Introduction to Subnetting

Subnetting is the process of taking a large network and dividing it into multiple smaller subnetworks (subnets). This helps manage network traffic efficiently and improves security.

Why is Subnetting Necessary?

Imagine you have a huge network with millions of devices. If all devices were connected to a single large network, it would:
- ☑ Overload network traffic
- ☑ Make managing devices harder
- ☑ Increase security risks

Subnetting **solves these issues** by breaking a large network into smaller, more manageable parts.

IP Address Basics

Each device in a network has a unique **IP address**. An IP address consists of two main parts:
1. **Network ID** – Identifies the overall network
2. **Host ID** – Identifies a specific device within the network

Example: **9.100.100.100**

- **Network ID**: 9.0.0.0 (Class A network)
- **Host ID**: 100.100.100 (specific device in the network)

How Data Travels on a Network

📍 If you send data to **9.100.100.100**, routers on the Internet:

1. Recognize that **9.0.0.0** is a Class A network.
2. Forward the data to the **gateway router** responsible for the 9.0.0.0 network.
3. The **gateway router** directs the data to the correct device using the Host ID.

🔴 **Problem:** A Class A network can have **16,777,216** devices!
💡 **Solution:** We need subnetting to break this huge network into smaller, more manageable subnets.

How Subnetting Works

Instead of having one massive network, **subnetting divides it into smaller sub-networks**. Each subnet has its **own gateway router**, which manages traffic for that subnet.

- ◆ Example:

  - Instead of one big 9.0.0.0 network, we could split it into:
    - ○ 9.1.0.0
    - ○ 9.2.0.0
    - ○ 9.3.0.0
    - ○ …and so on.

Each subnet now has **fewer devices**, making the network more **efficient and secure**.

Subnet Masks and CIDR (Classless Inter-Domain Routing)

🔢 **Subnet Mask**: A tool that helps determine which part of an IP address is the **network ID** and which part is the **host ID**.

📏 **CIDR (Classless Inter-Domain Routing)**: A flexible way of subnetting that doesn't rely strictly on traditional address classes (A, B, C).

Conclusion

☑ **Subnetting** improves network efficiency and security by dividing large networks into smaller, manageable subnets.
☑ **Subnet masks** help define network and host portions of an IP address.
☑ **CIDR** allows for more flexible subnetting than traditional class-based networks.