

NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCE

Computer Network Lab (CL-307)

Lab Session 06

Awais Ahmed || Faizan Yousuf || Munim Ali

awais.ahmed@nu.edu.pk || faizan.yousuf@nu.edu.pk || munim.ali@nu.edu.pk

APPLICATION LAYER PROTOCOL (cont.)

OBJECTIVE

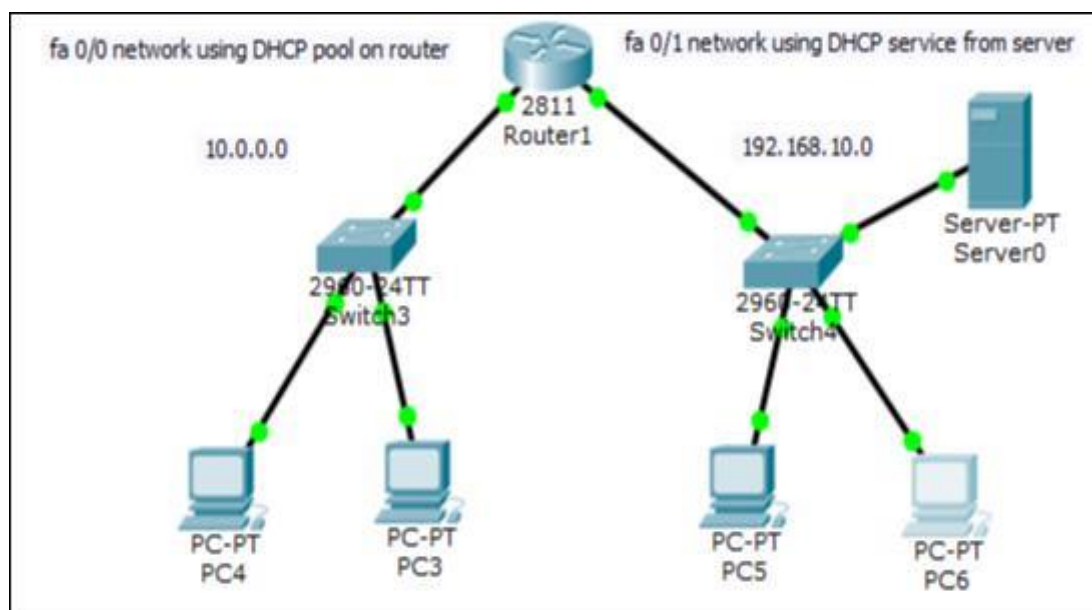
1. Dynamic Host Configuration Protocol
2. File Transfer Protocol
3. Simple Mail Transfer Protocol and Post Office Protocol version3

DYNAMIC HOST CONFIGURATION PROTOCOL

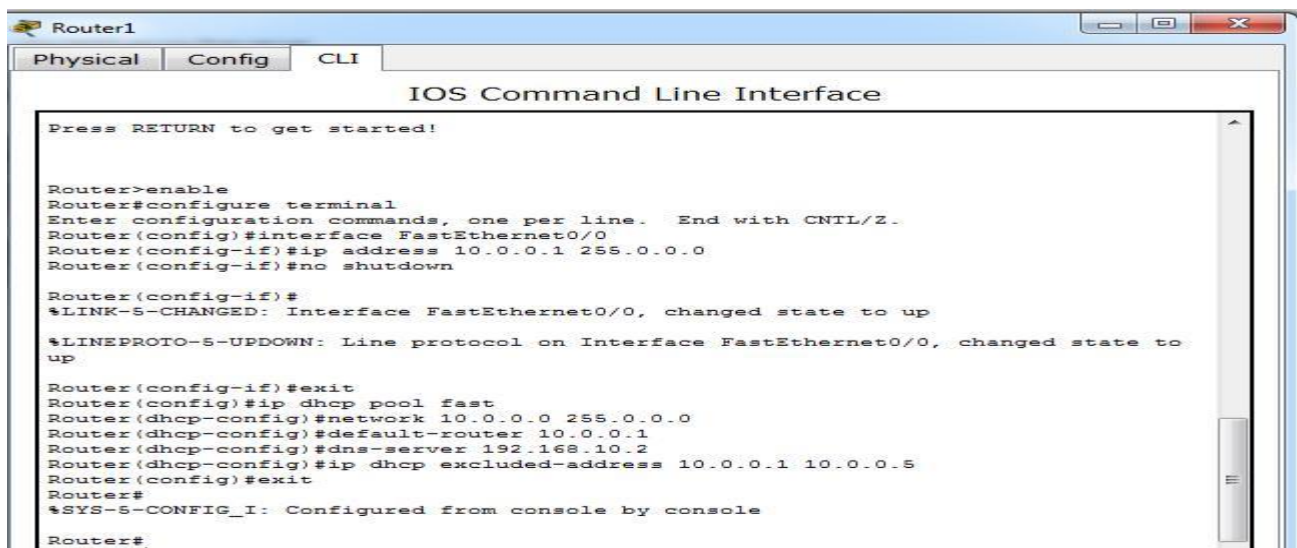
The Dynamic Host Configuration Protocol is used by computers for requesting Internet Protocol parameters, such as an IP address from a network server. The protocol operates based on the client-server model. DHCP is very common in all modern networks ranging in size from home networks to large campus networks and regional Internet service provider networks. Most residential network routers receive a globally unique IP address within the provider network. Within a local network, DHCP assigns a local IP address to devices connected to the local network.

When a computer or other networked device connects to a network, its DHCP client software in the operating system sends a broadcast query requesting necessary information. Any DHCP server on the network may service the request. The DHCP server manages a pool of IP addresses and information about client configuration parameters such as default gateway, domain name, the name servers, time servers. On receiving a request, the server may respond with specific information for each client, as previously configured by an administrator, or with a specific address and any other information valid for the entire network, and the time period for which the allocation (*lease*) is valid. A host typically queries for this information immediately after booting, and periodically thereafter before the expiration of the information. When an assignment is refreshed by the client computer, it initially requests the same parameter values, but may be assigned a new address from the server, based on the assignment policies set by administrators.

We can use DHCP service from router as well as from Server.



Now configuring network on Fa 0/0.



```
Router1
Physical Config CLI
IOS Command Line Interface

Press RETURN to get started!

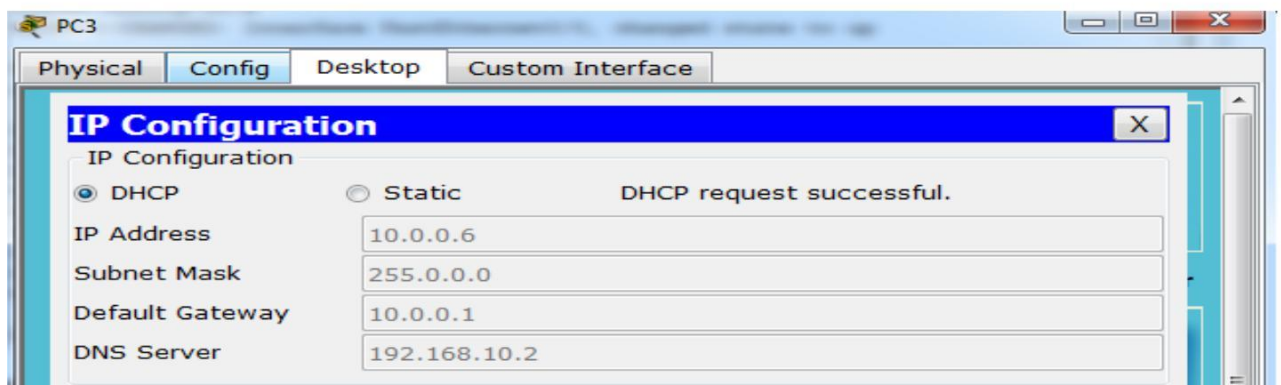
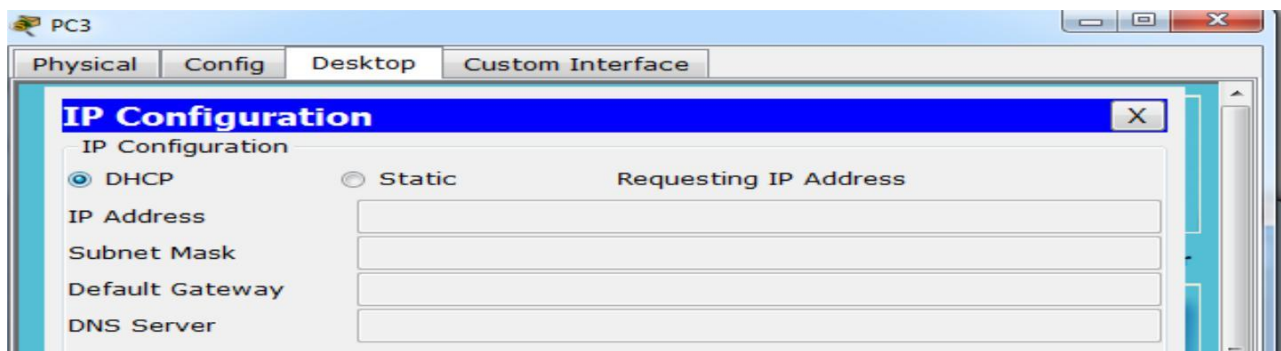
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

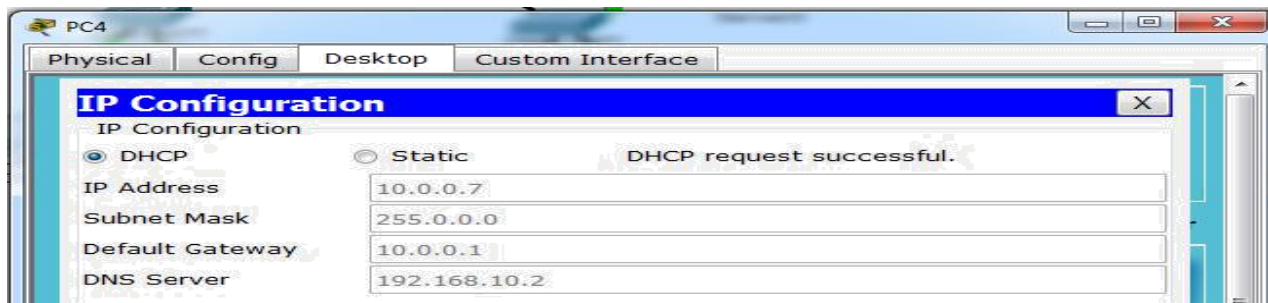
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#ip dhcp pool fast
Router(dhcp-config)#network 10.0.0.0 255.0.0.0
Router(dhcp-config)#default-router 10.0.0.1
Router(dhcp-config)#dns-server 192.168.10.2
Router(dhcp-config)#ip dhcp excluded-address 10.0.0.1 10.0.0.5
Router(dhcp-config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
```

Now assigning IP to PC3 and PC4.





You can check the status of assigned IP addresses as shown below.

```
Router#
```

```
Router#show ip dhcp binding
```

IP address	Client-ID/ Hardware address	Lease expiration	Type
10.0.0.6	000A.F385.2E85	--	Automatic
10.0.0.7	0060.5C58.2C01	--	Automatic

Now configuring network on Fa 0/1.

Click on router and assign IP address.

```
Router#
```

```
Router#configure terminal
```

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

```
Router(config)#interface FastEthernet0/0
```

```
Router(config-if)#
```

```
Router(config-if)#exit
```

```
Router(config)#interface FastEthernet0/1
```

```
Router(config-if)#ip address 192.168.10.1 255.255.255.0
```

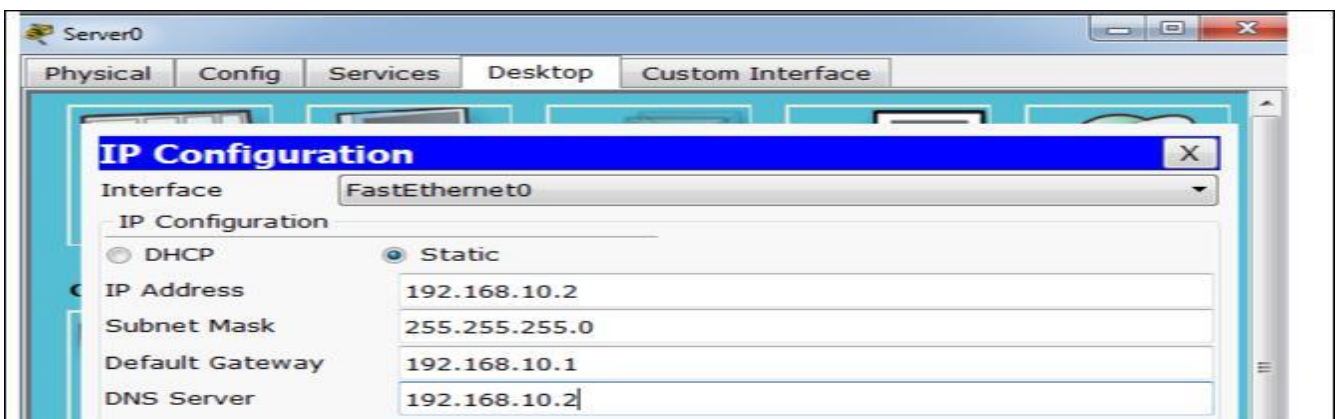
```
Router(config-if)#no shutdown
```

```
Router(config-if)#
```

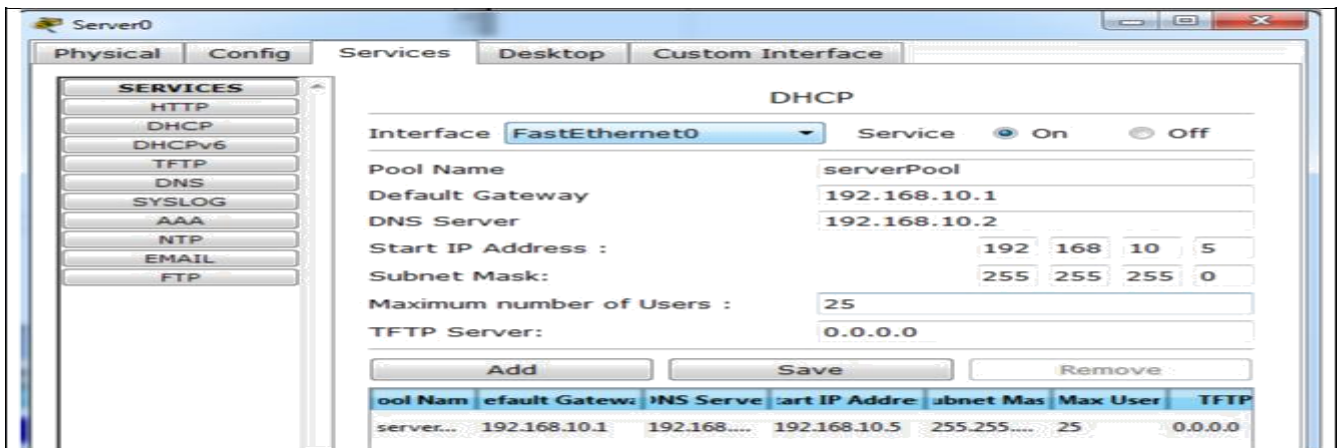
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

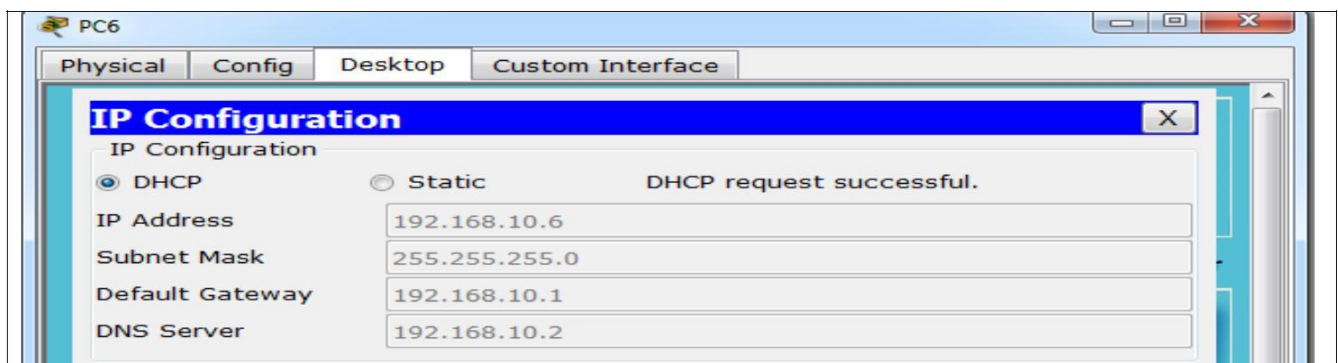
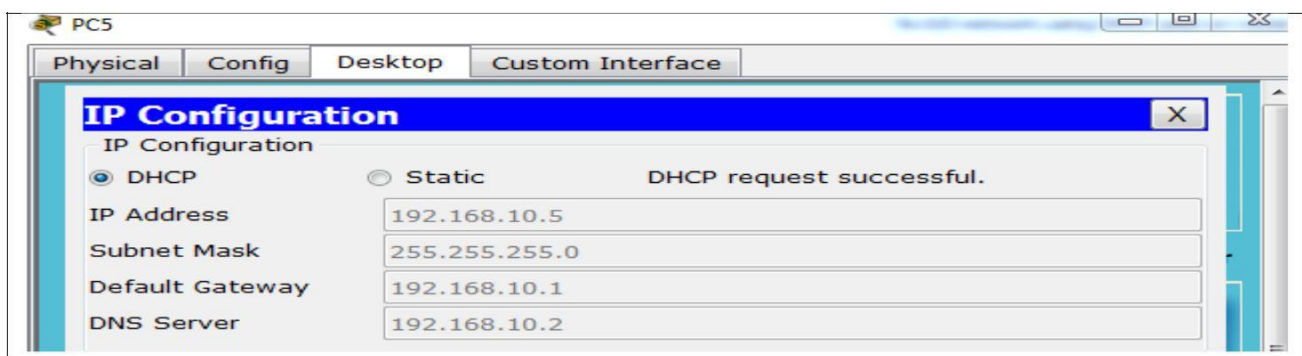
Click on server and assign IP address.



Now assigning DHCP pool on Server. Go to server → services → DHCP



Now assigning IP to PC5 and PC6.



SIMULATION

- Now click on simulation icon in the right bottom of packet Tracer.
- Now click on auto capture /play icon for packet capturing.
- Click on the PC and go to Desktop → IP configuration → DHCP

Simulation Panel					
Event List					
Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.000	--	PC5	DHCP	
	0.000	--	PC5	DHCP	
	0.001	PC5	Switch4	DHCP	
	0.001	--	PC5	DHCP	
	0.002	PC5	Switch4	DHCP	
	0.002	Switch4	Router1	DHCP	
	0.002	Switch4	PC6	DHCP	
	0.002	Switch4	Server0	DHCP	
	0.003	Switch4	Router1	DHCP	

Now click on the DHCP packet see how it lease IP address.

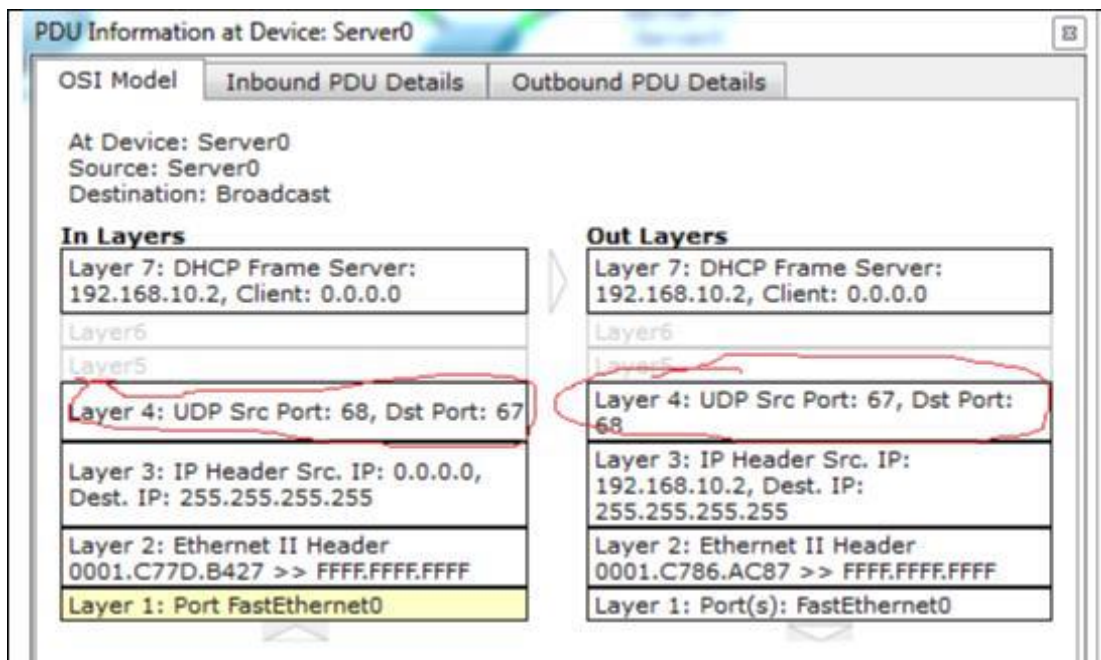
PDU Information at Device: Server0	
OSI Model	Inbound PDU Details
At Device: Server0 Source: PC5 Destination: 255.255.255.255	
In Layers	Out Layers
Layer 7: DHCP Frame Server: 0.0.0.0, Client: 0.0.0.0	Layer7
Layer6	Layer6
Layer5	Layer5
Layer 4: UDP Src Port: 68, Dst Port: 67	Layer4
Layer 3: IP Header Src. IP: 192.168.10.5, Dest. IP: 255.255.255.255	Layer3
Layer 2: Ethernet II Header 0030.F217.9616 >> FFFF.FFFF.FFFF	Layer2
Layer 1: Port FastEthernet0	Layer1

DHCP				
0	8	16	31	Bits
OP: 0x1	HW TYPE	HW LEN	HOPS	
TRANSACTION ID (4 BYTES)				
SECS		FLAGS		
CLIENT ADDRESS: 0.0.0.0				
"YOUR" CLIENT ADDRESS: 0.0.0.0				
SERVER ADDRESS: 0.0.0.0				
RELAY AGENT ADDRESS: 0.0.0.0				
CLIENT HARDWARE ADDRESS: 0030.F217.9616				
SERVER HOSTNAME (64 BYTES)				
FILE (128 BYTES)				
OPTIONS (312 BYTES)				

DHCP				
0	8	16	31	Bits
OP: 0x2	HW TYPE	HW LEN	HOPS	
TRANSACTION ID (4 BYTES)				
SECS		FLAGS		
CLIENT ADDRESS: 0.0.0.0				
"YOUR" CLIENT ADDRESS: 192.168.10.7				
SERVER ADDRESS: 192.168.10.2				
RELAY AGENT ADDRESS: 0.0.0.0				
CLIENT HARDWARE ADDRESS: 0030.F217.9616				
SERVER HOSTNAME (64 BYTES)				
FILE (128 BYTES)				
OPTIONS (312 BYTES)				

Show OSI layers involved in transmission

The popped up window (below) will enable you to trace the content of the message through the OSI layer and what changes will occur at each layer (use next and previous buttons to trace each layer content).



File Transfer Protocol

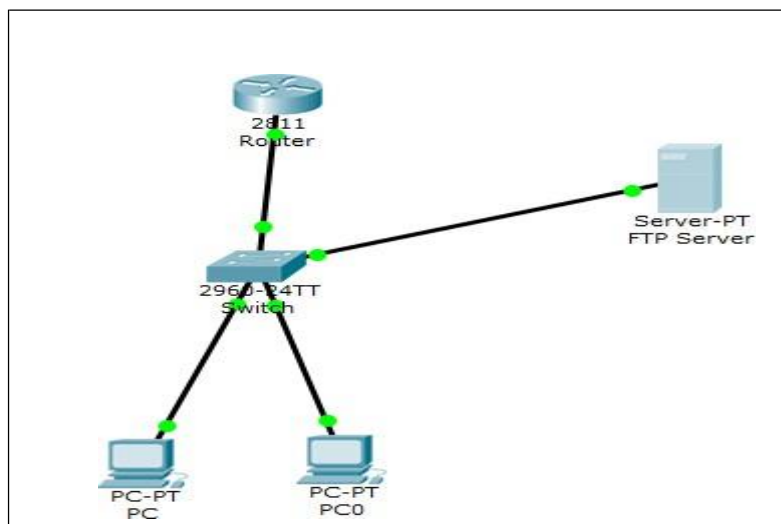
The File Transfer Protocol (FTP) is a standard network protocol used to transfer computer files between a client and server on a computer network. FTP is built on a client-server model architecture and uses separate control and data connections between the client and the server.

Objectives: In this activity, you will configure FTP services. You will then use the FTP services to transfer files between clients and the server.

Part 1: Configure FTP Services on Servers

Part 2: Upload a File to the FTP Server

Part 3: Download a File from the FTP Server



Part 1: Configure FTP Services on Servers

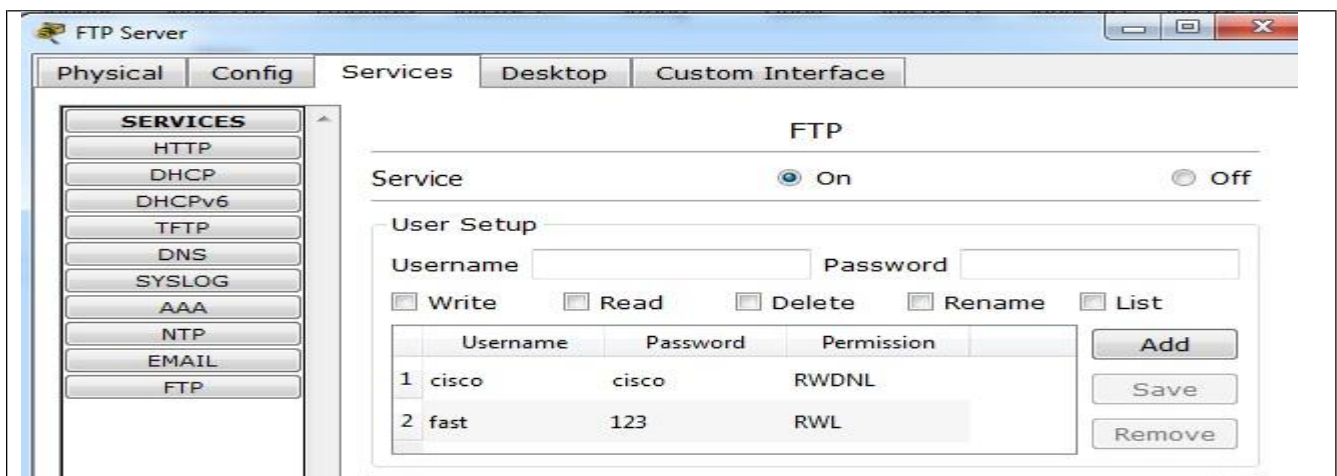
Step 1: Configure the FTP service on Server.

a. Click Server > Config tab > FTP.

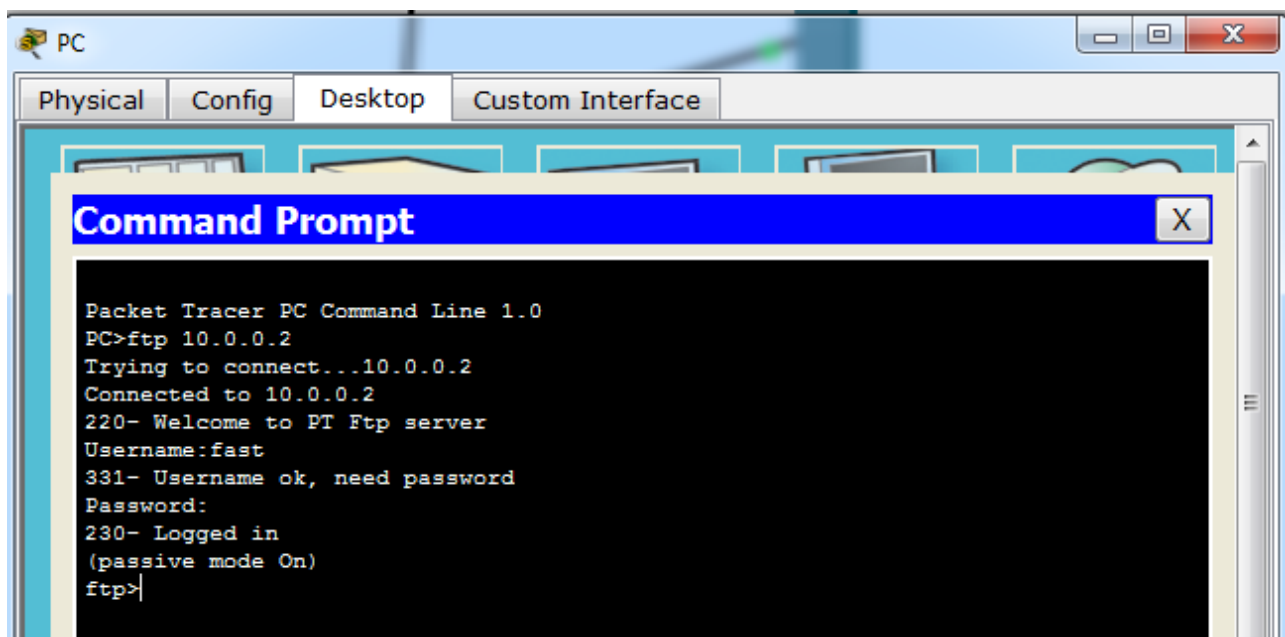
b. Click On to enable FTP service.

c. In User Setup, create the following user accounts. Click the + button to add the account:

Username	Password	Permissions
fast	123	limited to Read, write and List

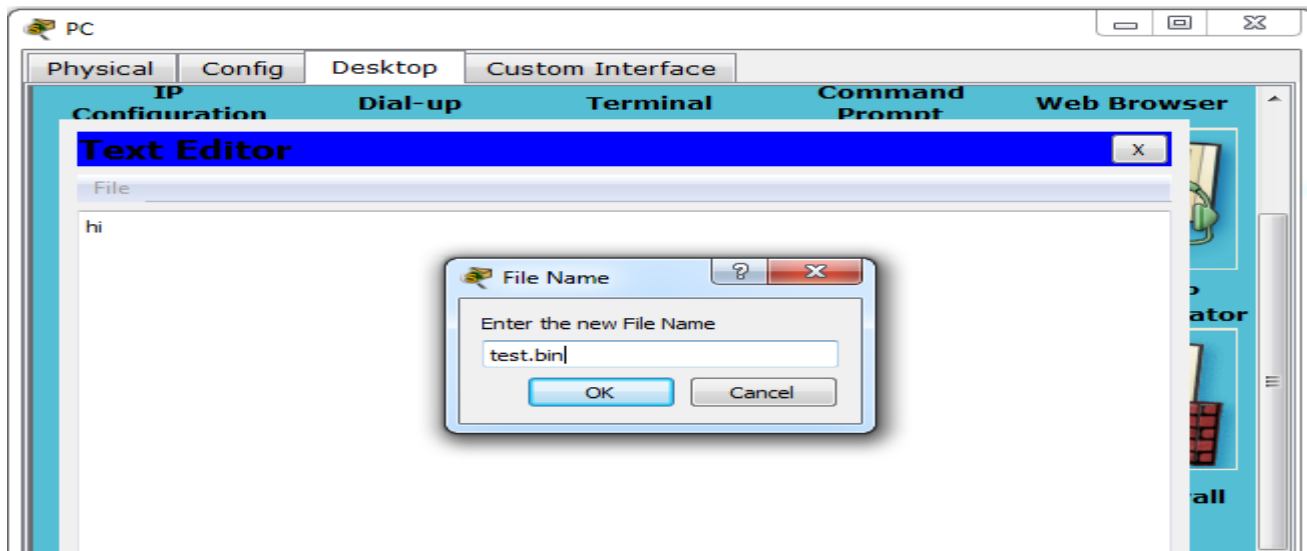


Now go to PC → Desktop → command prompt

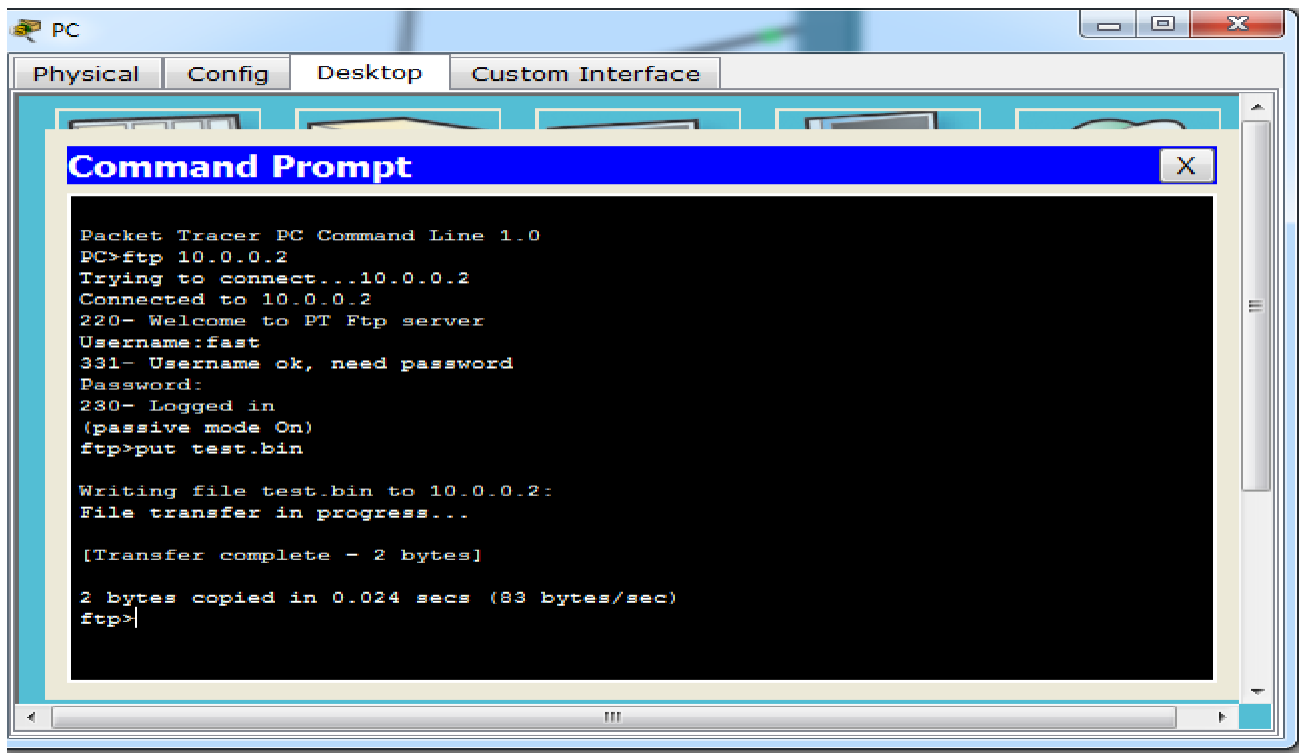


Part 2: Upload a File to the FTP Server

Now go to PC → Desktop → text editor → create file named test.bin

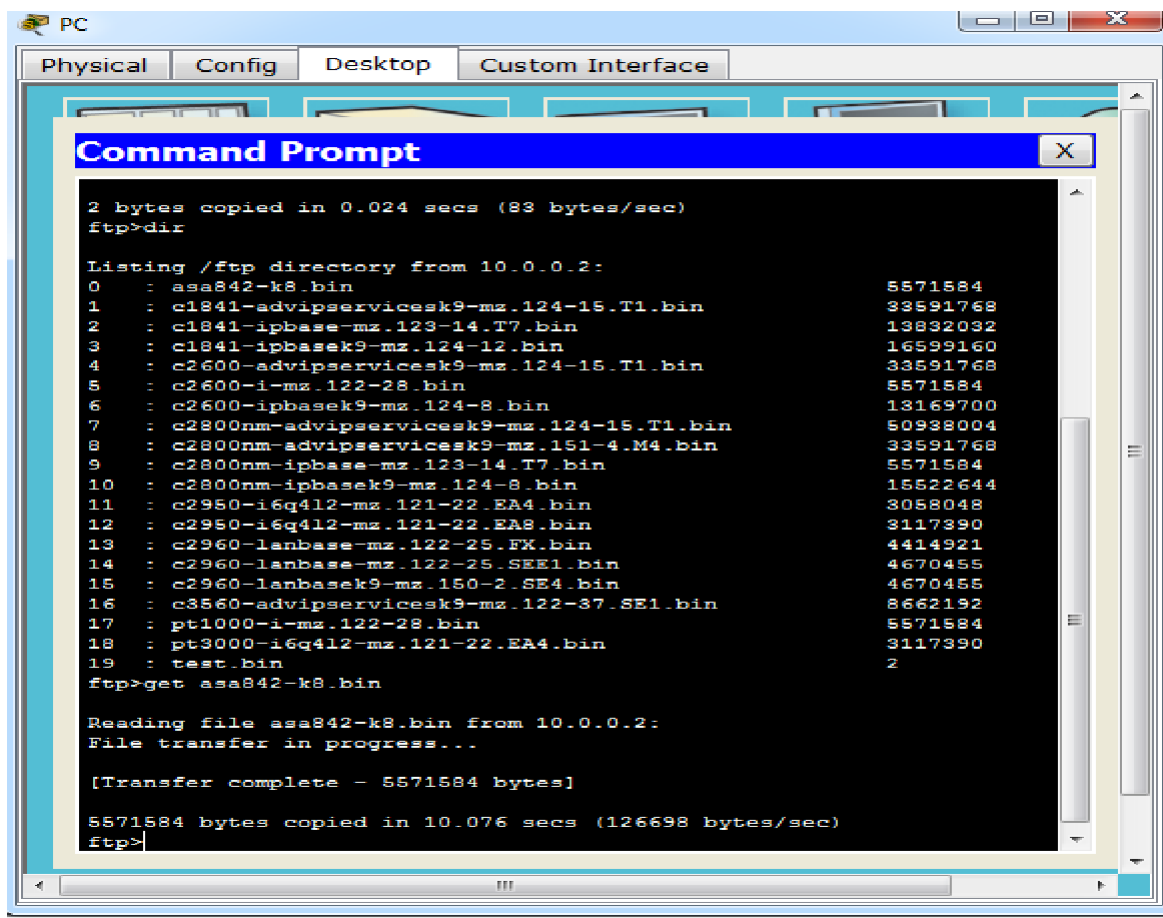


Now go to PC → Desktop → command prompt

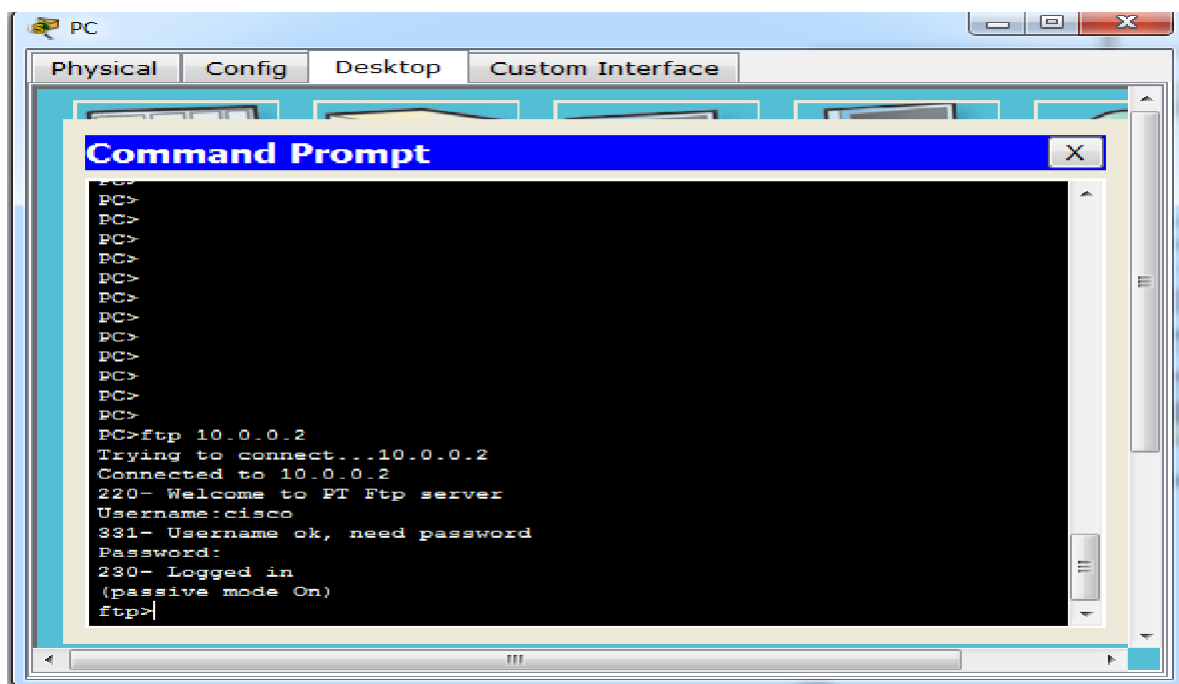


Part 3: Download a File from the FTP Server

Now go to PC → Desktop → command prompt

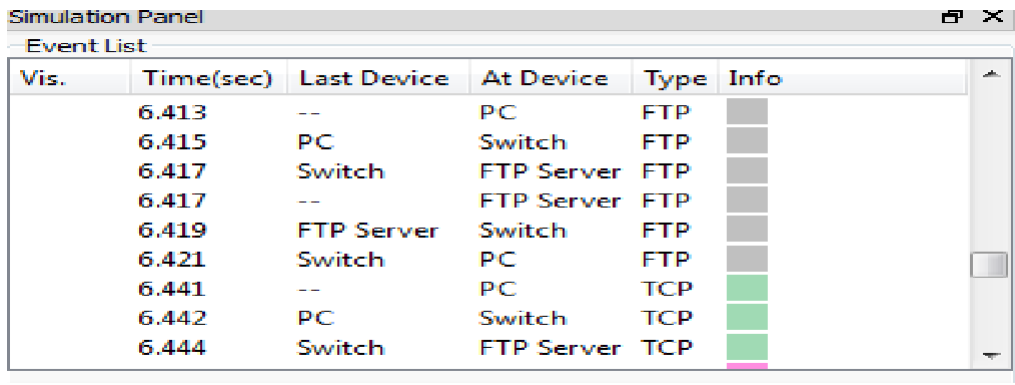


SIMULATION: Now click on PC and go to Desktop → command prompt. Now type ftp 10.0.0.2

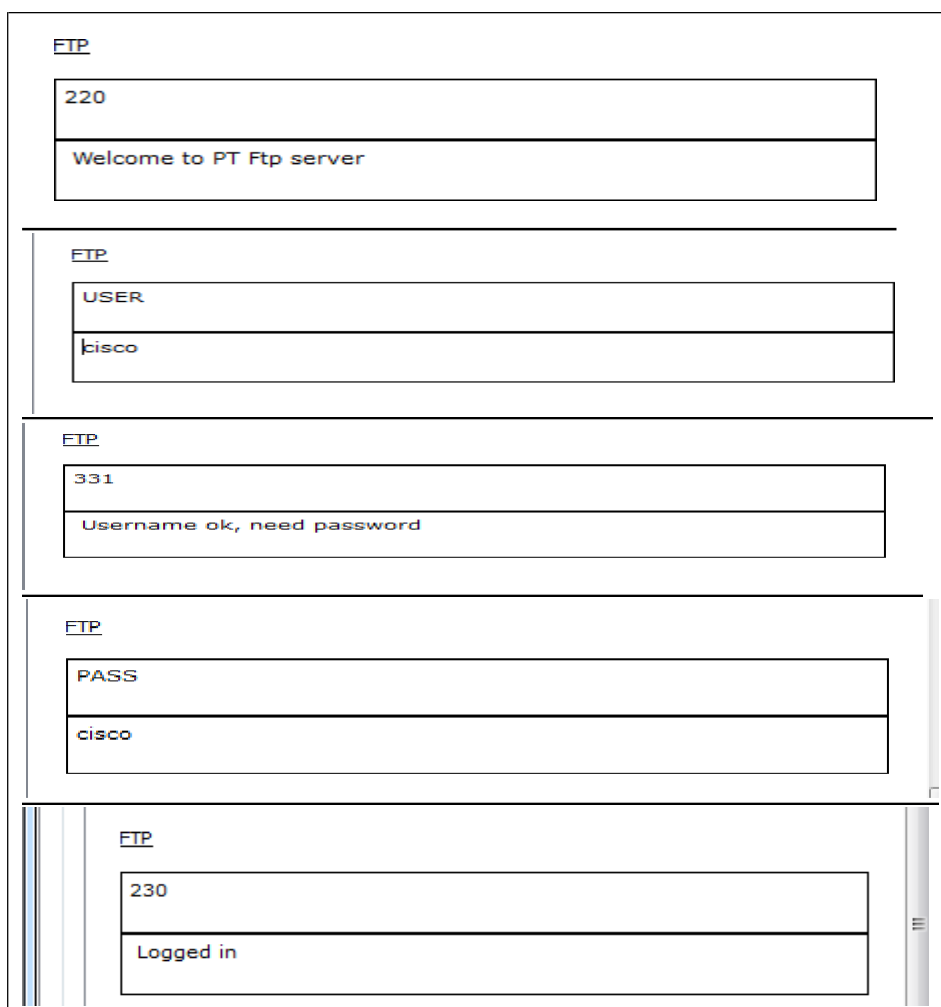


Now to note the FTP header format information go to simulation mode → edit filters and click on FTP check box then click on capture/forward button.

How FTP server resolve the login request.



Vis.	Time(sec)	Last Device	At Device	Type	Info
	6.413	--	PC	FTP	
	6.415	PC	Switch	FTP	
	6.417	Switch	FTP Server	FTP	
	6.417	--	FTP Server	FTP	
	6.419	FTP Server	Switch	FTP	
	6.421	Switch	PC	FTP	
	6.441	--	PC	TCP	
	6.442	PC	Switch	TCP	
	6.444	Switch	FTP Server	TCP	



FTP

220

Welcome to PT Ftp server

FTP

USER

cisco

FTP

331

Username ok, need password

FTP

PASS

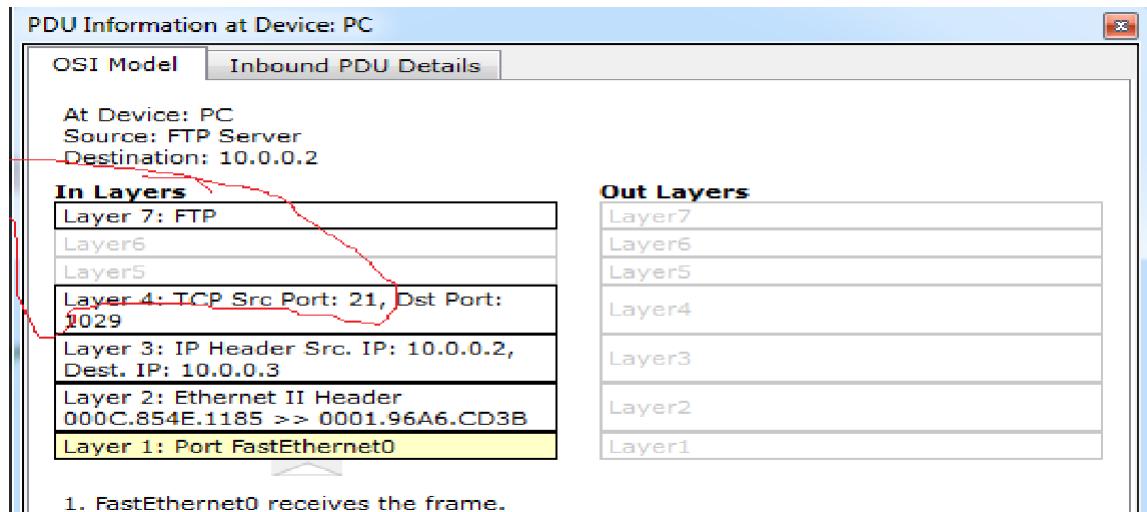
cisco

FTP

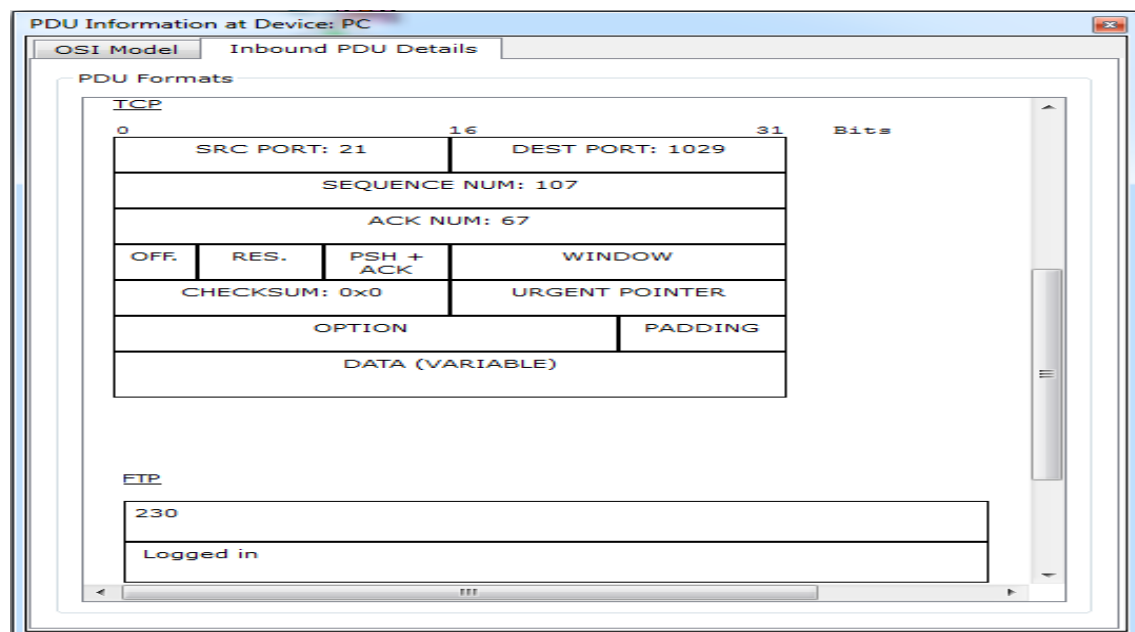
230

Logged in

Now click on the FTP packet, you can note that the destination port is 21.



Now scroll the Outbound PDU Details, you can see the FTP PDU.

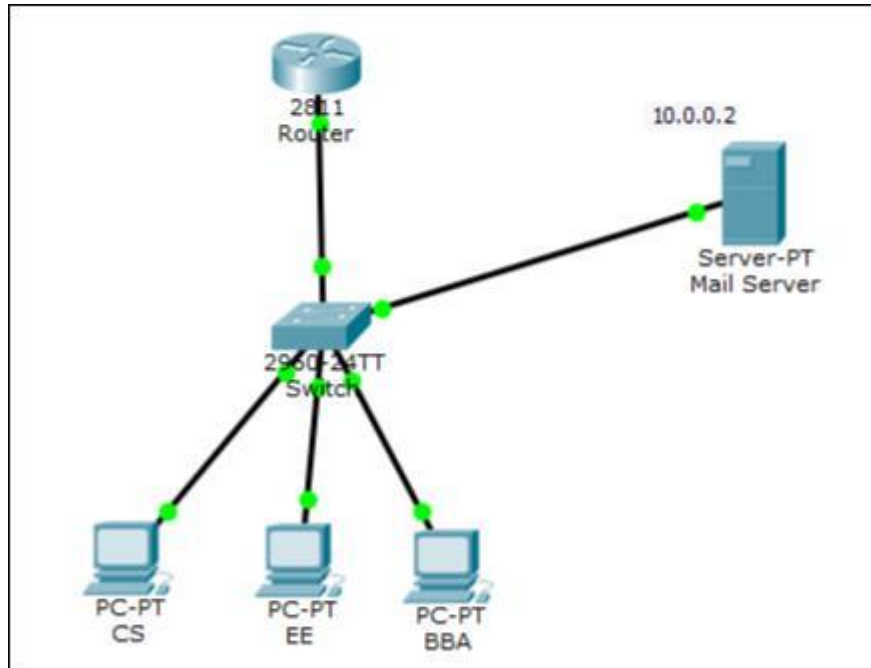


SMTP & POP3

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (email) transmission. First defined by RFC 821 in 1982, it was last updated in 2008 with Extended SMTP additions by RFC 5321, which is the protocol in widespread use today. Although electronic mail servers and other mail transfer agents use SMTP to send and receive mail messages, user-level client mail applications typically use SMTP only for sending messages to a mail server for relaying. For retrieving messages, client applications usually use either IMAP or POP3.

SMTP communication between mail servers uses port 25. Mail clients on the other hand, often submit the outgoing emails to a mail server on port 587. Despite being deprecated, mail providers sometimes still permit the use of nonstandard port 465 for this purpose.

Topology



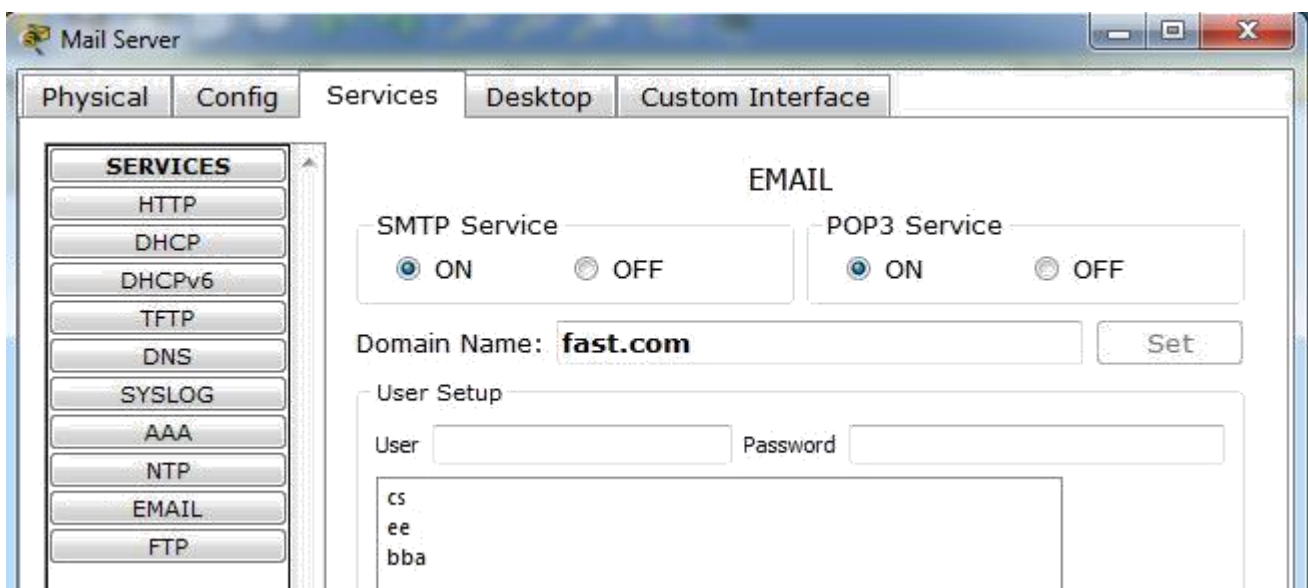
Objectives: Configure and Verify Email Services

Click on Mail server → services → EMAIL Enable SMTP & POP3 Service

Set Domain Name: fast.com Add

users.

User name	password
cs	123
ee	123
bba	123



Now configuring user email account.
Go to pc → desktop → Email

The screenshot shows a window titled 'CS' with tabs for 'Physical', 'Config', 'Desktop', and 'Custom Interface'. The 'Desktop' tab is active, displaying a 'Configure Mail' dialog box. The dialog has three sections: 'User Information', 'Server Information', and 'Logon Information'. In 'User Information', 'Your Name' is 'cs' and 'Email Address' is 'cs@fast.com'. In 'Server Information', both 'Incoming Mail Server' and 'Outgoing Mail Server' are '10.0.0.2'. In 'Logon Information', 'User Name' is 'cs' and 'Password' is masked with dots. At the bottom are 'Save', 'Clear', and 'Reset' buttons.

User Information	
Your Name:	cs
Email Address	cs@fast.com

Server Information	
Incoming Mail Server	10.0.0.2
Outgoing Mail Server	10.0.0.2

Logon Information	
User Name:	cs
Password:	...

The screenshot shows a window titled 'EE' with tabs for 'Physical', 'Config', 'Desktop', and 'Custom Interface'. The 'Desktop' tab is active, displaying a 'Configure Mail' dialog box. The dialog has three sections: 'User Information', 'Server Information', and 'Logon Information'. In 'User Information', 'Your Name' is 'ee' and 'Email Address' is 'ee@fast.com'. In 'Server Information', both 'Incoming Mail Server' and 'Outgoing Mail Server' are '10.0.0.2'. In 'Logon Information', 'User Name' is 'ee' and 'Password' is masked with dots. At the bottom are 'Save', 'Clear', and 'Reset' buttons.

User Information	
Your Name:	ee
Email Address	ee@fast.com

Server Information	
Incoming Mail Server	10.0.0.2
Outgoing Mail Server	10.0.0.2

Logon Information	
User Name:	ee
Password:	...

The screenshot shows the 'Configure Mail' dialog box within the BBA application. The dialog has a blue title bar with the text 'Configure Mail' and a close button (X). It contains three sections: 'User Information', 'Server Information', and 'Logon Information'. In the 'User Information' section, 'Your Name' is 'bba' and 'Email Address' is 'bba@fast.com'. In the 'Server Information' section, both 'Incoming Mail Server' and 'Outgoing Mail Server' are '10.0.0.2'. In the 'Logon Information' section, 'User Name' is 'bba' and 'Password' is masked with three dots. At the bottom, there are 'Save', 'Clear', and 'Reset' buttons.

Configure Mail

User Information

Your Name: bba

Email Address: bba@fast.com

Server Information

Incoming Mail Server: 10.0.0.2

Outgoing Mail Server: 10.0.0.2

Logon Information

User Name: bba

Password: ...

Save Clear Reset

Click save

The screenshot shows the 'MAIL BROWSER' window within the BBA application. The window has a blue title bar with the text 'MAIL BROWSER' and a close button (X). It features a 'Mails' section with buttons for 'Compose', 'Reply', 'Receive', 'Delete', and 'Configure Mail'. Below these buttons is a table with columns 'From', 'Subject', and 'Received'. The table is currently empty. At the bottom right, there is a 'Cancel Send/Receive' button.

MAIL BROWSER

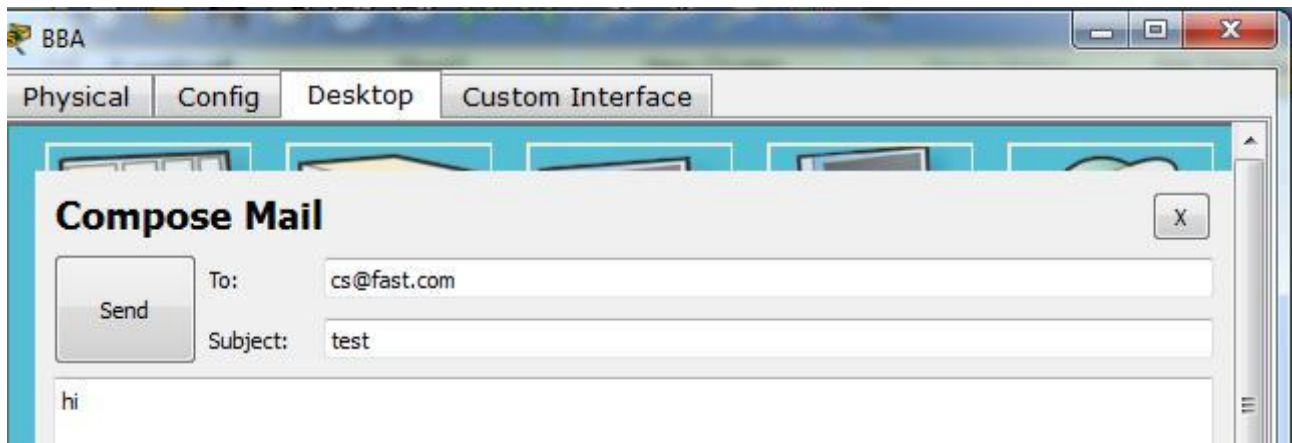
Mails

Compose Reply Receive Delete Configure Mail

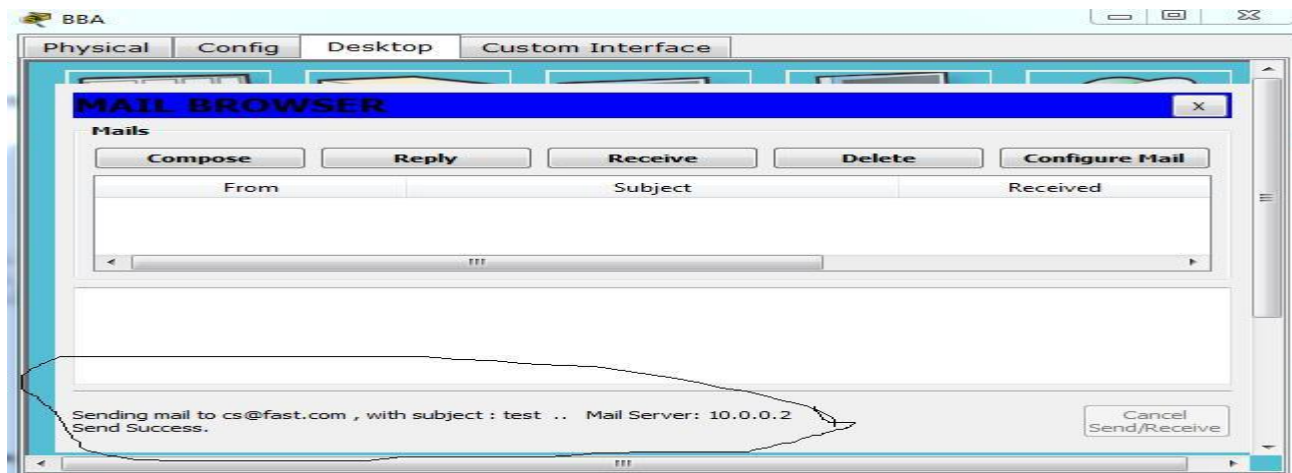
From	Subject	Received
------	---------	----------

Cancel Send/Receive

Now compose email → cs@fast .com

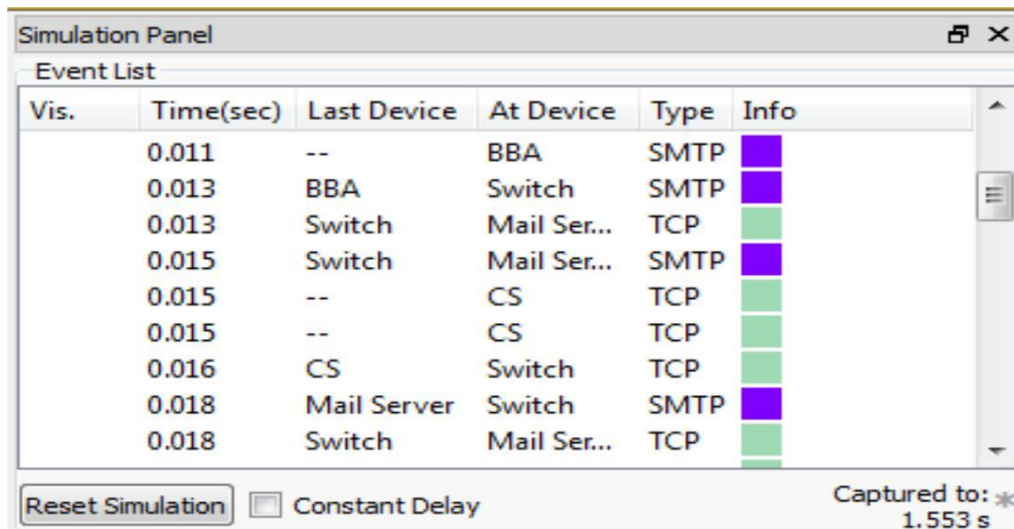


Click on send.



SIMULATION

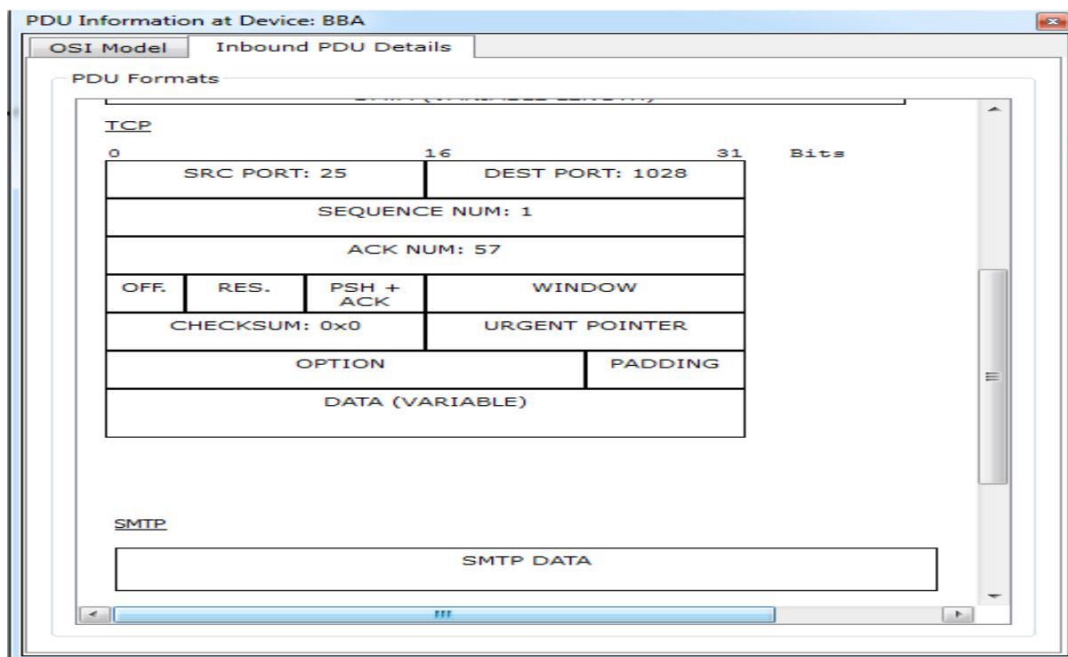
Now to note the POP3 header format information go to simulation mode → edit filters and click on SMTP & POP3 check box then click on capture/forward button. Now see how mail server works.

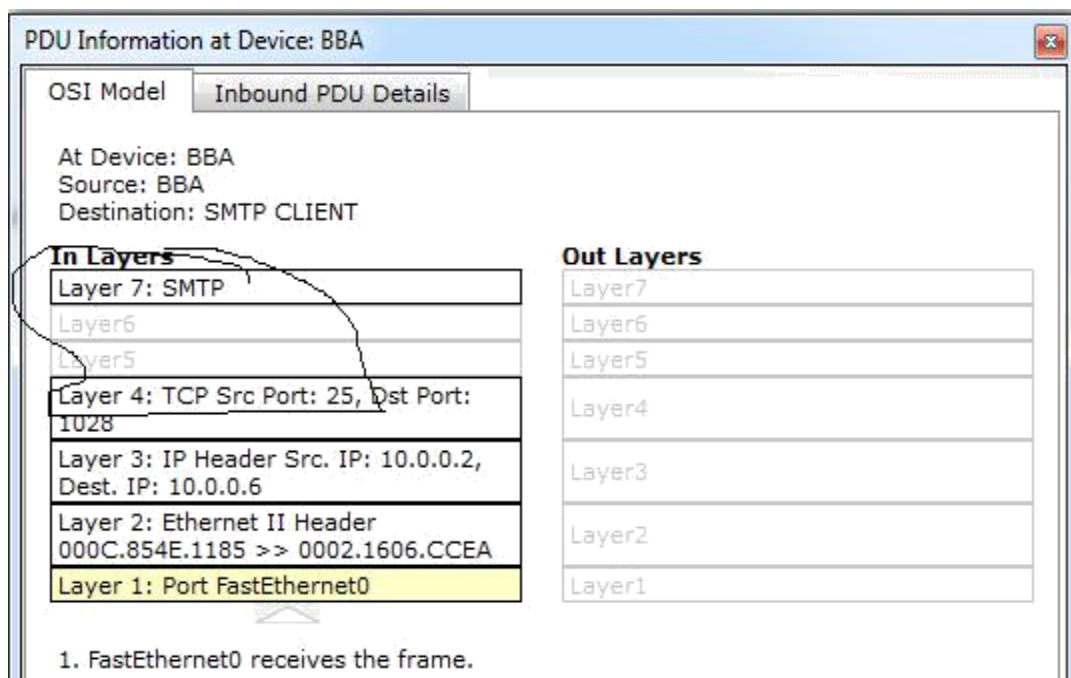


The Simulation Panel window displays an event list with the following data:

Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.011	--	BBA	SMTP	
	0.013	BBA	Switch	SMTP	
	0.013	Switch	Mail Ser...	TCP	
	0.015	Switch	Mail Ser...	SMTP	
	0.015	--	CS	TCP	
	0.015	--	CS	TCP	
	0.016	CS	Switch	TCP	
	0.018	Mail Server	Switch	SMTP	
	0.018	Switch	Mail Ser...	TCP	

At the bottom of the panel, there is a 'Reset Simulation' button, a 'Constant Delay' checkbox, and a status indicator 'Captured to: * 1.553 s'.





Now go CS account and click on receive:

