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**Subnetting vs. Supernetting**

**Subnetting** and **supernetting** are techniques used in IP address management to optimize network usage and organization. While both concepts involve manipulating network masks, they differ in terms of the size of the networks they create.

**1. Subnetting:**

**Definition:**  
Subnetting is the process of dividing a larger network into smaller, more manageable sub-networks (subnets). Each subnet has its own network address, subnet mask, and range of usable IP addresses. This is typically done to improve network performance, security, and management by isolating traffic within different subnets.

**Goal of Subnetting:**

* To create multiple smaller networks within a larger network.
* Allows better use of IP address space by creating smaller subnets.
* Reduces network traffic in each subnet.

**Example of Subnetting:**

Consider you have a Class C network:

* **Network Address:** 192.168.1.0/24
* **Default Subnet Mask:** 255.255.255.0

Suppose you want to divide this network into 4 subnets. To do this, you borrow 2 bits from the host part of the address (since 2 bits can provide 4 subnets).

* **New Subnet Mask:** 255.255.255.192 or /26
* **Subnet Breakdown:**
  + **Subnet 1:** 192.168.1.0/26 (IP range: 192.168.1.1 - 192.168.1.62)
  + **Subnet 2:** 192.168.1.64/26 (IP range: 192.168.1.65 - 192.168.1.126)
  + **Subnet 3:** 192.168.1.128/26 (IP range: 192.168.1.129 - 192.168.1.190)
  + **Subnet 4:** 192.168.1.192/26 (IP range: 192.168.1.193 - 192.168.1.254)

Each subnet has its own network address, usable IP range, and broadcast address.

**2. Supernetting:**

**Definition:**  
Supernetting is the reverse of subnetting. It is the process of combining multiple smaller networks into a larger network. This is typically done to reduce the number of routes in a routing table by aggregating multiple network prefixes into a single, larger network.

**Goal of Supernetting:**

* To combine smaller networks into a larger network.
* It reduces the number of routes and is used to simplify routing.
* Supernetting allows for more efficient use of IP address space when smaller networks are grouped together.

**Example of Supernetting:**

Suppose you have 4 Class C networks:

* **Network 1:** 192.168.1.0/24
* **Network 2:** 192.168.2.0/24
* **Network 3:** 192.168.3.0/24
* **Network 4:** 192.168.4.0/24

You can supernet these 4 networks into a single network by using a subnet mask of /22, which covers all 4 Class C networks:

* **New Supernet:** 192.168.0.0/22
  + **IP Range:** 192.168.0.1 to 192.168.3.254
  + **Subnet Mask:** 255.255.252.0

This results in a supernet that includes all four Class C networks (192.168.1.0, 192.168.2.0, 192.168.3.0, and 192.168.4.0), but it's a more efficient way of representing the aggregation.

**Summary of Differences:**

| **Feature** | **Subnetting** | **Supernetting** |
| --- | --- | --- |
| **Definition** | Dividing a larger network into smaller subnets. | Combining multiple smaller networks into a larger network. |
| **Subnet Mask** | More bits borrowed from host part to create subnets. | Fewer bits borrowed to aggregate multiple networks. |
| **IP Address Range** | Smaller range of IP addresses for each subnet. | Larger range of IP addresses for the supernet. |
| **Used For** | Organizing a network into subnets, improving network performance and management. | Reducing the size of the routing table by aggregating smaller networks. |
| **Example** | 192.168.1.0/24 to 192.168.1.0/26 (splitting into 4 subnets). | 192.168.0.0/22 (aggregating 4 Class C networks). |