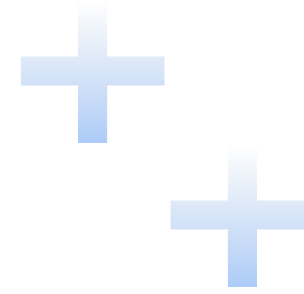


Network Design and Implementation for Corporate Headquarters

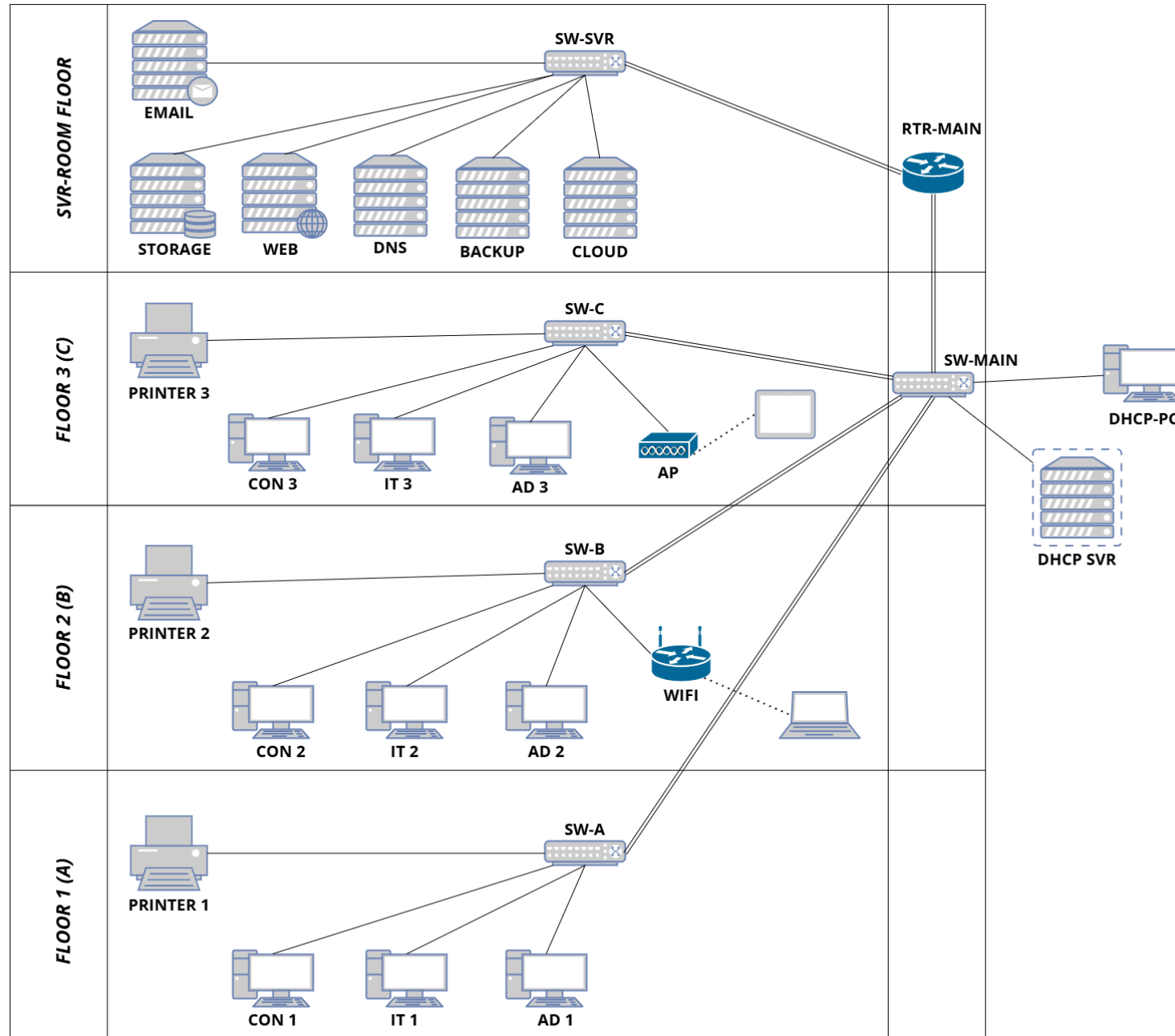
By Anjula Meegalla





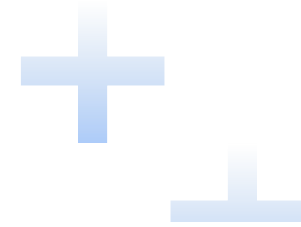
Project Aim

To apply core networking principles to design and simulate a secure, scalable, and multi-VLAN network that meets a given business specification.

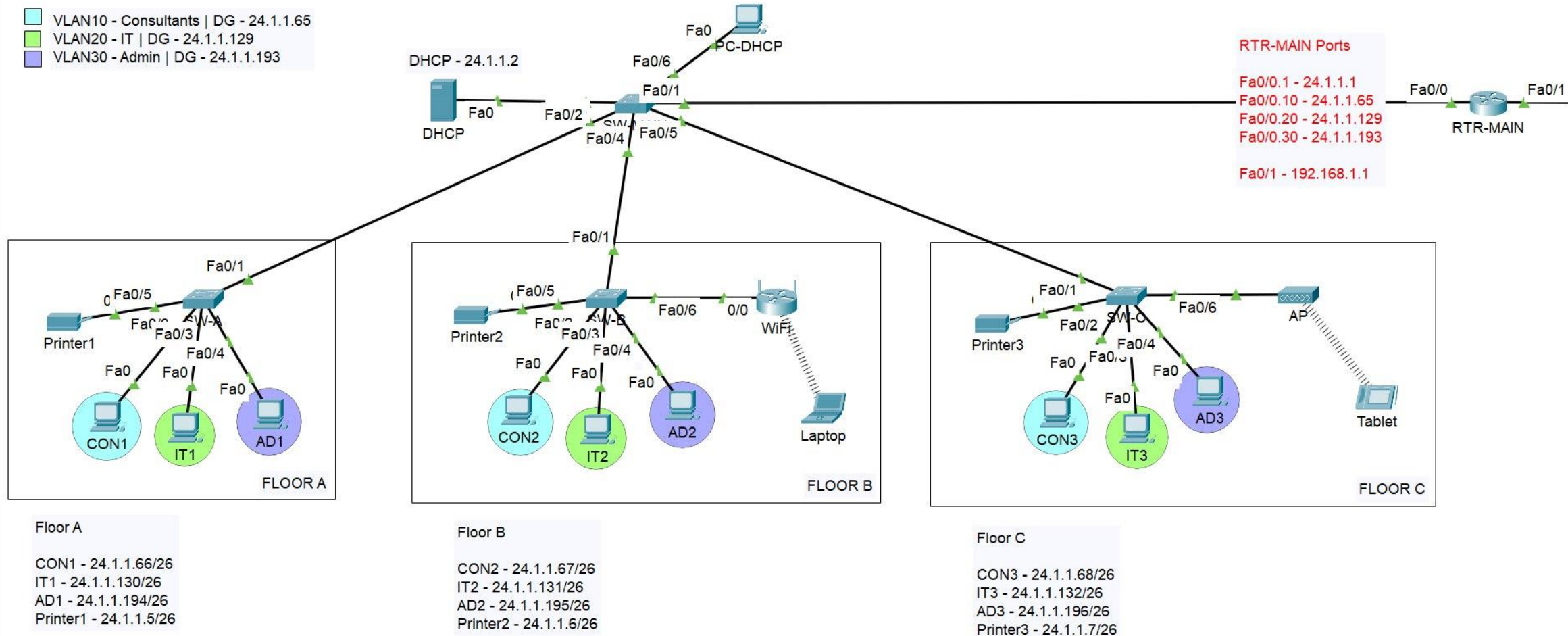


Network Diagram

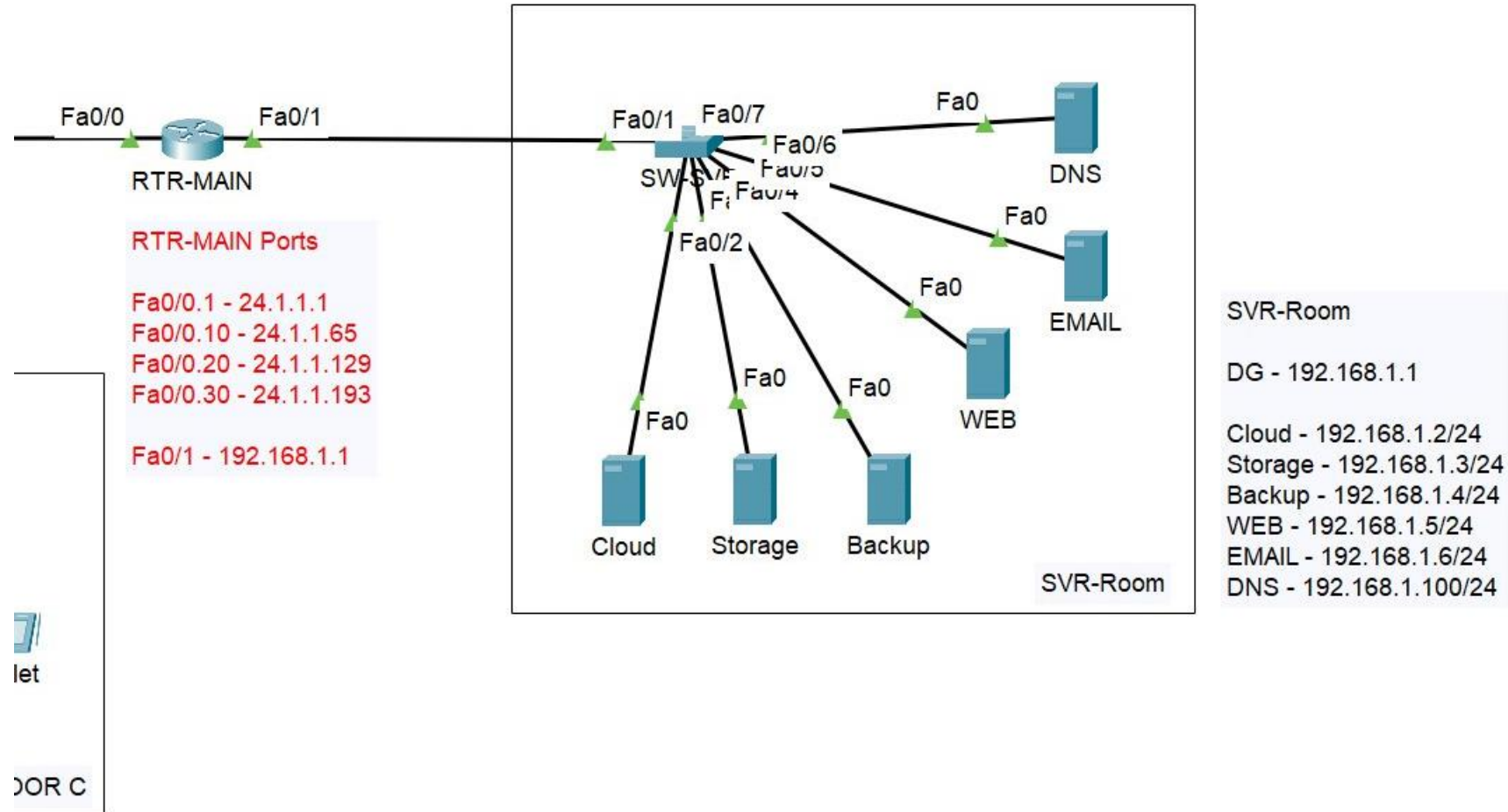
Packet Tracer Simulation



- VLAN10 - Consultants | DG - 24.1.1.65
- VLAN20 - IT | DG - 24.1.1.129
- VLAN30 - Admin | DG - 24.1.1.193

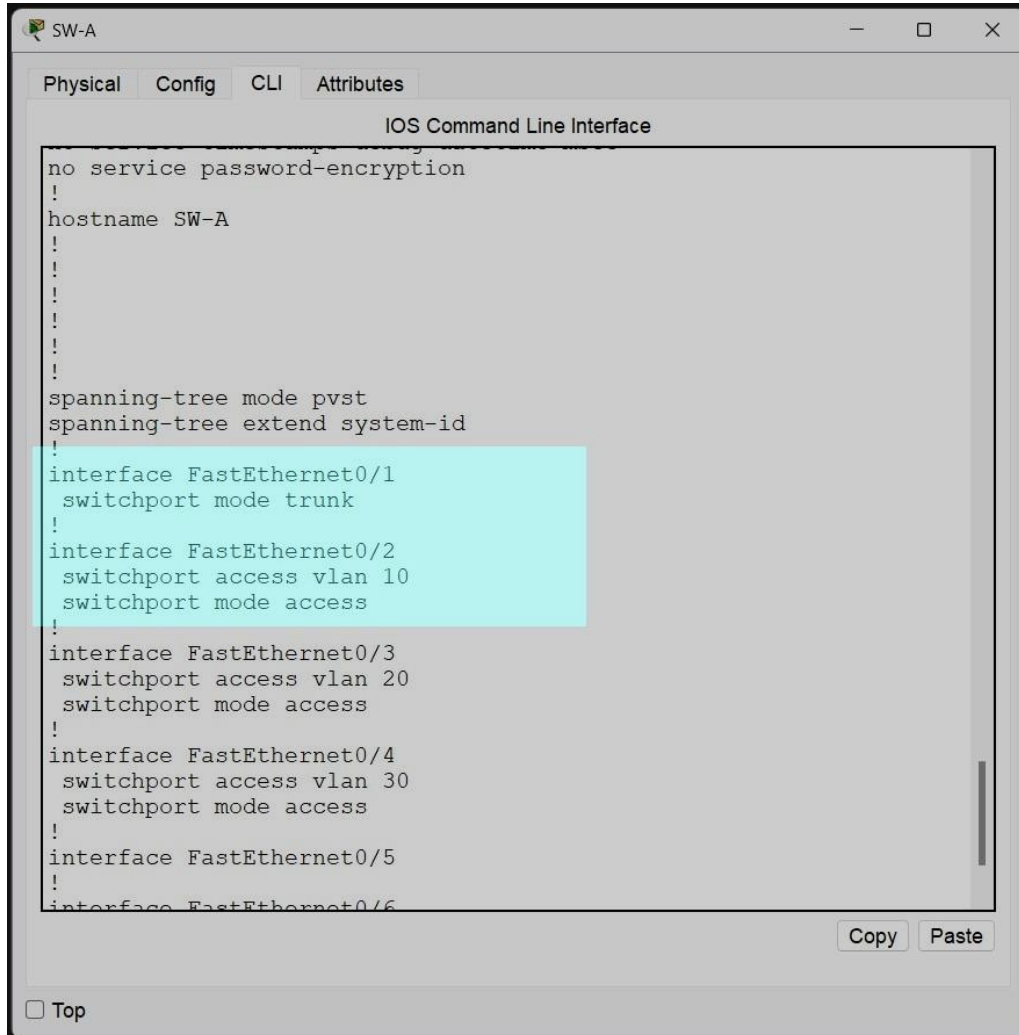


Packet Tracer Simulation +



6

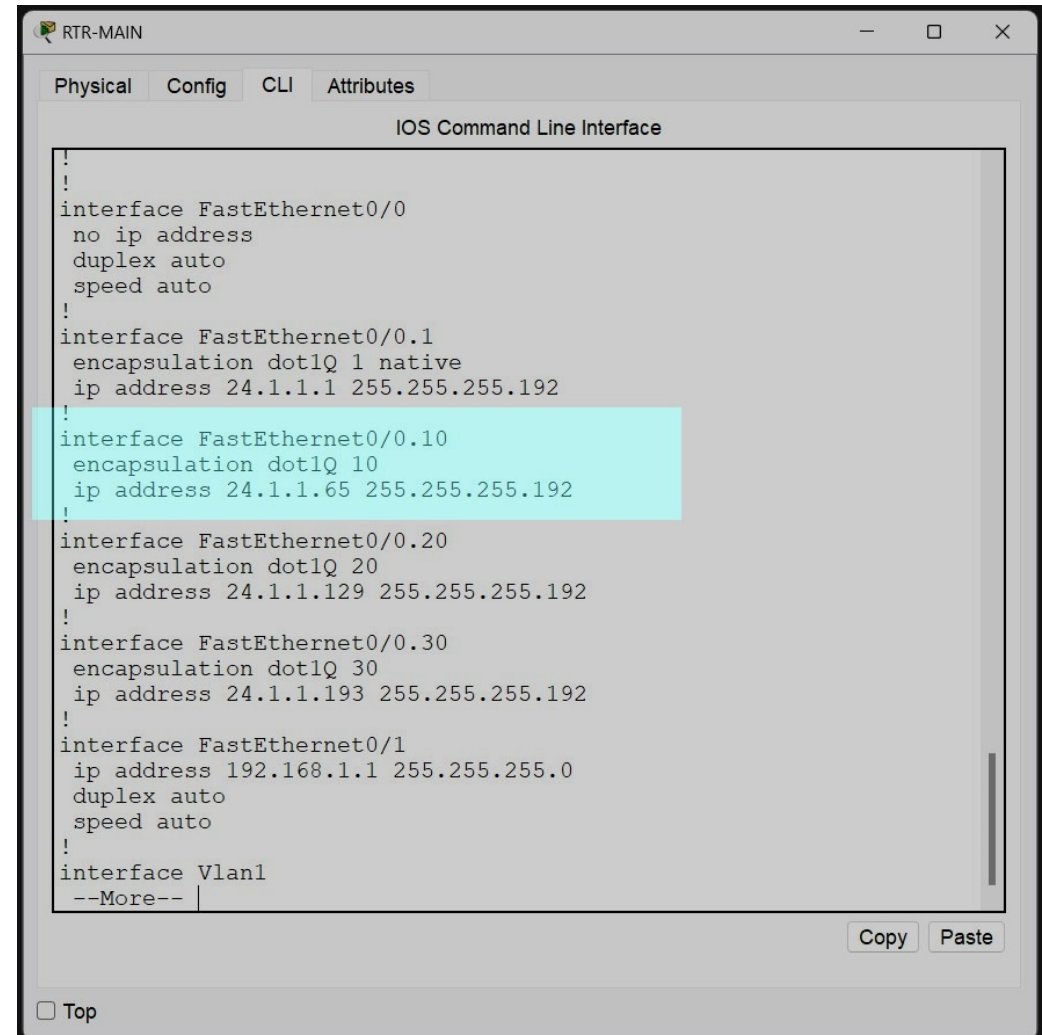
Implementation - Core Infrastructure

A screenshot of the SW-A configuration window. The window has tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, showing the IOS Command Line Interface. The configuration text is as follows:

```
no service password-encryption
!
hostname SW-A
!
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet0/4
 switchport access vlan 30
 switchport mode access
!
interface FastEthernet0/5
!
interface FastEthernet0/6
```

The configuration for interface FastEthernet0/1 is highlighted in a light blue box. At the bottom right, there are 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

SW-A Configuration

A screenshot of the RTR-MAIN configuration window. The window has tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, showing the IOS Command Line Interface. The configuration text is as follows:

```
!
!
interface FastEthernet0/0
 no ip address
 duplex auto
 speed auto
!
interface FastEthernet0/0.1
 encapsulation dot1Q 1 native
 ip address 24.1.1.1 255.255.255.192
!
interface FastEthernet0/0.10
 encapsulation dot1Q 10
 ip address 24.1.1.65 255.255.255.192
!
interface FastEthernet0/0.20
 encapsulation dot1Q 20
 ip address 24.1.1.129 255.255.255.192
!
interface FastEthernet0/0.30
 encapsulation dot1Q 30
 ip address 24.1.1.193 255.255.255.192
!
interface FastEthernet0/1
 ip address 192.168.1.1 255.255.255.0
 duplex auto
 speed auto
!
interface Vlan1
--More--
```

The configuration for interface FastEthernet0/0.10 is highlighted in a light blue box. At the bottom right, there are 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

RTR-MAIN Configuration

Implementation - Network Services

The screenshot shows the 'WEB' configuration window with tabs for Physical, Config, Services, Desktop, Programming, and Attributes. The 'Services' tab is active, displaying a list of services on the left and configuration options for HTTP and HTTPS on the right. Both HTTP and HTTPS are set to 'On'. Below the service settings is a 'File Manager' section with a table containing one file, 'index.html'. At the bottom right are 'New File' and 'Import' buttons.

HTTP		
HTTP	<input checked="" type="radio"/> On	<input type="radio"/> Off
HTTPS	<input checked="" type="radio"/> On	<input type="radio"/> Off

File Manager			
	File Name	Edit (edit)	Delete (delete)
1	index.html		

WEB SVR Configuration

The screenshot shows the 'DNS' configuration window with tabs for Physical, Config, Services, Desktop, Programming, and Attributes. The 'Services' tab is active, displaying a list of services on the left and configuration options for DNS on the right. The 'DNS Service' is set to 'On'. Below the service settings is a 'Resource Records' section with a table containing one record for 'www.sample.com' with IP address '192.168.1.5'. At the bottom right is a 'DNS Cache' button.

DNS		
DNS Service	<input checked="" type="radio"/> On	<input type="radio"/> Off

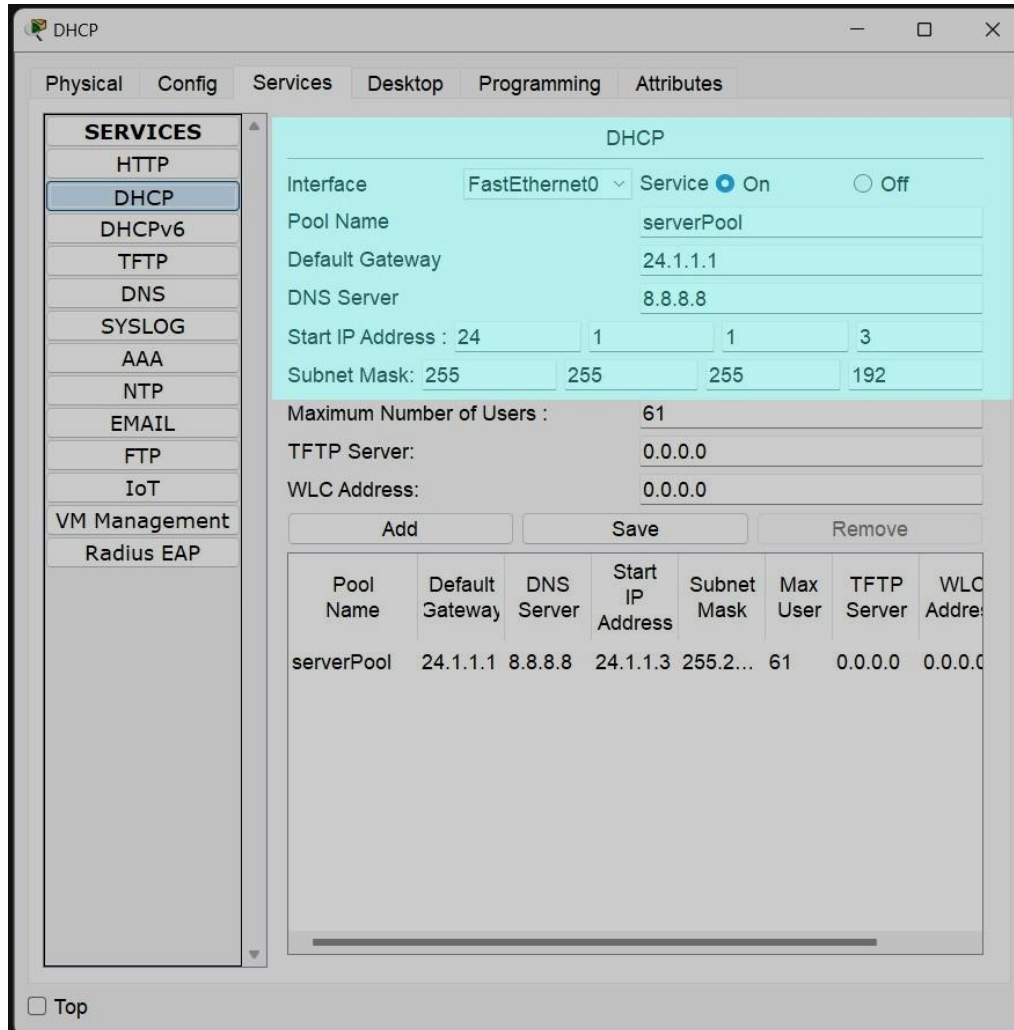
Resource Records		
Name	www.sample.com	Type A Record
Address	192.168.1.5	
<div>Add Save Remove</div>		

No.	Name	Type	Detail
0	www.sample.com	A Record	192.168.1.5

DNS SVR Configuration

8

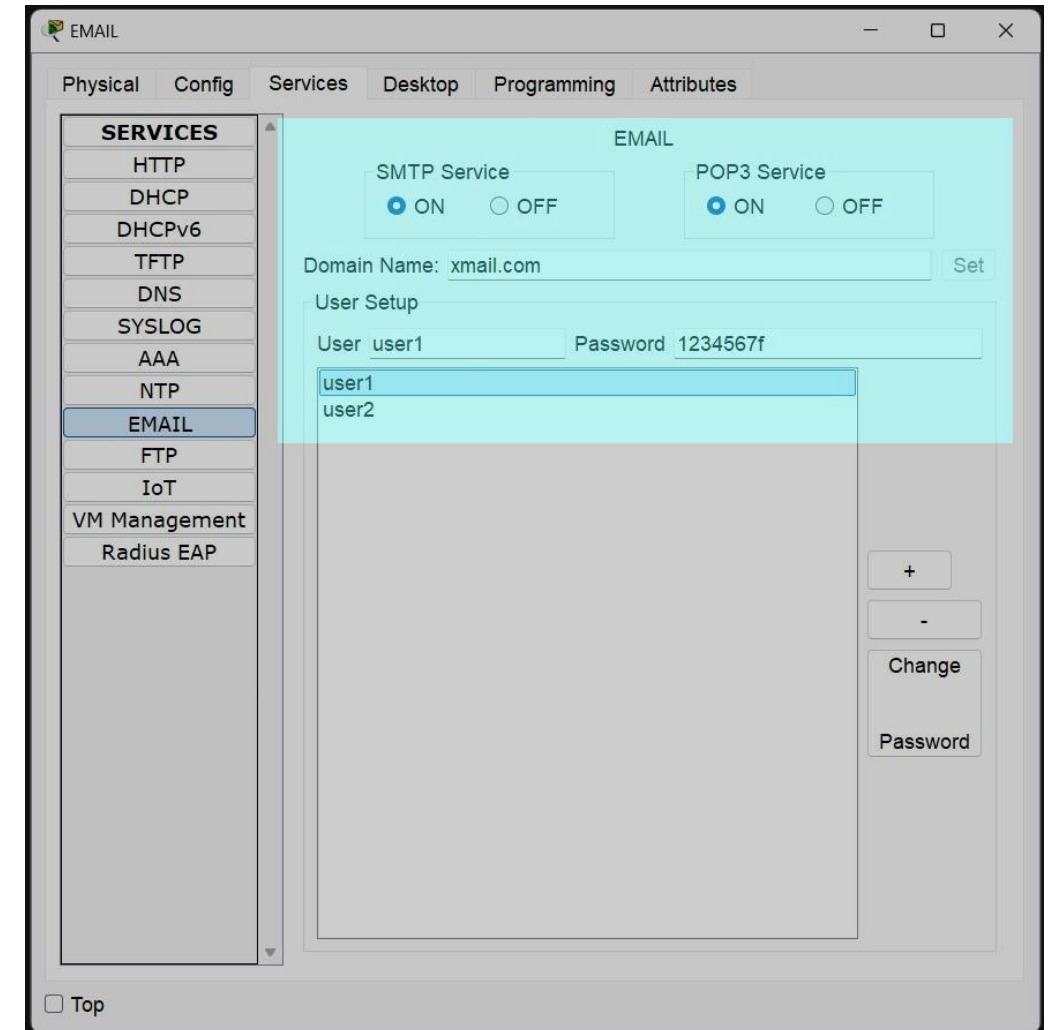
Implementation - Network Services



The DHCP SVR Configuration window shows the configuration for a DHCP server. The left sidebar lists various services, with DHCP selected. The main area contains fields for Interface (FastEthernet0), Service (On), Pool Name (serverPool), Default Gateway (24.1.1.1), DNS Server (8.8.8.8), Start IP Address (24.1.1.3), Subnet Mask (255.255.255.192), Maximum Number of Users (61), TFTP Server (0.0.0.0), and WLC Address (0.0.0.0). A table at the bottom lists the configured pool.

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	24.1.1.1	8.8.8.8	24.1.1.3	255.255.255.192	61	0.0.0.0	0.0.0.0

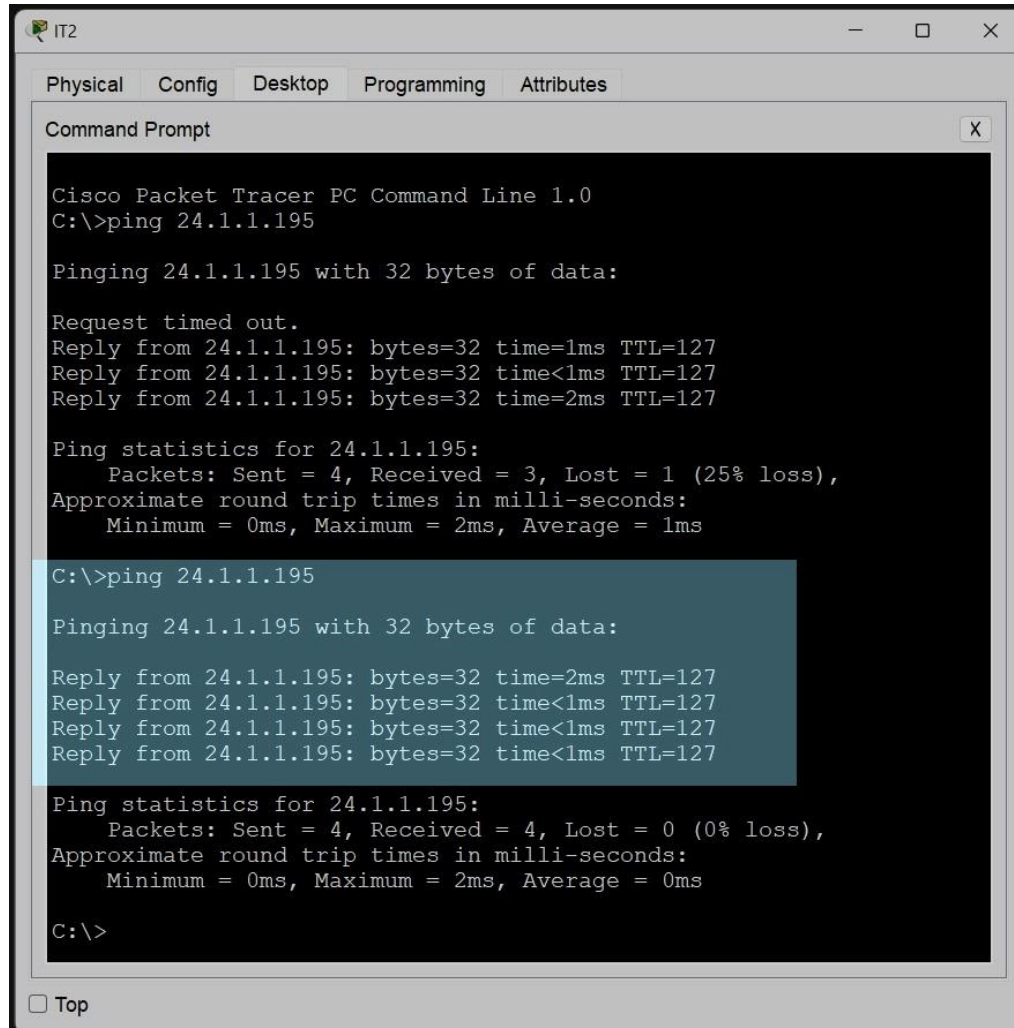
DHCP SVR Configuration



The EMAIL SVR Configuration window shows the configuration for an email server. The left sidebar lists various services, with EMAIL selected. The main area contains fields for SMTP Service (ON), POP3 Service (ON), Domain Name (xmail.com), User Setup (user1, Password 1234567f), and a list of users (user1, user2). Buttons for Add, Save, Remove, Change, and Password are visible on the right.

EMAIL SVR Configuration

Test Results (Network Connectivity)



The screenshot shows a Cisco Packet Tracer PC Command Line window for a device named IT2. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The Command Prompt shows the execution of the 'ping' command to 24.1.1.195. The first attempt shows a 25% packet loss (1 out of 4 packets lost). The second attempt, highlighted with a blue background, shows 0% packet loss (0 out of 4 packets lost).

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 24.1.1.195

Pinging 24.1.1.195 with 32 bytes of data:

Request timed out.
Reply from 24.1.1.195: bytes=32 time=1ms TTL=127
Reply from 24.1.1.195: bytes=32 time<1ms TTL=127
Reply from 24.1.1.195: bytes=32 time=2ms TTL=127

Ping statistics for 24.1.1.195:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms

C:\>ping 24.1.1.195

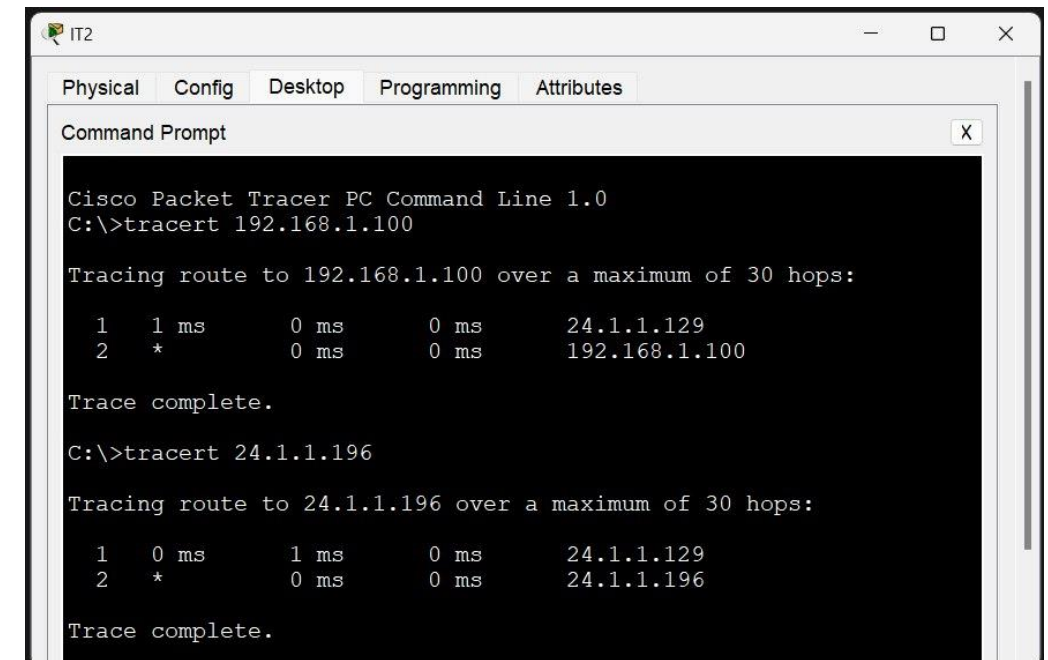
Pinging 24.1.1.195 with 32 bytes of data:

Reply from 24.1.1.195: bytes=32 time=2ms TTL=127
Reply from 24.1.1.195: bytes=32 time<1ms TTL=127
Reply from 24.1.1.195: bytes=32 time<1ms TTL=127
Reply from 24.1.1.195: bytes=32 time<1ms TTL=127

Ping statistics for 24.1.1.195:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>
```

“ping” Command Test



The screenshot shows a Cisco Packet Tracer PC Command Line window for a device named IT2. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The Command Prompt shows the execution of the 'tracert' command to 192.168.1.100 and 24.1.1.196. Both traceroutes show a two-hop path from 24.1.1.129 to the destination IP.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>tracert 192.168.1.100

Tracing route to 192.168.1.100 over a maximum of 30 hops:

  1  1 ms      0 ms      0 ms      24.1.1.129
  2  *         0 ms      0 ms      192.168.1.100

Trace complete.

C:\>tracert 24.1.1.196

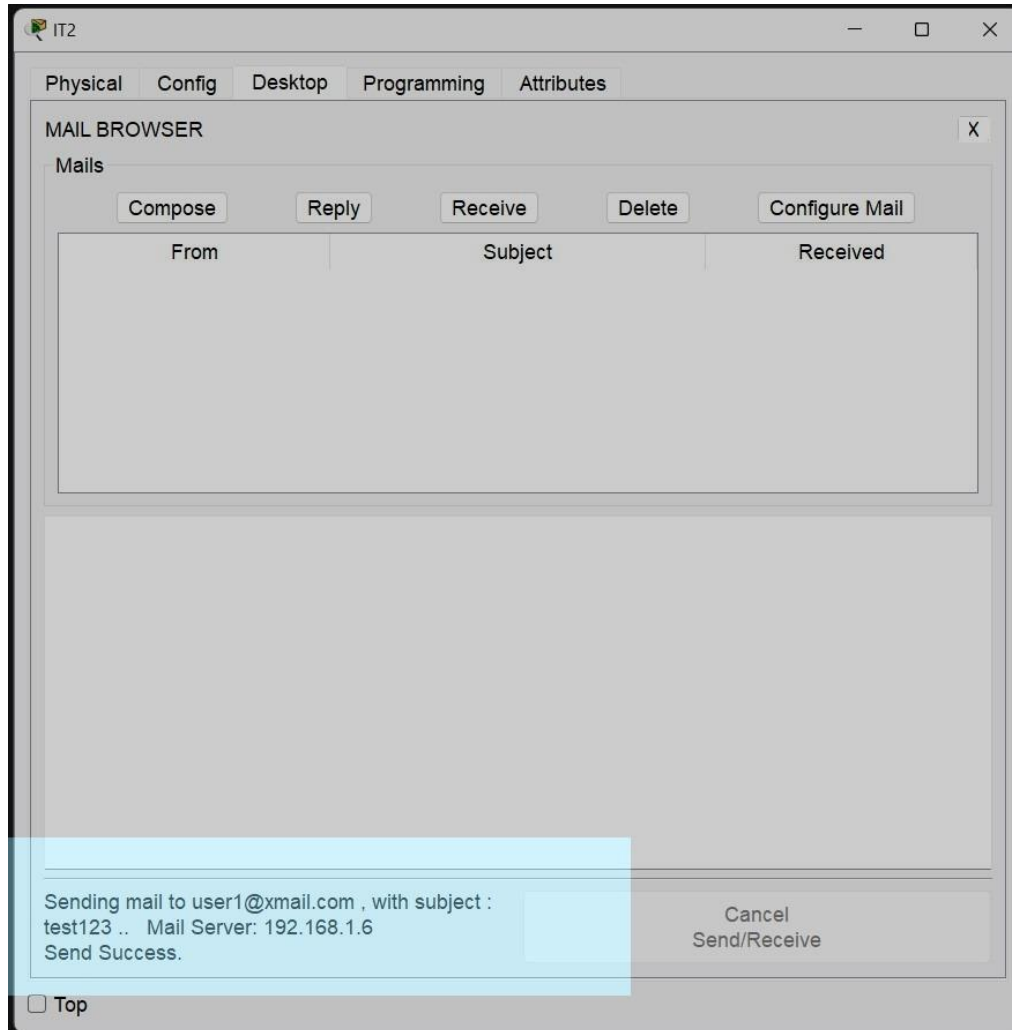
Tracing route to 24.1.1.196 over a maximum of 30 hops:

  1  0 ms      1 ms      0 ms      24.1.1.129
  2  *         0 ms      0 ms      24.1.1.196

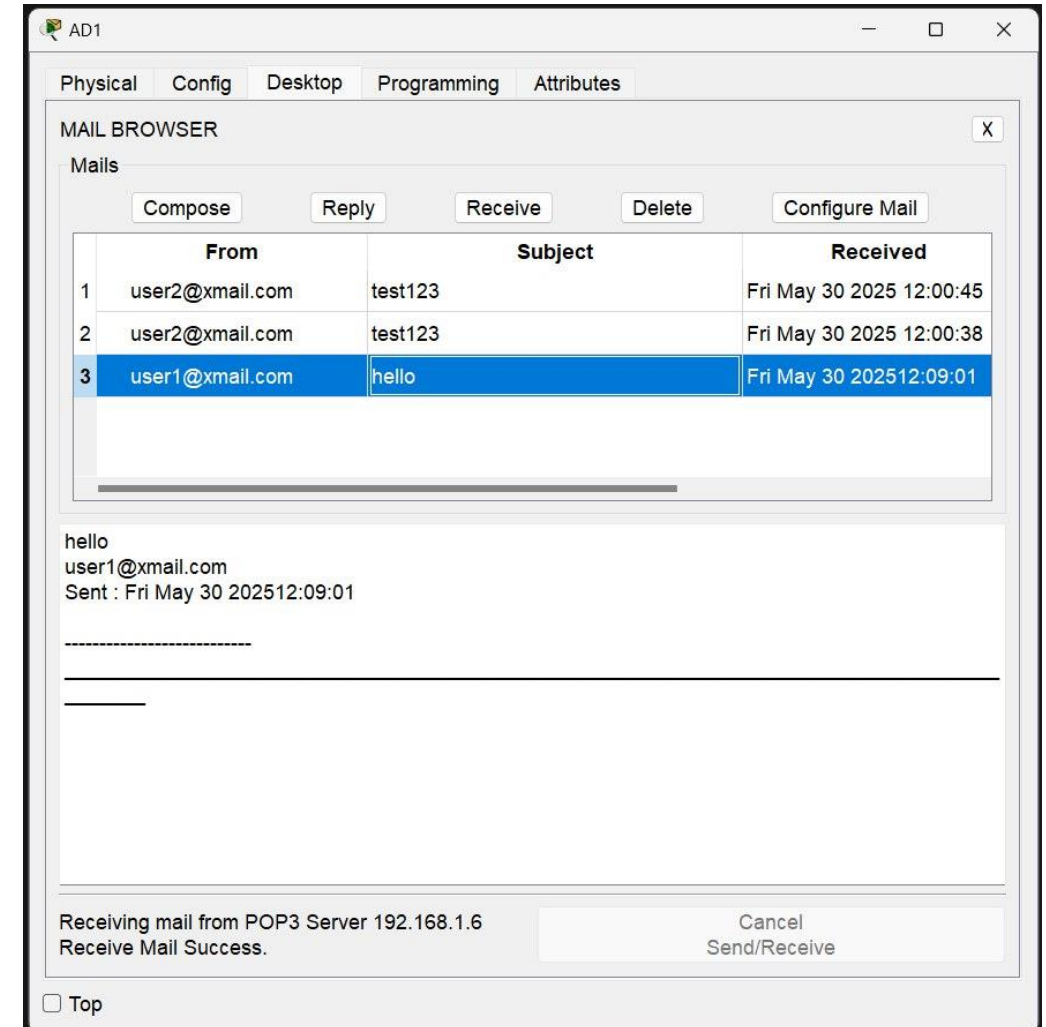
Trace complete.
```

“tracert” Command Test

Test Results (Email Send/Receive)

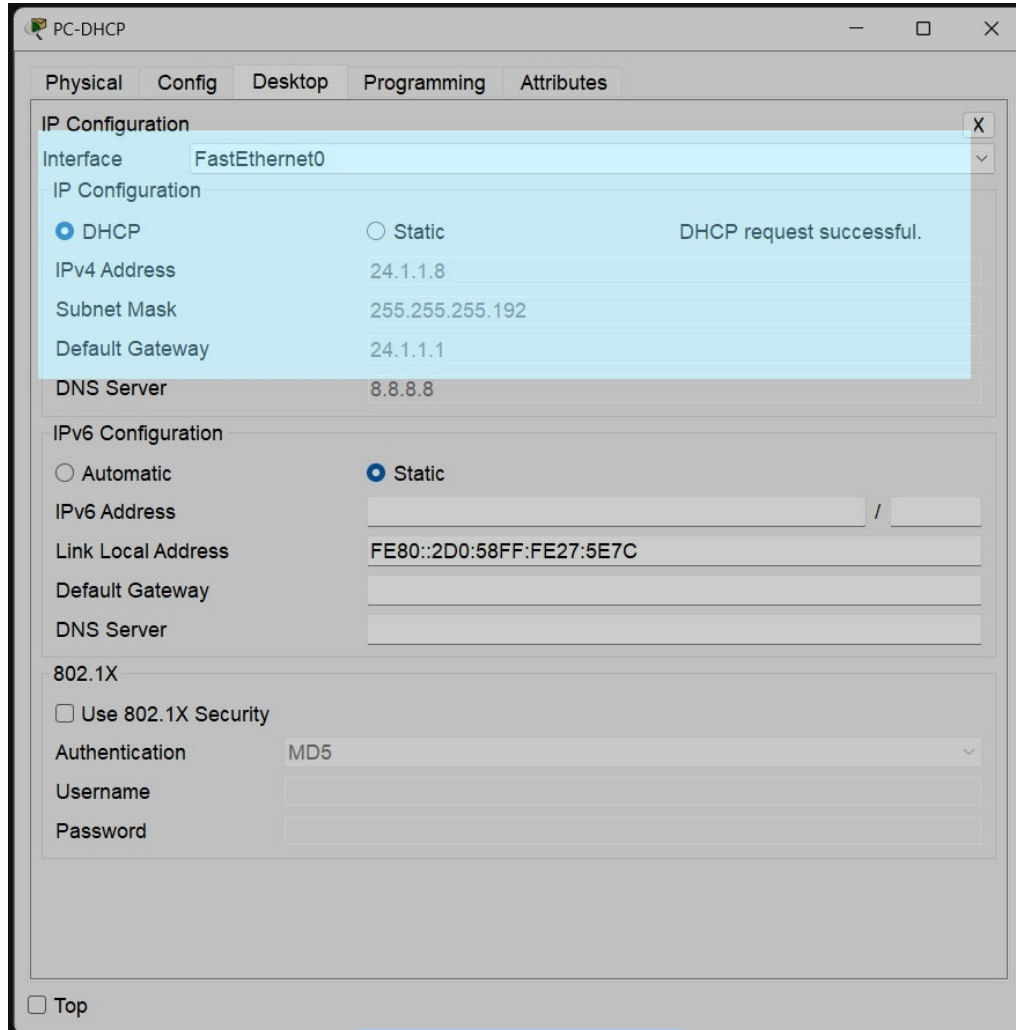


EMAIL Send Test

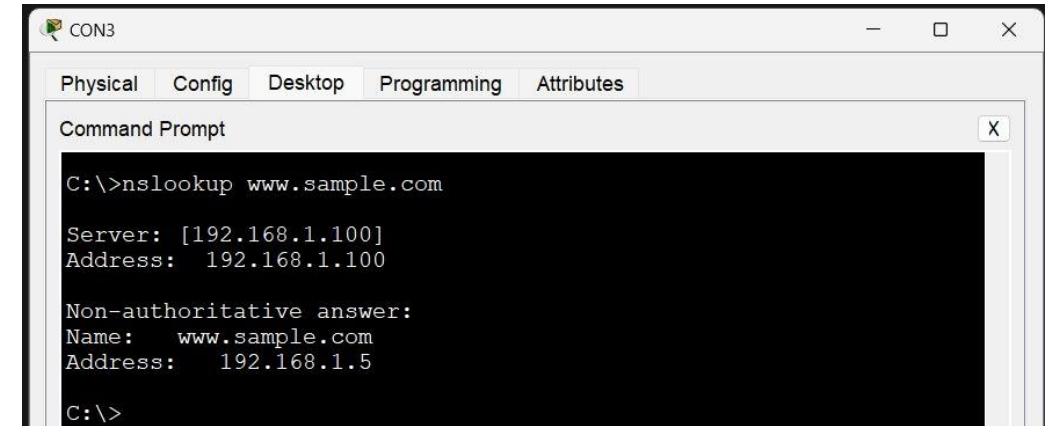


EMAIL Receive Test

Test Results



DHCP IP Test



A SAMPLE WEB PAGE

DNS Test

Live Demo - Network Verification

1. Inter-VLAN Connectivity
Test (ping)
2. Routing Path Verification
(traceroute)
3. DNS & Web Service Test
4. Email Function Test
5. DHCP Test



Analysis of Test Gaps

1. Wireless Coverage

Gap - While basic connection tests were successful, a minor gap was noted from user feedback, which suggested potential weak signal strength in the corner areas of Floor B.

2. Network Scalability

Gap - The network was verified under normal simulated conditions but has not been stress-tested to confirm its performance under peak load from all 50 employees, representing a future scalability risk.

Analysis of Test Gaps

3. Advanced Security

Gap - The implemented security measures are foundational. A comprehensive audit for advanced threats and vulnerabilities has not yet been performed, which is a necessary step for an organization handling sensitive data.

Summary of Gaps

- The core wired network and services are fully functional.
- Identified gaps relate primarily to future-proofing; wireless optimization, proving scalability, and advanced security hardening.

Further Improvements (Performance & Resilience)



To Improve Wireless Performance:

- Conduct a professional site survey to map RF coverage.
- Plan a future upgrade to Wi-Fi 6 access points.
- Deploy a Wireless LAN Controller (WLC) for centralized management.

To Improve Scalability & Resilience:

- Implement Layer 3 switching to accelerate inter-VLAN routing.
- Use Link Aggregation (EtherChannel) to increase bandwidth and redundancy.
- Deploy a second router for Gateway Redundancy.



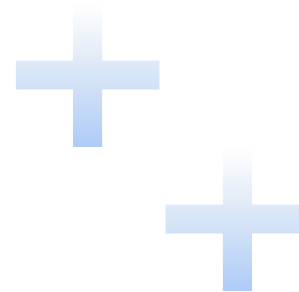
Further Improvements (Security)



To Strengthen Security Posture:

- Implement Network Access Control (NAC) to enforce security compliance on connecting devices.
- Deploy an Intrusion Detection/Prevention System (IDS/IPS) for real-time threat monitoring and blocking.
- Create more granular network segmentation for sensitive departments.
- Integrate automated vulnerability scanning with the patch management process.





Conclusion

Thank you

