LAB # 03

THE CISCO IOS CLI ARCHITECTURE

# OBJECTIVE

1. To practice some basic commands to interact with the Cisco IOS CLI Software.
2. To configure basic start-up settings on a Cisco Switch.

# Theory

This section presents the two user levels and various modes of the Cisco IOS software.

## OVERVIEW OF USER LEVELS AND MODES:

As a security feature, Cisco IOS software separates Sessions into two different access levels. User EXEC level allows you to access only basic monitoring commands; privileged EXEC level allows you to access all router commands. Privileged EXEC level can be password protected to allow only authorized users the ability to configure or manage the router. From privileged EXEC level, you can access all the command modes. There are five command modes: global configuration mode, interfaces configuration mode, sub-interface configuration mode, router configuration mode, and line configuration mode.

# Exercise:

## Step 1:

When you open a console session in a switch, you are automatically in user EXEC command mode. The EXEC commands available at the user level are a subset of those available at the privileged level. In general, the user EXEC commands allow you to connect to remote devices, change terminal settings on a temporary basis, perform basic tests, and list system information.

You'll notice that the switch displays a switch> prompt. The right arrow (>) in the prompt indicates that the switch is at the user EXEC level. The user EXEC level does not contain any commands that might control (for example, reload or configure) the operation of the switch. To list the commands available at The operation of the router. To list the commands available at the user EXEC level, type at the switch> prompt.

**Step 2: enable**

Critical commands (for example, configuration and management) require that the user be logged into privileged EXEC level. To change to the privileged EXEC level, type enable at the switch> prompt. The switch prompt changes to switch#. The privileged EXEC mode prompt consists of the host name of the device followed by the pound sign (#). Then use the help system to display the commands available in privileged EXEC mode.

Privileged EXEC level can be password protected to allow only authorized users the ability to configure or manage the switch.

**Step 3: configure, <CR>**

Global configuration commands apply to features that affect the system as a whole. Use the [con](javascript:openCmdRefWindow('configure'))[figure](javascript:openCmdRefWindow('configure')) privileged EXEC command to enter global configuration mode. When you enter this command, the system EXEC prompts you for the source of the configuration commands:

Configuring from terminal, memory, or network [terminal]?

You can then specify either the terminal, non-volatile memory (NVRAM), or a file stored on a network server as the source of configuration commands. Configuring from the terminal is the system default. You can specify the source of the commands when first entering the command, by entering [configure terminal](javascript:openCmdRefWindow('configure')), [configure memory](javascript:openCmdRefWindow('configure')), or [configure network](javascript:openCmdRefWindow('configure')). For now, press Return to select the default, terminal configuration.

When the global configuration mode is entered, the switch prompt changes to **Switch(config)#**. Then use the help system to display the commands available in global configuration mode.

**Step 4: interface ethernet 0 , ? , exit**

From global configuration mode, you can access many other command modes, the following being the most commonly accessed:

1. Interface configuration mode

* Sub-interface configuration mode

1. Router configuration mode
2. Line configuration mode

Interface configuration commands modify the operation. In order to configure a specific interface, you need to enter interface configuration mode, from global configuration mode, by entering the [interface](javascript:openCmdRefWindow('interface')) interface\_type port\_number command. Enter interface configuration mode on the Ethernet 0 interface by entering [interface](javascript:openCmdRefWindow('interface')) ethernet 0. The prompt Switch(config-if)# indicates that you are in interface configuration mode. Then use the help system to display the commands available in interface configuration mode.

To exit interface configuration mode and return to global configuration mode, enter the [exit](javascript:openCmdRefWindow('exit')) command.

## CLI EDITOR FEATURES:

The Cisco IOS CLI offers context-sensitive help, a useful tool if you are a new user because at any time during an EXEC session, you can type a question mark ([?](javascript:openCmdRefWindow('?'))) to get help. Two types of context-sensitive help are available: word help and command syntax help.

Command syntax help can be used to obtain a list of command, keyword, or argument options that are available based on the syntax you have already entered. To use command syntax help, enter [?](javascript:openCmdRefWindow('?')) In the place of a keyword or argument.

**Step 1 enable,co ?**

Context-sensitive command syntax help can be used to obtain a list of commands, keywords, or argument options that are available, based on the syntax you have already entered. To use command syntax help to see a list of arguments that can be used with the [configure](javascript:openCmdRefWindow('configure')) command, enter [configure](javascript:openCmdRefWindow('configure')), with ? in the place of a keyword or argument. Include a space before the question mark.

**Step 2: configure ?**

Context-sensitive command syntax help can be used to obtain a list of commands, keywords, or argument options that are available, based on the syntax you have already entered. To use command syntax help to see a list of arguments that can be used with the [configure](javascript:openCmdRefWindow('configure')) command, enter [configure](javascript:openCmdRefWindow('configure')), with ? in the place of a keyword or argument. Include a space before the question mark.

**Step 3:Ctrl-U, li<tab> , Ctrl-U, i<tab>**

**in<tab>**

Lets use another editing feature of the Cisco IOS software. While the characters "in," from the previous lab step, are still being displayed at the prompt, press the Control key, and while holding the Control key down, type a "u." The Control-U key combination, abbreviated "Ctrl-U," erases whatever is displayed on the current, active prompt line in the Cisco IOS software. Control key combinations, like Ctrl-U, are called "hot keys." Continuing with command abbreviation, another way to find the minimum number of characters that uniquely identifies a command is to use the tab-to-complete feature of the Cisco IOS software. For example, type li at the prompt and then press the tab key. The tab-to-complete feature will expand the entry "li" to [line](javascript:openCmdRefWindow('line')), because [line](javascript:openCmdRefWindow('line')) is the only command that begins with "li." Use the Ctrl-U hot key to delete the [line](javascript:openCmdRefWindow('line')) command from the prompt line. Now try typing i at the prompt and then press the tab key. The tab-to-complete feature will not expand this entry, because as we discovered in the previous lab step, i is an ambiguous command. Now enter in at the prompt and then press the tab key. The tab-to-complete feature will expand this entry to [interface](javascript:openCmdRefWindow('interface')), because that is the only command that begins with "in."

**Step 4: Ctrl-R,Ctrl-A,<up-arrow>,<up-arrow>,Ctrl-W,ethernet 0,Ctrl-Z**

You have already learned about the Ctrl-U hot key. The following table offers a comprehensive list of the hot keys and some other keyboard editing functions.

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| Delete | - Removes one character to the right of the cursor. |
| Backspace | - Removes one character to the left of the cursor. |
| TAB | - Finishes a partial command. |
| Ctrl-A | - Moves the cursor to the beginning of the current line. |
| Ctrl-R | - Redisplays a line. |
| Ctrl-U | - Erases a line. |
| Ctrl-W | - Erases a word. |
| [Ctrl-Z](javascript:openCmdRefWindow('end')) | - Ends configuration mode and returns to the EXEC mode. |
| Up Arrow | - Allows user to scroll forward through former commands. |
| Down Arrow | - Allows user to scroll backward through former commands. |

Use the Ctrl-R hot key to redisplay the current line in the IOS software. Then use the Ctrl-A hot key to move the cursor to the beginning of the current line. Then use the up arrow key on the keyboard to move backwards through the commands in the command buffer—that is, the commands that have been used since entering privileged EXEC mode. Note that a few of the commands you entered in privileged EXEC mode don't appear in the buffer. These are the commands you deleted from the command line with the Ctrl-U hot key; the deletion also removes those commands from the command buffer. You can use the down arrow key to move forward through the buffer. After inspecting the contents of the buffer, use the arrow keys to display "interface serial 11" at the prompt. This was a command with an intentionally invalid parameter, used to demonstrate the command syntax check capability of the Cisco IOS software. Use the Ctrl-W hot key twice, to delete the last two words in this command. Then enter "ethernet 0" after the [interface](javascript:openCmdRefWindow('interface')) command, and go into interface configuration mode for the. Finally, use the Ctrl-Z hot key to return to privileged EXEC mode.

BASIC SWITCH CONFIGURATION

**Step 1:** [**enable**](javascript:openCmdRefWindow('enable'))**,** [**configure**](javascript:openCmdRefWindow('configure')) **terminal,** [**hostname**](javascript:openCmdRefWindow('hostname')) **Router1**

The default router name is "Switch." Giving each switch a unique name aids in network management by allowing you to uniquely identify each switch within the network. The name of the switch is considered to be the host name and is displayed in the system prompt. Let's change the host name from "Switch" to "Switch1." Notice that the name in the system prompt changes immediately after the [hostname](javascript:openCmdRefWindow('hostname')) command is entered.

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| **Task** | **Command** |
| 1. From user EXEC mode, enter privileged EXEC mode. | [enable](javascript:openCmdRefWindow('enable')) |
| 1. From privileged EXEC mode, enter global configuration mode. | [configure](javascript:openCmdRefWindow('configure')) terminal |
| 1. From global configuration mode, configure a new host name. | [hostname](javascript:openCmdRefWindow('hostname')) host\_name |

**Step 2: exit , clock set 11:56:50 11 March 1999,** [**show clock**](javascript:openCmdRefWindow('show%20clock'))

The router will use this information to timestamp error messages. Use the following information for the time and date: 11:56:50 11 March 1999. Then use the [show clock](javascript:openCmdRefWindow('show%20clock')) command to view the new clock setting.

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| **Task** | **Command** |
| 1. From global configuration mode, return to privileged EXEC mode. | [exit](javascript:openCmdRefWindow('exit')) |
| 1. From privileged EXEC mode, set the system clock. | [clock set](javascript:openCmdRefWindow('clock%20set')) hh:mm:ss day month year |
| 1. From privileged EXEC mode, view the clock setting. | [show clock](javascript:openCmdRefWindow('show%20clock')) |

**Step 3:** [**configure**](javascript:openCmdRefWindow('configure')) **terminal,** [**banner motd**](javascript:openCmdRefWindow('banner%20motd')) **# TechnologyDepartment #,** [**exit**](javascript:openCmdRefWindow('exit'))**, <CR>**

The message-of-the-day banner is displayed at login and is useful for sending startup messages to all connected terminals. By default, no message is displayed at logon. Enter the [banner motd](javascript:openCmdRefWindow('banner%20motd')) command in global configuration mode. When using the [banner motd](javascript:openCmdRefWindow('banner%20motd')) command, enter a few blank spaces and then type a delimiting character. The information typed until the next delimiting character is recognized as the message of the day. In this simulation, use the pound key (**#**) as the delimiting character.

**Step 4:** [**enable**](javascript:openCmdRefWindow('enable'))**,** [**configure**](javascript:openCmdRefWindow('configure')) **terminal,** [**interface**](javascript:openCmdRefWindow('interface')) **ethernet 0,** [**description**](javascript:openCmdRefWindow('description')) **FirstEthernetInNetwork1, Ctrl-Z , show running-config**

Now display the running configuration, to see the interface description you just configured. To display the running configuration, use the [show running-config](javascript:openCmdRefWindow('show%20running-config')) command in privileged EXEC mode.

In a configuration display, the exclamation marks function as line separators to make reading easier. In this configuration, notice how commands entered at the interface configuration level, such as the interface description command, appear indented underneath the interface they were entered on. Global-level commands are not indented, so you can easily identify which configuration parameters are set at the global configuration level and which are set at the various configuration sublevels.

Notice the commands that you have configured so far in this Basic Configuration Lab: [hostname](javascript:openCmdRefWindow('hostname')), [service timestamps](javascript:openCmdRefWindow('service%20timestamps')), [banner motd](javascript:openCmdRefWindow('banner%20motd')), and interface [description](javascript:openCmdRefWindow('description')).

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| **Task** | **Command** |
| 1. From user EXEC mode, enter privileged EXEC mode. | [enable](javascript:openCmdRefWindow('enable')) |
| 1. From privileged EXEC mode, enter global configuration mode. | [configure](javascript:openCmdRefWindow('configure')) terminal |
| 1. From global configuration mode, enter interface configuration mode. | [interface](javascript:openCmdRefWindow('interface')) type number |
| 1. From interface configuration mode, configure an interface description. | [description](javascript:openCmdRefWindow('description')) interface\_description |
| 1. From interface configuration mode, return to privileged EXEC mode. | <[Ctrl-Z](javascript:openCmdRefWindow('end'))> |
| 1. From privileged EXEC mode, display the running configuration. | [show running-config](javascript:openCmdRefWindow('show%20running-config')) |

**STEP 5:** [**configure**](javascript:openCmdRefWindow('configure')) **terminal,** [**line console**](javascript:openCmdRefWindow('line')) **0,** [**password**](javascript:openCmdRefWindow('password')) **cisco,** [**Ctrl-Z**](javascript:openCmdRefWindow('end'))**,** [**exit**](javascript:openCmdRefWindow('exit'))**, <CR>, cisco**:

You can use the [password](javascript:openCmdRefWindow('password')) command, in line configuration mode, to configure a password to restrict access to a switch. Console passwords can be established on individual lines. Remember that passwords are case-sensitive. Passwords can be configured for console terminals or for incoming Telnet sessions. Configure the password cisco for console line 0. Then exit the EXEC completely and log back into the switch. You will be prompted for the console password you just configured before you can enter user EXEC mode.

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| **Task** | **Command** |
| 1. From privileged EXEC mode, enter global configuration mode. | [configure](javascript:openCmdRefWindow('configure')) terminal |
| 1. From global configuration mode, enter line configuration mode for a console line. | [line console](javascript:openCmdRefWindow('line')) line\_number |
| 1. From line configuration mode, configure a console password. | [password](javascript:openCmdRefWindow('password')) password |
| 1. From line configuration mode, return to privileged EXEC mode. | <[Ctrl-Z](javascript:openCmdRefWindow('end'))> |
| 1. From privileged EXEC mode, exit the EXEC entirely. | [exit](javascript:openCmdRefWindow('exit')) |
| 1. Press Return when prompted. | <CR> |
| 1. Enter the console password at the prompt, to enter user EXEC mode. | password |

**Step 6:** [**enable**](javascript:openCmdRefWindow('enable'))**,** [**configure**](javascript:openCmdRefWindow('configure')) **terminal,** [**line vty**](javascript:openCmdRefWindow('line')) **0 4,** [**password**](javascript:openCmdRefWindow('password')) **cisco**

To further restrict access to the switch, configure the password cisco for zero through four.

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| **Task** | **Command** |
| 1. From user EXEC mode, enter privileged EXEC mode. | [enable](javascript:openCmdRefWindow('enable')) |
| 1. From Privileged EXEC mode, enter global configuration mode. | [configure](javascript:openCmdRefWindow('configure')) terminal |
| 1. From global configuration mode, enter line configuration mode for a virtual terminal. | [line vty](javascript:openCmdRefWindow('line')) line\_number [ending\_line\_number] |
| 1. From line configuration mode, configure a virtual-terminal password. | [password](javascript:openCmdRefWindow('password')) password |

**Step 7:** [**exit**](javascript:openCmdRefWindow('exit'))**,** [**enable password**](javascript:openCmdRefWindow('enable%20password')) **Cisco,** [**exit**](javascript:openCmdRefWindow('exit'))**,** [**disable**](javascript:openCmdRefWindow('disable'))**,** [**enable**](javascript:openCmdRefWindow('enable'))**, Cisco**

Use the [enable password](javascript:openCmdRefWindow('enable%20password')) global configuration command to configure an enable password to restrict access to privileged EXEC mode. Use Cisco as the password. Then return to user EXEC mode and test the enable password by re-entering privileged EXEC mode.

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| **Task** | **Command** |
| 1. From line configuration mode, return to global configuration mode. | [exit](javascript:openCmdRefWindow('exit')) |
| 1. From global configuration mode, configure an enable password. | [enable password](javascript:openCmdRefWindow('enable%20password')) password |
| 1. From global configuration mode, return to privileged EXEC mode. | [exit](javascript:openCmdRefWindow('exit')) |
| 1. From privileged EXEC mode, return to user EXEC mode. | [disable](javascript:openCmdRefWindow('disable')) |
| 1. From user EXEC mode, reenter privileged EXEC mode, entering the enable password when prompted. | [enable](javascript:openCmdRefWindow('enable'))  password |

**Step 8: configure terminal,** [**logging buffered**](javascript:openCmdRefWindow('logging%20buffered'))

To copy logging messages, such as errors, to an internal buffer, use the [logging buffered](javascript:openCmdRefWindow('logging%20buffered')) command. The buffer is circular, so those newer messages overwrite older ones after the buffer is filled. Having a log of these messages can be useful when troubleshooting network problems. Now let's generate some logging messages.

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| **Task** | **Command** |
| 1. From privileged EXEC mode, return to global configuration mode. | [configure](javascript:openCmdRefWindow('configure')) terminal |
| 1. From global configuration mode, configure the system to log messages to an internal buffer. | [logging buffered](javascript:openCmdRefWindow('logging%20buffered')) |

**Step 9:** [**Ctrl-Z**](javascript:openCmdRefWindow('end'))**,** [**show interface**](javascript:openCmdRefWindow('show%20interfaces')) **ethernet 0**

To view information about a particular interface, you can use the [show interface](javascript:openCmdRefWindow('show%20interfaces')) command, which provides the following important information:

1. Interface state (for example, UP, DOWN, LOOPED)
2. Protocol addresses
3. Reliability and load
4. Packet rates
5. Error rates
6. Signaling status (that is, From privileged EXEC mode, display the interface information with the [show interface](javascript:openCmdRefWindow('show%20interfaces')) command.

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| **Task** | **Command** |
| 1. From interface configuration mode, return to privileged EXEC mode. | <[Ctrl-Z](javascript:openCmdRefWindow('end'))> |
| 1. From privileged EXEC mode, display interface information for the interface. | [Show interface](javascript:openCmdRefWindow('show%20interfaces')) interface\_type interface\_number |

**Step 10: show running-config**

To display the startup configuration that is stored in NVRAM, use the [show startup-config](javascript:openCmdRefWindow('show%20startup-config')) command in privileged EXEC mode.

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| **Task** | **Command** |
| 1. From privileged EXEC mode, display the startup configuration. | [show startup-config](javascript:openCmdRefWindow('show%20startup-config')) |

**Step 11: show startup-config**

Save the current running configuration by using the [copy running-config startup-config](javascript:openCmdRefWindow('copy')) command to overwrite the start-up configuration. A Cisco IOS switch stores configurations in two locations—RAM and NVRAM. Start-up configuration is used by the switch during operation. Any configuration changes to the switch are made to the running configuration and take effect immediately after the command is entered and is saved in NVRAM and is loaded as the running configuration when the switch boots up. If a switch loses power or is reloaded, changes to the running configuration are lost unless they have been saved to the startup configuration.

Tip: When editing a configuration, save often.

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| **Task** | **Command** |
| 1. From privileged EXEC mode, save the running configuration. | [copy running-config startup-config](javascript:openCmdRefWindow('copy')) |

**Step 12: show version**

Finally, you will use one more command that can be used to collect information about the configuration and status of a switch. This information can be very helpful in troubleshooting switch problems. The [show version](javascript:openCmdRefWindow('show%20version')) command provides much information, including the following:

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| Software Version | - IOS software version (stored in Flash) |
| Bootstrap Version | - Bootstrap version (stored in boot ROM) |
| System up-time | - Time since last reboot |
| System restart info | - Method of restart (for example, power cycle, crash) |
| Software image name | - IOS filename stored in Flash |
| Router Type and Processor type | - Model number and processor type |
| Memory type and allocation (Shared/Main) | - Main processor RAM  - Shared packet I/O buffering |
| Software Features | - Supported protocols / feature sets |
| Hardware Interfaces | - Interfaces available on router |
| Configuration Register | - Bootup specifications, console speed setting, etc. |

From privileged EXEC mode, display the software version information with the [show version](javascript:openCmdRefWindow('show%20version')) command.

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| **Task** | **Command** |
| 1. From privileged EXEC mode, display version information. | [show versio](javascript:openCmdRefWindow('show version'))[n](javascript:openCmdRefWindow('show version')) |

**HOME ASSIGNMENTS**

Q1: Perform all the basic switch configurations those are mention in manual & submit the hard copy.

Q2: Write description of any three commands of ‘User Mode” .

Q3: Write description of any three commands of ‘Privileged Mode” .

Q4: Run these commands:

1. #show version
2. #show interfaces
3. #show startup-config
4. #show running-config
5. #show interfaces
6. #show clock

& find out IOS version, IOS file name, interfaces, RAM and NVRAM.