1. What is IOS? Why IOS is used?

The Cisco Internetwork Operating System (IOS) is the kernel of Cisco routers and most

switches. The IOS was created to deliver network services and enable networked

applications. The Cisco IOS runs on most Cisco routers and on some Cisco Catalyst

switches, like the Catalyst 1900 switch.

The Cisco router IOS software is used to complete the following on Cisco hardware:

• Carry network protocols and functions.

• Connect high-speed traffic between devices.

• Add security to control access and stop unauthorized network use Provide scalability

for ease of network growth and redundancy.

• Supply network reliability for connecting to network resources.

You can access the Cisco IOS through the console port of a router, from a modem, or

even through Telnet. Access to the IOS command line is called an EXEC session.

2. What is the different alternative to have an access to Cisco device?

You can connect to a Cisco router to configure the router, verify the configuration, and

check statistics. There are different ways to connect to a Cisco router.

First way, you typically would connect to is the console port. The console port is usually a

RJ-45 connection on the back of the router. This is used to connect to and configure the

router. No password is set on the console port by default.

Another way to connect to a Cisco router is through an auxiliary port. This is really the

same as a console port and can be used as such. However, it also allows you to configure

modem commands to allow a modem connection to the router. This means you can dial

up a remote router and attach to the auxiliary port if the router is down and you need to

configure it.

The third way to connect to a Cisco router is through the program Telnet. Telnet is an

emulation program that emulates a dumb-terminal. You can then use Telnet to connect

to any active interface on a router like an Ethernet or serial port.

3. Describe the procedure of bringing up or booting router?

• When you first bring up a Cisco router, it will run a power-on self-test (POST)

• If that passes, it will look for and load the Cisco IOS from Flash memory if a file is

present. Flash memory is an electronically erasable programmable read-only

memory (EEPROM).

• The IOS will load and then look for a valid configuration called startup-config that is

stored by default in non- volatile RAM (NVRAM).

• If there is no configuration in NVRAM, then the router will bring up what is called

setup mode.

This is a step-by-step process to help you configure a router. You can also enter setup

mode at any time from the command line by typing the command setup from global

configuration mode. Setup only covers some very global commands, but is helpful if you

don’t know how to con-figure certain protocols, like bridging or DEC net, for example.

6. Give the procedure to apply user mode password as well as privilege mode password

for Cisco router?

User mode passwords: To configure user mode passwords, use the line command.

Router#config t

Enter configuration commands, one per line end with CNTL/Z.

Router(config)#line ?

<0-70> First Line number

Aux Auxiliary line

console Primary terminal line

Tty Terminal controller

Vty Virtual terminal

Aux: Is used to set the user-mode password for the auxiliary port. This is typically used

for configuring a modem on the router but can be used as a console as well. To configure

the auxiliary password, go to global configuration mode and type line aux ? .

Router#config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#line aux ?

<0-0> First Line number

Router(config)#line aux 0

Router(config-line)#login

Router(config-line)#password todd

Privilege mode password:

You can only view and change the configuration of a Cisco router in privileged mode,

which you enter with the command enable.

Router>enable

Router#

You now end up with a Router#, which indicates you are in privileged mode. You can

both view and change the configuration in privileged mode.

Router#configure terminal

Router(config)#enable password cisco

To check if our password “cisco” works, get out of enable mode:

Router#disable

Router>enable

Password:

7. Write a note on banners with available with Cisco IOS with example?

You can set a banner on a Cisco router so that when either a user logs into the router or

an administrator telnet into the router, for example, a banner will give them the

information you want them to have. Another reason for having a banner is to add a

security notice to users dialing into your internetwork. There are four different banners

available:

Router(config)#banner ?

LINE c banner-text c, where 'c' is a delimiting character

exec Set EXEC process creation banner

incoming Set incoming terminal line banner

login Set login banner

motd Set Message of the Day banner

Exec banner: You can configure a line-activation (exec) banner to be dis-played

when an EXEC process (such as a line-activation or incoming connection to a

VTY line) is created.

Incoming banner: You can configure a banner to be displayed on terminals

connected to reverse Telnet lines. This banner is useful for providing instructions

to users who use reverse Telnet.

Login banner: You can configure a login banner to be displayed on all connected

terminals. This banner is displayed after the MOTD banner but before the login

prompts. The login banner cannot be disabled on a per-line basis. To globally

disable the login banner, you must delete the login banner with the no banner

login command.

The Message of the Day: It is the most used and gives a message to every person dialing

in or connecting to the router via Telnet, auxiliary port, or console port.

Router(config)#banner motd ?

LINE c banner-text c, where 'c' is a delimiting character

Router(config)#banner motd #

Enter TEXT message. End with the character '#'.

8. Give the procedure to assign an IP address for a specific interface?

You don’t have to use IP on your routers; however, IP is typically used on all routers. To

configure IP addresses on an interface, use the ip address command from interface

configuration mode.

Router(config)#int e0

Router(config-if)#ip address 172.16.10.2 255.255.255.0

Router(config-if)#no shut

Turn on an interface with the no shut command.

Remember to look at the command show interface e0, for example, which will show you

if it administratively shut down or not. Show running-config will also show you if the

interface is shut down.

If you want to add a second subnet address to an interface, then you must

use the secondary command. If you type another IP address and press Enter. it

will replace the existing IP address and mask.

To add a secondary IP address, use the secondary command.

Router(config-if)#ip address 172.16.20.2 255.255.255.0 secondary

Router(config-if)#^Z

You can verify both addresses are configured on the interface with the

show running-config command (sh run for short).

Router#sh run

Building configuration...

Current configuration: [output cut] !

interface Ethernet0

ip address 172.16.20.2 255.255.255.0 secondary ip address 172.16.10.2 255.255.255.0 !

9. Give the procedure to configure a serial interface with the proper clock rate and

bandwidth?

To configure a serial interface, there are a couple of specifics that need to be discussed.

Typically, the interface will be attached to a CSU/DSU type of device that provides

clocking for the line. However, if you have a back-to-back configuration used in a lab

environment, for example, one end must provide clocking.

This would be the DCE end of the cable. Cisco routers, by default, are all DTE devices,

and you must tell an interface to provide clocking if it is to act as a DCE device. You

configure a DCE serial interface with the clock rate command.

Router#config t

Enter configuration commands, one per line. End with CNTL/Z

Router(config)#int s0

Router(config-if)#clock rate ?

Speed (bits per second)

1200

2400

4800

9600

19200

38400

56000

64000

72000

125000

148000

250000

500000

800000

1000000

1300000

2000000

4000000

<300-4000000>

Choose clockrate from list above

Router(config-if)#clock rate 64000

%Error: This command applies only to DCE interfaces

Router(config-if)#int s1

Router(config-if)#clock rate 64000

It does not hurt anything to try and put a clock rate on an interface. Notice that the clock

rate command is in bits per second. Every Cisco router ships with a default

serial link bandwidth of a T1, or 1.544Mbps. This has nothing to do with how data is

transferred over a link. The bandwidth of a serial link is used by routing protocols such as

IGRP, EIGRP, and OSPF to calculate the best cost to a remote network.

Router(config-if)#bandwidth ?

<1-10000000> Bandwidth in kilobits

Router(config-if)#bandwidth 64

Notice that unlike the clock rate command, the bandwidth command is c

configured in kilobits

10 marks module 3

1. What are the various alternative methods to connect to Cisco Router? Give the

procedure

The IOS was created to deliver network services and enable networked

applications. The Cisco IOS runs on most Cisco routers and on some Cisco Catalyst

switches, like the Catalyst 1900 switch (covered in Appendix B).The Cisco router IOS

software is used to complete the following on Cisco hardware:

 Carry network protocols and functions.

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scalability for ease of network growth and redundancy.

 Supply network reliability for connecting to network resources.

You can access the Cisco IOS through the console port of a router, from a modem,

or even through Telnet. Access to the IOS command line is called an EXEC session.

Connecting to a Cisco Router

You can connect to a Cisco router to configure the router, verify the

configuration, and check statistics. There are different ways to connect to a Cisco

router, but the first place you typically would connect to is the console port.

The console port is usually a RJ-45 connection on the back of the router.

This is used to connect to and configure the router. No password is set on the console port

by default.

\*Procedure\*:

- Connect the console cable to the router's console port and the other end to a computer's serial port or USB port (using a USB-to-Serial adapter).

- Open a terminal emulator and configure it to connect to the appropriate COM port or serial port with the specified settings (e.g., baud rate, data bits, stop bits, and parity).

- Once connected, you can access the router's CLI.

Another way to connect to a Cisco router is through an auxiliary port. This is

really the same as a console port and can be used as such. However, it also allows you to

configure modem commands to allow a modem connection to the router. This means

you can dial up a remote router and attach to the auxiliary port if the router is down and you

need to configure it.

The third way to connect to a Cisco router is through the program Telnet.

Telnet is an emulation program that emulates a dumb-terminal. You can then use

Telnet to connect to any active interface on a router like an Ethernet or serial port.

\*Procedure\*:

- Ensure the router has an IP address configured and is accessible over the network.

- Use a Telnet or SSH client (like PuTTY) to establish a connection to the router's IP address.

- Provide the username and password to log in to the router's CLI.

2. What is IOS? What are the activities of a IOS in networking devices? Explain in brief

The Cisco Internetwork Operating System (IOS) is the kernel of Cisco routers

and most switches. Cisco has created what they call Cisco Fusion, which is supposed to

make all Cisco devices run the same operating system. The reason they don’t all run the

same OS is because Cisco has acquired more devices than they have designed and built

themselves. Almost all Cisco routers run the same IOS, but only about half of the

switches currently run the Cisco IOS

The activities of an IOS in networking devices are diverse and crucial for network operations. Some of its key functionalities include:

1. \*Device Management\*: IOS allows administrators to configure, monitor, and manage Cisco devices through the command-line interface (CLI) or a graphical user interface (GUI). It provides various commands for device configuration, troubleshooting, and maintenance.

2. \*Routing and Switching\*: IOS governs the core networking functionalities, including routing and switching. It manages the routing tables, determines the best paths for data to travel, and controls how traffic is forwarded within the network.

3. \*Security\*: IOS includes features for network security, such as access control lists (ACLs), firewalls, encryption, Virtual Private Networks (VPNs), and other security protocols to protect the network from threats and unauthorized access.

4. \*\*Quality of Service (QoS)\*\*: It allows the prioritization of network traffic, ensuring that critical data receives higher priority over less important data, enabling better network performance for specific applications.

5. \*Network Protocols Support\*: IOS supports various network protocols, such as TCP/IP, OSPF, EIGRP, BGP, and more. These protocols enable devices to communicate and function within the network effectively.

6. \*Software Upgrades and Maintenance\*: IOS enables software upgrades, patches, and maintenance activities to keep devices up-to-date and secure. It allows for the installation of new features and improvements.