IP Address

Class A:

- **Range**: `1.0.0.0` to `126.0.0.0`
- **Number of Networks**: 128 (excluding reserved addresses)
- **Number of Hosts per Network**: Over 16 million
- **Purpose**: Large networks requiring a vast number of IP addresses.

Class B:

- **Range**: `128.0.0.0` to `191.255.0.0`
- **Number of Networks**: 16,384
- **Number of Hosts per Network**: About 65,000
- **Purpose**: Medium-sized networks with a moderate number of IP addresses.

Class C:

- **Range**: `192.0.0.0` to `223.255.255.0`
- **Number of Networks**: Over 2 million
- **Number of Hosts per Network**: About 254
- **Purpose**: Small networks with a limited number of IP addresses.

Class D:

- **Range**: `224.0.0.0` to `239.255.255.255`
- **Purpose**: Used for multicast communication, where data is sent to multiple recipients simultaneously.

Class E:

- **Range**: `240.0.0.0` to `255.255.255.255`
- **Purpose**: Reserved for experimental and future use, not assigned for standard network operations.

- **Private IP Address Ranges**

Private IP addresses are defined by the Internet standards and fall into specific ranges within the IPv4 address space. These ranges are reserved for private use and are not allocated or routable on the public Internet. The reserved ranges are:

1. **Class A Private Range**:
   - **Range**: `10.0.0.0` to `10.255.255.255`
   - **Number of Addresses**: Approximately 16.7 million addresses
2. **Class B Private Range**:
   - **Range**: `172.16.0.0` to `172.31.255.255`
   - **Number of Addresses**: Approximately 1 million addresses
3. **Class C Private Range**:
   - **Range**: `192.168.0.0` to `192.168.255.255`
   - **Number of Addresses**: Approximately 65,000 addresses

1. Bus Topology

- **Description**: All devices are connected to a single central cable, known as the bus or backbone. Data travels in both directions along the bus.
- **Advantages**:
  - Easy to set up and extend.
  - Requires less cable than other topologies.
- **Disadvantages**:
  - If the main cable fails, the entire network goes down.
  - Performance degrades as more devices are added.

2. Star Topology

- **Description**: All devices are connected to a central hub or switch. Data passes through the hub before reaching its destination.
- **Advantages**:
  - If one connection fails, it does not affect the rest of the network.
  - Easy to add or remove devices.
- **Disadvantages**:
  - If the central hub fails, the entire network goes down.
  - Requires more cable than bus topology.

3. Ring Topology

- **Description**: Each device is connected to two other devices, forming a circular pathway for data. Data travels in one direction (or both, in a dual-ring setup).
- **Advantages**:
    - Data packets travel at high speeds.
    - Easy to identify faults and isolate them.
- **Disadvantages**:
    - If one device fails, it can disrupt the entire network.
    - Adding or removing devices can be disruptive.

4. Mesh Topology

- **Description**: Every device is connected to every other device, either fully or partially (in a partial mesh).
- **Advantages**:
    - Highly reliable; if one connection fails, others can take over.
    - Offers redundancy and multiple pathways for data.
- **Disadvantages**:
    - Expensive to implement due to the high amount of cabling and complexity.
    - Difficult to set up and manage..

5. Hybrid Topology

- **Description**: A combination of two or more different topologies, such as star-bus or star-ring.
- **Advantages**:
    - Flexible and scalable.
    - Can be designed to suit specific network requirements.

Disadvantages:

Complex to design and implement.

Can be expensive depending on the mix of topologies used.

1. Local Area Network (LAN)

- **Description**: A network that connects computers and devices within a limited geographic area, such as a home, school, or office building.
- **Characteristics**:
    - High speed, low latency.
    - Usually owned and managed by a single organization.
- **Example**: Office networks, home Wi-Fi networks.

2. Wide Area Network (WAN)

- **Description**: A network that covers a broad area, often connecting multiple LANs. WANs can span cities, countries, or continents.
- **Characteristics**:
    - Lower speeds compared to LANs, higher latency.
    - Often owned by multiple organizations or telecommunications providers.
- **Example**: The internet, corporate networks connecting multiple locations.

3. Metropolitan Area Network (MAN)

- **Description**: A network that covers a larger geographic area than a LAN but is smaller than a WAN, typically within a city.
- **Characteristics**:
    - Can connect multiple LANs within a metropolitan area.
    - Often used by businesses and government entities.
- **Example**: City-wide Wi-Fi networks, cable TV networks.