

Introduction to computer basics

- * Computers are machines that perform tasks or calculations according to a set of instructions, or programs.
- * Computers play a major role in our daily lives
- * Computers work through an interaction of hardware and software.
- * Hardware refers to the components of a computer that you can see and touch, including the case and everything inside it
- * Software is an instruction or program that executes some jobs when it runs on a computer
 - * Two type → OS and application

Introduction to computer

Hardware components/parts of a computer

- * Input Devices (Keyboard, Mouse, webcam, scanner, mic)
- * Output Devices (Monitor, Speakers, etc.)
- * Central Processing Unit (CPU) and memory
- * Motherboard (Circuit Board)
- * Expansion Cards (Video Card, Sound Card, or NIC)
- * Hard Drive Ports and Connections (USB, Firewire, etc.)

Hardware Parts of a computer

Central Processing Unit (CPU)

- * A device that interprets and runs the commands that you give to the computer.
- * Also referred to as the processor or microprocessor
 - * CPU is often referred to as the **brain** of the computer
- * Major brands of commercialized processors → intel, AMD, ARM

- * The Latest intel processor logo



Memory

- * Memory is where information is stored and retrieved by the CPU.
- * There are two main types of memory:
 - * Random Access Memory (RAM) & Read Only Memory (ROM)

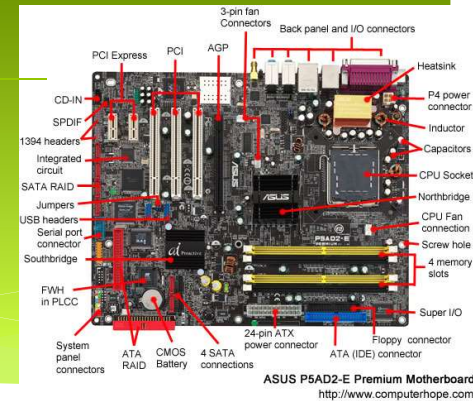
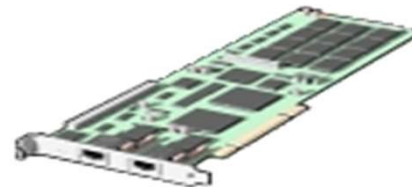
Hardware Parts of a computer

Mother board

- o Is the main circuit board inside the computer
- o Has tiny electronic circuits and other components on it
- o Connects input, output, and processing devices together (CPU, Memory, Hard Drive, DVD Drive)

Expansion Cards

- * Video Card – is connected to the computer monitor and is used to display information on the monitor.
- * Network interface card



Hardware Parts of a computer

Storage Devices

- Hard Disk



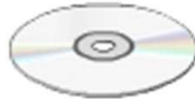
- Flash Drive



- CD-ROM



- DVD-ROM



- BD-RE

- Front of an experimental 200 GB rewritable Blu-ray Disc



Note:

current optical disc technologies such as DVD, DVD±R, DVD±RW, and DVD-RAM rely on a red laser to read and write data, the new format uses a blue-violet laser instead, hence the name Blu-ray.

Computer Software's

1. Operating Systems:

- * Is the most important software on the computer
- * Controls and manages the hardware connected to your computer
- * Provides an interface that helps you to interact with the computer
- * Ensures that your computer is functioning properly
- * Windows XP, 7, 8, 10 and Unix are examples of the operation system.
- * Can be either text-based or graphics-based.

2. Application Programs: there are many types of programs

- * Some programs allow you to perform tasks such as writing letters, doing calculations, or sending e-mail messages.
- * Other programs allow you to create illustrations, play games, watch movies, or communicate with other computer users.

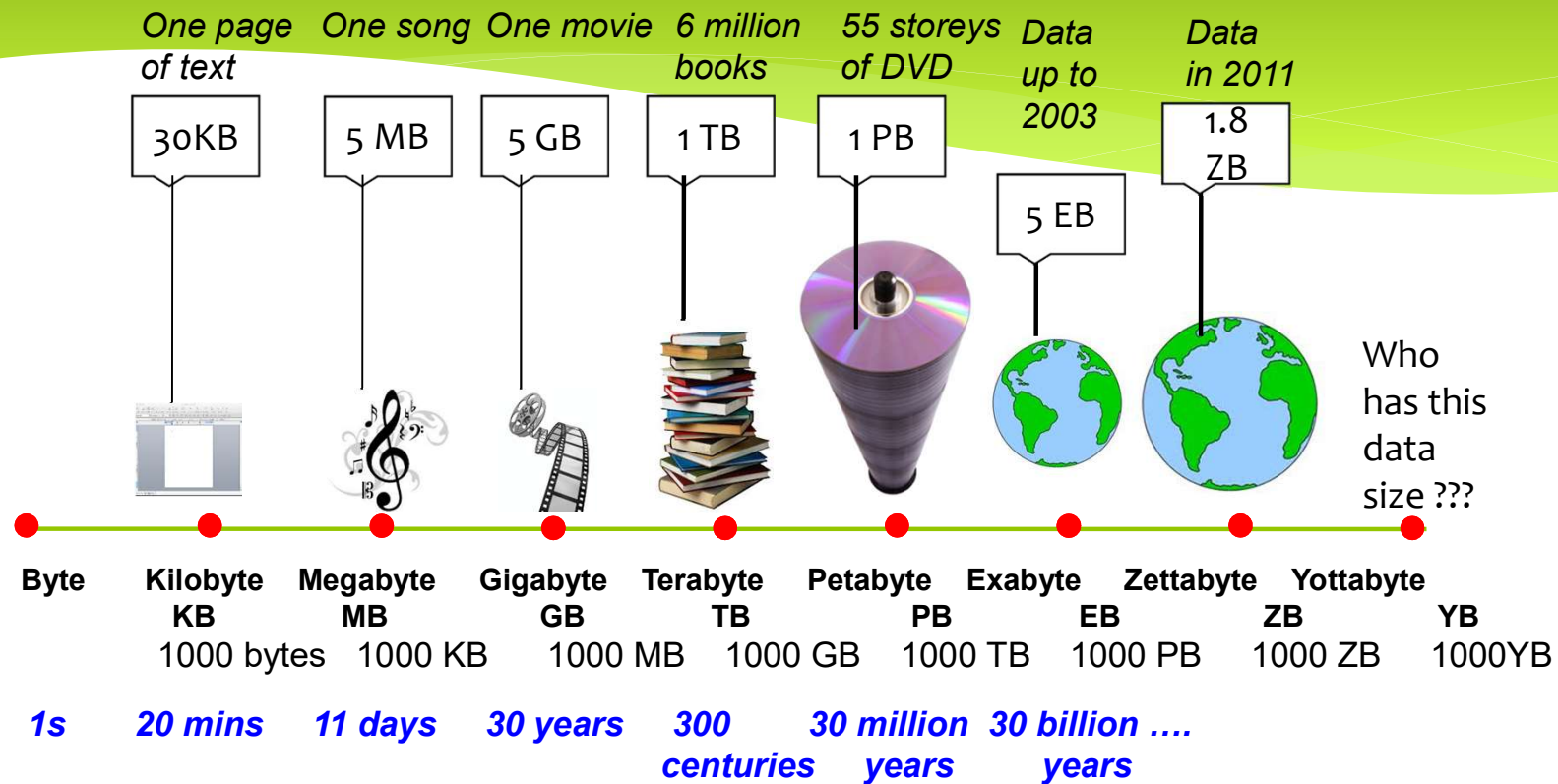
Data Representation: Unit of Measurement

- Programs process data that you provide as input to your computer
- Data can be in the form of text, graphics, audio, or video depending on the type of program
- Program processes the data and displays the output on the screen. You can save this output in a file.
- **What units of measurement are used for data storage?**
 - * The smallest unit of measurement used for measuring data is a bit
 - * A single bit can have a value of either 0 or 1
 - * It may contain a binary value (such as On/Off or True/False)
 - * a byte, or eight bits, is used as the fundamental unit of measurement for data. A byte can store 2^8 or 256 different values, which is sufficient to represent standard ASCII characters

List of all the standard units of measurement used for data storage

Unit	Value	Size
bit (b)	0 or 1	1/8 of a byte
byte (B)	8 bits	1 byte
kilobyte (KB)	1000^1 bytes	1,000 bytes
megabyte (MB)	1000^2 bytes	1,000,000 bytes
gigabyte (GB)	1000^3 bytes	1,000,000,000 bytes
terabyte (TB)	1000^4 bytes	1,000,000,000,000 bytes
petabyte (PB)	1000^5 bytes	1,000,000,000,000,000 bytes
exabyte (EB)	1000^6 bytes	1,000,000,000,000,000,000 bytes
zettabyte (ZB)	1000^7 bytes	1,000,000,000,000,000,000,000 bytes

Computer Software's



File system management

- * A file system (sometimes written *filesystem*) is the way in which files are named and where they are placed logically for storage and retrieval
- * All OS have file systems in which files are placed somewhere in a hierarchical form called tree structure
- * Files are placed at leaves in a tree structured directory system
 - * E.g: Root Directory/Directory/sub-directory/.../ file

Types of Computers

- * **Supercomputers:**

- * The highly calculation-intensive tasks can be effectively performed by means of supercomputers. Quantum physics, mechanics, weather forecasting, molecular theory are best studied by means of supercomputers.

- * **Mainframe Computers:**

- * Large organizations use mainframes for highly critical applications such as bulk data processing and ERP. Most of the mainframe computers have capacity to host multiple operating systems

- * **Microcomputers:**

- * A computer with a microprocessor and its central processing unit is known as a microcomputer.

- * **Personal computers**

- * **Desktops:**

- * **Laptops:**

- * **Personal Digital Assistants (PDAs):**

Types of Computers



Major parts to consider during purchasing a computer

Before you decide purchasing a computer:

1. Know your requirements and purpose
2. Does your requirement need high graphics?
3. Do you carry it and travel long distance?
4. How much do you want to invest?
5. Battery

First:

- * Processor speed, type and its version
- * Memory
- * Disc storage size or screen size

Second:

- * Weight
- * Battery power
- * Available ports and DVD/BD type

Computer networks

- * A collection of computing devices connected in order to communicate and share resources
- * Connections between computing devices can be physical using wires or cables or wireless using radio waves or infrared signals
- * Any device on a network is called **Node or Host**
- * The speed with which data is moved from one place to another on a network bandwidth (*data transfer rate*)
- * A set of rules that defines how data is formatted and processed on a network is called Protocols

Types of Networking

1. Local Area network (LAN)

A network that connects a relatively small number of machines in a relatively close geographical area

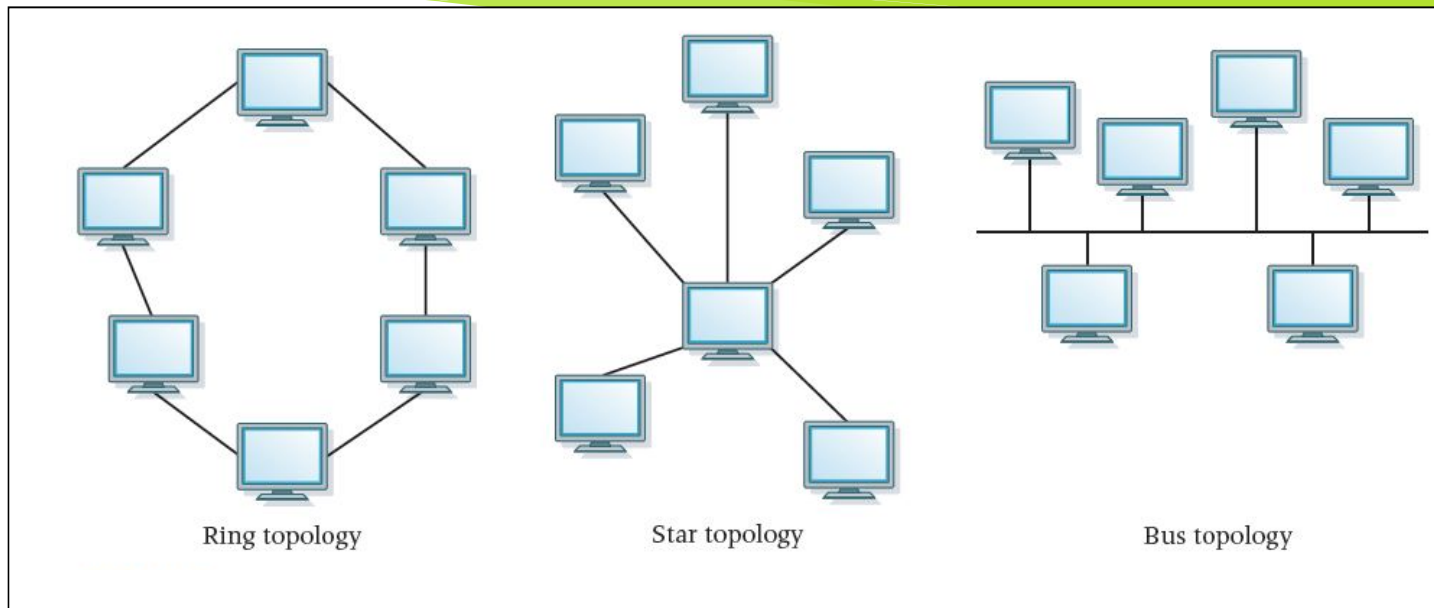
Ring topology connects all nodes in a closed loop on which messages travel in one direction

Star topology centers around one node to which all others are connected and through which all messages are sent

Bus topology nodes are connected to a single communication line that carries messages in both directions

Types of LAN

Ring, star and bus



Internet vs intranet

*

* The **Internet**, as we know it today, is essentially the ultimate wide-area network, spanning the entire globe

* Intranet : (computing) an internal network that makes use of internet technology

* Internal or a private network of an organization based on internet protocol technology and accessed over the internet

LAN, WAN, MAN & VPN

Local Area Network (LAN)

network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building

Wide-Area Network (WAN)

A network that connects local-area networks over a potentially large geographic distance

Metropolitan-area network (MAN)

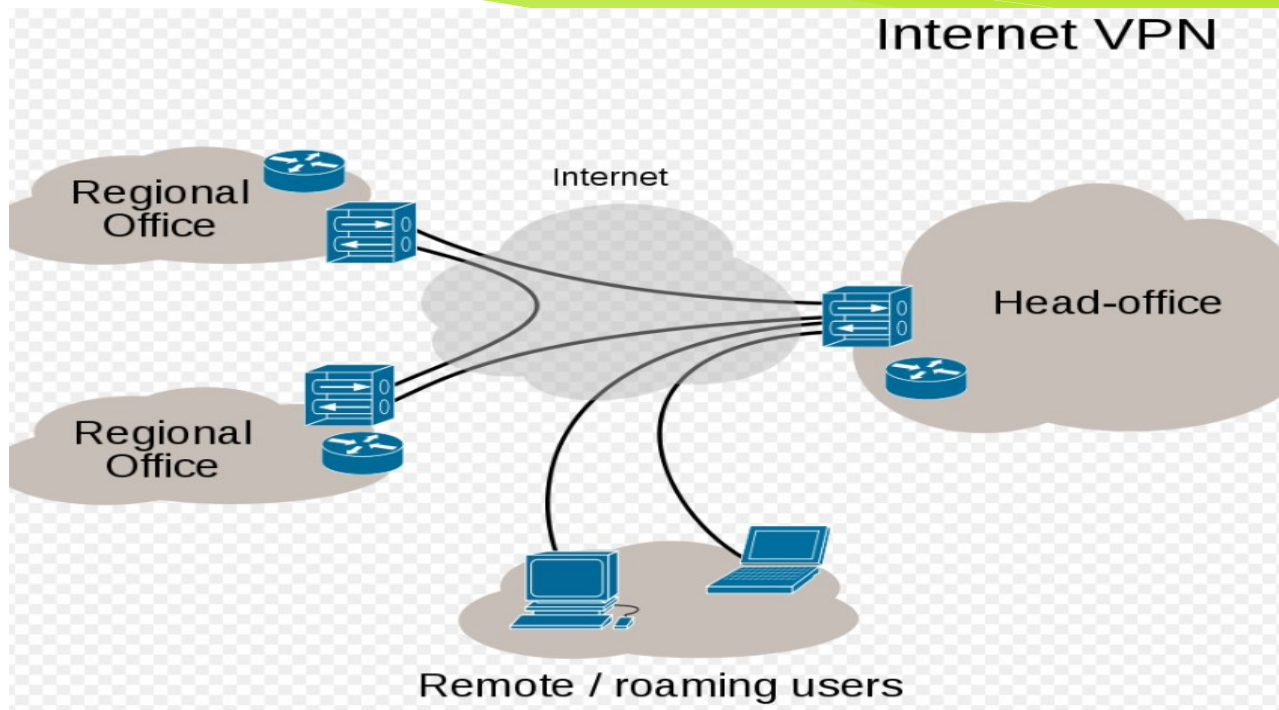
The communication infrastructures that have been developed in and around large cities

LAN, WAN, MAN & VPN

VPN? VIRTUAL PRIVATE NETWORK

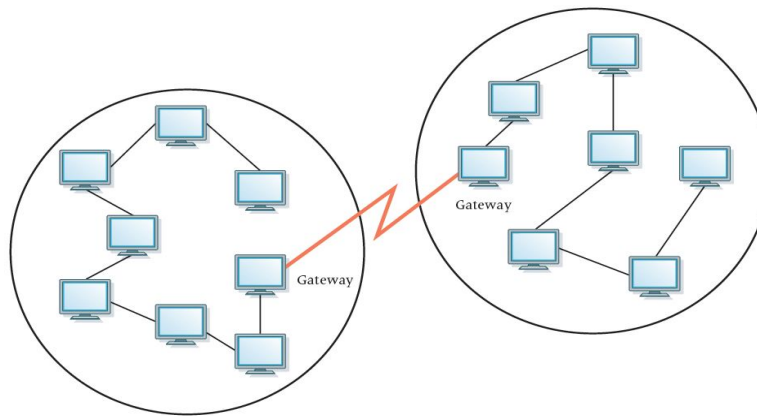
- * A **virtual private network (VPN)** extends a private network across a public network, and enables users to send and receive data across shared or public networks as if their computing devices were directly connected to the private network.
- * Applications running across the VPN may therefore benefit from the functionality, security, and management of the private network.
- * VPNs may allow employees to securely access a corporate intranet while located outside the office.

LAN, WAN, MAN & VPN



Gateway

- * Often one particular node on a LAN is set up to serve as a **gateway** to handle all communication going between that LAN and other networks
- * Communication between networks is called internetworking



Internet :

Well, nobody does. No single person or company owns the Internet or even controls it entirely. As a wide-area network, it is made up of many smaller networks. These smaller networks are often owned and managed by a person or organization. The Internet, then, is really defined by how connections can be made between these networks.

- * **Internet backbone** A set of high-speed networks that carry Internet traffic. These networks are provided by companies such as AT&T, ...
- * **Internet service provider (ISP)** A company that provides other companies or individuals with access to the Internet

Internet Connections

- * **Broadband** A connection in which transfer speeds are faster than 380 bits per second
 - * Digital Subscriber Line (DSL) connections and cable modems are broadband connections
 - * The speed for **downloads** (getting data from the Internet to your home computer) may not be the same as **uploads** (sending data from your home computer to the Internet)

Networking Communications

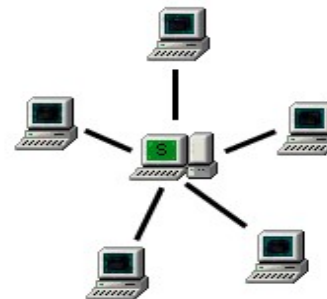
There are two type of network communication :

1. Peer-to-Peer (P2P)
2. Client-Server

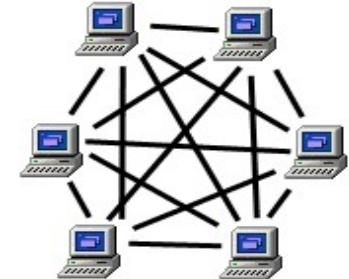
P2P

- * Network built and sustained by resources of each participant
- * Peers act as both client and server
- * Issues:
 - * volatility, scalability, legality

Server Based Network



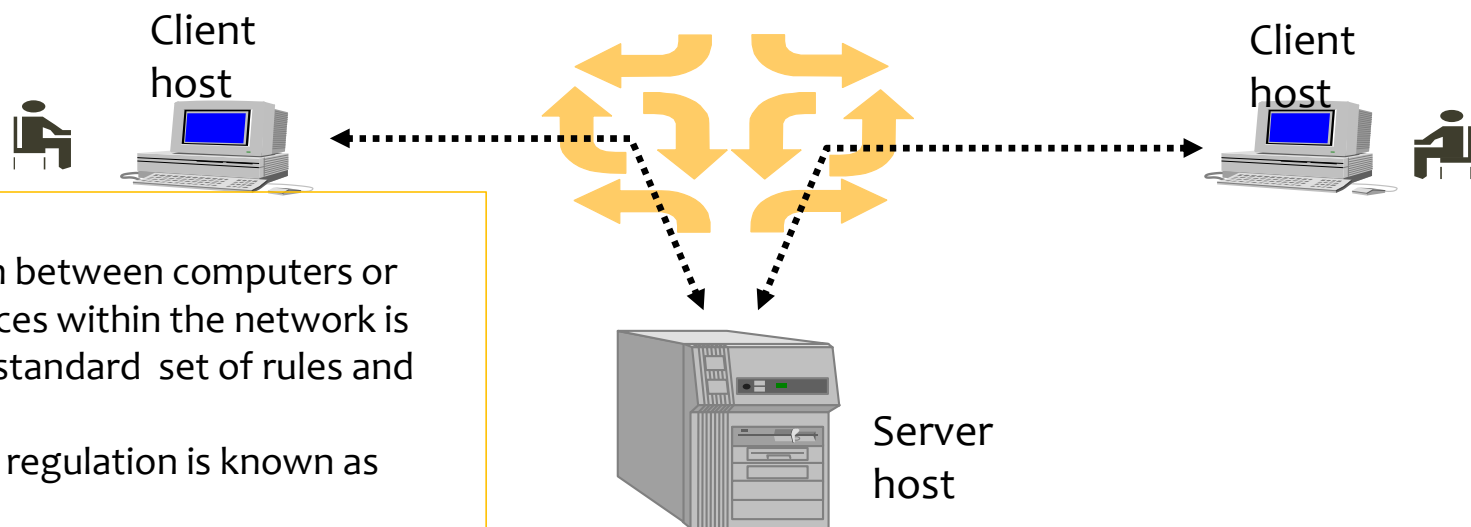
Peer to Peer Network



Networking Communications

2: Client – Server

- * Clients specialize in user interface
- * Servers specialize in managing data and application logic
- * Asymmetric relationship
- * Client predominately makes requests, server makes replies



Note:

- communication between computers or connected devices within the network is done based on standard set of rules and regulations.
- These rules and regulation is known as **Protocols**.

Some common protocols

- * A protocol is a convention or standard that controls or enables the connection, communication, and data transfer between computing endpoints
- * a protocol can be defined as the rules governing the syntax, semantics, and synchronization of communication

Some Examples of protocols grouped in their respective layers

- * *Application layer* → DNS, TFTP, SSL, FTP, HTTP, POP3, SMTP, SNMP, SSH, Telnet,
- * *Transport Layer* → TCP, UDP
- * *Internet Protocol Layer* → IP, Ipsec, DHCP
- * *Data Link Layer* → ARP, MAC (Ethernet, DSL, ISDN, ...)

Some common protocols

- * TCP stands for **Transmission Control Protocol**

TCP software breaks messages into packets, hands them off to the IP software for delivery, and then orders and reassembles the packets at their destination

- * UDP stands for **User Datagram Protocol**

- * It is an alternative to TCP

- * The main difference is that TCP is highly reliable, at the cost of decreased performance, while UDP is less reliable, but generally faster

- * IP stands for **Internet Protocol**

IP software deals with the routing of packets through the maze of interconnected networks to their final destination

IP Addressing (Network Addressing)

What is **Internet Protocol (IP) address** mean?

- * The address of a connected device in an IP network (TCP/IP network)
 - * Every desktop and laptop computer, server, scanner, printer, modem, router, smartphone and tablet is assigned an IP address, and every IP packet traversing an IP network contains a source IP address and a destination IP address.
- * IP addresses are written in "dotted decimal" notation, which is four sets of numbers separated by decimal points; for example, 204.171.64.2. and 10.10.10.120
 - * Instead of the domain name of a Web site, the actual IP address can be entered into the browser. However, the Domain Name System (DNS) exists so users can enter computerlanguage.com instead of an IP address, and the domain (the URL) is converted to the numeric IP address (see DNS).

IP Addressing (Network Addressing)

There are currently two version of Internet Protocol (IP):

➤ **IPv4** and a new version called **IPv6**

- * IPv6 is an evolutionary upgrade to the Internet Protocol. IPv6 will coexist with the older IPv4 for some time.
- * IPv4 (*Internet **P**rotocol **V**ersion **4***):
 - * is the fourth revision of the Internet Protocol (IP) used to identify **device** on a **network** through an addressing system
 - * is the most widely deployed Internet protocol used to connect devices to the Internet. IPv4 uses a 32-bit address scheme allowing for a total of 2^{32} addresses (just over 4 billion addresses)
- * IPv6 (*Internet **P**rotocol **V**ersion **6***):
 - * It is also called **IPng** (*Internet **P**rotocol **n**ext **g**eneration*) and it is the newest version of the Internet Protocol (IP) → uses 128 bit
 - * Will replace the current version of IPv4 (Internet Protocol Version 4) in the future
 - * IPv6 is designed to allow the Internet to grow steadily, both in terms of the number of hosts connected and the total amount of data traffic transmitted

IP Addressing (Network Addressing)

➤ **Public and Private Addresses:**

- * The entire local network is exposed to the public Internet via one public IP address for homes and small businesses. Large companies use several public IPs.
- * In contrast, the devices within the network use private addresses not reachable from the outside world, and the routers and firewalls make sure of it
- * these same private IP address ranges are used in every network. (192.168.1.1)

➤ **Static and Dynamic IP:**

- * Network infrastructure devices such as servers, routers and firewalls are typically assigned permanent "static" IP addresses
- * The client machines can also be assigned static IPs by a network administrator, but most often are automatically assigned "dynamic" IP addresses via software (see [DHCP](#))
 - * Example :
 - * Cable and DSL modems are typically assigned dynamic IPs for home users and static IPs for business users

Virtualization and Virtual Machine

What is virtual Machine:

- * A **Virtual Machine** is a software that creates a virtualized environment between the computer platform and the end user in which the end user can operate software.
- * A virtual machine provides an interface identical to the underlying bare hardware

Virtualization:

- * Virtualization is an abstraction layer that decouples the physical hardware from the operating system to deliver greater IT resource utilization and flexibility

Virtualization and ...

Benefits:

- * Partitioning

- * Multiple applications and operating systems can be supported within a single physical system.

- * Isolation

- * Virtual machines are completely isolated from the host machine and other virtual machines. If a virtual machine crashes, all others are unaffected.

Note:

Virtualizing hardware resources: CPU, I/O, memory, networking and GUI

The virtualizing software is called VMM (virtual machine monitor) or hypervisor

Application	Application
OS	OS
Virtual Machine	
Hardware	

Domain Name system

- * The Domain Name System (DNS) is the phonebook of the Internet.
- * Humans access information online through domain names, like amazon.com or espn.com.
- * Web browsers interact through Internet Protocol (IP) addresses.
- * DNS translates domain names to IP addresses so browsers can load Internet resources.
- * Each device connected to the Internet has a unique IP address which other machines use to find the device.
- * DNS servers eliminate the need for humans to memorize IP addresses such as 192.168.1.1 (in IPv4), or more complex newer alphanumeric IP addresses such as 2400:cb00:2048:1::c629:d7a2 (in IPv6).

Domain Name system

- * A hostname consists of the computer name followed by **the domain name**, **server1.sholla.com is an example of a computer name (host name).**
- * Amazon.com or sholla.com is the domain name
 - * A domain name is separated into two or more sections that specify the organization, and possibly a subset of an organization, of which the computer is a part
 - * Two organizations can have a computer named the same thing because the domain name makes it clear which one is being referred to.
 - * **Server1.amazon.com or server1.sholla.com**

Domain Name system

- The **domain name system** (DNS) is chiefly used to translate hostnames into numeric IP addresses
 - DNS is an example of a distributed database
 - If that server can resolve the hostname, it does so
 - If not, that server asks another domain name server

Note: learn about DNS servers and what they are used for.