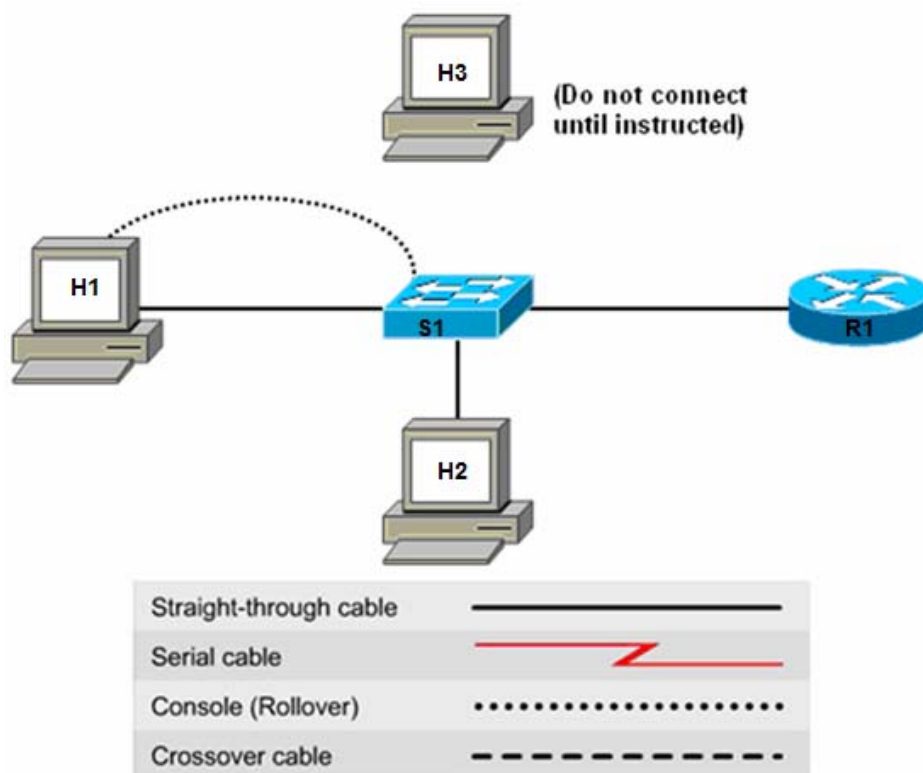


Lab 5.5.4 Configuring the Cisco 2960 Switch



Device	Host Name	Interface	IP Address	Subnet Mask	Default Gateway	Switch Port
S1	CustomerSwitch	VLAN 1	192.168.1.5	255.255.255.0	192.168.1.1	N/A
R1	CustomerRouter	Fa0/1	192.168.1.1	255.255.255.0	N/A	Fa0/5
H1	H1	NIC	192.168.1.2	255.255.255.0	192.168.1.1	Fa0/11
H2	H2	NIC	192.168.1.4	255.255.255.0	192.168.1.1	Fa0/18
H3	H3	NIC	192.168.1.6	255.255.255.0	192.168.1.1	None

Objectives

- Configure initial switch global settings.
- Configure host PCs and attach them to the switch.
- Configure a router and attach it to the switch.
- Configure a switch management VLAN IP address.
- Verify network connectivity.
- Configure basic port security.
- Configure port duplex and speed settings.

Background / Preparation

In this lab, you connect multiple hosts and a router to the switch and test connectivity. You will configure port security, speed, and duplex settings for a switch port. This lab focuses on the basic configuration of the Cisco 2960 switch using Cisco IOS commands. The Cisco Catalyst 2960 switch comes preconfigured and only needs to be assigned basic security information before being connected to a network. To use an IP-based management product or Telnet with a Cisco switch, you must configure a management IP address. You will configure VLAN 1 to provide IP access to management functions. The information in this lab applies to other switches, however, command syntax may vary.

Required Resources

The following resources are required:

- Cisco 2960 switch or other comparable switch
- Router with Ethernet interface to connect to switch
- Three Windows-based PCs, one with a terminal emulation program
- RJ-45-to-DB-9 connector console cable
- Three straight-through Ethernet cables
- Access to the PC command prompt
- Access to a PC network TCP/IP configuration

Note: Perform the instructions in the section “Erasing and Reloading the Switch” at the end of this lab before continuing.

Step 1: Connect the hosts to the switch and configure them.

- a. Connect host H1 to Fast Ethernet S1 switch port Fa0/11, and connect H2 to port Fa0/18. Configure the hosts to use the same IP subnet for the address and mask as on the switch, as shown in the topology diagram and table above.
- b. Do *not* connect host H3 to the switch yet.

Step 2: Connect the router to the switch and configure the router.

Note: If necessary, see Lab 5.3.5, “Configuring Basic Router Settings with the Cisco IOS CLI,” for instructions on setting the host name, passwords, and interface addresses.

- a. Connect the router to switch port Fa0/5.
- b. Configure the router with the host name **CustomerRouter**.
- c. Configure the console access and password, vty access and password, and enable secret password.
- d. Configure the router Fa0/1 interface as shown in the topology table.

Step 3: Configure the switch.

- a. Configure the switch with the host name **CustomerSwitch**.

```
Switch>enable  
Switch#config terminal  
Switch(config)#hostname CustomerSwitch
```
- b. Set the privilege exec mode password to **cisco**.

```
CustomerSwitch(config)#enable password cisco
```
- c. Set the privilege exec mode secret password to **cisco123**.

```
CustomerSwitch(config)#enable secret cisco123
```

- d. Set the console password to **cisco123**.

```
CustomerSwitch(config)#line console 0
CustomerSwitch(config-line)#password cisco123
```

- e. Configure the console line to require a password at login.

```
CustomerSwitch(config-line)#login
```

- f. Set the vty password to **cisco123**.

```
CustomerSwitch(config-line)#line vty 0 15
CustomerSwitch(config-line)#password cisco123
```

- g. Configure the vty to require a password at login.

```
CustomerSwitch(config-line)#login
CustomerSwitch(config-line)#end
```

Step 4: Configure the management interface on VLAN 1.

- a. Enter global configuration mode. Remember to use the new password.

```
CustomerSwitch>enable
CustomerSwitch#configure terminal
```

- b. Enter the interface configuration mode for VLAN 1:

```
CustomerSwitch(config)#interface vlan 1
```

- c. Set the IP address, subnet mask, and default gateway for the management interface. The IP address must be valid for the local network where the switch is installed.

```
CustomerSwitch(config-if)#ip address 192.168.1.5 255.255.255.0
CustomerSwitch(config-if)#exit
CustomerSwitch(config)#ip default-gateway 192.168.1.1
CustomerSwitch(config)#end
```

Step 5: Verify the configuration of the switch.

- a. Verify that the IP address of the management interface on the switch VLAN 1 and the IP address of host H1 are on the same local network. Use the **show running-configuration** command to check the IP address configuration of the switch.

```
CustomerSwitch#show running-configuration
Building configuration...

Current configuration : 1283 bytes
!
version 12.2
no service pad
hostname CustomerSwitch
!
enable secret 5 $1$XUe/$ch4WQ/SpcFCDD2iqd9bda/
enable password cisco
!
interface FastEthernet0/1
!
!
interface FastEthernet0/24
!
interface Vlan1
```

```
ip address 192.168.1.5 255.255.255.0
no ip route-cache
!
ip default-gateway 192.168.1.1
ip http server
!
line con 0
password cisco123
login
line vty 0 4
password cisco123
login
line vty 5 15
password cisco123
login
!
end
```

- b. Save the configuration.

```
CustomerSwitch#copy running-config startup-config
```

Step 6: Verify connectivity using ping and Telnet.

- To verify that the switch and router are correctly configured, ping the router Fa0/1 interface (default gateway) IP address from the switch CLI.
- Are the pings successful? _____
- To verify that the hosts and switch are correctly configured, ping the switch IP address from host H1.
- Are the pings successful? _____
- If the ping is not successful, verify the connections and configurations again. Check to ensure that all cables are correct and that connections are seated. Check the host, switch, and router configurations.
- Open a command prompt on host H1, and telnet the IP address assigned to switch management VLAN 1.
- Enter the vty password configured in Step 3. What is the result? _____ At the switch prompt, issue the **show version** command.

```
CustomerSwitch>show version
Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version
12.2(0.0.16)FX, CISCO
DEVELOPMENT TEST VERSION
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Tue 17-May-05 01:43 by yenanh
```

```
ROM: Bootstrap program is C2960 boot loader
BOOTLDR: C2960 Boot Loader (C2960-HBOOT-M), Version 12.2 [lqian-
flo_pilsner 100]
```

```
Switch uptime is 3 days, 20 hours, 8 minutes
System returned to ROM by power-on
System image file is "flash:c2960-lanbase-mz.122-0.0.16.FX.bin"
```

```
cisco WS-C2960-24TC-L (PowerPC405) processor with 61440K/4088K bytes of
memory.
Processor board ID FHH0916001J
Last reset from power-on
Target IOS Version 12.2(25)FX
```

```

1 Virtual Ethernet interface
24 FastEthernet interfaces
2 Gigabit Ethernet interfaces
The password-recovery mechanism is enabled.
64K bytes of flash-simulated non-volatile configuration memory.
Base ethernet MAC Address       : 00:0B:FC:FF:E8:80
Motherboard assembly number     : 73-9832-02
Motherboard serial number       : FHH0916001J
Motherboard revision number     : 01
System serial number            : FHH0916001J
Hardware Board Revision Number  : 0x01

```

Switch	Ports	Model	SW Version	SW Image
* 1	26	WS-C2960-24TC-L	12.2(0.0.16)FX	C2960-

LANBASE-M

Configuration register is 0xF

- h. What is the Cisco IOS version of this switch? _____
- i. Type **quit** at the switch command prompt to terminate the Telnet session.

Step 7: Determine which MAC addresses that the switch has learned.

- a. From the Windows command prompt, get the Layer 2 addresses of the PC network interface card for each host by using the **ipconfig /all** command.

Host H1: _____

Host H2: _____

Host H3: _____

- b. Determine which MAC addresses the switch has learned by using the **show mac-address-table** command at the privileged exec mode prompt.

```

CustomerSwitch#show mac-address-table
Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
All     000b.be7f.ed40   STATIC  CPU
All     0100.0ccc.cccc   STATIC  CPU
All     0100.0ccc.cccd   STATIC  CPU
All     0100.0cdd.dddd   STATIC  CPU
1       000b.db04.a5cd   DYNAMIC Fa0/5
1       000c.3076.8380   DYNAMIC Fa0/11
1       000d.1496.36ad   DYNAMIC Fa0/18
Total Mac Addresses for this criterion: 7

```

- c. How many dynamic addresses are there? _____
- d. Do the MAC addresses match the host MAC addresses? _____
- e. Review the options that the **mac-address-table** command has by using the **? help** feature.

```

CustomerSwitch(config)#mac-address-table ?
address          address keyword
aging-time       aging-time keyword
count            count keyword

```

```
dynamic      dynamic entry type
interface    interface keyword
multicast    multicast info for selected wildcard
notification MAC notification parameters and history table
static       static entry type
vlan         VLAN keyword
|            Output modifiers
<cr>
```

- f. Set up a static MAC address on the Fast Ethernet interface 0/18. Use the address that was recorded for H1 in Step 7. The MAC address XXXX.YYYY.ZZZZ is used in the example statement only.

```
CustomerSwitch(config)#mac-address-table static XXXX.YYYY.ZZZZ interface
fastEthernet 0/18 vlan 1
```

- g. Verify the MAC address table entries.

```
CustomerSwitch#show mac-address-table
Mac Address Table
```

```
-----
```

Vlan	Mac Address	Type	Ports
----	-----	-----	----
All	000b.be7f.ed40	STATIC	CPU
All	0100.0ccc.cccc	STATIC	CPU
All	0100.0ccc.cccd	STATIC	CPU
All	0100.0cdd.dddd	STATIC	CPU
1	000b.db04.a5cd	DYNAMIC	Fa0/5
1	000c.3076.8380	DYNAMIC	Fa0/11
1	000d.1496.36ad	STATIC	Fa0/18

- h. How many total MAC addresses are there now? _____
- i. What type are they? _____

Step 8: Configure basic port security.

- a. Determine the options for setting port security on Fast Ethernet interface 0/4.

```
CustomerSwitch#configure terminal
CustomerSwitch(config)#interface fastEthernet 0/18
CustomerSwitch(config-if)#switchport port-security ?
aging Port-security aging commands
mac-address Secure mac address
maximum Max secure addr
violation Security Violation Mode
```

- b. To allow the switch port FastEthernet 0/4 to accept only one device, configure port security.

```
CustomerSwitch(config-if)#switchport mode access
CustomerSwitch(config-if)#switchport port-security
CustomerSwitch(config-if)#switchport port-security mac-address sticky
CustomerSwitch(config-if)#end
```

- c. Check the port security settings.

```
CustomerSwitch#show port-security
```

Secure Port	MaxSecureAddr (Count)	CurrentAddr (Count)	SecurityViolation (Count)	Security Action
-----	-----	-----	-----	-----
Fa0/18	1	0	0	Shutdown
-----	-----	-----	-----	-----

- d. What is the security action for port Fa0/18 if a security violation occurs? _____
- e. What is the maximum secure address count? _____
- f. Display the running configuration.

Note: Some output is omitted in the following display.

```
CustomerSwitch#show running-config
Building configuration...
Current configuration : 1452 bytes
version 12.2
hostname CustomerSwitch
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
interface FastEthernet0/18
switchport mode access
switchport port-security
switchport port-security mac-address sticky
!
interface FastEthernet0/5
!

mac-address-table static 000b.db04.a5cd vlan 1 interface
FastEthernet0/18
!
end
```

- g. Are there statements that directly reflect the security implementation in the listing of the running configuration? _____

Step 9: Connect a different PC to the secure switch port.

- a. If you do not have another PC available (H3) or you cannot disconnect the PC, go to alternative Step 9.
- b. Disconnect host H2 from Fast Ethernet 0/18, and connect host H3 to the port. H3 has not yet been attached to the switch. From H3, ping the switch address 192.168.1.5 to generate some traffic.
- c. Record any observations at the PC and the switch terminal session.

```
01:11:12: %PM-4-ERR_DISABLE: psecure-violation error detected on Fa0/18, putting
Fa0/18 in err-disable state
01:11:12: %PORT_SECURITY-2-PSECURE_VIOLATION: Security violation occurred, cause
d by MAC address 000c.3076.8380 on port FastEthernet0/18.
01:11:13: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/18, chang
ed state to down
01:11:14: %LINK-3-UPDOWN: Interface FastEthernet0/18, changed state to down
```

- d. View the configuration information for just Fast Ethernet port 0/18.

```
CustomerSwitch#show interface fastethernet 0/18
```

- e. What is the state of this interface?

Fast Ethernet 0/18 is _____ and the line protocol is _____

Alternative Step 9: (Optional)

If you do not have a third PC (host H3) and you are working with a remote lab setup and cannot physically disconnect H2, you may be able to use the following procedure to change the MAC address of the H2. The following procedure works for a wide variety of NICs.

- Choose **Start > Settings > Control Panel**, and double-click **Network Connections**.
- Right-click on the NIC for which you want to change the MAC address, and click **Properties**.
- In the General tab, click the **Configure** button.
- In the Advanced tab, under the Property section, click on **Network Address or Locally Administered Address**.
- On the right side, under Value, type in the new MAC address. Use the original MAC address, but change only the last value. For example, if the original MAC is 000C29C1510A, change it to 000C29C1510B.
- Type **c:\>ipconfig /all** to verify the changes.
- From H2, ping the switch VLAN 1 address at 192.168.1.5.

```
c:\>ping 192.168.1.5
```
- Record any observations from the PC and switch terminal session.

```
01:11:12: %PM-4-ERR_DISABLE: psecure-violation error detected on Fa0/18, putting
Fa0/18 in err-disable state
01:11:12: %PORT_SECURITY-2-PSECURE_VIOLATION: Security violation occurred, cause
d by MAC address 000c.3076.8380 on port FastEthernet0/18.
01:11:13: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/18, chang
ed state to down
01:11:14: %LINK-3-UPDOWN: Interface FastEthernet0/18, changed state to down
```

- View the configuration information for just Fast Ethernet port 0/18.
CustomerSwitch#**show interface fastethernet 0/18**
- What is the state of this interface?
Fast Ethernet 0/18 is _____, and the line protocol is _____.

Step 10: Reactivate the port.

- Clear the sticky address entry for port Fa0/18 using the **clear port-security** command.

```
S1#clear port-security sticky interface fa0/18 access
```
- To return the interface from error disable to administratively up, enter the **shutdown** command followed by the **no shutdown** command.

```
S1(config)#interface fa0/18
S1(config-if)#shutdown
S1(config-if)#no shutdown
```
- Enter the original host or change the MAC address to its original value. Ping from the command prompt. You can ping multiple times or use the **ping 192.168.1.5 -n 100** command, which sets the number of ping packets to 100, instead of 4.

Step 11: Set speed and duplex options for the ports.

- Switch port settings default to auto-duplex and auto-speed. If a computer with a 100 Mbps NIC is attached to the port, it automatically goes into full-duplex 100 Mbps mode. If a hub is attached to the switch port, it normally goes into half-duplex 10 Mbps mode.

- b. Issue the **show interfaces** command to see the setting for ports Fa0/5, Fa0/11, and Fa0/18. This command generates a large amount of output. Press the spacebar until you can see all the information for these ports. What are the duplex and speed settings for these ports?

Port Fa0/5 _____

Port Fa0/11 _____

Port Fa0/18 _____

- c. It is sometimes necessary to set the speed and duplex of a port to ensure that it operates in a particular mode. You can set the speed and duplex with the **duplex** and **speed** commands while in interface configuration mode. To force Fast Ethernet port 5 to operate at half duplex and 10 Mbps, issue the following commands:

```
CustomerSwitch>enable
CustomerSwitch#Config Terminal
CustomerSwitch(config-if)#interface fastEthernet 0/10
CustomerSwitch(config-if)#speed 10
CustomerSwitch(config-if)#duplex half
CustomerSwitch(config-if)#end
CustomerSwitch#
```

- d. Issue the **show interfaces** command again. What is the duplex and speed setting for Fa0/5 now?

Step 12: Exit the switch.

- a. Type **exit** to leave the switch and return to the welcome screen.

```
Switch#exit
```

- b. When the steps are completed, turn off all the devices. Remove and store the cables and adapter.

Step 13: Reflection.

- a. Which password needs to be entered to switch from user mode to privilege exec mode on the Cisco switch, and why?

- b. Which symbol is used to show a successful ping in the Cisco IOS software?

- c. What is the benefit of using port security? _____

- d. What other port-related security steps could be taken to further improve switch security?

Erasing and Reloading the Switch

For the majority of the labs in CCNA Discovery, it is necessary to start with an unconfigured switch. Using a switch with an existing configuration may produce unpredictable results. The following instructions prepare the switch prior to performing the lab so that previous configuration options do not interfere. Instructions are provided for the 2900 and 2950 series switches.

- a. Enter privileged EXEC mode by typing **enable**. If prompted for a password, enter **class** (if that does not work, ask the instructor).

```
Switch>enable
```

- b. Remove the VLAN database information file.

```
Switch#delete flash:vlan.dat  
Delete filename [vlan.dat]?[Enter]  
Delete flash:vlan.dat? [confirm] [Enter]
```

If there was no VLAN file, this message is displayed:

```
%Error deleting flash:vlan.dat (No such file or directory)
```

- c. Remove the switch startup configuration file from NVRAM.

```
Switch#erase startup-config
```

The responding line prompt is:

```
Erasing the nvram filesystem will remove all files! Continue? [confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

- d. Check that the VLAN information was deleted in Step b by using the **show vlan** command. If the VLAN information was deleted, go to Step e and restart the switch using the **reload** command.

If previous VLAN configuration information (other than the default management VLAN 1) is still present, you must power cycle the switch (hardware restart) instead of issuing the **reload** command. To power cycle the switch, remove the power cord from the back of the switch or unplug it, and then plug it back in.

- e. Restart the software using the **reload** command in privileged EXEC mode.

Note: This step is not necessary if the switch was restarted using the power cycle method.

- 1) At the privileged EXEC mode, enter the **reload** command:

```
Switch(config)#reload
```

The responding line prompt is:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n**, and then press **Enter**.

The responding line prompt is:

```
Proceed with reload? [confirm] [Enter]
```

The first line of the response is:

```
Reload requested by console.
```

After the switch has reloaded, the line prompt is:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n**, and then press **Enter**.

The responding line prompt is:

```
Press RETURN to get started! [Enter]
```

Erasing and reloading the router

- a. Enter privileged EXEC mode by typing **enable**.

```
Router>enable
```

- b. In privileged EXEC mode, enter the **erase startup-config** command.

```
Router#erase startup-config
```

The responding line prompt is:

```
Erasing the nvram filesystem will remove all files! Continue?  
[confirm]
```

- c. Press **Enter** to confirm.

The response is:

```
Erase of nvram: complete
```

- d. In privileged EXEC mode, enter the **reload** command.

```
Router(config)#reload
```

The responding line prompt is:

```
System configuration has been modified. Save? [yes/no]:
```

- e. Type **n**, and then press **Enter**.

The responding line prompt is:

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

- f. Press **Enter** to confirm.

In the first line of the response is:

```
Reload requested by console.
```

After the router has reloaded the line prompt is:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

- g. Type **n**, and then press **Enter**.

The responding line prompt is:

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

- h. Press **Enter**.

The router is ready for the assigned lab to be performed.