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**Q1: VLSM**

VLSM allows dividing an IP address into subnets of different sizes, optimizing IP usage based on specific host requirements. Unlike fixed-length subnetting, it ensures minimal waste of IPs.

**Example**: Given 192.168.10.0/24 and these subnet needs:

1. 50 hosts → /26 (64 IPs): 192.168.10.0 – 192.168.10.63
2. 20 hosts → /27 (32 IPs): 192.168.10.64 – 192.168.10.95
3. 10 hosts → /28 (16 IPs): 192.168.10.96 – 192.168.10.111
4. 5 hosts → /29 (8 IPs): 192.168.10.112 – 192.168.10.119

**Benefits**:

1. Efficient IP utilization.
2. Flexibility for diverse network sizes.
3. Scalable for future expansion.

VLSM is widely used with classless addressing (e.g., CIDR).

| **No. of Subnets** | **No. of Hosts** | **Subnet Mask** | **IP Range** |
| --- | --- | --- | --- |
| Photocopy | 2 | /30 | 192.168.16.0 - 192.168.16.3 |
| HR Department | 9 | /28 | 192.168.16.4 - 192.168.16.19 |
| Accounts Department | 13 | /28 | 192.168.16.20 - 192.168.16.35 |
| LAB A | 45 | /26 | 192.168.16.36 - 192.168.16.99 |
| LAB B | 45 | /26 | 192.168.16.100 - 192.168.16.163 |
| Library | 300 | /23 | 192.168.16.164 - 192.168.17.255 |
| Café | 800 | /22 | 192.168.18.0 - 192.168.21.255 |
| Hall | 1400 | /21 | 192.168.22.0 - 192.168.29.255 |

**Host Bits:**

* Vary from 2 bits (/30) to 11 bits (/21) based on needs.

**Subnet Masks**:

* Adjusted for efficient IP allocation.

**IP Ranges**:

* Assigned without overlap, maximizing address usage.