ADVANCED NETWORK SECURITY



Simulation and Verification of HTTP and DNS Services in a Secured Network Environment"

CHANDRA SHEKHAR VENKATARAMA REDDY-11618700

NAGA VENKATA SAI NITIESH ANURAG PREPARA-11660912

KRISHNA SAI CHEGGOJU-11646472

Agenda

- Introduction
- Network Component
- Network Configuration
- Data Flow
- Simulation Results
- Challenges and Solution
- Conclusion



INTRODUCTION

In today's interconnected world, secure and efficient communication is the backbone of any modern network. Our project focuses on implementing and verifying a robust network topology featuring critical services like HTTP and DNS. By configuring routers, switches, and servers, we simulate a real-world environment where devices communicate seamlessly while ensuring data integrity and reliability.

The objective is to:

- •Build a scalable and functional network infrastructure.
- Configure essential services like HTTP and DNS to handle requests efficiently.
- Analyze and verify the data flow using network simulation tools.

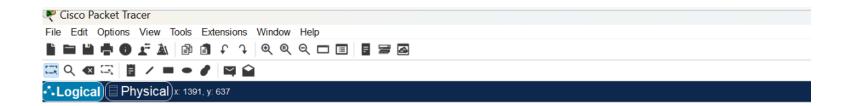
This project not only enhances our understanding of network design and configuration but also demonstrates practical solutions to real-world challenges in advanced networking and security.

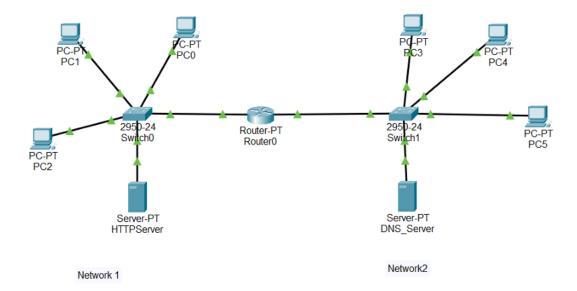
NETWORK COMPONENT

- •Routers: Connect and manage traffic between different networks.
- •Switches: Facilitate device communication within the same network.
- •HTTP Server: Responds to web requests from client devices.
- DNS Server: Resolves domain names into IP addresses.
- •PCs: Represent clients sending DNS and HTTP requests.

NETWORK CONFIGURATION

- •Each PC and server is assigned a unique IP address.
- Configuration of routers for packet forwarding.
- •DNS server setup to resolve domain names.
- •HTTP server setup to respond to requests.
- Proper routing tables and switching mechanisms are implemented

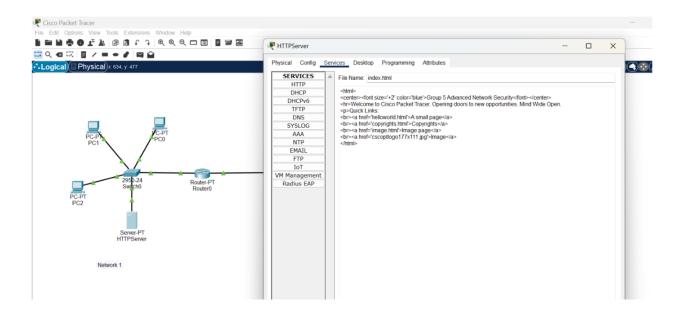


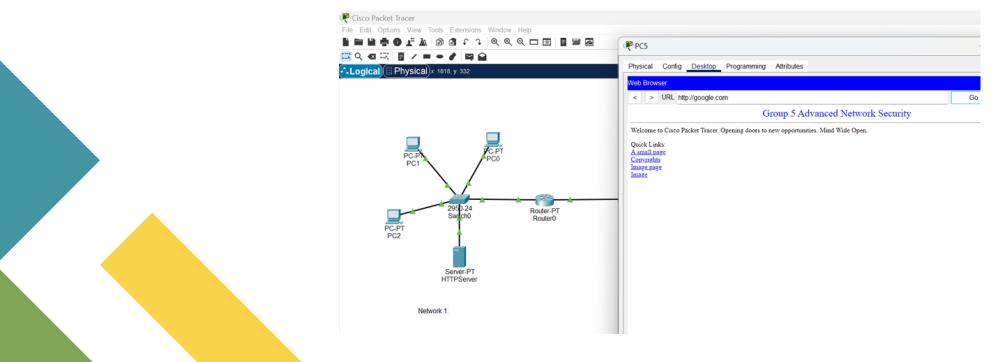


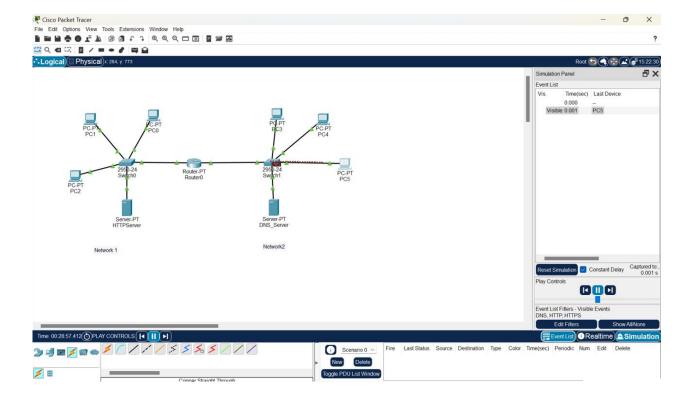
- •Network consists of two LANs (Network1 and Network2).
- •Networks are interconnected via a router (Router0).
- •Includes HTTP and DNS servers for functionality

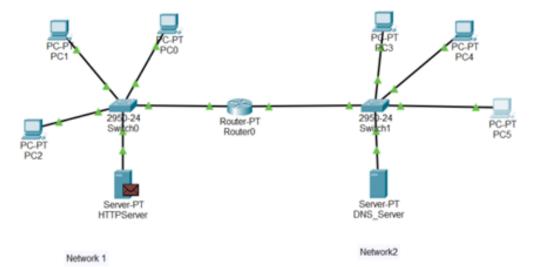
DATA FLOW

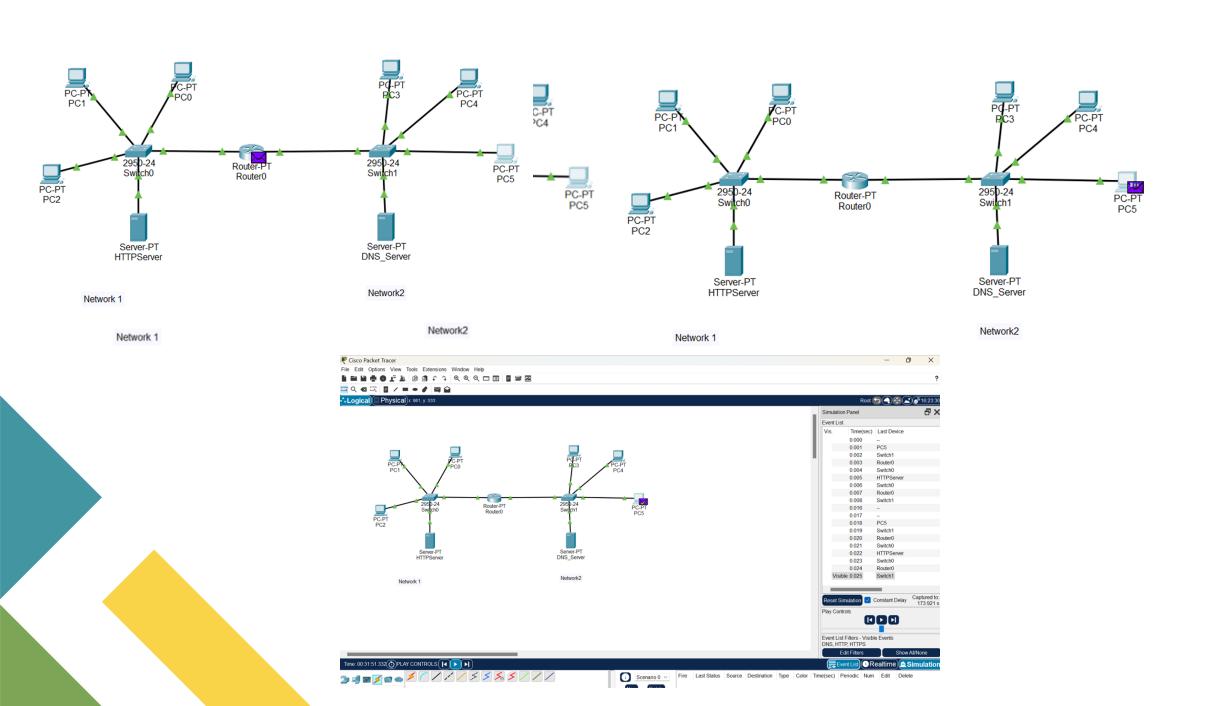
- •Step 1: DNS Request
- •PC sends a domain name query to the DNS server.
- •DNS server responds with the resolved IP address.
- •Step 2: HTTP Request
- •PC uses the resolved IP to send a request to the HTTP server.
- •HTTP server processes and responds to the request.
- Data traverses through configured routers and switches.



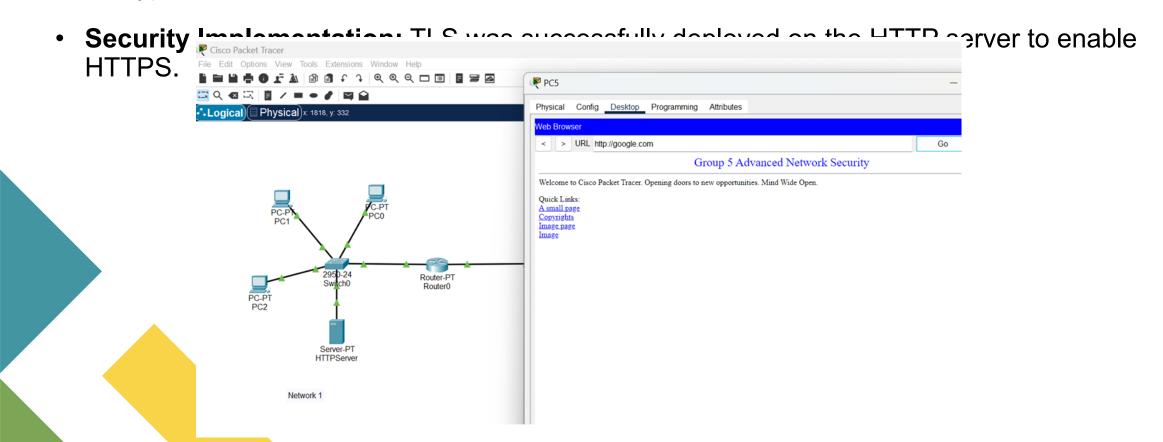








- Successful Connection: Client PC (PC5) connected to the HTTP server via HTTPS.
- **Browser View:** The custom webpage "Group 5 Advanced Network Security" loaded successfully, confirming server functionality.
- Traffic Encryption: HTTPS ensures all data transmitted between clients and the server is encrypted.



SIMULATION RESULTS

- •Successful HTTPS Communication: Clients in both networks accessed the HTTP server securely via https://, ensuring encrypted traffic.
- •TLS Encryption Validation: Packet inspection confirmed traffic on port 443 is encrypted, while HTTP (port 80) is blocked.
- •Access Control: Router ACLs enforced HTTPS-only access, denying unencrypted HTTP connections.
- •DNS Integration: DNS server resolved domain names correctly, enabling seamless HTTPS requests.

IMPLEMENTED FIREWALL

1.Placement in the Topology:

 The firewall was deployed between Router0 and the HTTP/DNS servers to control traffic

entering and exiting each network.

2.Access Control Rules (ACLs):

- 1. Permit HTTPS (port 443): Only encrypted HTTPS traffic is allowed to the HTTP server.
- 2. Block HTTP (port 80): Prevents unencrypted traffic, enforcing secure communication.
- **3. Permit DNS (port 53):** Allows domain name resolution traffic to and from the DNS server.
- 4. Deny All Other Traffic: Ensures no unauthorized access to other ports or services.

ACL Configuration:

•On Router0:

access-list 101 permit tcp any any eq 443 access-list 101 permit udp any any eq 53 access-list 101 deny ip any any

Applied the ACL to the interface connected to the server:

interface GigabitEthernet0/0 ip access-group 101 in

CHALLENGES AND SOLUTIONS

Challenges:

- Configuring DNS and HTTP services correctly.
- Assigning IP addresses without conflicts.
- Ensuring efficient routing and switching.

Solutions:

- Systematic configuration and testing.
- Troubleshooting routing paths and server responses.

CONCLUSION

- ☐ Successfully simulated network topology with working DNS and HTTP services
- Verified secure and efficient communication between devices.
- ☐ Highlighted practical applications of routers, switches, and IP configuration.

Thank you