**SCHOOL OF COMPUTER SCIENCE**

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**DEHRADUN, UTTARAKHAND**



**DATA COMMUNICATION AND NETWORKS LAB**

**LABORATORY FILE**

**(2024-2025)**

**For**

**Vth Semester**

**Submitted To: Submitted By:**

Prof. Abhishek Yadav Mr. Akshat Negi

Assistant Professor S.S. 500106533(SAP ID)

[Vth Semester] R2142220414(Roll No.)

School of Computer Sciences B.Tech. CSF (Batch-1)

**LAB EXPERIMENT – 4**

**Familiarization of Network IP & Subnetting & Supernetting**

**Aim:** Study of Network IP and Sub Netting & Super Netting.

* Classification of IP address

**Apparatus (Software):** No Software or hardware needed.

**Theory:** An Internet Protocol address (IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. An IP address serves two principal functions: host or network interface identification and location addressing. Its role has been characterized as follows: "A name indicates what we seek. An address indicates where it is. A route indicates how to get there."

A sub network, or subnet, is a logically visible subdivision of an IP network. The practice of dividing a network into two or more networks is called sub netting. A super network, or super net, is an Internet Protocol (IP) network that is formed from the combination of two or more networks (or subnets) with a common Classless Inter-Domain Routing (CIDR) prefix. The new routing prefix for the combined network aggregates the prefixes of the constituent networks. It must not contain other prefixes of networks that do not lie in the same routing path. The process of forming a super net is often called super netting, prefix aggregation, route aggregation, or route summarization.

**Procedure:** Following is required to be study under this practical.

* Classification of IP address
* Sub netting

Why we Develop sub netting and How to calculate subnet mask and how to identify subnet address.

* Super netting

Why we develop super netting and how to calculate super net mask and how to identify super net address.

**Conclusion:** Gain the knowledge about the IP address and Sub netting & Super netting.

1. **CLASSIFICATION OF IP ADDRESS: -**

**IP Address Classification**

IP addresses are divided into five classes: A, B, C, D, and E. Each class is assigned a specific range of addresses and has a different purpose.

**Class A**

* **Range:** 0.0.0.0 to 127.255.255.255
* **Purpose:** Primarily used for large networks, such as those of major organizations or countries.
* **Number of hosts:** Up to 16,777,214 hosts per network.

**Class B**

* **Range:** 128.0.0.0 to 191.255.255.255
* **Purpose:** Used for medium-sized networks, such as those of universities or large corporations.
* **Number of hosts:** Up to 65,534 hosts per network.

**Class C**

* **Range:** 192.0.0.0 to 223.255.255.255
* **Purpose:** Used for small networks, such as those of small businesses or homes.
* **Number of hosts:** Up to 254 hosts per network.

**Class D**

* **Range:** 224.0.0.0 to 239.255.255.255
* **Purpose:** Reserved for multicast addressing, which allows data to be sent to a group of hosts simultaneously.

**Class E**

* **Range:** 240.0.0.0 to 255.255.255.255
* **Purpose:** Reserved for experimental use and future expansion.

**SUBNETTING –**

Subnetting is the process of dividing a network into smaller, more manageable subnetworks. It's done by using some bits of the host ID to create a subnet ID.

**Why we Develop sub netting and how to calculate subnet mask and how to identify subnet address.**

* Subnetting is a network technique that divides large networks into smaller, more manageable subnets. Subnetting is used to improve network performance, security, and IP address utilization.

To calculate a subnet mask and identify a subnet address, you can:

* Convert the IP address and mask to binary
* Determine the network and host portions of the address
* Find the subnet ID in binary by changing all host bits to 0s
* Convert the binary representations to decimals

You can also use CIDR (Classless Inter-Domain Routing) notation to represent an IP address and its subnet mask. CIDR is a common way to represent the network address and the number of bits in the network portion of the address.

**SUPERNETTING -**

Super-netting is a computer networking technique that combines multiple smaller networks into one larger network to improve routing efficiency. It's used to reduce the size of routing tables and the strain on routers, which can be severely affected by large groups of networks.

To calculate a super-net mask and identify a super-net address, you can follow these steps:

1. Choose the required subnets, which must be contiguous.
2. Identify the super-net's network ID by translating the numerical IP addresses of the subnets' IDs into binary form.
3. Calculate the super-net's new subnet mask.

Here's an example of how to calculate a super-net mask:

1. Subtract the number of Class C networks you want from 256. For example, if you want eight Class C networks, the result is 248.
2. Place the value of 248 into the third octet of the mask, resulting in 255.255.248.0.

Super-netting, also known as CIDR, is a way to represent multiple networks with a single network prefix and mask. CIDR notation uses a forward slash (/) and the number of bits in the subnet mask to append the number of subnet mask bits to the network address.