



جامعة باجي مختار - عنابة
BADJI MOKHTAR - ANNABA UNIVERSITY

Course : Free Software (Open Source)

Presented by Dr. Bilal Dendani

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2025-2026

Objectives :

- To familiarize with information technologies (IT) tools and the Internet basics.
- Introduce hardware, software, and communication technologies.
- Explore the philosophy, tools, and practices of open source.
- Provide hands-on experience with Linux, LibreOffice, and collaborative platforms.

Recommended Prior Knowledge

General knowledge in computer science.

Course Information

- Announcements: Email & Moodle in :
 - <https://elearning.univ-annaba.dz/course/view.php?id=2284>
- Resources:
 - Readings will be announced/distributed on Moodle
- Discussion & Questions: Email your teacher via bilal.dendani@univ-annaba.dz
- Evaluation 100% exam

Course content

Chapter 1. Information Technologies

1.1. Definitions

1.2. Tools

1.2.1. Hardware

1. Computers: desktop PCs, laptops, servers, workstations.
2. Communication networks: routers, switches, modems, fiber optics, WiFi.
3. Peripherals: printers, scanners, keyboards, mice, cameras, sensors.
4. Mobile devices: smartphones, tablets, personal digital assistants (PDA).
5. Smart chips: RFID, NFC, embedded processors, IoT (Internet of Things) sensors.

1.2.2. Software

1. Operating systems: Windows, Linux, macOS, Android, iOS.
2. Business applications: ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), HR management, accounting software, etc.
3. Office software: word processors (Word), spreadsheets (Excel), presentations (PowerPoint), collaboration tools (Google Workspace, Microsoft 365).

Contenu du cours

Chapter 1. Information Technologies

1.3. Applications

1. Communication spaces: Internet, Intranet, Extranet.
2. Multimedia: audioconferencing, videoconferencing.
3. Electronic Data Interchange (EDI).
4. Workflows.

Chapter 2: Open Source Tools

1. Introduction (history, advantages/disadvantages, and licenses).
2. Development environment (Introduction to Linux, Introduction to code editors).
3. Office software (LibreOffice suite).
4. Collaboration (storage and sharing).
5. Contributing to an open source project.

Roadmap of Open Source course

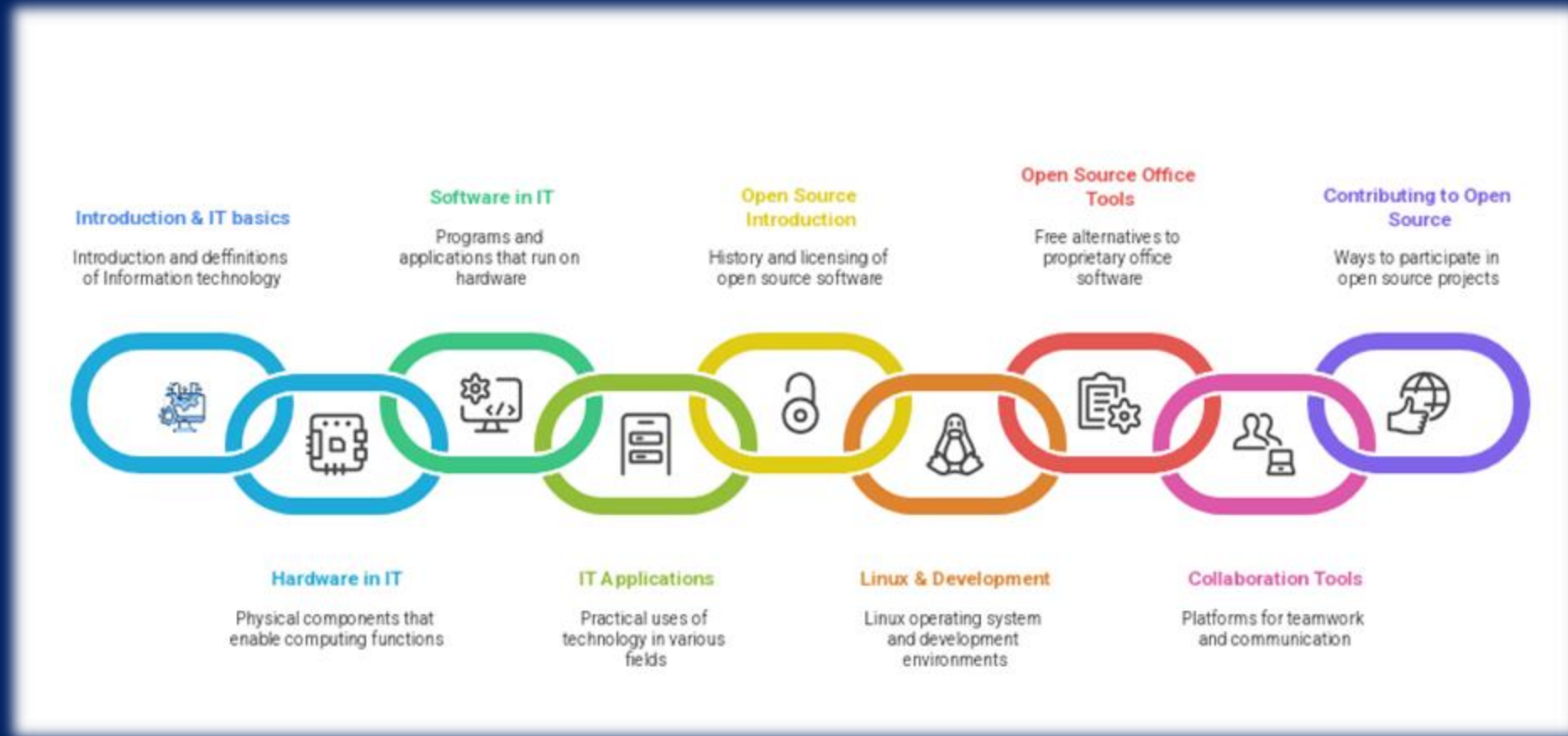
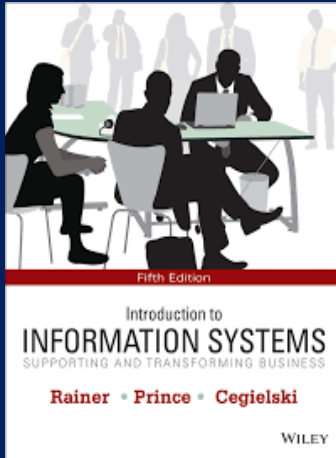


Figure 1. Foundations of IT and Open Source

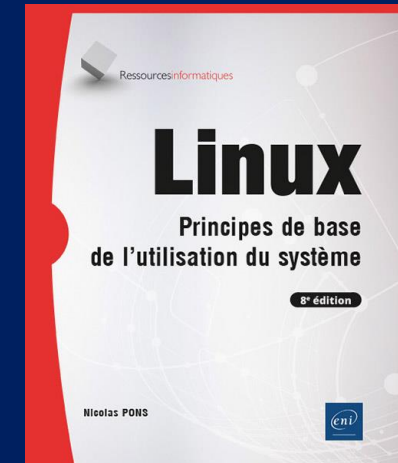
References



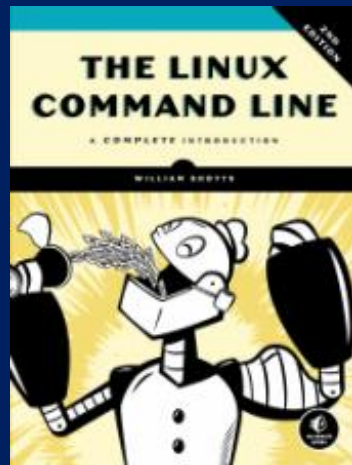
Introduction to
information
systems



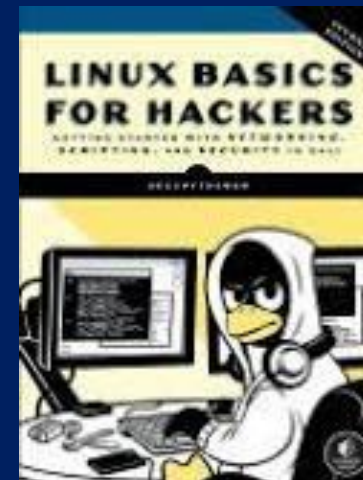
Collectif Eni, Microsoft
Office 2016 Word, Excel,
PowerPoint, Outlook 2016



Linux Principes de
base de l'utilisation du
système (8e édition)



The Linux Command Line



Linux Basics For
Hackers

Chapter 1

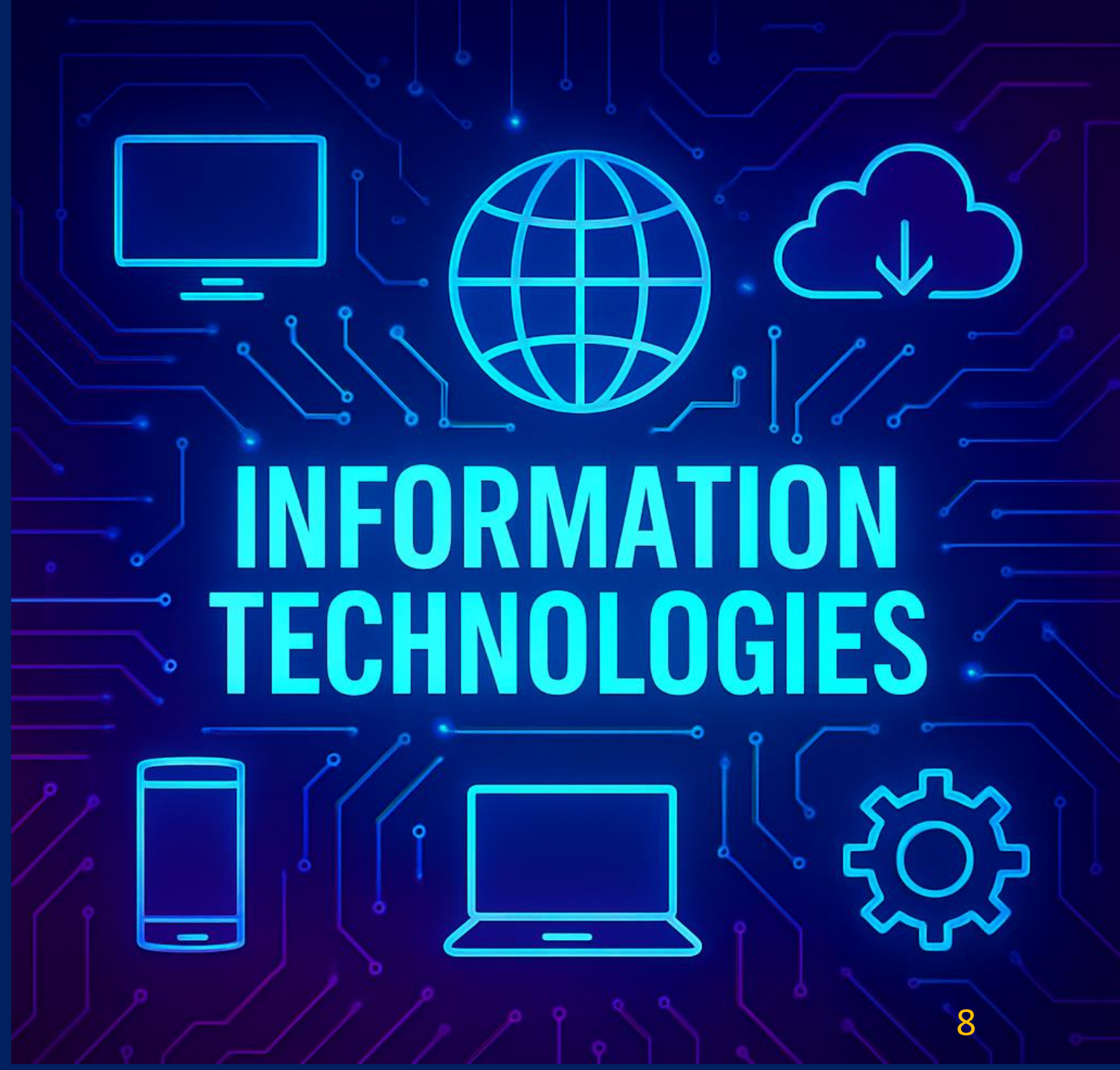
Information technologies

Prepared by:
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Dr. DENDANI Bilal



1. Data vs Information

- **Data** consists of raw, unorganized facts, figures, and symbols that lack meaning on their own.
 - Examples : (e.g., 2025, 37°C, "Open Source")
- **information** is data that has been processed, organized, and given context to make it meaningful, understandable, and useful for decision-making and understanding
 - Examples : (e.g., "The year is 2025", "The temperature is 37°C", Linux Open source)



Figure 2. Data vs Information

2. What is information technology?

Information technology encompasses the use of **computers**, **software**, **networks**, and other **electronic devices** to store, retrieve, transmit, and manipulate data. It is the foundation upon which our digital infrastructure is built, enabling everything from simple data processing to complex problem-solving in various industries.

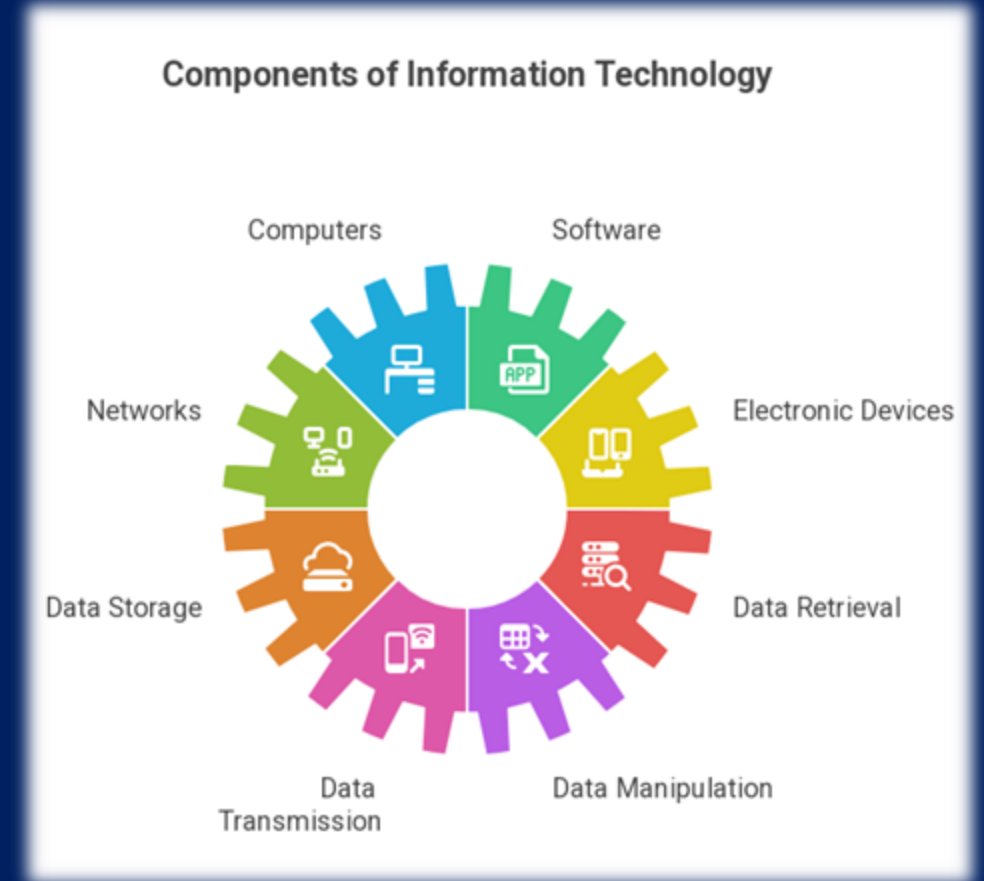


Figure 3. Information technology components

3. What is a Computer?

- A **computer** is an electronic device that **processes data** and **performs tasks** according to a set of instructions.
 - Components: Central Processing Unit (CPU), Memory, Input/Output Devices.
- **Types of Computers**
 - Personal Computers (PCs), Supercomputer, mainframe, Tablets and Smartphones, ...

4. Key components of Information technology (IT)

- **Hardware**

Physical components of a computer system, including the central processing unit (CPU), memory, storage devices, and input/output devices.

- **Software**

Programs and applications that control the hardware and enable users to perform specific tasks.

- **Networks**

Infrastructure that allows computers and devices to connect and share information.

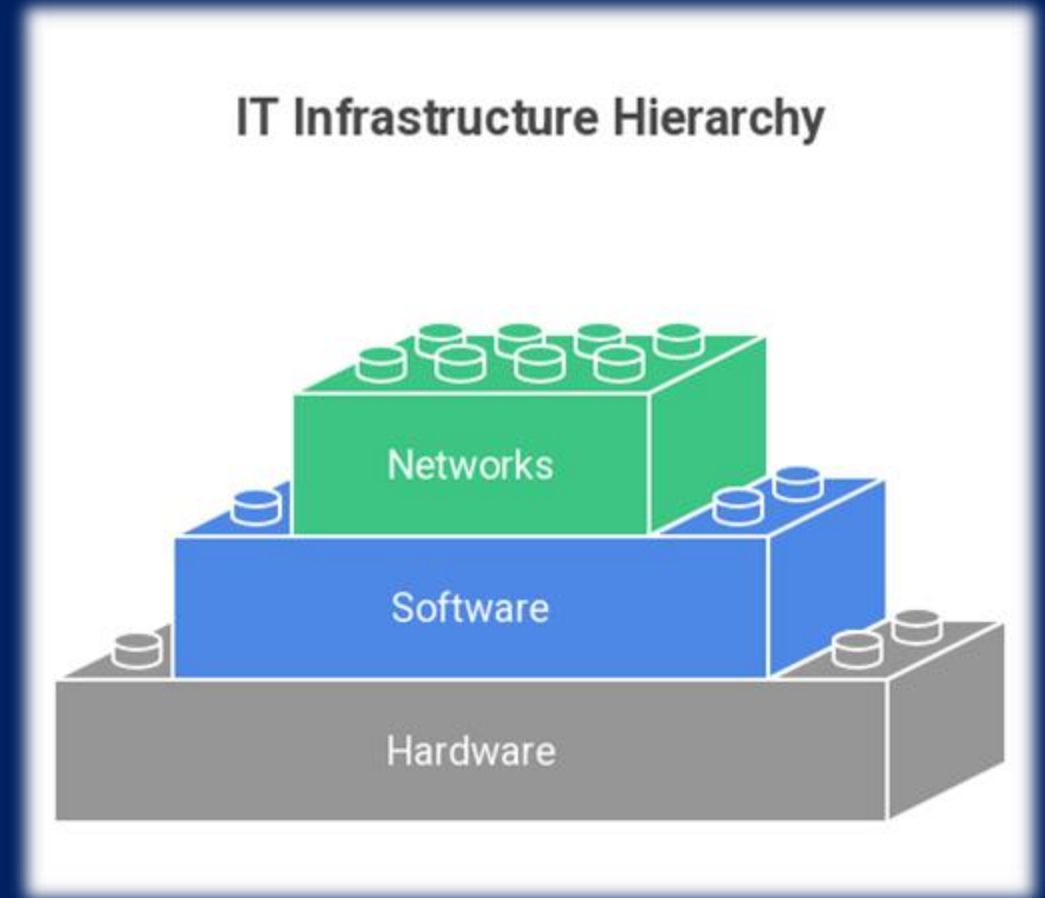


Figure 4. The main structure of information technology

5. Hardware vs software

- Computers consist of two main components:
 - **Hardware:** physical components of a computer system, consist of physical parts: Motherboard, CPU, RAM, Graphics Card Storage Device, Network Card.
 - **Software** Programs and instructions that run on hardware, such as Operating System (OS), browsers, and games applications.

6. Networks

- What is a computer network?
- The computer network refers to connected computers/devices to share resources and info through themselves.
- Computer networks allow users to communicate with each other and transfer information. Data transmissions can involve exchanging messages between users, remote access to databases, or sharing files.
- Types : Local Area Network (LAN), World Area Network (WAN), internet



Figure 5. A computer network

7. Internet

- The internet is a vast, global network of interconnected computer networks that allows billions of devices to communicate and exchange data with each other
- Main Functions:
 - Email, instant messaging, video calls
 - World Wide Web (WWW)
 - File sharing and cloud services
 - E-commerce, e-learning, e-government
- **Examples:** Google, Wikipedia, YouTube, Facebook.



Figure 6. The internet global network

8. Data communication

- Data communication refers to the process of **transmitting data** between two or more devices through a transmission medium.
- **Examples:**
 - Sending an email 📧
 - Video call via Zoom or Google Meet 🎥
 - Transferring files via Bluetooth 📶

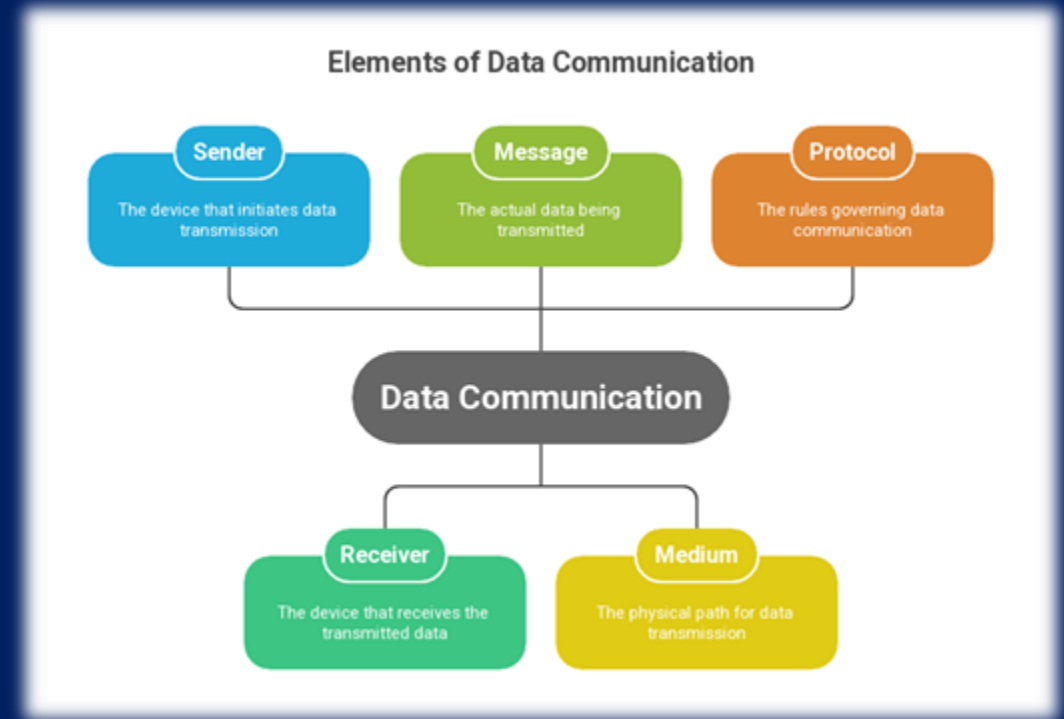


Figure 7. Data communication

9. Information systems

- An information system (IS) is an organized set of components that collect, store, process, and distribute information, to Support decision-making, coordination, control, and analysis in organizations.

Main Components

1. **Hardware** – physical devices (servers, computers, networks).
2. **Software** – programs that manage and process data.
3. **Data** – the raw material transformed into information.
4. **People & Processes** – users, managers, and rules that guide usage.

Example: University student management system (enrollment, grades, schedules).

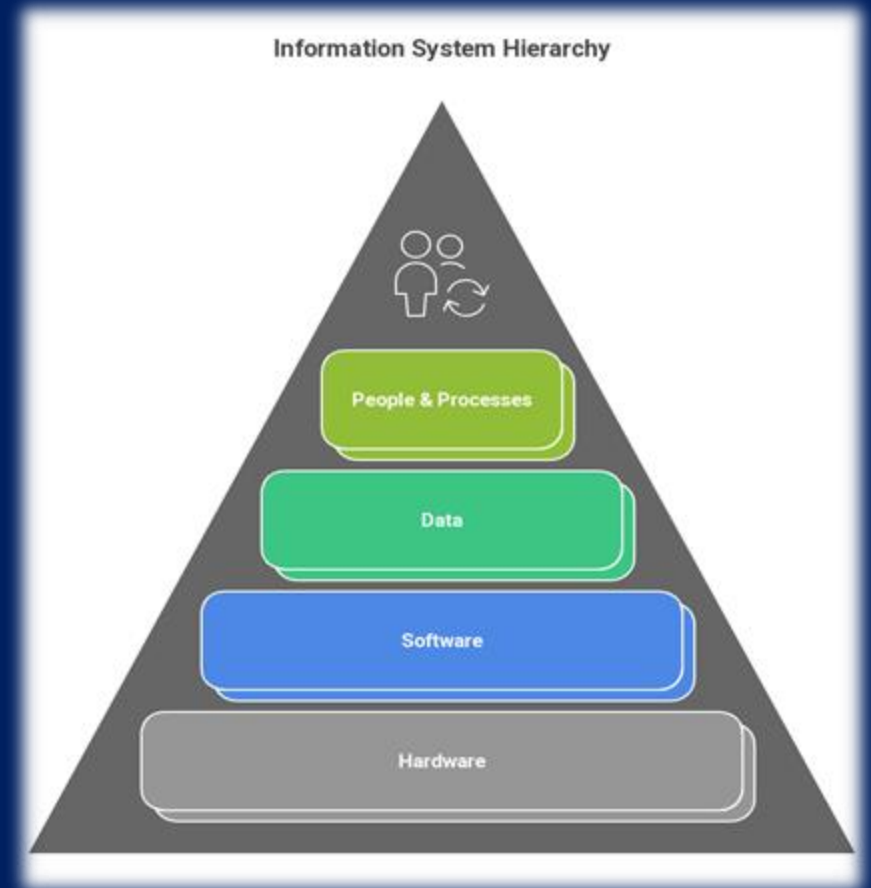


Figure 8. Information system hierarchy

10. Digital Devices

- Digital devices refers to the electronic devices that process and transmit digital data. These devices consists of an Entry points and tools to access, process, and exchange information.

Without digital devices, no interaction with information systems is possible.

Examples of digital device by category:

- **Personal Devices:** Laptops, desktops, tablets, smartphones.
- **Peripherals:** Printers, scanners, webcams.
- **Specialized Devices:** IoT sensors, smartwatches.

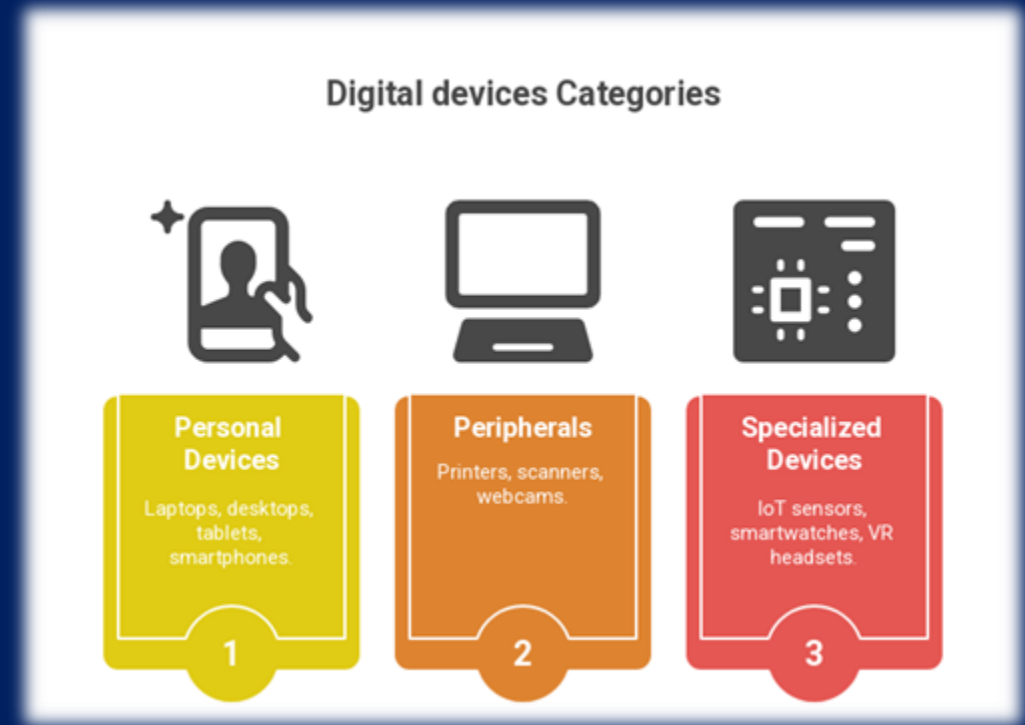


Figure 9. The digital devices

11. Cloud computing

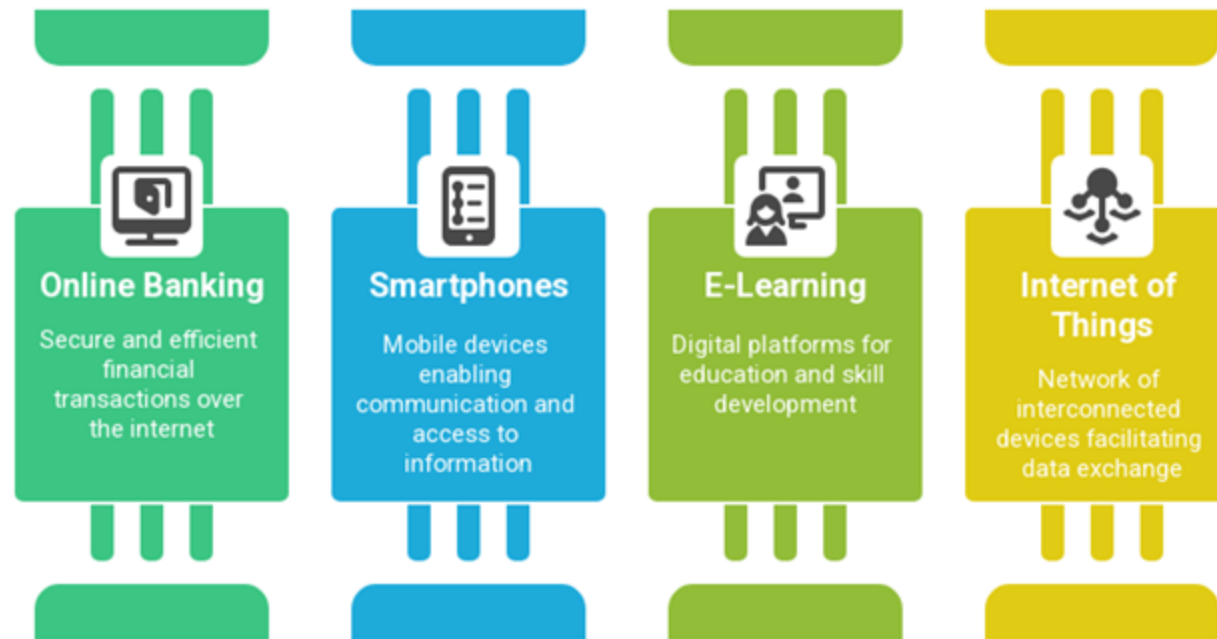
- Cloud computing refers to a concept of **on-demand** access to **computing resources** (storage, processing, applications) delivered via the Internet.
- Allows users to access and store data and applications over the internet instead of relying on local servers or personal computers.
- Service Models:
 - IaaS (Infrastructure as a Service): virtual machines, storage.
 - PaaS (Platform as a Service): development environments.
 - SaaS (Software as a Service): apps like Google Docs, Office 365.

Example: Google Drive, AWS, Microsoft Azure.



Figure 10. Cloud computing characteristics

12. Some examples information technologies



Examples of Modern IT

13. Importance of Information Technology

- Enhances **efficiency** and **productivity** by automating processes and reducing human errors.
- IT enables global **communication** and **collaboration**, connecting people from different parts of the world.
- IT drives **innovation** and enables the **development** of new products, services, and business models.

2. Tools of Information Technology

Definition:

Information technology (IT) tools refer to the **resources** and **technologies** (including hardware, software, and platforms) that enable the **collection**, **processing**, **storage**, **transmission**, and **utilization** of information.

These tools aim to transform and abstract IT concepts into **practical systems** we use in daily life (from smartphones to online platforms).

Categories of information technology (IT) Tools

Hardware 🖥️ :

Physical devices that store, process, and transmit information (computers, networks, peripherals, mobile devices, IoT).

Software ⚙️ Programs and operating systems that control hardware and allow tasks to be performed.

Applications 🌐 Practical uses of IT tools that enable communication, collaboration, and automation in real-world contexts.

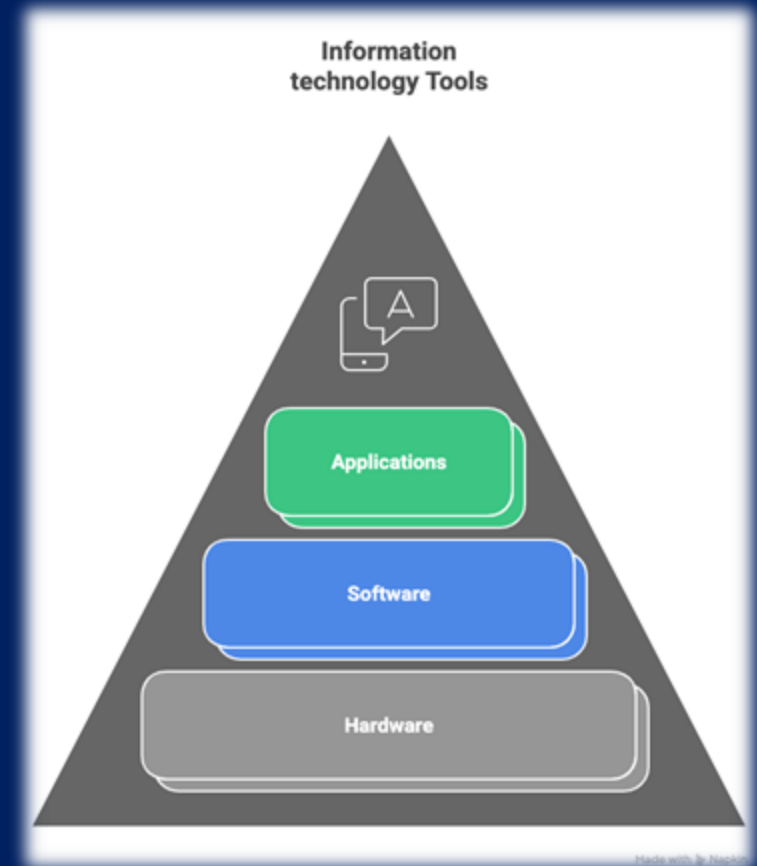
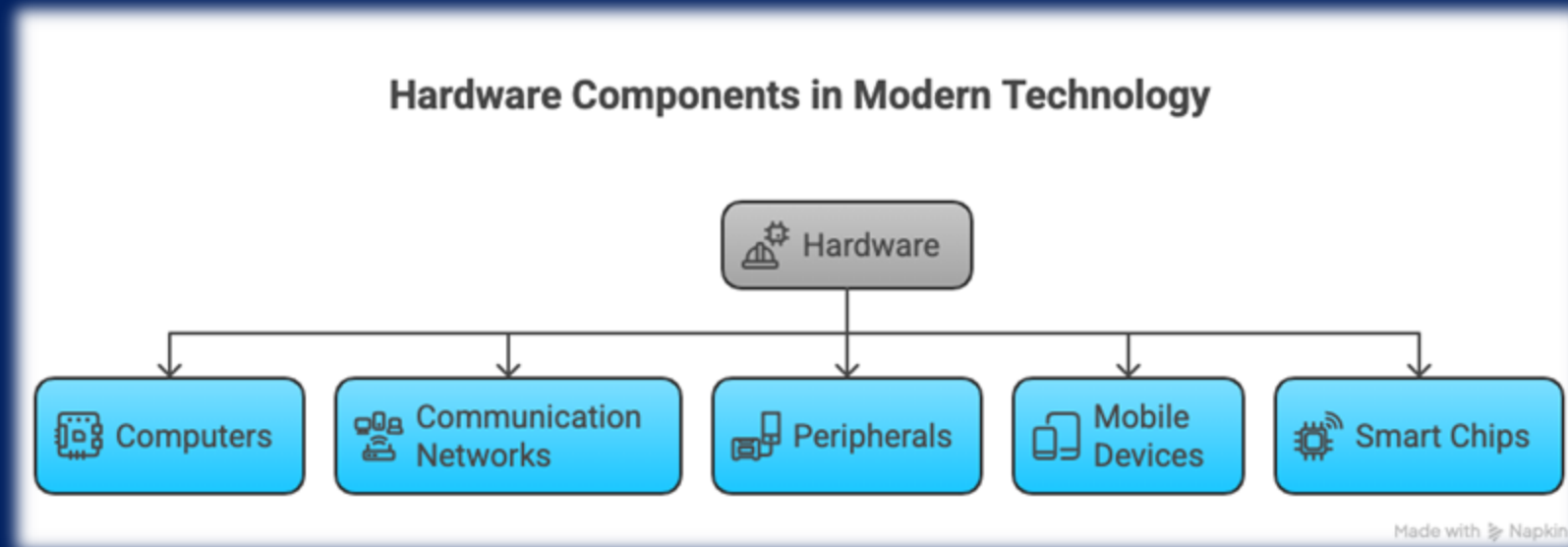


Figure 12. IT Tools

2.1 Hardware

- Hardware refers to the physical components of a computer that come in many different forms, including the monitor, servers, central processing unit, keyboard and mouse. Computer servers run business applications. Servers interact with client devices in the client-server model. They also communicate with other servers across computer networks, which typically link to the internet.



2.1.1. Computers

A computer is an electronic device that **processes data** and **performs tasks** according to a set of instructions. Computers come in different forms, each designed for specific tasks and users. The main types include:

Desktop PCs: fixed computers used at home or in offices.

Laptops: portable personal computers for mobility.

Servers: powerful systems that manage and store data.

Workstations: high-performance machines for engineers and designers.

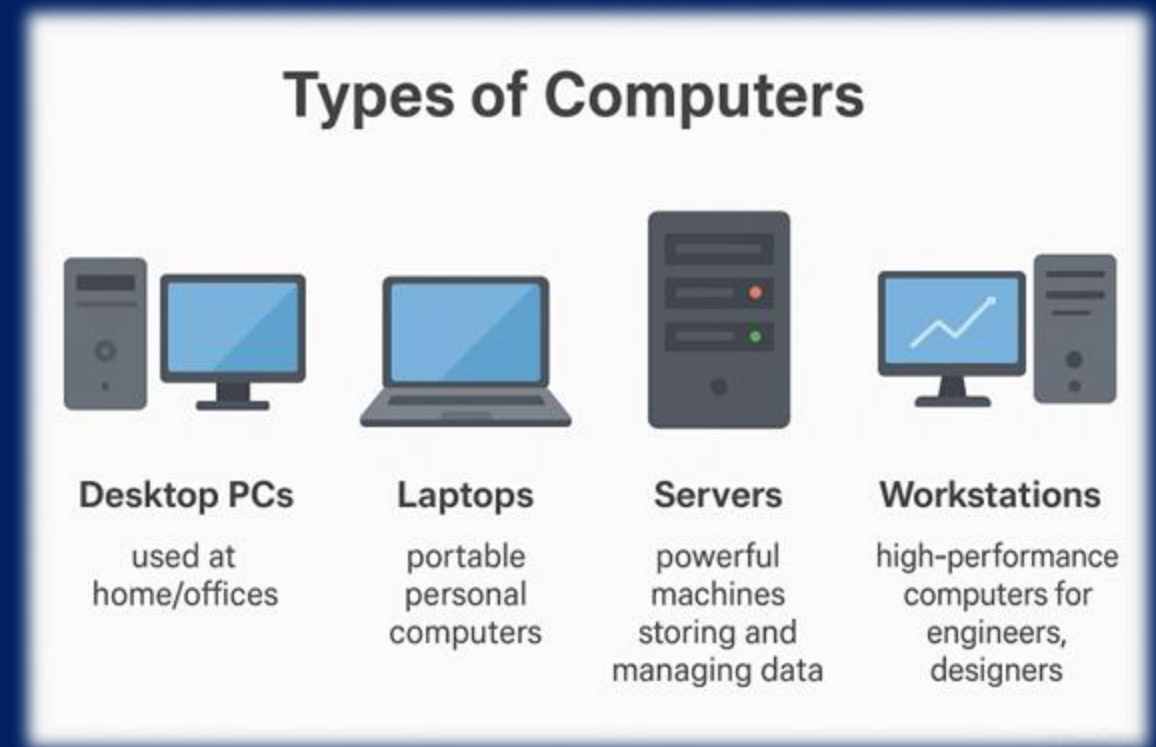


Figure 14. Types of computers

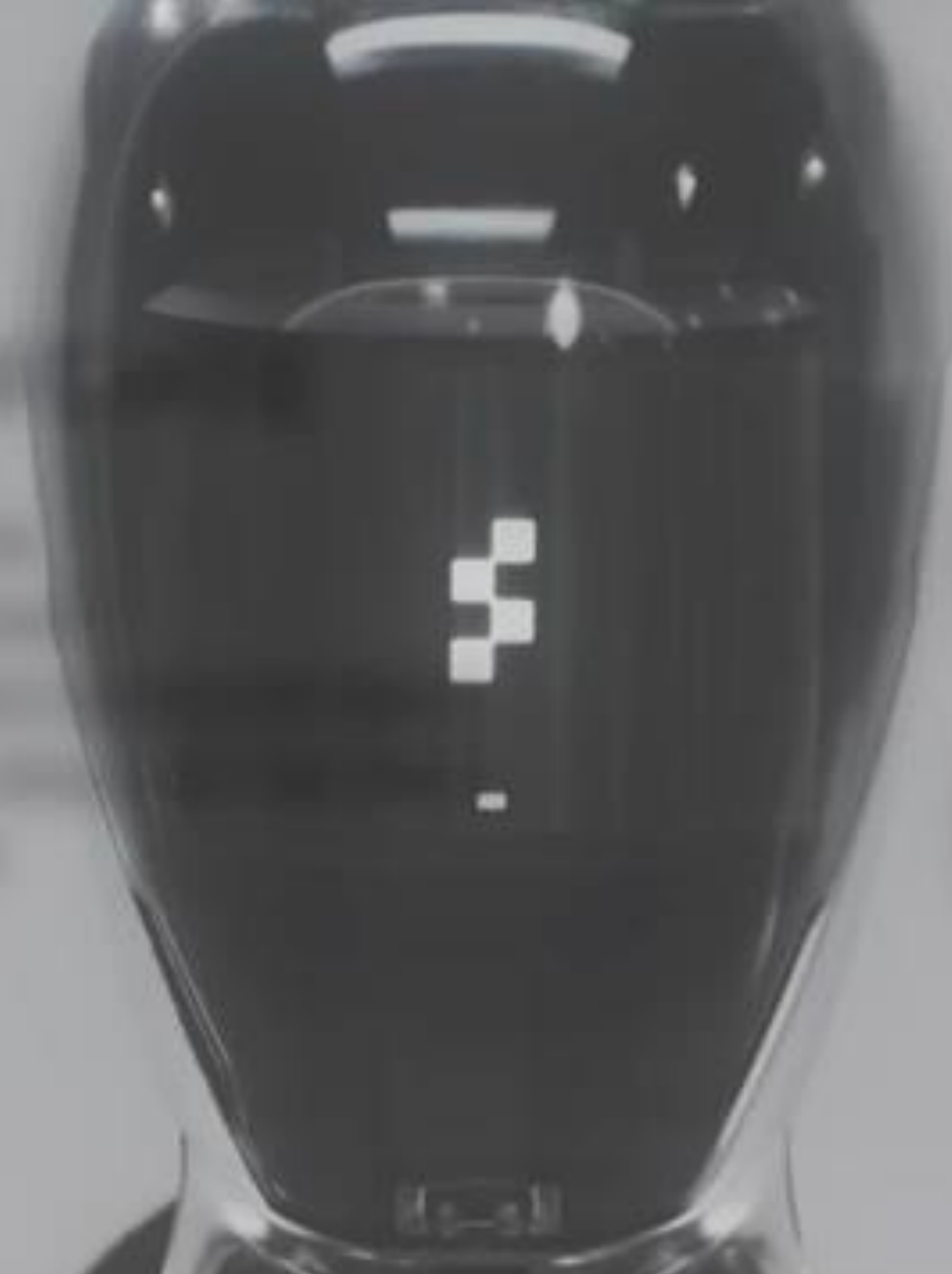
2.1.2 Comparison of Computer Types

Type of Computer	Mobility	Power & Performance	Common Users	Typical Uses / Examples
Desktop PC 	Low – fixed at one location	Moderate – suitable for office or home tasks	Home users, students, office workers	Word processing, Internet browsing, office work
Laptop 	High – portable with built-in battery	Moderate to high depending on model	Students, teachers, professionals	Studying, presentations, online work, travel computing
Server 	Low – stationary in data centers	Very High – handles multiple users and large data	Organizations, IT administrators, web hosting companies	Data storage, website hosting, network management
Workstation 	Low to medium – not easily portable	Very High – optimized for heavy computation & graphics	Engineers, designers, researchers	3D modeling, simulations, scientific calculations

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2.1.3 Main components of the computer

Every computer, regardless of its type, contains key components that work together to process data and execute instructions.

The main components are:

- Motherboard
- Processor (CPU)
- Random Access Memory (RAM)
- Hard Disk
- Graphics Card
- Network Card

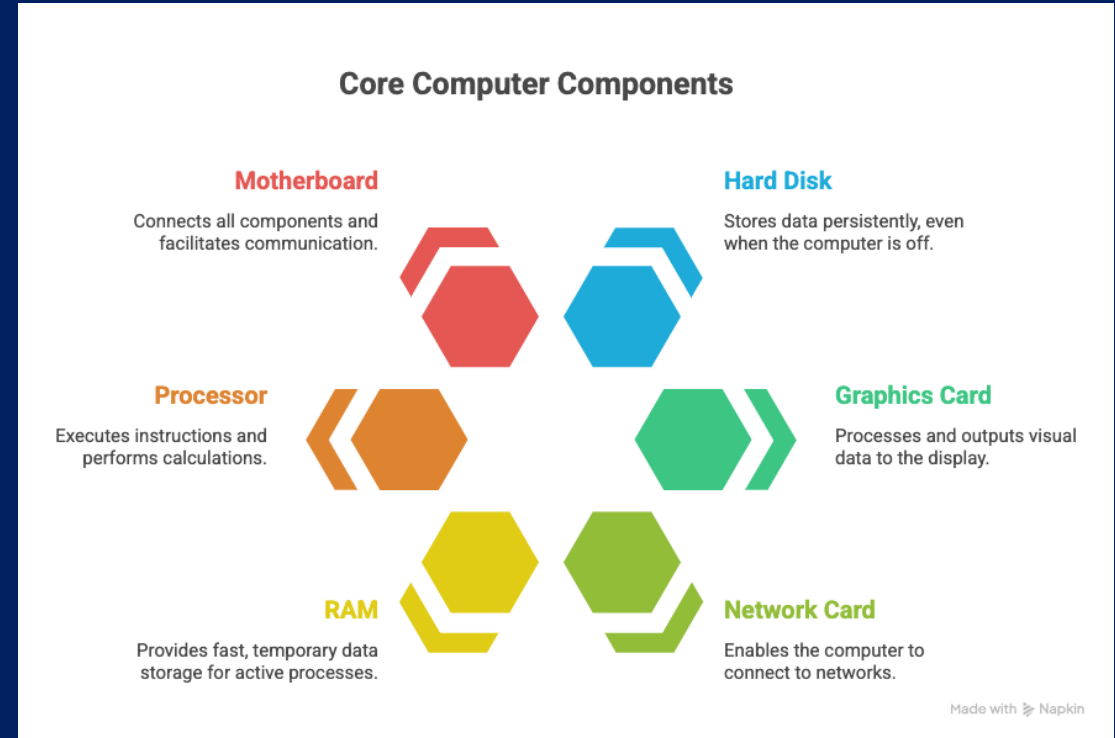


Figure 15. The core components of the computer 29

2.1.3.1 Motherboard

- Basic computer component consisting of printed circuit boards and connection ports.
- Supports all hardware components (RAM, graphics card, processor, sound card, etc.).
- the role of the motherboard is to centralize and process the data exchanged in a computer with the help of the processor
- The motherboard manages the hard disk, keyboard, mouse, and network USB ports...

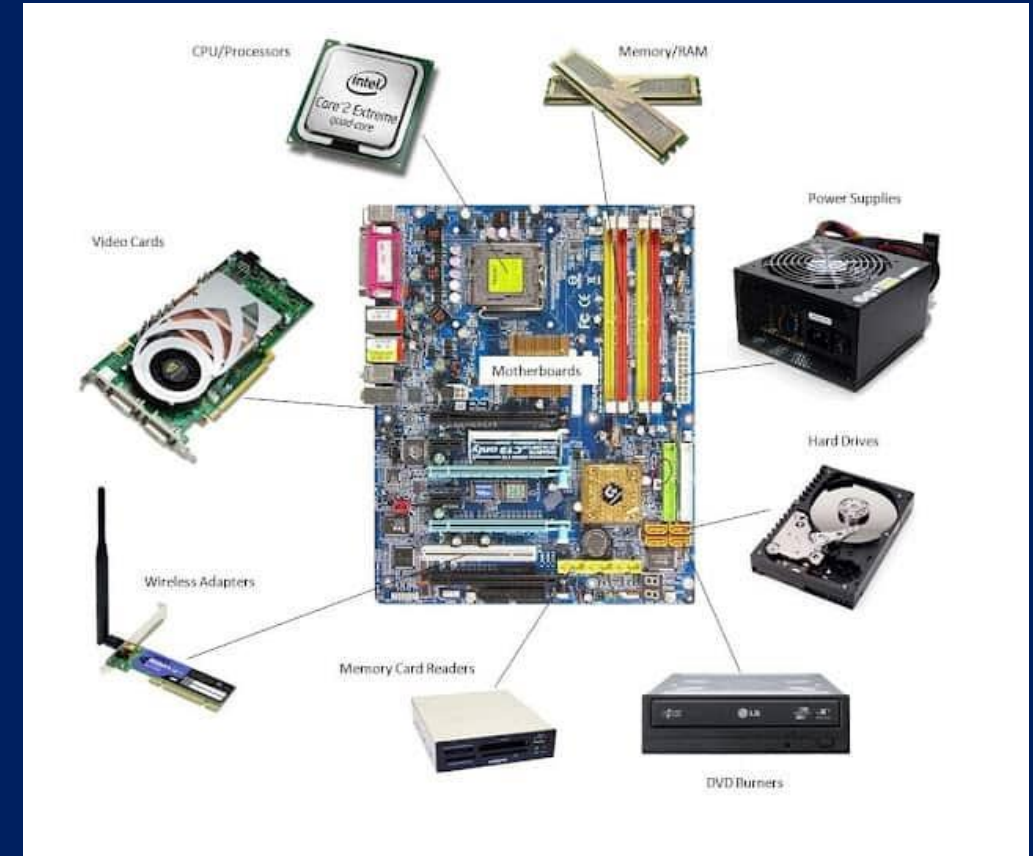


Figure 16. The motherboard components

2.1.3.2. Processor

- The processor is the brain of the computer, orchestrating the exchange of data between the various components (hard disk, RAM, graphics card).
- Executes program instructions stored in the memory.
- The processor is characterized by its frequency, i.e. the rate at which it executes instructions.
- A processor clocked at 800 MHz will perform roughly 800 million operations per second.
- The first microprocessor (Intel 4004) was invented by Intel engineers Marcian Hoff and Federico Faggin in 1971.



Figure 17. The processor the brain of the computer

2.1.3.3. Random Access Memory (RAM)

- RAM (Random Access Memory) is a temporary (volatile) storage component for the computer.
- The Random Access Memory (RAM) allows to storage and access of information in a quick and temporary manner.
- Its major advantage is that it can be read very quickly compared with a hard disk and other storage components.

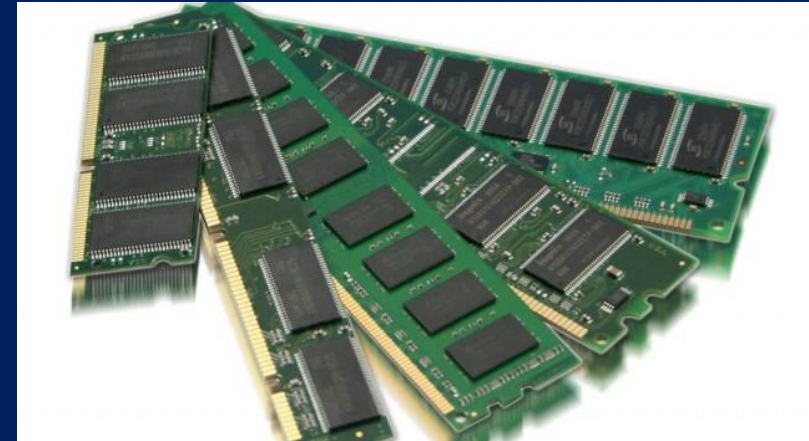


Figure 18. Internal memory, the RAM

2.1.3.4. Hard disk

- One of the main components of a computer.
- It's a non-volatile mass memory used to store data permanently.
 - unlike RAM, which is erased each time the computer is restarted.
- Hard disks have a greater storage capacity than RAM.
- The hard disk contains the operating system (OS), your installed programs, and your personal data.
- There are two categories of hard disk: HDD and SSD.



Figure 19. Secondary memory, the hard disc drive

2.1.3.5. Graphics card

- A graphics card is a hardware component that allows your computer to display images on the screen.
- It is also called a video card, a display adapter, or a graphics processing unit (GPU).
- A graphics card has its own memory and processor that can handle complex graphics tasks, such as rendering 3D scenes, playing videos, and running games
- different types and models of graphics cards. Some of the most popular brands of graphics cards are NVIDIA, AMD, and Intel



Figure 20. The graphics card

2.1.3.6. Network card

- A device that allows the computer to communicate with other devices on a network, such as the Internet.
- It is installed on the motherboard and connects to the network via RJ45 cable.
- There are different types of network cards: ethernet card, Wi-Fi card, Bluetooth card.



Figure 21. The network card



Figure 22. Ethernet cable

2.1.2. Communication Networks in IT

Communication networks connect computers and devices to share data and resources.

They form the **backbone of Information Technology**, allowing access to the Internet and other digital services.

- Main Components:
 - Routers
 - Switches
 - Modems
 - Transmission Media
 - (Fiber Optics)
 - Wireless Technology (Wi-Fi)

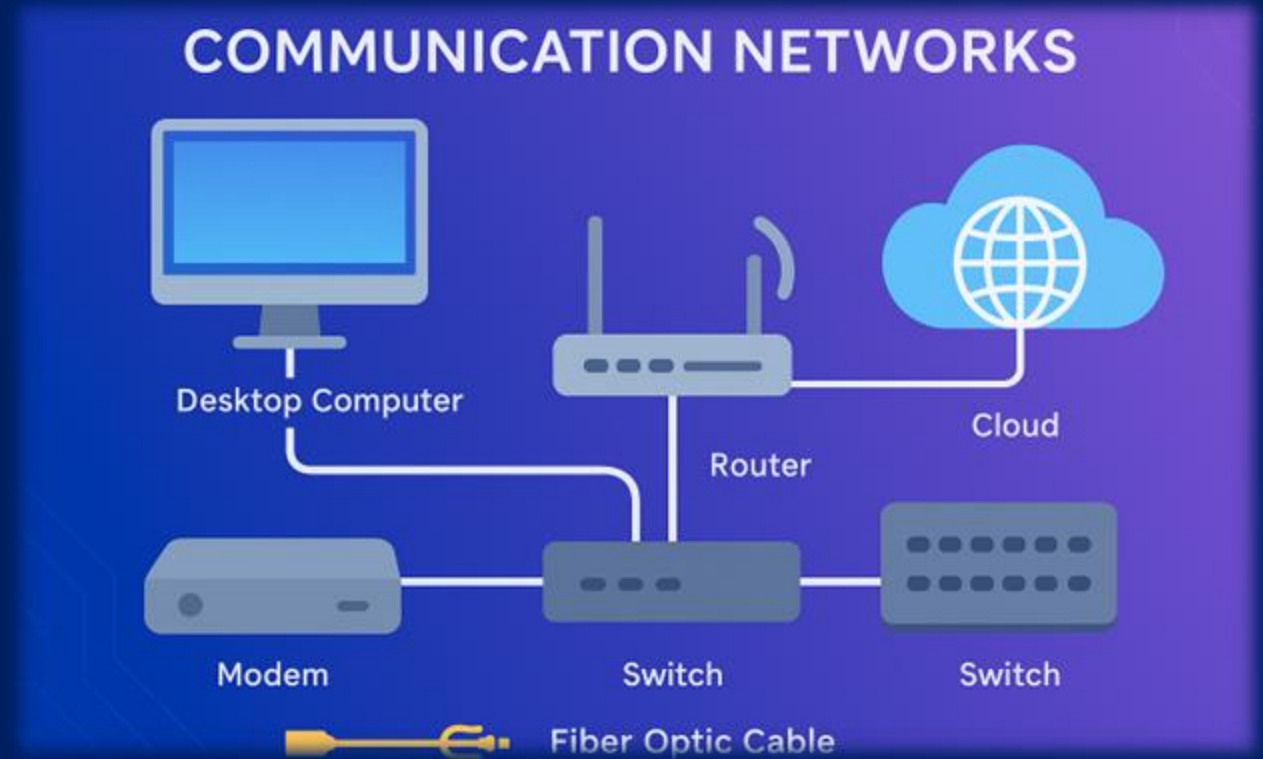


Figure 23. communication networks components

2.1.2.1. Switch

- A **switch** is a networking device that connects multiple devices (computers, printers, servers) within the same local area network (LAN).

The main roles of the switch are :

- Sends data only to the specific device that needs it.
- Increases network efficiency and reduces congestion.

Example: Switches are used in offices and universities to connect many computers in the same building.

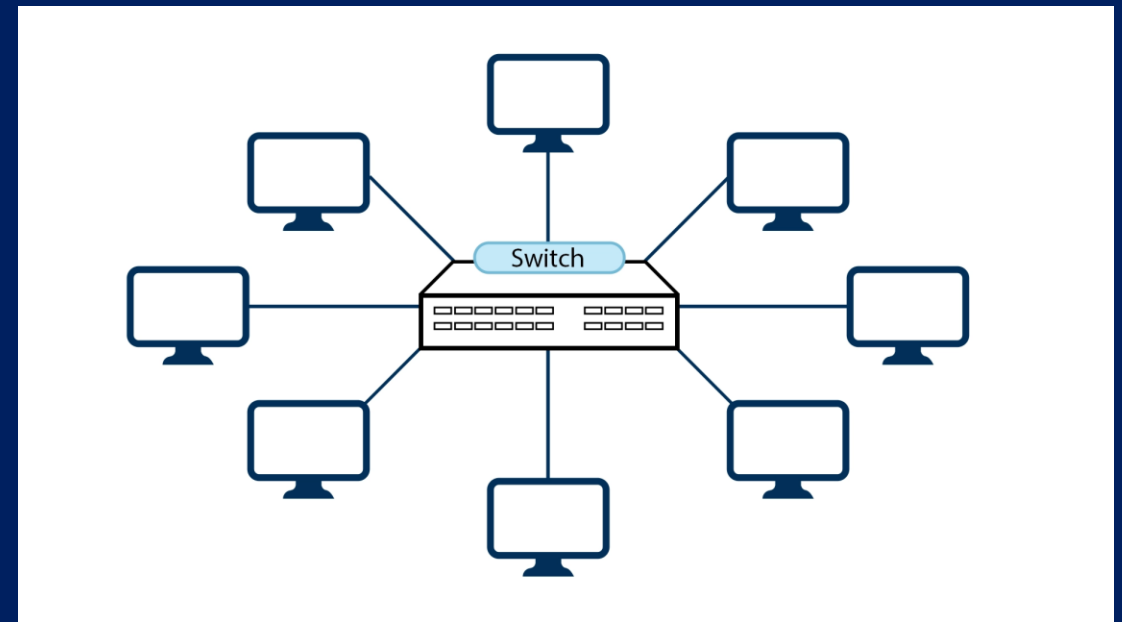


Figure 24. The role of the switch device

2.1.2.2. Router

- A router is a device that directs data packets between different networks (e.g., between your local home network and the Internet).
 - Connects local networks to external ones (LAN → WAN).
 - Determines the best path for data transmission.
 - Can also provide Wi-Fi functionality.

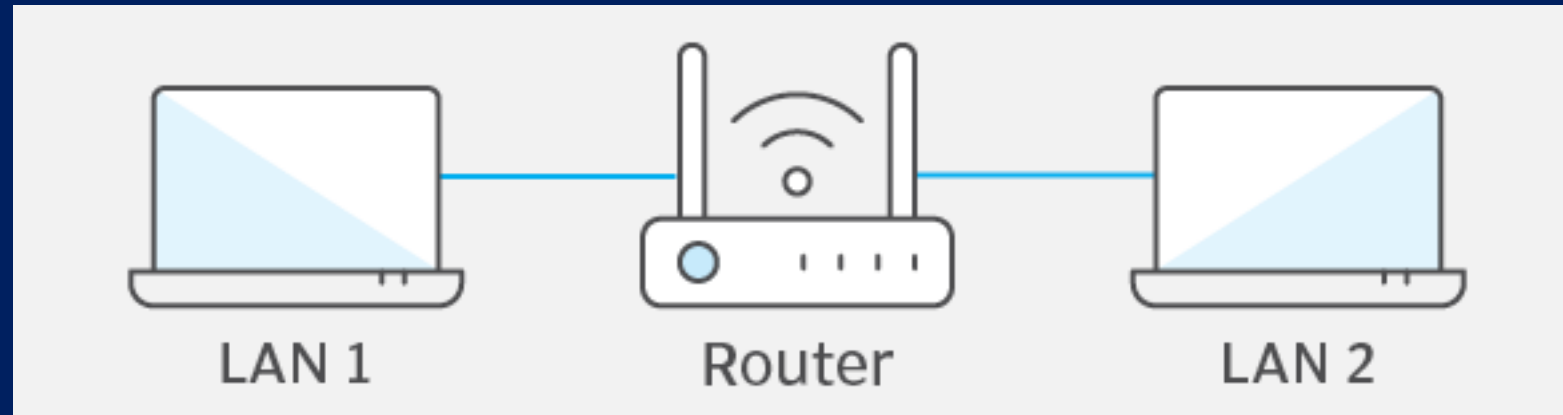


Figure 25. The role of the router device

2.1.2.3. Modem

- A **modem** (modulator-demodulator) converts digital data from computers into analog signals that can travel over telephone or cable lines — and vice versa.
- **The main roles of the modem are:**
 - Provides access to the Internet from your Internet Service Provider (ISP).
 - Translates between your network and the external world.

Example: The box your ISP installs at home is your modem — it's what connects your house to the Internet.

2.1.2.4. Fiber Optics

- Definition:

Fiber optic cables are transmission media that carry data as pulses of light through glass or plastic fibers.

- Functions:

- Provide high-speed Internet and long-distance communication.
- Offer greater bandwidth and reliability than traditional copper cables.

Example: Used by ISPs to connect cities and by universities for high-speed data transfer.

2.1.2.5. Wi-Fi (Wireless Communication)

Definition:

Wi-Fi is a wireless networking technology that allows devices to connect to a network or the Internet without physical cables.

- **Functions:**
 - Provides mobility and flexibility for users.
 - Connects smartphones, laptops, and IoT devices.
- Example: Campus Wi-Fi networks that let students connect anywhere without plugging in.