Virtual Network Fundamentals

Agenda

1. Introduction
2. Network Basics
3. Common Networking Configuration Concepts
4. Networking Hardware Devices, Ports and Protocols
5. Types of Servers and Internet Appliances
6. Wireless Networking Protocols
7. The OSI Model
8. Port Numbers
9. Domain Name Service (DNS)
10. Dynamic Host Configuration Protocol (DHCP)
11. Internet Protocol (IP)
12. TCP and UDP
13. Configuring IPv4 & IPv6
14. Subnetting

Introduction

- A virtual network is a software-defined network that provides the same functionalities as a physical network. It allows multiple devices to communicate with each other regardless of their location.
- Virtual networks are used for various purposes, including testing applications, creating isolated environments, and reducing hardware costs.

The benefits of virtual networks include:

1. Cost savings
2. Scalability
3. Flexibility
4. Improved security
5. Better performance
6. Ease of management

Network Basics

A network is a group of devices that are connected together to share resources and communicate with each other. The devices can be computers, servers, printers, routers, switches, or any other device that has a network interface card (NIC).

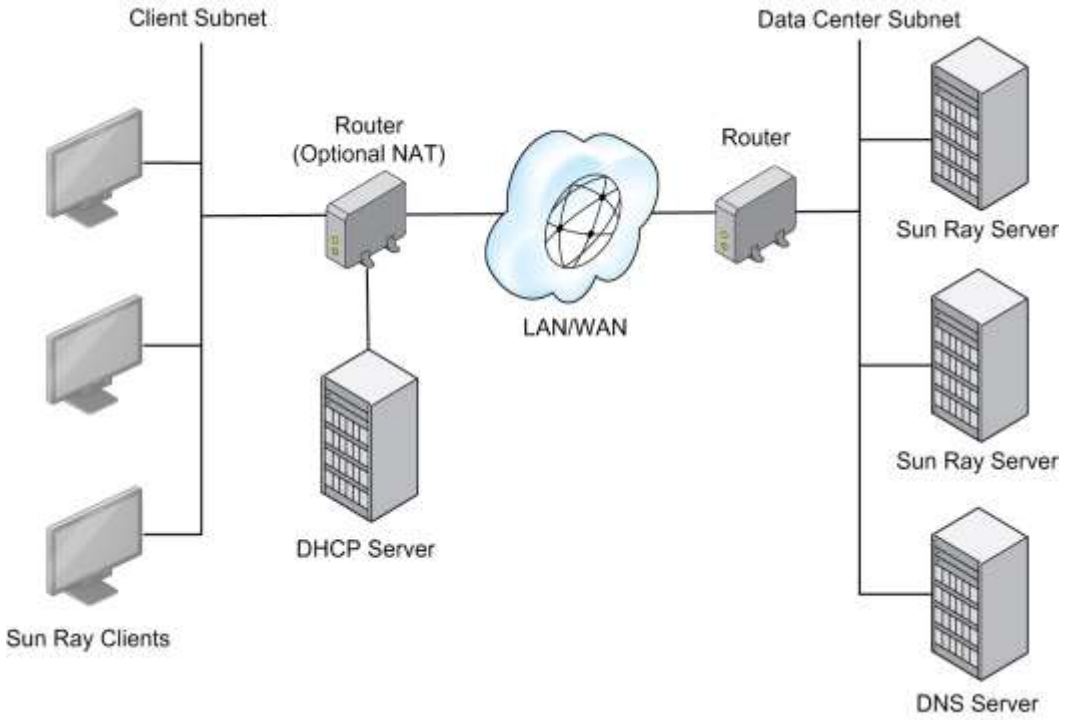
Networks can be classified based on their size and geographic scope:

- **Local Area Networks (LANs)** cover a small area like a home, office, or building.

- **Wide Area Networks (WANs)** cover a large area like a city, country, or continent.

Common Networking Configuration Concepts

- Networking configuration concepts refer to the settings and parameters that determine how a network operates. These concepts include IP addressing, subnetting, routing, switching, and security.
- Networking configuration concepts are important because they help network administrators to manage and troubleshoot network issues effectively.

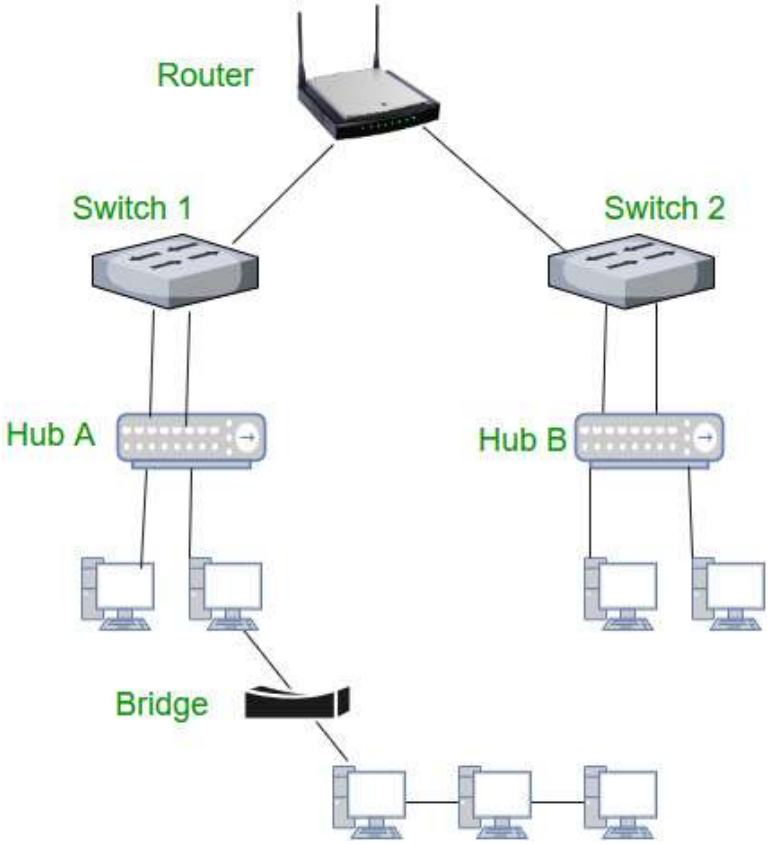


Networking Hardware Devices

Networking hardware devices include routers, switches, hubs, modems, and firewalls. These devices are used to connect devices, segment networks, filter traffic, and secure networks.

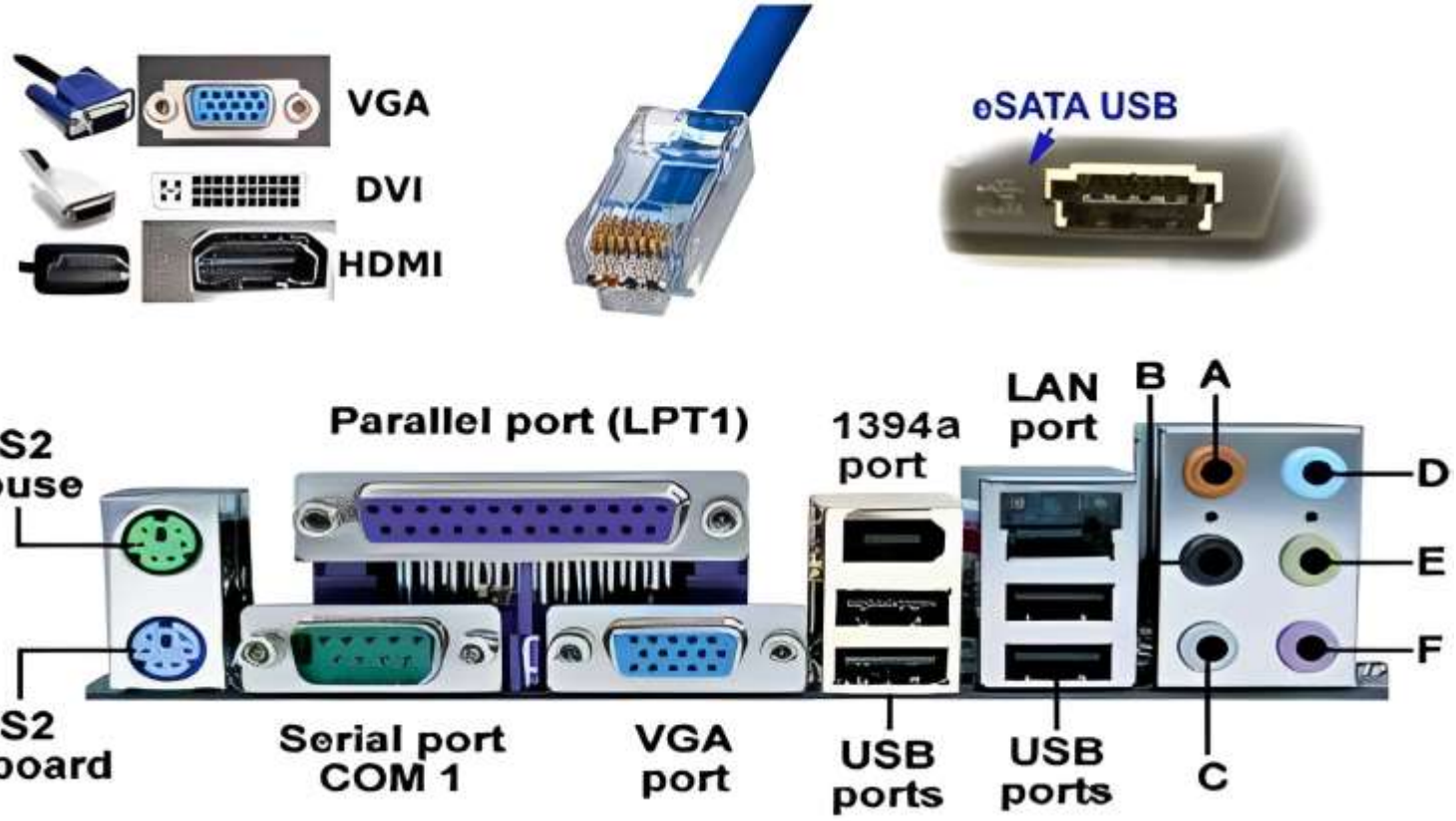
Examples:

- Repeater
- Hub
- Bridge
- Switch
- Routers
- Gateway
- Brouter
- NIC



Ports and Protocols

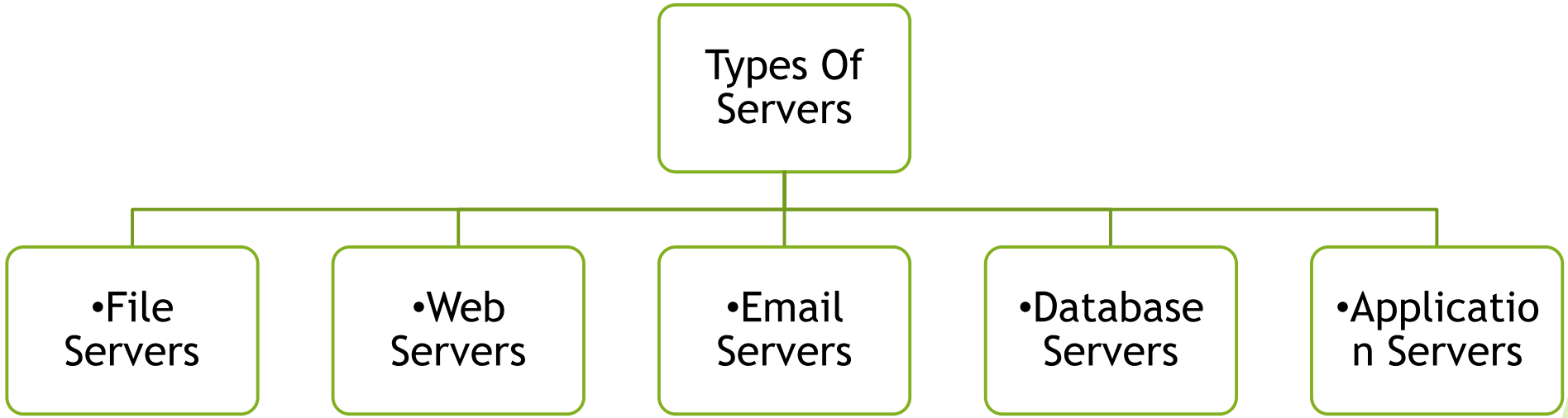
Ports and **protocols** are used to establish communication between devices. Ports are like doors that allow data to enter and exit a device. Protocols are like languages that devices use to understand each other.



Types of Servers and Internet Appliances

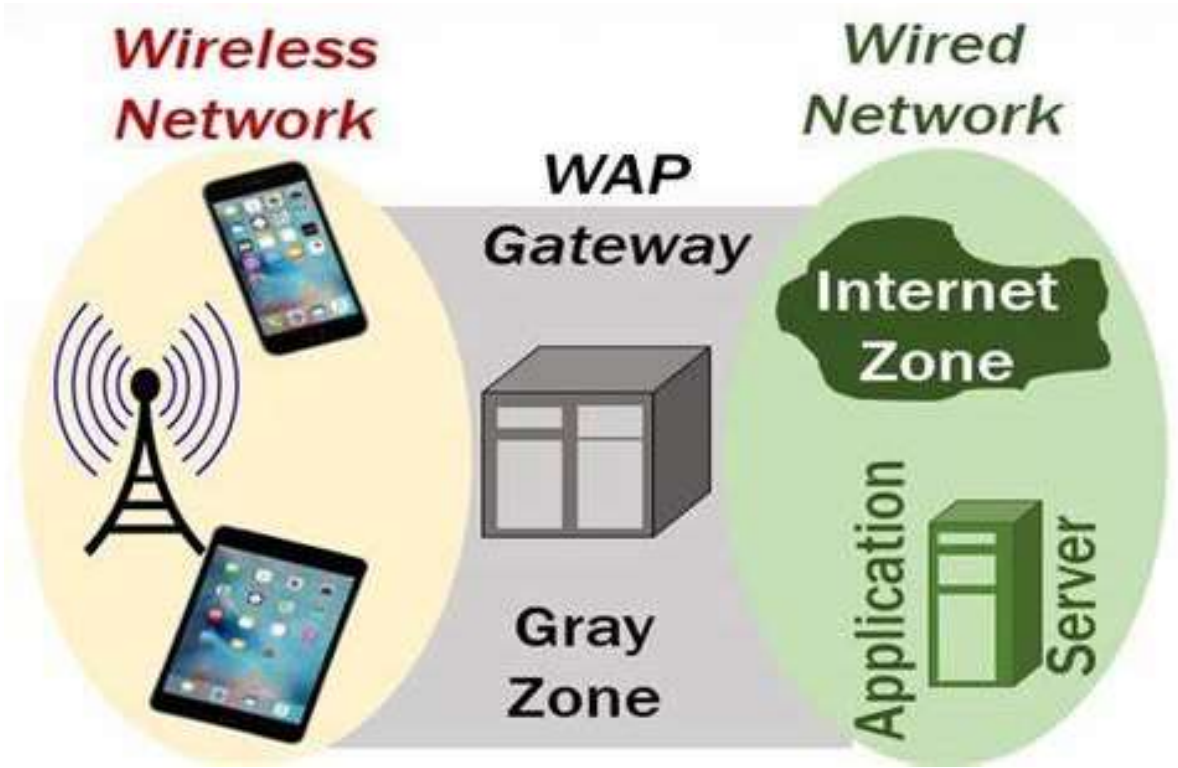
Servers are devices that provide services to other devices on a network.

Internet appliances are devices that perform specific functions related to internet connectivity, such as routers, modems, gateways, and access points.



Wireless Networking Protocols

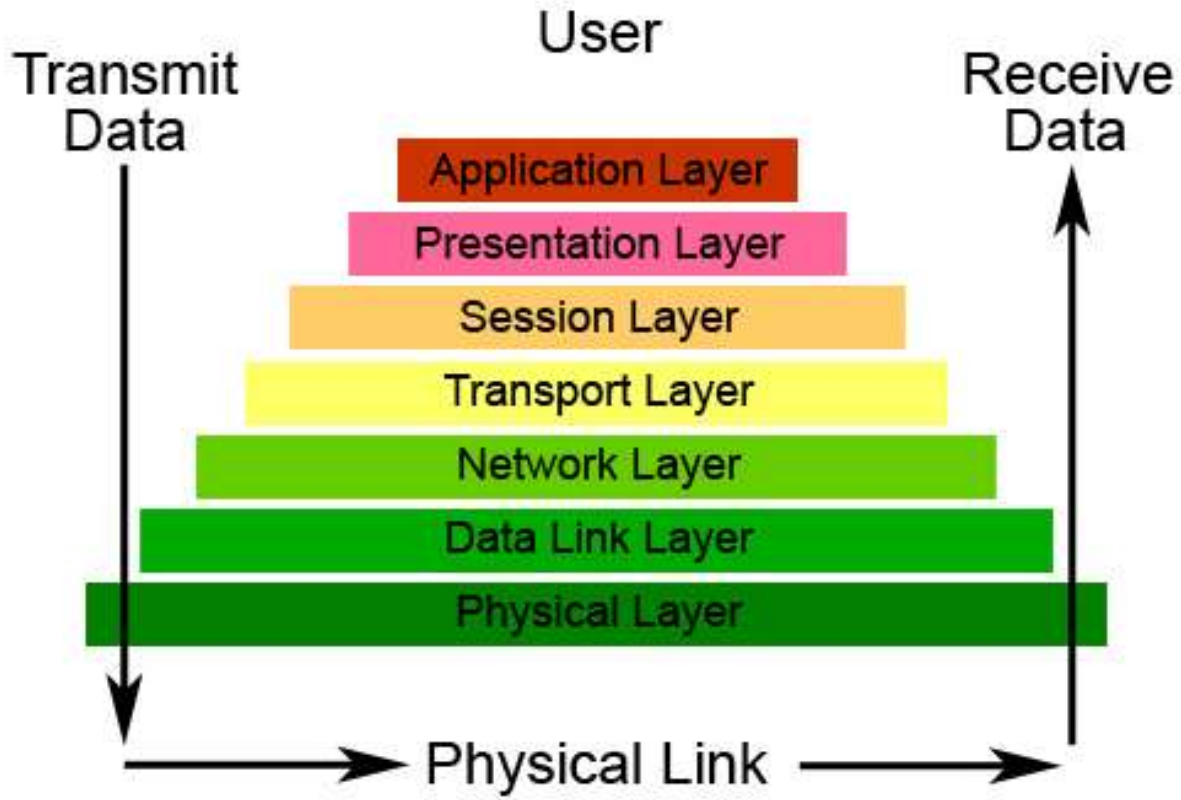
Wireless networking protocols are used to establish wireless connections between devices. Some common wireless networking protocols include Wi-Fi, Bluetooth, and NFC.



The OSI Model

The **OSI(Open System Interconnection)** model is a conceptual framework that describes how data travels through a network.

Seven Layers of OSI Model



Port Numbers

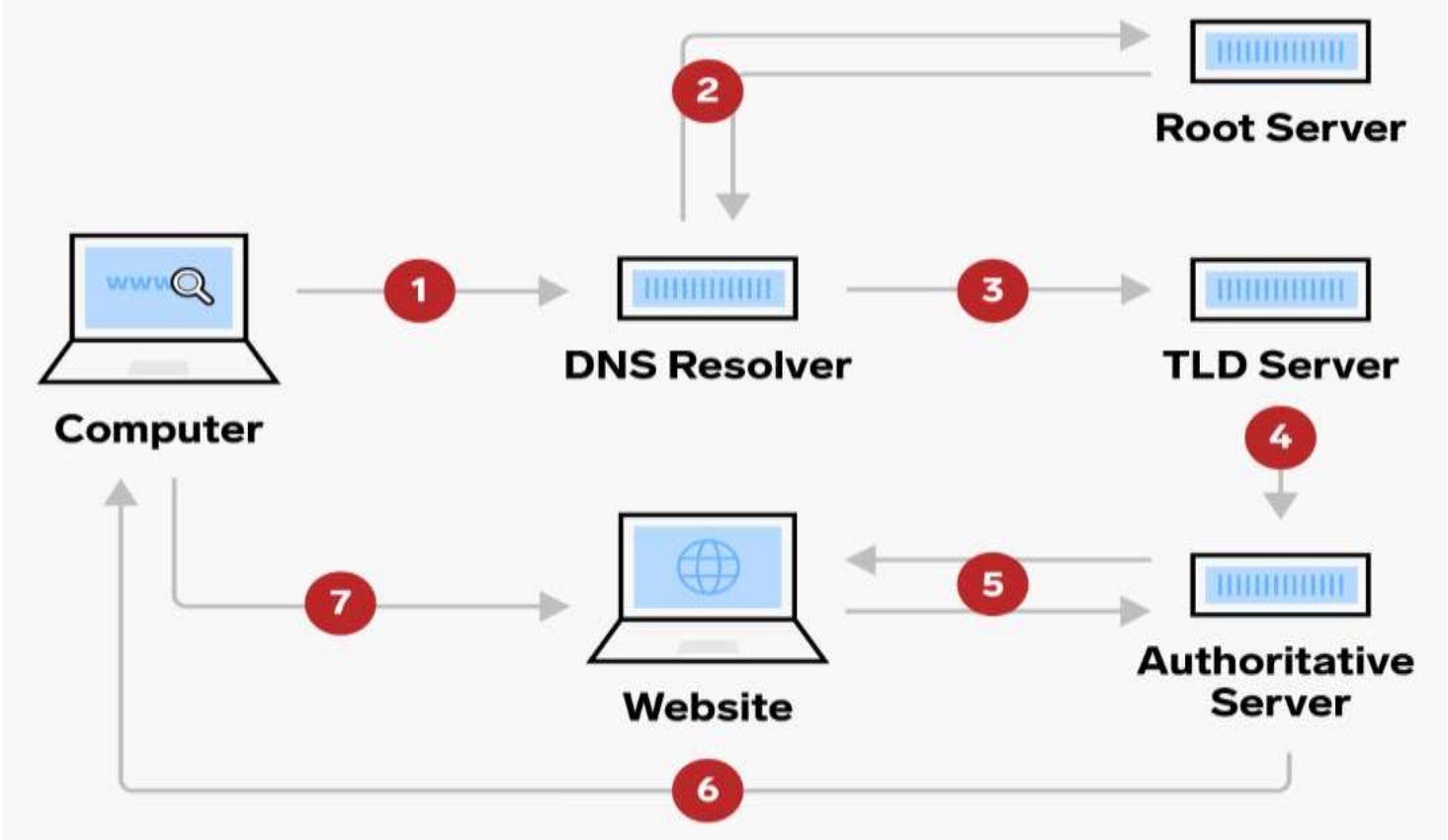
Port numbers are used to identify the type of traffic that is being sent or received. For example, port 80 is used for HTTP traffic, while port 443 is used for HTTPS traffic.

Port No	Protocol	Description
7	Echo	Echoes a received datagram back to the sender
9	Discard	Discards any datagram that is received
11	Users	Active user
13	Daytime	Returns the data and the time
17	Quote	Returns a quote of the day
19	Chargen	Returns a string of characters
20	FTP, Data	File Transfer Protocol(data connection)
21	FTP, Control	File Transfer Protocol(Control connection)
23	TELNET	Terminal Network
25	SMTP	Simple Mail Transfer Protocol
53	DNS	Domain Name Server
67	BOOTP	Bootstrap Protocol
79	Finger	Finger
80	HTTP	Hypertext Transfer Protocol
111	RPC	Remote Procedure Call
22	ssh	Secure shell
123	Ntp	Network time protocol
110	Pop3	Post office protocol

Domain Name Service (DNS)

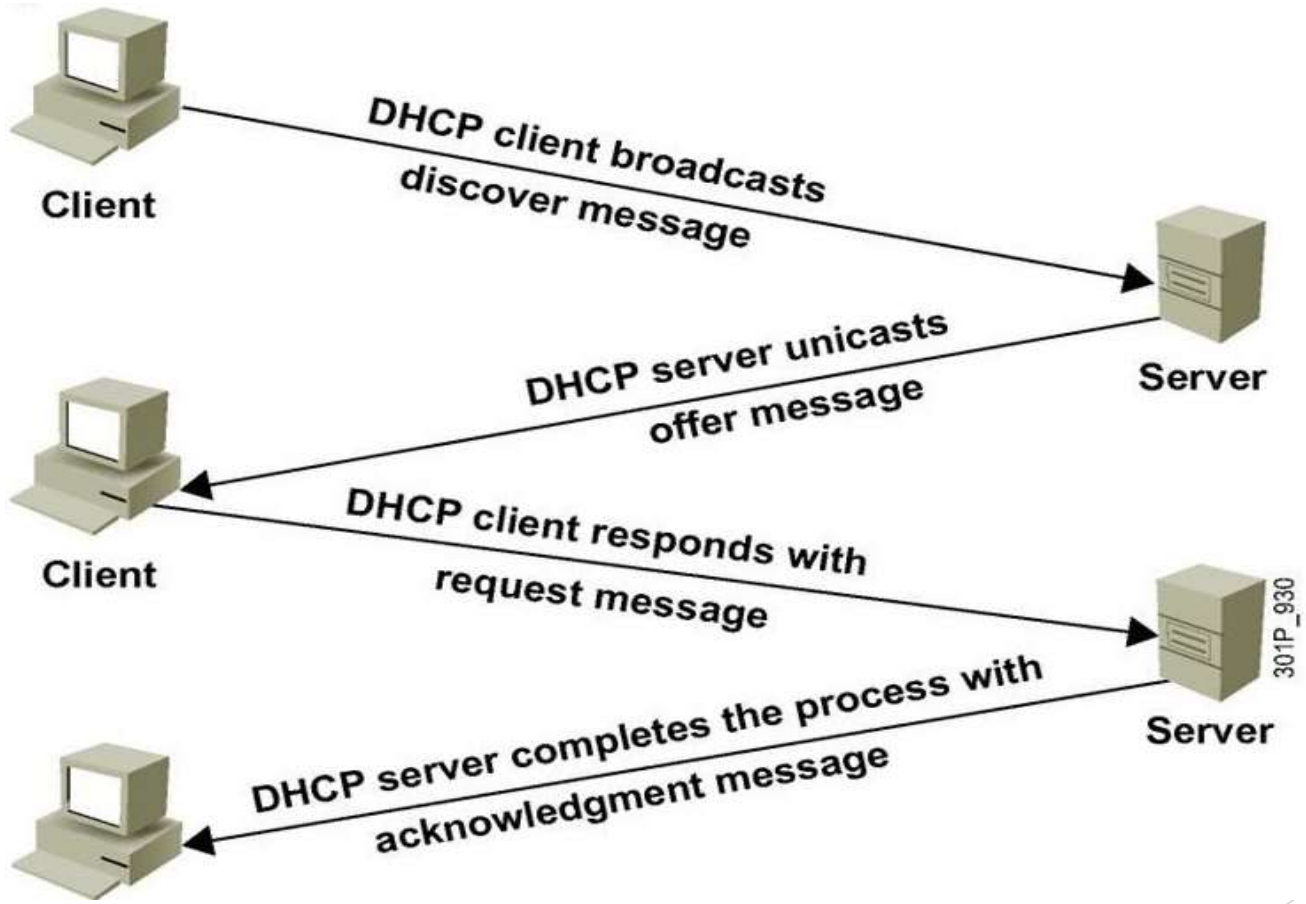
Domain Name Service (DNS) is a service that translates domain names into IP addresses. This makes it easier for users to remember website addresses.

DNS Process Step-by-Step



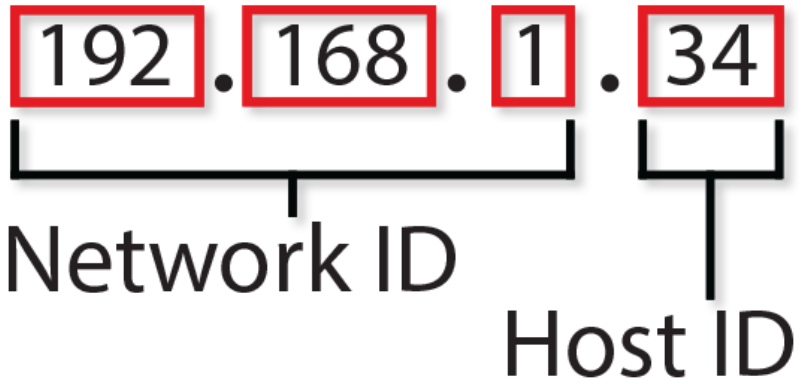
Dynamic Host Configuration Protocol (DHCP)

Dynamic Host Configuration Protocol (DHCP) is a protocol that automatically assigns IP addresses to devices on a network. This simplifies network administration and reduces the risk of conflicts.



Internet Protocol (IP)

Internet Protocol (IP) is a protocol that is used to send data packets over a network. There are two versions of IP: IPv4 and IPv6.



TCP & UDP

TCP(Transmission Control Protocol) and **UDP(User Datagram Protocol)** are protocols that are used to send data packets over a network.

TCP

- **Slower but more reliable transfers**
- **Typical Applications:**
  - File Transfer Protocol (FTP)
  - Web Browsing
  - Email

unicast

UDP

- **Faster but not guaranteed transfers ("best effort")**
- **Typical Applications:**
  - Live Streaming
  - Online Games
  - VoIP

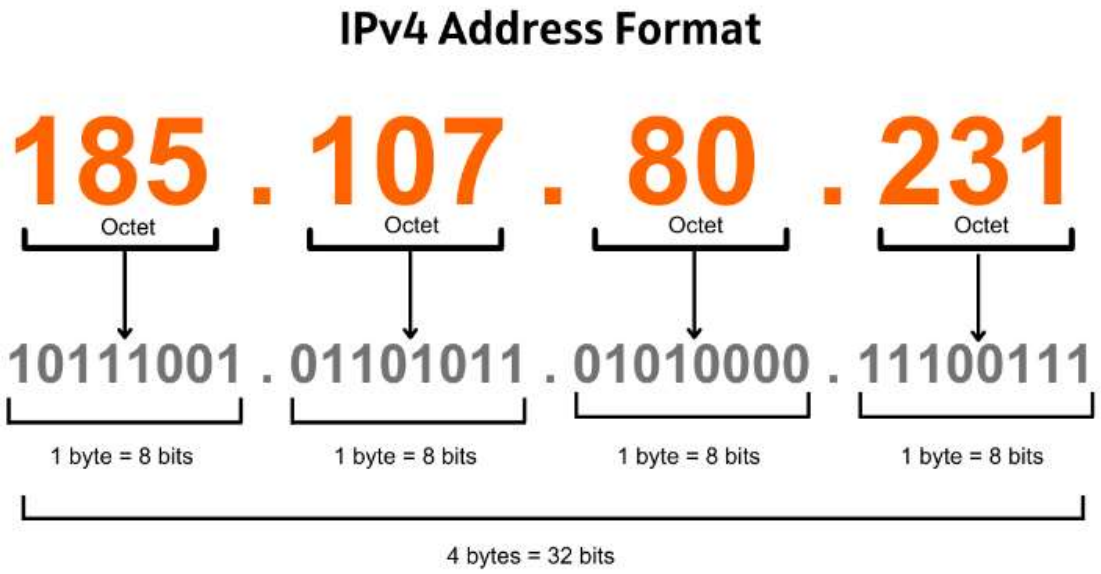
unicast

multicast

broadcast

Configuring IPv4 & IPv6

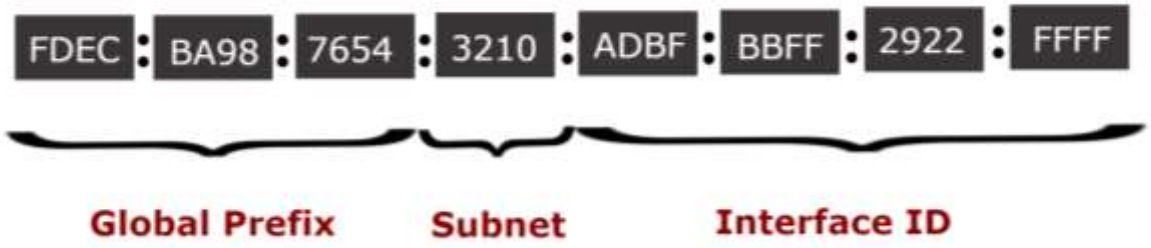
Configuring IPv4 involves assigning IP addresses, subnet masks, default gateways, and DNS servers to devices on a network. Configuring IPv6 involves assigning IPv6 addresses and configuring IPv6 routing.



Configuring IPv6

Configuring IPv6 involves assigning IPv6 addresses and configuring IPv6 routing.

IPv6 Address Format



Here each block is denoted in hexadecimal digits and each block is separated by a colon.

Subnetting

- Subnetting is a technique that is used to divide a network into smaller subnetworks.
- It improves the security.
- The maintenance and administration of subnets is easy.
- Each subnet has its unique network address known as its Subnet ID.
- The subnet ID is created by borrowing some bits from the Host ID part of the IP Address.
- The number of bits borrowed depends on the number of subnets created.