload command.
```

The following screen capture describes the previous steps.



After rebooting, switch will run configuration file **C2960-IPAV.cfg**.

3.3 HUAWEI S5700 Series Switches

We recommend models S5700-28P-LI-AC, S5700-48TP-SI-AC, S5700-28P-PWR-LI-AC and S5700-48TP-PWR-SI. They can be used in single switch networking and have similar configuration methods.

3.3.1 Basic Operations

3.3.1.1 Logging In to the Switches

If you want to configure switches, you need to use special cables and connect them to the switches' dedicated ports.

1. Connect your PC to a switch

Use a matching Console cable to connect between switch's **Console** port and PC's serial port. If your PC has no serial ports, use a USB-to-serial converter and install correct drivers.

2. Configure serial communication parameters

Run terminal emulation software on your PC. Create a session and configure serial communication parameters based on the following table.

Parameters	Value
Communication Port	If your PC is equipped with serial ports in factory defaults, COM1 port is usually enabled. If your PC's multiple serial ports are configured or PC is connected with a USB-to-serial converter, see the related user guides.
Baud Rate	9600 bps
Flow Control	None
Parity	None
Stop Bits	1
Data Bits	8 bits

3. Build communication connection

In terminal emulation software select the previous created session and start the connection. Switch will give the following prompt.

```
User interface con0 is available
Please Press ENTER.
```

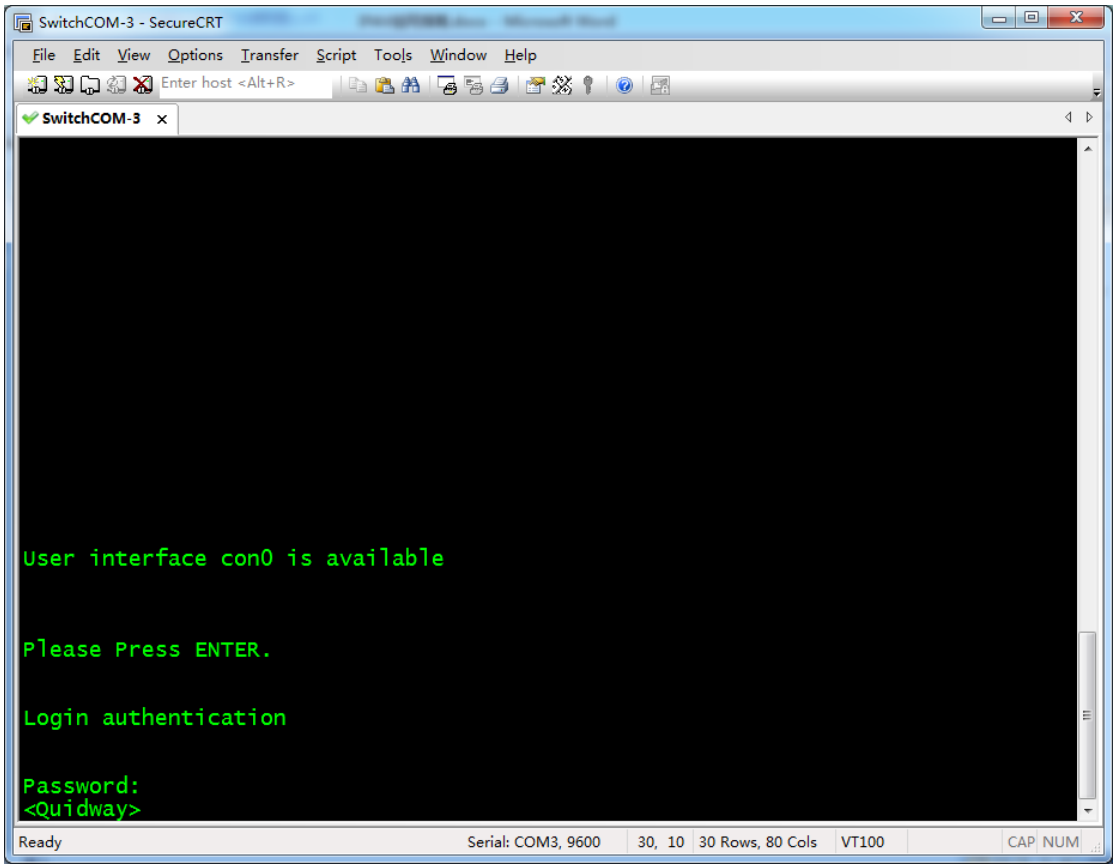
Press **Enter** (If switch does not give any prompt directly press **Enter**). Switch will give the following feedback.

```
Login authentication
Password:
```

After password is input, screen will display the following prompt, indicating that user is in default view.

```
<Quidway>
```

The following screen capture describes the previous steps.



Now, you have successfully logged in to the switches and can perform further operations.

3.3.1.2 Resetting to Factory Defaults

1. Log in to switch using terminal emulation software. Input **reset save**. Switch will give the following prompt.

```
<Quidway>reset save
The action will delete the saved configuration in the device.
The configuration will be erased to reconfigure. Continue? [Y/N]:
```

Input **Y**. Switch will give the following prompt.

```
Warning: Now clearing the configuration in the device.
Info: Succeeded in clearing the configuration in the device.
```

2. Continue to input **reboot** to make switches stay in factory defaults status. Switch will give the following prompt.

```
<Quidway>reboot
Info: The system is now comparing the configuration, please wait.
Warning: All the configuration will be saved to the configuration file for the next startup:, Continue?[Y/N]:
```

Input **N**. Switch will give the following prompt.

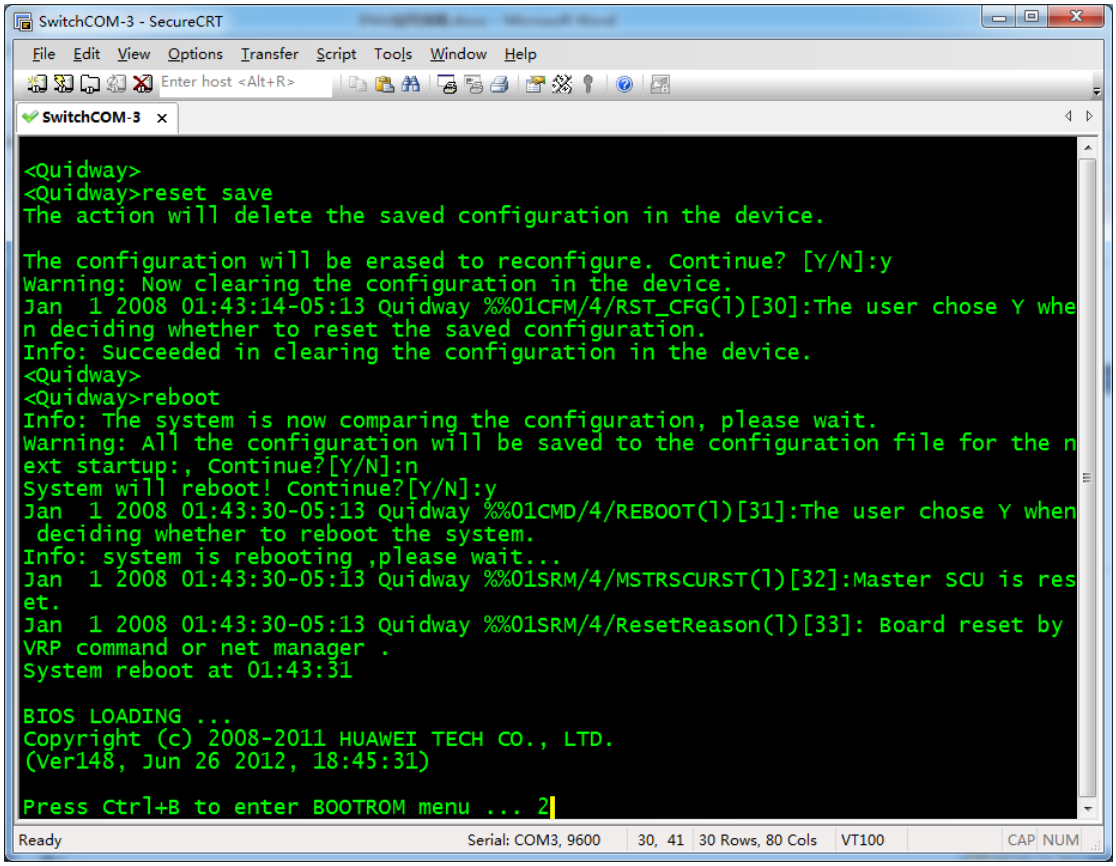
```
System will reboot! Continue?[Y/N]:
```

Input **Y**. Switch will give the following prompt after printing some information.

```
System reboot at 01:37:56

BIOS LOADING ...
```

The following screen capture describes the previous steps 1-2.



3. After switch is reset to factory defaults and reboots, it will give the following prompt.

```
Recover configuration...OK!
Press ENTER to get started.
done
```

After pressing **Enter**, switch will ask you to configure the login password.

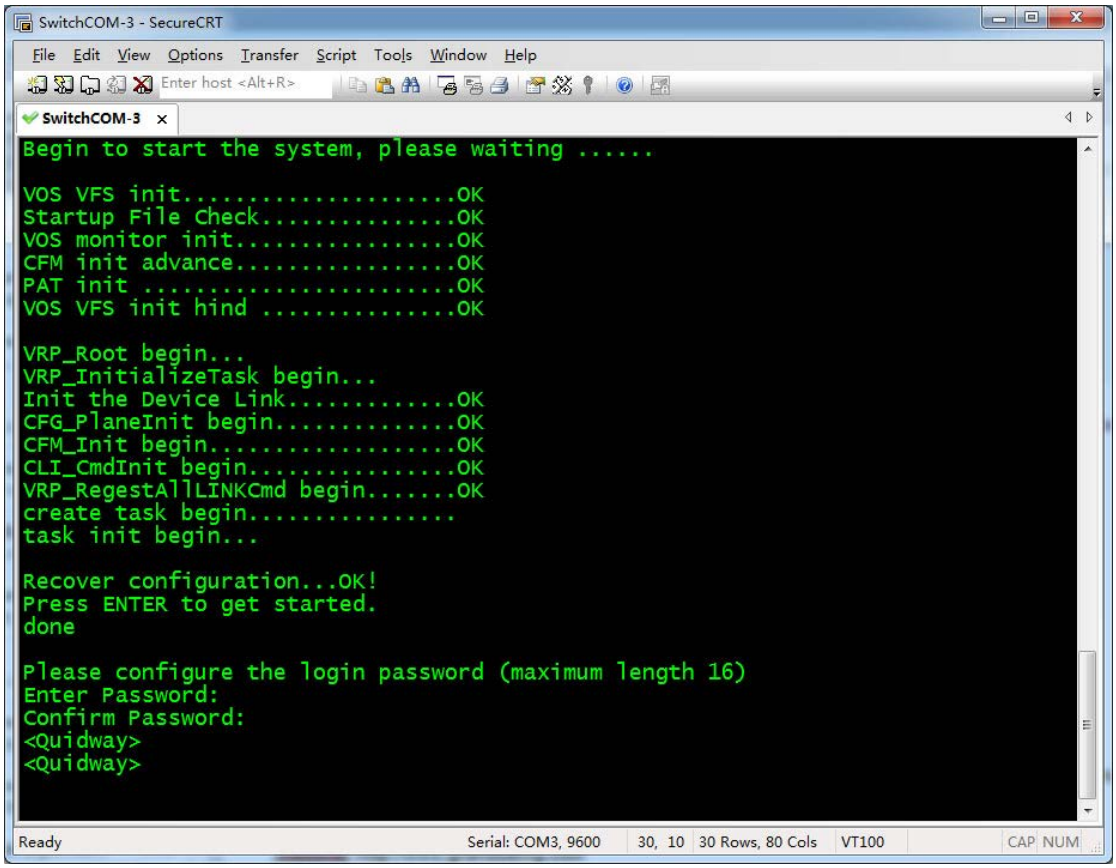
```
Please configure the login password (maximum length 16)
Enter Password:
```

After inputting the password, switch will ask you to input password again for confirmation.

```
Confirm Password:
```

After inputting the same password twice, you can now configure switches.

The following screen capture describes this step.



3.3.2 Manual Configuration

The following introduces operation process of manual configuration via commands. During the process, switch will give the similar prompt like below now and then.

```
Jan  5 2008 01:41:40-05:13 Quidway DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.191.3.1 configurations have been changed. The current change number is 1, the change loop count is 5, and the maximum number of records is 1.
```

You can directly press **Enter** to ignore it.

3.3.2.1 Changing the Configuration

1. After logging in to the switches input **system-view** in default view to enter system view.

```
<Quidway>system-view
Enter system view, return user view with Ctrl+Z.
[Quidway]
```

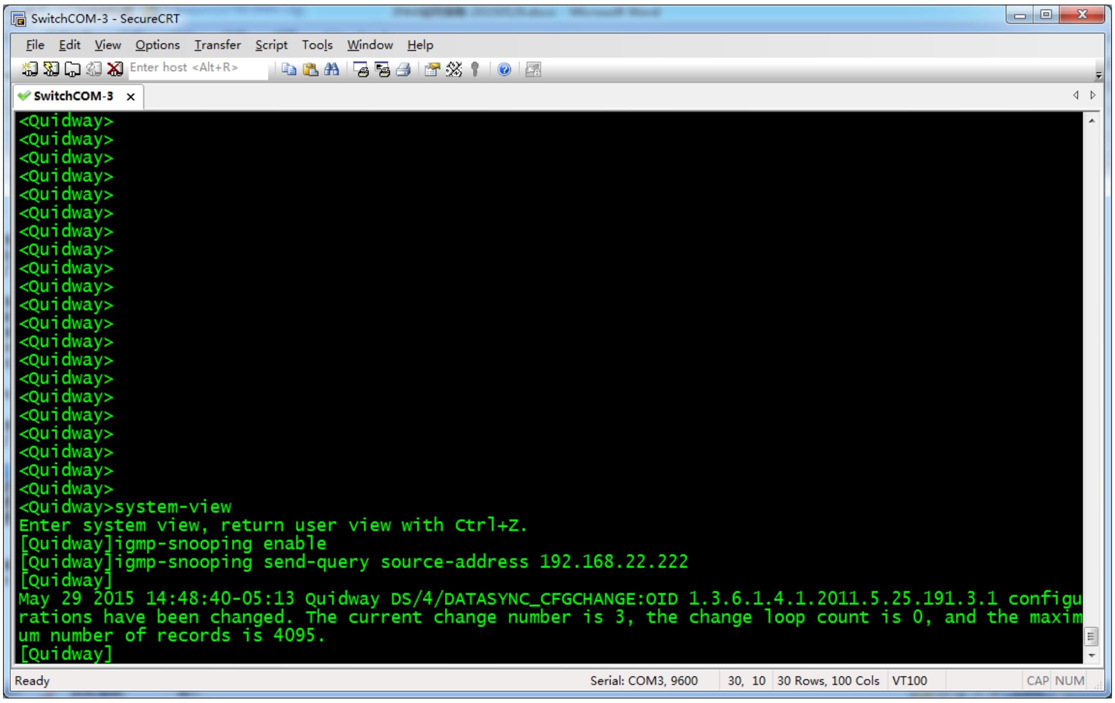
2. Input **igmp-snooping enable** to enable global IGMP Snooping.

```
[Quidway]igmp-snooping enable
[Quidway]
```

3. Input **igmp-snooping send-query source-address 192.168.22.222** to assign IP address for IGMP Querier.

```
[Quidway]igmp-snooping send-query source-address 192.168.22.222
[Quidway]
```

The following screen capture describes the previous steps 1-3.



4. In system view input **vlan 1** to enter the view of VLAN 1.

```
[Quidway]vlan 1
[Quidway-vlan1]
```

5. Input **igmp-snooping enable** to enable IGMP Snooping for VLAN 1.

```
[Quidway-vlan1]igmp-snooping enable
[Quidway-vlan1]
```

6. Input **multicast drop-unknown** to control switches to drop unknown multicast messages for VLAN 1.

```
[Quidway-vlan1]multicast drop-unknown
[Quidway-vlan1]
```

7. Input **igmp-snooping querier enable** to enable IGMP Querier for VLAN 1.

```
[Quidway-vlan1]igmp-snooping querier enable
[Quidway-vlan1]
```

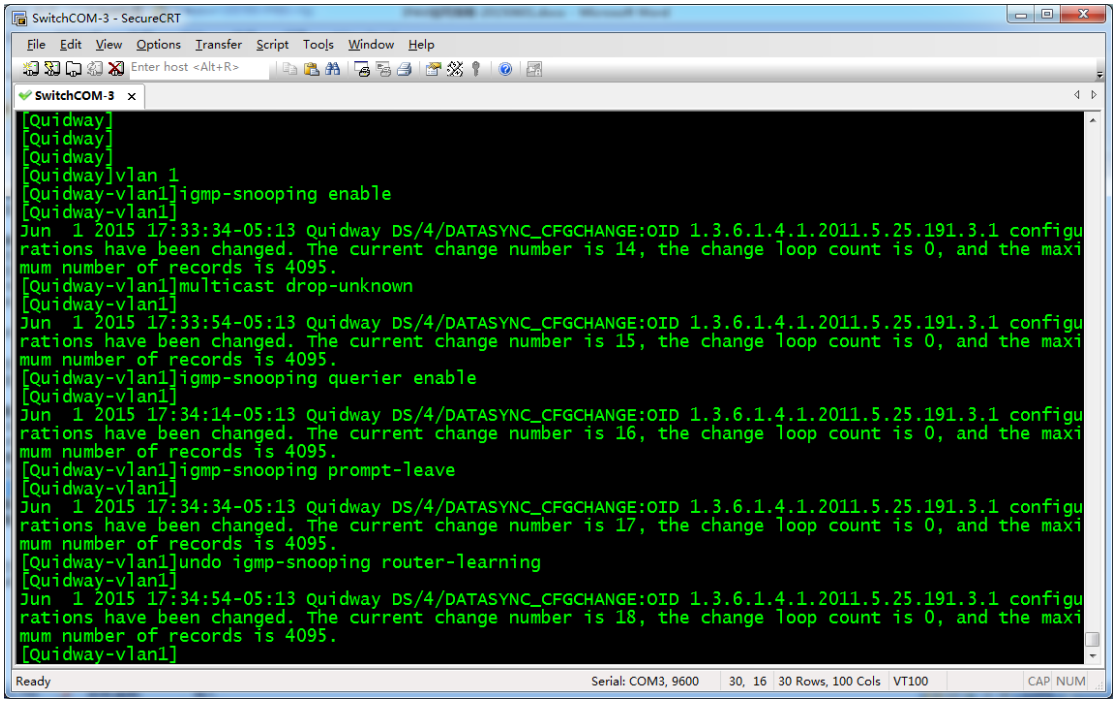
8. Input **igmp-snooping prompt-leave** to enable multicast fast leave for VLAN 1.

```
[Quidway-vlan1]igmp-snooping prompt-leave
[Quidway-vlan1]
```

9. Input **undo igmp-snooping router-learning** to disable dynamic multicast router ports for VLAN 1.

```
[Quidway-vlan1]undo igmp-snooping router-learning
[Quidway-vlan1]
```

The following screen capture describes the previous steps 4-9.



3.3.2.2 Confirming Configuration

1. In the view of VLAN 1 input **quit** to return system view.

```
[Quidway-vlan1]quit
[Quidway]
```

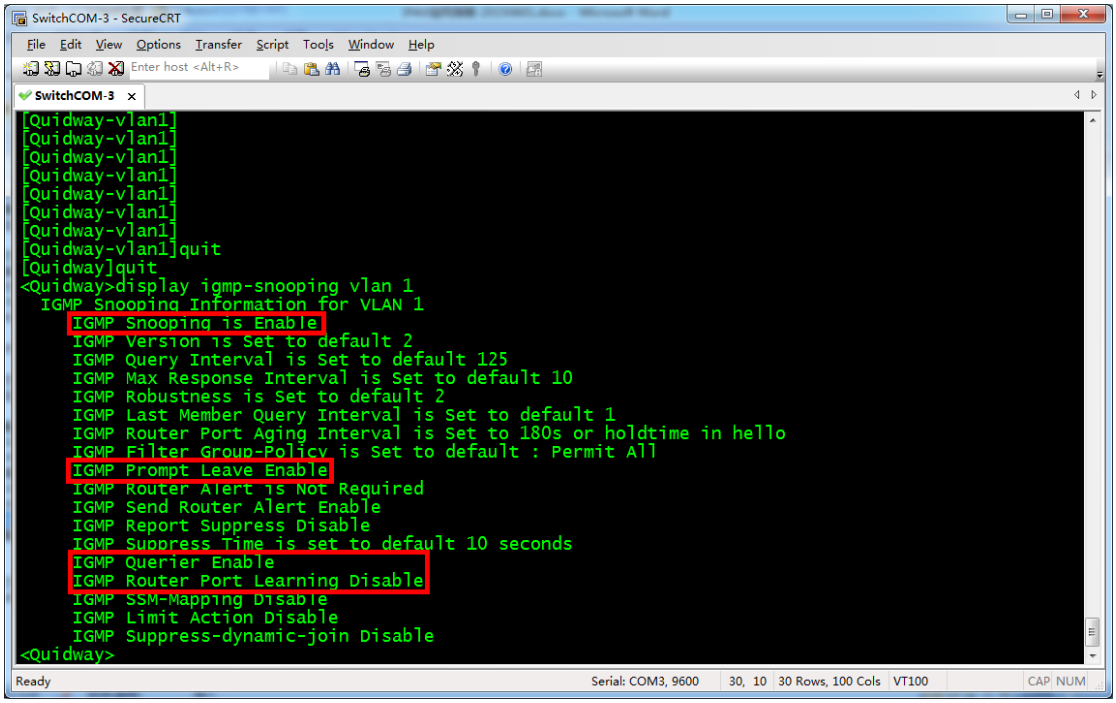
2. Input **quit** to return default view.

```
[Quidway]quit
<Quidway>
```

3. Input **display igmp-snooping vlan 1** to view the configuration of VLAN 1. Switch will give the following prompt.

```
<Quidway>display igmp-snooping vlan 1
  IGMP Snooping Information for VLAN 1
      IGMP Snooping is Enable
      ...
      IGMP Prompt Leave Enable
      ...
      IGMP Querier Enable
      IGMP Router Port Learning Disable
      ...
```

The following screen capture describes the steps above. The information in red boxes means that switches have been configured correctly.



3.3.2.3 Saving Configuration

After confirming correct configuration, save the configuration to make switches run the specific configuration after rebooting.

1. In default view input **save**. Switch will give the following feedback.

```
<Quidway>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]
```

2. Input **Y**. Switch will ask you to confirm configuration file name.

```
Info: Please input the file name(*.cfg,*.zip)[vrpcfg.zip]:
Jan  1 2008 03:05:30-05:13 Quidway %%01CFM/4/SAVE(l)[30]:The user chose Y when deciding whether to save the configuration to the device.
```

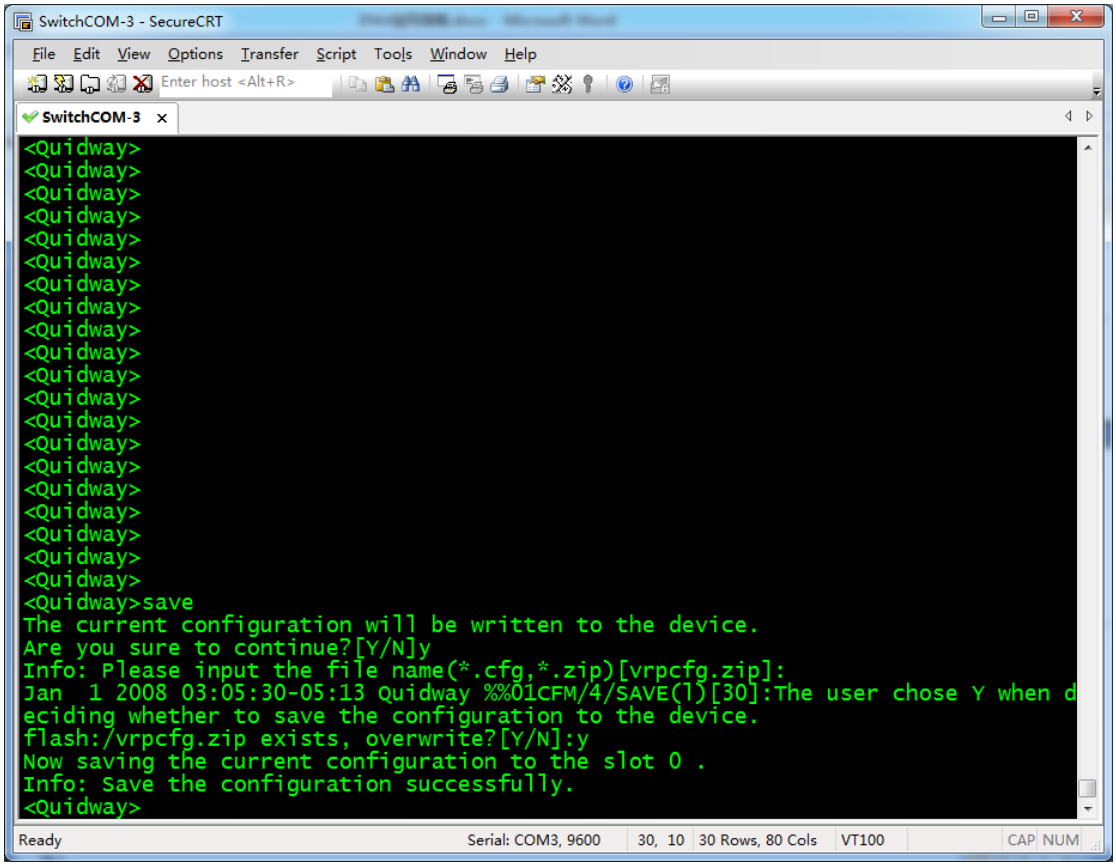
Press **Enter**. Switch will ask if you want to overwrite the original configuration file.

```
flash:/vrpcfg.zip exists, overwrite?[Y/N]:
```

3. Input **Y**. Switch will start saving the configuration. Switch will give the following feedback.

```
Now saving the current configuration to the slot 0.
Info: Save the configuration successfully.
<Quidway>
```

The following screen capture describes the previous steps. According to the different time of saving configuration, switches may not give prompt of confirming configuration file name and overwriting original configuration file in step 3. It's fine only if switches give prompt of saving configuration successfully.



3.3.3 Importing Configuration

Before importing configuration for switches, complete related preparations by referring to "Reference Information" section, and then operate based on the following steps. The steps are run at a HUAWEI S2700 switch and applicable in the case of HUAWEI S5700 switch too.

1. After logging in to switches, input **system-view** in default view to enter system view.

```
<Quidway>system-view
Enter system view, return user view with Ctrl+Z.
[Quidway]
```

2. Input **interface vlan 1** to enter the interface view of VLAN 1.

```
[Quidway]interface vlan 1
[Quidway-Vlanif1]
```

3. Input **ip address 192.168.1.39 255.255.255.0** to configure management IP address for VLAN 1.

```
[Quidway-Vlanif1]ip address 192.168.1.39 255.255.255.0
[Quidway-Vlanif1]
```

4. Input **quit** twice to return default mode.

```
[Quidway-Vlanif1]quit
[Quidway]quit
<Quidway>
```

5. Input **tftp 192.168.1.73 get S2700-IPAV.cfg** to obtain configuration file **S2700-IPAV.cfg** from a PC whose IP address is 192.168.1.73. Switch will give the following prompt.

```
<Quidway>tftp 192.168.1.73 get S2700-IPAV.cfg
Info: Transfer file in binary mode.
Downloading the file from the remote TFTP server. Please wait.../
```

```
TFTP: Downloading the file successfully.
      1482 bytes received in 1 second.
<Quidway>
```

6. Input **startup saved-configuration S2700-IPAV.cfg** to for switches to run using the downloaded configuration file for the next start-up.

```
<Quidway>startup saved-configuration S2700-IPAV.cfg
Info: Succeeded in setting the configuration for booting system.
<Quidway>
```

7. Enter **reboot** to reboot switch.

```
<Quidway>reboot
Info: The system is now comparing the configuration, please wait.
Warning: All the configuration will be saved to the configuration file for the next startup:, Continue?[Y/N]:
```

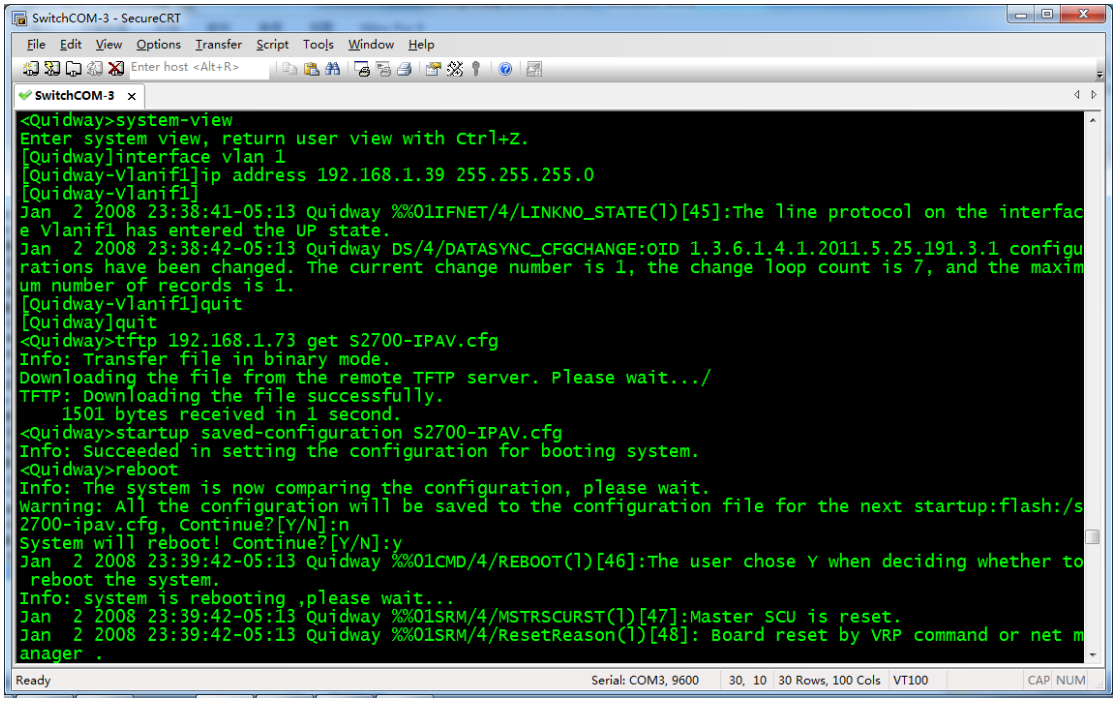
Input **N**. Switch will give the following prompt.

```
System will reboot! Continue?[Y/N]:
```

Now input **Y**. Switch starts rebooting.

```
Jan   2 2008 22:32:39-05:13 Quidway %%01CMD/4/REBOOT(l)[2]:The user chose Y when deciding whether to reboot the system.
Info: system is rebooting ,please wait...
```

The following screen capture describes the steps above.



After rebooting, switch will run the configuration of S2700-IPAV.cfg.

3.4 Reference Information

3.4.1 Preparations before Importing Configuration

Before importing configuration for switches, the following preparations are required.

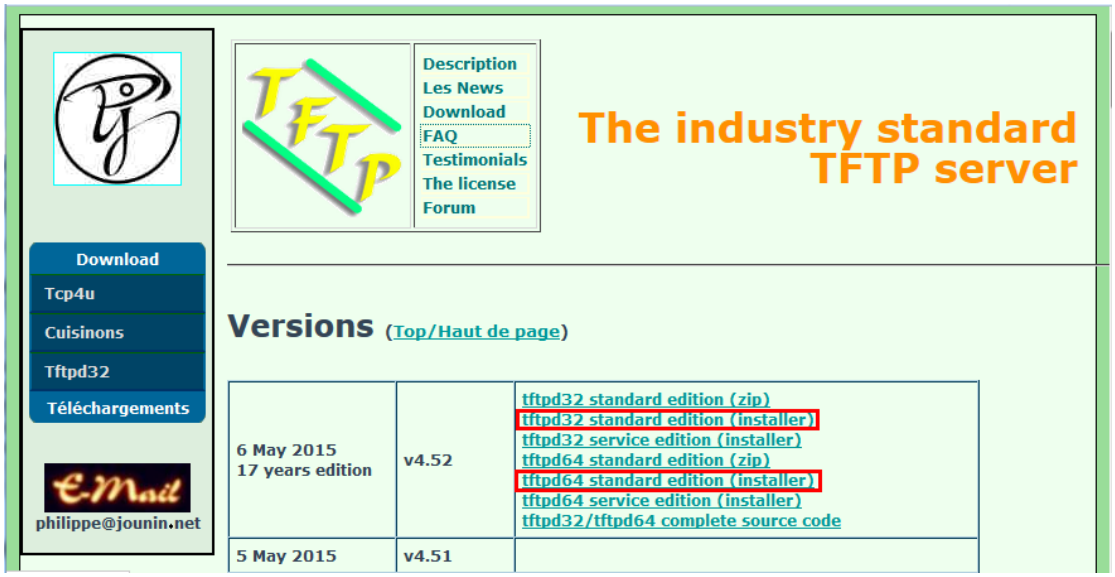
1. Contact your supplier to obtain switch's configuration files. A switch is configured to be a core switch and an extended switch using different configuration files.
2. Configuration file include password information as well as the configuration information of the AV matrix. Please ask configuration file provider for password in case no password is available after importing configuration.
3. Use a network cable to connect between PC and switch. Disconnect all the other network cables from the switch expect the one connected to your PC, preventing switch broadcasting TX's multicast messages to PC's Ethernet port to affect the transmission of configuration data.
4. Set a static IP for PC. For example, set PC's IP address as 192.168.1.73 with a subnet mask of 255.255.255.0. Different operating systems have different methods of setting a static IP. For more information, see their user guides.
5. Start TFTP server software on your PC and store the prepared configuration file in the directory of TFTP server. This operation is performed in a different way in different TFTP server software. The next section offers an example of using tftpd32.

3.4.2 Using Tftpd32

Tftpd32 is free open-source software, which can be used to set up a TFTP server on a Windows PC. Here we simply introduce how to use it.

1. Online download

Various versions of Tftpd32 are available on http://tftpd32.jounin.net/tftpd32_download.html

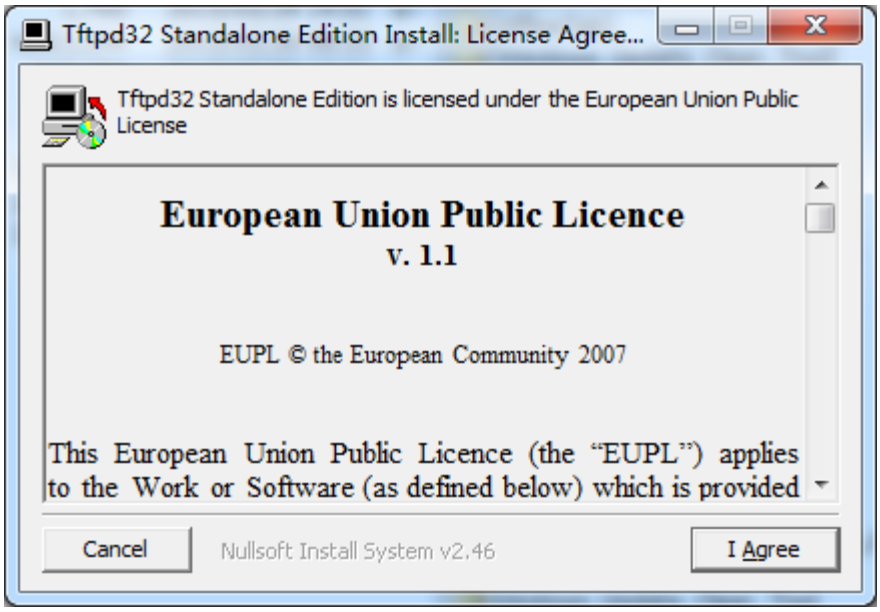


Note:

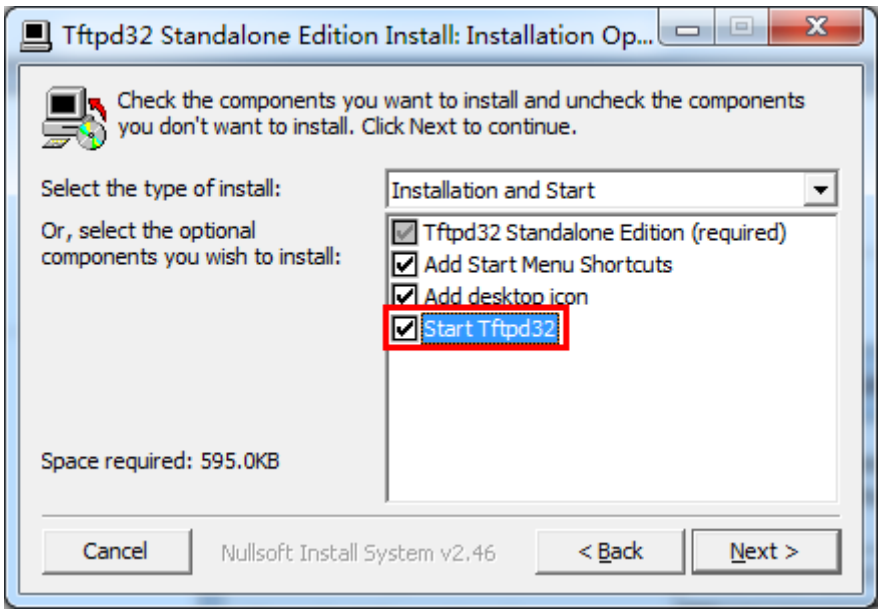
- ✧ Please download standard edition (installer) versions which are marked in red boxes in the screen capture above.
- ✧ Two versions are marked in red boxes, respectively corresponding to 32-bit and 64-bit Windows. Select an appropriate one that suits your needs.
- ✧ **tftpd32 standard edition (installer)** will be taken as an example latter in this chapter.

1. Installation

Click the downloaded installation package **Tftpd32-4.52-setup.exe**.



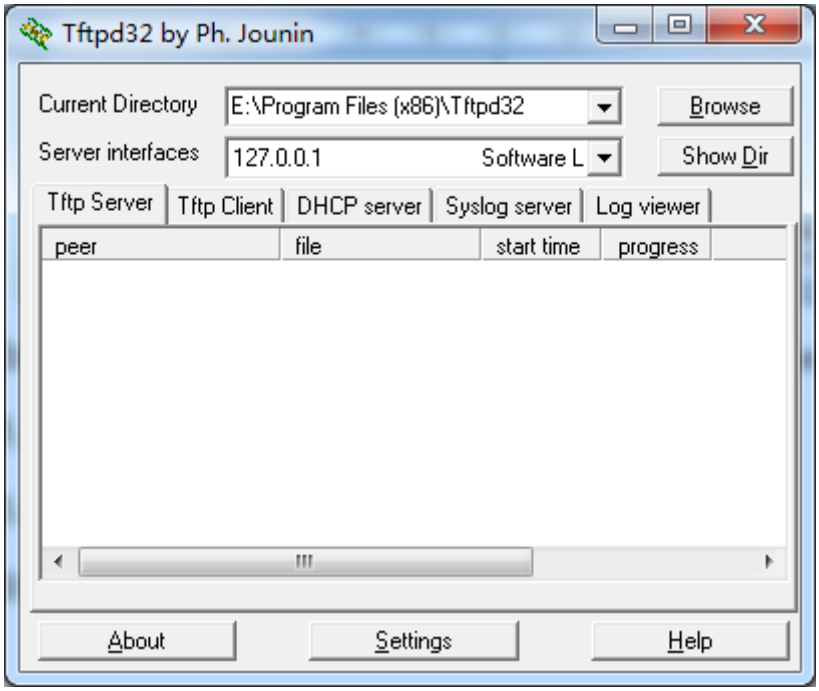
Click **I Agree**



Select **Start Tftpd32** (marked in red box in the screen capture above), and then click the **Next** button and follow the on-screen instructions to complete the installation.

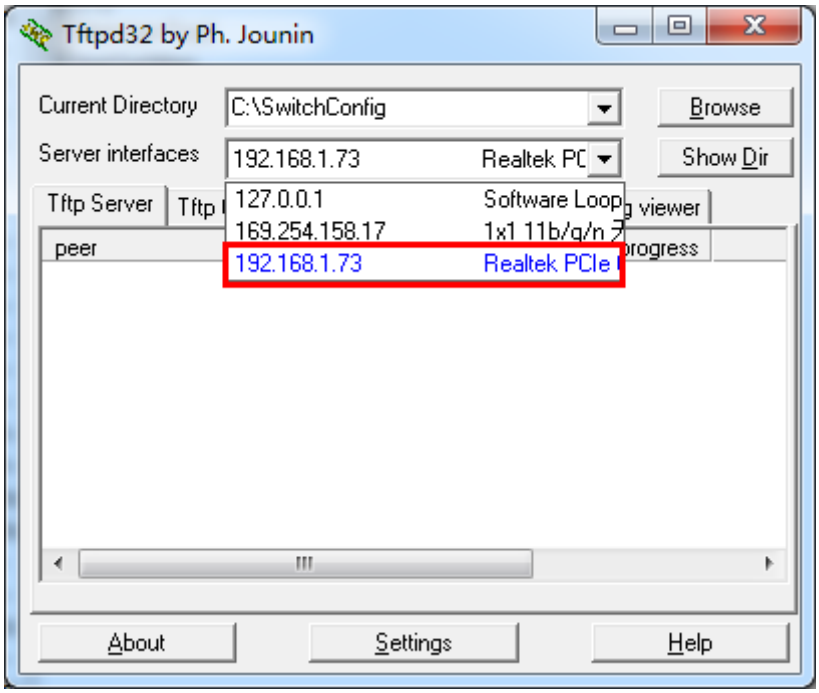
2. Getting started

After installation, Tftpd32 will start automatically.

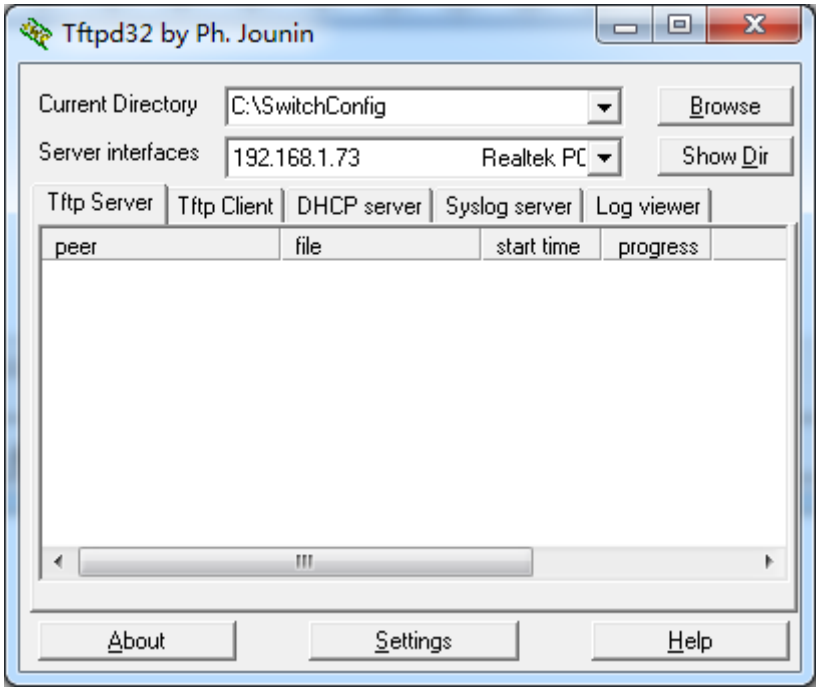


You need to configure **Current Directory** and **Server interfaces** before using **tftpd32** to perform import and export configuration for switches.

- ✧ Click the **Browse** button, and then select the directory which stores switch configuration file as the current working directory, for example **C:\SwitchConfig**.
- ✧ Select the network interface that offers TFTP service for **Server interfaces**, for example select 192.168.1.73.



Now, tftpd32 has been configured successfully. The screen capture is as follows.


Tftpd32 by Ph. Jounin
Current Directory
C:\SwitchConfig
Browse
Server interfaces
192.168.1.73
Realtek PC
Show Dir
Tftp Server
Tftp Client
DHCP server
Syslog server
Log viewer
peer
file
start time
progress
About
Settings
Help