Subnet Mask

A **Subnet Mask** is a 32-bit number that divides an IP address into **network** and **host** portions. It is used in IPv4 networking to determine which part of the address represents the network and which part represents the devices (hosts) within that network.

How Subnet Mask Works

- A subnet mask consists of a series of **1s** followed by **0s**.
- The **1s** indicate the network portion, and the **0s** indicate the host portion.
- Example:
  - **IP Address:** 192.168.1.10
  - **Subnet Mask:** 255.255.255.0
  - This means the first **24 bits** (255.255.255) represent the **network**, and the last **8 bits** (.0) are for **hosts**.

Common Subnet Masks and CIDR Notation

Subnet Mask	CIDR Notation	Number of Hosts
255.0.0.0	/8	16,777,214
255.255.0.0	/16	65,534
255.255.255.0	/24	254
255.255.255.128	/25	126
255.255.255.192	/26	62

Subnet Mask Functionality

1. **Defines Network and Host IDs**
   - Example: 192.168.1.10/24
     - **Network ID:** 192.168.1.0
     - **Host Range:** 192.168.1.1 - 192.168.1.254
     - **Broadcast Address:** 192.168.1.255
2. **Facilitates Subnetting**
   - Allows splitting large networks into smaller ones to improve performance and security.
3. **Helps in Routing**
   - Routers use subnet masks to determine which subnet an IP address belongs to.

192.168.10.0/25

255	255	255	0
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0
1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0

24 BITS-NETWORK   **8 BITS-HOST**

192.168.10.0/25

255	255	255	0
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	2^7	2^6 2^5 2^4 2^3 2^2 2^1 2^0
1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	0	0 0 0 0 0 0 0

$2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7$ $2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7$ $2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7$ 2^7

255   255   255   128