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Computer Network
ENCS3320
Project 2
Cisco Packet Tracer

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Abstract

This project aims on designing and simulating a computer network using Cisco Packet Tracer to develop proficiency in advanced networking concepts such as subnetting, routing, wireless security, and key network services. The objective is to integrate multiple autonomous systems ASs into a cohesive network with seamless communication. Each AS including the Google network, Faculty of Engineering and Technology network, and Home-ISP network, will employ static and dynamic routing protocols such as OSPF and BGP to ensure reliable data exchange. Key services such as DNS, DHCP, Web, and Email servers will be configured to meet real-world requirements, enhancing the functional capabilities of the network. Additionally, network address translation (NAT) and wireless LAN configurations will be implemented to support connectivity and security. By this project we will able to enhance our practical networking skills, and teamwork.

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1. Theory

1.1 Network of Networks:

The network of networks shown in **figure 1** represents a scalable and interconnected system that integrates multiple autonomous systems AS, including business, home, and cellular networks, to ensure seamless communication and resource sharing. Each subnetwork is designed for specific needs. the business network supports operations with servers, printers, and workstations, interconnected through switches and wireless access points for flexibility, the home network focuses on residential connectivity with wireless devices managed through routers offering NAT and DHCP services, and the cellular network enables mobile connectivity for devices like smartphones and tablets through base stations linked to regional and global networks. These subnetworks are connected through a robust backbone of routers, ensuring efficient data flow, high reliability, and scalability. Advanced routing protocols like OSPF and BGP enable seamless communication between ASs, while security measures such as encryption, NAT, and firewalls protect data and prevent unauthorized access. This interconnected system highlights the complexity and versatility of modern networking, meeting diverse demands while maintaining efficiency and security, and our project depend totally of the concept of network of network

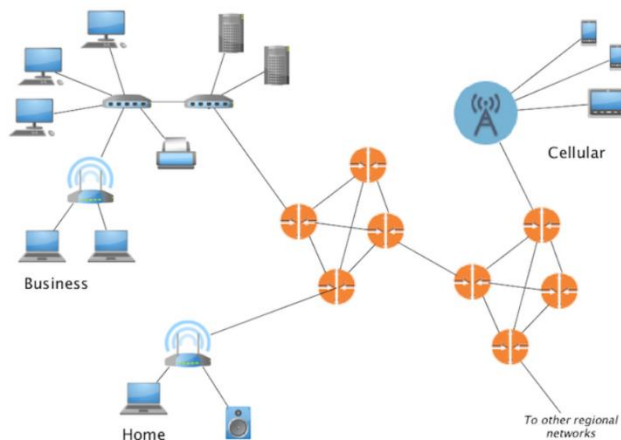


Figure 1: Network of Network

1.2 IP Addressing and Subnetting

IP addressing and subnetting are fundamental concepts in network design that allow efficient utilization and organization of IP addresses within a network. IP addressing assigns a unique identifier to each device on a network, enabling communication between them. Subnetting divides a larger network into smaller, more manageable subnets by borrowing bits from the host portion of an IP address. This process helps optimize IP address usage, reduce broadcast traffic, and enhance network performance and security. Each subnet is defined by a subnet mask, which specifies the division between the network and host portions of the address. Subnetting also supports hierarchical addressing, allowing networks to scale efficiently and enabling better routing decisions. It ensures the isolation of different network segments, reducing the scope of potential network issues and enhancing security, we will discuss the mane IP address of our project in details later.

1.3 Dynamic Host Configuration Protocol (DHCP)

Dynamic Host Configuration Protocol (DHCP) is a network management protocol that automates the process of assigning IP addresses and other network configuration parameters to devices on a network. Instead of requiring manual configuration, DHCP dynamically provides devices with a valid IP address, subnet mask, default gateway, and DNS server information. This process occurs through a client-server model, where a device DHCP client requests an IP configuration, and a DHCP server assigns an address from a pre-configured pool. DHCP simplifies network administration by reducing the need for manual IP assignments minimizing configuration errors and saving administrative time. It also enables efficient reuse of IP addresses by leasing them for a specific period, after which they can be reassigned to other devices. DHCP supports both IPv4 and IPv6 but for our project we need IPv4 networks and is particularly useful in dynamic environments where devices frequently join and leave the network as Shown in figure 2. It enhances scalability by automating address management, ensuring seamless device connectivity even in large and complex networks. By automating IP address allocation and configuration, DHCP ensures efficient use of address space, reduced conflicts, and seamless connectivity for network devices.

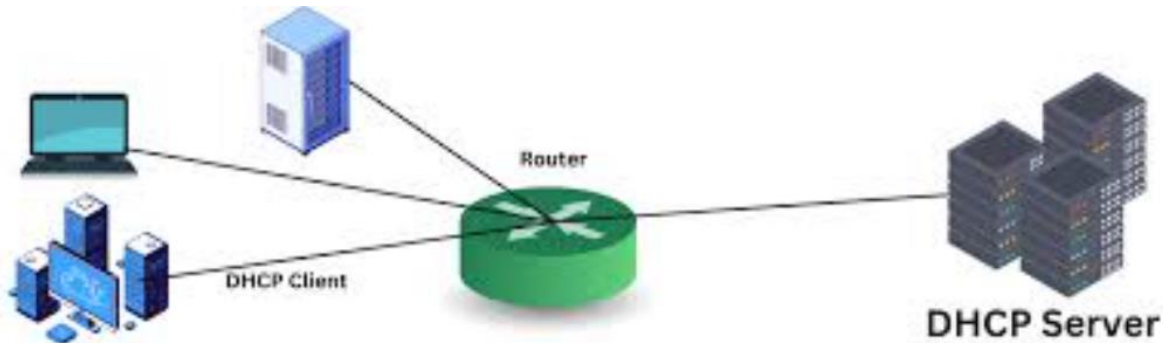


Figure 2: DHCP

1.4 Domain Name System (DNS)

The Domain Name System **DNS** is a critical network service that translates human-readable domain names www.google.com into machine readable IP addresses 192.168.1.1, allowing users to access resources on the internet or private networks easily. DNS operates through a hierarchical system of servers, including root servers, top level domain TLD servers, and authoritative name servers, each playing a role in resolving domain queries. When a user enters a **domain name**, the DNS server queries its database or forwards the request to other DNS servers to retrieve the corresponding IP address. DNS simplifies network navigation, eliminating the need for users to memorize complex IP addresses. It also supports essential functionalities like load balancing and redundancy by mapping multiple IP addresses to a single domain name. DNS resource records RRs, such as A address, CNAME canonical name, NS name server, and MX mail exchange, **shown in figure**

3

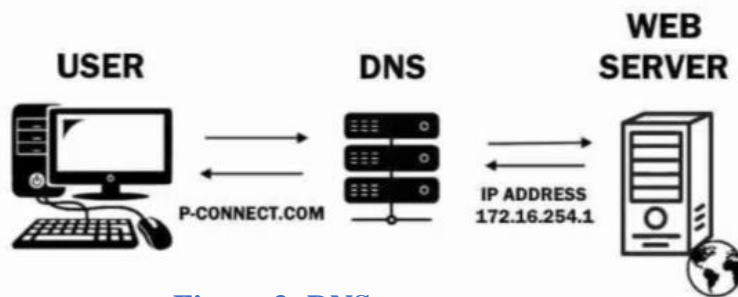


Figure 3: DNS

1.5 Web and Email

Web and email services are essential components of modern networking, enabling communication and access to resources over the internet. Web services are hosted on web servers, which deliver content such as websites and applications through **HTTP and HTTPS protocols**. These servers store and serve web pages, multimedia, and dynamic content to users based on their requests. Web services often incorporate security features like SSL/TLS encryption to ensure secure data exchange. Email services, on the other hand, facilitate the exchange of messages between users through protocols such as SMTP Simple Mail Transfer Protocol for sending emails, and **POP3 or IMAP** for receiving them shown in **figure 4**. Email servers manage user accounts, mail storage, and message delivery across networks. They often work with DNS to resolve domain names for mail exchange MX records, directing emails to the appropriate servers. Both services rely on robust configurations to ensure reliability, scalability, and security, with features like spam filtering, authentication, and encryption for protecting sensitive communication. Together, web and email services form the backbone of online communication, supporting personal, professional, and business interactions across the globe.

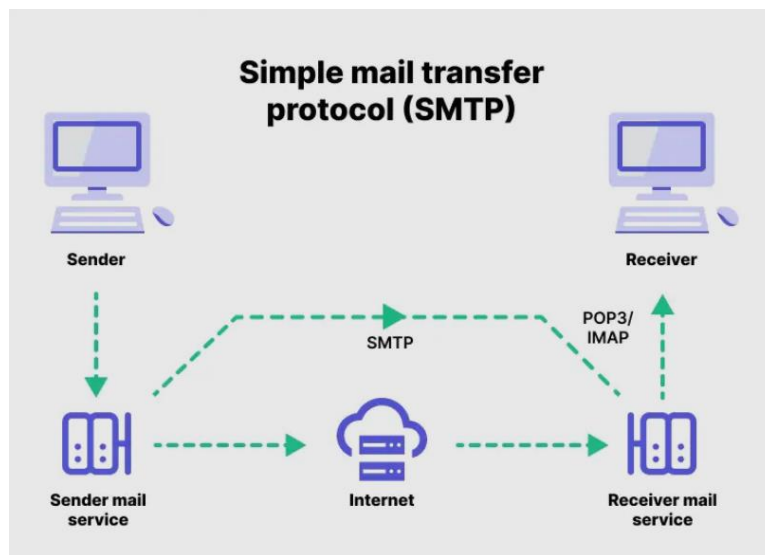


Figure 4: Email protocols

1.6 NAT

Network Address Translation **NAT** is a critical networking technique that allows multiple devices on a local network to share a single public IP address for accessing external networks, such as the internet. By mapping private IP addresses to a public address, NAT helps conserve the limited pool of IPv4 addresses. NAT operates by modifying IP headers in packets as they pass through a router or firewall, translating private source addresses to public ones for outgoing traffic and reversing the process for incoming traffic. It enhances network security by masking internal IP addresses, making it difficult for external entities to directly access devices within the network. NAT is commonly used in homes, businesses, and data centers to connect internal networks to the internet. It supports various modes, including static NAT for one-to-one mappings and **dynamic NAT or PAT Port Address** Translation for many-to-one mappings. While NAT is highly effective, it can introduce challenges for peer-to-peer communication and certain applications, requiring specialized solutions like port forwarding.

1.7 OSPF & BGP

Open Shortest Path First **OSPF** and Border Gateway Protocol **BGP** are two widely used routing protocols in modern networks. OSPF is a dynamic, link-state routing protocol designed for internal network routing within an Autonomous System AS. It uses Dijkstra's algorithm to calculate the shortest path, ensuring efficient and loop free routing. OSPF is highly scalable, supports hierarchical network design through areas, and converges quickly, making it suitable for large enterprise networks. On the other hand, BGP is an external gateway protocol used for routing between Autonomous Systems on the internet. Known as the "protocol of the internet, BGP determines the best path based on policies and attributes rather than just shortest-path metrics. It ensures reliable communication between different networks, supports path redundancy, and handles scalability for the vast number of routes in the global internet. Together, **OSPF and BGP** enable seamless communication within and between networks, ensuring flexibility, scalability, and efficient data exchange in diverse networking environments.

2. Procedure & Data Analysis:

2.1 Building the Topology

As our project involves many subnets, we ask to build the main topology and its shown in figure 5:

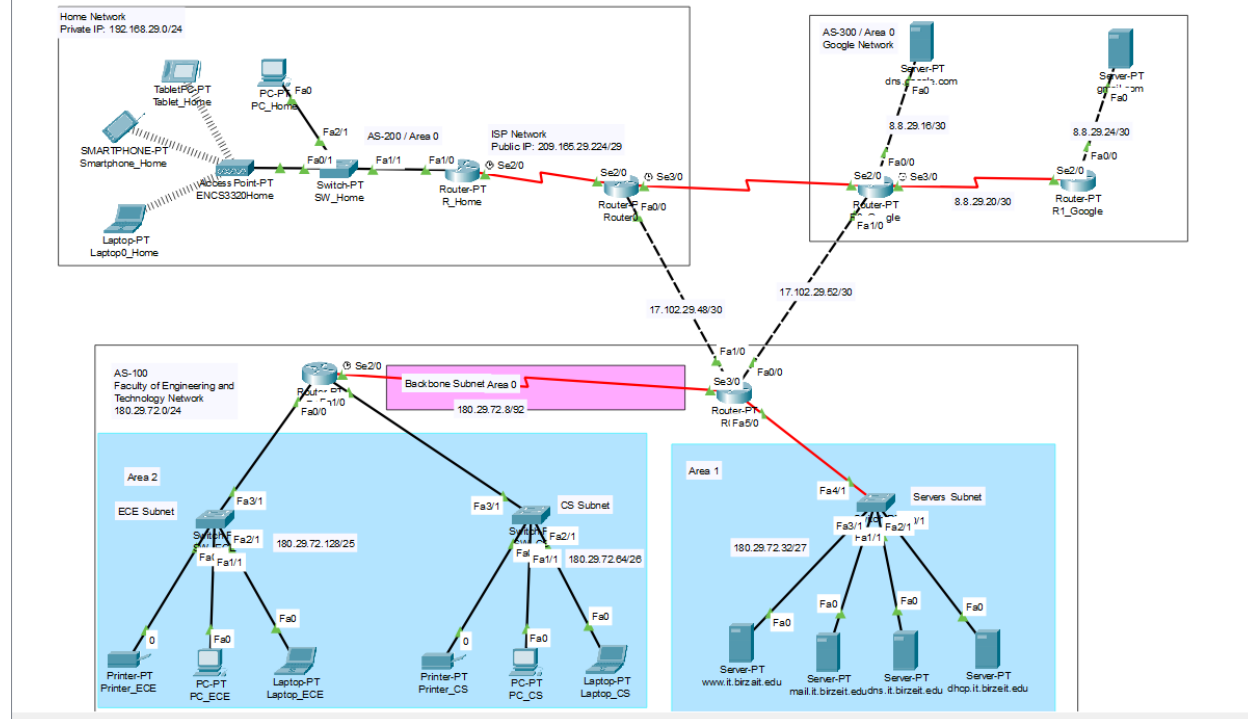


Figure 5: Topology

✚ **Subnetting** Steps according to our AES 100 Subnet in the project is as following:

1. **Sort Subnets by Size:**
 - ECE Subnet: Requires 120 IPs.
 - CS Subnet: Requires 55 IPs.
 - Servers Subnet: Requires 28 IPs.
 - Backbone Subnet: Requires 4 IPs.
2. **Start with the Largest Subnet** (ECE):
 - Step 1: Divide the /24 block into two /25 subnets.
 - ECE Subnet: Assign 180.29.72.128/25 (128 total IPs, 126 usable).
 - Remaining block: 180.29.72.0/25.
3. **Divide the Remaining Block for** CS:
 - Step 2: Divide 180.29.72.0/25 into two /26 subnets.
 - CS Subnet: Assign 180.29.72.64/26 (64 total IPs, 62 usable).
 - Remaining block: 180.29.72.0/26.
4. **Divide the Next Block for** Servers:
 - Step 3: Divide 180.29.72.0/26 into two /27 subnets.
 - Servers Subnet: Assign 180.29.72.33/27 (32 total IPs, 30 usable).
 - Remaining block: 180.29.72.0/27.
5. **Allocate the Smallest Subnet** for Backbone:
 - Step 4: Divide 180.29.72.0/27 into two /30 subnets.
 - Backbone Subnet: Assign 180.29.72.8/30 (4 total IPs, 2 usable).

2.2) AS 300

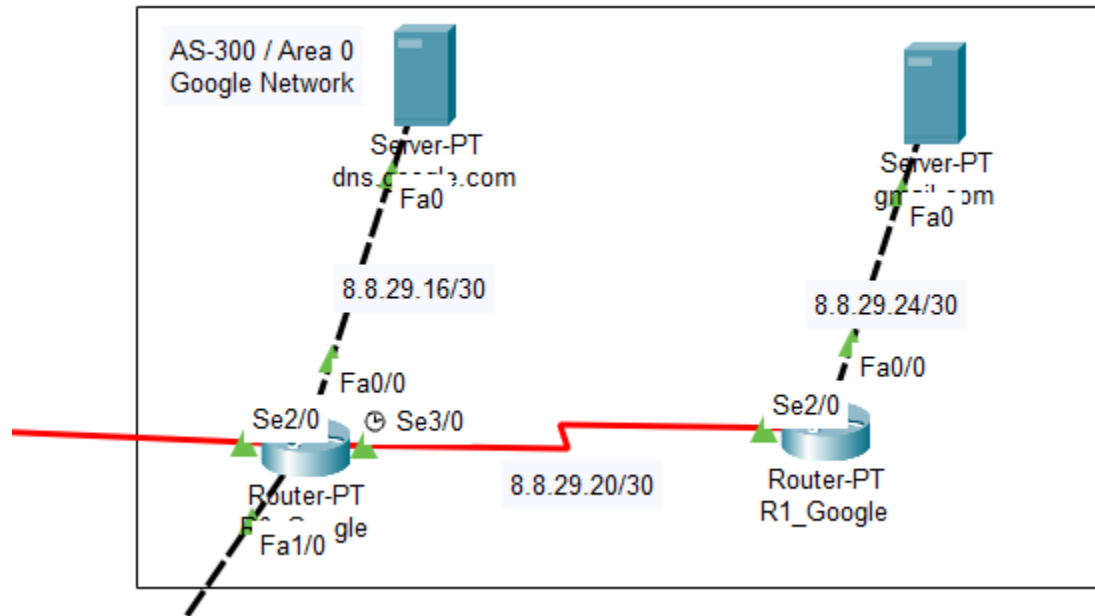


Figure 6: AS 300 /Area 0

For Router 1 (R0_Google), the following IP address configurations have been applied:

- **FastEthernet0/0:** Assigned the IP address **8.8.29.17** with a subnet mask of **255.255.255.252**.
- **FastEthernet1/0:** Assigned the IP address **17.102.29.54** with a subnet mask of **255.255.255.252**.
- **Serial2/0:** Configured with the IP address **17.102.29.57** and a subnet mask of **255.255.255.252**.
- **Serial3/0:** Assigned the IP address **8.8.29.21** with a subnet mask of **255.255.255.252**.

R0_Google

Physical Config CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

INTERFACE

- FastEthernet0/0**
- FastEthernet1/0
- Serial2/0
- Serial3/0
- FastEthernet4/0
- FastEthernet5/0

FastEthernet0/0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0004.9AE4.C338

IP Configuration

IPv4 Address 8.8.29.17

Subnet Mask 255.255.255.252

Tx Ring Limit 10

Equivalent IOS Commands

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

☐ Top

Figure 7: R0_Google Ethernet0/0 Configurations

R0_Google

Physical
Config
CLI
Attributes

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0

FastEthernet1/0
Port Status
Bandwidth
Duplex
MAC Address
IP Configuration
IPv4 Address
Subnet Mask
Tx Ring Limit

☒ On
☐ 100 Mbps
☐ 10 Mbps
☒ Auto
☐ Half Duplex
☒ Full Duplex
☒ Auto

0060.3E13.2799

17.102.29.54
255.255.255.252

10

Equivalent IOS Commands

```

Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#

```

☐ Top

Figure 8: R0_Google Ethernet1/0 Configurations

R0_Google

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

INTERFACE

- FastEthernet0/0
- FastEthernet1/0
- Serial2/0**
- Serial3/0
- FastEthernet4/0
- FastEthernet5/0

Serial2/0

Port Status ☒ On

Duplex ☐ Full Duplex

Clock Rate 2000000

IP Configuration

IPv4 Address 17.102.29.57

Subnet Mask 255.255.255.252

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
```

☐ Top

Figure 9: R0_Google Serial2/0 Configurations

R0_Google

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

INTERFACE

- FastEthernet0/0
- FastEthernet1/0
- Serial2/0
- Serial3/0**
- FastEthernet4/0
- FastEthernet5/0

Serial3/0

Port Status ☒ On

Duplex ☐ Full Duplex

Clock Rate 2000000

IP Configuration

IPv4 Address 8.8.29.21

Subnet Mask 255.255.255.252

Tx Ring Limit 10

Equivalent IOS Commands

```
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
```

☐ Top

Figure 10: R0_Google Serial3/0 Configurations

✚ For Router 2 (R1_Google), the following IP address configurations have been applied:

- **FastEthernet0/0:** Assigned the IP address **8.8.29.25** with a subnet mask of **255.255.255.252**.
- **Serial2/0:** Configured with the IP address **8.8.29.22** and a subnet mask of **255.255.255.252**

The screenshot shows the configuration window for R1_Google. The 'Config' tab is active, and the 'INTERFACE' section is expanded, showing 'FastEthernet0/0' selected. The 'FastEthernet0/0' configuration panel displays the following settings:

- Port Status: ☒ On
- Bandwidth: ☐ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex: ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address: 00D0.BA03.2EE2
- IP Configuration:
 - IPv4 Address: 8.8.29.25
 - Subnet Mask: 255.255.255.252
- Tx Ring Limit: 10

Below the configuration panel, the 'Equivalent IOS Commands' section shows the following commands:

```
Router>enable
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 FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
```

A 'Top' button is located at the bottom left of the window.

Figure 11: R1_Google Ethernet0/0 Configurations

R1_Google

Physical
Config
CLI
Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

Serial2/0

Port Status

☒ On

Duplex

☐ Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

8.8.29.22

Subnet Mask

255.255.255.252

Tx Ring Limit

10

Equivalent IOS Commands

```

Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#

```

☐ Top

Figure 12: R1_Google Serial2/0 Configurations

- ✚ In this figure we Enable only the DNS service on this server (dns.google.com).

dns.google.com

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	dns.it.birzeit.edu	A Record	180.29.72.36
1	gmail.com	A Record	8.8.29.26
2	it.birzeit.edu	NS	dns.it.birzeit.edu

DNS Cache

☐ Top

Figure 13: DNS of AES 300

✚ In this figure we assign a static IP configuration.

The screenshot shows a web-based configuration interface for dnsmasq. The browser address bar displays 'dns.google.com'. The interface has a top navigation bar with tabs: Physical, Config, Services, Desktop (selected), Programming, and Attributes. Below the navigation bar is a blue header for the 'IP Configuration' window, which includes a close button (X). The main configuration area is divided into three sections: IP Configuration, IPv6 Configuration, and 802.1X. In the IP Configuration section, the 'Static' radio button is selected, and the fields for IPv4 Address (8.8.29.18), Subnet Mask (255.255.255.252), Default Gateway (8.8.29.17), and DNS Server (0.0.0.0) are filled. The IPv6 Configuration section also has the 'Static' radio button selected, with fields for IPv6 Address (empty), Link Local Address (FE80::201:C9FF:FE15:334E), Default Gateway (empty), and DNS Server (empty). The 802.1X section has the 'Use 802.1X Security' checkbox unchecked, and the Authentication dropdown set to 'MD5'. There are also empty fields for Username and Password. At the bottom left, there is a 'Top' link.

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	8.8.29.18
Subnet Mask	255.255.255.252
Default Gateway	8.8.29.17
DNS Server	0.0.0.0

IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::201:C9FF:FE15:334E
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure 14: assign a static IP configuration for the DNS server

- ✚ In this figure we Add the following recourse records (RRs) required in project.

The screenshot shows the dnsmasq configuration interface. The 'Services' tab is selected, and the 'DNS' service is enabled. The 'Resource Records' section shows a table of existing records.

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

No.	Name	Type	Detail
0	dns.it.birzeit.edu	A Record	180.29.72.36
1	gmail.com	A Record	8.8.29.26
2	it.birzeit.edu	NS	dns.it.birzeit.edu

☐ Top

Figure 15: Adding RRs record

✚ In this figure we enable the SMTP (for sending emails) and POP3 (for receiving emails) protocols.

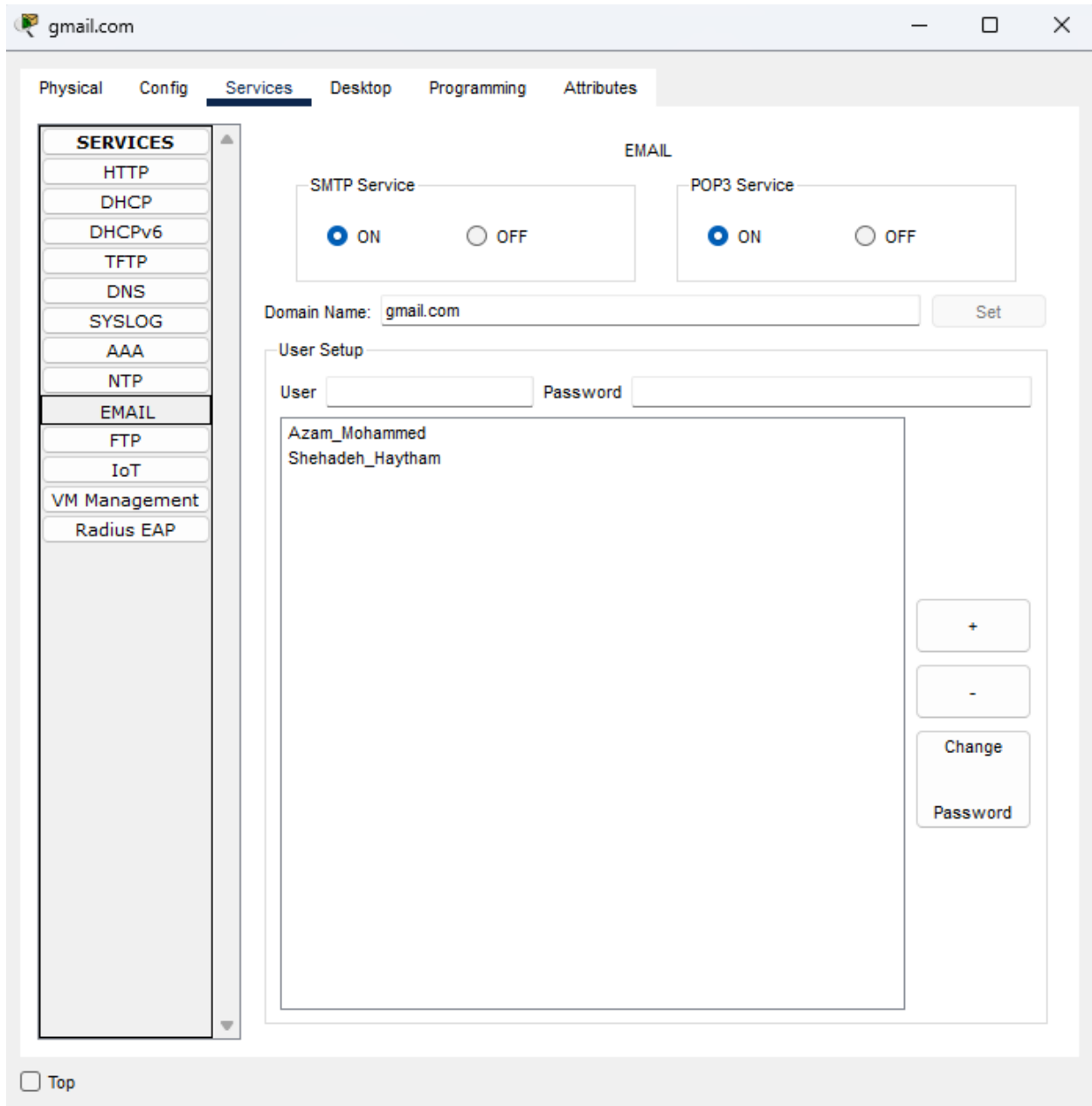


Figure 16: Enable SMTP AND POP3 protocols

✚ In this figure we assign a static IP configuration.

The image shows a web-based network configuration interface for a device named 'gmail.com'. The interface has a top navigation bar with tabs: Physical, Config, Services, Desktop (selected), Programming, and Attributes. Below the navigation bar is a blue header for the 'IP Configuration' window, which includes a close button (X). The main configuration area is divided into three sections: IP Configuration, IPv6 Configuration, and 802.1X. In the IP Configuration section, the 'Static' radio button is selected, and the fields for IPv4 Address (8.8.29.26), Subnet Mask (255.255.255.252), Default Gateway (8.8.29.26), and DNS Server (8.8.29.18) are filled. In the IPv6 Configuration section, the 'Static' radio button is also selected, and the Link Local Address is set to FE80::203:E4FF:FE3A:C245. The 802.1X section has the 'Use 802.1X Security' checkbox unchecked, and the Authentication dropdown is set to MD5. At the bottom left, there is a 'Top' link with a square icon.

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	8.8.29.26
Subnet Mask	255.255.255.252
Default Gateway	8.8.29.26
DNS Server	8.8.29.18

IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	/
Link Local Address	FE80::203:E4FF:FE3A:C245
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure 17: assign a static IP configuration for the Gmail server

In this figure we set the domain name (gmail.com).

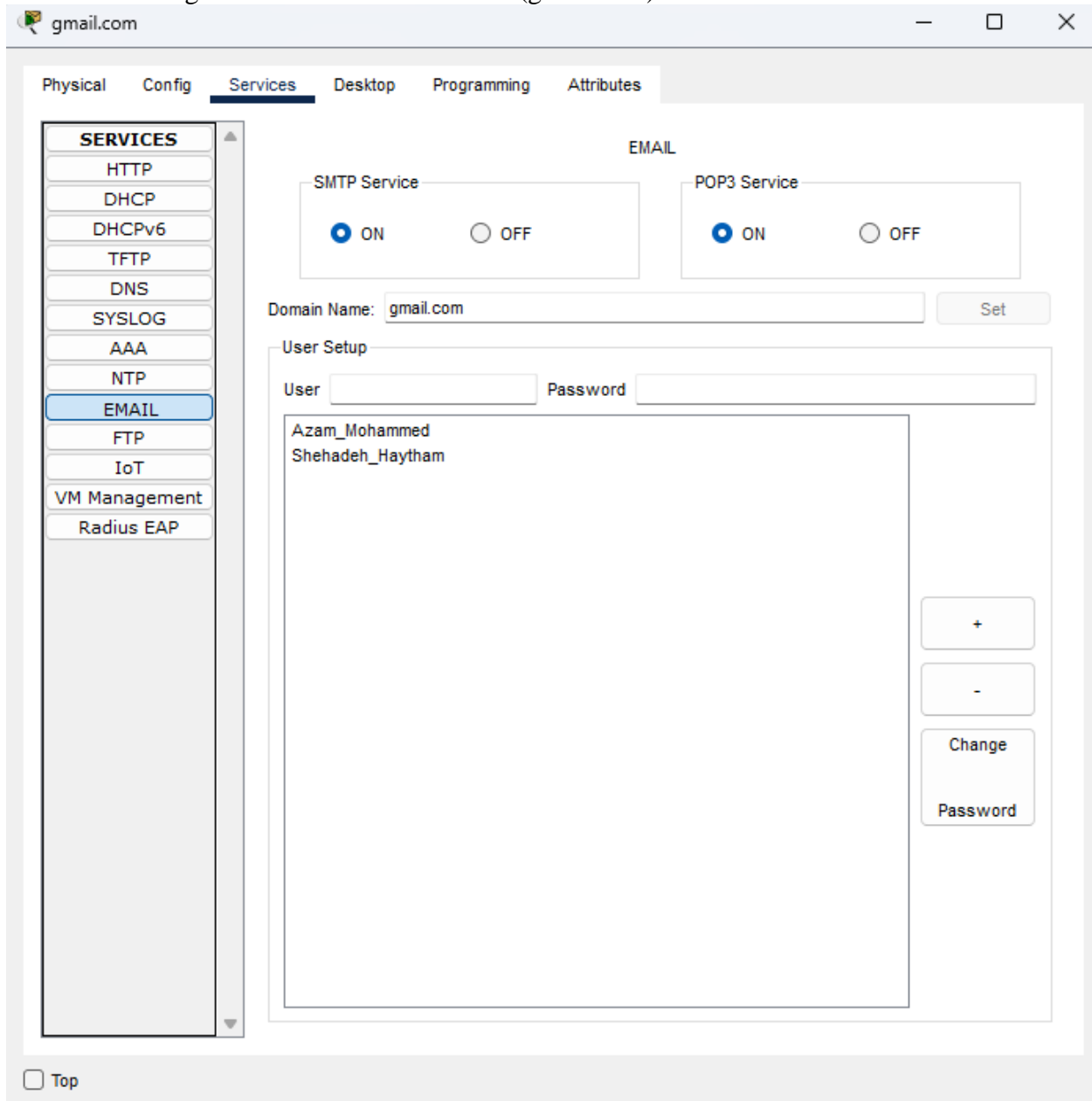


Figure 18: set the domain name

✚ In this figure we create first user account as required in project.

The screenshot shows a web-based configuration interface for a device, with a browser window titled 'gmail.com'. The interface has a top navigation bar with tabs: 'Physical', 'Config', 'Services', 'Desktop', 'Programming', and 'Attributes'. The 'Services' tab is selected. On the left, a 'SERVICES' sidebar lists various services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL (highlighted in blue), FTP, IoT, VM Management, and Radius EAP. The main content area is titled 'EMAIL' and contains two sections: 'SMTP Service' and 'POP3 Service'. Both services have radio buttons for 'ON' (selected) and 'OFF'. Below these, the 'Domain Name' is set to 'gmail.com' with a 'Set' button. The 'User Setup' section includes a 'User' field with 'Shehadeh_Haytham' and a 'Password' field with '1210991'. A list box below shows two users: 'Azam_Mohammed' and 'Shehadeh_Haytham' (highlighted in blue). To the right of the list box are three buttons: '+', '-', and 'Change Password'. At the bottom left, there is a 'Top' link.

Figure 19: create first user account

✚ In this figure we create second user account as required in project.

The screenshot shows a web-based configuration interface for a device, with the browser address bar displaying 'gmail.com'. The interface has a top navigation bar with tabs: 'Physical', 'Config', 'Services' (selected), 'Desktop', 'Programming', and 'Attributes'. On the left, a 'SERVICES' sidebar lists various services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL (highlighted in blue), FTP, IoT, VM Management, and Radius EAP. The main content area is titled 'EMAIL' and contains two service status boxes: 'SMTP Service' and 'POP3 Service', both with 'ON' selected via radio buttons. Below these is a 'Domain Name' field containing 'gmail.com' and a 'Set' button. The 'User Setup' section includes a 'User' field with 'Azam_Mohammed' and a 'Password' field with '1212429'. A large list box below shows two entries: 'Azam_Mohammed' (highlighted) and 'Shehadeh_Haytham'. To the right of the list are three buttons: '+', '-', and 'Change Password'. At the bottom left, there is a 'Top' link.

Figure 20: create second user account

2.3) AS 200

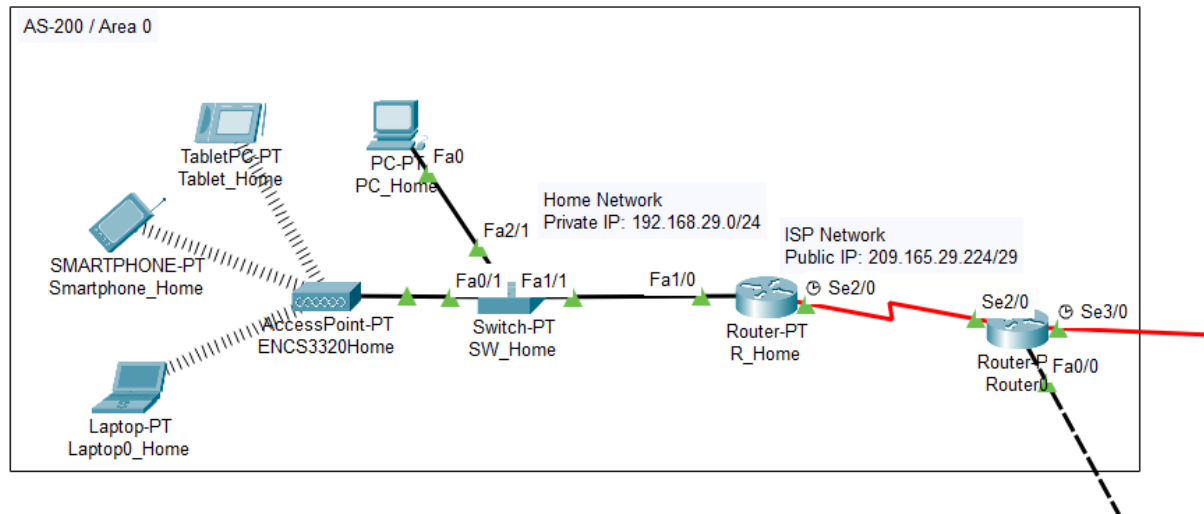


Figure 21: AS 200 / Area 0

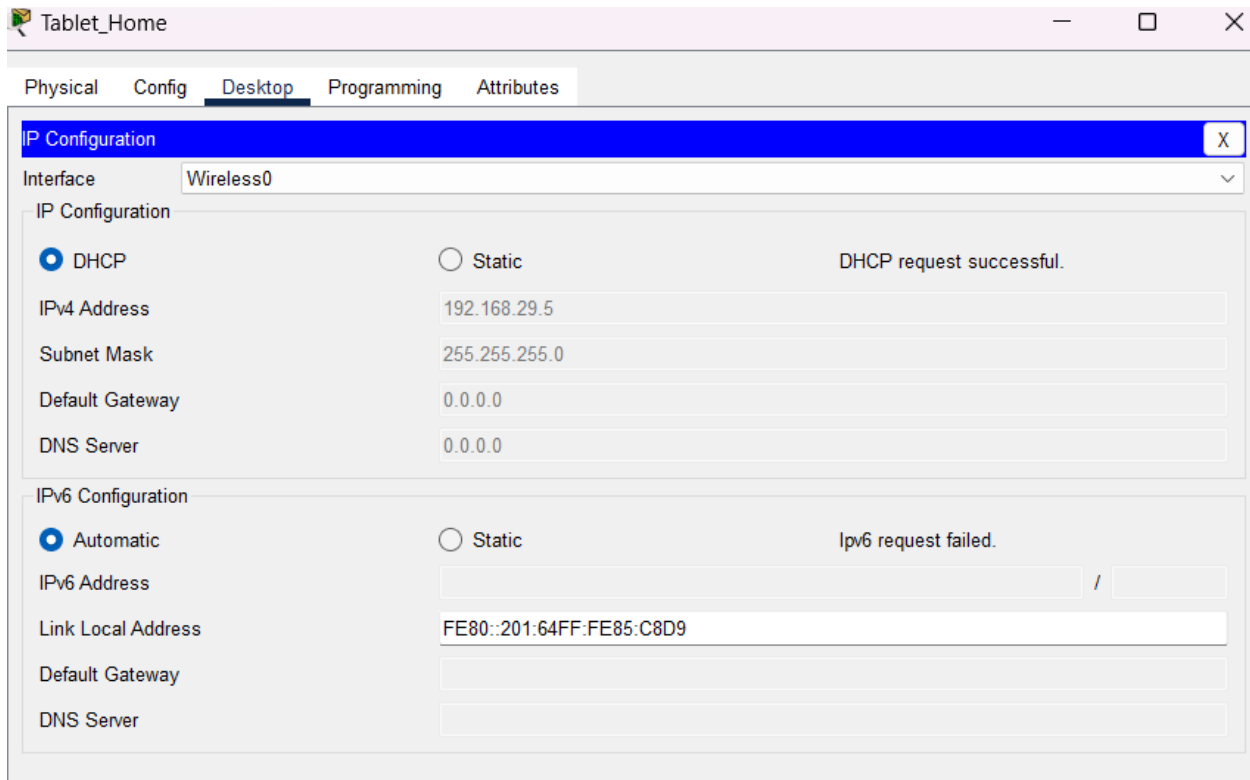


Figure 22: IP configuration of tablet

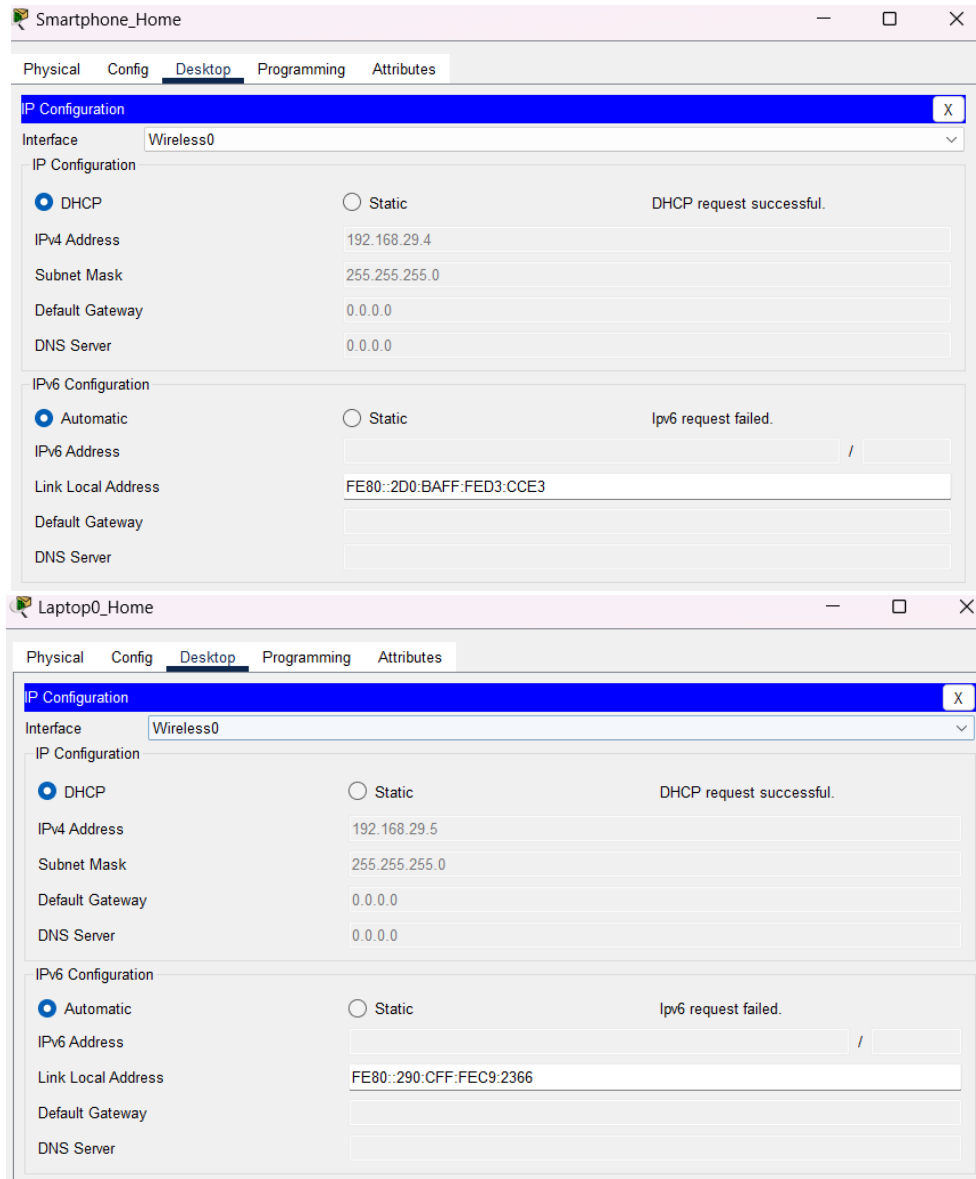


Figure 23: IP configuration of laptop and smart phone

- ✚ Connect wireless end devices to the ENCS3320Home network and cabled end devices through the switch.

- For end user configuration

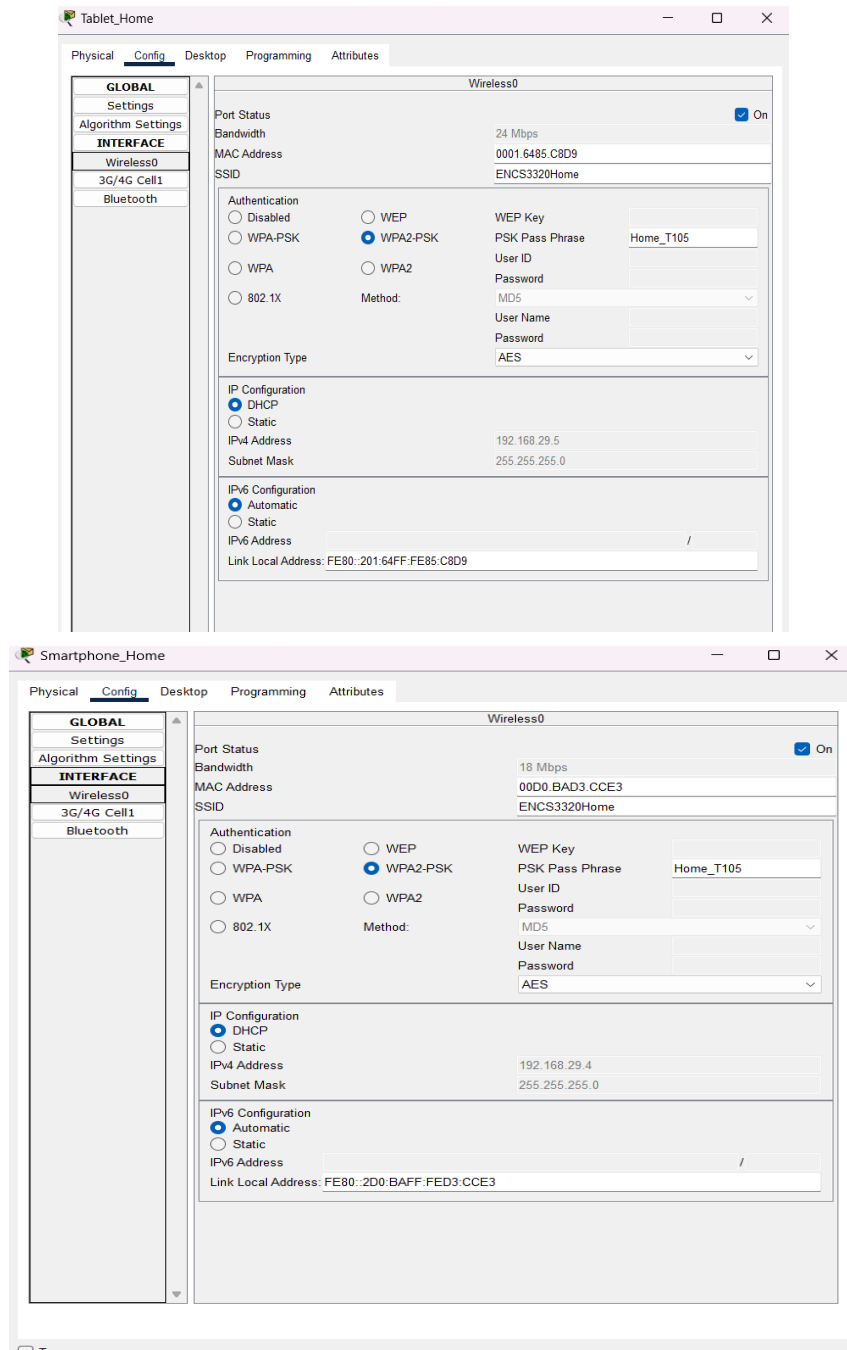


Figure 24: Tablet connection and smart phone AES 200

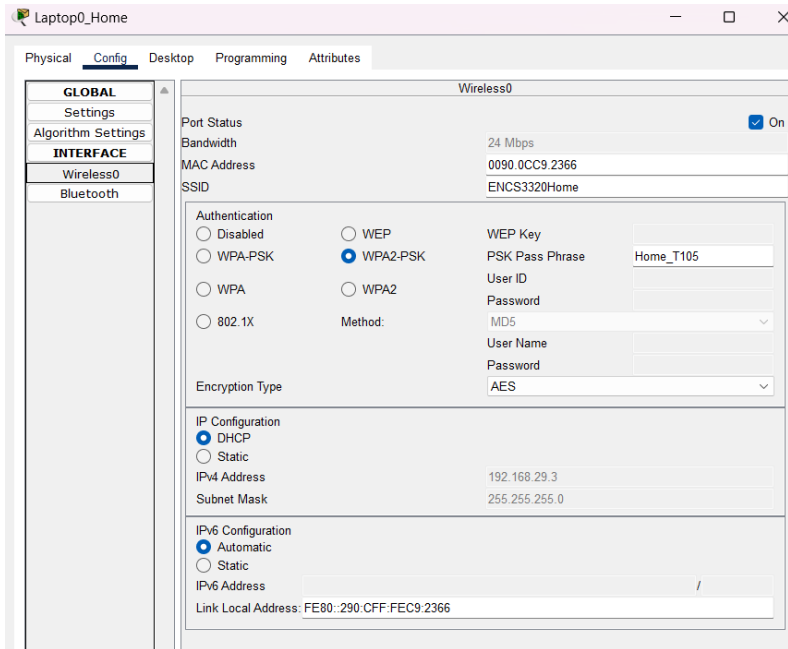


Figure 25: Laptop AES 200

Note:

- we add an extra Wi-Fi adaptor to the laptop to connect via switch
- End user in aes 200 can get a dynamic Ip address from without routing

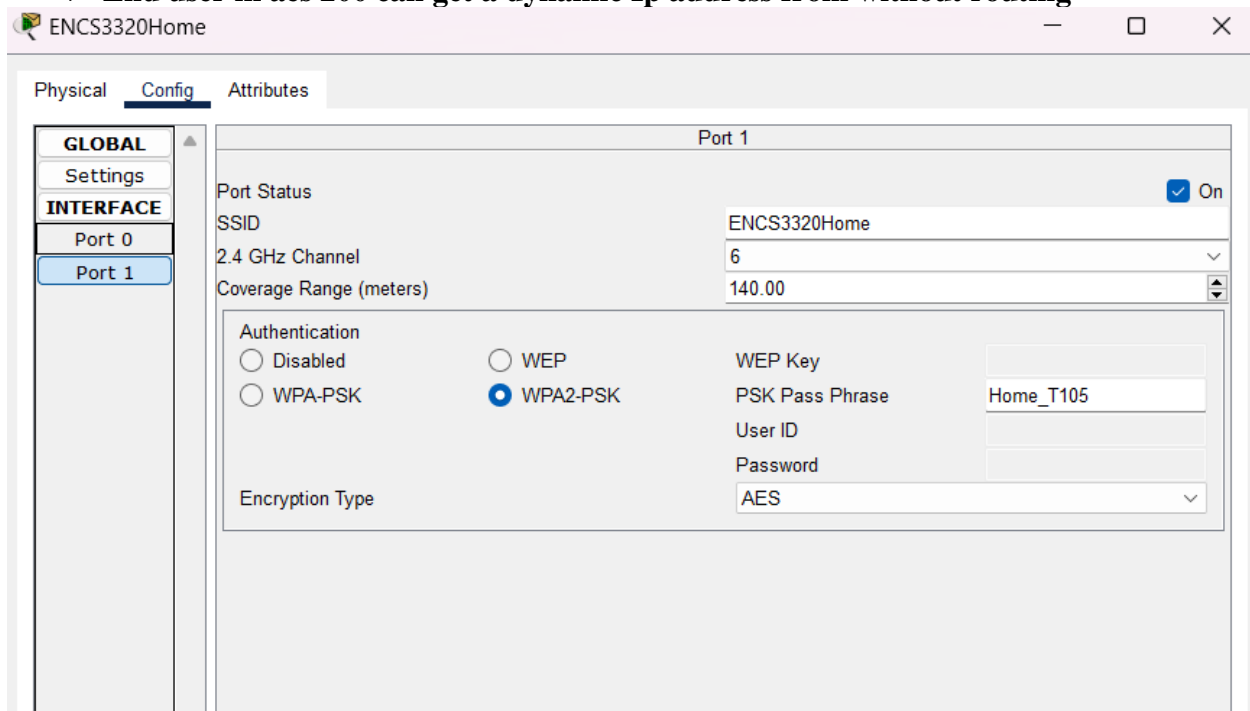


Figure 26: access point AES 200

- Name: **ENCS3320Home** The password of the user is: **Home_T05** with WPA2-PSK encryption scheme using the block cipher AES

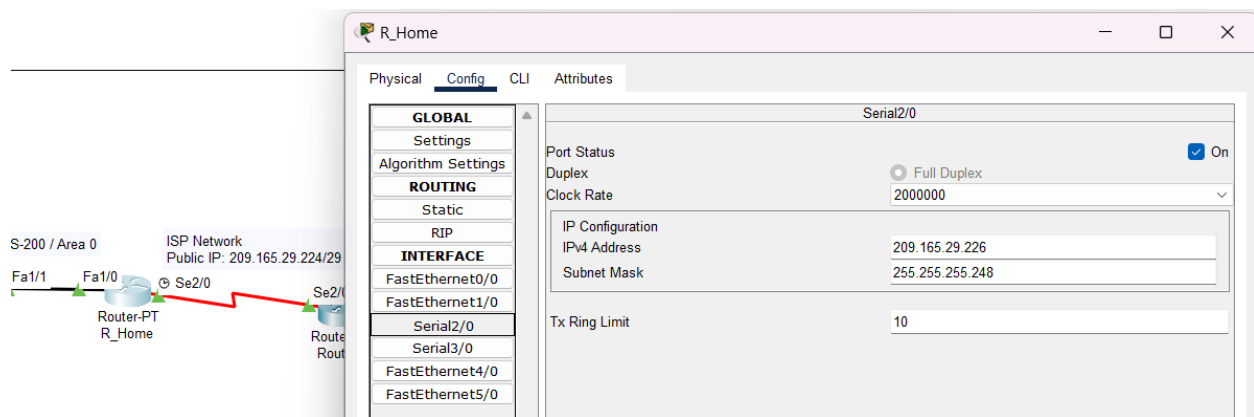


Figure 27: R_Home router with public IP AES 200

✚ Assign a static IP address for the R_home router

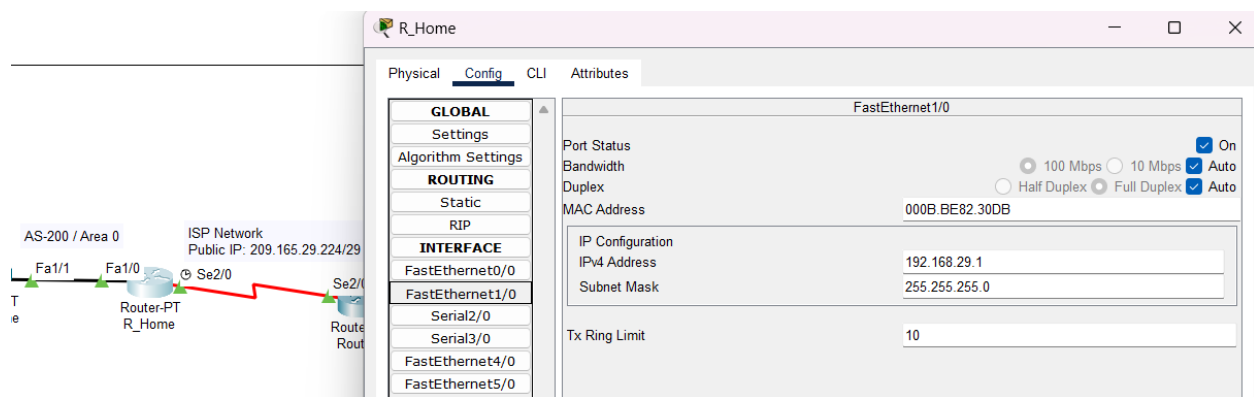


Figure 28: R_Home router with private IP AES 200


```

Router(config-if)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
enable
Router#show ip nat translations
Router#show running-config | include ip nat
ip nat inside
ip nat outside
ip nat pool p4 209.165.29.227 209.165.29.227 netmask 255.255.255.248
ip nat pool p8 209.165.29.227 209.165.29.227 netmask 255.255.255.248
ip nat inside source list 3 pool p3 overload
ip nat inside source list 6 pool p9 overload
Router#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: Serial2/0
Inside Interfaces: FastEthernet1/0
Hits: 0 Misses: 3
Expired translations: 0
Dynamic mappings:
-- Inside Source
access-list 3 pool p3 refCount 0
-- Inside Source
access-list 6 pool p9 refCount 0
Router#show ip nat translations

```

Figure 29: Nat and pool

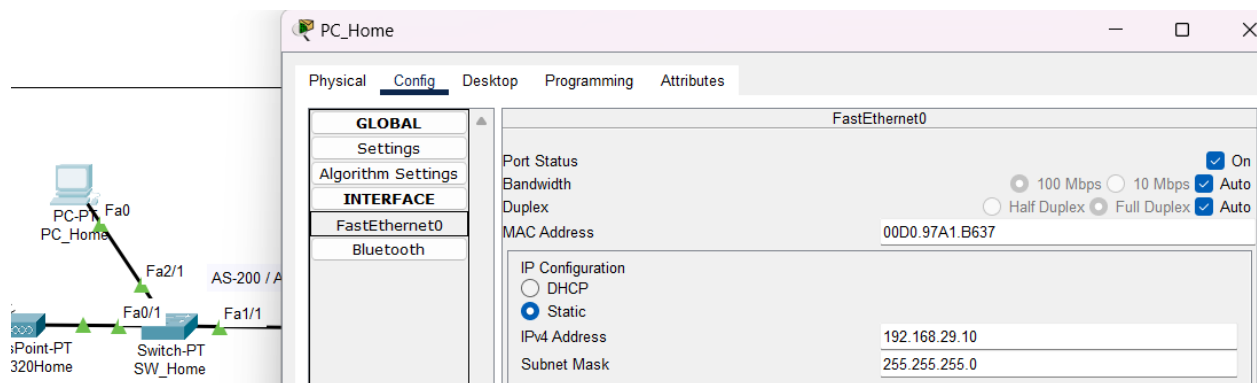


Figure 30: Apply a static IP address for the PC_Home

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	Tablet...	R_Home	ICMP		0.000	N	106	(edit)	(delete)
	Successful	Smart...	R_Home	ICMP		0.000	N	107	(edit)	(delete)
	Successful	PC_H...	R_Home	ICMP		0.000	N	108	(edit)	(delete)
	Successful	Lapto...	R_Home	ICMP		0.000	N	109	(edit)	(delete)
	Successful	PC_H...	R_Home	ICMP		0.000	N	110	(edit)	(delete)

Figure 31: successfully ping through the end device

- **Email client configuration for gmail.com and it.birzeit.edu accounts**

The figure displays two screenshots of a network configuration interface, likely from a Packet Tracer simulation. Both screenshots show a network diagram on the left and a 'Configure Mail' form on the right.

Top Screenshot: Laptop0_Home

- Network Diagram:** Shows a 'Home Network' with a Private IP of 192.168.29.0/24. Devices include Tablet-PT, Smartphone-PT, Laptop-PT, and PC-PT, all connected to an AccessPoint-PT (ENC3320Home). The PC-PT is also connected to a switch (Fa0).
- Configure Mail Form:**
 - User Information:** Your Name: Haytham Shehadeh, Email Address: Shehadeh_Haytham@gmail.com
 - Server Information:** Incoming Mail Server: gmail.com, Outgoing Mail Server: gmail.com
 - Logon Information:** User Name: Shehadeh_Haytham, Password: (masked)

Bottom Screenshot: Smartphone_Home

- Network Diagram:** Similar to the top screenshot, but includes a Switch-PT (SW_Home) connected to the AccessPoint-PT via Fa0/1. The PC-PT is connected to the Switch-PT via Fa2/1.
- Configure Mail Form:**
 - User Information:** Your Name: Mohammed Azam, Email Address: Azam_Mohammed@gmail.com
 - Server Information:** Incoming Mail Server: gmail.com, Outgoing Mail Server: gmail.com
 - Logon Information:** User Name: Azam_Mohammed, Password: (masked)

Figure 32: both Gmail account on tow devices in AES 200

- IP for the global router r0

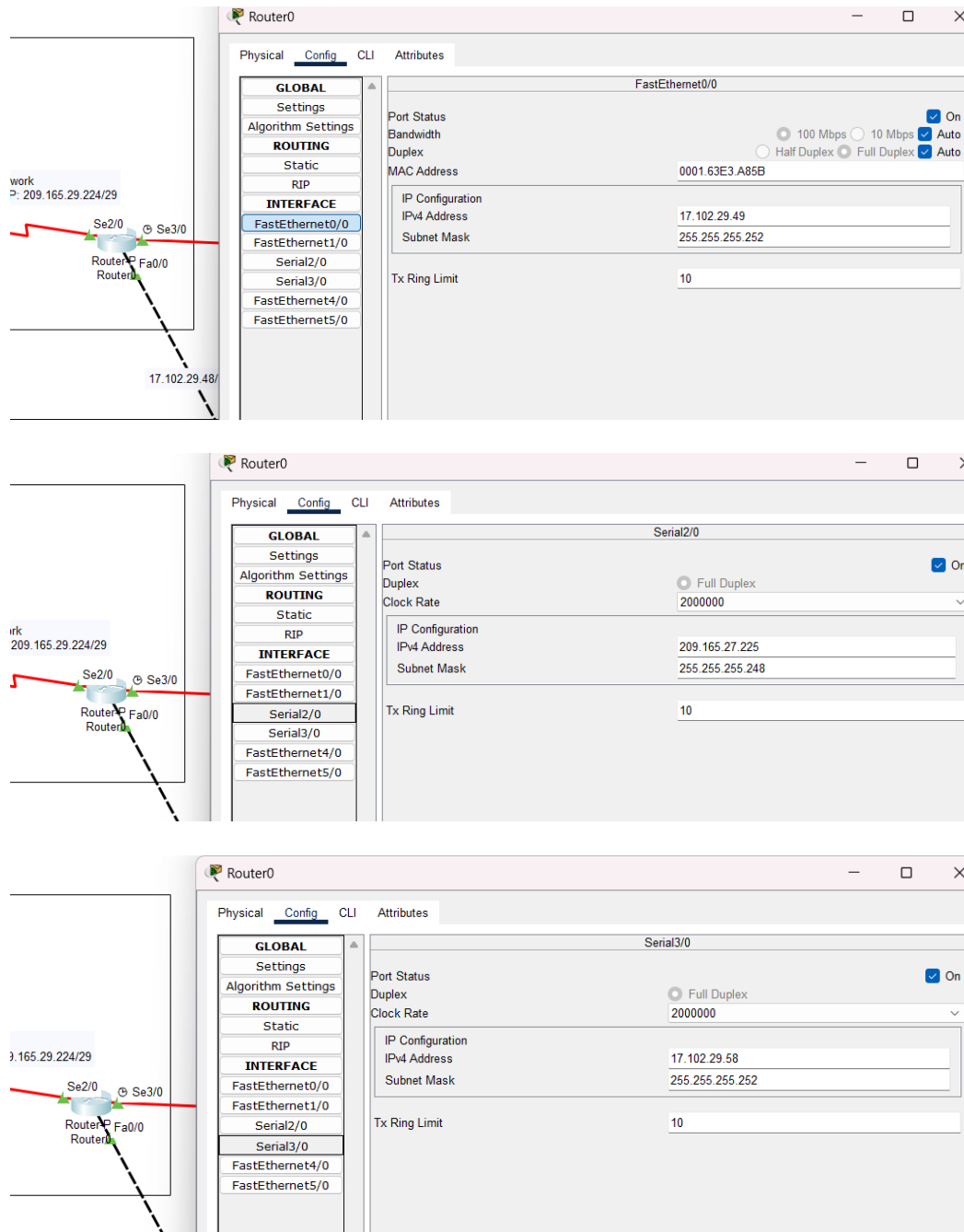


Figure 33: IP configuration of R_ISP

2.4) Faculty of Engineering and Technology Network (AS-100)

1. Servers Subnet

- **CIDR:** 180.29.72.0/27
- **Subnet Mask:** 255.255.255.224
- **Broadcast IP:** 180.29.72.31
- **First Usable IP:** 180.29.72.1
- **Last Usable IP:** 180.29.72.30

2. ECE Subnet

- **CIDR:** 180.29.72.32/25
- **Subnet Mask:** 255.255.255.128
- **Broadcast IP:** 180.29.72.159
- **First Usable IP:** 180.29.72.33
- **Last Usable IP:** 180.29.72.158

3. CS Subnet

- **CIDR:** 180.29.72.160/26
- **Subnet Mask:** 255.255.255.192
- **Broadcast IP:** 180.29.72.223
- **First Usable IP:** 180.29.72.161
- **Last Usable IP:** 180.29.72.222

4. Backbone Subnet

- **CIDR:** 180.29.72.224/30
- **Subnet Mask:** 255.255.255.252
- **Broadcast IP:** 180.29.72.227
- **First Usable IP:** 180.29.72.225
- **Last Usable IP:** 180.29.72.226

✚ For Router 4 (R1_IT), the following IP address configurations have been applied:

- **FastEthernet0/0:** Assigned the IP address **180.29.72.129** with a subnet mask of **255.255.255.128**
- **FastEthernet1/0:** Assigned the IP address **180.29.72.65** with a subnet mask of **255.255.255.192**.
- **Serial2/0:** Assigned the IP address **180.27.72.9** with a subnet mask of **255.255.255.248**.

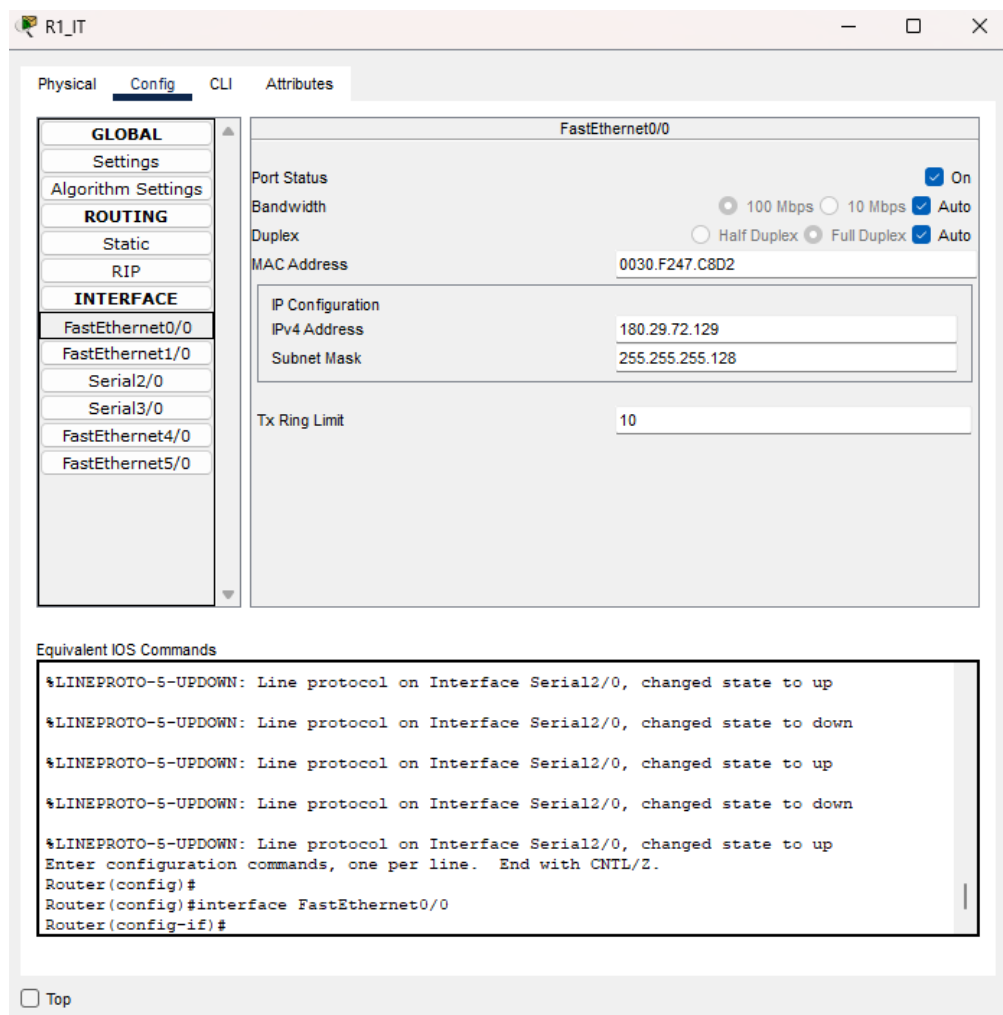


Figure 34: R1_IT Ethernet0/0 Configurations

R1_IT

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

FastEthernet1/0

Port Status

Bandwidth

Duplex

MAC Address

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

100 Mbps

10 Mbps

Half Duplex

Full Duplex

On

Auto

Auto

0090.2B72.6B51

180.29.72.65

255.255.255.192

10

Equivalent IOS Commands

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

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

Router(config)#

Router(config)#interface FastEthernet0/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface FastEthernet1/0

Router(config-if)#

Top

Figure 35: R1_IT Ethernet1/0 Configurations

R1_IT

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

Serial2/0

Serial3/0

FastEthernet4/0

FastEthernet5/0

Serial2/0

Port Status

On

Duplex

Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

180.27.72.9

Subnet Mask

255.255.255.248

Tx Ring Limit

10

Equivalent IOS Commands

Router(config)#interface FastEthernet4/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface FastEthernet5/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial2/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial3/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial2/0

Router(config-if)#

Top

Figure 36: R1_IT Serial2/0 Configurations

In this figure we enable HTTP and HTTP Secure (HTTPS) protocols.

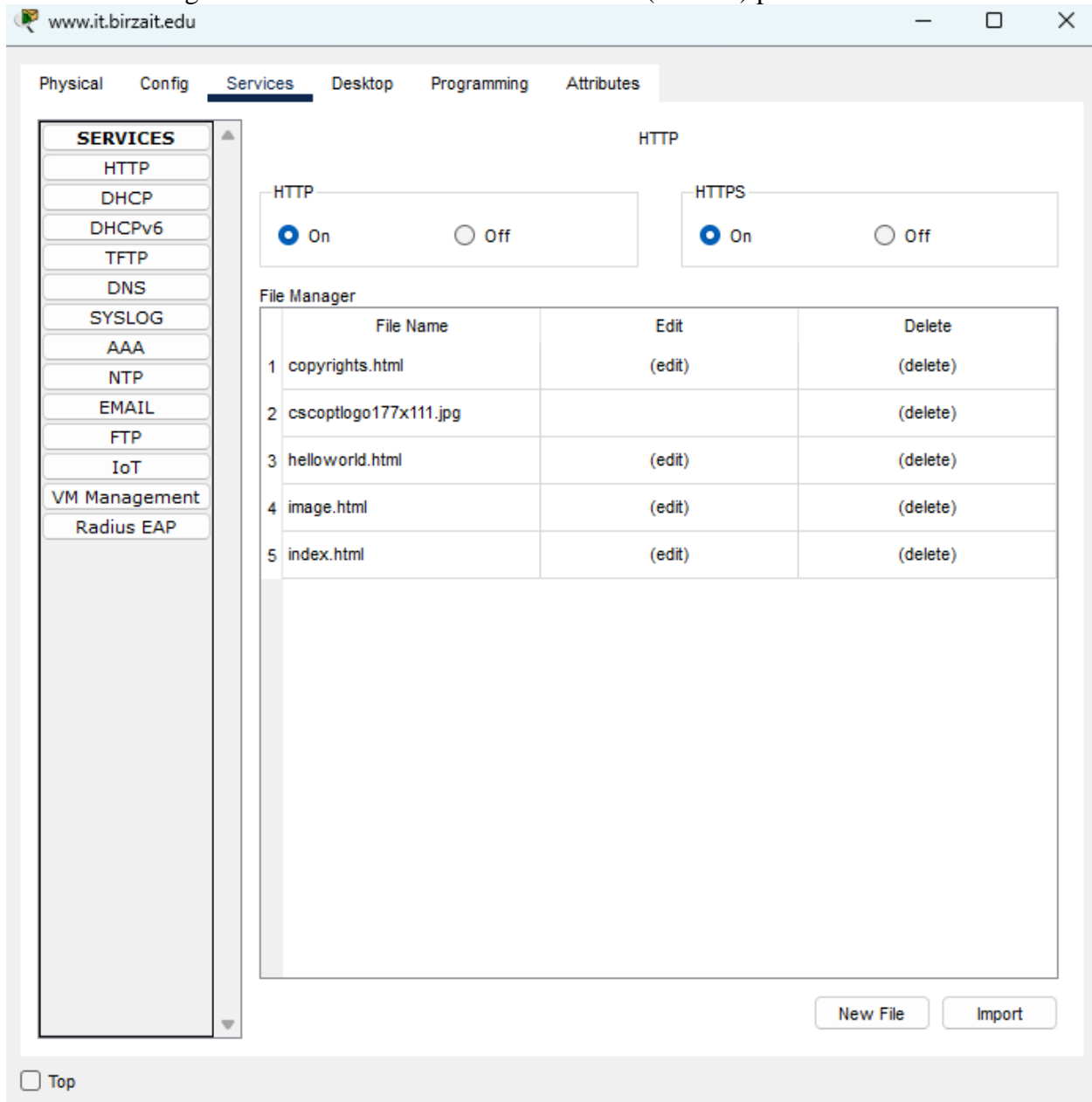


Figure 37: enable HTTP and HTTP

In this figure we assign a static IP configuration.

The screenshot shows a web-based configuration interface for a network device. The browser address bar displays 'www.it.birzait.edu'. The interface has a top navigation bar with tabs: 'Physical', 'Config', 'Services', 'Desktop' (selected), 'Programming', and 'Attributes'. Below this is a blue header bar for the 'IP Configuration' window, which includes a close button 'X'. The main content area is divided into three sections: 'IP Configuration', 'IPv6 Configuration', and '802.1X'. In the 'IP Configuration' section, the 'Static' radio button is selected, and the following fields are filled: IPv4 Address (180.29.72.34), Subnet Mask (255.255.255.224), Default Gateway (180.29.72.33), and DNS Server (180.29.72.36). The 'IPv6 Configuration' section also has the 'Static' radio button selected, with fields for IPv6 Address (empty), Link Local Address (FE80::260:70FF:FEC4:397E), Default Gateway (empty), and DNS Server (empty). The '802.1X' section has the 'Use 802.1X Security' checkbox unchecked, and the 'Authentication' dropdown menu set to 'MD5'. Below the '802.1X' section are empty input fields for 'Username' and 'Password'. At the bottom left of the configuration area is a 'Top' button.

Physical Config Services **Desktop** Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 180.29.72.34

Subnet Mask 255.255.255.224

Default Gateway 180.29.72.33

DNS Server 180.29.72.36

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::260:70FF:FEC4:397E

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

Figure 38: assign a static IP configuration for it.birazit.edu

✚ In this figure we customize the index.html page include as required.

The screenshot shows the Cisco IOS configuration interface for the 'Services' tab. On the left, a 'SERVICES' menu lists various services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL, FTP, IoT, VM Management, and Radius EAP. The 'HTTP' service is selected. The main area shows the 'HTTP' configuration with 'On' selected for both 'HTTP' and 'HTTPS'. Below this is a 'File Manager' table listing files and their edit/delete options. At the bottom right are 'New File' and 'Import' buttons. A 'Top' link is at the bottom left.

www.it.birzait.edu

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	helloworld.html	(edit)	(delete)
4	image.html	(edit)	(delete)
5	index.html	(edit)	(delete)

New File Import

☐ Top

Figure 39: customize the index.html page

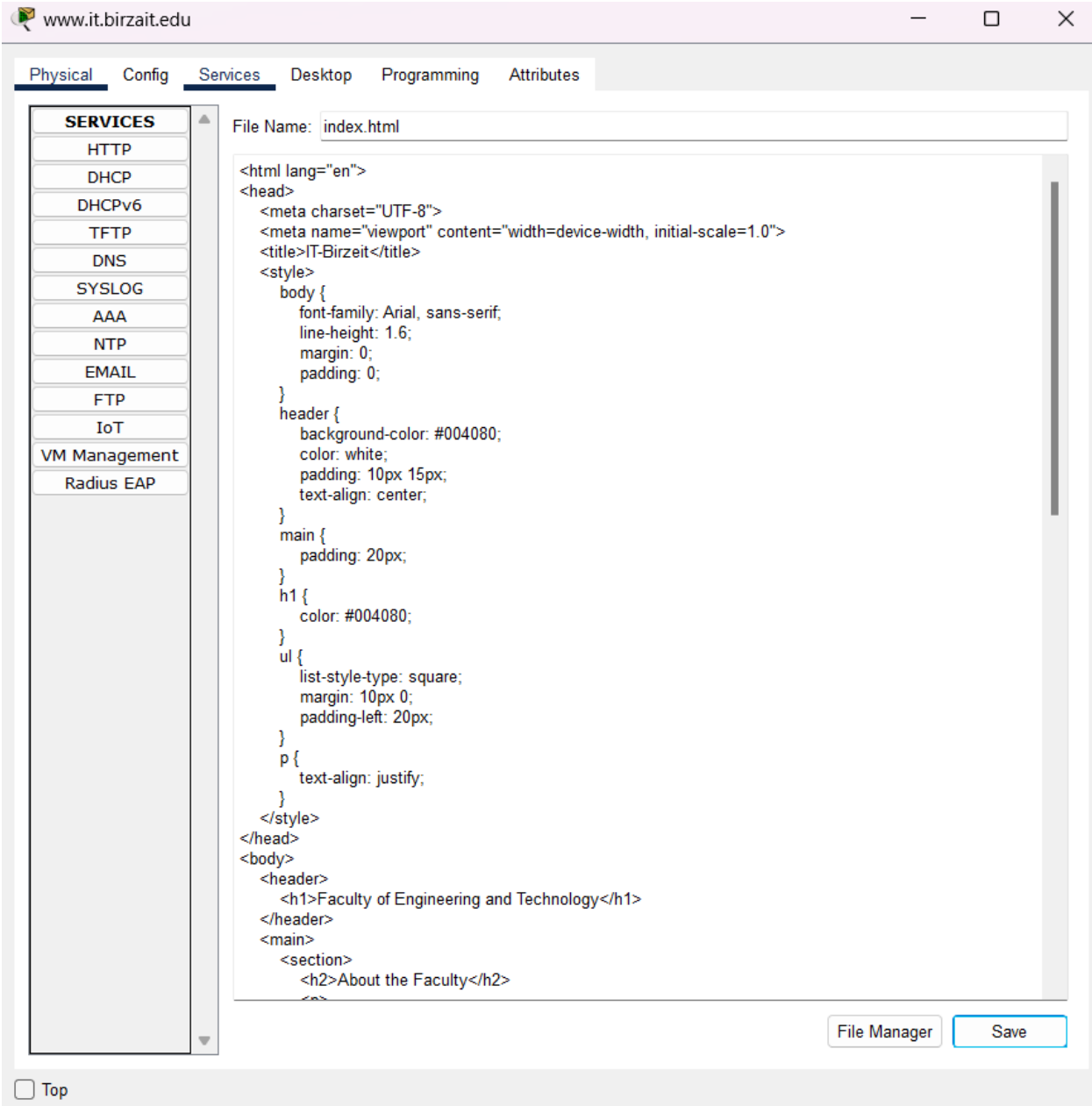


Figure 40: a snapshot of the html code

- In this figure we enable the **SMTP** (for sending emails) and POP3 (for receiving emails) protocols.

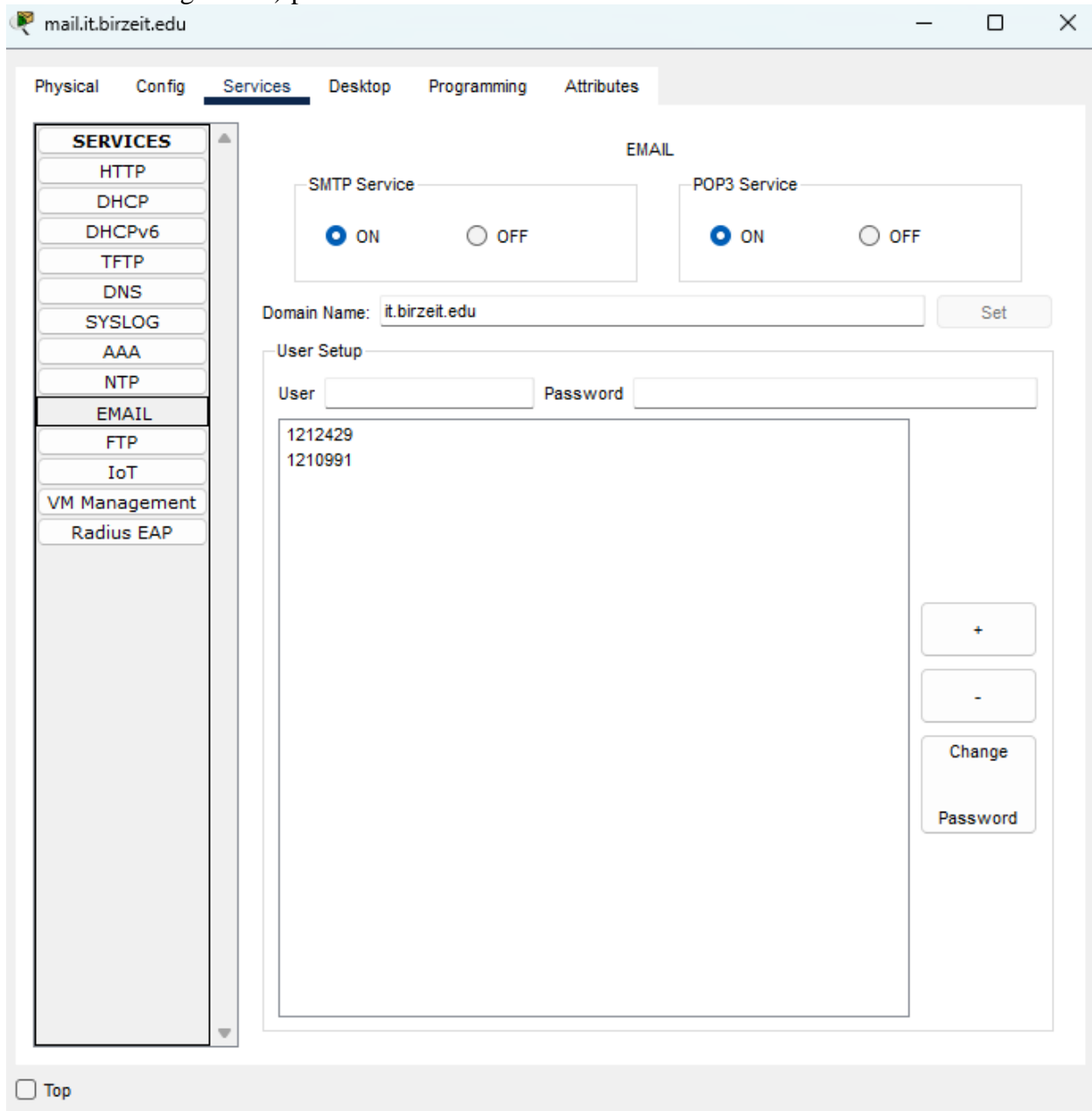


Figure 41: enable POP3 and SMTP protocols

- In this figure we assign a static IP configuration.

The screenshot shows a web-based network configuration interface for the device 'mail.it.birzeit.edu'. The 'Desktop' tab is selected, and the 'IP Configuration' window is open. The window has a blue title bar with a close button. Inside, there are three main sections: IP Configuration, IPv6 Configuration, and 802.1X. In the IP Configuration section, the 'Static' radio button is selected, and the following fields are filled: IPv4 Address (180.29.72.35), Subnet Mask (255.255.255.224), Default Gateway (180.29.72.33), and DNS Server (180.29.72.36). The IPv6 Configuration section has the 'Static' radio button selected, with the Link Local Address set to FE80::2E0:8FFF:FE86:55E6. The 802.1X section has 'Use 802.1X Security' unchecked, and the Authentication dropdown is set to MD5. At the bottom left, there is a 'Top' link.

IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	180.29.72.35
Subnet Mask	255.255.255.224
Default Gateway	180.29.72.33
DNS Server	180.29.72.36

IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::2E0:8FFF:FE86:55E6
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

[Top](#)

Figure 42: assign a static IP configuration for mail.it

✚ In this figure we set the domain name (it.birzeit.edu).

mail.it.birzeit.edu

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 ☒ ON ☐ OFF

POP3 Service ☒ ON ☐ OFF

Domain Name:

User Setup

User Password

1212429
1210991

☐ Top

Figure 43: set the domain name

✚ In this figure we create first user account as required in project.

The screenshot shows a web browser window with the address bar displaying "mail.it.birzeit.edu". The interface has a top navigation bar with tabs: "Physical", "Config", "Services", "Desktop", "Programming", and "Attributes". The "Services" tab is selected. On the left, a "SERVICES" sidebar lists various services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL (highlighted), FTP, IoT, VM Management, and Radius EAP. The main content area is titled "EMAIL" and contains two sections: "SMTP Service" and "POP3 Service", both with "ON" radio buttons selected. Below these is a "Domain Name" field with the value "it.birzeit.edu" and a "Set" button. The "User Setup" section includes "User" and "Password" fields, both containing "1210991". A list box below shows two entries: "1212429" and "1210991", with the latter selected. To the right of the list box are three buttons: "+", "-", and "Change Password". At the bottom left, there is a "Top" link.

Figure 44: create first user account

✚ In this figure we create second user account as required in project.

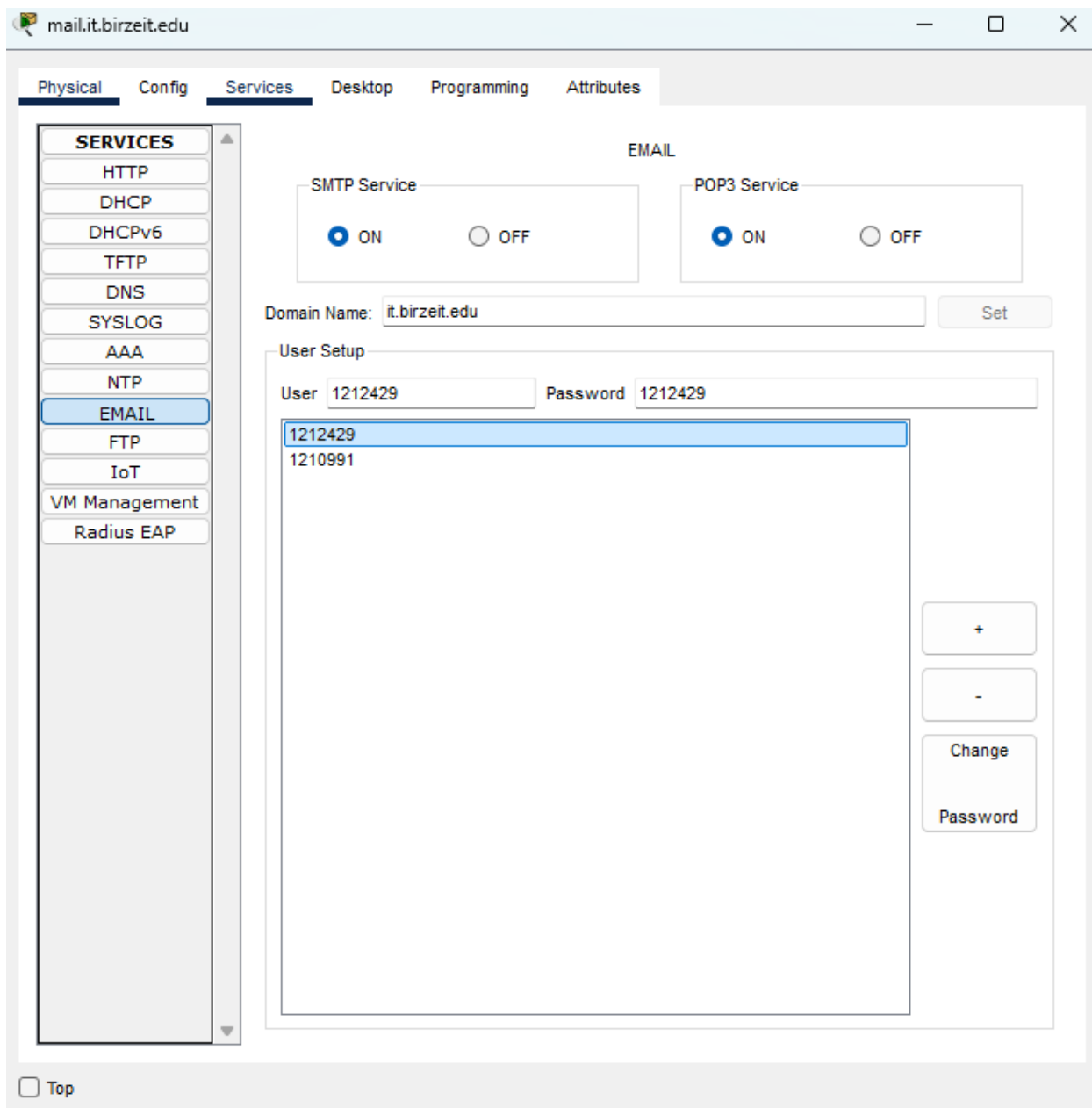


Figure 45: create second user account

In this figure we Enable only the DNS service on this server.

The screenshot shows the dnsmasq configuration interface for the server `dns.it.birzeit.edu`. The 'Services' tab is selected, and the 'DNS' service is enabled (radio button 'On' is selected). The 'Resource Records' section shows a list of records:

No.	Name	Type	Detail
0	dns.google.com	A Record	8.8.29.18
1	gmail.com	NS	dns.google.com
2	it.birzeit.edu	CNAME	mail.it.birzeit.edu
3	mail.it.birzeit.edu	A Record	180.29.72.35
4	www.it.birzeit.edu	A Record	180.29.72.34

At the bottom of the interface, there is a 'DNS Cache' button and a 'Top' link.

Figure 46: Enable only the DNS

✚ In this figure we assign a static IP configuration.

The screenshot shows a web-based configuration interface for dnsmasq, with the browser address bar displaying 'dns.it.birzeit.edu'. The interface has a top navigation bar with tabs: 'Physical', 'Config', 'Services', 'Desktop' (which is selected), 'Programming', and 'Attributes'. Below the navigation bar is a blue header for the 'IP Configuration' window, which includes a close button 'X'. The main configuration area is divided into three sections: 'IP Configuration', 'IPv6 Configuration', and '802.1X'. In the 'IP Configuration' section, the 'Static' radio button is selected, and the fields are filled with: IPv4 Address: 180.29.72.36, Subnet Mask: 255.255.255.224, Default Gateway: 180.29.72.33, and DNS Server: 0.0.0.0. In the 'IPv6 Configuration' section, the 'Static' radio button is also selected, with fields for IPv6 Address (empty), Link Local Address: FE80::2E0:F9FF:FE8B:4478, Default Gateway (empty), and DNS Server (empty). The '802.1X' section has the 'Use 802.1X Security' checkbox unchecked, and the 'Authentication' dropdown set to 'MD5'. Below these fields are empty input boxes for 'Username' and 'Password'. At the bottom left of the interface is a 'Top' link with a small square icon.

IP Configuration	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
IPv4 Address	180.29.72.36
Subnet Mask	255.255.255.224
Default Gateway	180.29.72.33
DNS Server	0.0.0.0

IPv6 Configuration	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
IPv6 Address	
Link Local Address	FE80::2E0:F9FF:FE8B:4478
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure 47: assign a static IP configuration for the DNS server

In this figure we add the RRs as required in project.

The screenshot shows the dnsmasq configuration window for the domain `dns.it.birzeit.edu`. The **Services** tab is selected, and the **DNS** service is enabled (radio button selected). The **Resource Records** section shows a list of records with columns for No., Name, Type, and Detail. The records are as follows:

No.	Name	Type	Detail
0	dns.google.com	A Record	8.8.29.18
1	gmail.com	NS	dns.google.com
2	it.birzeit.edu	CNAME	mail.it.birzeit.edu
3	mail.it.birzeit.edu	A Record	180.29.72.35
4	www.it.birzeit.edu	A Record	180.29.72.34

At the bottom of the window, there is a **DNS Cache** button and a **Top** link.

Figure 48: add the RRs record

In this figure we enable only DHCP service.

The screenshot shows a web-based configuration interface for a DHCP server. The browser address bar displays 'dhcp.it.birzeit.edu'. The interface has a top navigation bar with tabs: Physical, Config, Services (selected), Desktop, Programming, and Attributes. On the left, a 'SERVICES' sidebar lists various services: HTTP, DHCP (highlighted), DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL, FTP, IoT, VM Management, and Radius EAP. The main area is titled 'DHCP' and contains configuration fields for the 'FastEthernet0' interface. The 'Service' is set to 'On'. Fields include Pool Name (serverPool), Default Gateway (0.0.0.0), DNS Server (0.0.0.0), Start IP Address (180.29.72.32), Subnet Mask (255.255.255.224), Maximum Number of Users (512), TFTP Server (0.0.0.0), and WLC Address (0.0.0.0). Below these fields are 'Add', 'Save', and 'Remove' buttons. A table at the bottom lists existing DHCP pools.

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
CS_Pool	180.29.7...	180.29.7...	180.29.7...	255.255....	21	0.0.0.0	0.0.0.0
ECE_Pool	180.29.7...	180.29.7...	180.29.7...	255.255....	116	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	180.29.7...	255.255....	512	0.0.0.0	0.0.0.0

Top

Figure 49: enable only DHCP

✚ In this figure we assign a static IP configuration.

The screenshot shows a web-based configuration interface for a DHCP server. The browser address bar displays 'dhcp.it.birzeit.edu'. The interface has a top navigation bar with tabs: 'Physical', 'Config', 'Services', 'Desktop' (selected), 'Programming', and 'Attributes'. Below this, a blue header bar reads 'IP Configuration' with a close button 'X'. The main content area is divided into three sections: 'IP Configuration', 'IPv6 Configuration', and '802.1X'. In the 'IP Configuration' section, the 'Static' radio button is selected, and the following fields are filled: IPv4 Address (180.29.72.37), Subnet Mask (255.255.255.224), Default Gateway (180.29.72.33), and DNS Server (180.29.72.36). The 'IPv6 Configuration' section also has 'Static' selected, with IPv6 Address, Link Local Address (FE80::2E0:F9FF:FE3B:2099), Default Gateway, and DNS Server fields. The '802.1X' section has 'Use 802.1X Security' unchecked, and the Authentication dropdown set to 'MD5'. At the bottom left, there is a 'Top' button.

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	180.29.72.37
Subnet Mask	255.255.255.224
Default Gateway	180.29.72.33
DNS Server	180.29.72.36

IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::2E0:F9FF:FE3B:2099
Default Gateway	
DNS Server	

802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

☐ Top

Figure 50: Assign a static IP configuration

In this figure we create separate pools for the CS subnet (CS_Pool). In this

The screenshot shows a web-based configuration interface for DHCP services. The browser address bar displays 'dhcp.it.birzeit.edu'. The interface has a top navigation bar with tabs: Physical, Config, Services, Desktop, Programming, and Attributes. The 'Services' tab is selected, and a left sidebar lists various services: HTTP, DHCP (highlighted), DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL, FTP, IoT, VM Management, and Radius EAP.

The main configuration area is titled 'DHCP'. It includes fields for:

- Interface: FastEthernet0
- Service: On (radio button selected)
- Pool Name: CS_Pool
- Default Gateway: 180.29.72.65
- DNS Server: 180.29.72.36
- Start IP Address: 180.29.72.75
- Subnet Mask: 255.255.255.128
- Maximum Number of Users: 21
- TFTP Server: 0.0.0.0
- WLC Address: 0.0.0.0

Below these fields are 'Add', 'Save', and 'Remove' buttons. A table at the bottom lists existing DHCP pools:

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
CS_Pool	180.29.7...	180.29.7...	180.29.7...	255.255....	21	0.0.0.0	0.0.0.0
ECE_Pool	180.29.7...	180.29.7...	180.29.7...	255.255....	116	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	180.29.7...	255.255....	512	0.0.0.0	0.0.0.0

At the bottom left, there is a 'Top' link.

Figure 51: create separate pools (CS_Pool).

- ✚ In this figure we configure the R1_IT router to forward DHCP broadcast messages received on the gateway interface for the ECE and CS networks using the ip helper command.

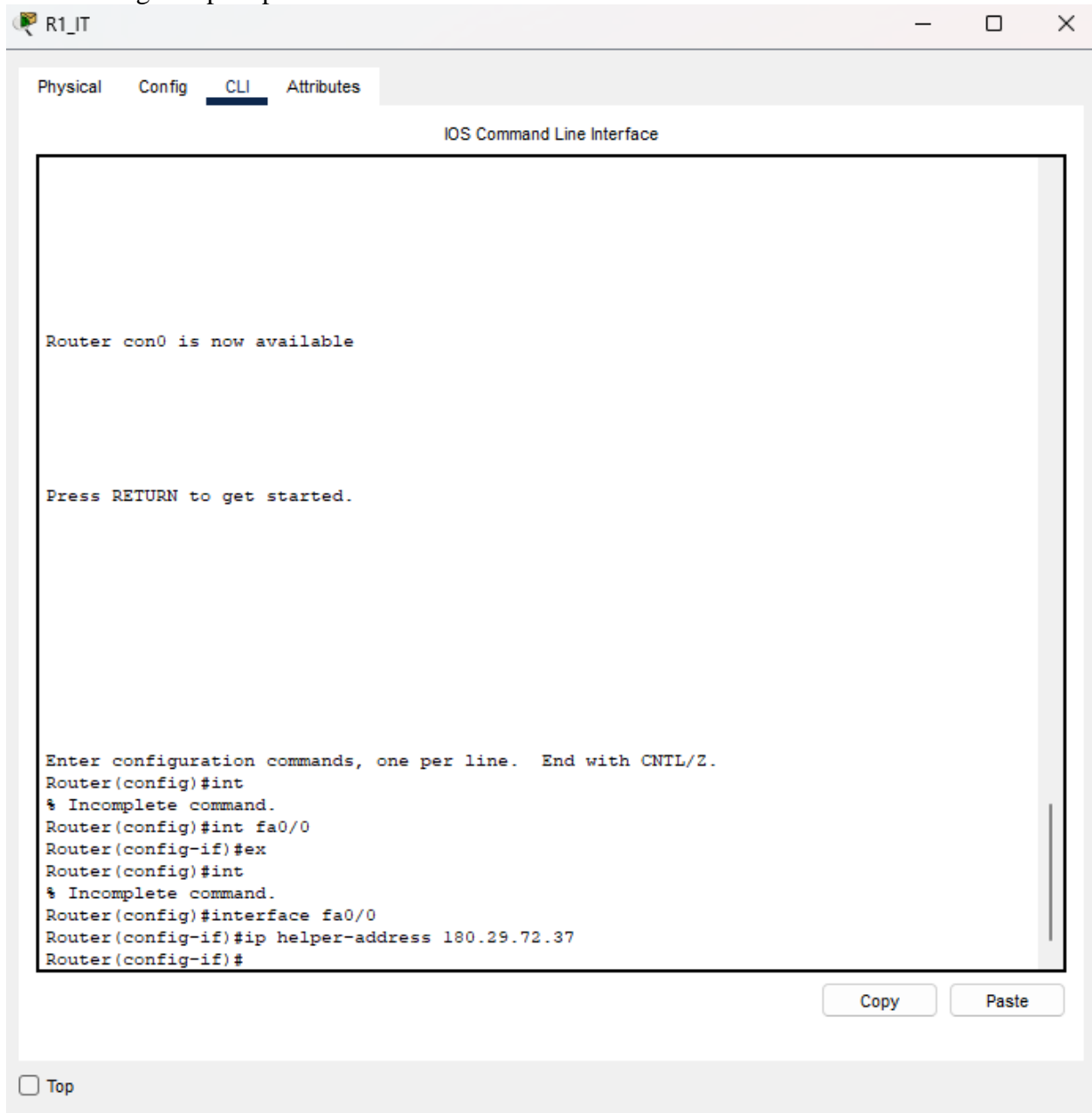


Figure 53: R1_IT router to forward DHCP broadcast messages

✚ In this figure we assign a static IP configuration to the printer

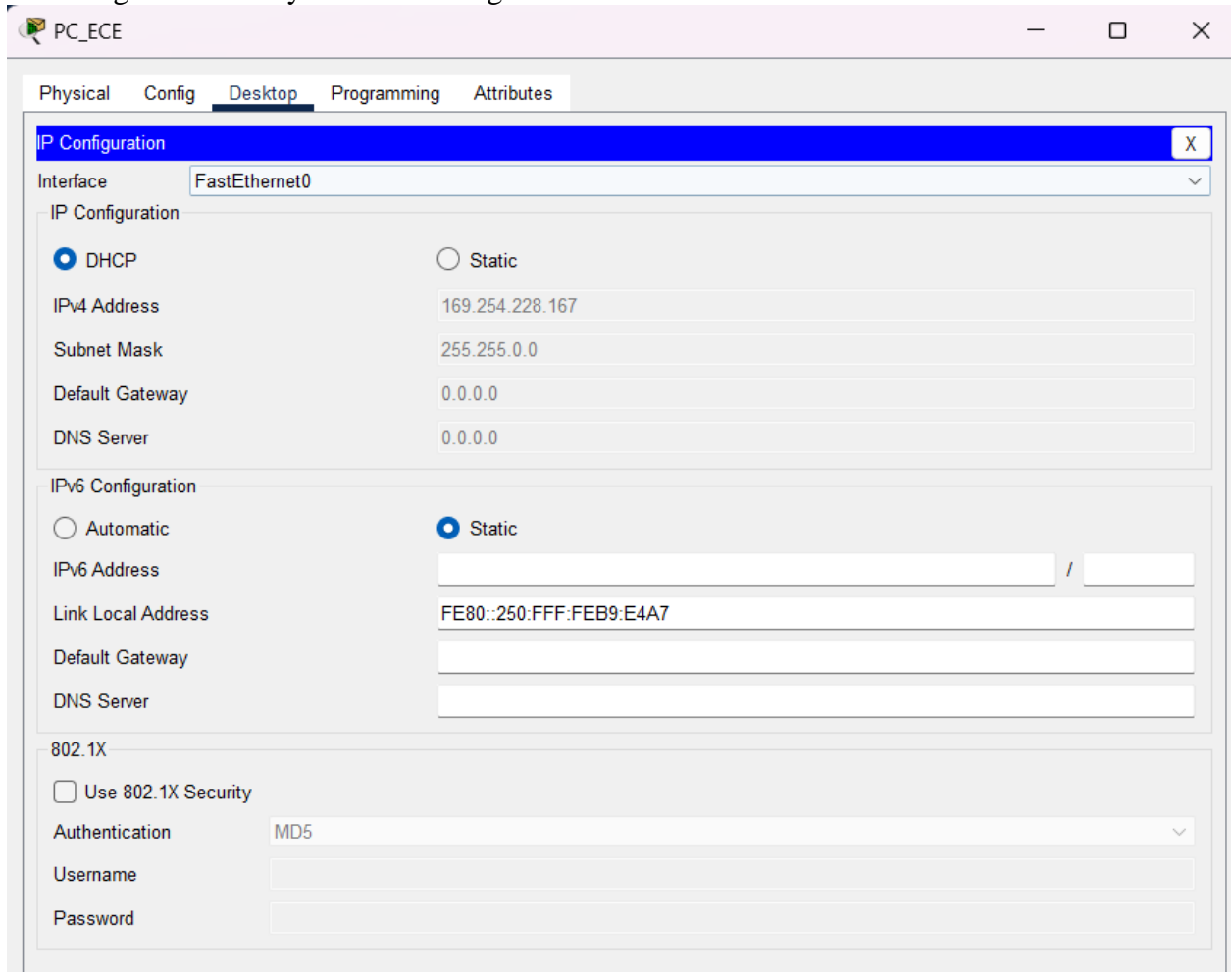
The screenshot shows the 'Printer_ECE' configuration window with the 'Config' tab selected. On the left, a sidebar contains 'GLOBAL' and 'INTERFACE' sections, with 'FastEthernet0' selected under 'INTERFACE'. The main area is titled 'FastEthernet0' and contains the following settings:

- Port Status:** ☒ On
- Bandwidth:** ☒ 100 Mbps ☐ 10 Mbps ☒ Auto
- Duplex:** ☐ Half Duplex ☒ Full Duplex ☒ Auto
- MAC Address:** 0001.9614.543A
- IP Configuration:** ☒ Static ☐ DHCP
 - IPv4 Address:** 180.29.72.130
 - Subnet Mask:** 255.255.255.128
- IPv6 Configuration:** ☒ Static ☐ Automatic
 - IPv6 Address:** [Empty field]
 - Link Local Address:** FE80::201:96FF:FE14:543A

At the bottom left, there is a 'Top' button with a square icon.

Figure 54: assign a static IP configuration to the printer

✚ In this figure we use dynamic IP configurations for the PC.



The screenshot shows a configuration window titled "PC_ECE" with a tabbed interface. The "Desktop" tab is selected, and the "IP Configuration" section is active. The interface is divided into three main sections: IP Configuration, IPv6 Configuration, and 802.1X.

IP Configuration:

- Interface: FastEthernet0
- IP Configuration: ☒ DHCP, ☐ Static
- IPv4 Address: 169.254.228.167
- Subnet Mask: 255.255.0.0
- Default Gateway: 0.0.0.0
- DNS Server: 0.0.0.0

IPv6 Configuration:

- IPv6 Configuration: ☐ Automatic, ☒ Static
- IPv6 Address: [Empty field] / [Empty field]
- Link Local Address: FE80::250:FFF:FEB9:E4A7
- Default Gateway: [Empty field]
- DNS Server: [Empty field]

802.1X:

- ☐ Use 802.1X Security
- Authentication: MD5
- Username: [Empty field]
- Password: [Empty field]

Figure 55: use dynamic IP configurations for the PC

✚ In this figure we use dynamic IP configurations for the laptop.

The screenshot shows a configuration window titled 'Laptop_ECE' with tabs for Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is active, displaying the 'IP Configuration' section for the 'FastEthernet0' interface. The 'IP Configuration' section has two radio buttons: 'DHCP' (selected) and 'Static'. Below these are fields for 'IPv4 Address' (169.254.120.156), 'Subnet Mask' (255.255.0.0), 'Default Gateway' (0.0.0.0), and 'DNS Server' (0.0.0.0). The 'IPv6 Configuration' section has two radio buttons: 'Automatic' and 'Static' (selected). Below these are fields for 'IPv6 Address' (empty), 'Link Local Address' (FE80::207:ECFF:FED2:789C), 'Default Gateway' (empty), and 'DNS Server' (empty). The '802.1X' section has a checkbox for 'Use 802.1X Security' (unchecked), a dropdown for 'Authentication' (MD5), and fields for 'Username' and 'Password' (both empty).

Figure 56: use dynamic IP configurations for the laptop

✚ In this figure we configure the PC email client for the first Gmail account using the settings as required in project.

PC_ECE

Physical Config **Desktop** Programming Attributes

Configure Mail X

User Information

Your Name: Mohammed Azam

Email Address: Azam_Mohammed@gmail.com

Server Information

Incoming Mail Server: gmail.com

Outgoing Mail Server: gamil.com

Logon Information

User Name: Azam_Mohammed

Password:

Save Remove Clear Reset

☐ Top

Figure 57: configure the PC email client for the first Gmail account

- ✚ In this figure we configure the laptop's email client for the first Birzeit account.

The screenshot shows a window titled 'Laptop_ECE' with a tabbed interface. The 'Desktop' tab is selected, displaying a 'Configure Mail' dialog box. The dialog box has a blue title bar with a close button (X). It is divided into three sections: 'User Information', 'Server Information', and 'Logon Information'. The 'User Information' section contains fields for 'Your Name' (mohammed Azam) and 'Email Address' (1212429@it.birzeit.edu). The 'Server Information' section contains fields for 'Incoming Mail Server' (it.birzeit.edu) and 'Outgoing Mail Server' (it.birzeit.edu). The 'Logon Information' section contains fields for 'User Name' (1212429) and 'Password' (represented by dots). At the bottom of the dialog box are four buttons: 'Save', 'Remove', 'Clear', and 'Reset'. A 'Top' button is located at the bottom left of the window.

Section	Field	Value
User Information	Your Name:	mohammed Azam
	Email Address	1212429@it.birzeit.edu
Server Information	Incoming Mail Server	it.birzeit.edu
	Outgoing Mail Server	it.birzeit.edu
Logon Information	User Name:	1212429
	Password:

Figure 58: configure the laptop's email client for the first Birzeit account

In this figure we assign a static IP configuration to the printer.

The screenshot shows the 'Printer_CS' configuration window with the 'Config' tab selected. The left sidebar shows a tree view with 'GLOBAL' and 'INTERFACE' sections. Under 'INTERFACE', 'FastEthernet0' is selected. The main area displays the configuration for 'FastEthernet0'. The 'Port Status' is 'On'. The 'Bandwidth' is set to '100 Mbps'. The 'Duplex' is set to 'Full Duplex'. The 'MAC Address' is '0009.7CC4.1ECE'. The 'IP Configuration' section has 'Static' selected, with 'IPv4 Address' set to '180.29.72.66' and 'Subnet Mask' set to '255.255.255.192'. The 'IPv6 Configuration' section has 'Static' selected, with 'IPv6 Address' set to 'FE80::209:7CFF:FEC4:1ECE' and 'Link Local Address' set to 'FE80::209:7CFF:FEC4:1ECE'. A 'Top' button is located at the bottom left of the window.

Printer_CS

Physical Config Attributes

GLOBAL

Settings

INTERFACE

FastEthernet0

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0009.7CC4.1ECE

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 180.29.72.66

Subnet Mask 255.255.255.192

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80::209:7CFF:FEC4:1ECE

Top

Figure 59: assign a static IP configuration to the printer

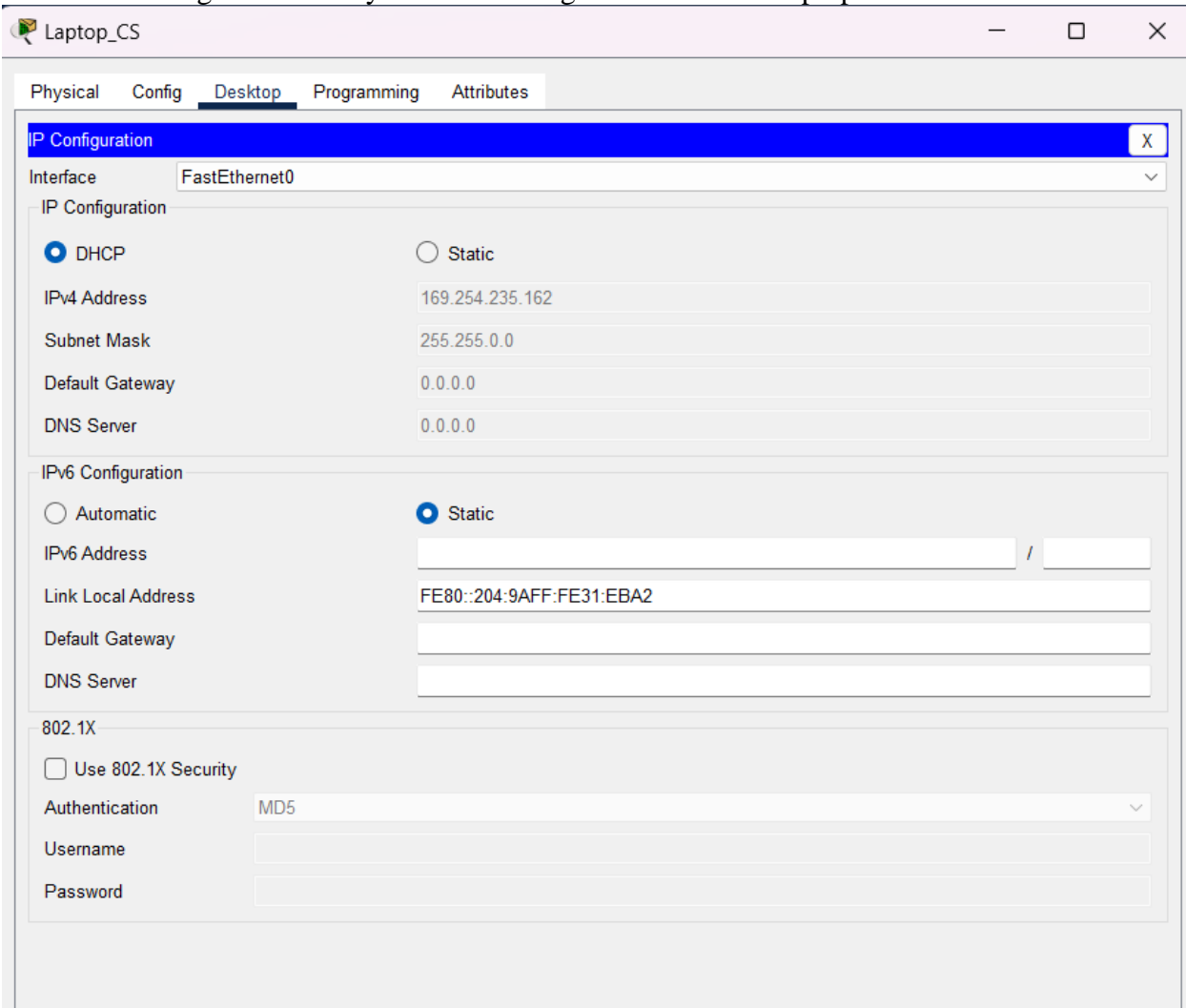
In this figure we use dynamic IP configurations for the PC.

The screenshot shows a configuration window titled "PC_CS" with tabs for Physical, Config, Desktop, Programming, and Attributes. The "Desktop" tab is active, displaying the "IP Configuration" section for the "FastEthernet0" interface. The "IP Configuration" section has a blue header bar with a close button (X). Below the header, the "Interface" is set to "FastEthernet0". The "IP Configuration" section contains two main parts: "IP Configuration" and "IPv6 Configuration". In the "IP Configuration" section, the "DHCP" radio button is selected, and the "Static" radio button is unselected. The fields for "IPv4 Address", "Subnet Mask", "Default Gateway", and "DNS Server" are all set to "0.0.0.0". In the "IPv6 Configuration" section, the "Automatic" radio button is unselected, and the "Static" radio button is selected. The fields for "IPv6 Address", "Link Local Address", "Default Gateway", and "DNS Server" are all empty. Below the "IPv6 Configuration" section, the "802.1X" section is visible, with the "Use 802.1X Security" checkbox unselected. The "Authentication" dropdown menu is set to "MD5", and the "Username" and "Password" fields are empty.

IP Configuration	
Interface	FastEthernet0
IP Configuration	
<input checked="" type="radio"/> DHCP	<input type="radio"/> Static
IPv4 Address	169.254.119.172
Subnet Mask	255.255.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::201:64FF:FED8:77AC
Default Gateway	
DNS Server	
802.1X	
<input type="checkbox"/> Use 802.1X Security	
Authentication	MD5
Username	
Password	

Figure 60: use dynamic IP configurations for the PC

 In this figure we use dynamic IP configurations for the Laptop.



The screenshot shows the 'Laptop_CS' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. Under 'IP Configuration', the 'DHCP' radio button is selected, and the 'Static' radio button is unselected. The 'IPv6 Configuration' section shows the 'Static' radio button selected. The '802.1X' section is also visible, with 'Use 802.1X Security' unchecked and 'Authentication' set to 'MD5'.

Section	Option	Value
IP Configuration	Interface	FastEthernet0
	DHCP	<input checked="" type="radio"/>
	Static	<input type="radio"/>
	IPv4 Address	169.254.235.162
	Subnet Mask	255.255.0.0
IPv6 Configuration	Automatic	<input type="radio"/>
	Static	<input checked="" type="radio"/>
	IPv6 Address	
	Link Local Address	FE80::204:9AFF:FE31:EBA2
	Default Gateway	
802.1X	Use 802.1X Security	<input type="checkbox"/>
	Authentication	MD5
	Username	
	Password	

Figure 61: use dynamic IP configurations for the laptop

- In this figure we configure the PC email client for the second Gmail account.

The screenshot shows a window titled "PC_CS" with a standard Windows-style title bar (minimize, maximize, close buttons). Inside the window, there are five tabs: "Physical", "Config", "Desktop", "Programming", and "Attributes". The "Desktop" tab is currently selected. Overlaid on this is a "Configure Mail" dialog box with a blue header bar and a close button (X). The dialog box is organized into three sections:

- User Information:** Contains two text input fields. The first is labeled "Your Name:" and contains the text "Haytham Shehadeh". The second is labeled "Email Address" and contains the text "Shehadeh_Haytham@gmail.com".
- Server Information:** Contains two text input fields. The first is labeled "Incoming Mail Server" and contains the text "gmail.com". The second is labeled "Outgoing Mail Server" and contains the text "gmail.com".
- Logon Information:** Contains two text input fields. The first is labeled "User Name:" and contains the text "Shehadeh_Haytham". The second is labeled "Password:" and contains a series of dots (masking).

At the bottom of the dialog box, there are four buttons: "Save", "Remove", "Clear", and "Reset". Below the dialog box, in the main window area, there is a small checkbox labeled "Top".

Figure 62: configure the PC email client

- In this figure we configure the laptop email client for the second Birzeit account.

The screenshot shows a window titled 'Laptop_CS' with a tabbed interface. The 'Desktop' tab is selected, and a 'Configure Mail' dialog box is open. The dialog box has a blue title bar with a close button (X). It contains three sections: 'User Information', 'Server Information', and 'Logon Information'. The 'User Information' section has fields for 'Your Name' (Haytham Shehadeh) and 'Email Address' (1210991@it.birzeit.edu). The 'Server Information' section has fields for 'Incoming Mail Server' (it.birzeit.edu) and 'Outgoing Mail Server' (it.birzeit.edu). The 'Logon Information' section has fields for 'User Name' (1210991) and 'Password' (masked with dots). At the bottom of the dialog box are four buttons: 'Save', 'Remove', 'Clear', and 'Reset'. A 'Top' button is located at the bottom left of the window.

Physical Config **Desktop** Programming Attributes

Configure Mail X

User Information

Your Name: Haytham Shehadeh

Email Address: 1210991@it.birzeit.edu

Server Information

Incoming Mail Server: it.birzeit.edu

Outgoing Mail Server: it.birzeit.edu

Logon Information

User Name: 1210991

Password:

Save Remove Clear Reset

☐ Top

Figure 63: configure the laptop email client

Issues and limitations

I think there are problems in the program itself when choosing the subnet mask automatically, as this thing did not make us reach a correct result until after calculating it, and there is also something wrong with the automatic wires, as the entire network works correctly, but when sending an email, we face a problem that we did not recognize, and although we walked through all the details of the complete project, there are difficulties in finding the IP for the devices and how to connect them together, as it is a new program for us, but we worked with all honesty and care on it

Teamwork

We both did all the tasks equally, each of us took a part of the project, and each of us took a part of the report in a fair and equitable manner. In terms of numbers, it was 50% for both parties.

Conclusion

Completing this project significantly enhanced our practical understanding of network design. Using Cisco Packet Tracer, we built a robust network that included various servers, end devices, and switches. The theoretical concepts of subnetting learned in lectures became tangible as we implemented them, deepening our grasp of the subject. Although we encountered challenges with device configurations and routing, we overcame these obstacles through teamwork and careful troubleshooting.

References

- 1 : <https://www.encyclopedia.com/computing/news-wires-white-papers-and-books/network-networks>
- 2: <https://www.geeksforgeeks.org/network-address-translation-nat/>
- 3: https://en.wikipedia.org/wiki/Network_address_translation
- 4: <https://www.techtarget.com/searchnetworking/definition/DHCP>
- 5: <https://www.geeksforgeeks.org/dynamic-host-configuration-protocol-dhcp/>
- 6: <https://www.cloudflare.com/learning/dns/what-is-dns/>