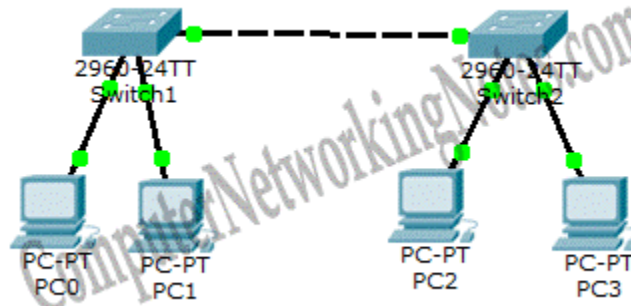


Basic Switch Configuration Guide with Examples

To explain basic switch configuration commands, I will use packet tracer network simulator software. You can use any network simulator software or can use a real Cisco switch to follow this guide. There is no difference in output as long as your selected software contains the commands explained in this lecture.

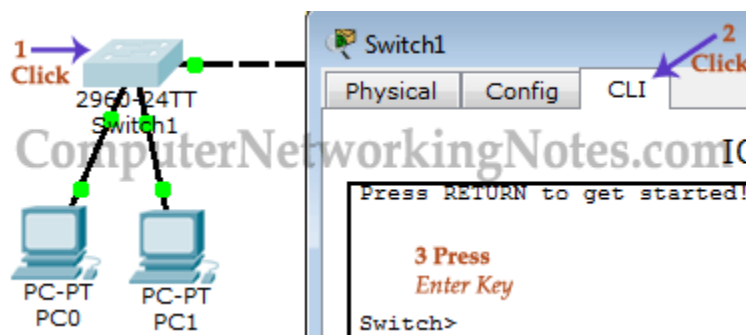
Create a practice lab as shown in following figure or download this pre-created practice lab and load in packet tracer



In this topology

- Two 2960 Series switches are used.
- Switch1 (Interface Gig1/1) is connected with Switch2 (Interface Gig1/1) via cross cable.
- Switch1 has two PCs connected on interfaces Eth0/1 and Eth0/2 via straight through cable.
- Same as switch1, Switch2 also has two PCs connected on its interfaces Eth0/1 and Eth0/2.
- IP address is configured on all PCs PC0 (192.168.1.1/24), PC1 (192.168.1.2/24), PC2 (192.168.1.3/24), PC3 (192.168.1.4/24).

Click *Switch1* and click *CLI* menu item and press *Enter Key*



Navigating between different switch command modes

Cisco switches run on proprietary OS known as Cisco IOS. IOS is a group of commands used for monitoring, configuring and maintaining cisco devices. For security and easy administration, IOS commands are divided in the set of different command modes. Each command mode has its own set of commands. Which commands are available to use, depend upon the mode we are in.

Mode	Purpose	Prompt	Command to enter	Command to exit
User EXEC	Allow you to connect with remote devices, perform basic tests, temporary change terminal setting and list system information	Router >	Default mode after booting. Login with password, if configured.	Use exit command
Privileged EXEC	Allow you to set operating parameters. It also includes high level testing and list commands like show, copy and debug.	Router #	Use enable command from user exec mode	Use exit command
Global Configuration	Contain commands those affect the entire system	Router(config)#	Use configure terminal command from privileged exec mode	Use exit command
Interface Configuration	Contain commands those modify the operation of an interface	Router(config-if)#	Use interface type number command from global configuration mode	Use exit command to return in global configuration mode
Sub-Interface Configuration	Configure or modify the virtual interface created from physical interface	Router(config-subif)	Use interface type sub interface number command from global configuration mode or interface configure mode	Use exit to return in previous mode. Use end command to return in privileged exec mode.
Setup	Used by router to create initial configuration, if running configuration is not present	Parameter[Parameter value]:	Router will automatically insert in this mode if running configuration is not present	Press CTRL+C to abort. Type Yes to save configuration, or No to exit without saving when asked in the end of setup.
ROMMON	If router automatically enter in this mode, then it indicates	ROMMON>	Enter reload command from privileged exec	Use exit command.

Mode	Purpose	Prompt	Command to enter	Command to exit
	that it fails to locate a valid IOS image. Manual entrance in this mode Allow you to perform low-level diagnostics.		mode. Press CTRL + C key combination during the first 60 seconds of booting process	

Following table lists necessary commands to navigate between different IOS modes with examples.

How to get help on Cisco Switch command mode

Switch provides two types of context sensitive help, word help and command syntax help.

Word help

Word help is used to get a list of available commands that begin with a specific letter. For example if we know that our command begins with letter **e**, we can hit enter key after typing **e?** at command prompt. It will list all possible commands that begin with letter **e**.

```
Switch>
Switch>e?
enable  exit
Switch>e
```

We can list all available commands, if we don't know the initials of our command. For example to list all available commands at User exec mode, just type **?** at command prompt and hit enter key.

```
Switch>?
Exec commands:
<1-99>      Session number to resume
connect     Open a terminal connection
disable     Turn off privileged commands
disconnect  Disconnect an existing network connection
enable      Turn on privileged commands
exit        Exit from the EXEC
logout      Exit from the EXEC
ping        Send echo messages
resume      Resume an active network connection
show        Show running system information
telnet      Open a telnet connection
terminal    Set terminal line parameters
traceroute  Trace route to destination
Switch>
```

Command syntax help

Command syntax help can be used to get the list of keyword, commands, or parameters that are available starting with the keywords that we had already entered. Enter **?** (Question mark) after hitting Space key and prompt will return with the list of available command options. For example to know the parameters required by **show ip** command type **show ip ?** and prompt will return with all associate parameters. If prompt

returns with <CR> only as an option, that means switch does not need any additional parameters to complete the command. You can execute the command in current condition.

```
Switch>show ip ?
  arp      IP ARP table
  interface IP interface status and configuration
  ssh      Information on SSH
Switch>show ip arp
<cr>
Switch>
```

How to set name on switch

Switch name can be set from global configuration mode. Use **hostname [desired hostname]** command to set name on switch.

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#
```

How to set password on a Catalyst switch

Passwords are used to restrict physical access to switch. Cisco switch supports console line for local login and VTYs for remote login. All supported lines need be secure for User Exec mode. For example if you have secured VTYs line leaving console line unsecure, an intruder can take advantage of this situation in connecting with device. Once you are connected with device, all remaining authentication are same. No separate configuration is required for further modes.

Password can be set from their respective line mode. Enter in line mode from global configuration mode.

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.
Switch(config)#line console 0
Switch(config-line)#password con123
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#line aux 0
Switch(config)#line vty 0 15
Switch(config-line)#password telnet123
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#
```

Console

VTYs

VTY term stand for virtual terminal such as telnet or SSH. Switch may support up to thousand VTYs lines. By default first five (0 - 4) lines are enabled. If we need more lines, we have to enable them manually. 2960 Series switch supports 16 lines. We can set a

separate password for each line, for that we have to specify the number of line. In our example we set a common password for all lines.

Above method is good for small companies, where numbers of network administrators are very few. In above method we have to share password between all administrators. Switch supports both local and remote server authentication. Remote server authentication is a complex process and not included in any entry level exams. For this article I am also skipping remote server method. In local database authentication method switch allows us to set a separate password for each user. Two global configuration commands are used to set local user database.

```
Switch(config)#username [Username] password[test123]
Or
Switch(config)#username [Username] secret[test123]
```

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#username sanjay password test123
Switch(config)#line console 0
Switch(config-line)#login local
Switch(config-line)#exit
Switch(config)#
```

Replace it with your username

Replace it with your password

Both commands do same job. Advantage of using **secret** option over **password** option is that in **secret** option password is stored in MD5 encryption format while in **password** option password is stored in plain text format.

Along with User Exec mode we can also secure Privilege Exec mode. Two commands are available for it.

```
Switch(config)# enable password Privilege_EXEC_password
or
Switch(config)# enable secret Privilege_EXEC_password
```

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#enable password enb123
Switch(config)#enable secret sec123
Switch(config)#
```

Again as I mentioned earlier, password stored with **secret** command is encrypted while password stored with **password** command remains in plain text. You only need to use single command. If you would use both commands as I did, **enable secret** command would automatically replace the **enable password** command.

How to reset switch to factory defaults

During the practice several times we have to reset switch to factory defaults. Make sure you don't run following commands in production environment unless you understand their effect clearly. Following commands will erase all configurations. In production

environment you should always take backup before removing configurations. In LAB environment we can skip backup process.

```
Switch>enable
Switch#delete flash:vlan.dat
Delete filename [vlan.dat]? [Press Enter Key]
Delete flash:vlan.dat? [confirm] [ Reconfirm by
pressing enter key]
Switch#erase startup-config
Switch#reload
```

How to set IP address in Switch

IP address is the address of device in network. Switch allows us to set IP address on interface level. IP address assigned on interface is used to manage that particular interface. To manage entire switch we have to assign IP address to VLAN1 (Default VLAN of switch). We also have to set default gateway IP address from global configuration mode. In following example we would assign IP **172.16.10.2 255.255.255.0** to VLAN1 and set default gateway to **172.16.10.1**.

```
Switch>enable
Switch#configure terminal
Switch(config)#interface vlan1
Switch(config-if)#ip address 172.16.10.2 255.255.255.0
Switch(config-if)#exit
Switch(config)#ip default-gateway 172.16.10.1
```

How to set interface description

Switches have several interfaces. Adding description to interface is a good habit. It may help you in finding correct interface. In following example we would add description **Development VLAN** to interface **FastEthernet 0/1**.

```
Switch(config)#interface fastethernet 0/1
Switch(config-if)#description Development VLAN
```

How to clear mac address table

Switch stores MAC addresses in MAC address table. Gradually it could be full. Once it full, switch automatically starts removing old entries. You can also clear these tables manually from privileged exec mode. To delete all entries use following command

```
switch#clear mac address-table
```

To delete only dynamic entries use

```
switch#clear mac address-table dynamic
```

How to add static MAC address in CAM table

For security purpose sometime we have to add mac address in CAM table manually. To add static MAC address in CAM table use following command

```
Switch(config)#mac address-table static aaaa.aaaa.aaaa vlan 1
interface fastethernet 0/1
```

In above command we entered an entry for static MAC address *aaaa.aaaa.aaaa* assigned to *FastEthernet 0/1* with default *VLAN1*.

How to save running configuration in switch

Switch keeps all running configuration in RAM. All data from RAM is erased when we turned off the device. To save running configuration use following command

```
Switch#copy running-config startup-config
```

How to set duplex mode

Switch automatically adjust duplex mode depending upon remote device. We could change this mode with any of other supported mode. For example to force switch to use full duplex mode use

```
Switch(config)# #interface fastethernet 0/1
Switch(config-if)#duplex full
```

To use half duplex use

```
Switch(config)# #interface fastethernet 0/1
Switch(config-if)#duplex half
```

show version

show version command provides general information about device including its model number, type of interfaces, its software version, configuration settings, location of IOS and configuration files and available memories.

```

Switch>show version
Cisco Internetwork Operating System Software
IOS (tm) C2950 Software (C2950-I6Q4L2-M), Version 12.1(22)EA4, REL
fc1)
IOS Version number
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 18-May-05 22:31 by jharirba
Image text-base: 0x80010000, data-base: 0x80562000

ROM: Bootstrap program is is C2950 boot loader
Switch uptime is 2 hours, 4 minutes, 49 seconds
System returned to ROM by power-on

Cisco WS-C2950-24 (RC32300) processor (revision C0) with 21039K by

Processor board ID FHK0610Z0WC
Last reset from system-reset
Running Standard Image
24 FastEthernet/IEEE 802.3 interface(s)
63488K bytes of flash-simulated non-volatile configuration memory.
Base ethernet MAC Address: 00D0.BCE9.5909
Motherboard assembly number: 73-5781-09
Power supply part number: 34-0965-01
Motherboard serial number: FOC061004SZ
Power supply serial number: DAB0609127D
Model revision number: C0
Motherboard revision number: A0
Model number: WS-C2950-24
System serial number: FHK0610Z0WC
Configuration register is 0xF

Switch>

```

Annotations:

- IOS Version number:** 12.1(22)EA4
- Type of memory:** 63488K bytes of flash-simulated non-volatile configuration memory.
- Type of interface:** 24 FastEthernet/IEEE 802.3 interface(s)
- Device model number:** WS-C2950-24
- Device serial number:** FHK0610Z0WC
- How device will boot setting:** Configuration register is 0xF

show mac-address-table

Switch stores MAC address of devices those are attached with its interfaces in CAM table. We can use *show mac-address-table* command to list all learned devices. Switch uses this table to make forward decision.

```

Switch>enable
Switch#show mac-address-table
Mac Address Table
-----
Vlan    Mac Address      Type      Ports
----
1       0001.643a.5501    DYNAMIC   Gig1/1
1       0003.e439.2190    DYNAMIC   Gig1/1
1       00e0.8f33.8539    DYNAMIC   Fa0/1
Switch#

```

show flash

Switch stores IOS image file in flash memory. show flash command will list the content of flash memory. This command is useful to get information about IOS file and available memory space in flash.


```
Switch#show flash
Directory of flash:
Size of
  1  -rw-  4414921  <no date>  c2960-lanbase-mz.122-25.FX.bin
available memory space
64016384 bytes total (59601463 bytes free)
Switch#
```

show running-config

Configuration parameter values are created, stored, updated and deleted from running configuration. Running configuration is stored in RAM. We can use show running-config command to view the running configuration.

```
Switch>enable
Switch#show running-config
Building configuration...

Current configuration : 1037 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
spanning-tree mode pvst
!
interface FastEthernet0/1
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
--More--
```

show startup-config

Any configuration stored in RAM is erased when devices is turned off. We can save running configuration in NVRAM. If we have saved running configuration in NVRAM, it would be automatically loaded back in RAM from NVRAM during the next boot. As switch load this configuration back in RAM in startup of device, at NVRAM it is known as startup-config.

```
development>enable
development#show startup-config
Using 1042 bytes
!
If startup configuration is available
version 12.2 it would be displayed
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname development
--More--
```

```
Switch>enable
Switch#show startup-config
startup-config is not present
Switch#
```

If startup configuration
is not available

show vlan

show vlan command will display the VLANs. For administrative purpose, switch automatically create VLAN 1 and assign all its interfaces to it. You can create custom VLANs from global configuration mode and then assign them to interfaces.

```
Switch#show vlan
```

VLAN Name	Status	Ports
1 default	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/18, Fa0/19, Fa0/20, Fa0/21 Fa0/22, Fa0/23, Fa0/24, Gig1/1 Gig1/2
20 development	Manually created VLAN active	Fa0/1
1002 fddi-default	act/unsup	
1003 token-ring-default	act/unsup	
1004 fddinet-default	act/unsup	
1005 trnet-default	act/unsup	

Switch#

By default all interfaces are the member of VLAN1

Unless you have manually assigned them another custom VLAN

Default VLANs

show interface

show interface command displays information about interfaces. Without argument it would list all interfaces. To get information about specific interface we need to pass its interface number as an argument. For example to view details about FastEthernet 0/1, use show interface fastethernet 0/1.

```
Switch#show interface
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 0060.2f9d.9101 (bia 0060.2f9d.9101)
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
--More--

Switch#show interface fastethernet 0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 0060.2f9d.9101 (bia 0060.2f9d.9101)
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
--More--
```

First line from output provides information about the status of interface.

```
FastEthernet0/1 is up, line protocol is up ( connected)
```

The first up indicates the status of the physical layer, and the second up indicates to the status of the data link layer.

Possible interface status

- **up and up** :- Interface is operational.
- **up and down** :- Its data link layer problem.
- **down and down** :- Its physical layer problem.
- **Administratively down and down** :- Interface is disabled with shutdown command.

Possible values for physical layer status

- **Up** :- Switch is sensing physical layer signal.
- **Down** :- Switch is not sensing physical layer signal. Possible reasons could be cable is not connected, wrong cable type is used and remote end device is turned off.
- **Administratively down** :- Interface is disabled by using shutdown command.

Possible values for data link layer status

- **Up** :- The data link layer is operational.
- **Down** :- The data link layer is not operational. Possible reasons could be a disabled physical layer, missed keep alives on a serial link, no clocking or an incorrect encapsulation type.

show ip interface brief

```
Switch>enable
Switch#show ip interface brief
Interface          IP-Address      OK? Method Status  Protocol
FastEthernet0/1    unassigned      YES manual up      up
FastEthernet0/2    unassigned      YES manual up      up
FastEthernet0/3    unassigned      YES manual down    down
FastEthernet0/4    unassigned      YES manual down    down
--More--
```

show ip interface brief is a extremely useful command to get quick overview of all interfaces on switch. It lists their status including IP address and protocol.