

Lesson Title: Introduction to IP Addressing (IPv4 & IPv6) **Lesson Goals:** 1. Understand what an IP address is and why it is important. 2. Differentiate between IPv4 and IPv6. 3. Explain different types of IP addresses (public, private, static, dynamic). 4. Describe how IP addressing works in real networks.

Vocabulary: IP Address - A unique number assigned to devices on a network for identification. IPv4 - 32-bit numeric IP addresses used widely on the internet. IPv6 - 128-bit alphanumeric IP addresses created to replace IPv4. Public IP - The globally unique address assigned to a device on the internet. Private IP - IP addresses used inside local networks. DHCP - A protocol that automatically assigns IP addresses to devices. Subnet - A smaller network created by dividing a larger network.

Concept 1: What is an IP Address? An IP address is like a home address for devices on a network. It allows computers to find and communicate with each other. Without IP addresses, the internet would not function. Every device—phones, laptops, printers—must have an IP address. IPv4 uses four sets of numbers (0-255) separated by dots, e.g., 192.168.1.1. IPv6 uses a longer format with letters and numbers separated by colons, e.g., 2001:0db8:85a3::8a2e:0370:7334.

Concept 2: Types of IP Addresses

Public IP: Assigned by an Internet Service Provider (ISP), used to identify your network on the internet.

Private IP: Used within homes, schools, and businesses—cannot be used on the public internet.

Examples: Easy: A laptop in a home network uses a private IP like 192.168.1.5. Medium: A school network assigns private IPs to hundreds of devices using DHCP.

Hard: A company with worldwide offices uses public IP ranges assigned by regional registries.

Concept 3: IPv4 vs IPv6

IPv4 has about 4.3 billion possible addresses. As the internet grew, these ran out. IPv6 provides 340 undecillion possible addresses, ensuring future growth.

Differences:

- IPv4: Shorter, numeric, easier to read.
- IPv6: Longer, supports more devices, built-in security features.

Concept 4: Subnetting

Subnetting divides a large network into smaller parts for better organization and security. It uses CIDR notation (e.g., /24).

Examples: Easy: A small office network uses a /24 subnet to divide employees.

Medium: A university separates labs, administration, and Wi-Fi users into subnets.

Hard: A cloud infrastructure uses advanced subnetting to isolate microservices.

Concept 5: Static vs Dynamic IPs

Static IP: Stays the same; used for servers, printers, CCTV systems.

Dynamic IP: Changes over time; assigned by DHCP.

Examples: Easy: Your home Wi-Fi devices use dynamic IPs.

Medium: School servers use static IPs so students can always access them.

Hard: A business hosting a website configures static public IPs for global access.

Summary: IP addressing is the backbone of internet communication. IPv4 and IPv6 provide ways to identify devices. Public and private IPs help organize networks, while subnetting and DHCP improve efficiency and security.