Computer Networks - Lab 03

OBJECTIVES

After these Lab students shall be able to perform

- Intro with IP Address and its type.
- Understanding of Ipv4 Address
    - Ipv4 classes.
    - Ipv4 classes range
    - Ipv4 classes subnet mask
    - Ipv4 host and network portion.
    - Ipv4 network Address, valid Ip address, broadcast address.

- Perform practicals simulation with different topologies in packet pracer for better understaning of Ip address in network devices.
    - Devices: Router, switch and Laptops.
    - Assign Ip Address to end devices and router
- Setting Router Modes on 2600 Series Routers
- Changing Hostname of the Router
- Configuring Date and Time on the Router (Clock Set Command)
- Setting a banner on the Router
- Displaying the Router's Running-Configuration and Start-Up Configuration
- Enable Password and Enable Secret Password with the Encryption Techniques/Levels
- Line Console Password Implementation on CISCO 2600 Series Router
- What is Telnet? How to Telnet? + Line VTY/Telnet Password
- Usage of Router with different topology.

PRE-LAB READING ASSIGNMENT

Remember the delivered lecture carefully.

Table of Contents

Understanding of Ipv4 Address

- Ipv4 classes.
- Ipv4 classes range
- Ipv4 classes subnet mask
- Ipv4 host and network portion.
- Ipv4 network Address, valid Ip address, broadcast address.

Perform communication of three devices using switch.

1. Use the IP Address of Class C

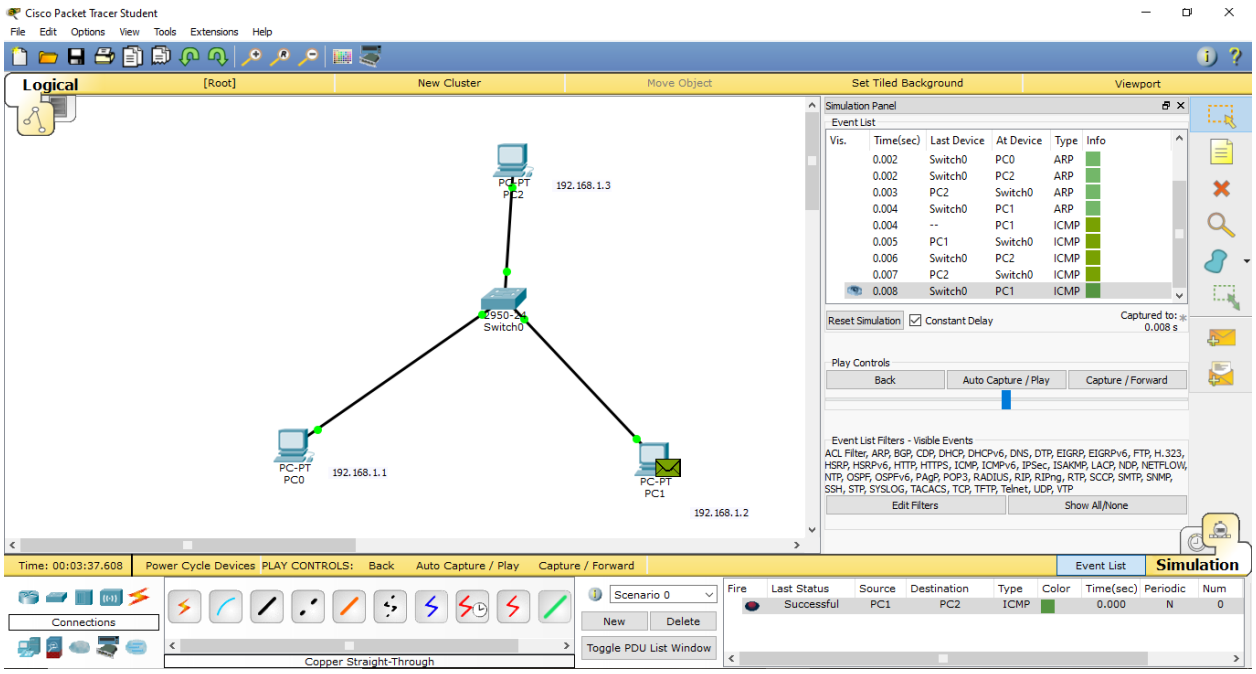


Figure 1 Communication using switch

Design these topologies and perform simulation in packet tracer.

- Assign IP Address of Class C
- Transfer packet betwene them.

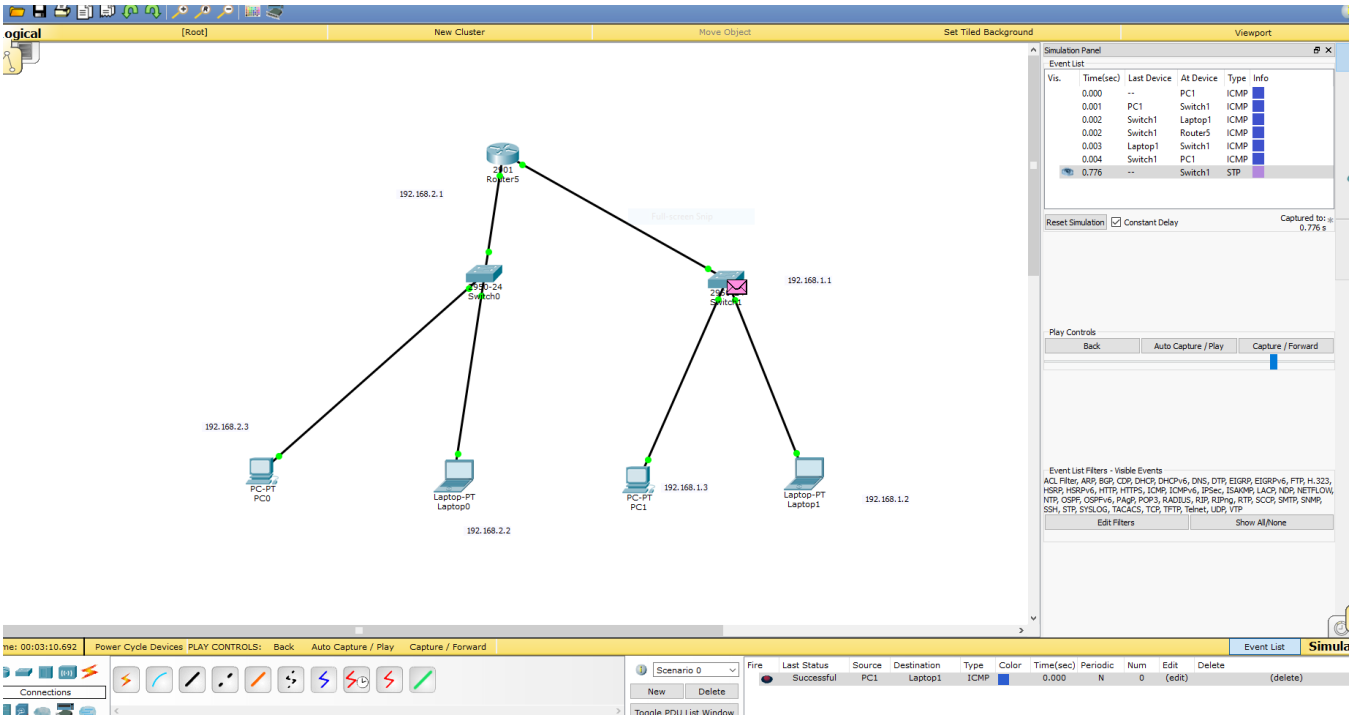


Figure 2 Communication using One Router

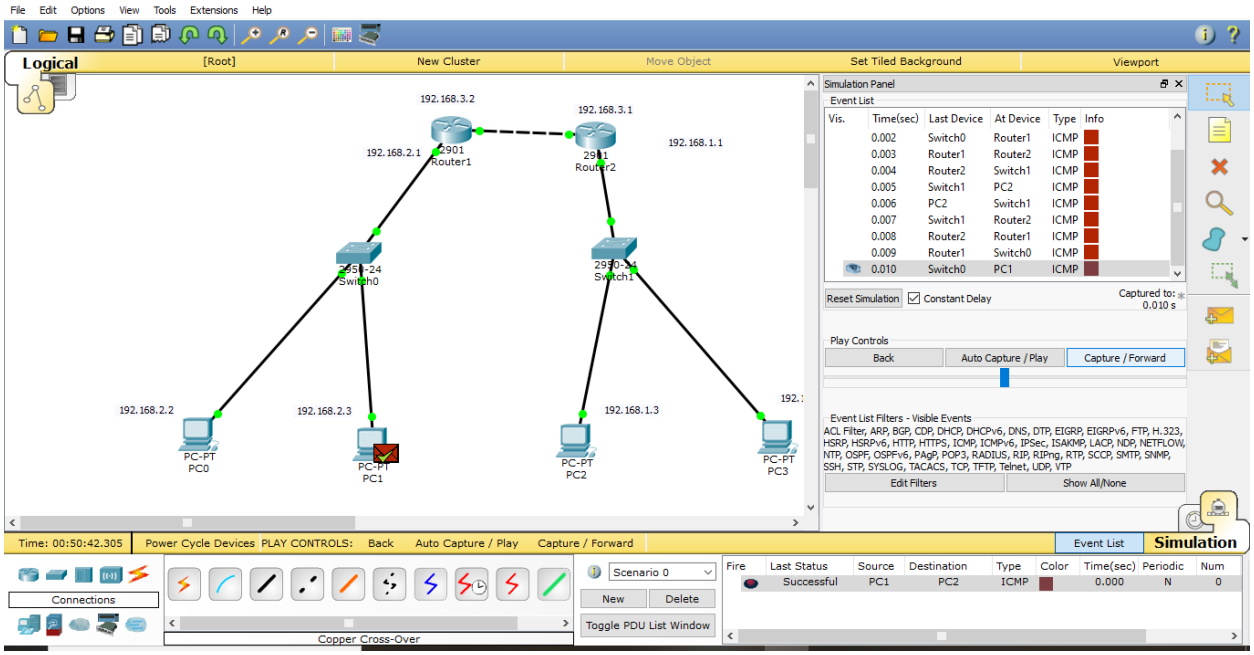


Figure 3 Communication using two Router

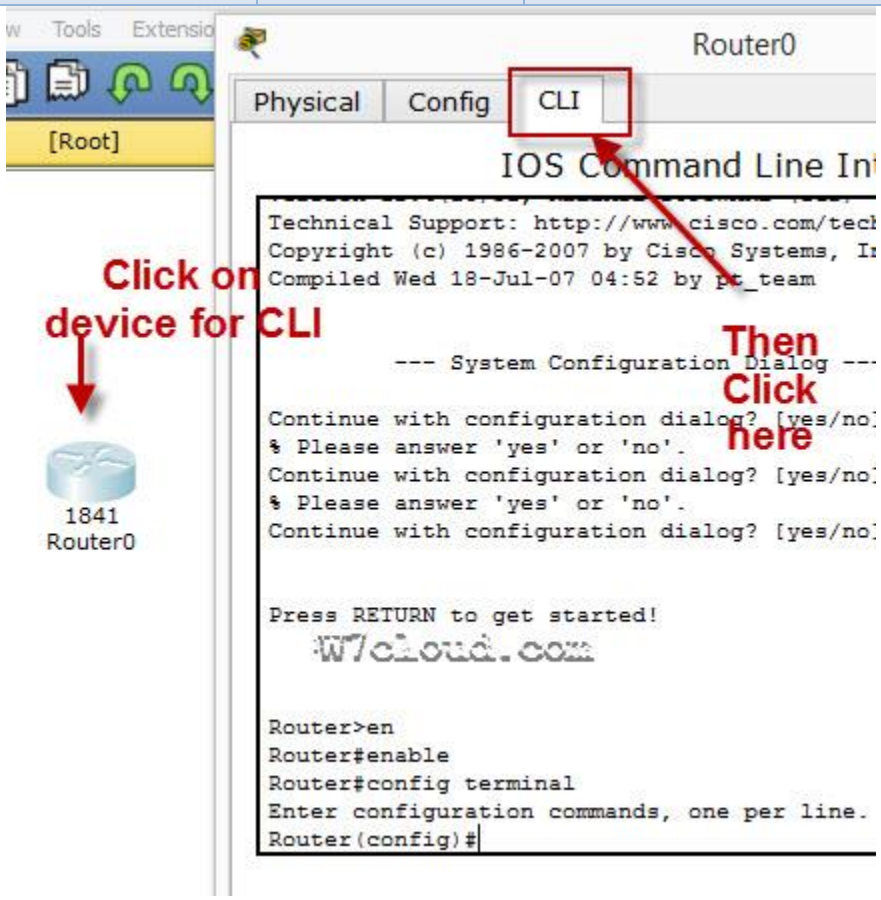
EXPERIMENTS WITH DETAILS

Router>	- User EXEC mode
Router#	- Privileged EXEC mode
Router(config)#	- Configuration mode (notice the # sign indicates this is accessible only at privileged EXEC mode)
Router(config-if)#	- Interface level within configuration mode
Router(config-router)#	- Routing engine level within configuration mode
Router(config-line)#	- Line level (vty, tty, async) within configuration mode

Cisco Router Configuration Step By Step

To configure any device in packet tracer you are required to open or access its CLI. You can do it by clicking any device and then navigating to CLI tab. Once you are at CLI you can perform all Cisco Commands here.

Mode	Symbol	How to access this mode	Command for leaving this mode
User EXEC Mode	Router >	Default mode after booting. Press enter for accessing this.	Use **exit** command
Privileged EXEC mode	Router #	Use **enable** command from user exec mode for entering into this mode	exit
Global Configuration mode	Router(config)#	Use **configure terminal** command from privileged exec mode	Exit or Ctrl+Z for user EXEC mode
Interface Configuration	Router(config-if)#	Use **interface <interface name+number>** command from global configuration mode	Use **exit** command to return in global mode



Cisco IOS supports numerous command modes which can be practice with packet tracer, followings are the main command modes of cisco CLI with specific commands to navigate from one mode to other.

IOS commands are not case sensitive it means that you can use them in uppercase, lowercase, or mixed case, but passwords are case sensitive. Therefore make sure you type it in correctly. In any mode, you can obtain a list of commands available on that mode by entering a question mark (?).

```
Braunch_office_router(config)#router ?
  bgp     Border Gateway Protocol (BGP)
  eigrp   Enhanced Interior Gateway Routing Protocol (EIGRP)
  ospf    Open Shortest Path First (OSPF)
  rip     Routing Information Protocol (RIP)
Braunch_office_router(config)#router
```

How to Change the Cisco Router name

You can change the cisco router name by using command **hostname** in global configuration mode.

```
Router(config)#hostname HR-Router
HR-Router(config)#
```

ROUTER MODES

Router> enable

Note: This command allows you to enter into Privileged exec mode/enable mode, where you can have more options for show and other commands. The next prompt looks like this:

Router#

Router#configure terminal

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

Note: This command allows you to enter into global configuration mode, where you can configure a range of commands. The prompt for this command looks like this:

Router(config)#

Router(config)# exit

Router#exit

Router>

CHANGING HOSTNAME

To specify or modify the host name for the router, global configuration command HOSTNAME is used. HOSTNAME is case sensitive. The host name is used in prompts and default configuration filenames. The factory-assigned default host name is router.

Router> enable

Router#configure terminal

Router(config)#hostname NP

Router(config)# exit

NP#

CONFIGURATION OF DATE & TIME

The system clock runs from the moment the system starts up and keeps track of the current date and the time based on coordinated Universal Time(UTC), also known as Greenwich Mean Time(GMT). The system clock can be set from a number of sources, and in turn can be used to distribute the current time through various mechanisms to other systems. To manually set the system clock, use one of the formats of the clock set Exec command.

NP#clock set ?

Hh:mm:ss current time

Note : Allow you to see the format of complete command.

NP#clock set 12:15:00 ?

<1-31> Day of the month

Month Month of the year

NP#clock set 12:15:00 17 ?

Month Month of the year

NP#clock set 12:15:00 17 March ?

<1993-2035> Year

NP#clock set 12:15:00 17 March 2021

Verification:

NP#show clock

12:16:56. 441 UTC Wed Mar 17 2021

SETTING A BANNER

When someone connects to the router, the MOTD (Message of the Day) banner appears before the login prompt.

NP>enable

NP#configure terminal

NP(config)#banner motd # welcome to Networks Professionals #

NP(config)#exit

NP#

Note: # is a delimiting character. It is used before the start and ending of a message. You can use any character.

Verification:

NP#exit

NP con0 is now available

Press return to get started

Welcome to Networks Professionals

NP>

DISPLAYING RUNNING-CONFIGURATION

```
NP#show running-config
Building configuration.
Current configuration : 599 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname NP
!


!
ip cef
no ipv6 cef
!
spanning-tree mode pvst
!
interface FastEthernet0/0
no ip address
duplex auto
speed auto
shutdown
```

```
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Vlan1
no ip address
shutdown
!
ip classless
!
ip flow-export version 9
!
!

banner motd ^C Welcome To Networks Professionals ^C
!
line con 0
!
line aux 0
!
line vty 0 4
```

login

!

!

end

LINE CONSOLE PASSWORD

The router has a number of ports that allow access to the router, on each of these ports you can specify passwords to provide a layer of security to the router. There is also the option of disabling login password checking to any of the ports by entering the command to get to the Router (config-line)# section of the port and entering the no login command.

The console port is on the back of the router and is used to directly connect a console to the router for configuring the router. This port should allow logins with passwords if the router is physically secured. The port should be disabled if it is not regularly used or the router is not secured. To specify a password on a line, use the password line configuration command. The first character cannot be a number. The string can contain any alphanumeric characters, including spaces, up to 80 characters. Console password is needed when logging into router at user EXEC mode from console.

NP>enable

NP#configure terminal

NP(config)#line console 0

NP(config-line)#password NP123

NP(config-line)#login

NP(config-line)#end

Verification:

NP#exit

NP con0 is now available

Press RETURN to get started

Welcome To Networks Professionals

User Access Verification

Password: NP123

NP>enable

LINE VTY / TELNET PASSWORD

virtual terminal lines (vty) are used to allow remote access to the router (by telnet through its interfaces). The router has variable virtual terminal lines depending upon the model of router.

Telnet is a network protocol used **to virtually access a computer** and to provide a two-way, collaborative and text-based communication channel between two machines. It follows a user command Transmission Control Protocol/Internet Protocol (TCP/IP) networking protocol for creating remote sessions.

Telnet is a text-based program that lets you access the console on a router or other device and issue commands. You can Telnet into a router **using the Telnet client included with Windows**. ... Unlike other protocols, Telnet isn't secure and shouldn't be used over the Internet

For example, **typing telnet hostname would connect a user to a hostname named hostname**. Telnet enables a user to manage an account or device remotely. For example, a user may telnet into a computer that hosts their website to manage his or her files remotely. ... As shown, a telnet session is a command line interface.

The term “vty” stands for **Virtual teletype**. VTY is a virtual port and used to get Telnet or SSH access to the device. VTY is solely used for inbound connections to the device. ... The abstract “0 – 4” means that the device can allow 5 simultaneous virtual connections which may be Telnet or SSH.

router(config-line)#exit. The virtual terminal or “VTY” lines are virtual lines that **allow connecting to the device using telnet** or Secure Shell (SSH). Cisco devices can have up to 16 VTY lines.
The VTY lines are the Virtual Terminal lines of the router, used **solely to control inbound**

Telnet connections. They are virtual, in the sense that they are a function of software - there is no hardware associated with them.

The term “vty” stands for Virtual teletype. VTY is a virtual port and used to get Telnet or SSH access to the device. The abstract “0 – 4” means that **the device can allow 5 simultaneous virtual connections which may be Telnet or SSH**

The Line Configuration Mode is **used to manage the terminal line characteristics for output formatting**.

NP# configure terminal

NP(config)# line vty 0 4

NP(config-line) # password NP456

NP(config-line)# login

NP(config-line)# exit

NP(config)# exit

NP#

AUXILIARY LINE PASSWORD

The auxiliary port is on the back of the router and is commonly used to connect a modem to. It is used to allow a remote user access to the configuration of the router. If a modem is connected to the port, it should definitely have a password specified for it.

Modem is short for "**Modulator-Demodulator**." It is a hardware component that allows a computer or another device, such as a router or switch, to connect to the Internet. It converts or "modulates" an analog signal from a telephone or cable wire to digital data (1s and 0s) that a computer can recognize.

A modem **modulates and demodulates electrical signals sent through phone lines, coaxial cables**, or other types of wiring; in other words, it transforms digital information from your computer into analog signals that can transmit over wires, and it can translate incoming analog signals back into digital data.

NP #configure terminal

NP(config)# line aux 0

NP(config-line)# password NP@786

NP(config-line)# exit

NP(config-line)#login

NP(config)# exit

NP#

PASSWORD FOR PRIVILEGED MODE

To set a local password to control access to various privilege levels, use the enable password global configuration command. An enable password is defined as follows:

It must contain uppercase and lowercase alphanumeric characters from 1 to 25. Must not have a number as the first character.

Can have leading spaces, but they are ignored. However, intermediate and trailing spaces are recognized.

NP# configure terminal

NP(config)# enable password NP222

NP(config)# exit

NP#

Verification:

NP con0 is now available

Press RETURN to get started.

Welcome To Networks Professionals

NP>

NP>enable

Password:NP222

NP#

```
NP#SHOW RUNNing-config
Building configuration...

Current configuration : 623 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname NP
!
!
!
enable password NP222
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
```

SECRET (ENCRYPTED) PASSWORD FOR PRIVILEGED MODE

The enable secret password is the password in encrypted form and is used to gain access to enable mode and to the global configuration mode on the router. The enable password is used when you do not specify an enable secret password. The enable password should be different from the enable secret password.

NP#configure terminal

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

NP(config)#enable ?

password Assign the privileged level password

secret Assign the privileged level secret

NP(config)#enable secret NP333

NP(config)#exit

NP#

REMOVING LINE CONSOLE PASSWORD

NP>enable

NP#configure terminal

NP(config)#line console 0

NP(config-line)#no login

NP(config-line)#no password

NP(config-line)#end

NP#

REMOVING LINE VTY / TELNET PASSWORD

NP>enable

NP#configure terminal

NP(config)#line vty 0 4

NP(config-line)#no login

NP(config-line)#no password

NP(config-line)#end

NP#

REMOVING AUXILIARY LINE PASSWORD

NP>enable

NP#configure terminal

NP(config)#line aux 0

NP(config-line)#no login

NP(config-line)#no password

NP(config-line)#exit

NP(config)#exit

NP#

REMOVING PASSWORD FOR PRIVILEGED EXEC MODE

NP>enable

NP# configure terminal

NP(config)#no enable password

NP(config)# exit

NP#

REMOVING SECRET PASSWORD

NP>enable

NP# configure terminal

NP(config)#no enable secret

NP(config)# exit

NP#

How to set the IP address to Cisco interface:

You can set the IP address to any Cisco device interface by using the following commands:

Router(config)#interface <interface name&number>
Router(config-if)#ip address <IP address> <subnet mask>

How to enable a port or interface
Router(config-if)#no shut
Example:

```
Router(config)#interface fastEthernet 4/0
Router(config-if)#ip address 192.168.77.88 255.255.255.0
Router(config-if)#no shut
```

How to check the IP address of all interfaces:

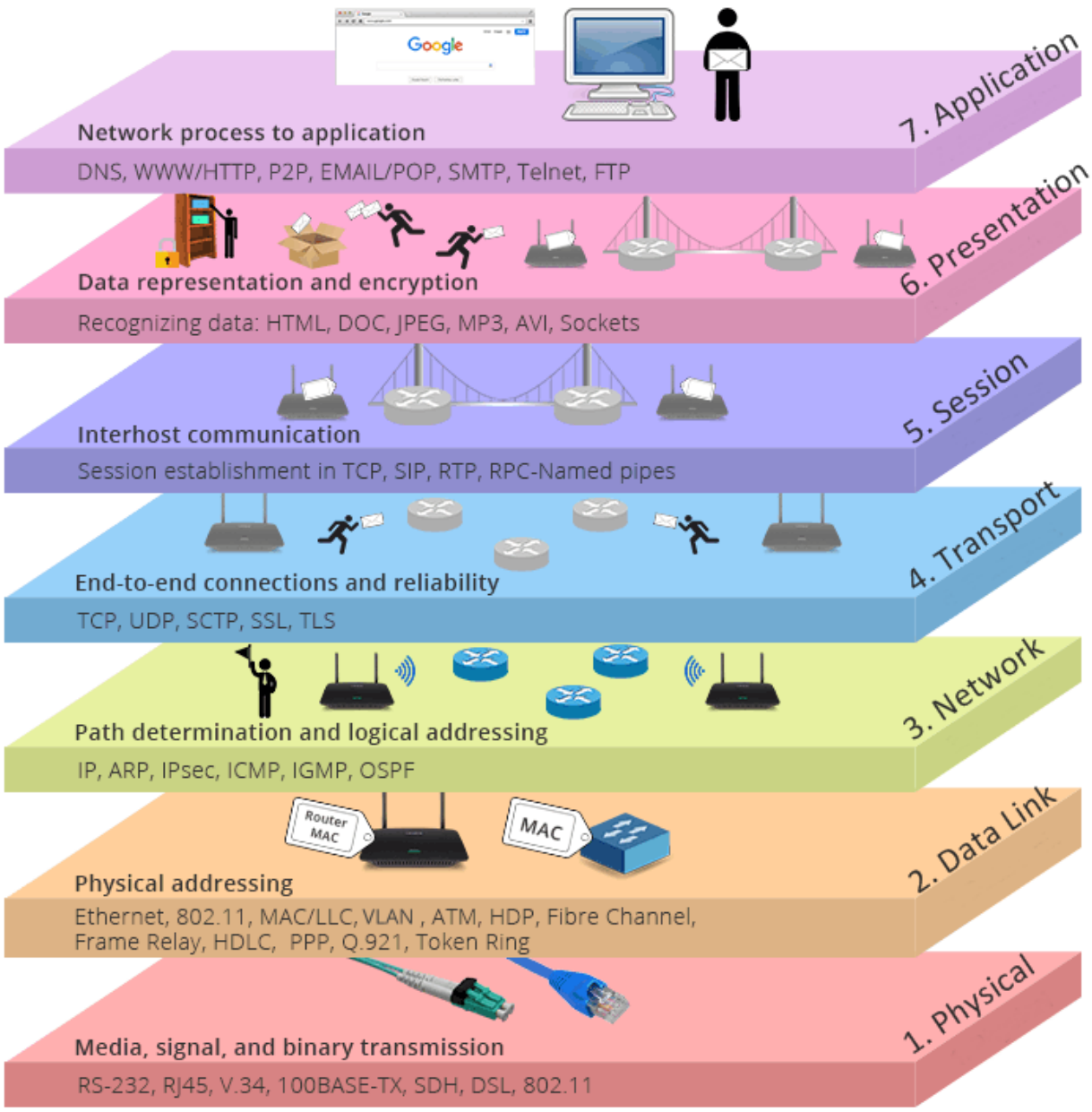
You can use the "**show ip interface brief**" command in Privileged EXEC mode for checking the IP address of all interface of Cisco device.

```
Router#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol

FastEthernet0/0        unassigned      YES NVRAM  administratively down down

FastEthernet1/0        unassigned      YES NVRAM  administratively down down

Serial2/0              unassigned      YES NVRAM  administratively down down

Serial3/0              unassigned      YES NVRAM  administratively down down

FastEthernet4/0        192.168.77.88   YES manual down                  down
```

STUDENT TASK-01

Students should make the physical scenario exactly given in the lab objectives. Implement the connectivity between router and computer and then manipulating with the different modes of the CISCO IOS. Students shall implement the security techniques used to secure the routers. Submit a final report after doing the mentioned task physically.


Google
Network process to application
7. Application
Data representation and encryption
6. Presentation
Interhost communication
5. Session
End-to-end connections and reliability
4. Transport
Path determination and logical addressing
3. Network
Physical addressing
2. Data link
Media, signal and binary transmission
1. Physical
01011001
MAC
router MAC


Google
7. Application
Network process to application
DNS, WWW/HTTP, P2P, EMAIL/POP, SMTP, Telnet, FTP
6. Presentation
Data representation and encryption
Recognizing data: HTML, DOC, JPEG, MP3, AVI, Sockets
5. Session
Interhost communication
Session establishment in TCP, SIP, RTP, RPC-Named pipes
4. Transport
End-to-end connections and reliability
TCP, UDP, SCTP, SSL, TLS
3. Network
Path determination and logical addressing
IP, ARP, IPsec, ICMP, IGMP, OSPF
Router MAC
MAC
2. Data Link
Physical addressing
Ethernet, 802.11, MAC/LLC, VLAN , ATM, HDP, Fibre Channel,
Frame Relay, HDLC, PPP, Q.921, Token Ring
1. Physical
Media, signal, and binary transmission
RS-232, RJ45, V.34, 100BASE-TX, SDH, DSL, 802.11