

**COMPUTER NETWORKS LAB**

**LAB 9**

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**Sub-Netting**

**Definition:**

* Sub-netting divides a large network into smaller, more manageable subnetworks (subnets). It helps improve network performance, security, and address management.

**Purpose:**

* Efficiently use IP address space.
* Isolate network segments for better performance and security.
* Reduce broadcast domains.

**How It Works:**

1. Take a larger network (e.g., a Class A, B, or C network).
2. Borrow bits from the host portion of the IP address to create subnets.
3. The number of borrowed bits determines the number of subnets and the size of each subnet.

**Example:**

* Given IP: 192.168.1.0/24 (Class C, 256 addresses).
* Sub-netting into 4 subnets:
  + Borrow 2 bits from the host portion:
    - Subnet mask becomes /26 or 255.255.255.192.
    - Number of subnets: 22=42^2 = 4.
    - Hosts per subnet: 26−2=622^{6} - 2 = 62.
  + Subnets:
    - 192.168.1.0 - 192.168.1.63
    - 192.168.1.64 - 192.168.1.127
    - 192.168.1.128 - 192.168.1.191
    - 192.168.1.192 - 192.168.1.255

**Super-Netting**

**Definition:**

* Super-netting combines multiple smaller networks into a single, larger network. This process is also known as CIDR (Classless Inter-Domain Routing).

**Purpose:**

* Reduce the size of routing tables.
* Aggregate routes for efficient routing (route summarization).
* Simplify network management.

**How It Works:**

1. Combine contiguous networks with a common prefix.
2. Use fewer bits for the network portion of the IP address.
3. Creates a larger block of addresses.

**Example:**

* Combine 192.168.0.0/24, 192.168.1.0/24, 192.168.2.0/24, 192.168.3.0/24.
  + Aggregated into a single supernet: 192.168.0.0/22.
  + Subnet mask: 255.255.252.0.
  + Address range: 192.168.0.0 - 192.168.3.255.
  + Reduces four routing entries into one.

**Differences Between Sub-Netting and Super-Netting**

| **Aspect** | **Sub-Netting** | **Super-Netting** |
| --- | --- | --- |
| **Definition** | Divides a network into smaller subnets. | Combines smaller networks into a larger one. |
| **Purpose** | Optimize internal network utilization. | Aggregate and summarize routes. |
| **Address Usage** | Increases subnet count, decreases host count. | Decreases subnet count, increases host count. |
| **CIDR Prefix** | Increases (e.g., /24 → /26). | Decreases (e.g., /24 → /22). |
| **Example** | 192.168.1.0/24 → 192.168.1.0/26. | 192.168.0.0/24 → 192.168.0.0/22. |
| **Routing Tables** | Adds more routes. | Reduces routes through summarization. |

**Practical Applications**

* **Sub-netting:**
  + Isolating departments in an organization (e.g., HR, IT, Finance).
  + Optimizing usage of limited IP address ranges.
* **Super-netting:**
  + Used by ISPs for summarizing multiple customer networks.
  + Reducing the size of global routing tables on the internet.