National University of Computer and Emerging Sciences

Laboratory Manuals

for

Computer Networks - Lab

(CL -3001)

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Lab Manual 14

Objective:

- Subnetting practice (Solve any problem of your choice)

What is Subnetting?

Subnetting is the process of dividing a large IP network into smaller, more manageable subnetworks (subnets). This allows for more efficient use of IP addresses, improved network performance, and better security. By subnetting, a network administrator can assign a specific range of IP addresses to each department, building, or floor, ensuring that each group has its own isolated communication space while still being part of a larger network.

Why Use MSBs or LSBs in Subnetting?

Subnetting involves **borrowing bits from the host portion** of an IP address to create more subnets. Here's how the bit direction matters:

When maximizing hosts per subnet:

- You **keep more bits** in the **host portion** (i.e., use fewer **MSBs** for subnetting).
- This way, each subnet has **more host addresses**.
- **Goal:** Fewer subnets, more hosts per subnet.

Example:

- 192.168.0.0/24 → 8 bits for hosts → 2^8 - 2 = 254 usable hosts
- Using fewer MSBs for subnetting retains more host bits.

When minimizing IP wastage (more subnets):

- You **take more bits** from the host portion — i.e., use more **MSBs** — to create **more subnets**.
- This **reduces host capacity per subnet** but allows **many subnetworks**.
- **Goal:** Efficient IP use by fitting subnet size to exact needs (e.g., 6-host subnet = /29).

Example:

From 192.168.1.0/24, to create subnets for 6-host networks:

- Need at least 3 bits for hosts (since 2^3 - 2 = 6)
- So use **5 MSBs** for subnetting → /29 mask → 32 subnets of 6 hosts each.

Problem 1: Maximize Hosts per Subnet

Scenario:
A logistics company has been assigned the network block 10.0.0.0/24 for its regional offices. It needs to divide this into **4 subnets** for:

- **Warehouse Operations** (needs largest number of devices, at least 2000)
- **Office Staff (at most 500)**
- **Security Team (at most 100)**
- **Transportation (at most 150)**

There is no strict host requirement, but you are instructed to **maximize the number of usable hosts in each subnet**, particularly for the warehouse. All three subnets must not overlap. List gateway and total usable IPs for each subnet (Gateway is usually the first usable IP).

Problem 2: Minimize IP Wastage

Scenario:
A software firm has been assigned the network block 192.168.10.0/24. It has three teams that need to be placed on **separate subnets**:

- **Frontend Team**: 20 hosts
- **Backend Team**: 12 hosts
- **Management Team**: 4 hosts

You are instructed to **minimize IP wastage** by subnetting the network as efficiently as possible, assigning just enough hosts to each subnet.