PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE

ACADEMIC YEAR: 2022-23

DEPARTMENT of COMPUTER ENGINEERING DEPARTMENT

CLASS: T.E. **SEMESTER: I**

SUBJECT: CNSL

ASSINGMENT NO.	C4
TITLE	Study and Analyze the performance of HTTP, HTTPS and FTP protocol using Packet tracer tool.
PROBLEM STATEMENT /DEFINITION	Setup a WAN which contains wired as well as wireless LAN by using packet tracer tool. Demonstrate HTTP, HTTPS and FTP Protocol
OBJECTIVE	To develop and understand various application protocols, modern technologies and applications
OUTCOME	Analyze the performance of HTTP, HTTPS and FTP protocol using Packet tracer tool.
S/W PACKAGES AND HARDWARE APPARATUS USED	Open Source Operating System, Packet Tracer, Core I3/I5/I7 with 4GB RAM system, Wired Wireless AP/Router, Wireless Adapter
REFERENCES	1. http://vlabs.iitb.ac.in/vlab/ 2. https://www.netacad.com/courses/packet-tracer 3. https://www.netacad.com/courses/networking
STEPS	1. Install packet tracer 2. Make LAN/WAN as discussed in earlier Assignments using packet tracer 3. Add HTTP, HTTPS and FTP servers in the above network 4. Add content(files, webpage) on each of the server. 5. Assign IP addresses to each host in the network (static of dynamic) 6. Enable HTTP HTTPS and DNS services for web server 7. Perform ping to check server is reachable from hosts or not 8. If server is reachable, open the web browser application(HTTP and HTTPS)/Terminal(FTP) from client machine and enter URL. 9. Take screenshots 10. Repeat the same for each of the protocols.
INSTRUCTIONS FOR WRITING JOURNAL	1. Date 2. Assignment no. 3. Problem definition 4. Learning objective 5. Learning Outcome 6. Concepts related Theory 7. Algorithm 8. Test cases 10. Conclusion/Analysis

Prerequisites: Setup a WAN which contains wired as well as wireless LAN by using packet tracer tools, Open Source Operating System, Packet Tracer, Wireshark, Core I3/I5/I7 with 4GB RAM system, Wired Wireless AP/Router, Wireless Adapter

Concepts related Theory:

Application protocol: Application Layer provides App to App connectivity. There are several protocols which work for users in Application Layer. Application layer protocols can be broadly divided into two categories:

- Protocols which are used by users.For email for example, Email, HTTP, HTTPS.
- Protocols which help and support protocols used by users.For example DNS.

In this assignment we will learn about HTTP, HTTPS And FTP protocol and understand its performance using packet tracer tool.

HTTP (Hypertext Transfer Protocol**):**

The Hypertext Transfer Protocol HTTP is an application-level protocol for distributed, collaborative, hypermedia information systems. This is the foundation for data communication for the World Wide Web ie. internet since 1990. HTTP is a generic and stateless protocol which can be used for other purposes as well using extension of its request methods, error codes and headers. Basically, HTTP is an TCP/IP based communication protocol, which is used to deliver data HTMLfiles, image files, query results etc on the World Wide Web. The default port is TCP 80, but other ports can be used. It provides a standardized way for computers to communicate with each other. HTTP specification specifies how clients request data will be constructed and sent to the serve, and how servers respond to these requests. Before explaining HTTP in detail, we should review some Web terminology

A **Web page** (also called a document) consists of objects. An object is simply a file—such as an HTML file, a JPEG image, a Java applet, or a video clip—that is addressable by a single URL. Most Web pages consist of a base HTML file and several referenced objects. For example, if a Web page contains HTML text and five JPEG images, then the Web page has six objects: the base HTML file plus the five images. The base HTML file references the other objects in the page with the objects' URLs. Each URL has two components: the hostname of the server that houses the object and the object's path name. **Web browsers** (such as Internet Explorer and Firefox) implement the client side of HTTP

Web servers, which implement the server side of HTTP, house Web objects, each addressable by a URL. Popular Web servers include Apache and Microsoft Internet Information Server.

Basic features of HTTP:

1. HTTP is connectionless
2. HTTP is media independent
3. HTTP is stateless

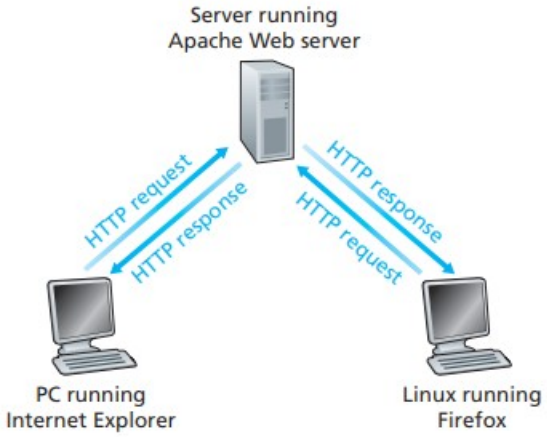
The HTTP protocol is a request/response protocol based on client/server based architecture where web browser, robots and search engines, etc. act like HTTP clients and Web server acts as server.

Client : The HTTP client sends a request to the server in the form of a request method, URI, and protocol

version, followed by a MIME-like message containing request modifiers, client information, and possible body content over a TCP/IP connection.

Server: The HTTP server responds with a status line, including the message's protocol version and a success or error code, followed by a MIME-like message containing server information, entity metainformation, and possible entity-body content.

HTTP defines how Web clients request Web pages from Web servers and how servers transfer Web pages to clients. When a user requests a Web page (for example, clicks on a hyperlink), the browser sends HTTP request messages for the objects in the page to the server. The server receives the requests and responds with HTTP response messages that contain the objects. HTTP uses TCP as its underlying transport protocol (rather than running on top of UDP). The HTTP client first initiates a TCP connection with the server. Once the connection is established, the browser and the server processes access TCP through their socket interfaces.



HTTP request-response behavior

While setting up HTTP/HTTPS server it would also require to set DNS for the URL. The Domain Name System (DNS) is the phonebook of the Internet. Humans access information online through domain names, like ‘nytimes.com’ or ‘espn.com’. Web browsers interact through Internet Protocol (IP) addresses. DNS translates domain names to IP addresses so browsers can load Internet resources.

HTTPS (Hypertext Transfer Protocol Secure**)**:

HTTPS is an abbreviation of Hypertext Transfer Protocol Secure. It is a secure extension or version of HTTP This protocol is mainly used for providing security to the data sent between a website and the web browser. It is widely used on the internet and used for secure communications. This protocol uses the 443 port number for communicating the data. This protocol is also called HTTP over SSL because the HTTPS communication protocols are encrypted using the SSL (Secure Socket Layer). By default, it is supported by various web browsers. Those websites which need login credentials should use the HTTPS

protocol for sending the data. It allows users to create a secured encrypted connection and helps them to protect their information from being stolen.

Secure Socket Layer (SSL) provides security to the data that is transferred between web browser and server. SSL encrypts the link between a web server and a browser which ensures that all data passed between them remain private and free from attack.

FTP(File Transfer Protocol):

FTP represents File transfer protocol and it is a standard internet protocol supported by TCP/IP used for transmitting the files from one host to another. FTP needs TCP as a transport protocol to help the reliable end to end connections and executes two types of connections in managing data transfers.

The FTP clients initiate the first connection, referred to as the control connection, to well-known port 21 (the clients port is typically ephemeral). It is on this part that an FTP server listens for it and accepts new connections. The control connection is issued for all of the control commands a client user uses to log on to the server, manipulate files, and terminate a session. This is also the relationship across which the FTP server will transmit messages to the client in response to their control commands.

The second connection used by FTP is defined as the data connection. Typically, the data connection is established on the server port 20. It depends on how the data connection is established; both the client and server can use ephemeral ports. It is across the connection that FTP shares the information.

FTP opens a data connection when a user concerns a command requiring a data transfer, including a request to retrieve a file or to view a list of the files available. Therefore, an entire FTP session can open and close without a data connection ever having been opened.

In other words, when a client starts an FTP session, the control connections open while the control connection is open, and the data connection can be opened and closed multiple times if several files are transferred.

Connecting to a remote host

To implement a file transfer, the user begins by logging into the remote host. Four commands are used.

- **Open** selects the remote host and sets up the login session.
- **User** recognizes the remote user ID.
- **Pass** authenticates the client.
- **Site** sends data to the foreign host that is used to provide services specific to that host.

Navigating the directory structure

After a client has been authenticated and logged on to the server, that client can navigate through the remote host's directory structure to locate the file desired for retrieval or locate the directory into which will transfer a local file.

The subcommands that execute these services are as follows:

- **cd** Changes the directory on the private host. A pathname can be determined but must conform to the directory structure of the remote host.
- **Icd** Change the directory on the localhost. It is equal to the cd command. A pathname can be determined but must conform to the directory structure of the localhost.
- **Is** Lists the contents of the remote directory
- **dir** Lists the contents of the private directory. It is similar to the ls command; the list generated by dir is treated as data and requires a data connection.

Controlling how the data is transferred

Transferring data between dissimilar systems often involves the transformation of the data as part of the transfer process. The three aspects of transfer can be the mode of the bits, representation of the data and file structure. Modes of data transfer can be block mode (B) and byte stream mode (S). Representation of data can be ASCII based or EBCDIC based.

A file structure can be a continuous sequence of a data byte, sequential record, or file made up of pages.

Transferring Files

It can use the following commands to copy files between FTP clients and servers.

- **get** Copies of a file from the remote host to the localhost.
- **mget** Copies various files from the remote to the localhost.
- **put** Copies of a file from the localhost to the remote host.
- **mput** Copies multiple files from the localhost to the remote host.

Terminating the FTP session

It can use the following commands to end an FTP session

- **quit** − It can disconnect from the remote host and removes FTP. Some implementations use the BYE subcommand.
- **Close** − It can disconnect from the remote host but leaves the FTP client running.

CISCO Packet Tracer:

Cisco Packet Tracer is Cisco's simulation software. It can be used to create complicated network typologies, as well as to test and simulate abstract networking concepts. It acts as a playground for you to explore networking and the experience is very close to what you see in computer networks.

Packet Tracer enables to create complicated and huge networks, which is frequently impossible with physical hardware due to cost considerations. Packet Tracer is available for Linux, Windows, MacOS, Android, and iOS.

Packet Tracer allows users to drag and drop routers, switches, and other network devices to create simulated network topologies. This programme cannot replace hardware routers or switches because the protocols are implemented solely in software. This tool, however, does not just contain Cisco hardware but also a wide range of other networking devices.

Key Features:

- Unlimited devices
- E-learning
- Customize single/multi user activities
- Interactive Environment
- Visualizing Networks
- Real-time mode and Simulation mode
- Self-paced
- Supports majority of networking protocols
- International language support
- Cross platform compatibility

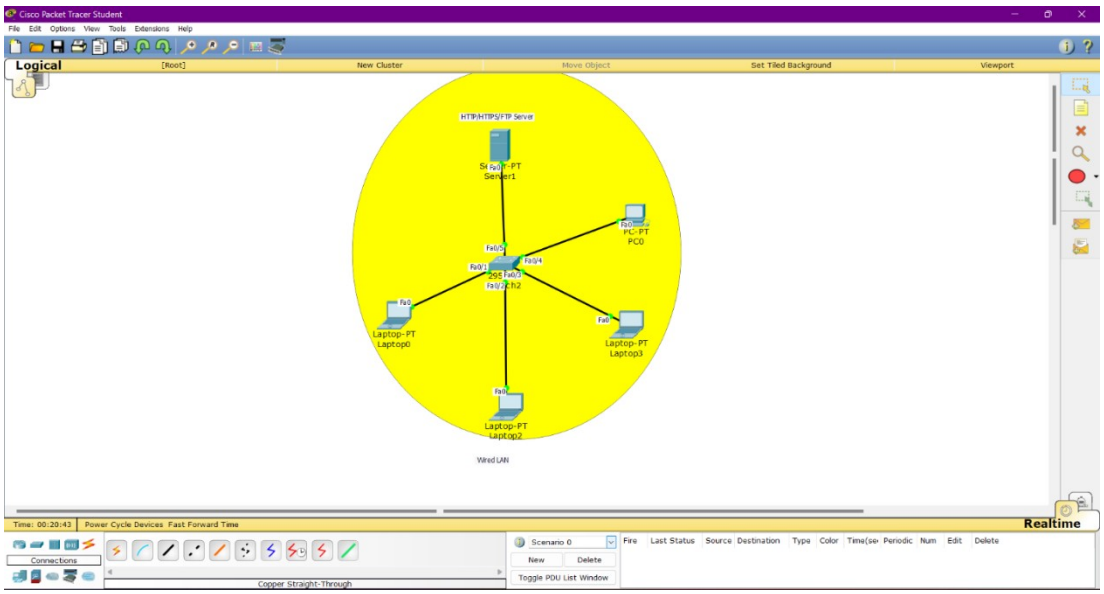
Algorithm:

1. Install packet tracer
2. Make LAN/WAN as discussed in earlier Assignments using packet tracer
3. Add HTTP, HTTPS and FTP servers in the above network
4. Add content(files, webpage) on each of the server.
5. Assign IP addresses to each host in the network (static of dynamic)
6. Enable HTTP HTTPS and DNS services for web server
7. Perform ping to check server is reachable from hosts or not
8. If server is reachable, open the web browser application(HTTP and HTTPS)/Terminal(FTP) from client machine and enter URL.
9. Take screenshots
10. Repeat the same for each of the protocols.

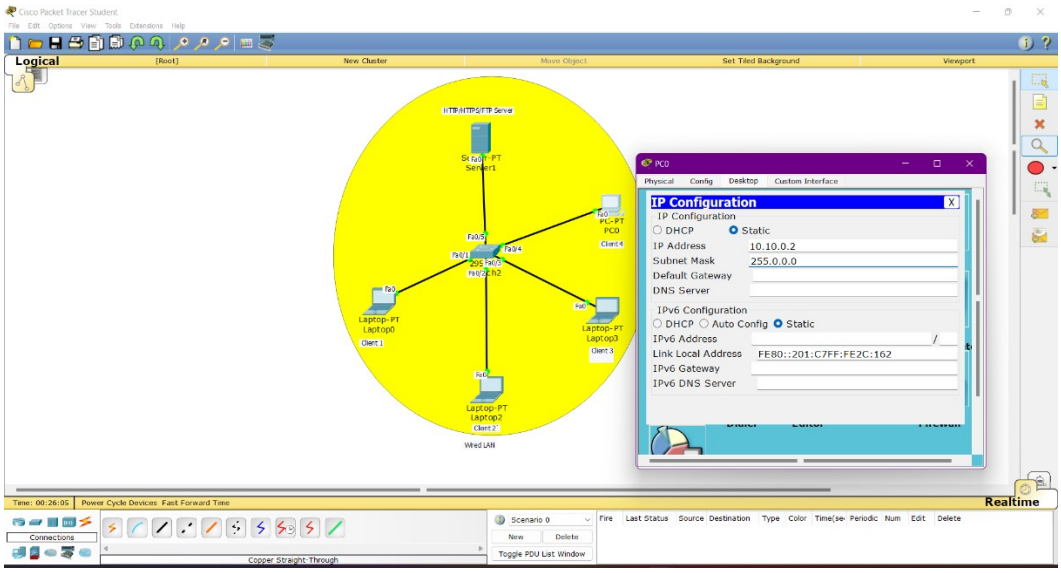
Implementation of (HTTP,HTTPS & FTP)Topology

Step 1:

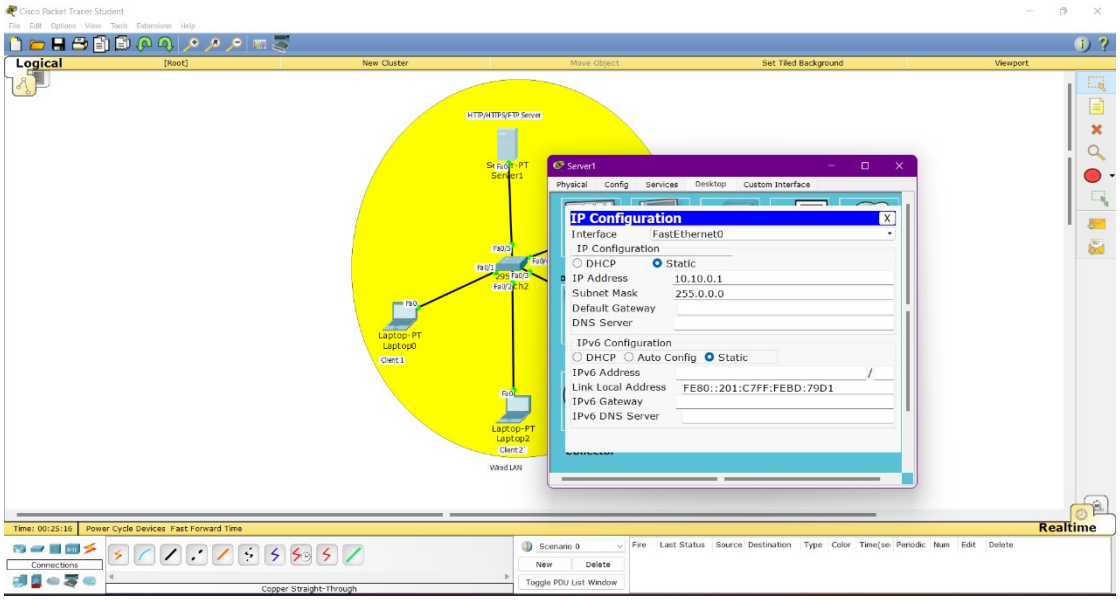
Setup Lan (Wired/ wireless) by connecting five devices (1 server and 4 laptops) and connect trough switch



Step 2:
configure all devices by assigning IP addresses (Static / DHCP)

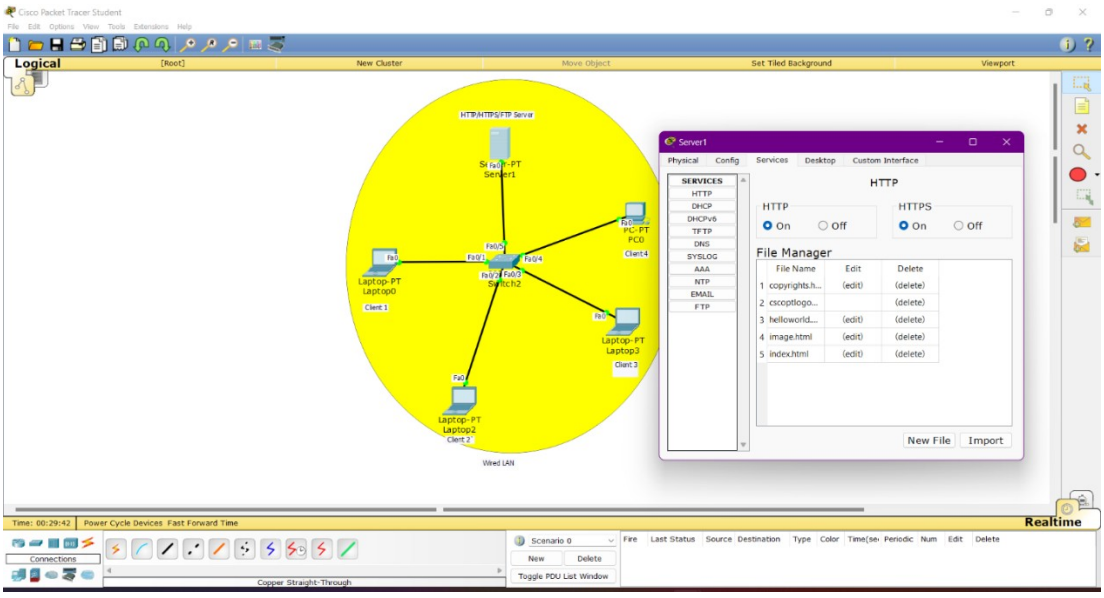


Server IP Configuration- 10.10.0.1

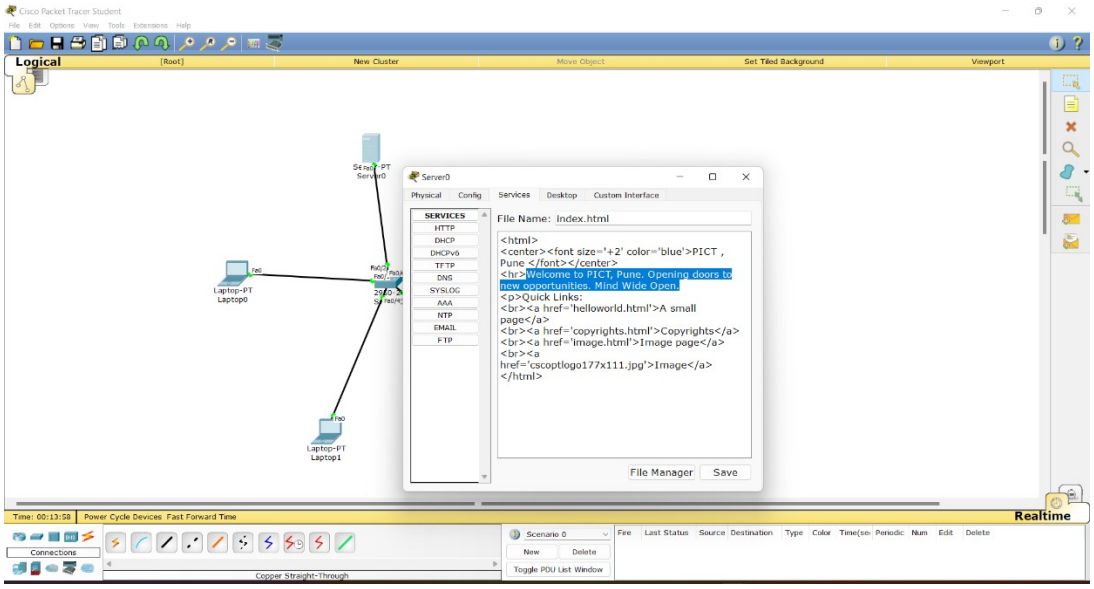


Step 3:

- **Click on Sever machine and open Services tab**
- **Configure HTTP and HTTPS by click on “On” button**
- **Click on index.html (edit)**

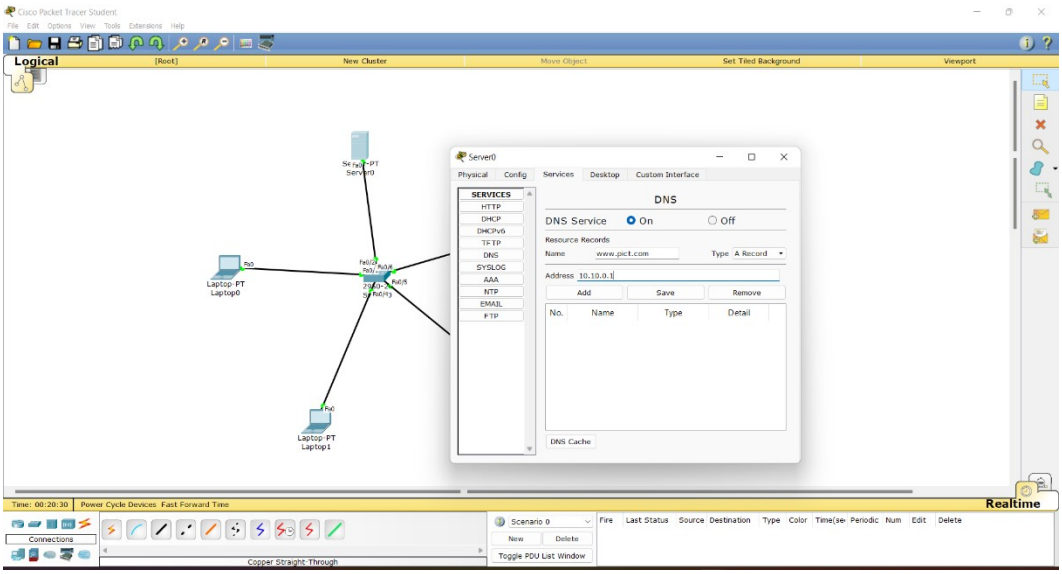


Step 4: Edit index.html file and save

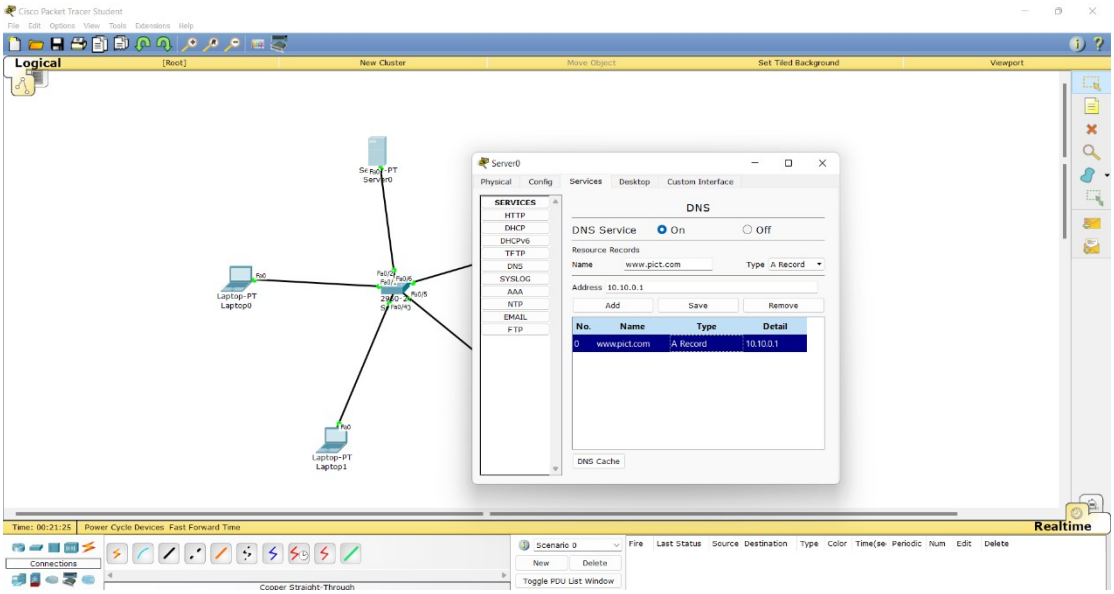


Step 5: For accessing HTTP server setup DNS server

- **Click on Services tab and select DNS**
- **Click on "on" button enter DNS name www.pict.com**
- **Enter the address "10.10.10.1" i.e sever address and click on "Add" button**

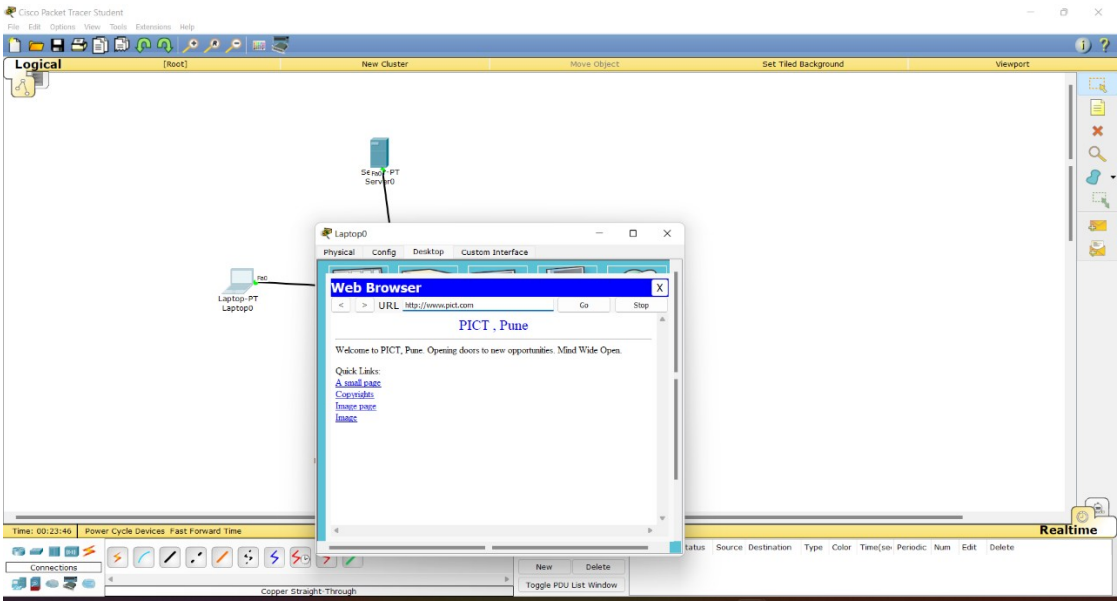


Step 6: The DNS record added to the list



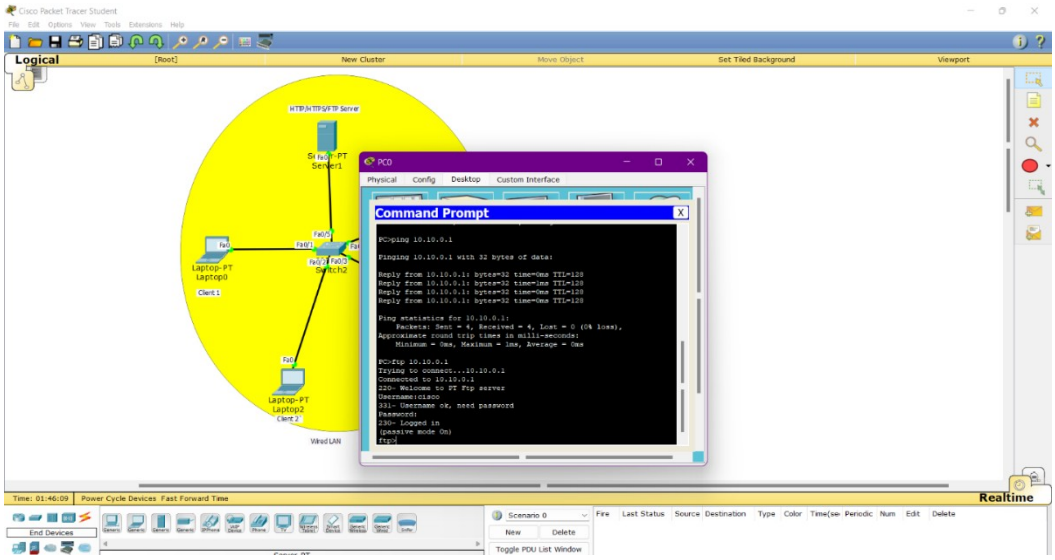
Step 7: Open Web Browser on Client Machine

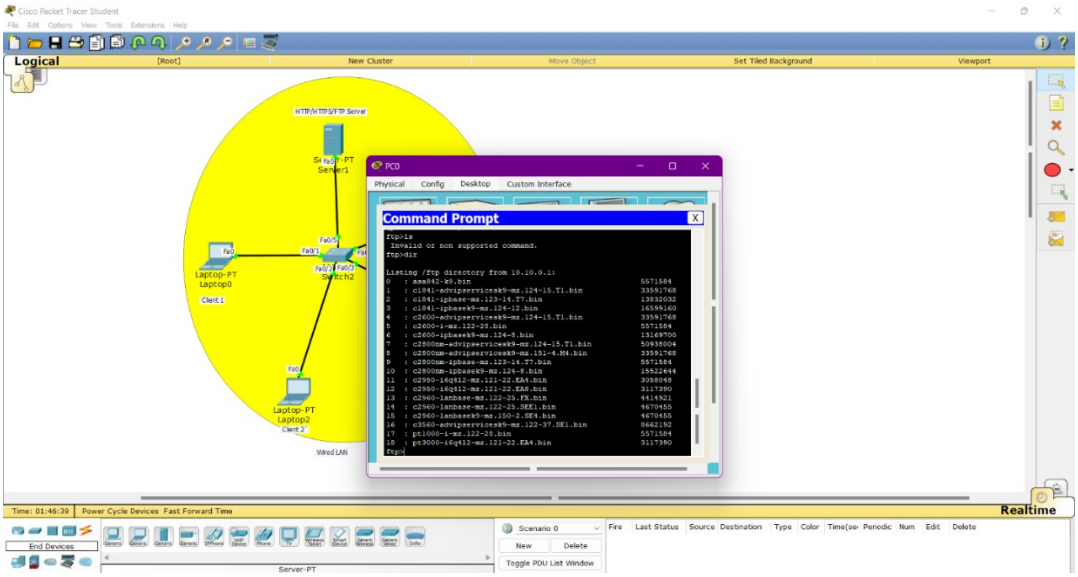
- **Type URL "www.pict.com" and enter**



FTP server

Step 1: Ping Server from Client and Initiate FTP connection and Perform FTP operations


Cisco Packet Tracer Student
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
HTTP/HTTP/S/FTP Server
Server1
PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
PC>ping 10.10.0.1
Pinging 10.10.0.1 with 32 bytes of data:
Reply from 10.10.0.1: bytes=32 time=0ms TTL=128
Reply from 10.10.0.1: bytes=32 time=1ms TTL=128
Reply from 10.10.0.1: bytes=32 time=0ms TTL=128
Reply from 10.10.0.1: bytes=32 time=0ms TTL=128
Ping statistics for 10.10.0.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
PC>ftp 10.10.0.1
Trying to connect...10.10.0.1
Connected to 10.10.0.1
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>
Laptop-PT
Laptop0
Client 1
Laptop-PT
Laptop2
Client 2
Switch2
Wired LAN
Time: 01:46:09
Power Cycle Devices
Fast Forward Time
Realtime
End Devices
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(se
Periodic
Num
Edit
Delete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New Cluster
Move Object
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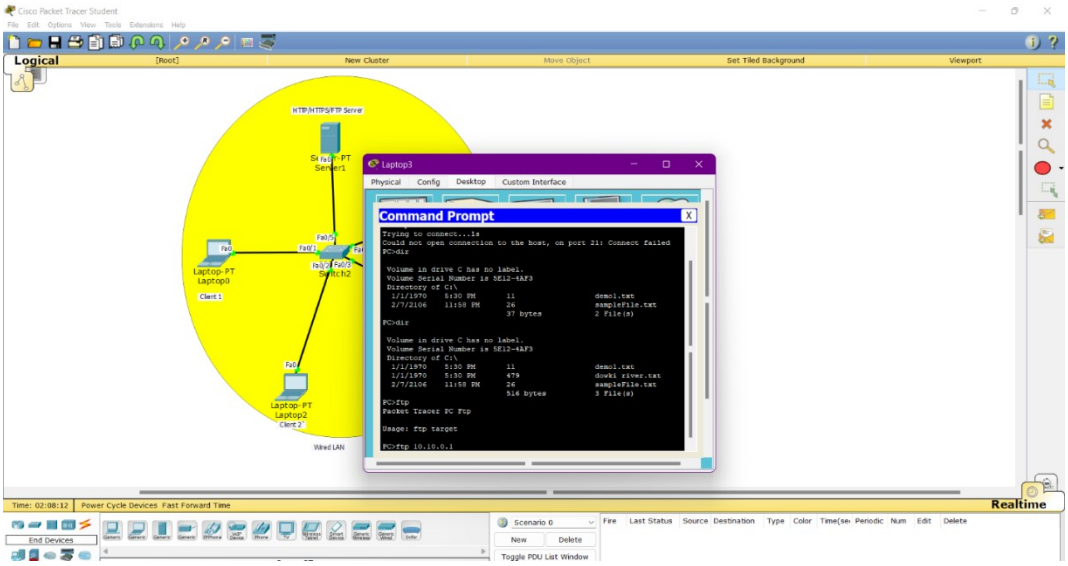
Viewport
HTTP/HTTP/S/FTP Server
Server1
PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
ftp>ls
Invalid or non supported command.
ftp>dir
Listing /ftp directory from 10.10.0.1:
0 : asa842-k8.bin 5571584
1 : c1841-advipservicesk9-mz.124-15.T1.bin 33591768
2 : c1841-ipbase-mz.123-14.T7.bin 13832032
3 : c1841-ipbasek9-mz.124-12.bin 16599160
4 : c2600-advipservicesk9-mz.124-15.T1.bin 33591768
5 : c2600-i-mz.122-28.bin 5571584
6 : c2600-ipbasek9-mz.124-8.bin 13169700
7 : c2800nm-advipservicesk9-mz.124-15.T1.bin 50938004
8 : c2800nm-advipservicesk9-mz.151-4.M4.bin 33591768
9 : c2800nm-ipbase-mz.123-14.T7.bin 5571584
10 : c2800nm-ipbasek9-mz.124-8.bin 15522644
11 : c2950-i6q412-mz.121-22.EA4.bin 3058048
12 : c2950-i6q412-mz.121-22.EA8.bin 3117390
13 : c2960-lanbase-mz.122-25.FX.bin 4414921
14 : c2960-lanbase-mz.122-25.SEE1.bin 4670455
15 : c2960-lanbasek9-mz.150-2.SE4.bin 4670455
16 : c3560-advipservicesk9-mz.122-37.SE1.bin 8662192
17 : pt1000-i-mz.122-28.bin 5571584
18 : pt3000-i6q412-mz.121-22.EA4.bin 5117390
ftp>
Laptop-PT
Laptop0
Client 1
Laptop-PT
Laptop2
Client 2
Switch2
Wired LAN
Time: 01:46:39
Power Cycle Devices
Fast Forward Time
Realtime
End Devices
Server-PT
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(se
Periodic
Num
Edit
Delete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Laptop0
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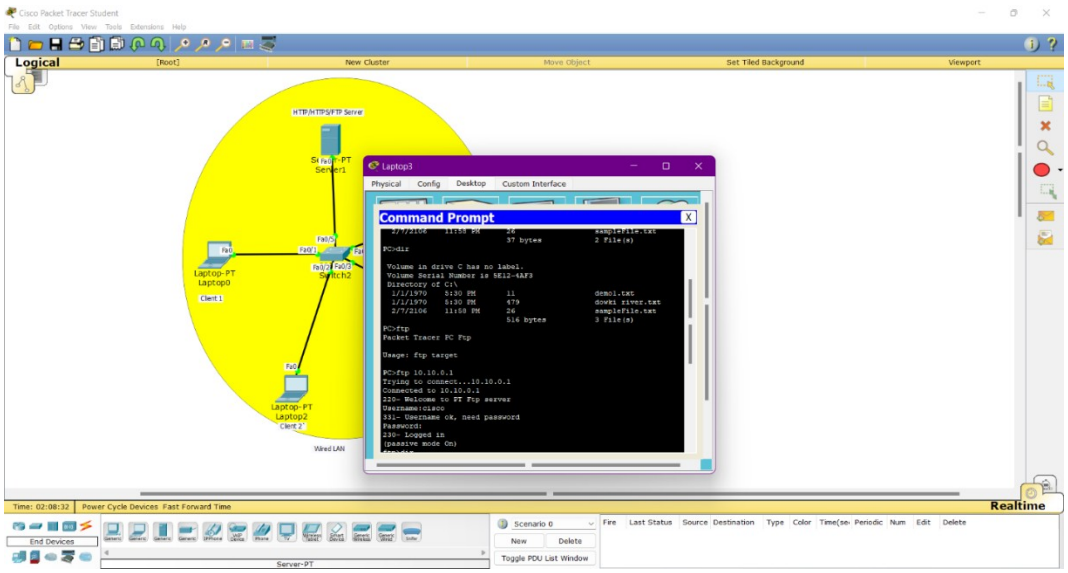
Switch2
Laptop-PT
Laptop2
Client 2
Wired LAN
Laptop3
Physical
Config
Desktop
Custom Interface
Command Prompt
Trying to connect...is
Could not open connection to the host, on port 21: Connect failed
PC>dir
Volume in drive C has no label.
Volume Serial Number is 5E12-4AF3
Directory of C:\
1/1/1970 5:30 PM 11 demo1.txt
1/1/1970 5:30 PM 479 dowki river.txt
2/7/2106 11:58 PM 26 sampleFile.txt
3 File(s) 516 bytes
PC>ftp
Packet Tracer PC Ftp
Usage: ftp target
PC>ftp 10.10.0.1
Time: 02:08:12
Power Cycle Devices Fast Forward Time
Realtime
End Devices
Scenario 0
New
Delete
Toggle PDU List Window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Packet Tracer PC Ftp
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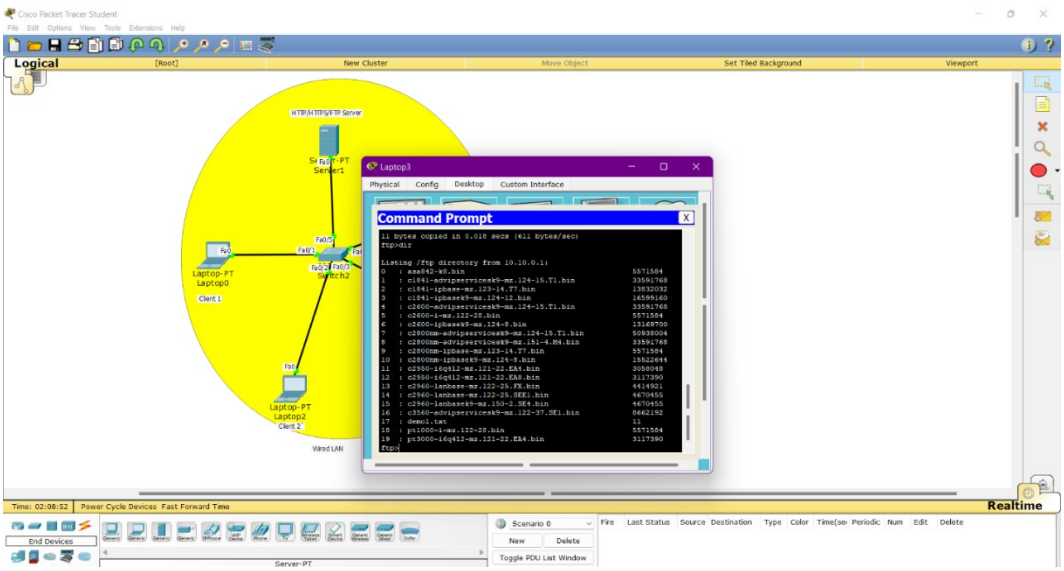
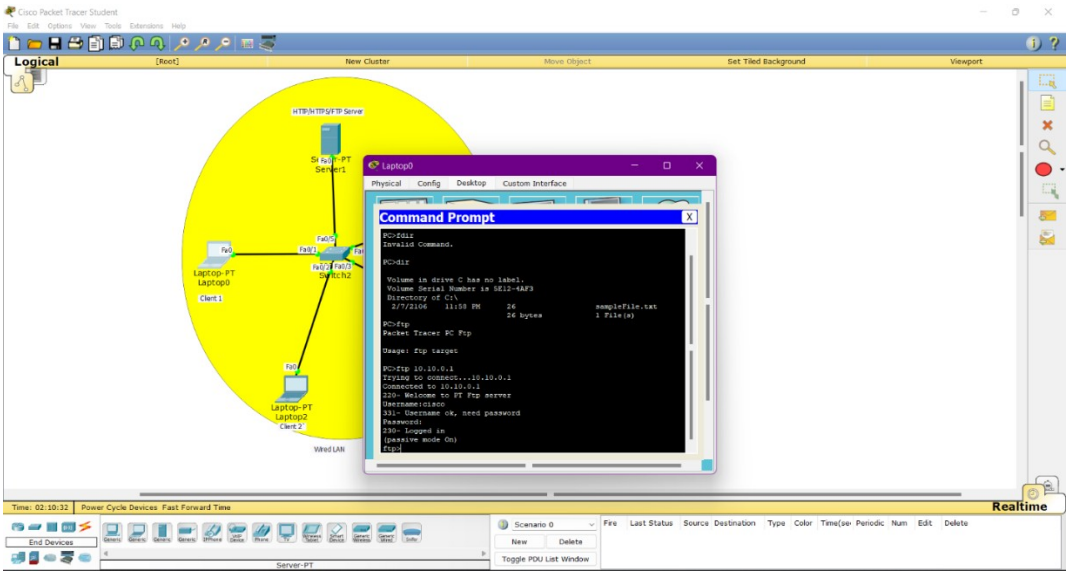
Trying to connect...10.10.0.1
Connected to 10.10.0.1
220- Welcome to PT Ftp server
Username:cisco
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
Time: 02:08:32
Power Cycle Devices Fast Forward Time
Realtime
End Devices
Server-PT
Scenario 0
New
Delete
Toggle PDU List Window





Conclusion:

This assignment enables to understand the working and performance of HTTP, HTTPS and FTP protocols.

Review Questions:

1. Why HTTP is stateless protocol?

2. What are the defaults ports used in linux ftp server ?
3. What are HTTP Request Messages?
4. What are HTTP Request Methods?
5. What are Persistent Connections?
6. What is HTTPS? Which protocol is responsible for security in HTTPS?
7. Which TCP/IP Layer is responsible for Security?