

**Course: Computer Networks - 00207N**

**Faculty: Faculty of Computers and Data Science**

**Programs: Intelligent Systems/Cybersecurity Programs**

**Tool: CISCO Packet Tracer**

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## **Designing and Simulating ANU Campus Network**

### **1. Introduction**

This report outlines the design and simulation of a network for ANU's new campus. The project involves connecting **five buildings** using two Class C networks: 193.158.1.0 and 193.158.2.0, and ensuring efficient connectivity, security, and routing.

### **2. Network Topologies**

The network incorporates four different LAN topologies implemented on CISCO Packet Tracer:

- **Bus Topology (Building A)**
  - Contains 3 switches.
  - Subnet: 193.158.1.0/24
  - Number of Hosts: 212
- **Ring/Token Ring Topology (Building B)**
  - Contains 5 switches.
  - Subnet: 193.158.2.0/24
  - Number of Hosts: 36

- Tree Topology (**Building C**)
  - Contains 5 switches.
  - Subnet: 193.158.1.0/24
  - Number of Hosts: 47
- Star Topology (**Building D**)
  - Contains 1 switch.
  - Subnet: 193.158.2.0/24
  - Number of Hosts: 125

A VLAN is implemented in the Bus Topology (Building A) to segment the network for enhanced performance and security.

### 3. IP Addressing and Subnetting

Each building is assigned a subnet from the Class C networks. The external router interfaces use the Class A network 10.0.0.0/8. The server in the Data Center Building has an IP of 172.125.12.9 (Class B).

IP and Subnet Mask Table:

Building	Subnet	Subnet Mask	Number of Hosts	VLAN (if applicable)
A	193.158.1.0	255.255.255.0	212	Yes
B	193.158.2.0	255.255.255.0	36	No
C	193.158.1.0	255.255.255.0	47	No
D	193.158.2.0	255.255.255.0	125	No
Data Center	172.125.12.9	255.255.0.0	1	No

## 4. Network IP Details

### Building A (Bus Topology)

- Subnet: 193.158.1.0/24
- First Valid IP: 193.158.1.1
- Default Gateway: 193.158.1.254
- Subnet Mask: 255.255.255.0
- IPs Range: 193.158.1.1 - 193.158.1.254
- Broadcast IP: 193.158.1.255

### Building B (Ring/Token Ring Topology)

- Subnet: 193.158.2.0/24
- First Valid IP: 193.158.2.1
- Default Gateway: 193.158.2.254
- Subnet Mask: 255.255.255.0
- IPs Range: 193.158.2.1 - 193.158.2.254
- Broadcast IP: 193.158.2.255

### Building C (Tree Topology)

- Subnet: 193.158.1.0/24
- First Valid IP: 193.158.1.1
- Default Gateway: 193.158.1.254
- Subnet Mask: 255.255.255.0
- IPs Range: 193.158.1.1 - 193.158.1.254
- Broadcast IP: 193.158.1.255

## Building D (Star Topology)

- Subnet: 193.158.2.0/24
- First Valid IP: 193.158.2.1
- Default Gateway: 193.158.2.254
- Subnet Mask: 255.255.255.0
- IPs Range: 193.158.2.1 - 193.158.2.254
- Broadcast IP: 193.158.2.255

## Data Center Building

- Server IP: 172.125.12.9
  - Default Gateway: 172.125.12.1
  - Subnet Mask: 255.255.0.0
  - Broadcast IP: 172.125.255.255
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## 5. NAT Implementation

Three types of Network Address Translation (NAT) are implemented:

- PAT (Port Address Translation) on the server LAN (Data Center Building)
  - Static NAT
  - Dynamic NAT
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## 6. Routing

The network employs the Open Shortest Path First (OSPF) dynamic routing protocol. This ensures efficient path selection and routing of data across the network. Additionally, for demonstration purposes, RIP and EIGRP are also configured as alternative routing protocols.

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## 7. Security Measures

Security is paramount in the network design. The following measures are implemented:

- Router Authorization: Password protection with MD5 hashing.
  - Firewalls: Configured for each network.
  - DHCP, DNS, FTP, SSH, and Telnet Servers: Deployed to enhance network functionality and security.
  - Port Security: Enhanced security measures on all switches
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## 8. Additional Features

- VLSM (Variable Length Subnet Masking): Implemented to optimize IP address usage.
- Port Forwarding: Configured to allow external access to internal services.
- Web Server: Deployed with a custom HTML page.

- Extra LANs: Added to support future network expansion.