Using Cisco IOS XE Software

Understanding Command Modes

The command modes available in Cisco IOS XE are the same as those available in traditional Cisco IOS. Use the CLI to access Cisco IOS XE software. Because the CLI is divided into many different modes, the commands available to you at any given time depend on the mode that you are currently in. Entering a question mark (**?**) at the CLI prompt allows you to obtain a list of commands available for each command mode.

When you log in to the CLI, you are in user EXEC mode. User EXEC mode contains only a limited subset of commands. To have access to all commands, you must enter privileged EXEC mode, normally by using a password. From privileged EXEC mode, you can issue any EXEC command—user or privileged mode—or you can enter global configuration mode. Most EXEC commands are one-time commands. For example, **show** commands show important status information, and **clear** commands clear counters or interfaces. The EXEC commands are not saved when the software reboots.

Configuration modes allow you to make changes to the running configuration. If you later save the running configuration to the startup configuration, these changed commands are stored when the software is rebooted. To enter specific configuration modes, you must start at global configuration mode. From global configuration mode, you can enter interface configuration mode and a variety of other modes, such as protocol-specific modes.

ROM monitor mode is a separate mode used when the Cisco IOS XE software cannot load properly. If a valid software image is not found when the software boots or if the configuration file is corrupted at startup, the software might enter ROM monitor mode.

The following table describes how to access and exit various common command modes of the Cisco IOS XE software. It also shows examples of the prompts displayed for each mode.

Table 1: Accessing and Exiting Command Modes

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Log in.	`Router>`	Use the **logout** command.
Privileged EXEC	From user EXEC mode, use the **enable** command.	`Router#`	To return to user EXEC mode, use the **disable** command.
Global configuration	From privileged EXEC mode, use the **configure terminal** command.	`Router(config)#`	To return to privileged EXEC mode from global configuration mode, use the **exit** or **end** command.
Interface configuration	From global configuration mode, specify an interface using an **interface** command.	`Router(config-if)#`	To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.
Diagnostic	The router boots up or accesses diagnostic mode in the following scenarios: • In some cases, diagnostic mode will be reached when the Cisco IOS process or processes fail. In most scenarios, however, the router will reload. • A user-configured access policy is configured using the **transport-map** command that directs a user into diagnostic mode. • A break signal (**Ctrl-C**, **Ctrl-Shift-6**, or the **send break** command) is entered and the router is configured to go to diagnostic mode when the break signal is received.	`Router(diag)#`	If failure of the Cisco IOS process is the reason for entering diagnostic mode, the Cisco IOS problem must be resolved and the router rebooted to get out of diagnostic mode. If the router is in diagnostic mode because of a transport-map configuration, access the router through another port or by using a method that is configured to connect to the Cisco IOS CLI.

Command Mode	Access Method	Prompt	Exit Method
ROM monitor	From privileged EXEC mode, use the **reload** EXEC command. Press the **Break** key during the first 60 seconds while the system is booting.	`rommon#>`	To exit ROM monitor mode, manually boot a valid image or perform a reset with autoboot set so that a valid image is loaded.

Keyboard Shortcuts

Commands are not case sensitive. You can abbreviate commands and parameters if the abbreviations contain enough letters to be different from any other currently available commands or parameters.

The following table lists the keyboard shortcuts for entering and editing commands.

Table 2: Keyboard Shortcuts

Key Name	Purpose
Ctrl-B or the **Left Arrow** key	Move the cursor back one character.
Ctrl-F or the **Right Arrow** key	Move the cursor forward one character.
Ctrl-A	Move the cursor to the beginning of the command line.
Ctrl-E	Move the cursor to the end of the command line.
Esc B	Move the cursor back one word.
Esc F	Move the cursor forward one word.

Using the no and default Forms of Commands

Almost every configuration command has a **no** form. In general, use the **no** form to disable a function. Use the command without the **no** keyword to re-enable a disabled function or to enable a function that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, use the **no ip routing** command; to re-enable IP routing, use the **ip routing** command. The Cisco IOS software command reference publications provide the complete syntax for the configuration commands and describe what the **no** form of a command does.

Many CLI commands also have a **default** form. By issuing the *<command>* **default** command-name, you can configure the command to its default setting. The Cisco IOS software command reference publications describe the function from a **default** form of the command when the **default** form performs a different function than the plain and **no** forms of the command. To see what default commands are available on your system, enter **default ?** in the appropriate command mode.

Using the History Buffer to Recall Commands

The history buffer stores the last 20 commands you entered. History substitution allows you to access these commands without retyping them, by using special abbreviated commands.

The following table lists the history substitution commands.

Table 3: History Substitution Commands

Command	Purpose
Ctrl-P or the **Up Arrow** key[1]	Recalls commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.
Ctrl-N or the **Down Arrow** key[1]	Returns to more recent commands in the history buffer after recalling commands with **Ctrl-P** or the **Up Arrow** key.
Router# `show history`	While in EXEC mode, lists the last few commands you entered.

[1] The arrow keys function only on ANSI-compatible terminals such as VT100s.

Managing Configuration Files

The startup configuration file is stored in the nvram: file system and the running configuration files are stored in the system: file system. This configuration file storage setup is also used on several other Cisco router platforms.

IOS XE provides encryption of the configuration file. Encryption is discussed in length in the IOS XE hardening device guide which can be found here:https://www.cisco.com/c/en/us/support/docs/ip/access-lists/13608-21.html

As a matter of routine maintenance on any Cisco router, users should back up the startup configuration file by copying the startup configuration file from NVRAM to one of the router's other file systems and, additionally, to a network server. Backing up the startup configuration file provides an easy method of recovering the startup configuration file if the startup configuration file in NVRAM becomes unusable for any reason.

The **copy** command can be used to back up startup configuration files.

For more detailed information on managing configuration files, see the "Managing Configuration Files" section in the Cisco IOS XE Configuration Fundamentals Configuration Guide.

Saving Configuration Changes

Use the **copy running-config startup-config** command to save your configuration changes to the startup configuration so that the changes will not be lost if the software reloads or a power outage occurs. For example:

```
Router# copy running-config startup-config
Destination filename [startup-config]?
```

```
Building configuration...
[OK]
Router#
*Sep 8 05:41:03.450: %SYS-6-PRIVCFG_ENCRYPT_SUCCESS: Successfully encrypted private config
 file
Router#
```

Note   It may take a few minutes to save the configuration.

This task saves the configuration to the NVRAM.

Filtering Output from the show and more Commands

You can search and filter the output of **show** and **more** commands. This functionality is useful if you need to sort through large amounts of output or if you want to exclude output that you need not see.

To use this functionality, enter a **show** or **more** command followed by the "pipe" character (|); one of the keywords **begin**, **include**, or **exclude**; and a regular expression on which you want to search or filter (the expression is case sensitive):

show *command* | {**append** | **begin** | **exclude** | **include** | **redirect** | **section** | **tee**} *regular-expression*

The output matches certain lines of information in the configuration file.

Example

In this example, a modifier of the **show interface** command (**include protocol**) is used to provide only the output lines in which the expression **protocol** is displayed:

```
Router# show interface | include protocol
GigabitEthernet0/0/0 is up, line protocol is up
1401 unknown protocol drops
GigabitEthernet0/0/1 is up, line protocol is up
3073 unknown protocol drops
WPAN0/1/0 is up, line protocol is up
0 unknown protocol drops
Cellular0/4/0 is up, line protocol is up
0 unknown protocol drops
Cellular0/4/1 is up (spoofing), line protocol is up (spoofing)
0 unknown protocol drops
Cellular0/5/0 is up, line protocol is up
0 unknown protocol drops
Cellular0/5/1 is down, line protocol is down
0 unknown protocol drops
Loopback1 is up, line protocol is up
0 unknown protocol drops
Tunnel1 is up, line protocol is up
Tunnel protocol/transport GRE/IP
0 unknown protocol drops
Tunnel2 is up, line protocol is up
Tunnel protocol/transport GRE/IP
0 unknown protocol drops
VirtualPortGroup1 is up, line protocol is up
0 unknown protocol drops
```

Finding Support Information for Platforms and Cisco Software Images

The Cisco IOS XE software is packaged in feature sets consisting of software images that support specific platforms.

All of the Cisco IOS-XE configuration guides can be found here: https://www.cisco.com/c/en/us/support/ios-nx-os-software/ios-xe-17/series.html

The group of feature sets that are available for a specific platform depends on which Cisco software images are included in a release. To identify the set of software images available in a specific release or to find out if a feature is available in a given Cisco IOS XE software image, you can use Cisco Feature Navigator or see the https://www.cisco.com/c/en/us/support/ios-nx-os-software/ios-xe-17/series.html.

Using Cisco Feature Navigator

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator is a tool that enables you to determine which Cisco IOS XE software images support a specific software release, feature set, or platform. To use the navigator tool, an account on Cisco.com is not required.

Getting Help

Entering a question mark (**?**) at the CLI prompt displays a list of commands available for each command mode. You can also get a list of keywords and arguments associated with any command by using the context-sensitive help feature.

To get help that is specific to a command mode, a command, a keyword, or an argument, use one of the following commands.

Command	Purpose
`help`	Provides a brief description of the help system in any command mode.
`abbreviated-command-entry?`	Provides a list of commands that begin with a particular character string. **Note** There is no space between the command and the question mark.
`abbreviated-command-entry<Tab>`	Completes a partial command name.
`?`	Lists all the commands that are available for a particular command mode.
`command ?`	Lists the keywords or arguments that you must enter next on the command line. **Note** There is a space between the command and the question mark.

Finding Command Options: Example

This section provides information about how to display the syntax for a command. The syntax can consist of optional or required keywords and arguments. To display keywords and arguments for a command, enter a question mark (**?**) at the configuration prompt or after entering a part of a command followed by a space. The Cisco IOS XE software displays a list and brief descriptions of the available keywords and arguments. For example, if you are in global configuration mode and want to see all the keywords and arguments for the **arap** command, you should type **arap ?**.

The <cr> symbol in command help output stands for carriage return. On older keyboards, the carriage return key is the **Return** key. On most modern keyboards, the carriage return key is the **Enter** key. The <cr> symbol at the end of command help output indicates that you have the option to press **Enter** to complete the command and that the arguments and keywords in the list preceding the <cr> symbol are optional. The <cr> symbol by itself indicates that no more arguments or keywords are available, and that you must press **Enter** to complete the command.

The following table shows examples of using the question mark (**?**) to assist you in entering commands.

Table 4: Finding Command Options

Command	Comment

`Router>` **`enable`**
`Password: <password>`
`Router#`
	Enter the **enable** command and password to access privileged EXEC commands. You are in privileged EXEC mode when the prompt changes to a " # " from the " > ", for example, `Router>` to `Router#`

`Router#` **`configure terminal`**
`Enter configuration commands, one per line. End`
` with CNTL/Z.`
`Router(config)#`
	Enter the **configure terminal** privileged EXEC command to enter global configuration mode. You are in global configuration mode when the prompt changes to `Router (config)#`

`Router(config)#` **`interface GigabitEthernet ?`**
`<0-0> GigabitEthernet interface number`
 	
`Router(config)#` **`interface GigabitEthernet 0/?`**
`<0-0> Port Adapter number`
 	
`Router (config)#` **`interface GigabitEthernet 0/0/?`**
`<0-1> GigabitEthernet interface number`
 	
`Router (config)#` **`interface GigabitEthernet`**
`0/0/0?`
`<0-1>`
 	
`Router(config-if)#`
	Enter interface configuration mode by specifying the interface that you want to configure, using the **interface GigabitEthernet** global configuration command.
	
	Enter **?** to display what you must enter next on the command line.
	
	When the <cr> symbol is displayed, you can press **Enter** to complete the command.
	
	You are in interface configuration mode when the prompt changes to `Router(config-if)#`

Command	Comment
| ```
Router(config-if)# ?
Interface configuration commands:
  .
  .
  .
  ip                 Interface Internet
Protocol
                     config commands
  keepalive          Enable keepalive
  lan-name           LAN Name command
  llc2               LLC2 Interface Subcommands

  load-interval      Specify interval for load
 calculation
                     for an interface
  locaddr-priority   Assign a priority group
  logging            Configure logging for
interface
  loopback           Configure internal
loopback on an
                     interface
  mac-address        Manually set interface
MAC address
  mls                mls router sub/interface
 commands
  mpoa               MPOA interface
configuration commands
  mtu                Set the interface
                     Maximum Transmission Unit
 (MTU)
  netbios            Use a defined NETBIOS
access list
                     or enable
                     name-caching
  no                 Negate a command or set
its defaults
  nrzi-encoding      Enable use of NRZI
encoding
  ntp                Configure NTP
  .
  .
  .
Router(config-if)#
``` | Enter **?** to display a list of all the interface configuration commands available for the interface. This example shows only some of the available interface configuration commands. |

Command	Comment
	Enter the command that you want to configure for the interface. This example uses the **ip** command.
	Enter **?** to display what you must enter next on the command line. This example shows only some of the available interface IP configuration commands.

Command	Comment
Router(config-if)# **ip ?** Interface IP configuration subcommands: access-group Specify access control for packets address Set the IP address of an interface admission Apply Network Admission Control auth-proxy Apply authenticaton proxy authentication authentication subcommands bandwidth-percent Set EIGRP bandwidth limit bgp BGP interface commands broadcast-address Set the broadcast address of an interface cef Cisco Express Forwarding interface commands cgmp Enable/disable CGMP clear-dont-fragment Enable clear dont fragment (Currently Only SDWAN Tunnel Interface) dampening-change Percent interface metric must change to cause update dampening-interval Time in seconds to check interface metrics ddns Configure dynamic DNS dhcp Configure DHCP parameters for this interface directed-broadcast Enable forwarding of directed broadcasts dlep DLEP interface commands dns Configure DNS server flow NetFlow related commands flowspec FlowSpec configuration header-compression IPHC options hello-interval Configures EIGRP-IPv4 hello interval helper-address Specify a destination address for UDP broadcasts hold-time Configures EIGRP-IPv4 hold time igmp IGMP interface commands information-reply Enable sending ICMP Information Reply messages irdp ICMP Router Discovery Protocol load-sharing Style of load sharing local-proxy-arp Enable local-proxy ARP mask-reply Enable sending ICMP Mask Reply messages mfib Interface Specific MFIB Control mrm Configure IP Multicast Routing Monitor tester mroute-cache Enable switching cache for incoming multicast packets mtu Set IP Maximum Transmission Unit multicast IP multicast interface commands mux Enable IP multiplexing for outgoing packets nat NAT interface commands nbar Network-Based Application Recognition network-broadcast Accept and respond to network-prefix-directed broadcasts next-hop-self Configures EIGRP-IPv4 next-hop-self ospf OSPF interface commands pim PIM interface commands policy Enable policy routing portbundle IP Portbundle configuration	

Command	Comment
probe Enable HP Probe support proxy-arp Enable proxy ARP rarp-server Enable RARP server for static arp entries reassembly Reassembly redirects Enable sending ICMP Redirect messages rgmp Enable/disable RGMP rip Router Information Protocol route-cache Enable fast-switching cache for outgoing packets router IP router interface commands rsvp RSVP Interface Commands rtp RTP parameters sap Session Advertisement Protocol interface commands sdr Session Directory Protocol interface commands security DDN IP Security Option service IP service split-horizon Perform split horizon sticky-arp Allow the creation of sticky ARP entries subscriber IP session configuration options summary-address Perform address summarization tcp TCP interface commands topology-accounting Enable accounting for IP on all topologies of Router(config-if)# **ip**	

Router(config-if)# **ip address ?**
  A.B.C.D IP address
  dhcp IP Address negotiated via DHCP
  pool IP Address autoconfigured from a local DHCP pool
Router(config-if)# **ip address**
	Enter the command that you want to configure for the interface. This example uses the **ip address** command.
	
	Enter **?** to display what you must enter next on the command line.
	
	A carriage return (<cr>) is not displayed. Therefore, you must enter additional keywords or arguments to complete the command.

Router(config-if)# **ip address 172.16.0.1 ?** A.B.C.D IP subnet mask Router(config-if)# **ip address 172.16.0.1**	Enter the keyword or argument that you want to use. This example uses the 172.16.0.1 IP address. Enter **?** to display what you must enter next on the command line. In this example, you must enter an IP subnet mask. <cr> is not displayed. Therefore, you must enter additional keywords or arguments to complete the command.

Command	Comment
```Router(config-if)# ip address 172.16.0.1 255.255.255.0 ? secondary Make this IP address a secondary address <cr> Router(config-if)# ip address 172.16.0.1 255.255.255.0```	Enter the IP subnet mask. This example uses the 255.255.255.0 IP subnet mask. Enter **?** to display what you must enter next on the command line. In this example, you can enter the **secondary** keyword, or you can press **Enter**. <cr> is displayed. Press **Enter** to complete the command, or enter another keyword.
```Router(config-if)# ip address 172.16.0.1 255.255.255.0 Router(config-if)#```	Press **Enter** to complete the command.

Using Software Advisor

Cisco maintains the Software Advisor tool. See Tools and Resources. Use the Software Advisor tool to see if a feature is supported in a Cisco IOS XE release, to locate the software document for that feature, or to check the minimum software requirements of Cisco IOS XE software with the hardware installed on your router. You must be a registered user on Cisco.com to access this tool.

Using Software Release Notes

See the release notes for information about the following:

- Open and resolved severity 1 and 2 caveats

Release notes are intended to be release-specific for the most current release, and the information provided in these documents may not be cumulative in providing information about features that first appeared in previous releases. For cumulative feature information, refer to the Cisco Feature Navigator at: http://www.cisco.com/go/cfn/.