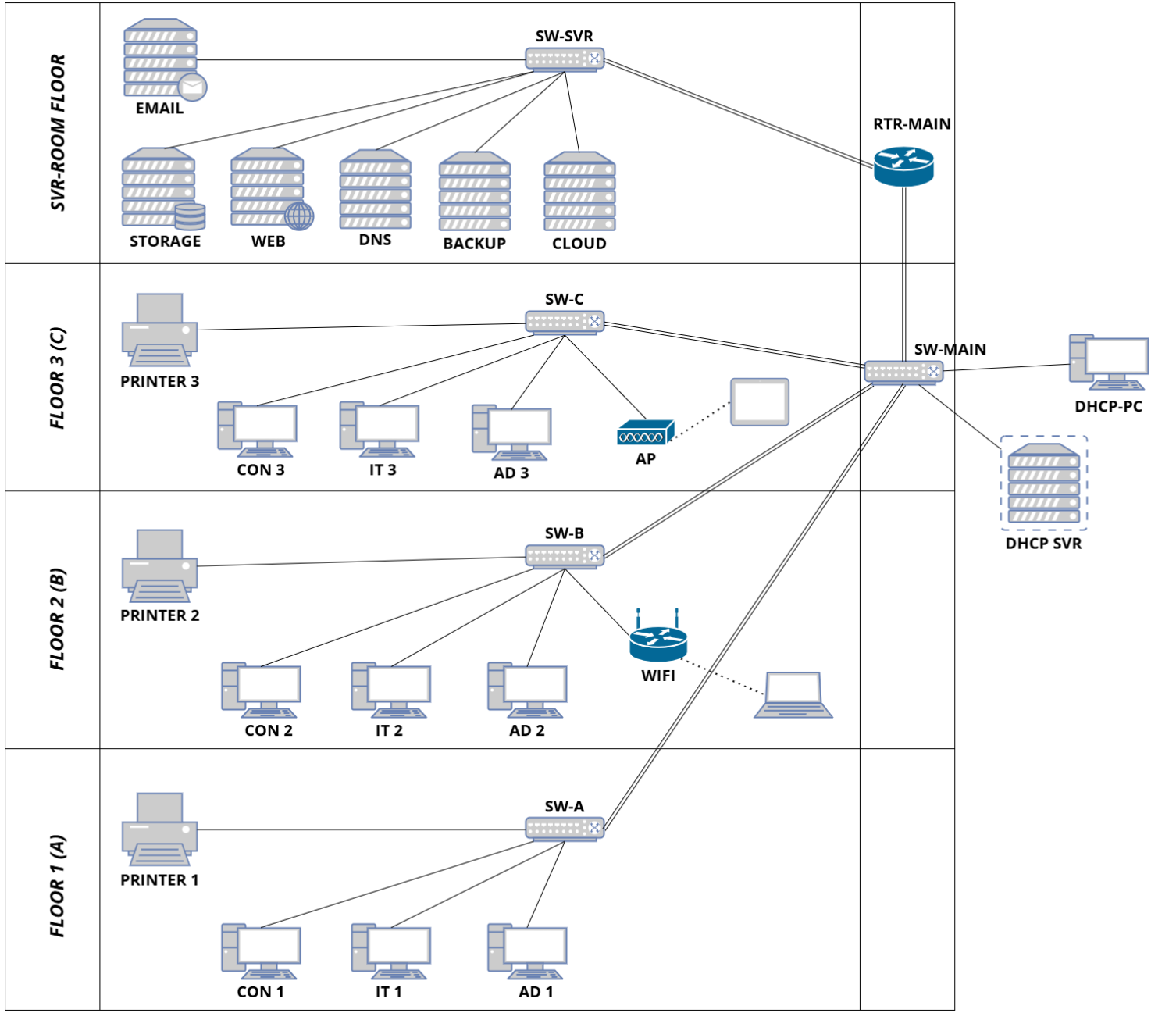
Network Design and Implementation for Corporate Headquarters

By Anjula Meegalla

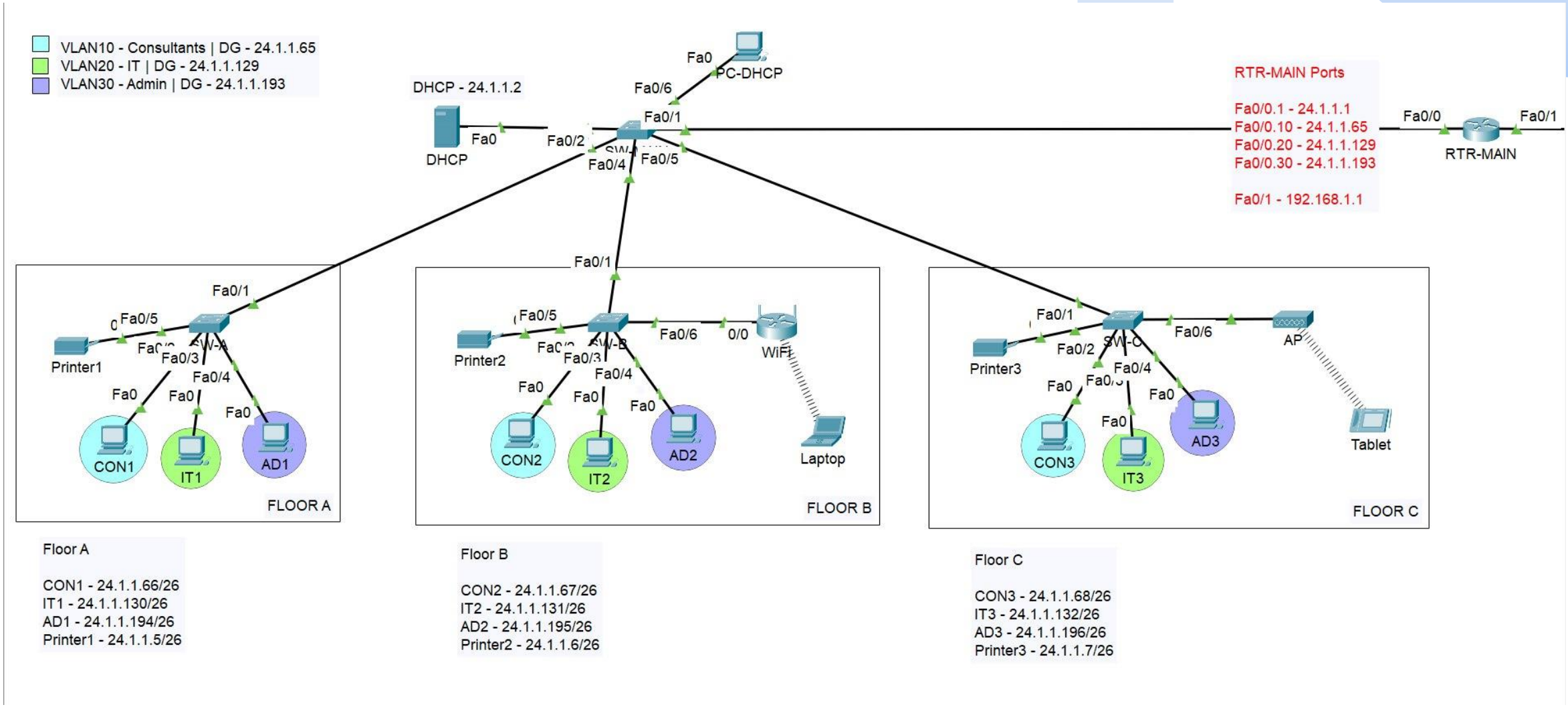
Project Aim

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



Floor A

CON1 - 24.1.1.66/26
IT1 - 24.1.1.130/26
AD1 - 24.1.1.194/26
Printer1 - 24.1.1.5/26

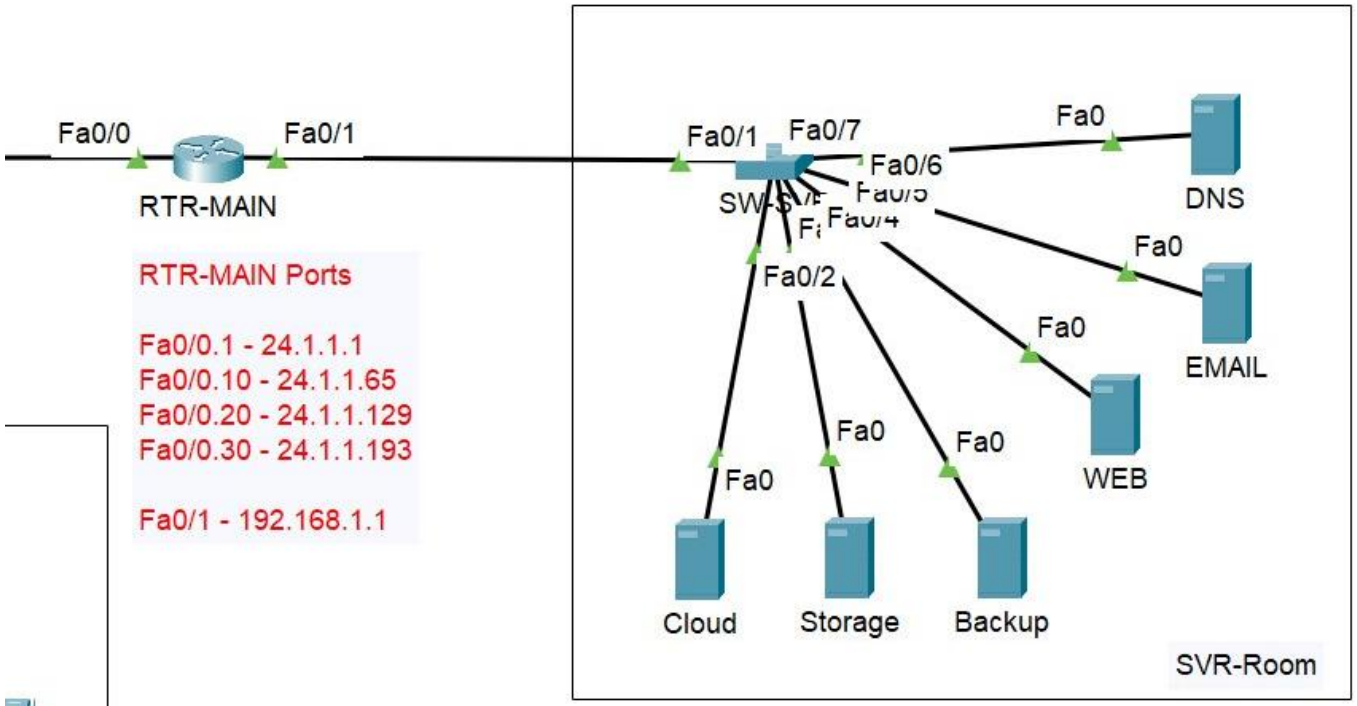
Floor B

CON2 - 24.1.1.67/26
IT2 - 24.1.1.131/26
AD2 - 24.1.1.195/26
Printer2 - 24.1.1.6/26

Floor C

CON3 - 24.1.1.68/26
IT3 - 24.1.1.132/26
AD3 - 24.1.1.196/26
Printer3 - 24.1.1.7/26

Packet Tracer Simulation



RTR-MAIN Ports

Fa0/0.1 - 24.1.1.1
Fa0/0.10 - 24.1.1.65
Fa0/0.20 - 24.1.1.129
Fa0/0.30 - 24.1.1.193

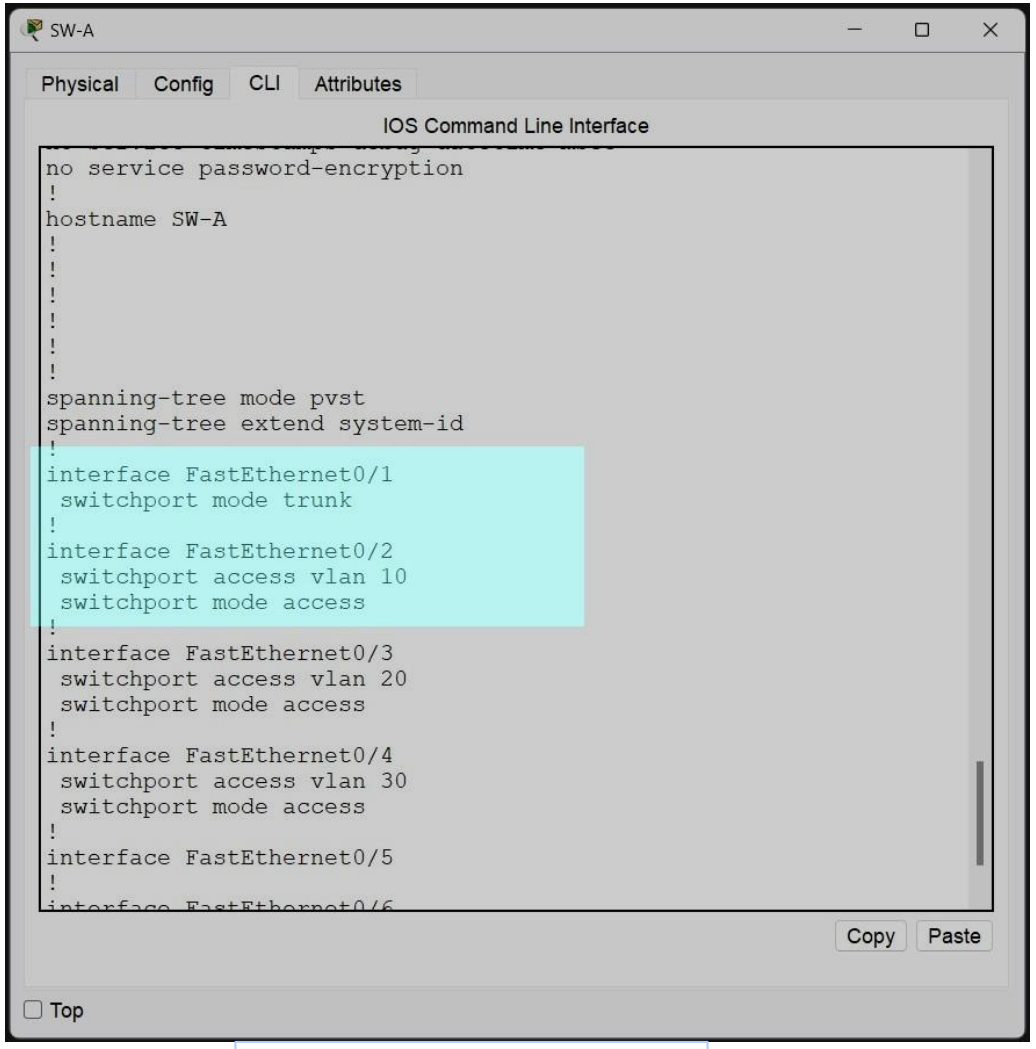
Fa0/1 - 192.168.1.1

SVR-Room

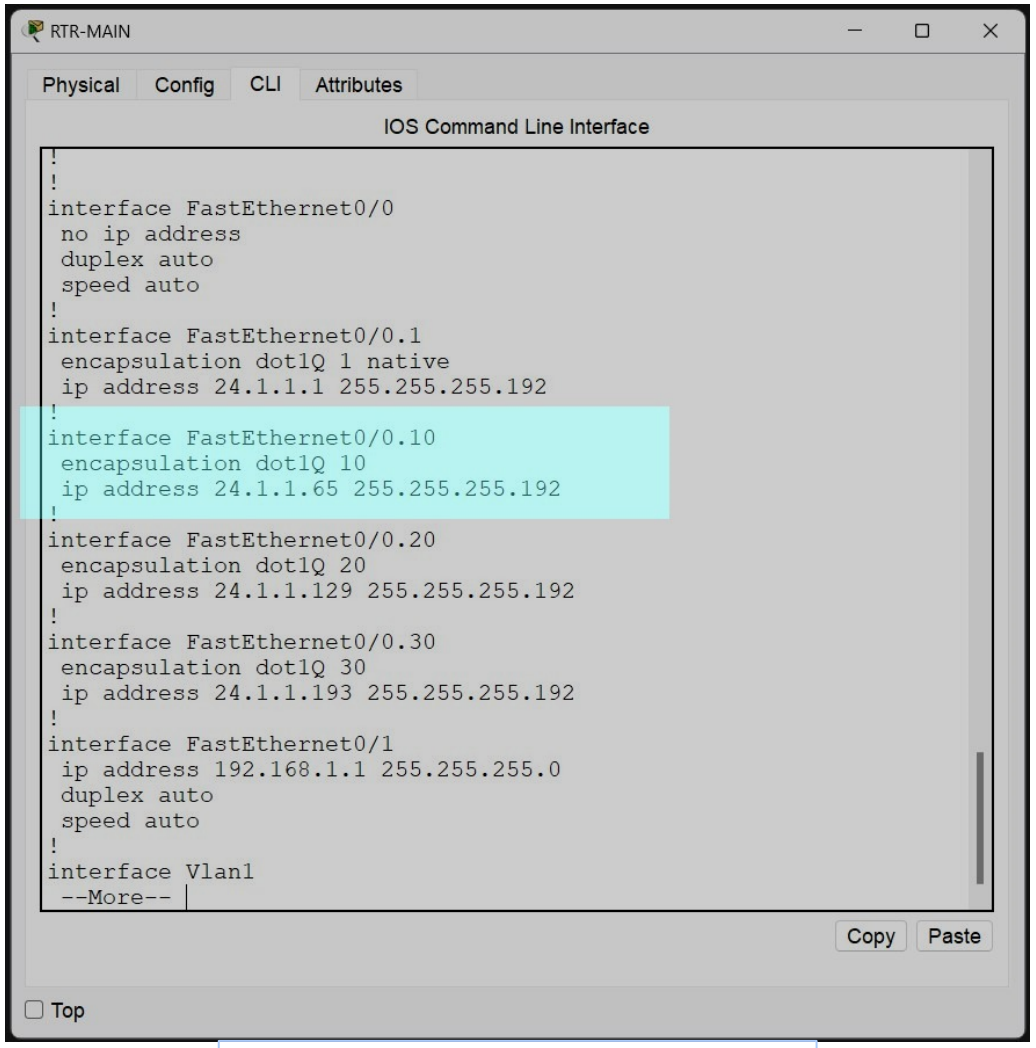
DG - 192.168.1.1

Cloud - 192.168.1.2/24
Storage - 192.168.1.3/24
Backup - 192.168.1.4/24
WEB - 192.168.1.5/24
EMAIL - 192.168.1.6/24
DNS - 192.168.1.100/24

Implementation - Core Infrastructure

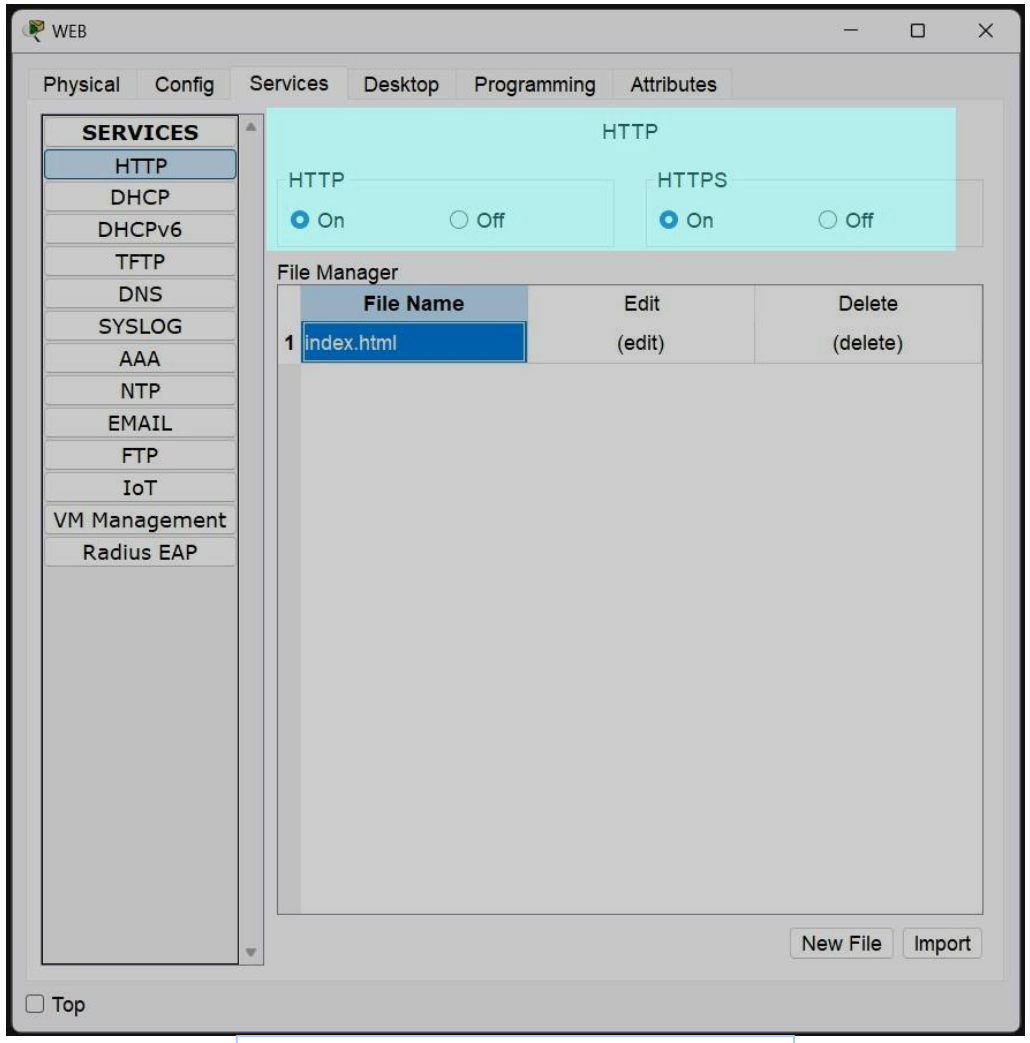


SW-A Configuration

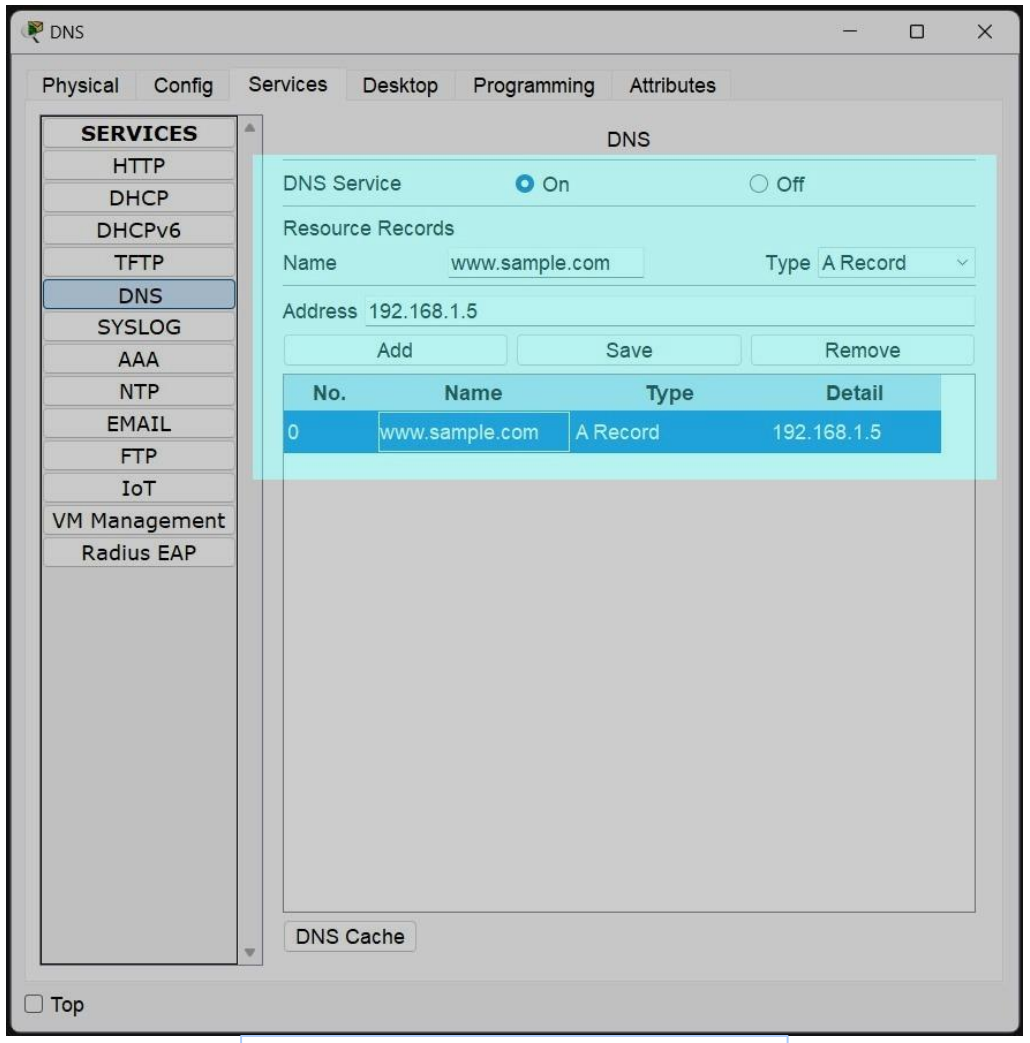


RTR-MAIN Configuration

Implementation - Network Services

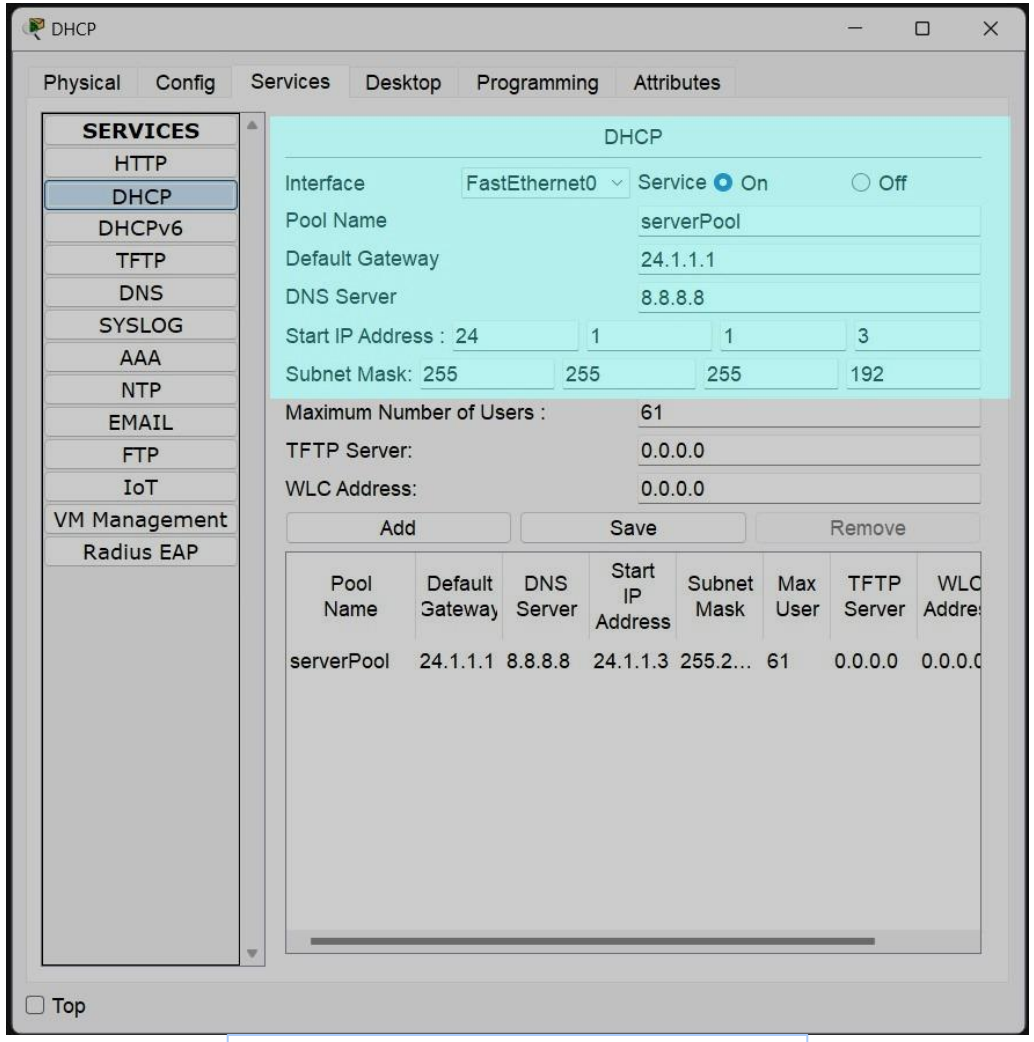


WEB SVR Configuration

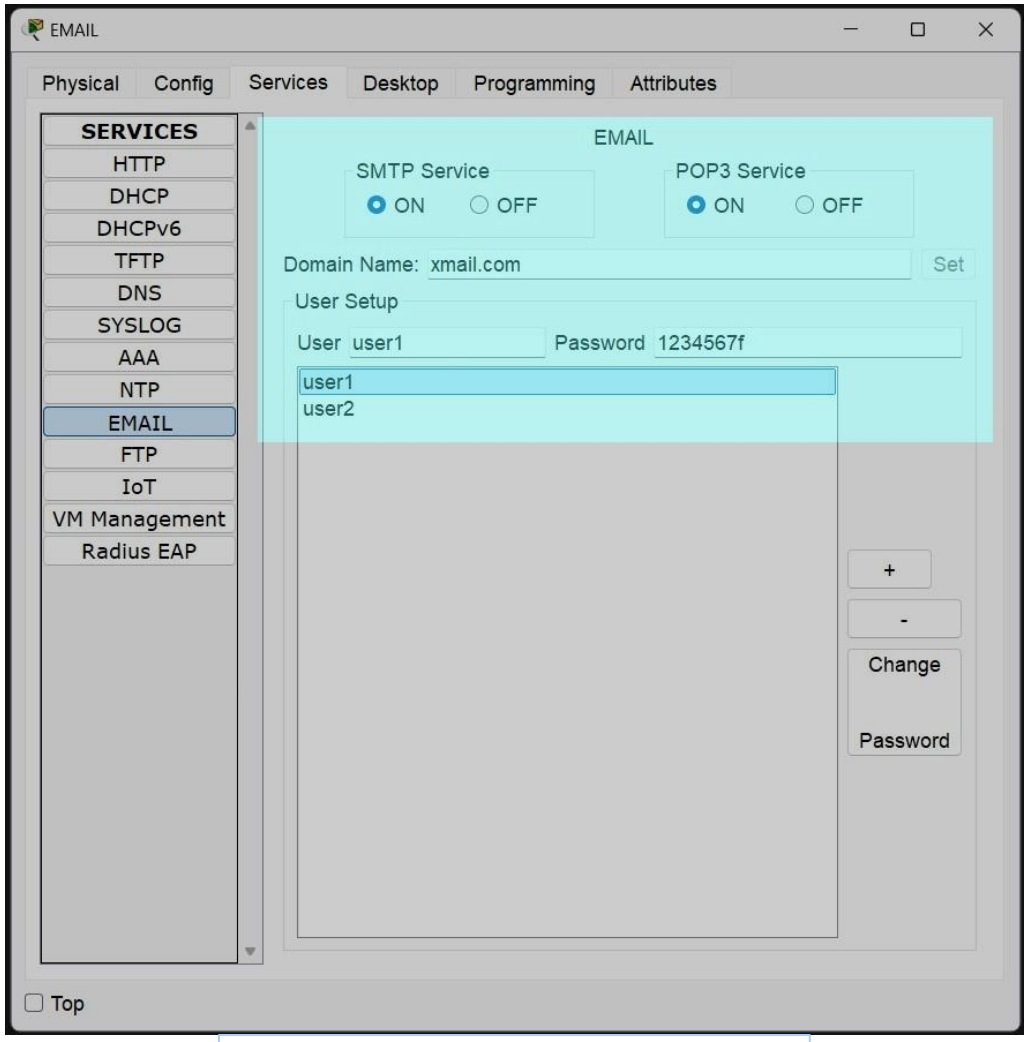


DNS SVR Configuration

Implementation - Network Services

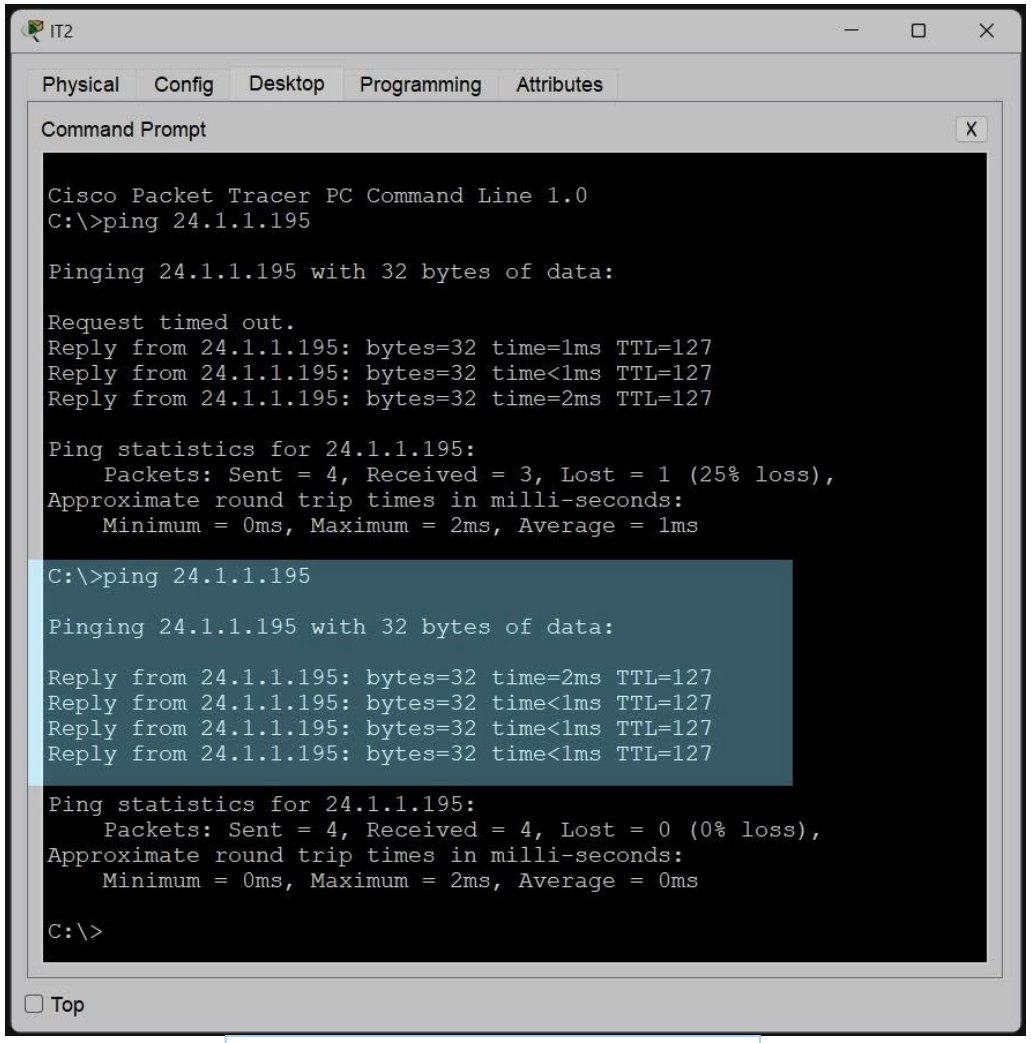


DHCP SVR Configuration

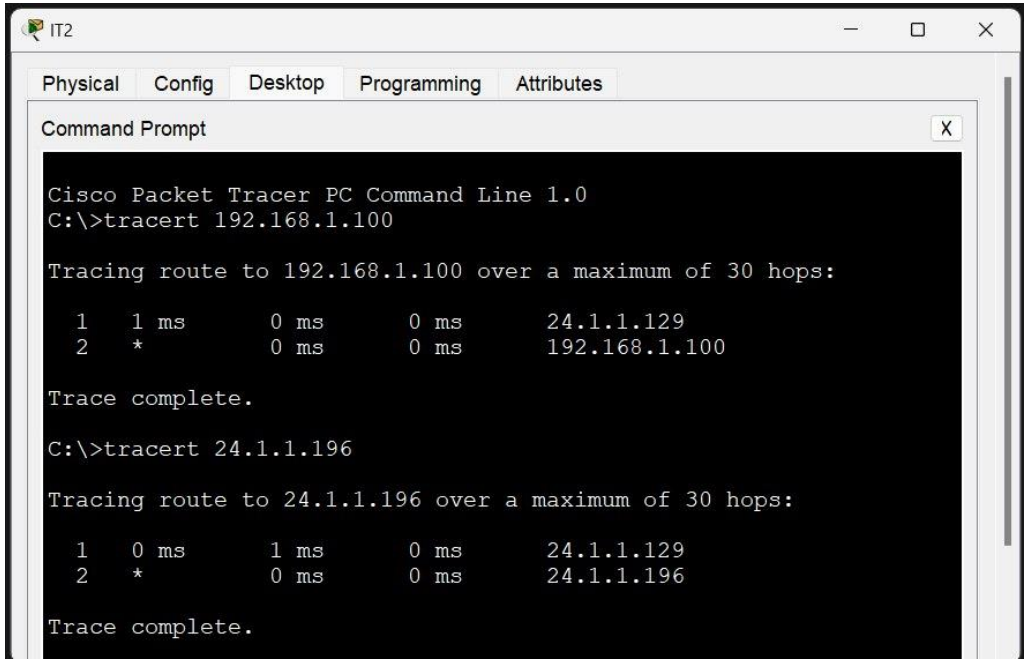


EMAIL SVR Configuration

Test Results (Network Connectivity)

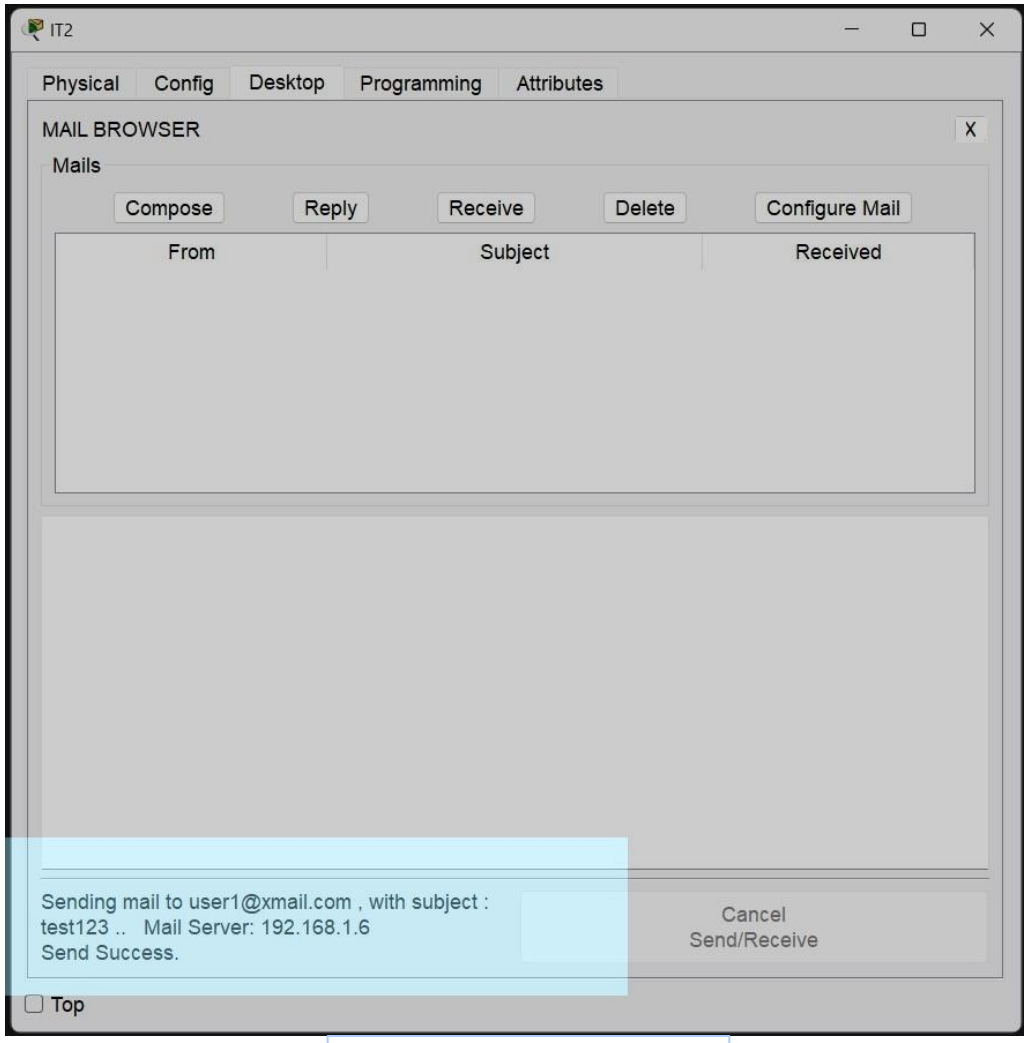


“ping” Command Test

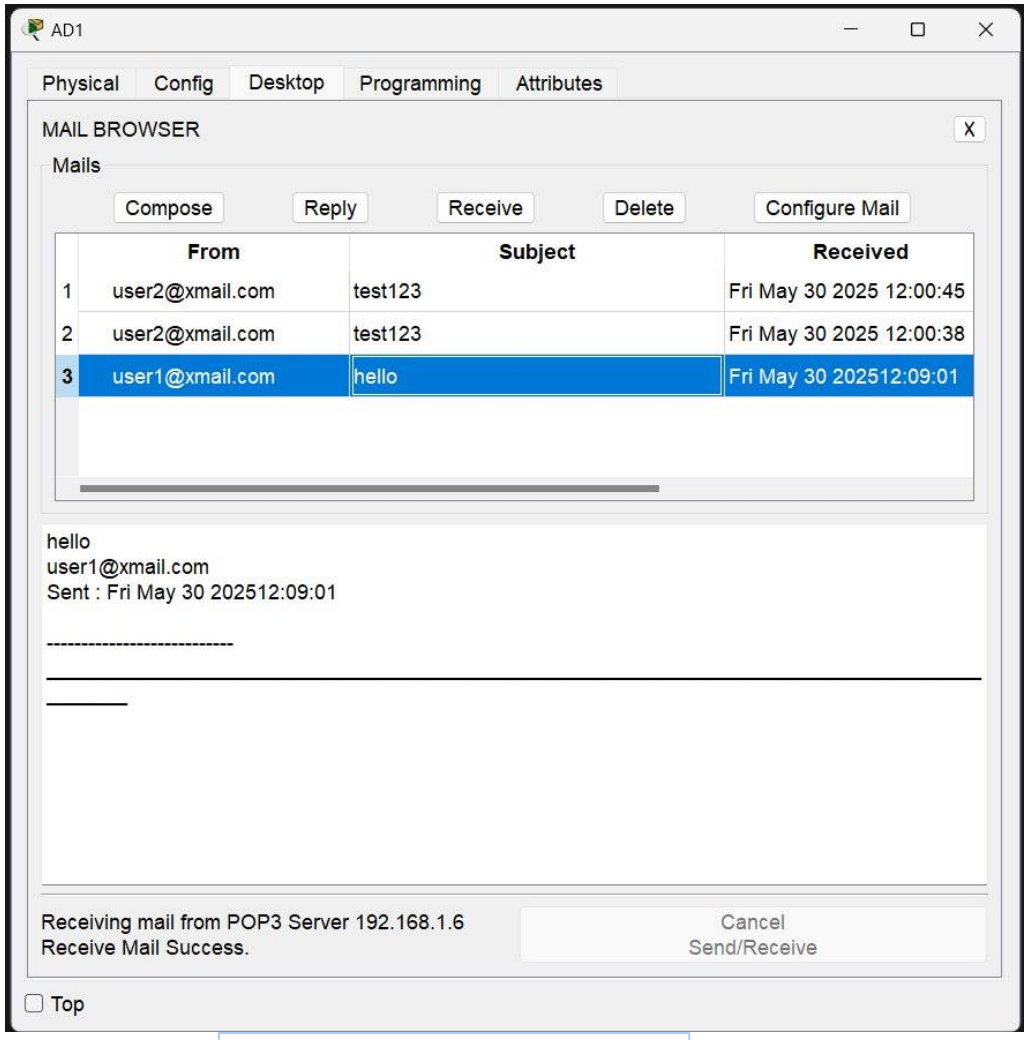


“tracert” Command Test

Test Results (Email Send/Receive)

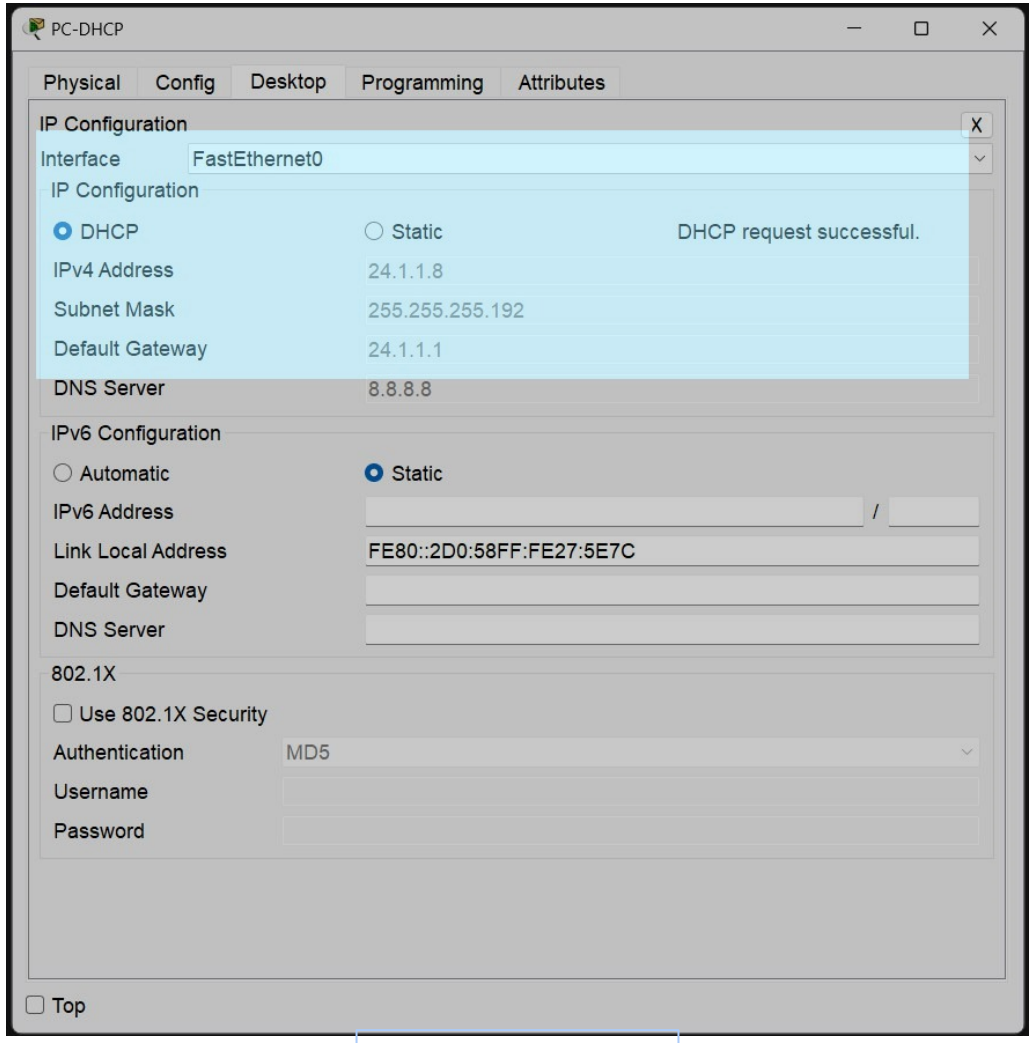


EMAIL Send Test

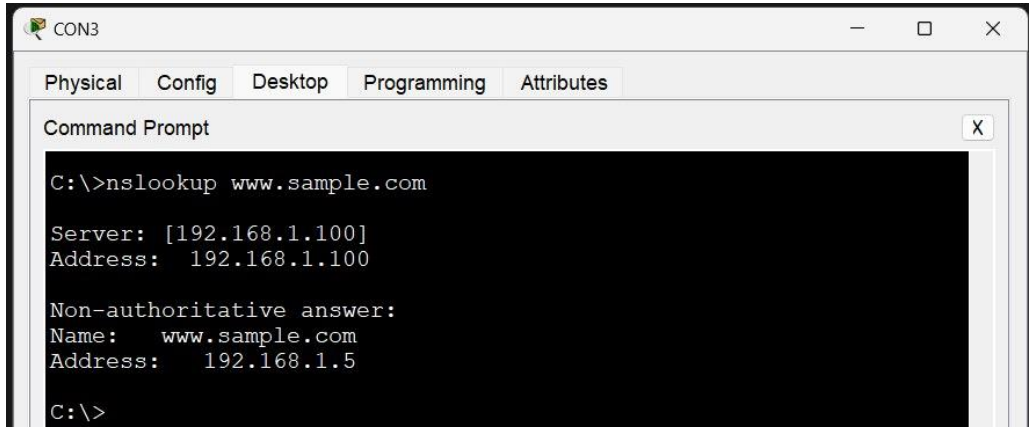


EMAIL Receive Test

Test Results



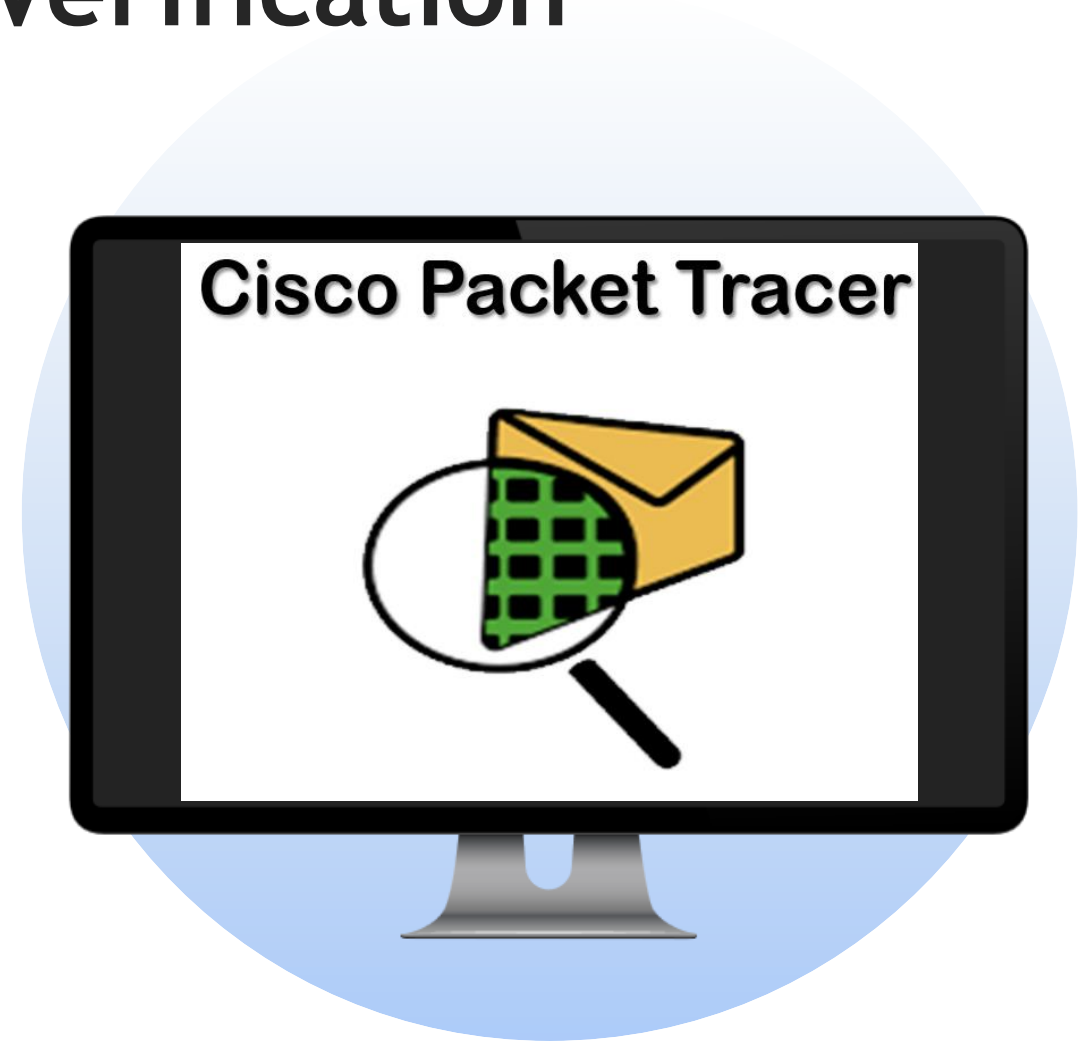
DHCP IP Test



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