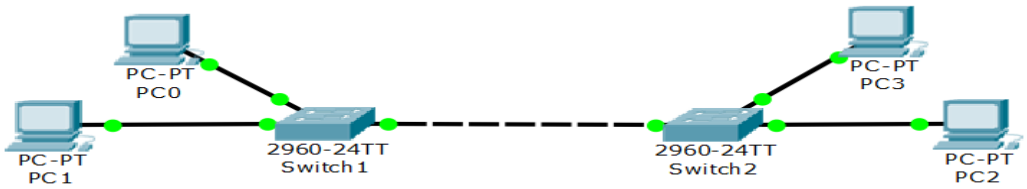
LAB 3 – Basic Switch Configuration Commands

This lab explains basic switch configuration commands in detail with examples. Configuration and commands explained in this tutorial are essential commands to manage a Cisco switch effectively.

Packet tracer network simulator software will be used to explain basic switch configuration commands. You can use any network simulator software like GNS3 or can use a real Cisco switch to follow this lab. There is no difference in output as long as your selected software contains the commands explained in this tutorial.

Create a practice lab as shown in following figure:



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.*

Cisco Switch command modes

Cisco switch runs 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

Mode	Purpose	Prompt	Command to enter	Command to exit
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 that it fails to locate a valid IOS image. Manual entrance in this mode Allow you to perform low-level diagnostics.	ROMMON>	Enter **reload** command from privileged exec mode. Press `CTRL + C` key combination during the first 60 seconds of booting process	Use **exit** command.

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 **`t`**, we can hit enter key after typing **`t?`** at command prompt. It will list all possible commands that begin with letter **`t`**.

```
Switch>t?
telnet  terminal  traceroute
Switch>t
```

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:
  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
  dhcp        Show items in the DHCP database
  interface   IP interface status and configuration
  ssh         Information on SSH
Switch>show ip arp ?
  <cr>
Switch>show ip arp
```

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. TAB key can be pressed to auto-complete possible command.

```
Switch>enable
Switch#conf
Switch#configure ter
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname SW1
SW1(config)#
SW1(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.

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#line console 0
Switch(config-line)#password con1234
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#line vty 0 15
Switch(config-line)#password telnet1234
Switch(config-line)#login
Switch(config-line)#exit
Switch(config)#
```

CONSOLE

VTY

Password can be set from their respective line mode. Enter in line mode from global configuration mode. VTY term stand for virtual terminal such as telnet or SSH. Switch may support up to thousand VTYs lines. By default, the 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 the line. In the example above, we have set a common password `"telnet1234"` for all lines.

Above method is good for small companies, where there are a few network administrators. In above method, a password is shared among all administrators. The switch supports both local and remote server authentication. Remote server authentication is a complex process. In local database authentication method, the 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 rishi password test123
Switch(config)#line console 0
Switch(config-line)#login local
Switch(config-line)#exit
Switch(config)#exit
```

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
```

Again as 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 above, **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 runfollowing commands in production environment unless you understand their effect clearly. Following commands will erase all configurations. In production environment you should always takes 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, type s`witch# 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 the above command we entered an entry for static MAC address **`aaaa.aaaa.aaaa`** assigned to **`FastEnternet 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, RELEASE
SOFTWARE(fc1)
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 27 minutes, 33 seconds
System returned to ROM by power-on

Cisco WS-C2950-24 (RC32300) processor (revision C0) with 21039K bytes of memory.
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: 0004.9A69.4C0A
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>
```

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>show mac address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0000.0c2d.7635    DYNAMIC     Fa0/2
   1    0000.0c6d.ceb1    DYNAMIC     Fa0/3
   1    0004.9ab1.4326    DYNAMIC     Fa0/4
   1    0060.5c62.ced0    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>enable
Switch#show flash
Directory of flash:/

    1  -rw-     3058048          <no date>  c2950-i6q412-mz.121-22.EA4.bin

64016384 bytes total (60958336 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 : 990 bytes
!
version 12.1
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
 duplex half
!
interface FastEthernet0/2
!
interface FastEthernet0/3
!
```

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.

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    Fa0/1, 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
17   Outcast                          active
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup
```

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 fastethernet 0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 0010.11dc.8101 (bia 0010.11dc.8101)
 BW 100000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-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
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     956 packets input, 193351 bytes, 0 no buffer
     Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     2357 packets output, 263570 bytes, 0 underruns
```

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 second up indicates the status of the data link layer.

Possible interface status

- **up and up :-** Interface is operational.
- **up and down :-** Data link layer problem.
- **down and down :-** 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 up                    up

FastEthernet0/4        unassigned      YES manual up                    up

FastEthernet0/5        unassigned      YES manual down                  down

FastEthernet0/6        unassigned      YES manual down                  down

FastEthernet0/7        unassigned      YES manual down                  down

FastEthernet0/8        unassigned      YES manual down                  down
```

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.