

**DOKUZ EYLUL UNIVERSITY**

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**METROPOLITAN AREA NETWORK SIMULATION  
PROJECT**

by

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1. Project Definition and Problem Formulation**

A metropolitan area network (MAN) is a computer network that connects computers within a metropolitan area, which could be a single large city, multiple cities and towns, or any given large area with multiple buildings. A MAN is larger than a local area network (LAN) but smaller than a wide area network (WAN). The term MAN is applied to the interconnection of local area networks (LANs) in a city into a single larger network which may then also offer efficient connection to a wide area network. The term is also used to describe the interconnection of several local area networks in a metropolitan area through the use of point-to-point connections between them. It is used to mean the interconnection of several local area networks by bridging them with backbone lines.

In our project, communication between different users of a company that has two different branches in a city and three facilities in each of these branches and these users have some duties/features aims to design a metropolitan area network. Users of both branches do not have dedicated servers for their facilities, that is, there is only one server room (system room) and users carry out transactions using these common servers. Each facility has several users with different roles/features. This project also aims to ensure process synchronization and communication between branches, facilities and users here by using ISP and connection methods/tools when necessary.

### **1.2. The Purpose and Motivation of The Project**

While preparing for this project, MAN (Metropolitan Area Network), the goal was to design maximum network users, traffic load with minimum delay, and sufficient hardware support for network expansions (using very popular technologies in the world such as fiber optic technology to provide high network speed) with minimum cost. The designed MAN topology aims to transmit email transactions, browse the internet, file transfer, security protocols such as SSH, and voice transfer using protocols such as VoIP, with low cost and high efficiency, as mentioned before. In this project, two branches and three facilities will be connected to each other through ISP.

Since the project is designed considering the maximum efficiency and minimum cost that can be obtained, there may be some deficiencies, in this case, if there are features that are desired or expected to be developed beyond the desired, in this case the cost will be negatively affected while the performance will be positively affected.

### 1.3.Term Definitions

**Network :** Network is a group of two or more devices or nodes that can communicate. The devices or nodes in question can be connected by physical or wireless connections. The key is that there are at least two separate components, and they are connected.

**Wireless :** Wireless is a term used to define telecommunication and data transmission without wires. In a broad sense, wireless refers to any telecommunications or data transfer in which electromagnetic waves - rather than some form of wire or cable -carry signals over all or part of the data communication path.This refers to a type of network that broadcasts an access signal to the workstations.This allows for transporting laptops and tablet PCs from room to room while maintaining a network connection continuously.

**Nodes :** Node is a connection point inside a network that can receive, send, create, or store data. Each node requires you to provide some form of identification to receive access, like an IP address. A few examples of nodes include computers, printers, modems, bridges, and switches. A node is essentially any network device that can recognize, process, and transmit information to any other network node.

**Ethernet :** Ethernet is the standard way to connect computers on a network over a wired connection. It provides a simple interface and for connecting multiple devices, such computers, routers, and switches. With a single router and a few Ethernet cables, you can create a LAN, which allows all connected devices to communicate with each other.

**Frame :** Frame is a digital data transmission unit in computer networking and telecommunication. In packet switched systems, a frame is a simple container for a single network packet. In other telecommunications systems, a frame is a repeating structure supporting time-division multiplexing.

**Access Point :** An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area.

**Switches :** A switch is a device that connects other devices and manages node-to-node communication within a network, ensuring data packets reach their ultimate destination. While a router sends information between networks, a switch sends information between nodes in a single network. When discussing computer networks, ‘switching’ refers to how data is transferred between devices in a network.

**Router :** A router is a physical or virtual device that sends information contained in data packets between networks. Routers analyze data within the packets to determine the best way for the information to reach its ultimate destination. Routers forward data packets until they reach their destination node.

**Packet :** A packet is a small amount of data sent over a network, such as a LAN or the Internet. Similar to a real-life package, each packet includes a source and destination as well as the content (or data) being transferred. When the packets reach their destination, they are reassembled into a single file or other contiguous block of data. While the exact structure of a packet varies between protocols, a typical packet includes two sections: a header and payload. Information about the packet is stored in the header.

**Network Architecture :** Network architecture is the complete framework of an organization's computer network. The diagram of the network architecture provides a full picture of the established network with detailed view of all the resources accessible. It

includes hardware components used for communication, cabling and device types, network layout and topologies, physical and wireless connections, implemented areas and future plans. In addition, the software rules and protocols also constitute the network architecture.

**Protocol :** A protocol is a set of rules for formatting and processing data. Network protocols are like a common language for computers. The computers within a network may use vastly different software and hardware; however, the use of protocols enables them to communicate with each other regardless.

**IP address :** An IP address is a unique address that identifies a device on the internet or a local network. IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network. They contain location information and make devices accessible for communication. The internet needs a way to differentiate between different computers, routers, and websites.

**TCP :** The Transmission Control Protocol (TCP) is one of the main protocols of the Internet protocol suite. It originated in the initial network implementation in which it complemented the Internet Protocol (IP). Therefore, the entire suite is commonly referred to as TCP/IP. Major internet applications such as the World Wide Web, email, remote administration, and file transfer rely on TCP, which is part of the Transport Layer of the TCP/IP suite.

**Channel :** A channel refers either to a physical transmission medium such as a wire, or to a logical connection over a multiplexed medium such as a radio channel in telecommunications and computer networking. A channel is used to convey an information signal, for example a digital bit stream, from one or several senders (or transmitters) to one or several receivers.

**Workstation :** Workstation, a high-performance computer system that is basically designed for a single user and has advanced graphics capabilities, large storage capacity, and a powerful central processing unit. A workstation is more capable than a personal computer (PC) but is less advanced than a server (which can manage a large network of peripheral PCs or workstations and handle immense data-processing and reporting tasks).

**Server :** A server is a piece of computer hardware or software (computer program) that provides functionality for other programs or devices, called "clients". This architecture is called the client-server model. Servers can provide various functionalities, often called "services", such as sharing data or resources among multiple clients, or performing computation for a client. Typical servers are database servers, file servers, mail servers, print servers, web servers, game servers, and application servers.

**DNS :** The Domain Name System is a hierarchical and decentralized naming system for computers, services, or other resources connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates more readily memorized domain names to the numerical IP addresses needed for locating and identifying computer services and devices with the underlying network protocols.

**FTP :** File transfer protocol (FTP) is a set of rules that computers follow for the transferring of files from one system to another over the internet. It may be used by a business to transfer files from one computer system to another, or websites may use FTP to upload or download files from a website's server.

**HTTP :** HTTP is the protocol used to transfer data over the web. It is part of the Internet protocol suite and defines commands and services used for transmitting web page data.

**POP :** A point of presence (PoP) is an artificial demarcation point or interface point between communicating entities. A common example is an ISP point of presence, the local access point that allows users to connect to the Internet with their Internet service provider (ISP). A PoP typically houses servers, routers, network switches, multiplexers, and other network interface equipment, and is typically located in a data center.

**SMTP :** Stands for "Simple Mail Transfer Protocol." This is the protocol used for sending e-mail over the Internet. Your email client uses SMTP to send a message to the mail server, and the mail server uses SMTP to relay that message to the correct receiving mail server.

## **1.4.Related Work**

We could not examine other simulation studies on the same subject related to the Metropolitan Area Network Simulation project, but as a result of our research on network simulations over the internet. We were able to observe and evaluate. These reviews are related to different parts rather than the whole project. There were no noticeable differences in the design of the simulation. Devices using the connection type was done by the same logic. There are some differences in the router, switch type and visual design used. Apart from the user devices in our project, various other user devices were also used. The simulation tool used was, in most examples, the Cisco Packet Tracer only a few in the example, we saw the Tp-Link simulation tool, but we did not examine it, thinking that it would not contribute to our project.

## **CHAPTER TWO**

### **METHOD AND SIMULATION**

#### **2.1. Simulation and Modeling Concepts**

While creating the network, logical and physical requirements were determined. A construction phase took place from small units to large units, that is, the bottom-up alternative approach was applied. Designing a network with a bottom-up approach enables us to get our network set up much faster. They have a tendency to begin the design process at this level, leaving applications and services as an afterthought to be considered later. In most cases, taking a bottom-up approach tends to require a less thorough initial analysis, and is easier to implement as a quick fix.

In our modeling, workstation users, wireless users, tablet users and smartphone users in the facilities in the branches were created. While users were connecting to each other, they were connected to successfully communicate with switches, routers, wireless routers and connecting cables. We created our servers and assigned IP addresses to the users in each facility using the DHCP server. Network device connections between workstations and network devices are analyzed. At the same time, are the locations of the connection and network tools in the facilities correct in the physical part. Network devices were configured.

While connecting the workstations and other network devices with each other, the cable was automatically selected over the packet tracer simulation and the connection was made with the 'copper straight cable'. Facilities which are located in the same branches are connected to each other with a main switch over a fast ethernet port. Router has been used for two different networks which are commonly used with the same network channel rules/bases. It is provided with a serial ethernet port between routers used for communication between different branches. At the same time, the connection between the routers between different branches is formed by the serial ethernet port. The other significant responsibility of the router is managing the packages; if one of the workstation wants to send something (message/mail or etc.) to another workstation on a different network, the router ensures the package goes to the other network with the help of static routing.

Finally, server farms at the third facility of the first branch office so that users can send/receive mail, browse the web, send/receive files, VoIP Services (sending voice data over an IP between private users/workstations), automatically assigning an IP. created. In the server room, web server, dns server, mail server, ftp server and dhcp server were configured, and the servers were made ready for use and connected to the main switch of the server farm. The server farm switch was connected to the server router. After connecting the common connection router of the three facilities in the second branch to the server router as serial, we created our metropolitan area network by making control trials between the workstations after the connection was established between the two branches.

In summary, although we did not talk about the details of each phase of the metropolitan area network design, we briefly talked about what was done. All of our workstations and other

devices can perform their duties correctly with the network cables/devices we use, thus providing the network of two different branches in the same city.

## **2.2. Simulation Environment/Tool**

Our project was done using Cisco Packet Tracer simulation. Cisco Packet Tracer is a simulation program used by Cisco to configure the necessary configurations before installing router, switch, hub, or security devices on a real network. This tool provides a network simulation to practice simple and complex networks. Cisco Packet Tracer offers two operating modes to envision the network behavior: Real-time and Simulation Mode. Cisco Packet Tracer has two workspaces-logical and physical. The logical workspace allows users to build logical network topologies by placing, connecting, and clustering virtual network devices. The physical workspace provides a graphical physical dimension of the logical network, giving a sense of scale and placement in how network devices such as routers, switches, and hosts would look in a real environment. The physical view also provides geographic representations of networks, including multiple cities, buildings, and wiring closets. The application itself has only a handful of features available inside the actual hardware that runs the Cisco IOS version. It is not suitable for modeling production networks. It has limited command sets, making it impossible to practice all IOS commands required. The software is mainly focused towards Certified Cisco Network Associate Academy students as an educational tool for helping them learn fundamental CCNA concepts.

The benefits of the Cisco Packet Tracer program include:

- It provides a comfortable and well-informed environment.
- It provides multi-user, real-time training laboratories.
- It can prepare exams for students and give points according to what they do.
- Network environment is designed, and network devices are configured using virtual equipment.

To summarize, Cisco Packet Tracer significantly simplifies learning and teaching by supporting multi-user providing a realistic simulation environment for collaboration and exploration, and experiment.



### **2.3. Network Design Requirements**

We have realized the most suitable and useful network design for the requirements requested in the project. The network design requirements of our project are as follows.

Server/client architecture was used as the architecture of the network. HTTP, HTTPS, DHCP, DNS, FTP, POP3, TCP, SSH, SMTP protocols were used for the communication between devices. This design used six switches, four access points, three routers, eight servers, forty workstation users, fifteen wireless users, ten smartphone users, ten tablet users, and five IP Phones(for VoIP conference). Star topology is used in the connections. LANs contained in the MAN use the star topology. Connections of star topologies are provided with hybrid topology. Therefore, our general topology can be considered hybrid topology. Laptop (wireless), smartphone and tablet connections are provided with the WRT300N. The connections of the workstations were provided with the 2960-24TT switch. The connections of the servers were provided with the 2960-24TT switch. WRT300Ns are connected to switches, switches are connected to routers, and routers are connected within themselves. Thus, the Metropolitan Area Network has been provided.

### **2.4. Requirement Analysis**

All the necessary requirement analysis for the project were made according to the requested situations. Our requirement analysis is as follows.

Access to servers was granted according to the actions required by the devices.

All devices in the first branch and second branch can access the web servers in the third facility of the first branch. Devices can access sites defined on web servers.

Sending mail to devices in the mail server first facility of the first branch, first facility of the second branch and third facility of the second branch has the authority. Access to the first facility of the first branch mail server and permission to send mail has been granted. first facility of the second branch access to mail server and mail authorized to use the application. Access to the third facility of the second branch mail server and permission to send and receive mail has been granted.

First facility of the first branch, second facility of the first branch and second facility of the second branch access to ftp server and permission to send files have been granted. In this way, devices can transfer files to each other.

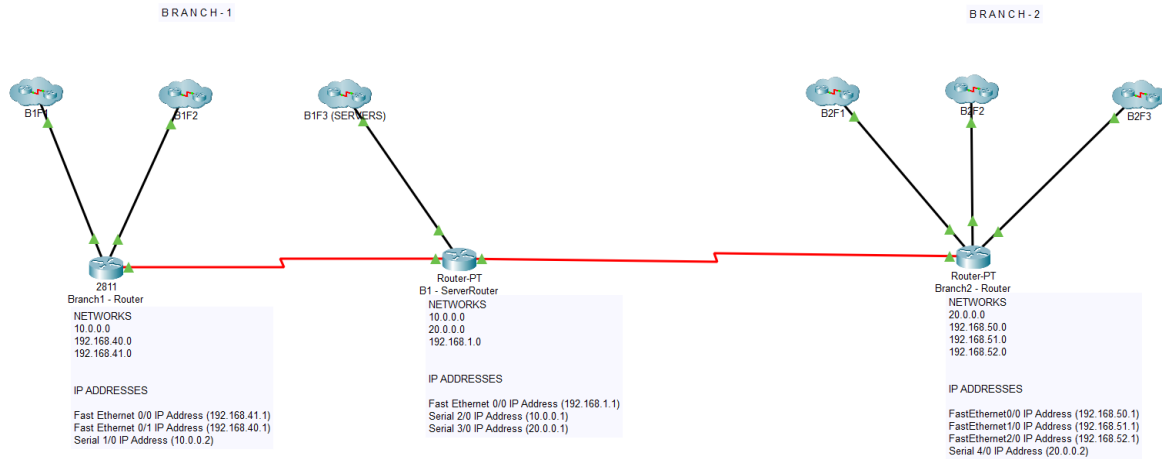
All devices in the second facility of the second branch are authorized to edit applications.

Router 2811 was used so that 5 workstations in the second facility of the first branch could hold Voip conferences.

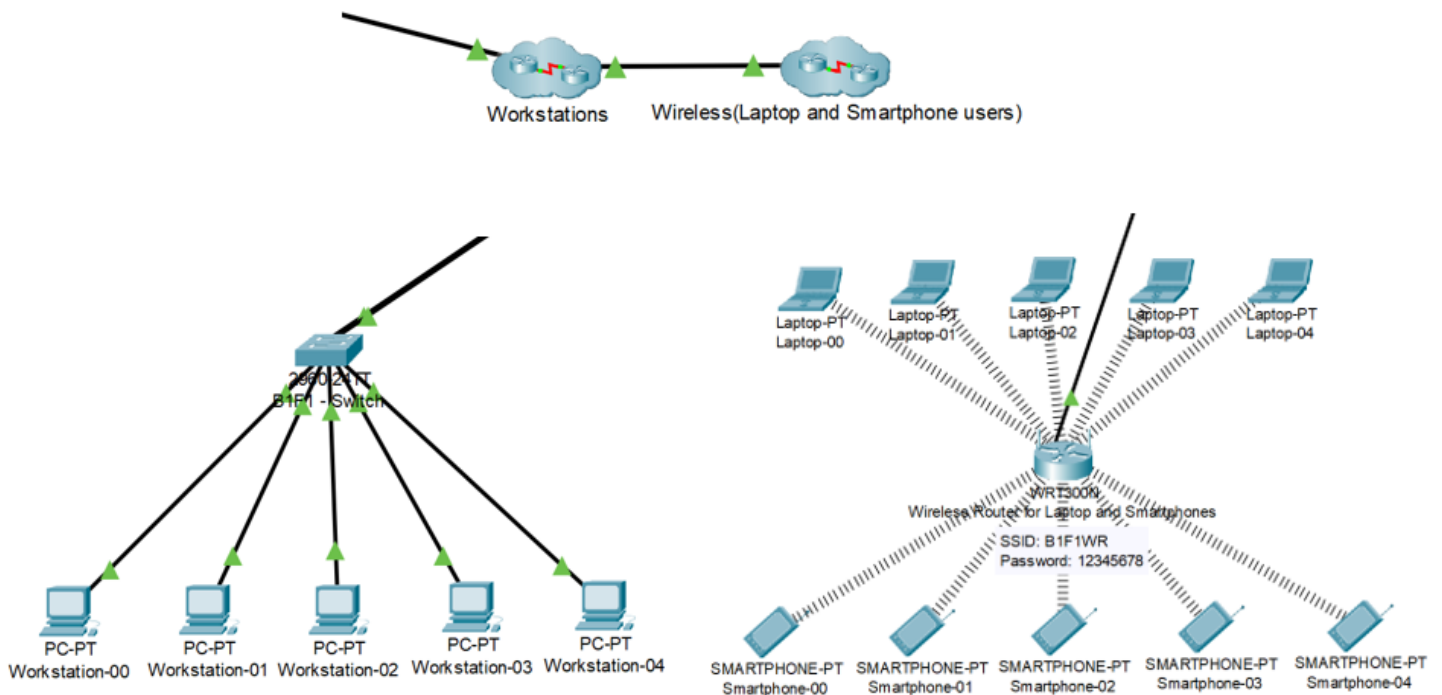
In order to use the project in the most efficient way, we used the right architecture, protocols and topologies considering our requirements. Therefore, the speed and efficiency of our network is sufficient to ensure user satisfaction.

## 2.5. Definitions of the System/Model

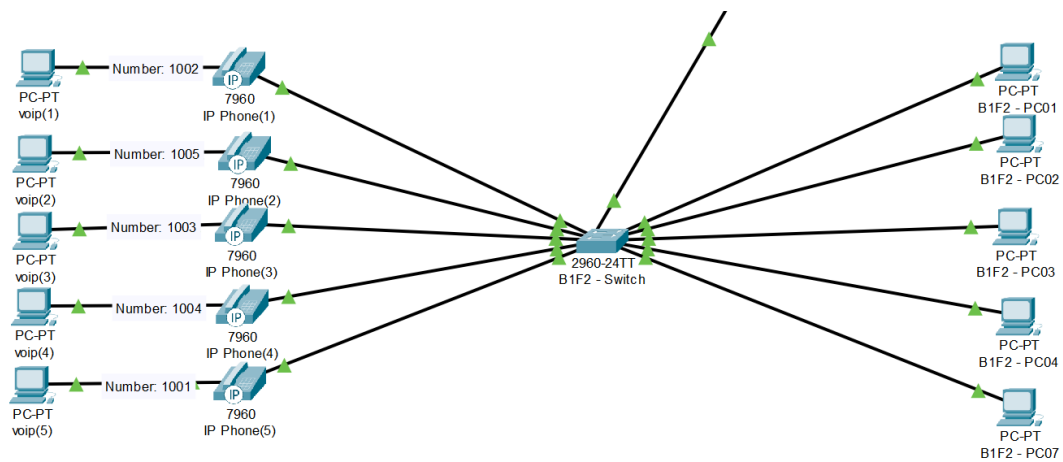
### General Design of the System



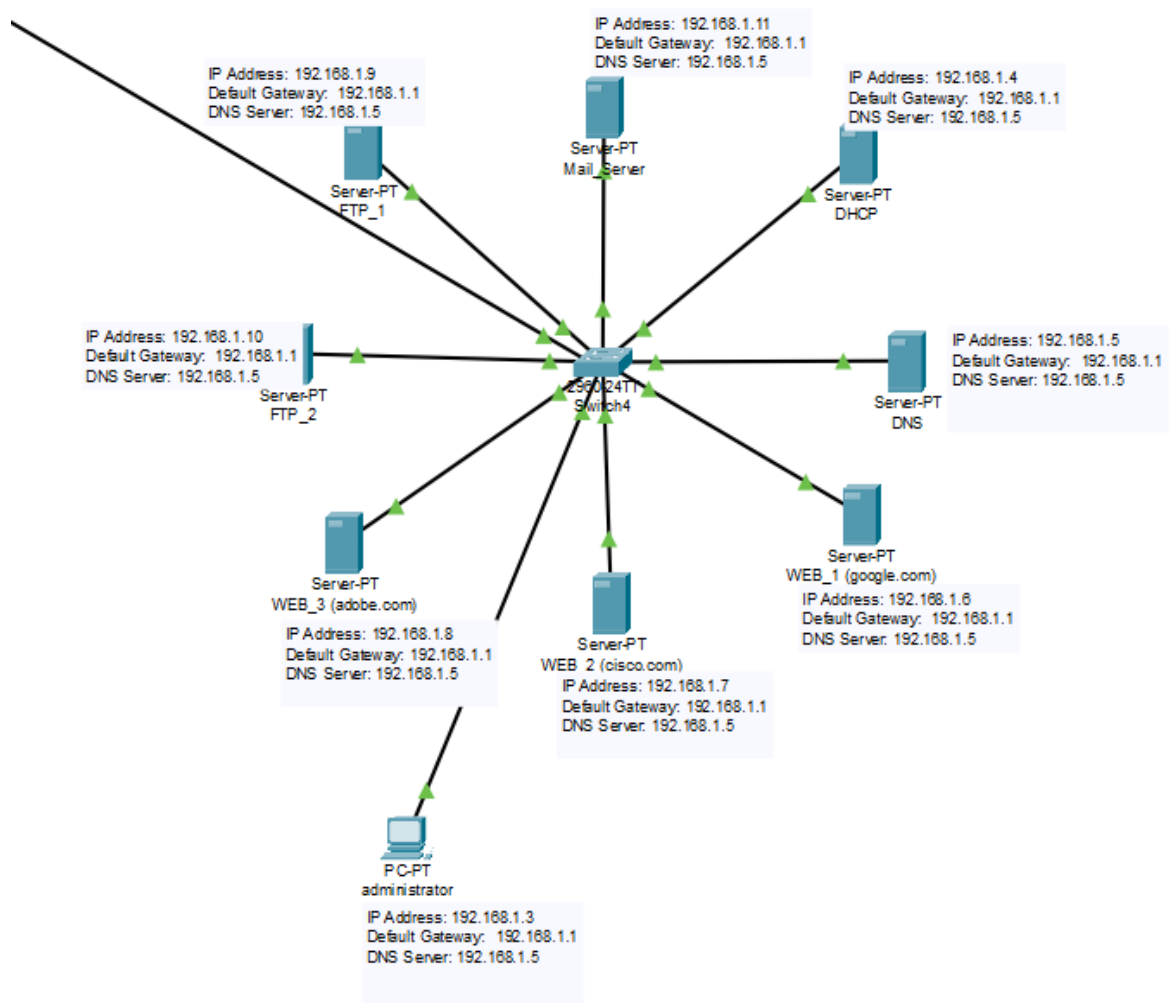
### First Branch First Facility



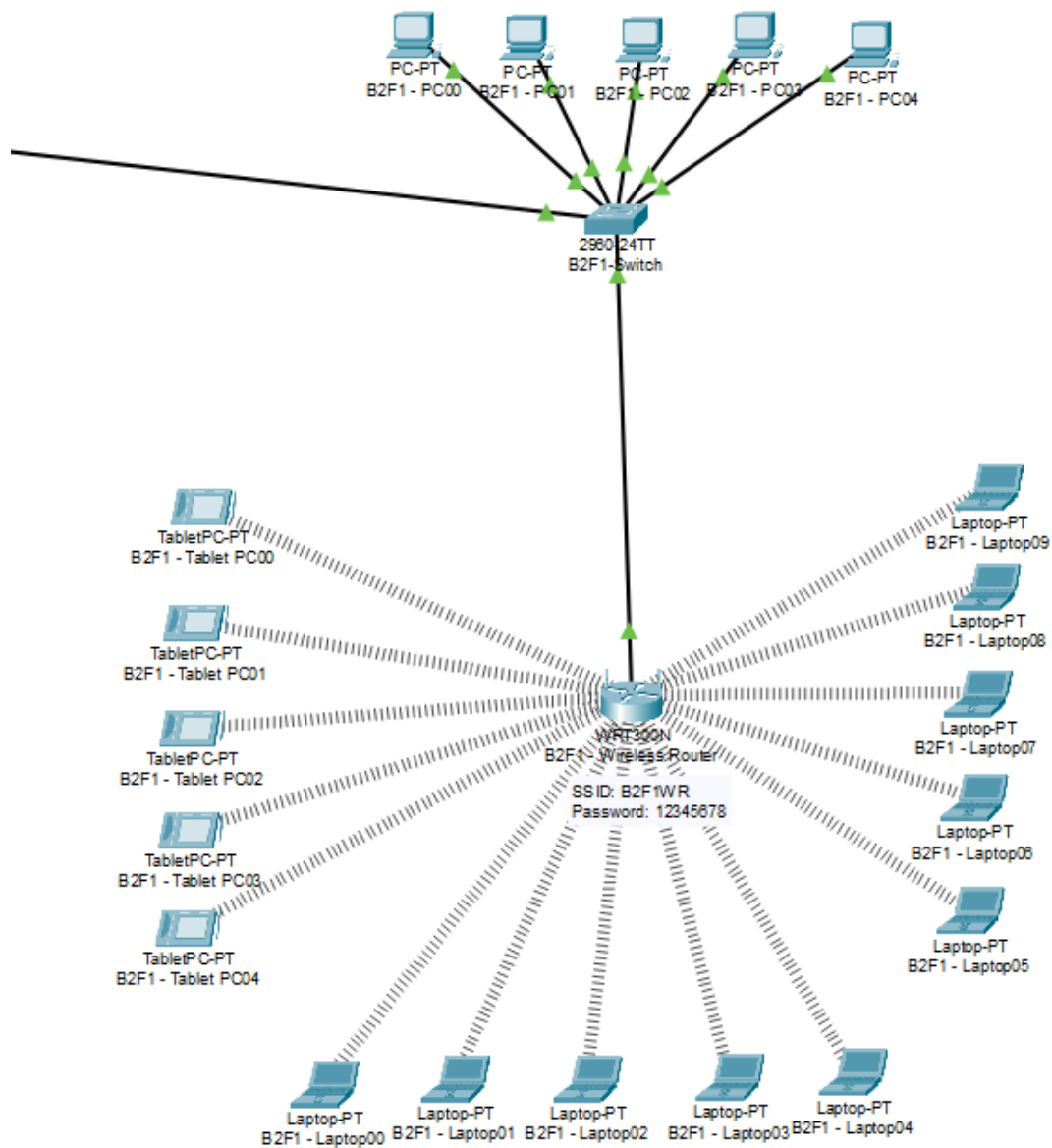
## First Branch Second Facility



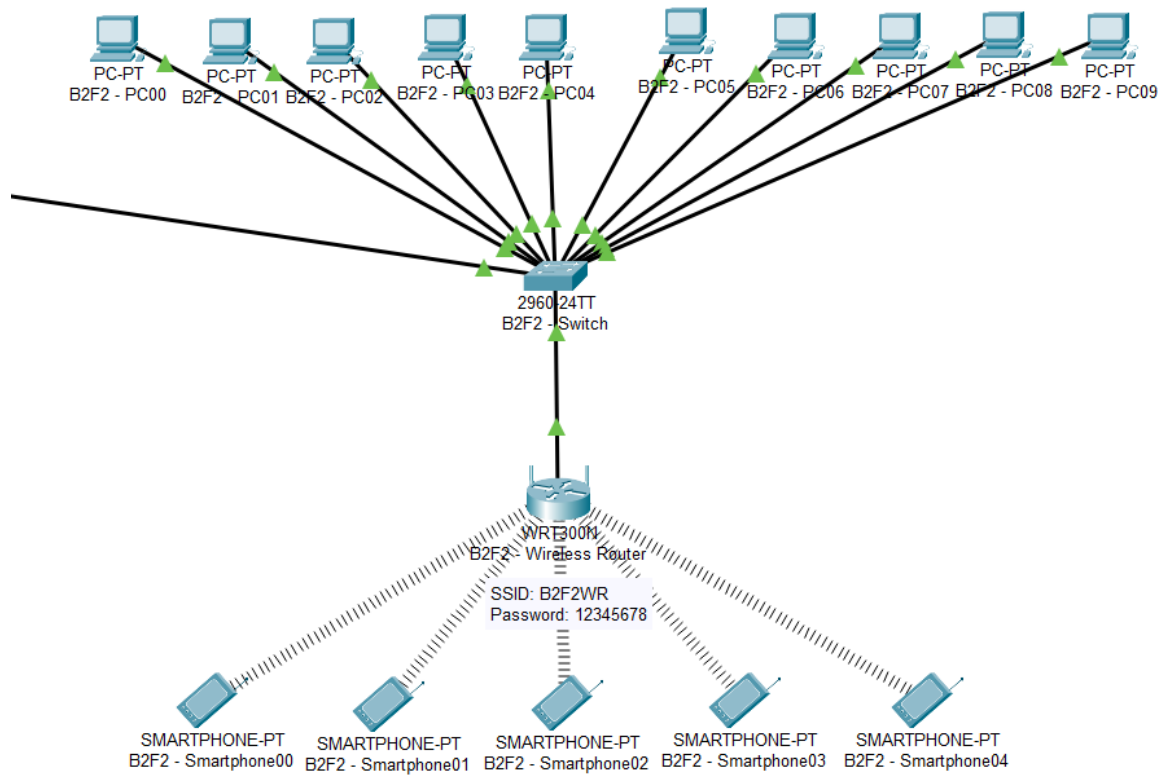
## First Branch Third Facility



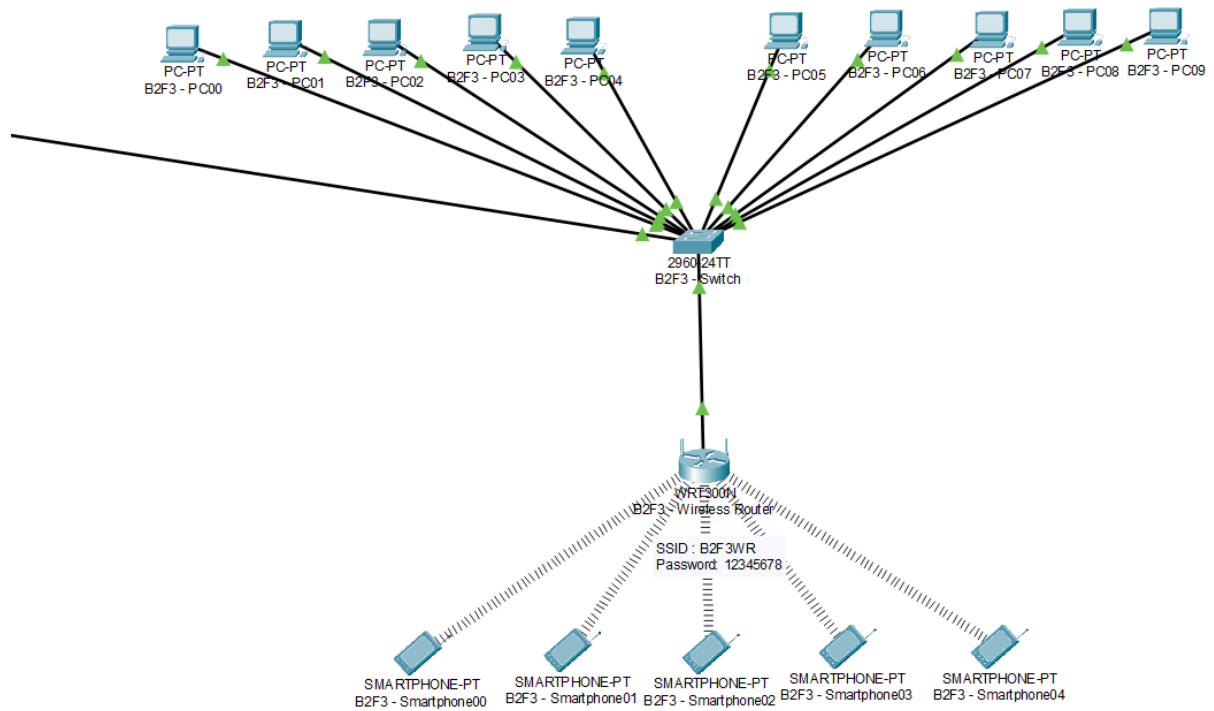
## Second Branch First Facility



## Second Branch Second Facility

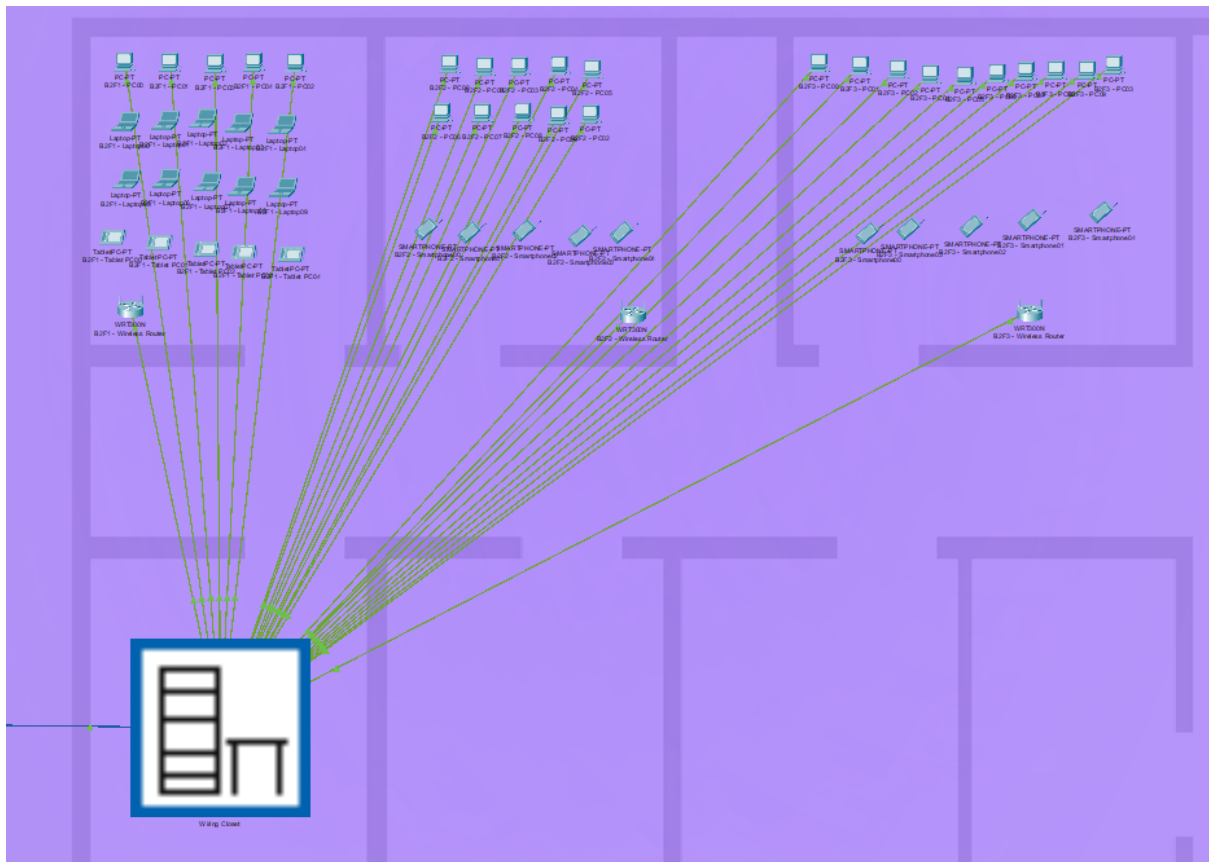


## Second Branch Third Facility



The diagram illustrates a two-branch network. A central gray area is flanked by two purple areas. On the left, a white rectangle labeled "Branch 1" is connected to the central area by a blue line with a green arrow pointing right. On the right, a white rectangle labeled "Branch 2" is connected to the central area by a blue line with a green arrow pointing left. The two blue lines meet in the center of the gray area, indicating a bidirectional flow or connection between the two branches.

## Second Branch



## 2.6. Simulation Elements

### System entities:

The screenshot shows a window titled "DHCP" with a standard Windows-style title bar (minimize, maximize, close buttons). The window has a tabbed interface with the following tabs: "Physical", "Config" (which is the active tab), "Services", "Desktop", "Programming", and "Attributes".

On the left side of the "Config" tab, there is a vertical sidebar with a tree view. The tree view has two main sections: "GLOBAL" and "INTERFACE". Under "GLOBAL", there are sub-items: "Settings" (which is selected), "Algorithm Settings", and "FastEthernet0".

The main area of the window displays the "Global Settings" for the selected "Settings" item. It contains the following fields and options:

- Display Name:** A text field containing the value "DHCP".
- Gateway/DNS IPv4:** A section with two radio buttons: "DHCP" (unselected) and "Static" (selected). Below the radio buttons are two text fields: "Default Gateway" with the value "192.168.1.1" and "DNS Server" with the value "192.168.1.5".
- Gateway/DNS IPv6:** A section with two radio buttons: "Automatic" (unselected) and "Static" (selected). Below the radio buttons are two empty text fields: "Default Gateway" and "DNS Server".

At the bottom left of the window, there is a "Top" button with a small square icon next to it.

*DHCP Server - Config*



DHCP

Physical

Config

Services

Desktop

Programming

Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DHCP

Interface

FastEthernet0

Service

On

Off

Pool Name

serverPool

Default Gateway

0.0.0.0

DNS Server

0.0.0.0

Start IP Address :

192

168

1

0

Subnet Mask:

255

255

255

0

Maximum Number of Users :

255

TFTP Server:

0.0.0.0

WLC Address:

0.0.0.0

Add

Save

Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
b2f3Pool	192.168....	192.168....	192.168....	255.255....	254	0.0.0.0	0.0.0.0
b2f2Pool	192.168....	192.168....	192.168....	255.255....	254	0.0.0.0	0.0.0.0
b2f1Pool	192.168....	192.168....	192.168....	255.255....	254	0.0.0.0	0.0.0.0
secondBranch	192.168....	192.168....	192.168....	255.255....	254	0.0.0.0	0.0.0.0
firstBranchPool...	192.168....	192.168....	192.168....	255.255....	254	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	192.168....	255.255....	255	0.0.0.0	0.0.0.0

Top

### DHCP Server - Services

DNS

—

□

×

Physical

Config

Services

Desktop

Programming

Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Global Settings

Display Name

DNS

Gateway/DNS IPv4

DHCP

Static

Default Gateway

192.168.1.1

DNS Server

192.168.1.5

Gateway/DNS IPv6

Automatic

Static

Default Gateway

DNS Server

Top

*DNS Server - Config*

DNS

Physical
 Config
 **Services**
 Desktop
 Programming
 Attributes

**SERVICES**

HTTP
 DHCP
 DHCPv6
 TFTP
 **DNS**
 SYSLOG
 AAA
 NTP
 EMAIL
 FTP
 IoT
 VM Management
 Radius EAP

DNS

DNS Service
 ☒ On
 ☐ Off

Resource Records
 Name
 
 Type
 A Record

Address

Add

Save

Remove

No.	Name	Type	Detail
0	www.adobe.com	A Record	192.168.1.8
1	www.cisco.com	A Record	192.168.1.7
2	www.google.com	A Record	192.168.1.6

DNS Cache

☐ Top

*DNS Server - Services*

FTP\_1

Physical **Config** Services Desktop Programming Attributes

**GLOBAL**  
Settings  
Algorithm Settings  
**INTERFACE**  
FastEthernet0

Global Settings

Display Name

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

☐ Top

*FTP1 Server - Config*

FTP\_1

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

FTP

Service ☒ On ☐ Off

User Setup

Username

Password

☐ Write
☐ Read
☐ Delete
☐ Rename
☐ List

	Username	Password	Permission	
1	admin	123	RWDNL	Add
2	cisco	cisco	RWDNL	Save
				Remove

File

1	asa842-k8.bin
2	asa923-k8.bin
3	c1841-advipservicesk9-mz.124-15.T1.bin
4	c1841-ipbase-mz.123-14.T7.bin
5	c1841-ipbasek9-mz.124-12.bin

Remove

☐ Top

*FTP1 Server - Services*

FTP\_2

Physical **Config** Services Desktop Programming Attributes

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

FastEthernet0

Global Settings

Display Name

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

☐ Top

*FTP2 Server - Config*

FTP\_2

PhysicalConfigServicesDesktopProgrammingAttributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

FTP

Service ☒ On ☐ Off

User Setup

Username

Password

☐ Write
☐ Read
☐ Delete
☐ Rename
☐ List

	Username	Password	Permission	
1	admin	123	RWDNL	Add
2	cisco	cisco	RWDNL	Save
				Remove

File

1	asa842-k8.bin
2	asa923-k8.bin
3	c1841-advipservicesk9-mz.124-15.T1.bin
4	c1841-ipbase-mz.123-14.T7.bin
5	c1841-ipbasek9-mz.124-12.bin

Remove

☐ Top

*FTP2 Server - Services*

Mail\_Server

Physical **Config** Services Desktop Programming Attributes

**GLOBAL**  
Settings  
Algorithm Settings  
**INTERFACE**  
FastEthernet0

Global Settings

Display Name Mail\_Server

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway 192.168.1.1

DNS Server 192.168.1.5

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

☐ Top

*Mail Server - Config*



Mail\_Server

Physical

Config

Services

Desktop

Programming

Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

EMAIL

SMTP Service

POP3 Service

Domain Name: soz.com

Set

User Setup

User

Password

b2f1\_ws00

b2f1\_ws01

b2f1\_ws02

b2f1\_ws03

b2f1\_ws04

b2f1\_tablet00

b2f1\_tablet01

b2f1\_tablet02

b2f1\_tablet03

b2f1\_tablet04

b2f1\_laptop00

b2f1\_laptop01

b2f1\_laptop02

b2f1\_laptop03

b2f1\_laptop04

b2f1\_laptop05

b2f1\_laptop06

b2f1\_laptop07

b2f1\_laptop08

b2f1\_laptop09

b2f3\_ws00

b2f3\_ws01

+

-

Change Password

Top

Mail Server - Services

WEB\_1 (google.com)

Physical

Config

Services

Desktop

Programming

Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Global Settings

Display Name

WEB\_1 (google.com)

Gateway/DNS IPv4

DHCP

Static

Default Gateway

192.168.1.1

DNS Server

192.168.1.5

Gateway/DNS IPv6

Automatic

Static

Default Gateway

DNS Server

Top

WEB1 Server - Config



WEB\_2 (cisco.com)

Physical **Config** Services Desktop Programming Attributes

**GLOBAL**  
Settings  
Algorithm Settings  
**INTERFACE**  
FastEthernet0

Global Settings

Display Name

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

☐ Top

*WEB2 Server - Config*

WEB\_2 (cisco.com)

Physical Config **Services** Desktop Programming Attributes

**SERVICES**

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

HTTP

HTTP ☒ On ☐ Off

HTTPS ☒ On ☐ Off

File Manager

	File Name	Edit	Delete
1	copyrights.html	(edit)	(delete)
2	cscoptlogo177x111.jpg		(delete)
3	events.html	(edit)	(delete)
4	helloworld.html	(edit)	(delete)
5	image.html	(edit)	(delete)
6	index.html	(edit)	(delete)
7	partners.html	(edit)	(delete)
8	products.html	(edit)	(delete)
9	support.html	(edit)	(delete)

New File Import

☐ Top

*WEB2 Server - Services*

WEB\_3 (adobe.com)

Physical **Config** Services Desktop Programming Attributes

**GLOBAL** ^

Settings

Algorithm Settings

**INTERFACE**

FastEthernet0

Global Settings

Display Name

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

☐ Top

*WEB3 Server - Config*

WEB\_3 (adobe.com)

Physical Config **Services** Desktop Programming Attributes

**SERVICES**

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

HTTP

HTTP ☒ On ☐ Off

HTTPS ☒ On ☐ Off

File Manager

	File Name	Edit	Delete
1	business.html	(edit)	(delete)
2	copyrights.html	(edit)	(delete)
3	creativity.html	(edit)	(delete)
4	cscoptlogo177x111.jpg		(delete)
5	helloworld.html	(edit)	(delete)
6	image.html	(edit)	(delete)
7	index.html	(edit)	(delete)
8	marketing.html	(edit)	(delete)
9	pdf.html	(edit)	(delete)

New File Import

☐ Top

*WEB3 Server - Services*

B2F1 - PC00

Physical Config **Desktop** Programming Attributes

**Configure Mail** X

User Information

Your Name: B2F1\_PC00

EmailAddress: b2f1\_ws00@soz.com

Server Information

Incoming Mail Server: 192.168.1.11

Outgoing Mail Server: 192.168.1.11

Logon Information

User Name: b2f1\_ws00

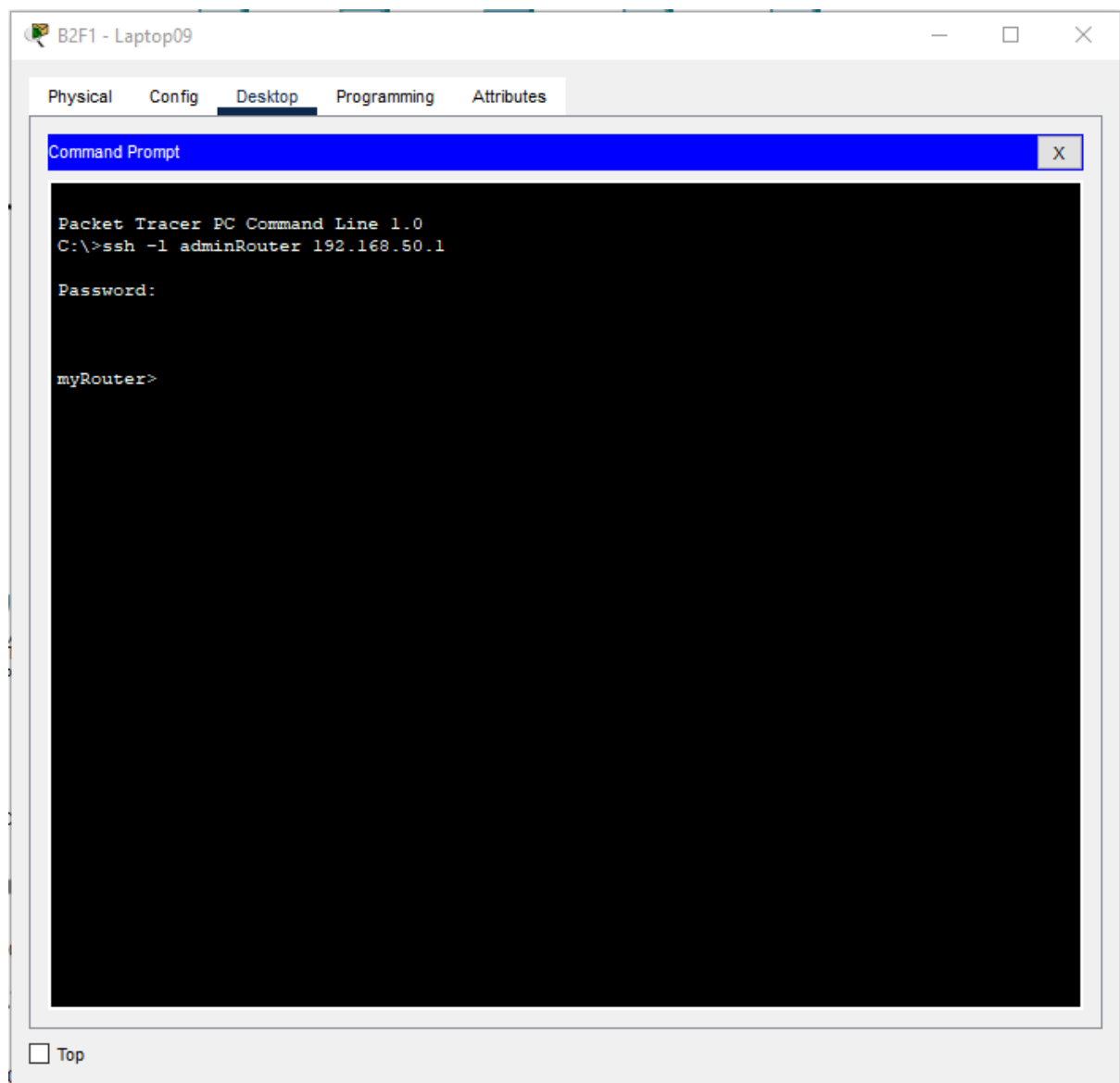
Password: ....

Save Clear Reset





☐ Top

*E-Mail Configuration Example*





*SSH Login Example*

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	B2F1 ...	Mail_Server	ICMP		56.289	N	0	(edit)	
	In Progress	B2F1 ...	Mail_Server	ICMP		0.000	N	1	(edit)	

*Scenario Output Example*

## CHAPTER THREE

### TRAFFIC ANALYSIS AND SIMULATION RESULTS

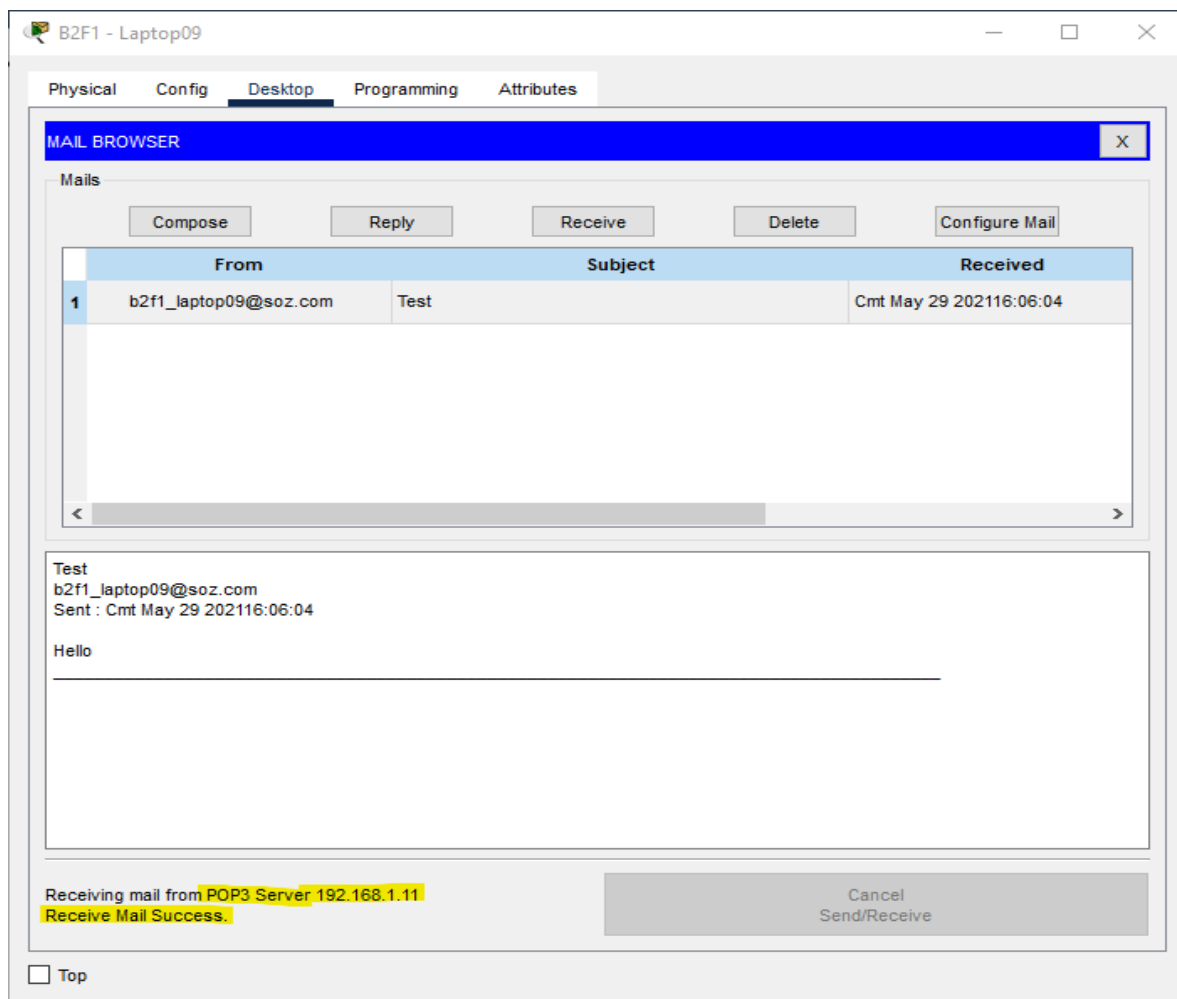
**Scenario 1:** A wireless user from first facility of second branch wants to read emails and browse Web.

The read mail process was performed by communicating between the Laptop09 user and the mail server. The network path followed for this scenario is as follows.

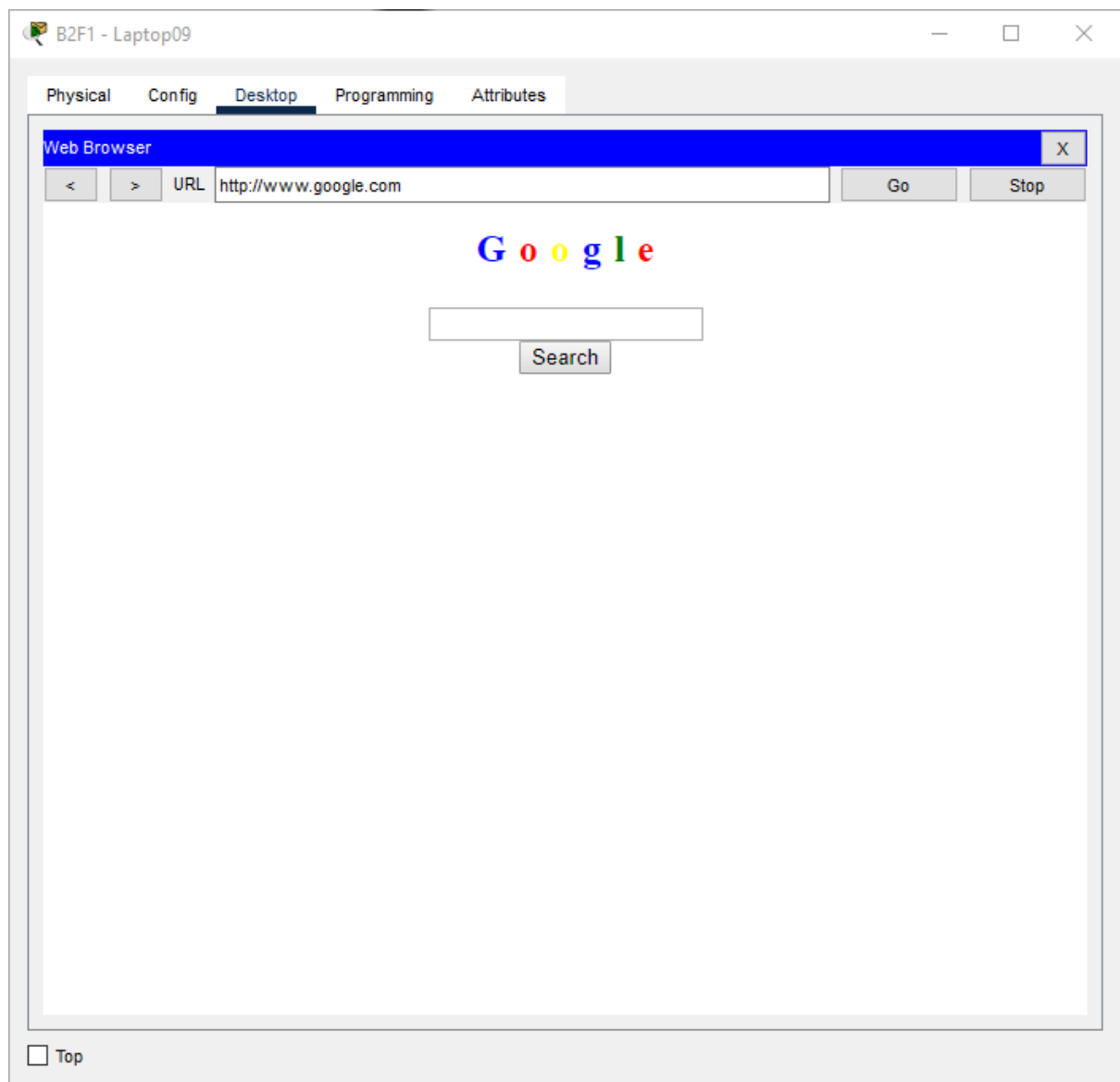
B2F1-Laptop09, B2F1-Wireless Router, B2F1-Switch, Branch2-Router, B1-ServerRouter, Server Switch, Mail\_Server The network path was repeated more than once to make the scenario happen.

By providing communication between Laptop09 user and web server, browse web operation was performed. The network path followed for this scenario is as follows.

B2F1-Laptop09, B2F1-Wireless Router, B2F1-Switch, Branch2-Router, B1-ServerRouter, Server Switch, WEB\_1 The network path was repeated more than once to make the scenario happen.



Result of Scenario 1 for read mail



Result of Scenario 1 for browse Web

PDU Information at Device: B2F1 - Laptop09

OSI Model

Outbound PDU Details

At Device: B2F1 - Laptop09

Source: B2F1 - Laptop09

Destination: 192.168.1.11

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

Out Layers

Layer7
Layer6
Layer5
Layer 4: TCP Src Port: 1030, Dst Port: 110
Layer 3: IP Header Src. IP: 192.168.0.101, Dst. IP: 192.168.1.11
Layer 2: Wireless
Layer 1: Port(s):

1. The device closes the TCP connection to 192.168.1.11 on port 110.
2. The device sets the connection state to FIN\_WAIT\_1.
3. The device sends a TCP FIN+ACK segment.
4. Sent segment information: the sequence number 97, the ACK number 23, and the data length 20.

Challenge Me

<< Previous Layer

Next Layer >>

OSI Model of Scenario 1 for read mail

At Device: B2F1 - Laptop09  
 Source: B2F1 - Laptop09  
 Destination: 192.168.1.6

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer7
Layer6
Layer5
Layer 4: TCP Src Port: 1034, Dst Port: 80
Layer 3: IP Header Src. IP: 192.168.0.101, Dst. IP: 192.168.1.6
Layer 2: Wireless
Layer 1: Port(s):

1. The device closes the TCP connection to 192.168.1.6 on port 80.
2. The device sets the connection state to FIN\_WAIT\_1.
3. The device sends a TCP FIN+ACK segment.
4. Sent segment information: the sequence number 104, the ACK number 522, and the data length 20.

[Challenge Me](#)
[<< Previous Layer](#)
[Next Layer >>](#)

OSI Model of Scenario 1 for browse Web

## PDU Formats

**802.11 Wireless**

0 16 Bits

FRAME CONTROL	DURATION/ID
ADDRESS 1:0040.0B6A.6106	
↑	↑
ADDRESS 2:0030.F2E0.16DA	
ADDRESS 3:0002.17AE.00D6	
↑	↑
SEQUENCE CONTROL	
ADDRESS 4:	
↑	↑
DATA (VARIABLE LENGTH)	
FCS	

**IP**

0 4 8 16 20 24 Bits

VER:4	IHL:5	DSCP:0x00	TL:40
ID:0x002d		FLA GS:	FRAG OFFSET:0x000
TTL:128	PRO:0x06	CHKSUM	
SRC IP:192.168.0.101			
DST IP:192.168.1.11			
DATA (VARIABLE LENGTH)			

**TCP**

0 4 8 16 24 Bits

SOURCE PORT:1030		DESTINATION PORT:110	
SEQUENCE NUMBER:97			
ACKNOWLEDGEMENT NUMBER:23			
OFF SET:	RES ERV	FLAGS:0b0001 0001	WINDOW:65535
CHECKSUM:0x0000		URGENT POINTER:0x0000	

PDU Output of Scenario 1 for read mail

PDU Formats

802.11 Wireless
0 16 32 48 64 80 96 112 128 144 160 176 192 208 224 240 256 272 288 304 320 336 352 368 384 400 416 432 448 464 480 496 512 528 544 560 576 592 608 624 640 656 672 688 704 720 736 752 768 784 800 816 832 848 864 880 896 912 928 944 960 976 992 1008 1024 Bits

FRAME CONTROL																DURATION/ID															
ADDRESS 1:0040.0B6A.6106																															
ADDRESS 2:0030.F2E0.16DA																															
ADDRESS 3:0002.17AE.00D6																															
																SEQUENCE CONTROL															
ADDRESS 4:																															
DATA (VARIABLE LENGTH)																															
FCS																															

IP
0 4 8 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 184 188 192 196 200 204 208 212 216 220 224 228 232 236 240 244 248 252 256 260 264 268 272 276 280 284 288 292 296 300 304 308 312 316 320 324 328 332 336 340 344 348 352 356 360 364 368 372 376 380 384 388 392 396 400 404 408 412 416 420 424 428 432 436 440 444 448 452 456 460 464 468 472 476 480 484 488 492 496 500 504 508 512 516 520 524 528 532 536 540 544 548 552 556 560 564 568 572 576 580 584 588 592 596 600 604 608 612 616 620 624 628 632 636 640 644 648 652 656 660 664 668 672 676 680 684 688 692 696 700 704 708 712 716 720 724 728 732 736 740 744 748 752 756 760 764 768 772 776 780 784 788 792 796 800 804 808 812 816 820 824 828 832 836 840 844 848 852 856 860 864 868 872 876 880 884 888 892 896 900 904 908 912 916 920 924 928 932 936 940 944 948 952 956 960 964 968 972 976 980 984 988 992 996 1000 1004 1008 1012 1016 1020 1024 Bits

VER:4				IHL:5				DSCP:0x00								TL:40																			
ID:0x0043																FLAG S:0x2				FRAG OFFSET:0x000															
TTL:128								PRO:0x06								CHKSUM																			
SRC IP:192.168.0.101																																			
DST IP:192.168.1.6																																			
DATA (VARIABLE LENGTH)																																			

TCP
0 4 8 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 184 188 192 196 200 204 208 212 216 220 224 228 232 236 240 244 248 252 256 260 264 268 272 276 280 284 288 292 296 300 304 308 312 316 320 324 328 332 336 340 344 348 352 356 360 364 368 372 376 380 384 388 392 396 400 404 408 412 416 420 424 428 432 436 440 444 448 452 456 460 464 468 472 476 480 484 488 492 496 500 504 508 512 516 520 524 528 532 536 540 544 548 552 556 560 564 568 572 576 580 584 588 592 596 600 604 608 612 616 620 624 628 632 636 640 644 648 652 656 660 664 668 672 676 680 684 688 692 696 700 704 708 712 716 720 724 728 732 736 740 744 748 752 756 760 764 768 772 776 780 784 788 792 796 800 804 808 812 816 820 824 828 832 836 840 844 848 852 856 860 864 868 872 876 880 884 888 892 896 900 904 908 912 916 920 924 928 932 936 940 944 948 952 956 960 964 968 972 976 980 984 988 992 996 1000 1004 1008 1012 1016 1020 1024 Bits

SOURCE PORT:1034																DESTINATION PORT:80															
SEQUENCE NUMBER:104																															
ACKNOWLEDGEMENT NUMBER:522																															
OFFS ET:0x				RESE RVED				FLAGS:0b000100 01								WINDOW:65535															
CHECKSUM:0x0000																URGENT POINTER:0x0000															

PDU Output of Scenario 1 for browse Web

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.006	B2F1 - Wire...	B2F1 - Laptop05	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop00	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop03	TCP
	0.006	B2F1 - Wire...	B2F1 - Tablet PC04	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop01	TCP
	0.006	B2F1 - Wire...	B2F1 - Tablet PC00	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop06	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop08	TCP
	0.006	B2F1 - Wire...	B2F1 - Laptop09	TCP
	0.006	B2F1 - Wire...	B2F1 - Tablet PC02	TCP
	0.006	B2F1 - Wire...	B2F1 - Tablet PC01	TCP
	0.010	Branch2 - R...	B2F1-Switch	TCP
	0.011	B2F1-Switch	B2F1 - Wireless Router	TCP
	0.012	B2F1 - Wire...	B2F1 - Tablet PC03	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop07	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop02	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop04	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop05	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop00	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop03	TCP
	0.012	B2F1 - Wire...	B2F1 - Tablet PC04	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop01	TCP
	0.012	B2F1 - Wire...	B2F1 - Tablet PC00	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop06	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop08	TCP
	0.012	B2F1 - Wire...	B2F1 - Laptop09	TCP
	0.012	B2F1 - Wire...	B2F1 - Tablet PC02	TCP
	0.012	B2F1 - Wire...	B2F1 - Tablet PC01	TCP
	0.012	--	B2F1 - Laptop09	POP3
	0.016	--	B2F1 - Laptop09	TCP

Reset Simulation
☒ Constant Delay
Captured to: 0.036 s

Play Controls

Event List Filters - Visible Events  
HTTP, HTTPS, POP3, SMTP, TCP

Edit Filters
Show All/None

Event List of Scenario 1 for read mail



Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.060	B2F1 - Wireles...	B2F1 - Laptop08	TCP
	0.060	B2F1 - Wireles...	B2F1 - Laptop09	TCP
	0.060	B2F1 - Wireles...	B2F1 - Tablet PC02	TCP
	0.060	B2F1 - Wireles...	B2F1 - Laptop06	TCP
	0.060	B2F1 - Wireles...	B2F1 - Tablet PC01	TCP
	0.060	B2F1 - Wireles...	B2F1 - Laptop07	TCP
	0.060	B2F1 - Wireles...	B2F1 - Tablet PC03	TCP
	0.060	B2F1 - Wireles...	B2F1 - Tablet PC04	TCP
	0.060	B2F1 - Wireles...	B2F1 - Laptop04	TCP
	0.061	--	B2F1 - Wireless Router	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop05	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop00	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop01	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop02	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop03	TCP
	0.062	B2F1 - Wireles...	B2F1 - Tablet PC00	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop08	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop09	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop04	TCP
	0.062	B2F1 - Wireles...	B2F1 - Tablet PC02	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop06	TCP
	0.062	B2F1 - Wireles...	B2F1 - Tablet PC01	TCP
	0.062	B2F1 - Wireles...	B2F1 - Laptop07	TCP
	0.062	B2F1 - Wireles...	B2F1 - Tablet PC03	TCP
	0.062	B2F1 - Wireles...	B2F1 - Tablet PC04	TCP
	0.062	--	B2F1 - Laptop09	HTTP

Reset Simulation
☒ Constant Delay
Captured to: 48.882 s

Play Controls

Event List Filters - Visible Events  
HTTP, HTTPS, POP3, SMTP, TCP

Edit Filters
Show All/None

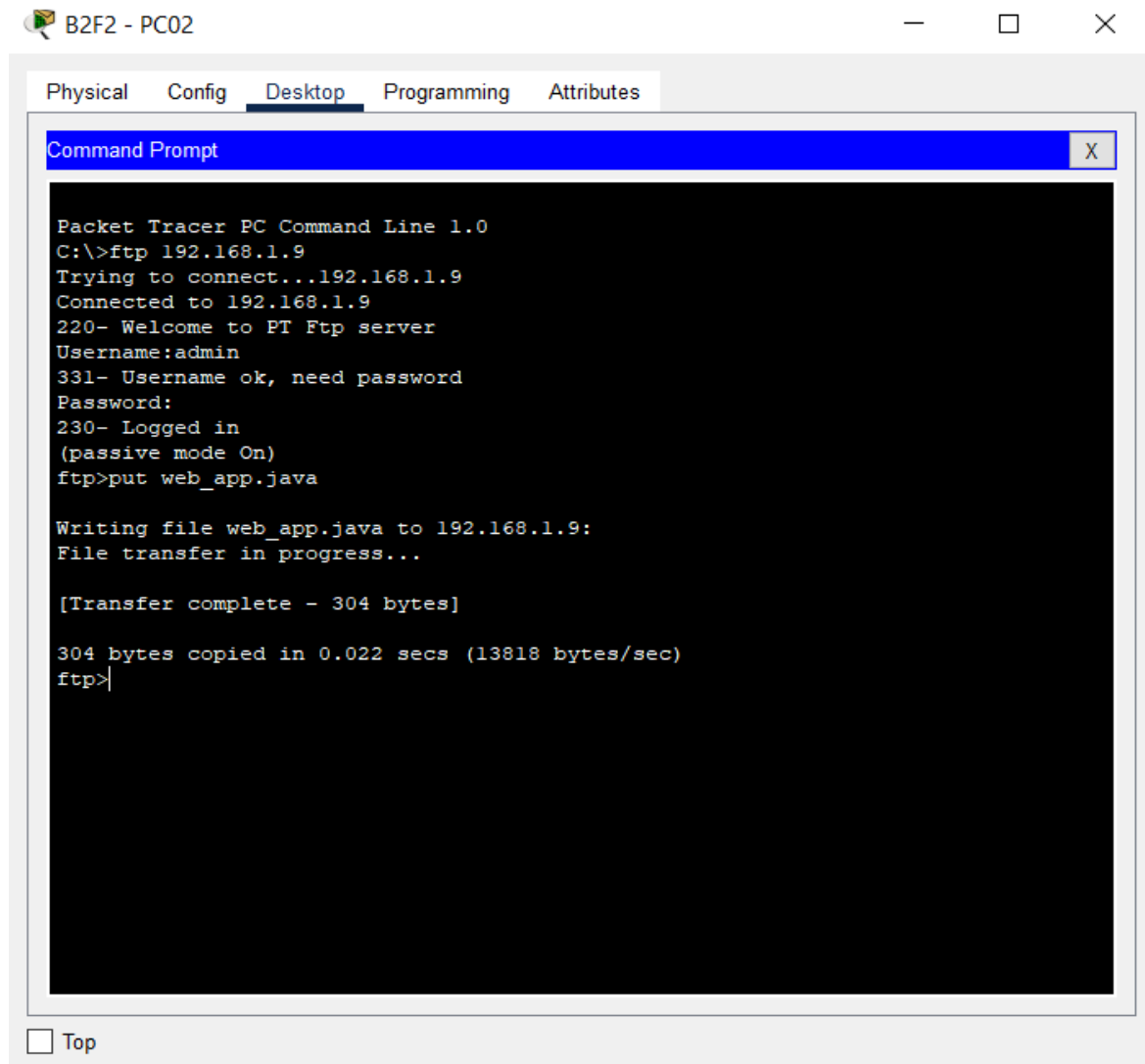
Event List of Scenario 1 for browse Web

**Scenario 2 :** A computer engineer from second facility of second branch developed a web application and wants to send her code files to FTP server in the third facility of first branch.

Network connection established between FTP server and PC02 user. The network path followed when sending files to the FTP server of the PC02 user is as follows.

B2F2-PC02,B2F2-Switch,Branch2-Router,B1-ServerRouter,Server Switch,FTP\_1,Server Switch,B1-ServerRouter,Branch2-Router,B2F2-Switch,B2F2-PC02

This network path was repeated more than once until the process was finished.



```
Packet Tracer PC Command Line 1.0
C:\>ftp 192.168.1.9
Trying to connect...192.168.1.9
Connected to 192.168.1.9
220- Welcome to PT Ftp server
Username:admin
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>put web_app.java

Writing file web_app.java to 192.168.1.9:
File transfer in progress...

[Transfer complete - 304 bytes]

304 bytes copied in 0.022 secs (13818 bytes/sec)
ftp>
```

Result of Scenario 2

**OSI Model**   Inbound PDU Details

At Device: B2F2 - PC02  
Source: FTP\_1  
Destination: 192.168.1.9

**In Layers**

Layer 7: FTP
Layer6
Layer5
Layer 4: TCP Src Port: 21, Dst Port: 1025
Layer 3: IP Header Src. IP: 192.168.1.9, Dest. IP: 192.168.51.121
Layer 2: Ethernet II Header 00D0.BAC3.AE7E >> 0001.979B.66D0
Layer 1: Port FastEthernet0

**Out Layers**

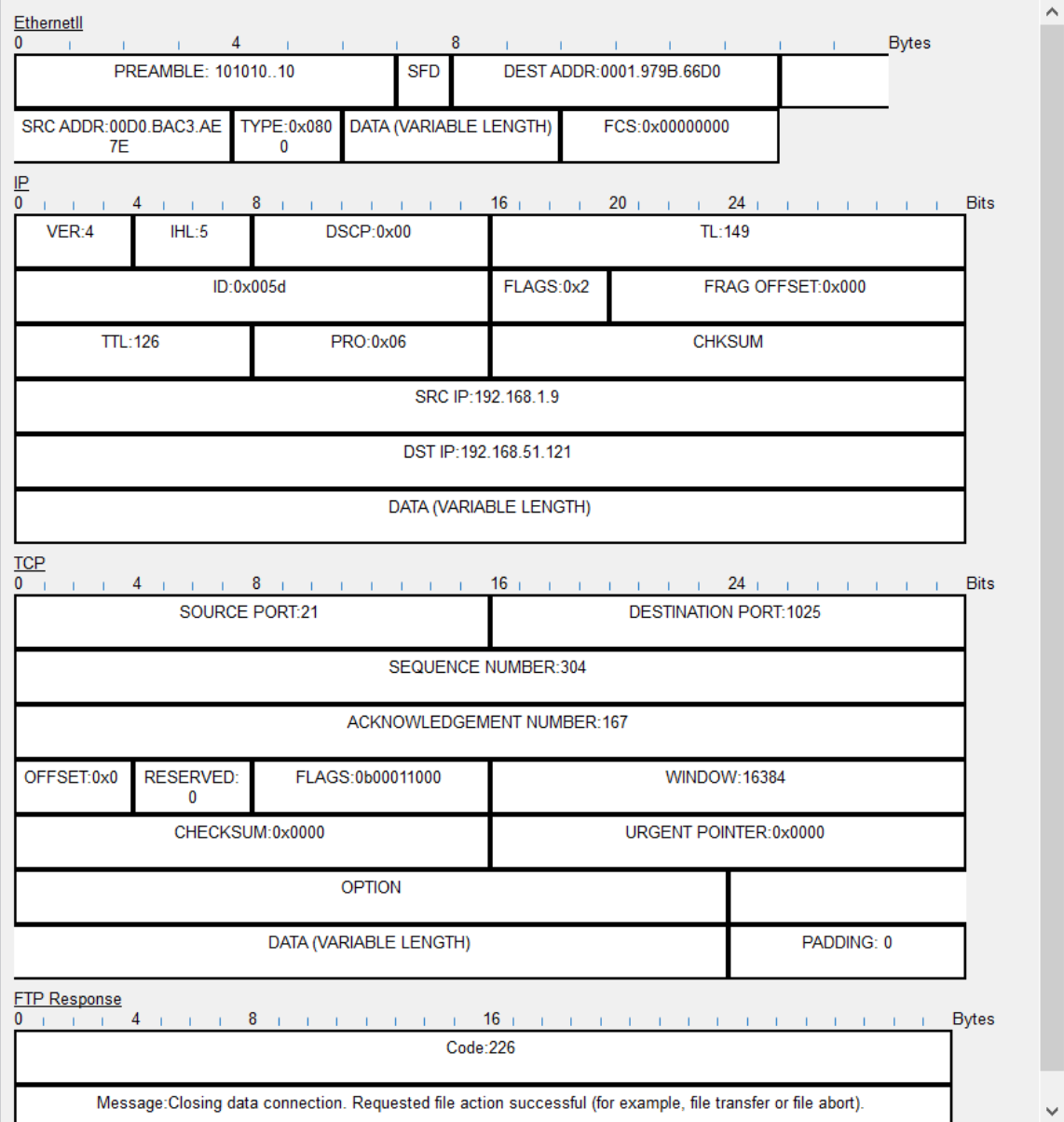
Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

1. FastEthernet0 receives the frame.

[Challenge Me](#)[<< Previous Layer](#)[Next Layer >>](#)

## OSI Model of Scenario 2

## PDU Formats



PDU Output of Scenario 2

## Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.162	B2F2 - Switch	Branch2 - Router	FTP
	0.169	Branch2 - R...	B2F2 - Switch	FTP
	0.170	B2F2 - Switch	B2F2 - PC02	FTP
	0.170	--	B2F2 - PC02	FTP
	0.171	B2F2 - PC02	B2F2 - Switch	FTP
	0.172	B2F2 - Switch	Branch2 - Router	FTP
	0.179	Branch2 - R...	B2F2 - Switch	FTP
	0.180	B2F2 - Switch	B2F2 - PC02	FTP
	0.180	--	B2F2 - PC02	TCP
	0.181	B2F2 - PC02	B2F2 - Switch	TCP
	0.182	B2F2 - Switch	Branch2 - Router	TCP
	0.189	Branch2 - R...	B2F2 - Switch	TCP
	0.190	B2F2 - Switch	B2F2 - PC02	TCP
	0.190	--	B2F2 - PC02	FTP
	0.191	B2F2 - PC02	B2F2 - Switch	TCP
	0.191	--	B2F2 - PC02	FTP
	0.192	--	B2F2 - PC02	TCP
	0.192	B2F2 - PC02	B2F2 - Switch	FTP
	0.192	B2F2 - Switch	Branch2 - Router	TCP
	0.192	--	B2F2 - PC02	TCP
	0.193	B2F2 - PC02	B2F2 - Switch	TCP
	0.193	B2F2 - Switch	Branch2 - Router	FTP
	0.194	B2F2 - Switch	Branch2 - Router	TCP
	0.200	Branch2 - R...	B2F2 - Switch	TCP
	0.201	Branch2 - R...	B2F2 - Switch	FTP
	0.201	B2F2 - Switch	B2F2 - PC02	TCP
	0.201	--	B2F2 - PC02	TCP
	0.202	B2F2 - Switch	B2F2 - PC02	FTP
	0.202	B2F2 - PC02	B2F2 - Switch	TCP
	0.203	B2F2 - Switch	Branch2 - Router	TCP

Reset Simulation

☒ Constant DelayCaptured to:  
0.203 s

## Play Controls



## Event List Filters - Visible Events

ARP, DHCP, FTP, TCP

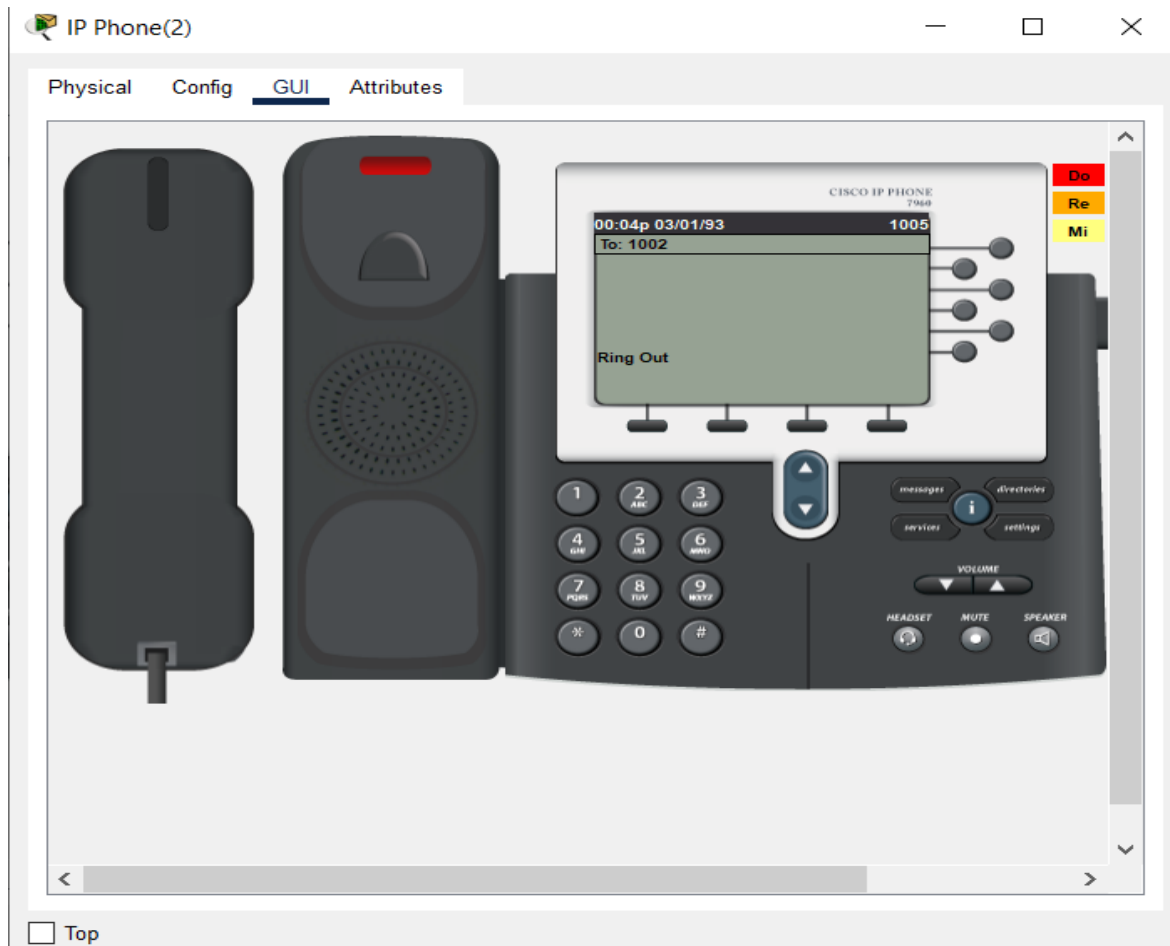
Edit Filters

Show All/None

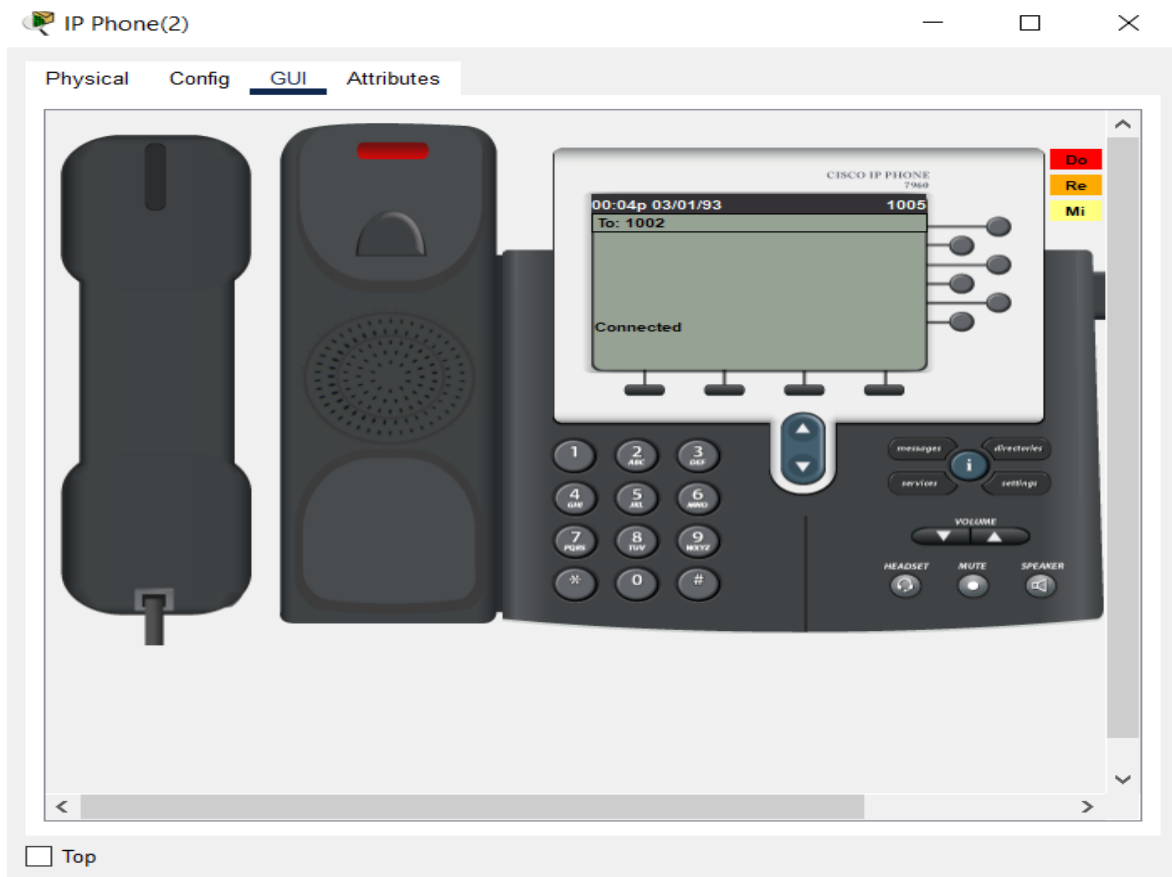
Event List of Scenario 2

**Scenario 3 :** Two users from second facility of first branch want to talk via VoIP.

VoIP conference was held between IP Phone(2) user and IP Phone(1) user. The network path followed for this scenario is as follows. B1F2-Switch, Branch1-Router, B1F2-Switch, IP Phone(2), B1F2-Switch, Branch1-Router, B1F2-Switch, IP Phone(1), IP Phone(2), B1F2-Switch(twice for IP Phones ), Branch1-Router, IP Phone(2), IP Phone(1)



Result of Scenario 3



Result of Scenario 3

PDU Information at Device: IP Phone(2)

OSI Model    Inbound PDU Details    Outbound PDU Details

At Device: IP Phone(2)  
Source: IP Phone(1)  
Destination: 1002

**In Layers**

Layer 7: SCCP MESSAGE
Layer 6
Layer 5
Layer 4: TCP Src Port: 2000, Dst Port: 1025
Layer 3: IP Header Src. IP: 192.168.41.1, Dest. IP: 192.168.41.9
Layer 2: Ethernet II Header 0010.11DE.AC01 >> 00E0.8F48.2722
Layer 1: Port Switch

**Out Layers**

Layer 7
Layer 6
Layer 5
Layer 4: TCP Src Port: 1025, Dst Port: 2000
Layer 3: IP Header Src. IP: 192.168.41.9, Dest. IP: 192.168.41.1
Layer 2: Ethernet II Header 00E0.8F48.2722 >> 0010.11DE.AC01
Layer 1: Port(s): Switch

1. Switch receives the frame.

Challenge Me    << Previous Layer    Next Layer >>

OSI Model of Scenario 3

## PDU Formats

EthernetII																									
0 4 8 Bytes																									
PREAMBLE: 101010..10												SFD		DEST ADDR:00E0.8F48.2722											
SRC ADDR:0010.11DE.AC0						TYPE:0x080		DATA (VARIABLE LENGTH)								FCS:0x00000000									
1						0																			
IP																									
0 4 8 16 20 24 Bits																									
VER:4				IHL:5				DSCP:0x00								TL:41									
ID:0x0103												FLAGS:0x2				FRAG OFFSET:0x000									
TTL:255						PRO:0x06						CHKSUM													
SRC IP:192.168.41.1																									
DST IP:192.168.41.9																									
DATA (VARIABLE LENGTH)																									
TCP																									
0 4 8 16 24 Bits																									
SOURCE PORT:2000												DESTINATION PORT:1025													
SEQUENCE NUMBER:421																									
ACKNOWLEDGEMENT NUMBER:379																									
OFFSET:0x0				RESERVED:0				FLAGS:0b00011000								WINDOW:65535									
CHECKSUM:0x0000												URGENT POINTER:0x0000													
OPTION																									
DATA (VARIABLE LENGTH)																PADDING: 0									
SCCP																									
0 16 Bits																									
Type:261												Port:0													

PDU Output of Scenario 3



## PDU Formats

<u>EthernetII</u>																								Bytes					
PREAMBLE: 101010...10												SFD		DEST ADDR: 0010.11DE.AC01															
SRC ADDR: 00E0.8F48.2722								TYPE: 0x0800				DATA (VARIABLE LENGTH)								FCS: 0x00000000									
<u>IP</u>																								Bits					
VER: 4		IHL: 5		DSCP: 0x00								TL: 41																	
ID: 0x002a												FLAGS: 0x0				FRAG OFFSET: 0x000													
TTL: 255						PRO: 0x06						CHKSUM																	
SRC IP: 192.168.41.9																													
DST IP: 192.168.41.1																													
DATA (VARIABLE LENGTH)																													
<u>TCP</u>																								Bits					
SOURCE PORT: 1025												DESTINATION PORT: 2000																	
SEQUENCE NUMBER: 379																													
ACKNOWLEDGEMENT NUMBER: 442																													
OFFSET: 0x0		RESERVED: 0		FLAGS: 0b00011000								WINDOW: 65535																	
CHECKSUM: 0x0000												URGENT POINTER: 0x0000																	
OPTION																													
DATA (VARIABLE LENGTH)																		PADDING: 0											
<u>SCCP</u>																								Bits					
Type: 34												Port: 0																	

PDU Output of Scenario 3

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.026	IP Phone(2)	B1F2 - Switch	TCP
	0.026	B1F2 - Switch	Branch1 - Router	TCP
	0.027	B1F2 - Switch	Branch1 - Router	TCP
	0.592	--	B1F2 - Switch	STP
	0.593	B1F2 - Switch	IP Phone(3)	STP
	0.593	B1F2 - Switch	IP Phone(4)	STP
	0.593	B1F2 - Switch	Branch1 - Router	STP
	0.593	B1F2 - Switch	IP Phone(1)	STP
	0.593	B1F2 - Switch	IP Phone(2)	STP
	0.593	B1F2 - Switch	B1F2 - PC04	STP
	0.593	B1F2 - Switch	B1F2 - PC07	STP
	0.593	B1F2 - Switch	B1F2 - PC01	STP
	0.593	B1F2 - Switch	B1F2 - PC02	STP
	0.593	B1F2 - Switch	IP Phone(5)	STP
	0.593	B1F2 - Switch	B1F2 - PC03	STP
	0.594	IP Phone(3)	voip(3)	STP
	0.594	IP Phone(4)	voip(4)	STP
	0.594	IP Phone(1)	voip(1)	STP
	0.594	IP Phone(2)	voip(2)	STP
	0.594	IP Phone(5)	voip(5)	STP
	0.594	--	IP Phone(1)	SCCP
	0.595	IP Phone(1)	B1F2 - Switch	SCCP
	0.596	B1F2 - Switch	Branch1 - Router	SCCP
	0.597	Branch1 - Router	B1F2 - Switch	SCCP
	0.597	--	Branch1 - Router	SCCP
	0.598	Branch1 - Router	B1F2 - Switch	SCCP
	0.598	B1F2 - Switch	IP Phone(2)	SCCP
	0.599	B1F2 - Switch	IP Phone(1)	SCCP
	0.599	IP Phone(2)	B1F2 - Switch	SCCP
	0.600	IP Phone(1)	B1F2 - Switch	SCCP
	0.600	B1F2 - Switch	Branch1 - Router	SCCP

Reset Simulation ☒ Constant Delay Captured to: 0.600 s

Play Controls

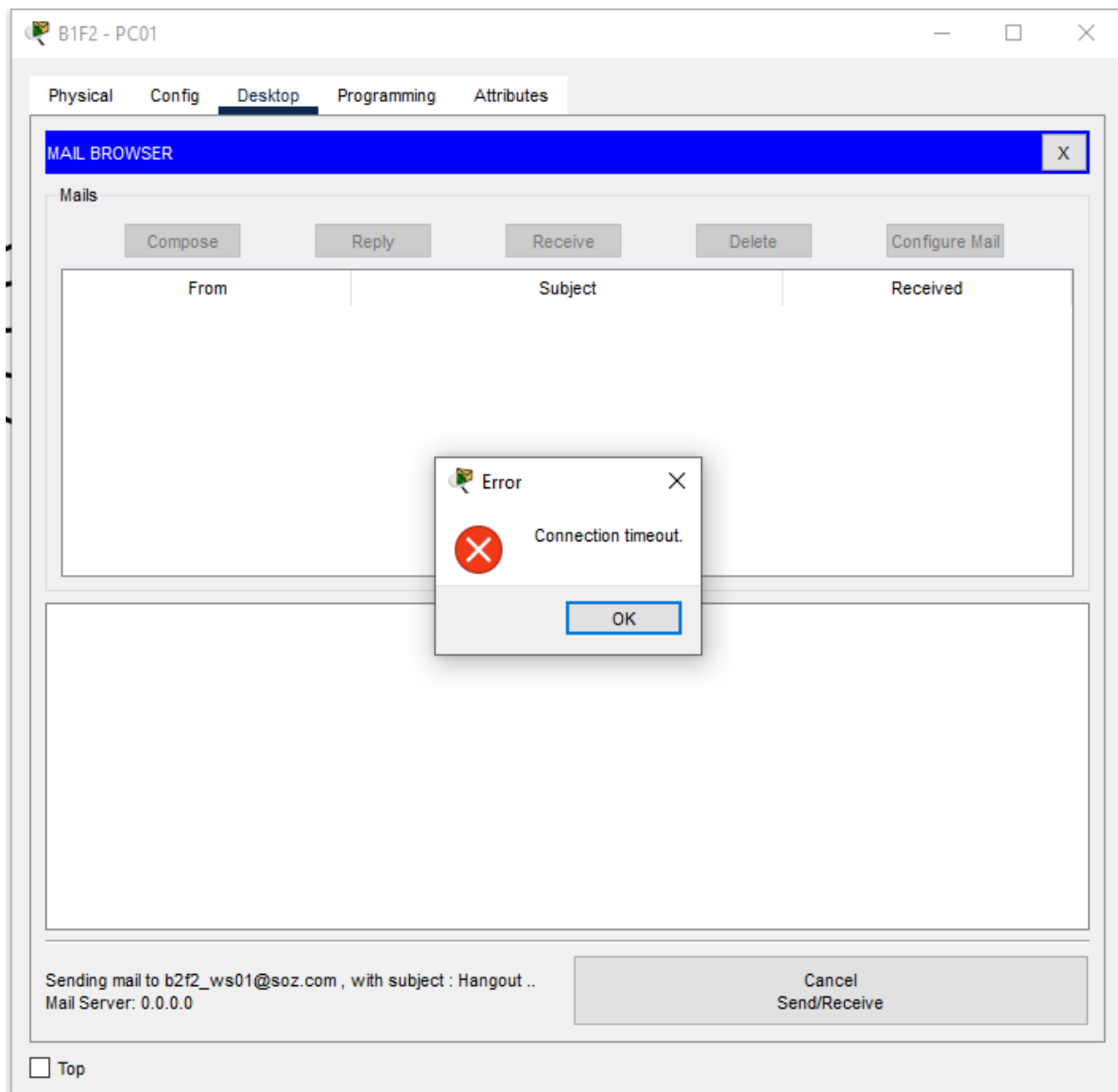
Event List Filters - Visible Events  
SCCP, STP, TCP

Edit Filters Show All/None

Event List of Scenario 3

**Scenario 4:** A user in the second facility of first branch wants to send an email message to his friend in the second facility of second branch.

Users in the second facility of first branch and second facility of second branch are not authorized to send or receive mail. So the workstation user in the second facility of first branch could not send an email to the workstation user in the second facility of the second branch.



Result of Scenario 4

x
PDU Information at Device: B1F2 - PC01

OSI Model

At Device: B1F2 - PC01  
Source: B1F2 - PC01  
Destination: 0.0.0.0

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer7
Layer6
Layer5
<b>Layer 4:</b>
Layer3
Layer2
Layer1

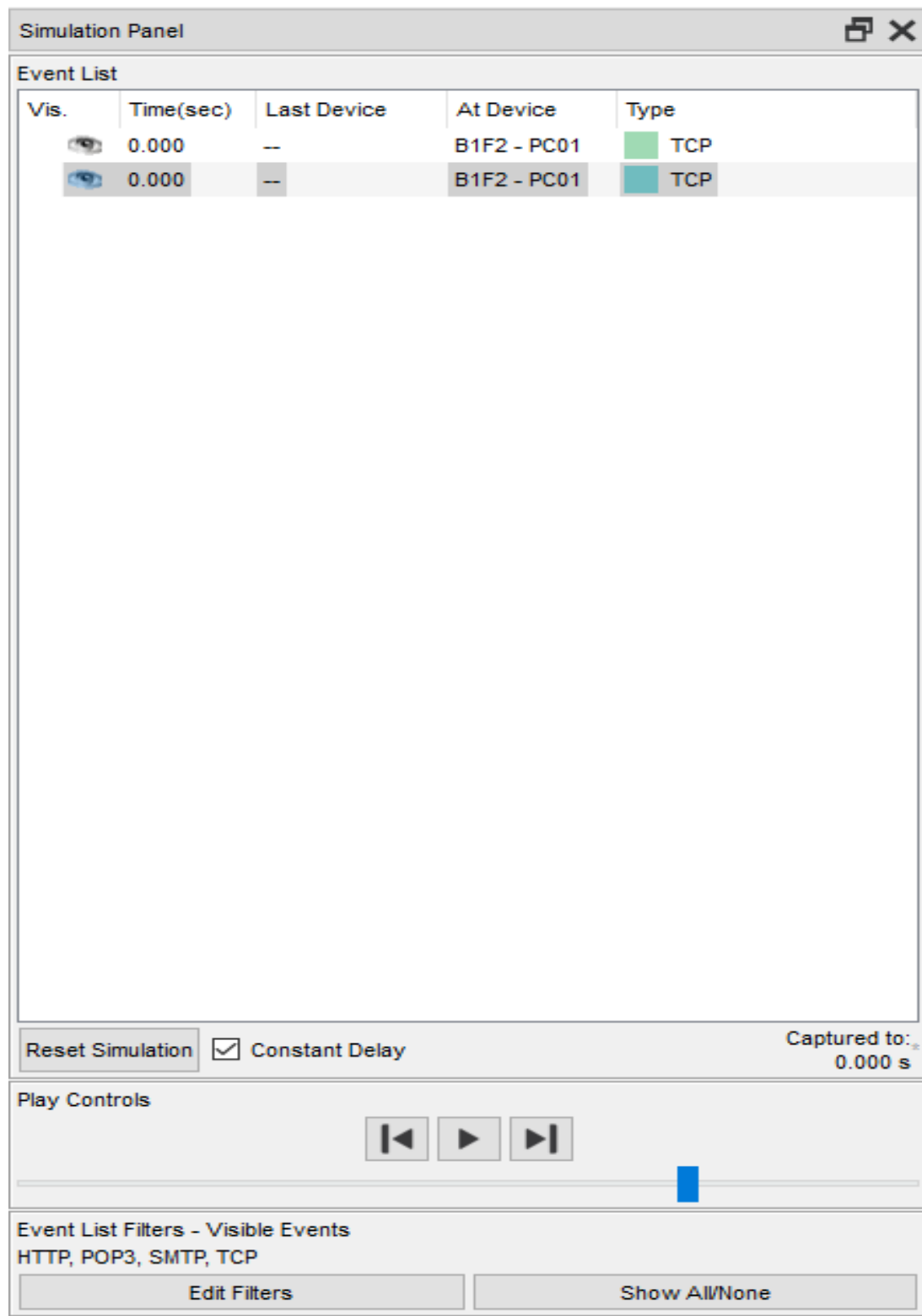
1. The device tries to make a TCP connection to 0.0.0.0 on port 25.
2. The destination IP address is not valid. The connection failed.

Challenge Me

<< Previous Layer

Next Layer >>

OSI Model of Scenario 4

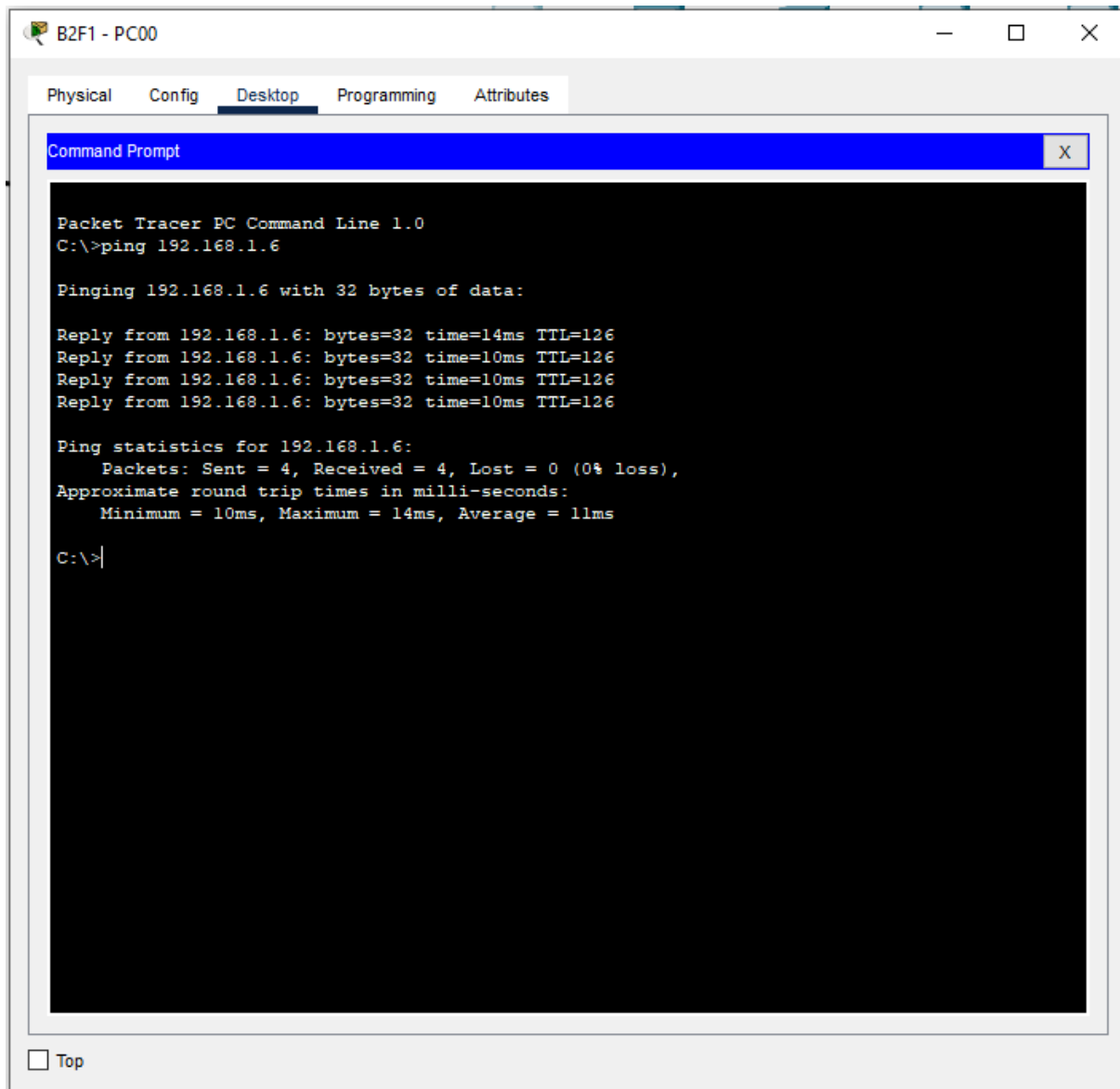


### Event List of Scenario 4

**Scenario 5:** A user from first facility of second branch pings Web server of second facility of first branch.

A ping has been performed between the web server and the PC00 user. The network path followed for this scenario is as follows.

B2F1-PC00, B2F1-Wireless Router, B2F1-Switch, Branch2-Router, B1-ServerRouter, Server Switch, WEB\_1



The screenshot shows a Packet Tracer PC Command Line window for B2F1-PC00. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with Desktop selected. Inside the Desktop tab is a Command Prompt window. The Command Prompt shows the following text:

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.6

Pinging 192.168.1.6 with 32 bytes of data:

Reply from 192.168.1.6: bytes=32 time=14ms TTL=126
Reply from 192.168.1.6: bytes=32 time=10ms TTL=126
Reply from 192.168.1.6: bytes=32 time=10ms TTL=126
Reply from 192.168.1.6: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.1.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 14ms, Average = 11ms

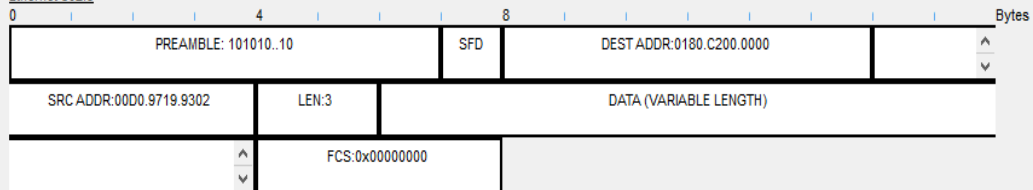
C:\>|
```

At the bottom left of the Command Prompt window is a checkbox labeled "Top".

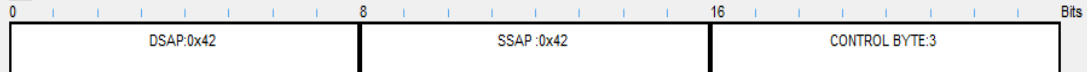
Result of Scenario 5

## PDU Formats

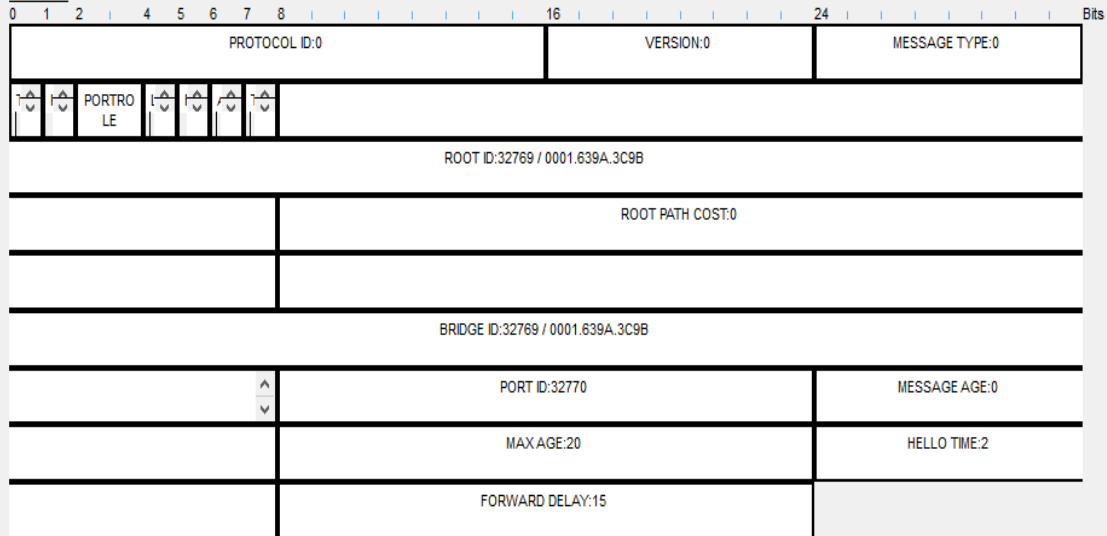
## Ethernet 802.3



## LLC



## STP BPDV



## PDU Output of Scenario 5

PDU Information at Device: B2F1 - PC00
x

OSI Model
Inbound PDU Details

At Device: B2F1 - PC00  
Source: B2F1-Switch  
Destination: STP Multicast Address

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: IEEE 802.3 Header 00D0.9719.9302 >> 0180.C200.0000 LLC STP BPDU
Layer 1: Port FastEthernet0

**Out Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

1. FastEthernet0 receives the frame.

Challenge Me

<< Previous Layer

Next Layer >>

## OSI Model for Scenario 5



Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.231	--	B2F1-Switch	STP
	0.232	B2F1-Switch	B2F1 - PC02	STP
	0.232	B2F1-Switch	Branch2 - R...	STP
	0.232	B2F1-Switch	B2F1 - PC00	STP
	0.232	B2F1-Switch	B2F1 - PC01	STP
	0.232	B2F1-Switch	B2F1 - PC03	STP
	0.232	B2F1-Switch	B2F1 - PC04	STP
	0.232	B2F1-Switch	B2F1 - Wirel...	STP
	2.229	--	B2F1-Switch	STP
	2.230	B2F1-Switch	B2F1 - PC02	STP
	2.230	B2F1-Switch	Branch2 - R...	STP
	2.230	B2F1-Switch	B2F1 - PC00	STP
	2.230	B2F1-Switch	B2F1 - PC01	STP
	2.230	B2F1-Switch	B2F1 - PC03	STP
	2.230	B2F1-Switch	B2F1 - PC04	STP
	2.230	B2F1-Switch	B2F1 - Wirel...	STP
	4.226	--	B2F1-Switch	STP
	4.227	B2F1-Switch	B2F1 - PC02	STP
	4.227	B2F1-Switch	Branch2 - R...	STP
	4.227	B2F1-Switch	B2F1 - PC00	STP
	4.227	B2F1-Switch	B2F1 - PC01	STP
	4.227	B2F1-Switch	B2F1 - PC03	STP
	4.227	B2F1-Switch	B2F1 - PC04	STP
	4.227	B2F1-Switch	B2F1 - Wirel...	STP
	6.224	--	B2F1-Switch	STP
	6.225	B2F1-Switch	B2F1 - PC02	STP

Reset Simulation
☒ Constant Delay
Captured to: 60.246 s

Play Controls

Event List Filters - Visible Events
DHCP, DNS, HTTP, HTTPS, STP, TCP

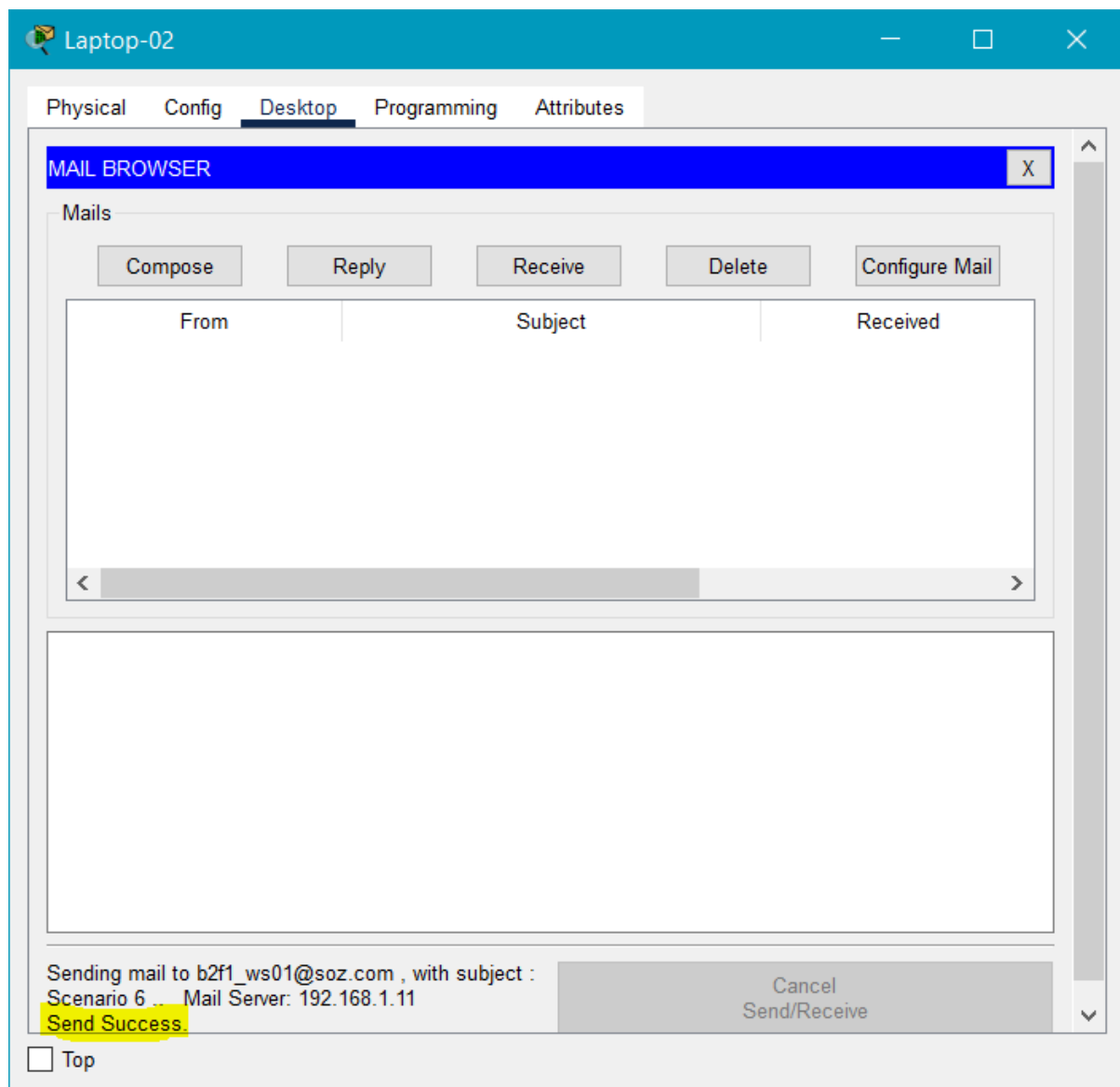
Edit Filters
Show All/None

Event List of Scenario 5

56

**Scenario 6 :** A laptop user from first facility of first branch office wants to send email to her friend in the first facility of second branch office.

The user named "Laptop-02" in the first facility of the first branch, the user in the first facility of the second branch when sending an e-mail to the "b2f1\_ws01" workstation user, Wireless Router for Laptop and Smartphones, B1F1-Switch in Workstations cluster, B1-ServerRouter to which servers are connected after Branch1-Router, B1F3(SERVERS) cluster our mail sent to the Server Switch inside, it comes to the mail server . The user to be sent in the server user name and domain name are determined. After Mail Server, Server Switch, B1-ServerRouter, common router of facilities in the second branch the mail reaching the Branch2-Router, using the ip address of the user to be sent, within the cluster of the first facility of the second branch, after the B2F1-Switch found, it reaches the computer of the user named "b2f1-ws01", that is, B2F1-PC01. While all these processes are taking place, DHCP, DTP, STP, TCP and SMTP protocols related to sending mail are involved.



Result of Scenario 6

PDU Information at Device: Laptop-02 ×

OSI Model
Outbound PDU Details

At Device: Laptop-02  
 Source: Laptop-02  
 Destination: 192.168.1.11

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer7
Layer6
Layer5
Layer 4: TCP Src Port: 1025, Dst Port: 25
Layer 3: IP Header Src. IP: 192.168.7.104, Dest. IP: 192.168.1.11
Layer 2: Wireless
Layer 1: Port(s):

1. The device closes the TCP connection to 192.168.1.11 on port 25.
2. The device sets the connection state to FIN\_WAIT\_1.
3. The device sends a TCP FIN+ACK segment.
4. Sent segment information: the sequence number 99, the ACK number 25, and the data length 20.

Challenge Me

<< Previous Layer

Next Layer >>

### OSI Model of Scenario 6 (TCP)

PDU Information at Device: Laptop-02 ×

OSI Model
Outbound PDU Details

At Device: Laptop-02  
 Source: Laptop-02  
 Destination: SMTP CLIENT

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer 7: SMTP
Layer6
Layer5
Layer 4: TCP Src Port: 1025, Dst Port: 25
Layer 3: IP Header Src. IP: 192.168.7.104, Dest. IP: 192.168.1.11
Layer 2: Wireless
Layer 1: Port(s):

1. The device sends out a SMTP packet.

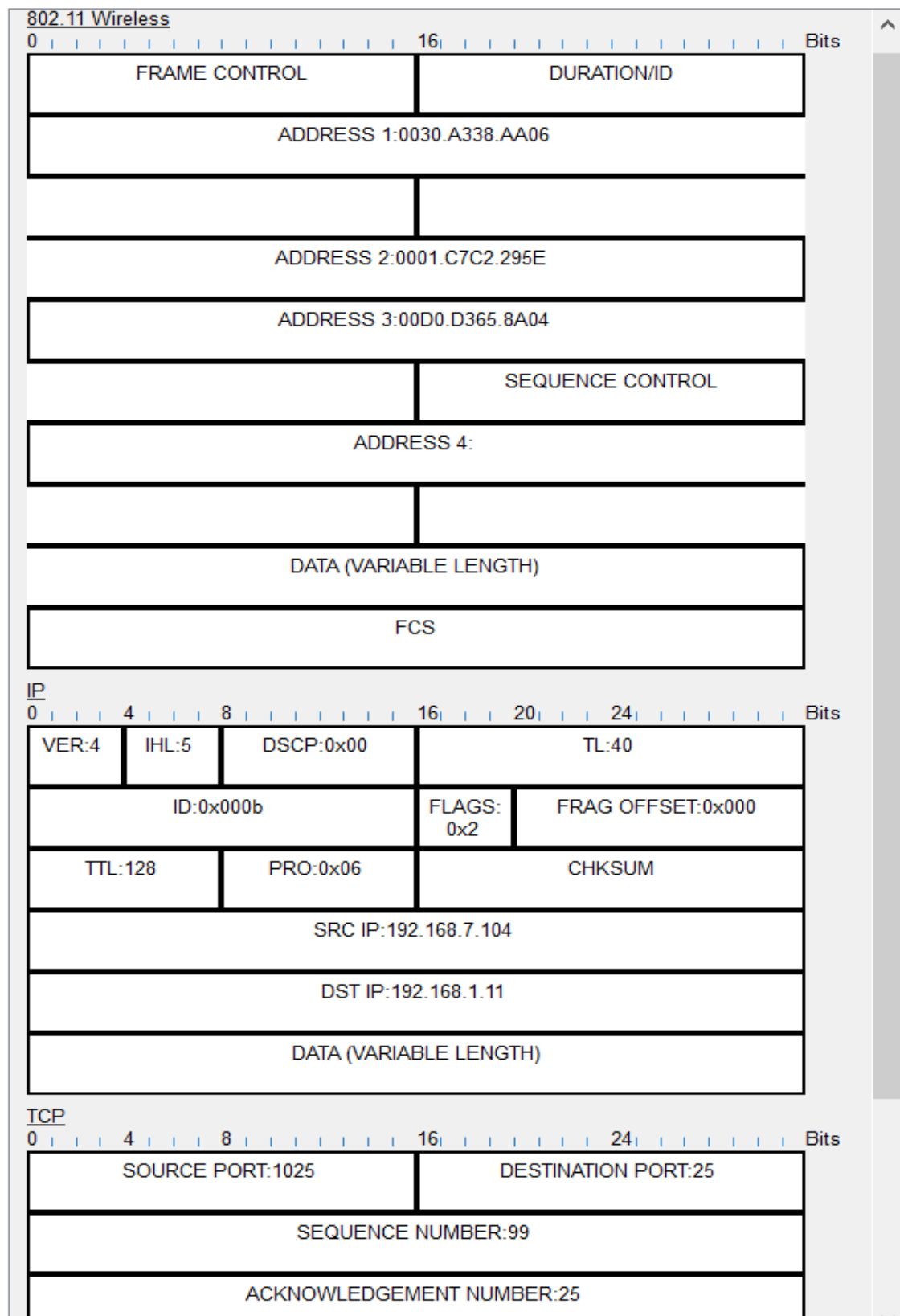
Challenge Me

<< Previous Layer

Next Layer >>

### OSI Model of Scenario 6 (SMTP)

## PDU Formats



PDU Output of Scenario 6

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.319	--	Laptop-02	TCP
	0.320	Laptop-02	Wireless Router for Lapto...	TCP
	0.321	Wireless Router for ...	B1F1 - Switch	TCP
	0.321	--	Laptop-02	SMTP
	0.322	Laptop-02	Wireless Router for Lapto...	SMTP
	0.323	Wireless Router for ...	B1F1 - Switch	SMTP
	0.323	--	Wireless Router for Lapto...	TCP
	0.324	Wireless Router for ...	Smartphone-04	TCP
	0.324	Wireless Router for ...	Laptop-01	TCP
	0.324	Wireless Router for ...	Laptop-00	TCP
	0.324	Wireless Router for ...	Laptop-02	TCP
	0.324	Wireless Router for ...	Smartphone-01	TCP
	0.324	Wireless Router for ...	Smartphone-00	TCP
	0.324	Wireless Router for ...	Smartphone-02	TCP
	0.324	Wireless Router for ...	Smartphone-03	TCP
	0.324	Wireless Router for ...	Laptop-03	TCP
	0.324	Wireless Router for ...	Laptop-04	TCP
	0.329	--	Wireless Router for Lapto...	SMTP
	0.330	Wireless Router for ...	Smartphone-04	SMTP
	0.330	Wireless Router for ...	Laptop-01	SMTP

Reset Simulation

☒ Constant Delay

Captured to: 0.334 s

Play Controls

⏮

⏪

⏩

⏭

Event List Filters - Visible Events

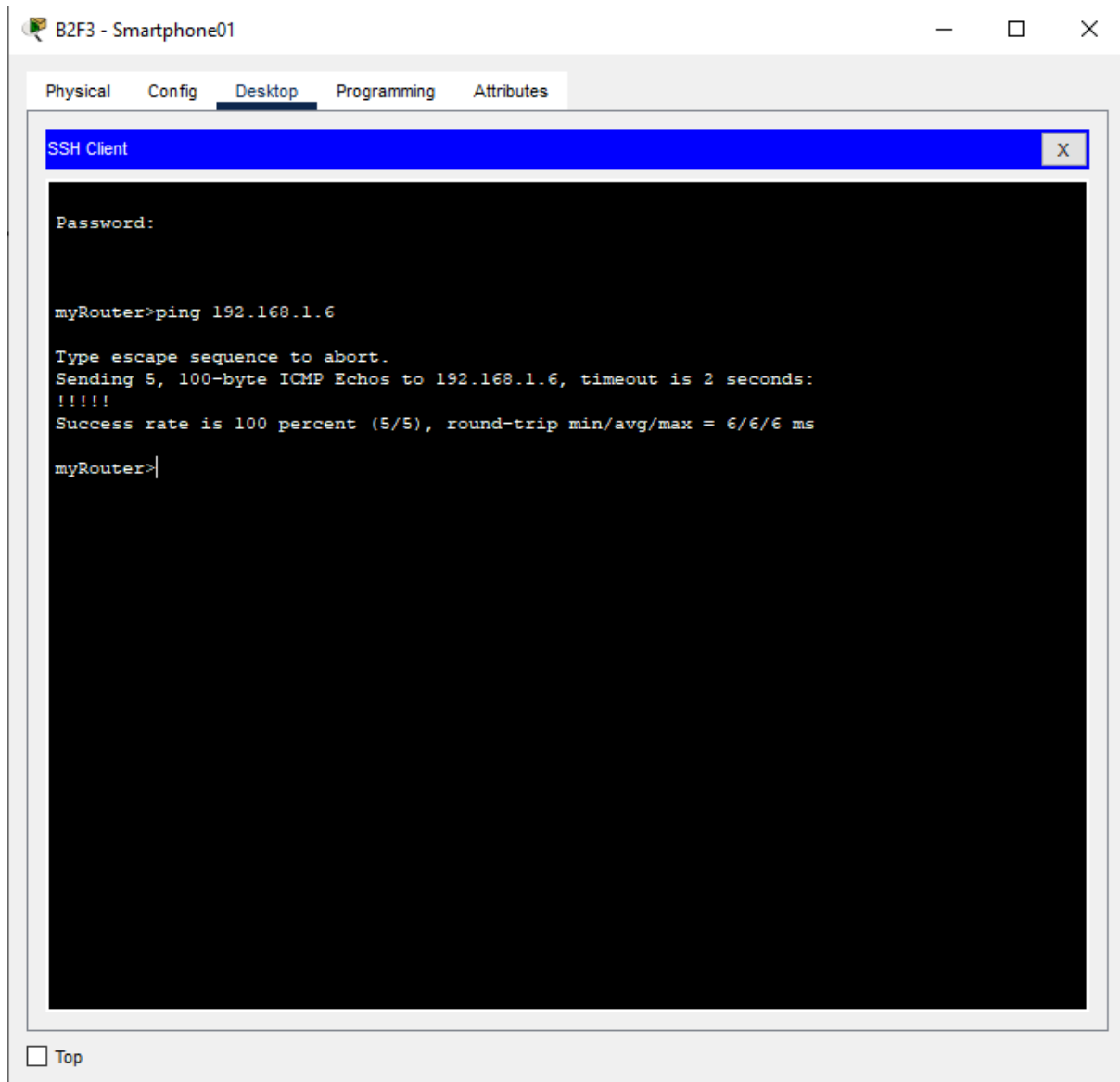
DHCP, DTP, SMTP, STP, TCP

Edit Filters

Show All/None

### Event List of Scenario 6

**Scenario 7 :** A smartphone user from third facility of second branch office wants to use ssh to connect to a Web server in the third facility of first branch office.



Result of Scenario 7

At Device: Branch2 - Router  
 Source: Branch2 - Router  
 Destination: 192.168.52.126

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer 7: SSH
Layer6
Layer5
Layer 4: TCP Src Port: 22, Dst Port: 1048
Layer 3: IP Header Src. IP: 192.168.50.1, Dest. IP: 192.168.52.126
Layer 2: Ethernet II Header 00D0.FF97.C434 >> 0001.97C8.0C01
Layer 1: Port(s): FastEthernet2/0

1. The SSH server sends data to the SSH client.

Challenge Me

<< Previous Layer

Next Layer >>

## OSI Model of Scenario 7

PDU Information at Device: Branch2 - Router

OSI Model

Outbound PDU Details

PDU Formats

EthernetII

0 4 8 Bytes

PREAMBLE: 101010..10

DEST ADDR:0001.97C8.0C01

SRC ADDR:00D0.FF97.C434

TYP:0xE:0x

DATA (VARIABLE LENGTH)

FCS:0x00000000

IP

0 4 8 16 20 24 Bits

VER:4

IHL:5

DSCP:0x00

TL:112

ID:0x0406

FLAG:0

FRAG OFFSET:0x000

TTL:255

PRO:0x06

CHKSUM

SRC IP:192.168.50.1

DST IP:192.168.52.126

DATA (VARIABLE LENGTH)

TCP

0 4 8 16 24 Bits

SOURCE PORT:22

DESTINATION PORT:1048

SEQUENCE NUMBER:989

ACKNOWLEDGEMENT NUMBER:240

OFF SET:

RESE RVE

FLAGS:0b00011000

WINDOW:65535

CHECKSUM:0x0000

URGENT POINTER:0x0000

OPTION

DATA (VARIABLE LENGTH)

PADDING: 0

PDU Output of Scenario 7

63



Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.358	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.372	--	B2F3 - Smar...	TCP
	0.373	B2F3 - Smartp...	B2F3 - Wirel...	TCP
	0.374	B2F3 - Wireles...	B2F3 - Switch	TCP
	0.375	B2F3 - Switch	Branch2 - R...	TCP
	0.378	--	B2F3 - Wirel...	TCP
	0.379	B2F3 - Wireles...	B2F3 - Smar...	TCP
	0.379	B2F3 - Wireles...	B2F3 - Smar...	TCP
	0.379	B2F3 - Wireles...	B2F3 - Smar...	TCP
	0.379	B2F3 - Wireles...	B2F3 - Smar...	TCP
	0.379	B2F3 - Wireles...	B2F3 - Smar...	TCP
	0.459	--	Branch2 - R...	SSH
	0.460	Branch2 - Router	B2F3 - Switch	SSH
	0.460	--	Branch2 - R...	SSH
	0.461	Branch2 - Router	B2F3 - Switch	SSH
	0.461	B2F3 - Switch	B2F3 - Wirel...	SSH
	0.461	--	Branch2 - R...	SSH
	0.462	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.462	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.462	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.462	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.462	Branch2 - Router	B2F3 - Switch	SSH
	0.462	B2F3 - Switch	B2F3 - Wirel...	SSH
	0.462	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.463	B2F3 - Wireles...	B2F3 - Smar...	SSH
	0.463	B2F3 - Wireles...	B2F3 - Smar...	SSH

Reset Simulation
☒ Constant Delay
Captured to: 48.843 s

Play Controls

Event List Filters - Visible Events
HTTP, HTTPS, SSH, TCP

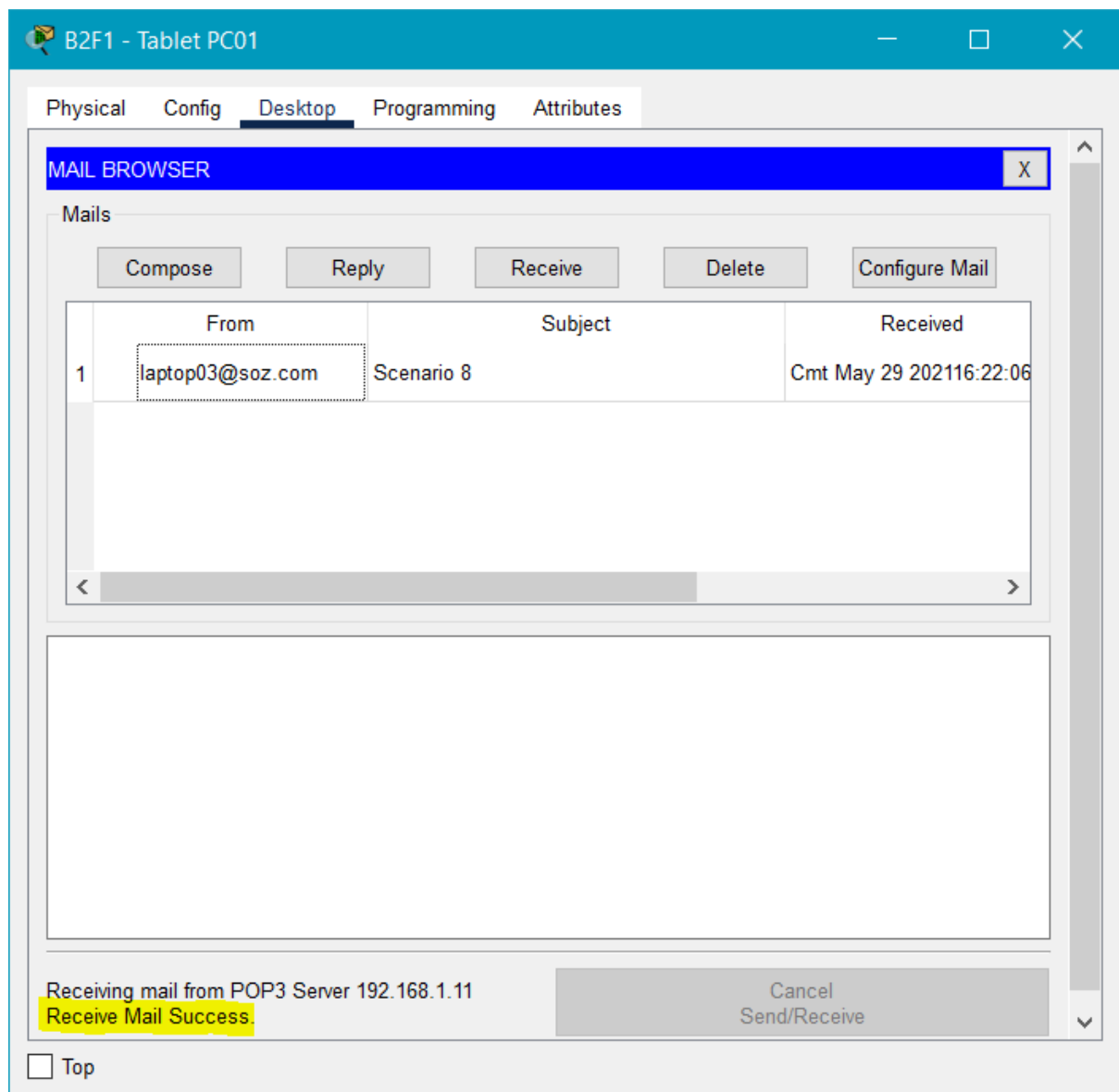
Edit Filters
Show All/None

Event List of Scenario 7

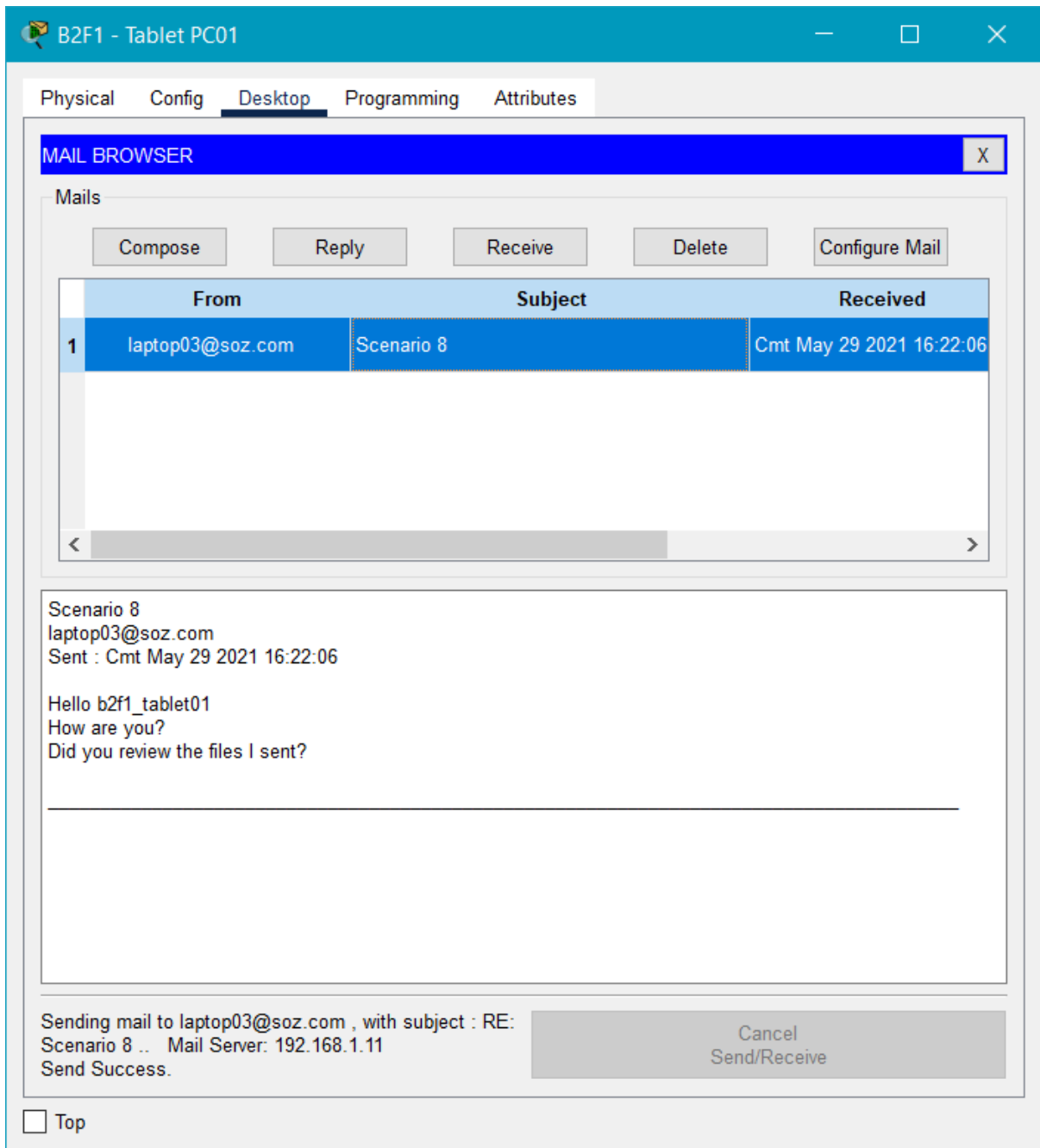
64

**Scenario 8:** A tablet user from the first facility of the second branch wants to receive and reply to a message.

In the first facility of the second branch, the tablet user clicks reply to reply to the message sent to him after receiving it from the mailbox to reply to the e-mail he received, and the answer is B2F1 Wireless Router , B2F1-Switch, Branch2-Router to which B2F1 cluster is connected, reply mail to B1-ServerRouter where servers are located after the user name, domain name and ip address of the user to whom the reply is sent from the mail server to which it is connected Server Switch, B1F3 (SERVERS) cluster, B1-ServerRouter. After B1-ServerRouter, a reply is sent to the target user with username and ip address. DHCP, DNS, TCP, POP3 and SMTP protocols took part in these processes.



Result of Scenario 8



Result of Scenario 8

PDU Information at Device: B2F1 - Tablet PC01

OSI Model

Outbound PDU Details

At Device: B2F1 - Tablet PC01  
Source: B2F1 - Tablet PC01  
Destination: POP3 CLIENT

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

**Out Layers**

Layer 7: POP3
Layer6
Layer5
Layer 4: TCP Src Port: 1032, Dst Port: 110
Layer 3: IP Header Src. IP: 192.168.0.102, Dst. IP: 192.168.1.11
Layer 2: Wireless
Layer 1: Port(s):

1. The device sends out a POP3 packet.

Challenge Me

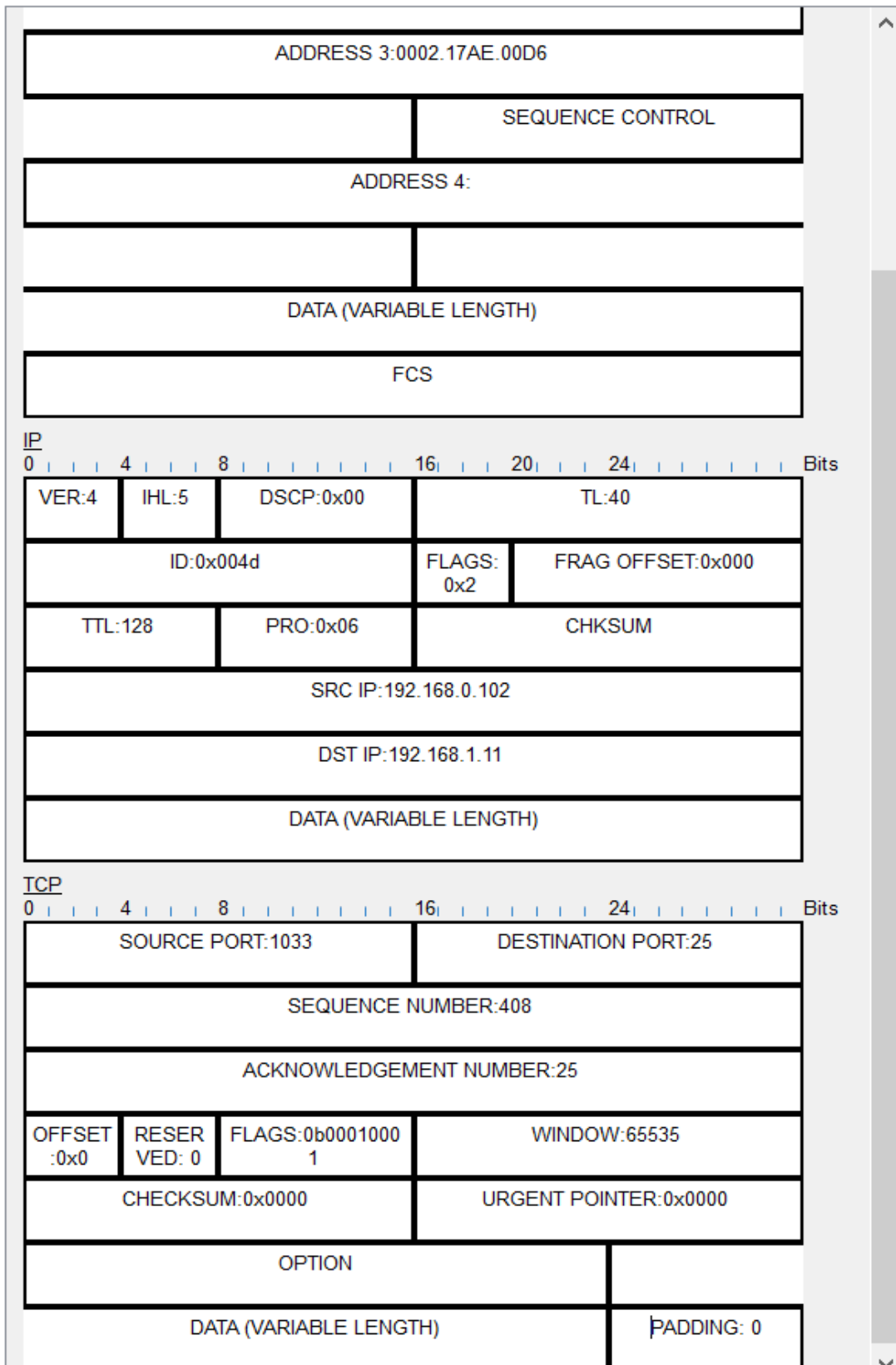
<< Previous Layer

Next Layer >>

## OSI Model of Scenario 8

OSI Model    Outbound PDU Details

## PDU Formats



PDU Output of Scenario 8

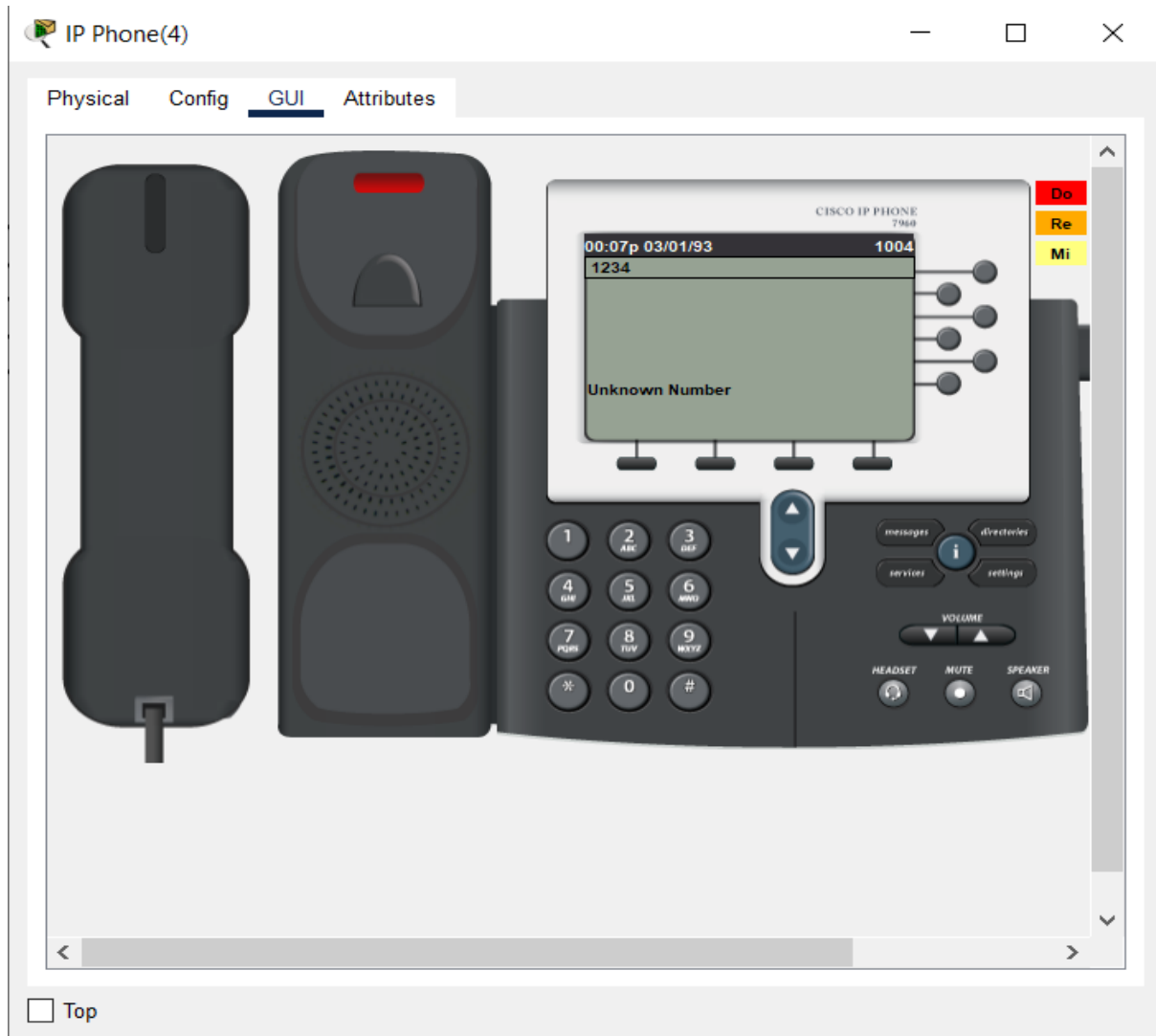




**Scenario 9 :** User from the first branch of the first facility call an unidentified number.

The IP Phone(4) user held a VoIP conference with an unknown number (1234). However, an unknown number notification was received because the number was not identified.

The network path followed for this scenario is as follows. B1F2-Switch, IP Phone(4), Branch1-Router, B1F2-Switch, Branch1-Router, B1F2-Switch, IP Phone(4),



Result of Scenario 9



## PDU Information at Device: IP Phone(4)



**OSI Model**

Inbound PDU Details

Outbound PDU Details

At Device: IP Phone(4)  
Source: B1F2 - Switch  
Destination: STP Multicast Address

### In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: IEEE 802.3 Header 00D0.BADB.0E05 >> 0180.C200.0000 LLC STP BPDU
Layer 1: Port Switch

### Out Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: Ethernet II Header 00E0.A3C2.7926 >> 0180.C200.0000 STP BPDU
Layer 1: Port(s): PC

1. Switch receives the frame.

Challenge Me

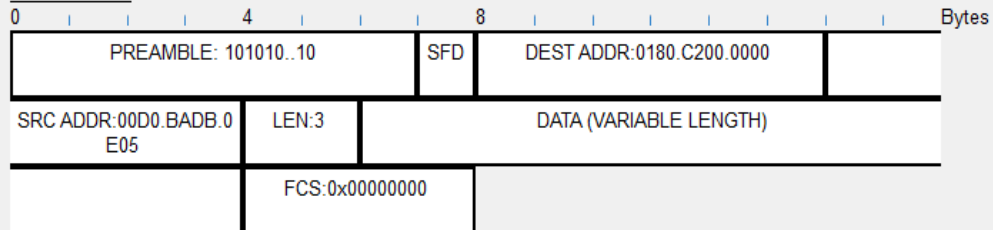
<< Previous Layer

Next Layer >>

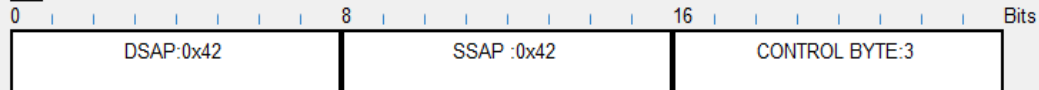
OSI Model of Scenario 9

## PDU Formats

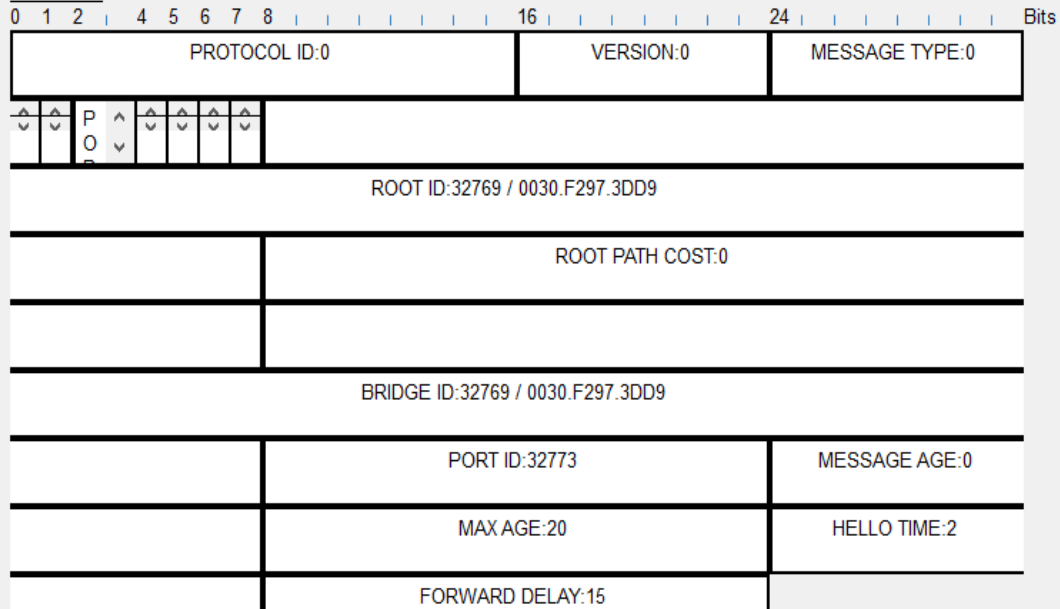
## Ethernet 802.3



## LLC



## STP BPDV



PDU Output of Scenario 9

## PDU Formats

## EthernetII

0	4	8	Bytes
PREAMBLE: 101010...10		SFD	DEST ADDR: 0180.C200.0000
SRC ADDR: 00E0.A3C2.79 26	TYPE: 0x01 0b	DATA (VARIABLE LENG H)	FCS: 0x00000000

## STP BPDU

0	1	2	4	5	6	7	8	16	24	Bits	
PROTOCOL ID:0								VERSION:0		MESSAGE TYPE:0	
^	^	P	^	^	^	^	^				
v	v	O	v	v	v	v	v				
ROOT ID:32769 / 0030.F297.3DD9											
				ROOT PATH COST:0							
BRIDGE ID:32769 / 0030.F297.3DD9											
				PORT ID:32773				MESSAGE AGE:0			
				MAX AGE:20				HELLO TIME:2			
				FORWARD DELAY:15							

PDU Output of Scenario 9

## Simulation Panel



## Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.565	B1F2 - Switch	B1F2 - PC02	STP
	0.565	B1F2 - Switch	IP Phone(5)	STP
	0.565	B1F2 - Switch	B1F2 - PC04	STP
	0.565	B1F2 - Switch	Branch1 - Router	STP
	0.565	B1F2 - Switch	IP Phone(1)	STP
	0.565	B1F2 - Switch	IP Phone(2)	STP
	0.565	B1F2 - Switch	IP Phone(3)	STP
	0.565	B1F2 - Switch	IP Phone(4)	STP
	0.565	--	IP Phone(4)	SCCP
	0.566	IP Phone(5)	voip(5)	STP
	0.566	IP Phone(1)	voip(1)	STP
	0.566	IP Phone(2)	voip(2)	STP
	0.566	IP Phone(3)	voip(3)	STP
	0.566	IP Phone(4)	voip(4)	STP
	0.566	IP Phone(4)	B1F2 - Switch	SCCP
	0.567	B1F2 - Switch	Branch1 - Router	SCCP
	0.568	Branch1 - Router	B1F2 - Switch	SCCP
	0.569	B1F2 - Switch	IP Phone(4)	SCCP
	0.569	--	IP Phone(4)	SCCP
	0.570	IP Phone(4)	B1F2 - Switch	SCCP
	0.571	B1F2 - Switch	Branch1 - Router	SCCP
	0.572	Branch1 - Router	B1F2 - Switch	SCCP
	0.573	B1F2 - Switch	IP Phone(4)	SCCP
	0.589	--	IP Phone(4)	TCP
	0.589	--	IP Phone(4)	SCCP
	0.590	IP Phone(4)	B1F2 - Switch	TCP

Reset Simulation



Constant Delay

 Captured to:   
 0.590 s

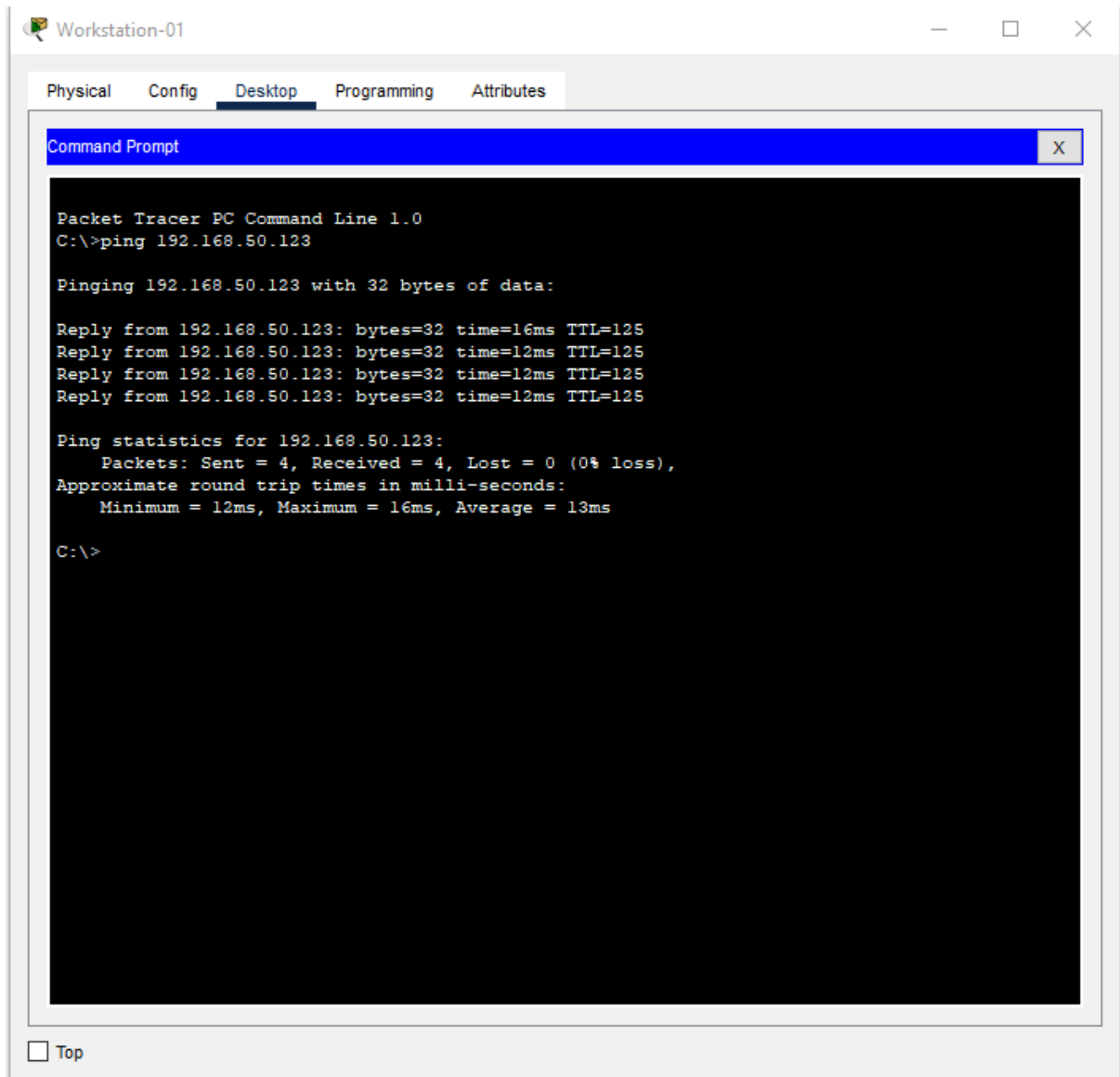
## Play Controls


 Event List Filters - Visible Events  
 SCCP, STP, TCP

Event List of Scenario 9

**Scenario 10:** A workstation user from first facility first branch ping to workstation user from first facility second branch

Pinging was performed between the Workstation-01 user and the B2F1-PC00 user.



The screenshot shows a Packet Tracer workstation window titled "Workstation-01". The "Desktop" tab is selected, displaying a "Command Prompt" window. The Command Prompt shows the execution of a ping command from the C:\> prompt to the IP address 192.168.50.123. The output indicates that the ping was successful, with 4 packets sent, 4 received, and 0% loss. The round trip times are listed as Minimum = 12ms, Maximum = 16ms, and Average = 13ms.

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.50.123

Pinging 192.168.50.123 with 32 bytes of data:

Reply from 192.168.50.123: bytes=32 time=16ms TTL=125
Reply from 192.168.50.123: bytes=32 time=12ms TTL=125
Reply from 192.168.50.123: bytes=32 time=12ms TTL=125
Reply from 192.168.50.123: bytes=32 time=12ms TTL=125

Ping statistics for 192.168.50.123:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 12ms, Maximum = 16ms, Average = 13ms

C:\>
```

Result of Scenario 10

## PDU Formats

SRC ADDR:0003.E4A1.DA B8		LEN:3	DATA (VARIABLE LENGTH)
		FCS:0x00000000	

**LLC**

0	8	16	Bits
DSAP:0x42		SSAP:0x42	CONTROL BYTE:3

**STP BPDU**

0	1	2	4	5	6	7	8	16	24	Bits
PROTOCOL ID:0								VERSION:0		MESSAGE TYPE:0
↕	↕	P	↕	↕	↕	↕	↕			
O	↕	↕	↕	↕	↕	↕	↕			
ROOT ID:32769 / 00D0.BA72.20E5										
								ROOT PATH COST:0		
BRIDGE ID:32769 / 00D0.BA72.20E5										
								PORT ID:32770		MESSAGE AGE:0
								MAX AGE:20		HELLO TIME:2
								FORWARD DELAY:15		

PDU Details of Scenario 10

**OSI Model**   Inbound PDU Details

At Device: Workstation-01  
Source: B1F1 - Switch  
Destination: STP Multicast Address

**In Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer 2: IEEE 802.3 Header 0003.E4A1.DAB8 >> 0180.C200.0000 LLC STP BPDU
Layer 1: Port FastEthernet0

**Out Layers**

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

1. FastEthernet0 receives the frame.

Challenge Me

<< Previous Layer

Next Layer >>

## OSI Model of Scenario 10

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	23.502	B1F1 - Switch	Workstation-04	STP
	23.502	B1F1 - Switch	Branch1 - R...	STP
	23.502	B1F1 - Switch	Wireless Ro...	STP
	23.502	--	B1F1 - Switch	STP
	23.503	B1F1 - Switch	Branch1 - R...	STP
	25.502	--	B1F1 - Switch	STP
	25.503	B1F1 - Switch	Workstation-03	STP
	25.503	B1F1 - Switch	Workstation-01	STP
	25.503	B1F1 - Switch	Workstation-02	STP
	25.503	B1F1 - Switch	Workstation-00	STP
	25.503	B1F1 - Switch	Workstation-04	STP
	25.503	B1F1 - Switch	Branch1 - R...	STP
	25.503	B1F1 - Switch	Wireless Ro...	STP
	25.503	--	B1F1 - Switch	STP
	25.504	B1F1 - Switch	Branch1 - R...	STP
	27.500	--	B1F1 - Switch	STP
	27.501	B1F1 - Switch	Workstation-03	STP
	27.501	B1F1 - Switch	Workstation-01	STP
	27.501	B1F1 - Switch	Workstation-02	STP
	27.501	B1F1 - Switch	Workstation-00	STP
	27.501	B1F1 - Switch	Workstation-04	STP
	27.501	B1F1 - Switch	Branch1 - R...	STP
	27.501	B1F1 - Switch	Wireless Ro...	STP
	27.501	--	B1F1 - Switch	STP
	27.502	B1F1 - Switch	Branch1 - R...	STP
	29.498	--	B1F1 - Switch	STP

Reset Simulation
☒ Constant Delay
Captured to: 29.498 s

Play Controls

⏮

▶

⏭

Event List Filters - Visible Events  
DHCP, DNS, STP, TCP

Edit Filters
Show All/None

Event List of Scenario 10



## **CHAPTER FOUR**

### **PROBLEMS ENCOUNTERED**

When starting to use the Cisco Packet Tracer software, the interface was unfamiliar, but it started to be used effectively in a short time.

The capabilities of each facility were determined differently from each other. In a facility where voice transmission will be made over IP using VoIP, there was a problem in assigning the internal numbers to the phones, but this problem was overcome with a few commands written on the Router and Switch.

Another problem encountered was when we got an APIPA error while assigning IP to computers in the facilities via DHCP. This problem was solved by distributing the generated DHCP Pools via the Router with a few commands.

There were two different branches and these branches were added in the physical interface using Cisco Packet Tracer, but the entities in it were added in the logical interface, which caused the branch 2 created in the physical interface to be empty and all the added entities were added in branch 1. Later, a wiring closet was added to branch 2 via the physical interface, and routers and switches were placed in it. Other devices such as computers, tablets and laptops were added to branch 2 via the physical interface, and the connection operations were made again in the logical interface.

## **CHAPTER FIVE**

### **CONCLUSION**

In the Metropolitan Area Network Simulation project, two branches, each of which has three facilities, included features and tasks such as communication between different users, file transfer, web browsing. Between users for the project to work properly, necessary devices providing connections and their configuration also had to be provided. The information we learned, the research we did, the accuracy check at every step of the project, the project was completed as a result of the trials and healthy communication of the group members. The desired scenarios of the project, the analysis and tests on it, the desired features and tasks of the topology and architecture selection was observed by the group members that he successfully performed. The use of metropolitan area network instead of wide area network provided the desired security and speed. The network was successful in providing the requested services using the protocols outlined in the report. As a result, users in each facility can fulfill their own tasks, communication was provided between users at the same facility, different facility or different branches of different branches with the ability to communicate with each other and the servers in the project could be used jointly for both branches.

In this long-term project, the project team focused on network design, protocols, servers, users and binding devices, Cisco Packet Tracer etc. gained ideas and experience as a result of the synchronization of the group members with each other and their task sharing on the subjects. The project started on May 18, 2021 and we finished it on June 10, 2021 with its reporting.

## CHAPTER SIX

### REFERENCES

- [1] [Cisco Packet Tracer'da VoIP Nasıl yapılır?](#)
- [2] [How to configure an FTP server in Packet Tracer](#)
- [3] [Configuration of SSH on Cisco Switch in Packet Tracer](#)
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- [10] [IBM Cloud Learn Hub The Fundamentals of Networking](#)
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