Chapter 9

OUTPUT DEVICES

Definition

- Output devices are hardware devices used to present processed data from a computer to the user.
- Output can be displayed visually, printed on paper, or produced as sound.
- Output devices convert digital data into human-understandable form.

1.1 Display Devices

Definition of Display Devices

- A display device presents output visually on a screen.
- The output shown on a display device is temporary and is called **soft copy**.
- Soft copy disappears when the device is turned off.

Naming of Display Devices

- A display device for a **desktop computer** is called a **monitor**.
- A display device built into a **laptop, tablet, smartphone, or smartwatch** is called a **display screen**.

Uses of Display Devices

- Used with computers and mobile devices.
- Built into handheld gaming devices.
- Used in home entertainment devices such as televisions and remote controls.
- Found in kitchen appliances.

1.2 Display Device Haracteristics

Color vs. Monochrome Displays

- Display images are formed by tiny dots called **pixels**.
- A pixel is the smallest colorable area on a screen.
- **Monochrome displays**:
    - Each pixel can display only two colors.
    - Common colors are black and white.
- **Color displays**:
    - Each pixel displays a combination of **Red, Green, and Blue (RGB)**.
    - RGB combinations allow millions of colors.
- Most modern display devices are color displays.

• Used in e-book readers (e-readers). • Used in digital signs, e-posters, and video walls.	

CRT Monitors vs. Flat-Panel Displays

CRT (Cathode Ray Tube) Monitors	Flat-Panel Displays
• CRT monitors were commonly used in older computers. • They use an **electron gun** inside a glass tube. • The electron beam strikes phosphor dots to form images. CRT monitors are large, bulky, and heavy. They consume more power and space.	• Flat-panel displays are thin and lightweight. • They are used in modern computers and TVs. • Common in laptops, smartphones, and tablets. • They consume less power than CRT monitors.

Size and Aspect Ratio
 	
• Display size is measured diagonally from one corner to the opposite corner.
• **Common display sizes:**
  o Desktop monitors: 19 to 30 inches
  o Laptops: 14 to 17 inches
  o Netbooks: 10 to 11 inches
  o Tablets: 7 to 11 inches
• **Aspect ratio** describes screen width to height.
• **16:9** is a widescreen aspect ratio.
• **4:3** is an older, traditional aspect ratio.
 	
Screen Resolution
 	
• Screen resolution refers to the total number of pixels on a display screen.
	Video Adapters, Interfaces, and Ports
	
	• A **video card (graphics card)** is responsible for generating images.
	• The graphics card contains a **GPU (Graphics Processing Unit)**.
	• GPU performs image rendering tasks.
	• The video card determines:
	  o Screen resolution options, Color depth (bit depth)
	  o Number of monitors supported
	  o Types of connectors and ports
	• **VRAM (Video RAM)** stores image data.
	• Some systems use shared system RAM as video memory.
	• Video cards include cooling fans to prevent overheating.

- Higher resolution means more pixels and sharper images.
- Lower resolution means fewer pixels and less detail.
- Common examples:
  - 1920×1080 (high resolution)
  - 1024×768 (low resolution)

Users can change screen resolution based on preference

Wired vs. Wireless Displays

Wired Displays

- Wired displays are connected using physical cables.
- They provide stable and reliable connections.
- Common in traditional desktop computers.

Wireless Displays

- Wireless displays connect without cables.
- They use **Wi-Fi, Bluetooth, or special wireless standards**.
- Reduce cable clutter.
- Used in smart TVs, e-readers, and digital photo frames.

Wearable Displays

- Wearable displays are designed to be worn on the body.
- They can project images from smartphones or the Internet.
- Control buttons are usually located on the side.
- Many wearable displays support **Augmented Reality (AR)**.
- AR overlays digital information on real-world views.

Example: Smart glasses (e.g., GoogleClass).

PRINTERS

Definition of Printers

- Printers produce output on paper.
- Printed output is called **hard copy**.
- Hard copy is permanent.
- Printers are used in homes, schools, and offices.

2.1 TYPES OF PRINTERS

Impact Printers	Non-Impact Printers
- Impact printers print by physically striking the paper. - They use an inked ribbon. - Example: **Dot-Matrix Printer**. - They are noisy during operation. - Commonly used for: - Multipart forms - Invoices - Packing slips - Receipts	- Non-impact printers do not touch the paper. - They produce high-quality output. - They operate quietly. - Common types: - Laser printers - Inkjet printers - Widely used in homes and offices.

2.2 PRINTER CHARACTERISTICS

Color vs. Black-and-White Printers	Print Speed
- Color printers use **Cyan, Magenta, Yellow, and Black (CMYK)** inks or toner. - Color printers can apply colors in one or multiple passes. - Black-and-white printers use only black ink or toner. - Color printers are suitable for photos and graphics.	- Print speed is measured in **PPM (Pages Per Minute)**. - Some printers also use **IPM (Images Per Minute)**. - Printing images takes longer than printing text. - Color printing takes longer than black-and-white printing.

- Black-and-white printers are ideal for text documents.

Print Resolution

- Print resolution is measured in **DPI (Dots Per Inch)**.
- Higher DPI produces sharper and clearer output.
- Resolution guidelines:
    - 300 DPI for general printing
    - 600 DPI for high-quality documents
    - 2400 DPI for professional printing

Personal vs. Network Printers

- **Personal printers**:
    - Connected to one computer
    - Usually connected via USB
- **Network printers**:
    - Connected to a network
    - Used by multiple users
    - Wired or wireless
- Enterprise printers support:
    - High-volume printing
    - Duplex printing
    - Stapling and collating

AUDIO OUTPUT

- Audio output includes sound produced by a computer.
- **Audio output consists of:**
    - Voice
    - Music
    - Sound effects
- **Audio output devices include:**
    - Speakers
    - Headphones
    - Subwoofers
- **Used for:**
    - Games
    - Videos
    - Web conferencing
    - Multimedia applications

Chapter 10

SOFTWARE

Definition of Software

- Software is a collection of programs and instructions.
- Software tells the computer how to perform tasks.

4.1 TYPES OF SOFTWARE

System Software	Application Software
- Controls computer hardware. **Includes:** - Operating systems - Utility programs - Enables the computer to boot. - Manages files, memory, and devices. - Provides security and networking support.	- Designed for specific user tasks. **Examples include:** - Word processors - Web browsers - Games - Media players - Installed by users. - Helps users perform work efficiently.

5. OPERATING SYSTEM (OS)

Definition
- An operating system is a collection of programs.
- It manages computer activities.
- It coordinates hardware and software resources.
- It is the most important software in a computer.

5.1 FUNCTIONS OF OPERATING SYSTEM

Interfacing with Users • OS translates user commands into machine language. • OS provides feedback from hardware to users. • User interface types: ○ Graphical User Interface (GUI) Command Line Interface (CLI)	**Booting the Computer** • Booting is the process of starting a computer. • The **kernel** is loaded into memory first. • Startup programs are launched. • Hardware devices are detected and configured.
Managing Network Connections • OS manages wired and wireless networks. • Detects available networks. • Connects and reconnects automatically. • Troubleshoots network issues.	**Configuring Devices** • OS uses **device drivers** to communicate with hardware. • Drivers help printers, monitors, and keyboards work properly. • New devices are detected automatically. • Drivers can be installed from CDs or websites.
Managing Resources and Jobs • OS manages memory, storage, and processing power. • Schedules tasks and jobs. • Prevents system overload. • Closes unresponsive programs if needed.	**File Management** • OS organizes files and folders. • Uses a hierarchical structure. • **Root directory** is the top-level folder. • Files have names and extensions. • Files can be opened, moved, copied, renamed, and deleted.
Security • OS protects data and resources. • Uses passwords and biometric authentication. • Includes firewalls. • Installs security patches. • Prevents unauthorized access.	

TYPES OF OPERATING SYSTEMS

DOS (Disk Operating System)

- **(Definition)** DOS was the dominant operating system in the 1980s and early 1990s for microcomputers.
- **(Interface)** It mainly used a **command-line interface**, later a menu-driven interface.
- **(Types)** Two main types: **PC-DOS (IBM)** and **MS-DOS (Microsoft)**.
- **(Status)** DOS is now **obsolete** but Windows can still run DOS commands via Command Prompt.

Microsoft Windows

- **(Definition)** Windows is the most widely used personal operating system with about **90% market share**.
- **(Early Versions)** Windows 1.0 to 3.11 were graphical environments for DOS, not full OS.
- **(Modern Versions)** Windows 95, 98, Me, NT, 2000, XP, Vista, 7, 8, and **Windows 10**.
- **(Windows 10)** A **universal operating system** for all devices (PCs, tablets, phones, servers).

OS X (Mac Operating System)

- **(Definition)** OS X is Apple's operating system based on **UNIX**.
- **(Features)** Supports multitasking, multiprocessing, 64-bit processors, and multimedia.
- **(Interface)** Includes **Safari browser**, Dock, and Notification Center.
- **(Continuity)** Allows calls and messages between iPhone and Mac.

UNIX

- **(Definition)** UNIX was developed in the late 1960s at AT&T Bell Labs.
- **(Type)** It is a **multiuser and multitasking** operating system.
- **(Flexibility)** Runs on many types of computers and devices.
- **(Limitation)** More expensive and harder to maintain than other OS.

Linux

- **(Definition)** Linux was developed by **Linus Torvalds (1991)** and is open-source.
- **(Interface)** Uses both command line and graphical user interface.
- **(Availability)** Free to download and can be sold as commercial versions.
- **(Advantages)** Low cost, customizable, fast performance, and low hardware requirements.

Software License (EULA)

- **(Definition)** Buying software means buying a **license**, not the software itself.
- **(EULA)** End User License Agreement defines usage conditions.
- **(Installation)** Must be accepted during software installation.
- **(Apps)** Mobile apps use **terms of use agreements**.

Computer Network

- **(Definition)** A network connects computers and devices to share data and resources.
- **(Purpose)** Allows communication, file sharing, and hardware sharing.
- **(Convergence)** Data and voice are sent over the same networks today.
- **(Range)** From small private networks to the Internet.

Networking Applications

Internet

- Largest network in the world.
- Used for e-mail, shopping, entertainment, and information.

Telephone Service

- Uses **POTS** (plain old telephone service).
- Used for landline calls and some Internet connections.

Mobile Phones

- Use wireless networks for communication.

TV & Radio Broadcasting

- Used for delivering TV and radio content.

GPS

- Uses 24 satellites for location and navigation.

Network Characteristics

Wired vs Wireless Networks

- **Wired:** Uses physical cables.
- **Wireless:** Uses radio signals.
- Wired used in schools and offices.

Wireless used in homes and mobile networks.

# Network Topologies	# Network Size & Coverage
Star Topology • Uses a central device. • If central device fails, network fails. **Bus Topology** • Uses a central cable. • If cable fails, network fails. **Mesh Topology** • Uses multiple paths. • Network works even if one device fails.	**PAN (Personal Area Network)** • Small network for personal devices. • Example: phone, laptop, smartwatch. **LAN (Local Area Network)** • Covers home, office, or school. • Shares files, printers, Internet. **MAN (Metropolitan Area Network)** • Covers a city or large area. • Used for municipal Wi-Fi. **WAN (Wide Area Network)** • Covers large geographical areas. • Internet is the largest WAN.

Intranet & Extranet

- **Intranet:** Private network for employees.
- Used for internal communication and documents.
- **Extranet:** Accessible to authorized outsiders.
- Both are secured and restricted networks.

VPN (Virtual Private Network)

- **(Definition)** A secure private path over the Internet.
- **(Purpose)** Allows safe remote access to company network.
- **(Security)** Uses tunneling and encryption.
- **(Benefit)** Protects data on public Wi-Fi hotspots.

Chapter 12

Internet of Things (IoT)

- **(Definition)** The **Internet of Things (IoT)** connects everyday physical objects to the Internet so they are **uniquely identifiable** and can communicate (**Machine-to-Machine, M2M**).
- **(Examples)** Smart homes, fitness devices, healthcare monitors, home automation systems, smart farms, and traffic lights.
- **(Benefits)** Increases convenience, saves money, improves control, and helps businesses through automation and fast feedback.
- **(Concern)** The main issue is **security and privacy**, especially protection from hackers and data leaks.

Malware

- **(Definition)** **Malware** is any type of **malicious software**.
- **(Purpose)** Designed to damage programs, delete files, erase hard drives, or slow computers.
- **(Activation)** Damage may occur immediately after infection or when a specific condition is met.
- **(Impact)** Affects system performance and data security.

Computer Virus

- **(Definition)** A **computer virus** installs without user permission, changes computer operation, and **replicates itself**.
- **(Spread)** Often hidden in software, games, videos, and music files.
- **(Sources)** Commonly spread through web downloads and **P2P services**.
- **(Effect)** Infects new media and causes system damage.

Computer Worm

- **(Definition)** A **computer worm** spreads by sending copies of itself through a network.
- **(User Action)** Usually does **not require user action** to infect devices.
- **(Zero-day attacks)** Exploits new security weaknesses before patches are available.

- **(Example)** The **Conficker worm (2008)** infected millions of computers.

Trojan Horse

- **(Definition)** A **Trojan horse** appears as a legitimate program but infects the device when installed.
- **(Types)** Includes **ransomware** (locks or encrypts files) and **spyware** (steals information).
- **(Limitation)** Cannot replicate itself.
- **(Spread)** Spread through Internet downloads and e-mail attachments.

Protecting Against Computer Sabotage

- **(Security Software)** Using **up-to-date security software** is essential.
- **(Antivirus)** Protects against viruses, worms, Trojans, and other malware.
- **(Antispyware)** Detects and removes spyware; mobile security protects smartphones.
- **(Network Safety)** Schools and businesses may check devices before allowing network access.

Health Risks

- **(Physical Risks)** CTS, RSIs, CVS, eye strain, backaches, and headaches.
- **(Ergonomics)** Designing workspaces to fit the user reduces injury.
- **(Prevention)** Good posture, rest breaks, and ergonomic equipment help prevent problems.
- **(Emotional Risks)** Stress, burnout, information overload, and Internet addiction.