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Hardware and Networking Tutorial

Published On: September 16, 2024

Hardware and Networking Tutorial

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Introduction to Hardware and Networking

The breadth of the hardware and networking sectors has greatly expanded due to the growing use of computers, laptops, and the Internet. A certification from a reputable IT training institute

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can earn an individual between Rs 40,000 and Rs 50,000 per month. There are several certifications available in hardware and networking. We cover the following in our hardware and networking tutorial:

- Overview of Hardware and Networking
- Basics of Computer Hardware
- Computer Networks
- Computer Network Architecture
- Types of Computer Network

Overview of Hardware and Networking

Hardware: The internal and external parts that comprise the physical components of a computer. Examples of external hardware include the monitor, keyboard, printer, and scanner; examples of internal hardware include the hard drive, RAM, and motherboard.

Networking: Computer networks are made up of interconnected computing devices that can share resources and exchange data. To exchange data over wired or wireless technologies, these networked devices follow a set of guidelines known as communications protocols.

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Basics of Computer Hardware

All digital computers do five things: they take in data, process it to make useful information, store the data and instructions in memory and use them when needed, provide an output, and oversee the first four operations.

Features of Computer Hardware

Key features of computer hardware are:

- **High Speed:** In comparison to a human, who would need many months to do the same task,

it can execute millions of computations in a matter of seconds.

- **Accuracy:** All tasks are completed by computers 100% accurately as long as the input is accurate.
- **Storage Capacity:** A computer can store a lot more data than a human can. It has a lot of data storage capacity.
- **Carefulness:** A computer, in contrast to humans, is immune to boredom, fatigue, and lack of focus.
- **Versatility:** In one instant, it could be playing cards, and in the next, it might be tackling a challenging scientific puzzle.
- **Reliability:** The lifespan of modern electronic components is long. Computers are built with ease of maintenance in mind.
- **Automation:** After a program is loaded into computer memory, the computer can control its execution of the program without the need for human intervention.
- **Decrease in documentation and expenses:** When computers are used in an organization for data processing, fewer paper documents are generated, which speeds up the process.

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Applications of Computer Hardware

Computer hardware can be applicable in all sectors. Some of them are as follows:

- **Business Sector:** In business firms, computers are used for payroll computations, setting a budget, analysis of sales, economic projections, taking care of the employee database, upkeep of supplies, etc.
- **Banking Sector:** These days, computers have

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a nearly exclusive role in banking. Online accounting tool that allows you to view administrator records, interest charges, shares, and current balances to make deposits and overdrafts. The fully automated ATMs are simplifying banking transactions for consumers even further.

- **Insurance Sector:** Insurance providers keep a database of all their customers that includes details about the process of carrying on with the policies, the date of the policies' commencement, the next installment that's due on a policy, the date of maturity, interest owed, advantages for survival, and bonus
- **Education Sector:** Educational institutions can use computers in a variety of ways to teach their pupils. It is utilized to create a database regarding a student's performance, and analysis is done using this data.
- **Marketing Sector:** Using computers, advertising experts draft and edit material, produce artwork and visuals, print and distribute advertisements, and ultimately increase sales. Computerized catalogs that offer product information and allow clients to directly enter orders to be filled have made it possible for people to purchase from home.
- **Healthcare Sector:** Computers are now a necessary component of labs, dispensaries, and hospitals. They are utilized in hospitals to maintain patient and medication records. Additionally, it is utilized for disease diagnosis and scanning. Computerized devices are also used for ECG, EEG, ultrasounds, CT scans, and other procedures.
- **Engineering Design Sector:** Engineering uses computers for a variety of purposes. CAD, or computer-aided design, is one of the main fields that allows for the generation and editing of graphics. The fields of structural, industrial, and architectural engineering are included.
- **Military:** Computers are used extensively in the military. modern weapons, tanks, missiles, etc.

Computerized control systems are also used by the military. Controlling missiles, military interaction, military coordination and strategy, and intelligent weaponry are a few military applications where computers have been used.

- **Communication Purpose:** The process of precisely and successfully conveying a message, concept, image, or voice to its intended audience is known as communication. Computer hardware is applied to perform functions like email, chat, video conferencing, and so on.
- **Government Sector:** Computers play a major role in government functions. Planning a budget, income tax, and GST, calculating the gender gap, computerizing voter lists and PAN cards, forecasting the weather, and other important processes are included in this category. **MCSA training** at SLA offers a promising career for IT aspirants.

Evolution of Computer Hardware

There have been several improvements in the evolution of computers, with notable advances in technology and architecture.

The concepts and ideas that ultimately led to the development of the computers we use today were greatly influenced by the computers built in the 19th century.

- ENIAC (1945)
- Stored-Program Computers (1940s-1950s)
- Transistors and Integrated Circuits (1950s-1960s)
- Minicomputers (1960s-1970s)
- Microprocessors and Personal Computers (1970s-1980s)
- Graphical User Interfaces (1980s-1990s)
- Internet and World Wide Web (1990s)

The 20th century saw the advancement of

computer technology to new heights. High-tech portable and lightweight devices are available and popular.

The internet has become a more valuable platform for centralizing data access and computation on servers due to cloud computing technology.

- Computers, tablets, and smartphones (2000s–Present)
- AI and cloud computing are the two most in-demand cutting-edge technologies.

Computer history is characterized by an ongoing cycle of invention, whereby successive generations build upon the accomplishments of their predecessors.

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Types of Computer Hardware

Two categories of computer hardware exist:

Internal hardware: The computer peripherals that are attached to the computer are known as internal hardware. Hard drives, motherboards, and DDR (RAM) are a few of these.

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External hardware: The computer peripherals that are externally attached to the computer system are known as external hardware. Monitors, keyboards,

printers, and scanners are examples of external hardware.

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Functions of Computer Hardware

A computer system's hardware functions cover a broad variety of processes that enable the machine to perform tasks effectively. These tasks are frequently divided into several groups, with a distinct set of hardware components managing each group. Some of the primary purposes of the computer hardware are listed below.

Input Hardware Device: Users can enter data into the system with the help of an input device. Text can be entered using a keyboard, selected by clicking on an option on a mouse, photographs or pages can be scanned using a scanner, etc.

Output Hardware: The output is transformed into forms that are understandable to humans by output devices, such as a monitor to show the output on a screen, a printer to print the output on paper, speakers to play sounds, and projectors to project the output's visuals onto larger surfaces.

Processors: They carry out calculations and program or instruction execution.

Storage Hardware: Similar to memory devices, storage hardware keeps data for later use. HDDs store data permanently, while RAM is used for short-term storage.

Communication Hardware: Users can communicate data over a computer network between various devices because of communication technology. These consist of Bluetooth and Wi-Fi adapters, modems, and network interface cards (NICs).

Control Hardware: It oversees and guides the functions of various system-attached components. It comes with a motherboard, UEFI/BIOS, and a power supply unit (PSU).

Computer Networks

A computer network is a collection of computers connected by cables, fiber optic connections, or optical optics to enable networked device interaction. The sharing of resources between different devices is the goal of a computer network.

There are various types of networks in computer network technology, ranging in complexity from simple to complicated.

Components of Computer Network

The major components of a computer network are:

- National Interface Card (NIC)
- Hub
- Switches
- Cables and connectors
- Router
- Modem

National Interface Card

A NIC is a component that facilitates communication between a computer and another device. The hardware addresses found on the network interface card are used by the data-link

layer protocol to identify the machine on the network and direct data transfers to the appropriate location. Wireless and wired NICs are the two different types of NICs.

- **Wireless NIC:** This type of NIC is used by every laptop made today. An antenna that uses radio wave technology is used in Wireless NIC to establish a connection.
- **Wired NIC:** To transport data over the medium, cables employ a wired NIC.

Hub

A hub is a central component that divides a network connection among several devices. A computer sends a request to the Hub when it needs information from another machine. Hub sends out this request to every PC that is connected.

Switches

A switch is a networking device that transfers data from one device to another by grouping all the devices via the network. A switch is preferable to a hub because it delivers messages directly to the device to which they belong rather than broadcasting them throughout the network. Switch transmits the communication straight from the source to the destination.

Cables and connectors

The transmission medium used to carry communication signals is cable.

Three different kinds of cables exist:

- **Twisted-pair cable:** This type of high-speed cable can send data at speeds of up to 1 Gbps.
- **Coaxial cable:** Coaxial cables are similar to those used for TV installations. Although coaxial cable costs more than twisted pair cable, it offers faster data transfer rates.
- **Fibre optic cables:** Fiber optic cables use light beams to transfer data at a fast speed. It offers

a faster rate of data transmission than other cables. Because of its higher cost in comparison to alternative cables, the government installs it.

Router

A router connects a local area network (LAN) to the internet. The router's primary function is to link many networks together or to connect several PCs to the internet.

Modem

Through the existing phone connection, the modem links the computer to the internet. The motherboard of a computer is not integrated with a modem. A modem is a discrete component that fits into a motherboard-based PC slot.

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Applications of Computer Network

The following are the applications of computer networks:

- **Resource Sharing:** Resource sharing is the practice of allowing users on a network to share resources like software, printers, and data without requiring that the resource and user be physically located in the same place.
- **Server-Client Model:** A component of the server-client model is computer networking. A server is a central computer that the system administrator maintains and uses to store data. The computers used to remotely view the data kept on the server are known as clients.
- **Communication Medium:** A computer network functions as a channel for user communication. Employees at a corporation with multiple computers, for instance, communicate daily via email.
- **E-commerce:** Computer networks are crucial for businesses as well. We can conduct

business online. As an illustration, Amazon.com does business online.

Features of Computer Network

Below is a list of features of computer networks.

- **Speed of communication:** We can quickly and effectively communicate via a network thanks to networks.
- **File sharing:** We can share files over computer networks.
- **Roll back and resume:** It is simple to get the backup from the primary server because all of the files are kept on this centrally placed server.
- **Sharing of Hardware and Software:** The user can access the applications centrally since we can install them on the main server.
- **Security Network:** Security is made possible by guaranteeing that the user is authorized to access particular data and programs.
- **Scalability:** Scalability refers to the network's ability to accommodate new components. To add new devices and expand the network, it must be scalable.
- **Reliability:** If it is a hardware failure, computer networks can employ an alternative source for data communication.

Computer Network Architecture

The physical and logical layout of the hardware, software, protocols, and media used in data transmission is known as computer network architecture. We can describe the arrangement of computers and the distribution of duties among them.

There are two types of network architectures in use:

- Peer-to-Peer network
- Client/Server network

Peer-To-Peer network:

- In a peer-to-peer network, every computer in the network has equal access to and responsibility for processing data.
- Up to 10 PCs can benefit from peer-to-peer networks.
- The peer-to-peer network lacks a centralized server.
- Each computer is given specific permissions to share resources; however, if the computer containing the resource goes down, this could cause issues.

Client/Server Network

A client/server network is a type of network architecture wherein end users, referred to as clients, can access resources, such as music, videos, and other files, from a central computer, referred to as the server.

- All other computers connected to the network are referred to as clients, while the central controller is referred to as a server.
- All of the main functions, including network management and security, are handled by servers.
- All of the resources such as files, directories, printers, etc. are managed by a server.
- Via a server, every client can speak with every other client.
    - To transfer data to client 2, client 1 must first request authorization from the server.
    - To start a conversation with client 2, the server delivers the response to client 1.

Types of Computer Network

A computer network can be divided into groups based on its size. There are primarily four kinds of computer networks:

- LAN (Local Area Network)
- PAN (Personal Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

LAN

A local area network (LAN) is a collection of computers linked to one another in a constrained space, like an office or building.

- Using a communication means like coaxial cable or twisted pair, LANs are used to link two or more personal computers.
- Because it is constructed using less expensive hardware, like hubs, network adapters, and Ethernet cables, it is less expensive.
- Local area networks allow for far quicker data transfer rates. A local area network offers more protection.

PAN

A personal area network is set up inside a single person and usually has a 10-meter range.

- The term “personal area network” refers to the network used to connect individual computer devices.
- The initial researcher and scientist to propose the concept of the Personal Area Network was Thomas Zimmerman. A 30-foot radius is covered by a personal area network.
- The laptop, cell phone, media player, and PlayStation are examples of personal computer devices that are used to create a personal area network.

PAN has two types:

Wireless Personal Area Network: The development of a wireless personal area network just requires the use of wireless technologies like Bluetooth and WiFi. The network has a limited range.

Wired Personal Area Network: A USB is used to

establish a wired PA network.

Examples:

- Body area network such as mobile network.
- Offline networks, such as home networks for devices like printers.
- Small home office networks like VPN.

MAN

A metropolitan area network is a network that connects several local area networks (LANs) to build a larger network, hence covering a greater geographic area.

MAN is a tool used by government organizations to interact with the public and private sectors. A telephone exchange line connects the several LANs in a MAN to one another.

- The banks in a city communicate with one another via MAN.
- Utilizing it in an airline reservation is possible.
- It applies to a city college.
- The military may also use it for communication.

WAN

A wide-area network spans several states or nations, or a substantial geographic area. Compared to a LAN, a wide-area network is far larger.

- Through the use of satellite links, fiber optic cables, or phone lines, a wide area network can cover a vast geographic area without being restricted to a single site.
- Businesses, governments, and educational institutions all make extensive use of wide-area networks.

Some examples of WAN are mobile broadband, last mile, private network, etc.

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Advantages of Internetwork

Any two or more computer network segments, LANs, or WANs that are connected by devices and set up using a local addressing system are referred to as internetwork. We call this method "internetworking."

- **Communication:** It offers inexpensive and simple communication.
- **Time-saving:** The intranet saves time because information is shared instantly.
- **Collaboration:** The organization's personnel are given access to the information, which is only accessible to those who are authorized.
- **Platform independence:** As the computer can be connected to another device with a different architecture, it has a neutral architecture.
- **Cost-effective:** Duplicate copies are distributed via the intranet and can be viewed via a browser by users. It reduces communication costs.

Conclusion

Beyond the ideas covered in this hardware and networking tutorial, there is much more to learn. Enroll in our **hardware and networking courses in Chennai** to launch your IT career easily.

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