Exp 4: Build Connected LANs on Different Subnets with Router and Test Performance using Simulator

Aim

To design and configure two LANs on different subnets, connects them via a router, and test their inter-network communication and performance using network simulator

Objective

- To build two LANs with different IPv4 subnets
- To configure router interfaces with appropriate IPs
- To assign correct IP addresses and default gateways to PCS
- To test connectivity and simulate performance between subnets

Software Required

- Cisco Packet tracer

Background theory

In real-world networks, different LANS often on separate IP subnets for performance, security or organizational reasons. Routers are used to connect these LANS and route packets between them.

A subnet is a segment of a network defined by a unique IP range. Devices on different subnets cannot communicate directly unless a router is present

In this experiment:

- Switches connect end devices in each LAN
- A router connects the switches
- Each router interface acts as the default gateway for its respective subnet.

Algorithm

1. Set up two LANs with switches and PCs
2. Connect each LAN to a router interface
3. Assign appropriate IP addresses to router interface and PCs
4. Set default gateways on PCs to the router interface
5. Use ping and simulation to verify performance

Step-by-Step Procedure

1. Design the Topology

Drag and Place

- 1 Router (e.g., 1941)
- 2 switches
- 2 PCs (PC1 & PC2)

Connections

- PC1 → Switch 1 → Gig0/0
- PC2 → Switch 2 → Gig0/1

Use copper straight through cables

2. IP Addressing Plan

Device/Interface	IP Address	Subnet Mask
PC 1	192.168.1.2	255.255.255.0
PC 2	192.168.2.2	255.255.255.0
Router Gig0/0	192.168.1.1	255.255.255.0
Router Gig0/1	192.168.2.1	255.255.255.0

3. Configure Router Interfaces

Click on the router →CLI tab

Router > enable

Router# configure terminal

Router(config)# interface gig0/0

Router(config-if)# ip address 192.168.1.1 255.255.255.0

Router(config-if)# no shutdown

Router(config-if)# exit

Router(config)# exit

Router# write memory

4. Configure PCs

PC1:

- IP Address: 192.168.1.2
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.1

PC2:

- IP Address: 192.168.2.2
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.2.1

5. Test Performance

On PC1 open command prompt and enter

Ping 192.168.2.2

Expected Output

Reply from 192.168.2.2 : bytes =32 times <1ms TTL=225

To simulate traffic:

- Use simulation mode in packet tracer
- Add traffic enerators or larger pins (ping -1 1000 on some systems)

Expected Output

- Successful pings between devices on different subnets
- Green status light on all connections
- Traffic simulation shows successful routing through the router

Result

Two LANs on different subnets were created and connected through a router. The communication was successfully tested and verified using ping.

Pre-Viva Questions

1. Why is a router necessary between different subnets?
2. What is the role of a default gateway?
3. Which OSI layer does a router operate on ?

Post- Viva Questions

1. What is the difference between static and dynamic routing?
2. How can you improve performance between subnets?
3. Can a router be replaced with a layer 3 switch in this scenario?