EXPERIMENT 9

Aim

Configure DHCP and SMTP in a small LAN

Prerequisite

Nil

Outcome

To impart knowledge of Computer Networking Technology

Theory

1. **Dynamic Host Configuration Protocol (DHCP)**
   DHCP is a network protocol used for the automatic configuration of IP addresses and other network parameters in a local network. In a Cisco Packet Tracer environment, DHCP plays a crucial role in simplifying IP address management. It allows a DHCP server to dynamically allocate IP addresses to client devices as they join the network. Key points to consider include:

   - **IP Address Assignment**: DHCP assigns IP addresses to devices within a defined range. This range is often referred to as a DHCP pool.
   - **Lease Duration**: Each IP address assignment comes with a lease duration, determining how long a device can use the assigned address. When the lease expires, the device may request a renewal.
   - **Subnet Masks and Gateways**: In addition to IP addresses, DHCP can provide subnet masks and default gateways, streamlining network configuration.
   - **Conflict Resolution**: DHCP servers detect and resolve IP address conflicts to prevent network disruptions.

2. **Simple Mail Transfer Protocol (SMTP):** SMTP is a protocol used for sending and receiving email messages. In the context of Cisco Packet Tracer, SMTP is employed to simulate email communication. Key aspects to consider include:

   - **SMTP Server Configuration**: To enable SMTP communication, an SMTP server is configured on a specific PC. This server handles the sending and receiving of email messages.
   - **Email Clients**: Other PCs in the network are configured as email clients, and they use the SMTP server for sending outgoing emails. The server routes these messages to their destinations.
   - **Email Accounts**: Proper configuration of email accounts on the email clients is essential for sending and receiving messages. This typically includes settings for incoming and outgoing email servers, usernames, and passwords.
   - **Email Routing**: SMTP is responsible for routing email messages from the sender to the recipient's mailbox. It communicates with other SMTP servers on the internet to relay messages.

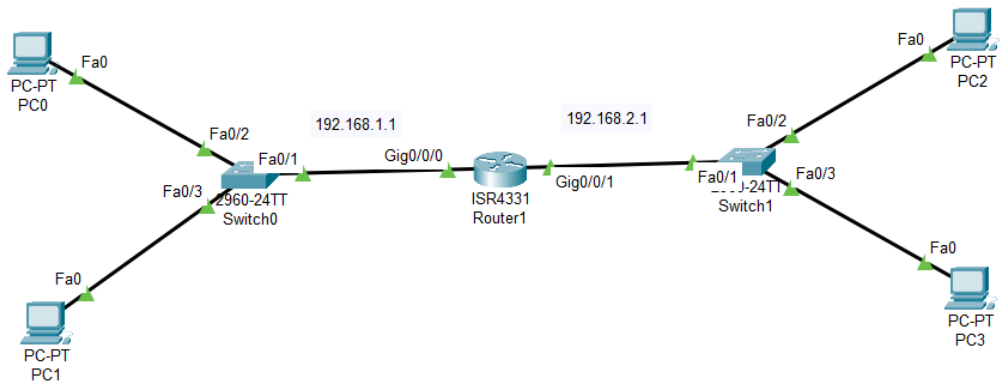
Understanding DHCP and SMTP is fundamental in network management and communication within Cisco Packet Tracer simulations, as these protocols automate IP address assignments and email transmission, ensuring efficient and reliable networking and messaging services.

Procedure

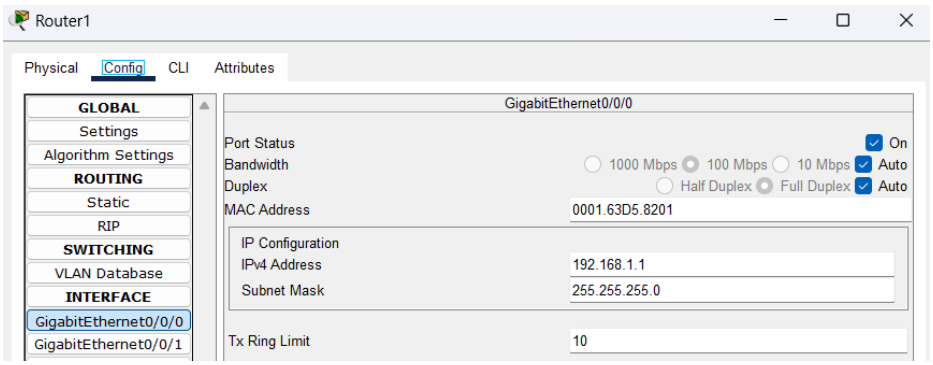
1. **Setting Up DHCP in Cisco Packet Tracer:**
   - Launch Cisco Packet Tracer and create a new project.
   - Add a router, a switch, and multiple PCs to the workspace.
   - Configure the router and switch as needed to create a LAN.
   - Set up a DHCP server on one of the PCs within the LAN.
   - Configure the DHCP server to define the IP address range and lease duration.
   - Connect client PCs to the switch and set them to obtain IP addresses automatically.
   - Observe the IP address assignment process and network connectivity within the simulation.
2. **Configuring SMTP in Cisco Packet Tracer:**
   - Add a server (another PC) to the workspace for hosting the SMTP server.
   - Configure the server as an SMTP server and set up email accounts.
   - Configure email clients on other PCs to use this SMTP server for sending emails.
   - Send test emails between clients to observe the SMTP communication within the Cisco Packet Tracer simulation.

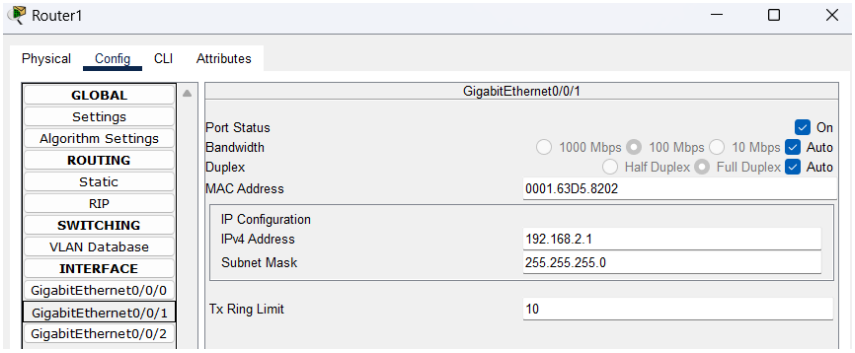
Output

1. **DHCP**



Router Configuration

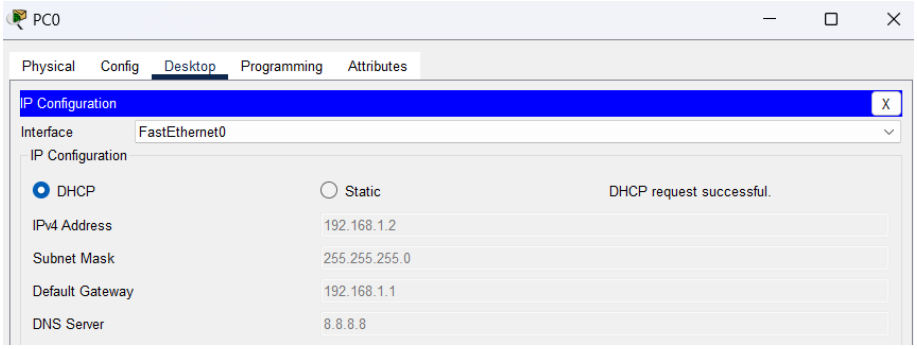


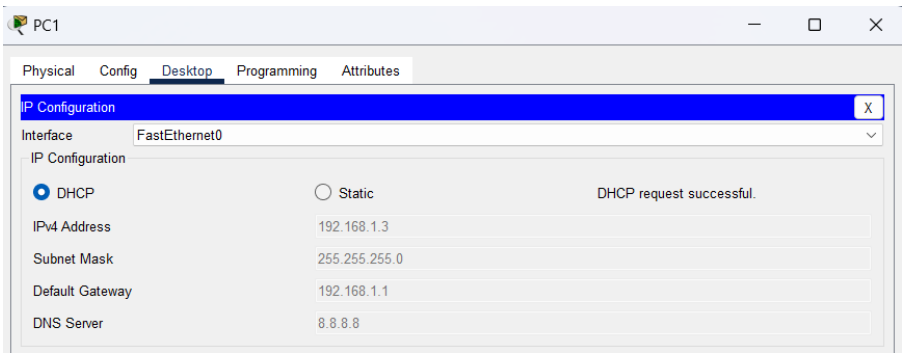


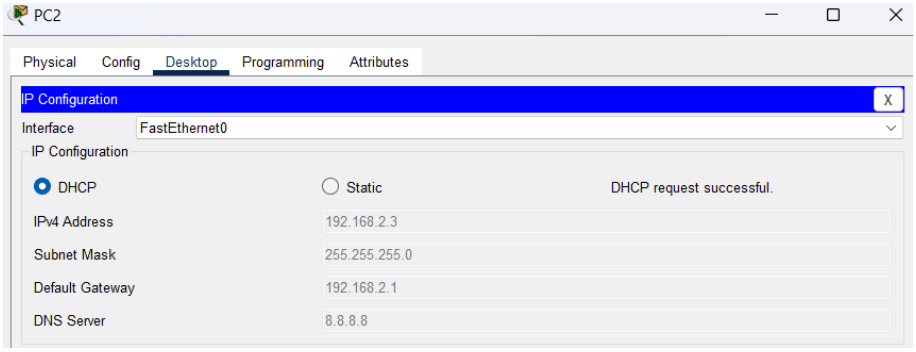
DHCP Configuration

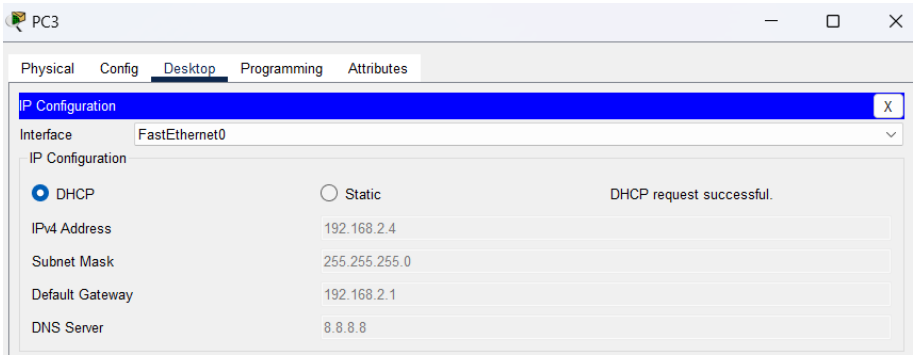
```
dhcp-server#config t
Enter configuration commands, one per line.  End with CNTL/Z.
dhcp-server(config)#ip dhcp excluded-address 192.168.1.1
dhcp-server(config)#ip dhcp excluded-address 192.168.2.1
dhcp-server(config)#ip dhcp pool 192.168.1.1
dhcp-server(dhcp-config)#network 192.168.1.0 255.255.255.0
dhcp-server(dhcp-config)#default-router %DHCPD-4-PING_CONFLICT:
DHCP address conflict:  server pinge
dhcp-server(dhcp-config)#
dhcp-server(dhcp-config)#network 192.168.1.0 255.255.255.0
dhcp-server(dhcp-config)#de
dhcp-server(dhcp-config)#default-router 192.168.1.1
dhcp-server(dhcp-config)#dns
dhcp-server(dhcp-config)#dns-server 8.8.8.8
dhcp-server(dhcp-config)#exit
dhcp-server(config)#ip
dhcp-server(config)#ip
dhcp-server(config)#ip dh
dhcp-server(config)#ip dhcp po
dhcp-server(config)#ip dhcp pool 192.268.2.1
dhcp-server(dhcp-config)#network 192.168.2.0 255.255.255.0
dhcp-server(dhcp-config)#default
dhcp-server(dhcp-config)#default-router 192.168.2.1
dhcp-server(dhcp-config)#dns
dhcp-server(dhcp-config)#dns-server 8.8.8.8
dhcp-server(dhcp-config)#
```

IP Address assigned to PCs



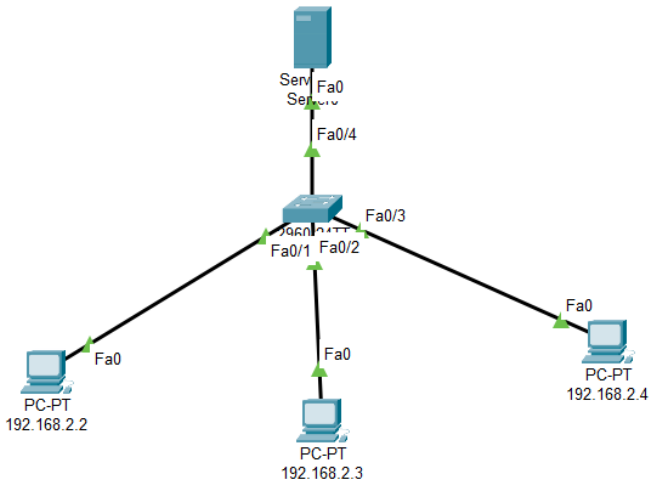


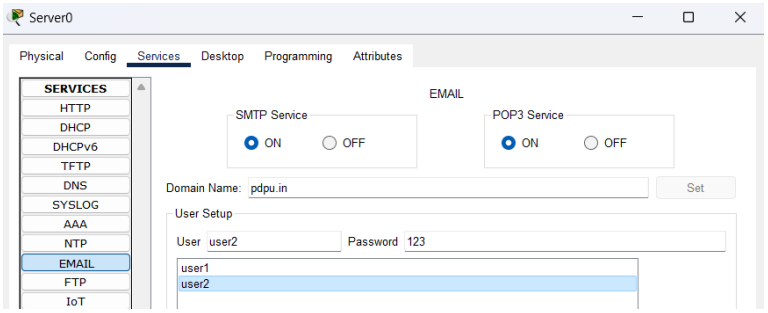


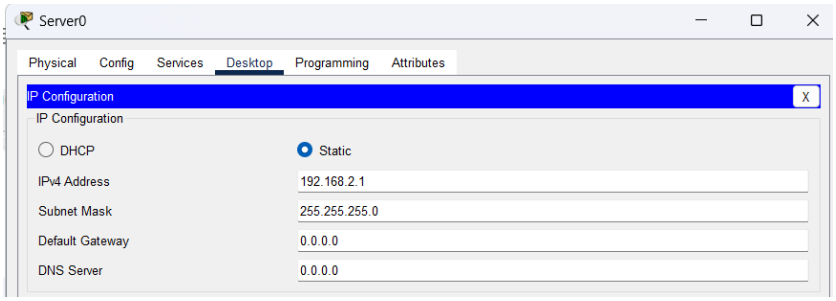


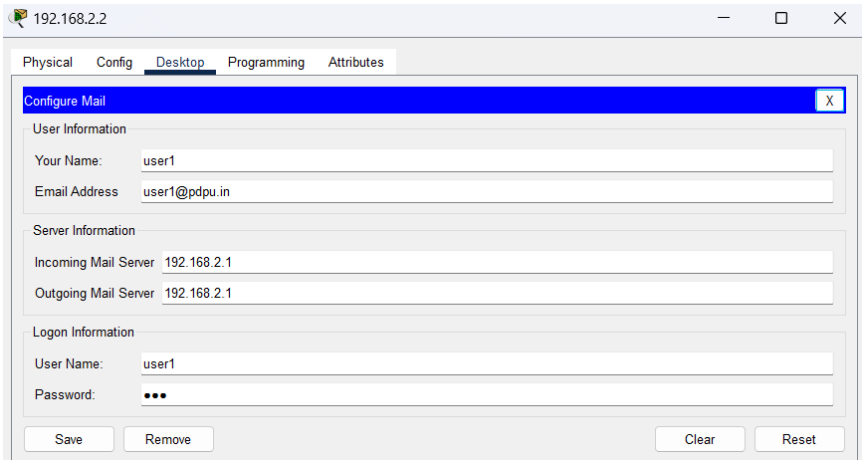

```
14065 51.358914    192.168.0.102   23.200.79.138   TLSv1.3  1020 Application Data
14066 51.372515    23.200.79.138   192.168.0.102   TCP        54 443 → 50121 [ACK] Seq=77338 Ack=6151 Win=64128 Len=0
14067 51.372515    23.200.79.138   192.168.0.102   TCP        54 443 → 50121 [ACK] Seq=77338 Ack=7591 Win=64128 Len=0
14068 51.372604    23.200.79.138   192.168.0.102   TCP        54 443 → 50121 [ACK] Seq=77338 Ack=8557 Win=64128 Len=0
14069 51.375044    192.168.0.102   23.200.79.138   TLSv1.3   175 Application Data
14070 51.391967    23.200.79.138   192.168.0.102   TCP        54 443 → 50120 [ACK] Seq=5205 Ack=1530 Win=64128 Len=0
14071 51.403821    23.200.79.138   192.168.0.102   TLSv1.3   440 Application Data
14072 51.403821    23.200.79.138   192.168.0.102   TLSv1.3    85 Application Data
14073 51.403899    192.168.0.102   23.200.79.138   TCP        54 50120 → 443 [ACK] Seq=1530 Ack=5622 Win=132352 Len=0
14074 51.485004    192.168.0.102   192.168.0.1     DHCP      346 DHCP Request  - Transaction ID 0xdac728ae
14075 51.496644    192.168.0.1     192.168.0.102   DHCP      590 DHCP ACK      - Transaction ID 0xdac728ae
14076 51.507513    fe80::4039:285d:a0f… ff02::16   ICMPv6     90 Multicast Listener Report Message v2
14077 51.507629    192.168.0.102   224.0.0.22      IGMPv3     54 Membership Report / Leave group 224.0.0.252
14078 51.514759    192.168.0.102   172.253.118.188 TCP        55 [TCP Keep-Alive] 49823 → 5228 [ACK] Seq=1 Ack=1 Win=510 Len=1
14079 51.514770    192.168.0.102   142.250.4.188   TCP        55 [TCP Keep-Alive] 49825 → 5228 [ACK] Seq=1 Ack=1 Win=512 Len=1
14080 51.529895    192.168.0.102   224.0.0.251     MDNS       75 Standard query 0x0000 ANY Smitpatel.local, "QM" question
14081 51.530075    192.168.0.102   224.0.0.22      IGMPv3     54 Membership Report / Join group 224.0.0.252 for any sources
14082 51.530171    fe80::4039:285d:a0f… ff02::16   ICMPv6     90 Multicast Listener Report Message v2
14083 51.530729    192.168.0.102   224.0.0.251     MDNS      113 Standard query response 0x0000 AAAA fe80::4039:285d:a0f3:37ee A 192.168.0.102
```

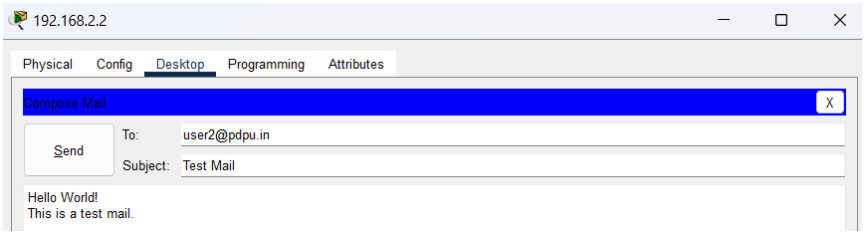
2. SMTP

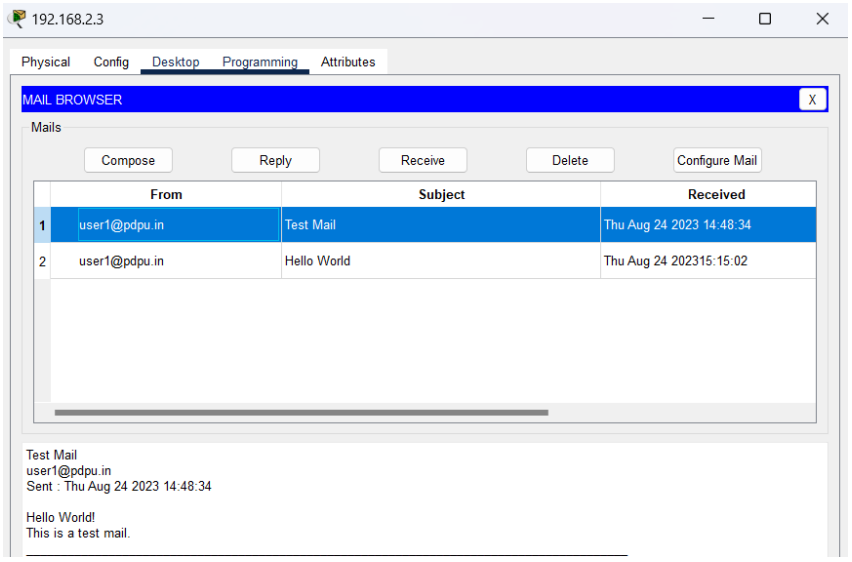


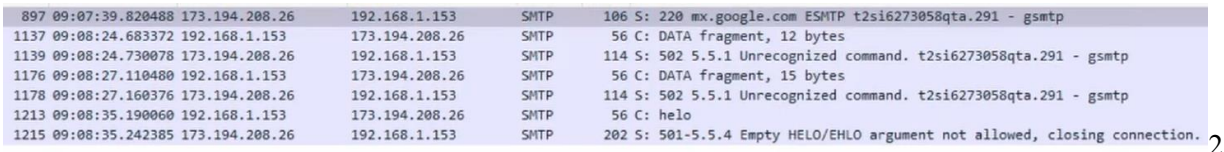

Server0
Physical Config Services Desktop Programming Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
EMAIL
SMTP Service
ON
OFF
POP3 Service
ON
OFF
Domain Name: pdpu.in
Set
User Setup
User user2
Password 123
user1
user2


Server0
Physical Config Services Desktop Programming Attributes
IP Configuration
X
IP Configuration
DHCP
Static
IPv4 Address 192.168.2.1
Subnet Mask 255.255.255.0
Default Gateway 0.0.0.0
DNS Server 0.0.0.0


192.168.2.2
Physical Config Desktop Programming Attributes
Configure Mail
X
User Information
Your Name: user1
Email Address user1@pdpu.in
Server Information
Incoming Mail Server 192.168.2.1
Outgoing Mail Server 192.168.2.1
Logon Information
User Name: user1
Password: •••
Save
Remove
Clear
Reset


192.168.2.2
Physical Config Desktop Programming Attributes
Compose Mail
X
Send
To: user2@pdpu.in
Subject: Test Mail
Hello World!
This is a test mail.


192.168.2.3
Physical Config Desktop Programming Attributes
MAIL BROWSER
X
Mails
Compose
Reply
Receive
Delete
Configure Mail
From
Subject
Received
1 user1@pdpu.in Test Mail Thu Aug 24 2023 14:48:34
2 user1@pdpu.in Hello World Thu Aug 24 202315:15:02
Test Mail
user1@pdpu.in
Sent : Thu Aug 24 2023 14:48:34
Hello World!
This is a test mail.



897	09:07:39.820488	173.194.208.26	192.168.1.153	SMTP	106	S: 220 mx.google.com ESMTP t2si6273058qta.291 - gsmtp
1137	09:08:24.683372	192.168.1.153	173.194.208.26	SMTP	56	C: DATA fragment, 12 bytes
1139	09:08:24.730078	173.194.208.26	192.168.1.153	SMTP	114	S: 502 5.5.1 Unrecognized command. t2si6273058qta.291 - gsmtp
1176	09:08:27.110480	192.168.1.153	173.194.208.26	SMTP	56	C: DATA fragment, 15 bytes
1178	09:08:27.160376	173.194.208.26	192.168.1.153	SMTP	114	S: 502 5.5.1 Unrecognized command. t2si6273058qta.291 - gsmtp
1213	09:08:35.190060	192.168.1.153	173.194.208.26	SMTP	56	C: helo
1215	09:08:35.242385	173.194.208.26	192.168.1.153	SMTP	202	S: 501-5.5.4 Empty HELO/EHLO argument not allowed, closing connection.

2

Observation & Learning

- DHCP successfully assigned IP addresses, subnet masks, and gateways to client PCs, demonstrating efficient network parameter management within Cisco Packet Tracer.
- SMTP facilitated seamless email communication as messages were routed through the SMTP server, emphasizing its role in relaying emails.
- Network connectivity was established swiftly, allowing clients with dynamically assigned IP addresses to access the internet and interact within the LAN.
- The experiment exhibited rapid response times for DHCP lease assignments and email message delivery, ensuring prompt network and communication services.
- Error handling mechanisms for DHCP and SMTP were observed, showcasing automatic resolution of issues like IP conflicts and email address validation, enhancing network reliability.

Conclusion

In this experiment, we successfully configured DHCP and SMTP services within a small LAN simulation. DHCP simplified IP address management, and SMTP facilitated the transmission of email messages. These services are essential for efficient network management and communication in real-world networks as well as simulations.

Questions

1. **What are the different ports used by the DHCP and SMTP within the Cisco Packet Tracer environment?2**

   In Cisco Packet Tracer, the port numbers used by DHCP and SMTP are the same as in real-world scenarios. DHCP uses **UDP port 67** for the server and **UDP port 68** for the client. SMTP uses **TCP port 25**.

2. **What are the benefits of using DHCP services in Cisco Packet Tracer simulations and real networks?**

   - DHCP simplifies IP address management, **reducing the risk of IP address conflicts** in Cisco Packet Tracer simulations and real networks.
   - It **automates** the configuration of network parameters, such as subnet masks and gateways.
   - It makes it **easier to add and remove** devices from the network without manual IP configuration.

3. **What is the role of Active Directory in the DHCP context within Cisco Packet Tracer?**

   In Cisco Packet Tracer simulations, Active Directory may not be available. However, in real-world networks, Active Directory can be used to **store and manage DHCP server configuration** information, providing centralized DHCP management, security, and access control features.