Subnetting Concept

What is subnetting:

Subnetting is a technique used in computer networking to divide and allocate an IP network into smaller, more manageable subnetworks or subnets. This process is essential for efficient IP address management, improved network performance, and enhanced security. By breaking down a large network into smaller subnets, administrators can control and optimize the flow of traffic, isolate network issues, and enhance overall network organization.

Concept related to subnetting:

- **IP Address:**

An IP address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. IPv4 addresses, the most common type, are typically expressed as four sets of numbers separated by dots. Each set represents 8 bits, and the possible values for each set range from 0 to 255. (e.g., 10.10.1.0)

- **Subnet Mask:**

A subnet mask is a 32-bit number that divides an IP address into network and host portions. It helps identify the network to which an IP address belongs. In binary, the subnet mask consists of a series of consecutive 1s followed by 0s.

- **Subnetting Process:**

subnetting involves taking a larger IP network and dividing it into smaller, more manageable subnetworks. This is done by borrowing bits from the host portion of the IP address to create subnets.

- **CIDR Notation:**

Classless Inter-Domain Routing (CIDR) is a notation used to represent IP addresses and their associated routing prefix. It allows for a more flexible and efficient allocation of IP addresses compared to traditional class-based addressing.

CIDR Notation Format:

CIDR notation combines an IP address with a prefix length. The general format is:

IP_Address/Prefix_Length

For example: 192.168.1.0/24

Here, "192.168.1.0" is the IP address, and "/24" indicates that the first 24 bits are the network portion. The remaining 8 bits are available for addressing hosts within that network.

Network and Host Bits:

CIDR notation divides the IP address into network bits and host bits. The prefix length determines how many bits belong to the network, and the remaining bits are available for addressing hosts within that network.

In the example "192.168.1.0/24":

The first 24 bits represent the network.

The last 8 bits represent host addresses within that network.

CIDR notation uses a prefix length to indicate the size of the network portion of an IP address. This prefix length is directly related to the subnet mask, which is a set of bits that separates the network and host portions of the IP address.

In CIDR notation, if you have a prefix length of "X," it means that the first "X" bits of the subnet mask are set to 1, and the remaining bits are set to 0.

Example:

Let's take a practical example to illustrate this relationship. Consider a CIDR notation of "/24":

CIDR Notation: "/24"

Binary Representation:
11111111.11111111.11111111.00000000

Decimal Subnet Mask: 255.255.255.0

The binary representation of the subnet mask has the first 24 bits set to 1 and the remaining 8 bits set to 0.

Dividing a CIDR

Dividing a CIDR (Classless Inter-Domain Routing) block involves subnetting, which is the process of breaking down a larger network into smaller, more manageable subnetworks. Subnetting is a crucial skill when designing networks, especially in the context of creating VPCs (Virtual Private Clouds) or managing IP address space efficiently.

Steps guide on how to divide a CIDR block:

CIDR Block: 192.168.0.0/24

In this example, we have a CIDR block 192.168.0.0/24, which represents a network with 256 IP addresses (from 192.168.0.0 to 192.168.0.255).

Step 1: Determine the Number of Subnets

Decide how many subnets you want to create and the number of IP addresses each subnet should have. For instance, if you want four subnets with approximately 64 addresses each, you

may choose a subnet mask of /26 (which provides 64 addresses per subnet).

Step 2: Calculate the New Subnet Mask

To create subnets, you need to adjust the subnet mask. For example, if you want four subnets, you might use a '/26' subnet mask, which allocates '64' addresses to each subnet. The binary representation of a '/26' subnet mask is '11111111.11111111.11111111.11000000'.

Step 3: Divide the CIDR Block

Subnet 1:

CIDR: 192.168.0.0/26

Usable IP Range: 192.168.0.1 to 192.168.0.62 (63 addresses)

Subnet 2:

CIDR: 192.168.0.64/26

Usable IP Range: 192.168.0.65 to 192.168.0.126 (63 addresses)

Subnet 3:

CIDR: 192.168.0.128/26

Usable IP Range: 192.168.0.129 to 192.168.0.190 (63 addresses)

CIDR: 192.168.0.192/26

Usable IP Range: 192.168.0.193 to 192.168.0.254 (63 addresses)

Important Points:

- The number of addresses in each subnet is 2^(32 - subnet mask length). In our case, it's 2^(32-26) = 64.

- The first address in each subnet is reserved as the network address, and the last address is reserved as the broadcast address.

- Usable IP addresses for devices typically range from the second to the second-to-last address in each subnet.