UNIT 5

Software System

Student Learning Outcomes

By the end of this chapter, you will be able to:

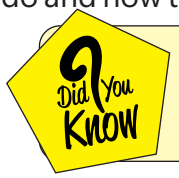
1. Identify and explain the significance of system software and application software.
2. Understand the role and main functions of system software.
3. Explain how operating systems manage hardware resources, provide user interfaces, and run applications.
4. Describe how utility software enhances system performance, security, and maintenance.
5. Understand how device drivers facilitate communication between hardware devices and the operating system.
6. Recognize the main functions of commonly used application software, such as word processing, spreadsheet, presentation, and graphic design applications.
7. Discuss the uses and significance of various application software in different domains (e.g., business, education, graphics design, etc.).
8. Differentiate between system software (e.g., operating systems, utility software, device drivers) and application software in terms of their roles and functions.
9. Proficiently use prominent system software including operating systems, utility software, and device drivers.
10. Navigate the user interface, manage files, and perform system tasks using operating systems.
11. Utilize utility software and tools for optimizing system performance and maintaining security. Install, update, and troubleshoot device drivers for various hardware components
12. Use commonly used application software to perform specific tasks or create content (e.g., word processing, spreadsheets, presentations).
13. Identify appropriate software tools for specific tasks, taking into account their functions and capabilities.
14. Use application software for productivity, creativity, and communication purposes.
15. Demonstrate and differentiate between system software and application software, understanding their roles within a computer system.

Introduction

Software is an integral part of any computing system, acting as the intermediary between the user and the hardware. In this chapter, we will explore the significance of system software and application software, understanding their roles, functions, and applications in various domains. By the end of this chapter, students will be proficient in identifying, using, and differentiating between different types of software.

5.1 Software

Software is a collection of programs and instructions that tell a computer what to do and how to do. Without software, computers would be useless machines.



The first computer virus, called "Creeper," was created in 1971 as an experimental self-replicating program. It simply displayed the message, "Fm the creeper, catch me if you can!"

5.1.2 Types of Software

5.1.2.1 System Software

System software is designed to manage the system resources and provide a platform for application software to run. It acts as a bridge between the hardware and the user applications. Here are some examples:

- Operating Systems: Examples include Microsoft Windows, macOS, and Linux.
- Device Drivers: These include printer drivers, graphics card drivers, and sound card drivers.
- Utility Programs: Examples are antivirus software, disk cleanup tools, and backup software.

5.1.2.2 Application Software

Application software is designed to help users perform specific tasks. These programs are built to fulfill user needs and are typically more varied than system software. Examples include:

- Word Processors: Such as Microsoft Word and Google Docs.
- Web Browsers: Such as Google Chrome, Mozilla Firefox, and Safari.
- Games: Such as Minecraft, Fortnite, and Among Us.
- Media Players: Such as VLC Media Player and Windows Media Player.

5.1.2.3 Differentiating Between System Software and Application Software

- **Purpose:** System software manages and operates computer hardware, making it possible for application software to run. Application software helps the user to perform specific tasks.
- **Examples:** System software includes operating systems and device drivers. Application software includes word processors, web browsers, and games.
- **Installation:** System software is usually pre-installed on a computer, while application software can be installed by the user as needed.

Always keep your system software updated to ensure your computer runs smoothly and is protected from security threats.

Tidbits

Class activity

Make a list of all the software you use on your computer or tablet. Categorize them into system software and application software. Discuss with your classmates which software you find most useful and why.

5.2 Introduction to System Software

System software is essential for the operation of a computer system, acting as an intermediary between the hardware and the user applications. It ensures that the hardware components of a computer work together efficiently and provides a stable environment for application software to run. Here, we discuss the role and main functions of system software in detail.

5.2.1 Operating System

An Operating System (OS) is a type of system software that manages all the hardware and software on a computer. It acts as an intermediary between the computer hardware and the user applications. The operating system ensures that different programs and users running on a computer do not interfere with each other. It also provides a stable and consistent way for applications to interact with the hardware without having to know all the details of the hardware. Some most commonly used operating systems are:

Windows: A popular OS for personal computers developed by Microsoft. It has a start menu, taskbar, and windows for applications. See Figure 5.1.

macOS: An OS for Apple's Mac computers. It has a dock at the bottom of the screen and unique features like Mission Control. See Figure 5.2.

Linux: An open-source OS that is used for everything from servers to desktop computers. It can look different depending on the distribution (version) you use. See Figure 5.3.

Android: An OS for smartphones and tablets, developed by Google. It is used on many different devices from various manufacturers.

iOS: An OS for iPhones and iPads, developed by Apple. It is known for its smooth performance. Let's study some key functions of an operating system.

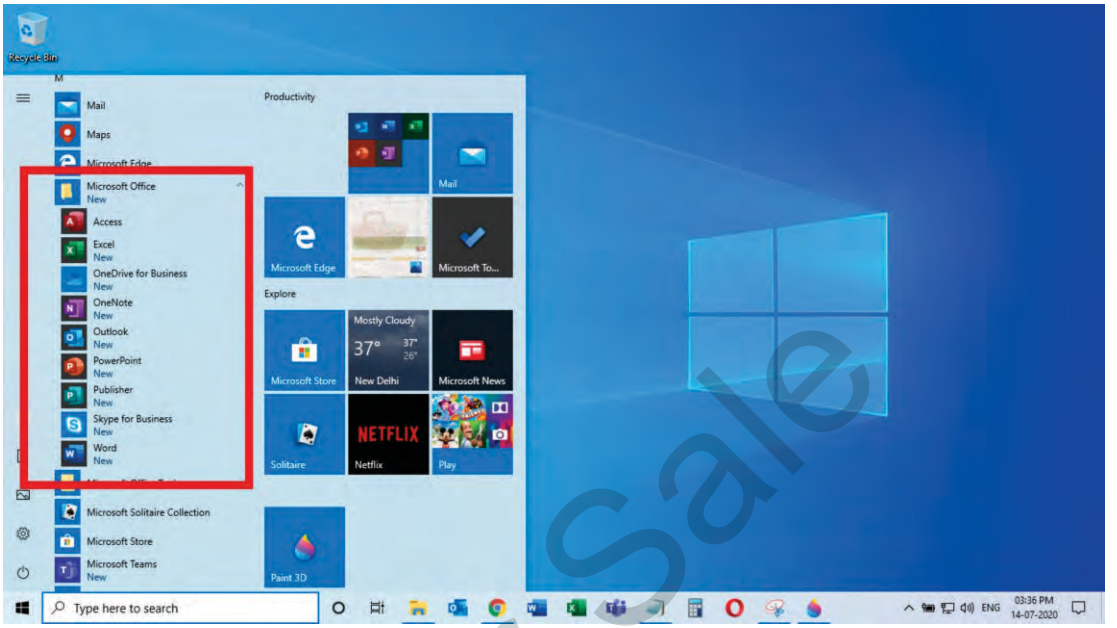


Figure 5.1: Screenshot of a Windows desktop

5.2.1.1 Managing Hardware Resources

One of the primary functions of an operating system is to manage the hardware resources of a computer system. This includes the CPU, memory, disk drives, and peripheral devices such as printers and keyboards. The OS ensures that each application gets the necessary resources to function correctly without interfering with other applications.

Example: When you open a web browser while listening to music on your computer, the operating system allocates CPU time and memory to both the web browser and the music player. It ensures that both applications run smoothly by managing the resources effectively.

5.2.1.2 Providing a User Interface

The operating system provides a User Interface (UI) that allows users to interact with the computer.

There are two main types of user interfaces:

- Graphical User Interfaces (GUIs)
- Command-Line Interfaces (CLIs).

Graphical User Interface (GUI): A GUI allows users to interact with the computer using visual elements such as windows, icons, and menus. This type of interface is user-friendly and intuitive, making it easy for users to navigate and perform tasks.

Example: Microsoft Windows and macOS are operating systems that use GUIs. Users can click on icons to open applications, drag and drop files to move them, and use menus to access different functions.

Command-Line Interface (CLI): A CLI requires users to type text commands to perform specific tasks. This interface is more flexible and powerful, but it can be more difficult for beginners to use.

Figure 5.2: Screenshot of a macOS desktop

Example: Linux and Disk Operating System (DOS) provide CLIs. Use can type commands to copy files, run programs, and configure system settings.

5.2.1.3 Running Applications

The operating system is responsible for running applications on a computer. It loads applications into memory, allocates the necessary resources, and manages their execution. The OS also ensures that applications do not interfere with each other and that they run efficiently.

Example: When you open a word processor like Microsoft Word, the operating system loads the application into the computer's memory and allocates CPU time for it to run. If you open multiple applications, the OS manages the distribution of resources so that all applications can run simultaneously without performance issues.

Tidbits

To keep your operating system running smoothly, regularly update it to the latest version and perform routine maintenance tasks such as disk cleanup and virus scans.

Class activity

Explore the task manager (Windows) or activity monitor (Mac) on your computer. Identify the different running applications and observe how much CPU and memory each application is using. Discuss why the operating system's role in managing these resources is crucial for the computer's performance.

5.2.2 Utility Programs

Utility programs are essential components of system software that enhance the functionality of a computer system. They perform various tasks to ensure smooth operation and efficient management of hardware, software, and data. Here are some common utility programs along with their functionalities in real-life scenarios.

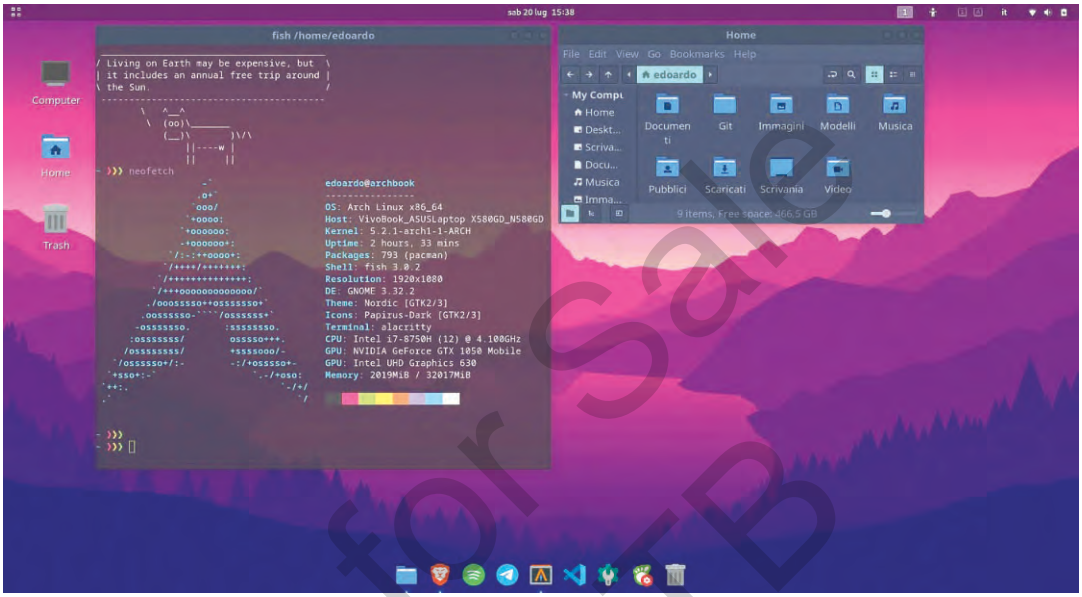


Figure 5.3: Screenshot of a Linux desktop

5.2.2.1 Disk Cleanup

Functionality: Disk Cleanup scans your hard drive for temporary files, cached files, and other unnecessary items that can be safely deleted.

Real-life Scenario: After using your computer for a while, you notice it's running slower than usual. Running Disk Cleanup can help reclaim disk space, potentially improving performance.

5.2.2.2 Antivirus Software

Functionality: Antivirus software scans files and incoming data for known viruses and malware signatures. It also provides real-time protection to prevent virus attacks.

Real-life Scenario: You receive an email attachment from an unknown sender. Before opening it, you run your antivirus software to scan for any potential threats, ensuring your computer remains safe.

5.2.2.3 Backup Software

Functionality: Backup software schedules regular backups of files and folders to external drives, cloud storage, or network locations. It allows for full system backups or selective file backups.

Real-life Scenario: You accidentally delete an important presentation file. Using backup software, you retrieve the latest backup version of the file, ensuring minimal disruption to your work.

File compression tools reduce file size to save storage space and make file transfer faster.

Tidbits

5.2.2.4 File Compression Tools

Functionality: File compression tools compress one or multiple files into a single archive format (e.g., ZIP, RAR) while preserving data integrity. They also provide options for encryption and password protection.

Real-life Scenario: You need to send a large folder of high-resolution photos via email. Using a file compression tool, you create a ZIP archive to reduce file size, making it easier and quicker to upload and send.

These utility programs are essential for maintaining the efficiency, security, and reliability of your computer system. Understanding their functionalities can help you better manage and optimize your computing experience.

5.2.3 Device Drivers

Device drivers facilitate communication between hardware devices and the operating system, ensuring that devices function correctly. Imagine your computer as a superhero with many powers, but sometimes it needs help to talk to its gadgets, like a printer, keyboard, or mouse. Here's where device drivers come in. A device driver is like a translator between the computer and its gadgets

Printer Driver: Helps the computer send the correct signals to the printer, so it can print documents.

- Graphics Card Driver: Makes sure the computer can display images and videos correctly on the screen.

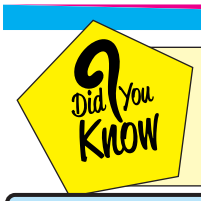
How Device Drivers Work

1. **Installation:** When you connect a new device to your computer, you often need to install a driver.
2. **Communication:** The driver acts as a translator, converting general instructions from the computer into specific instructions that the device can understand.
3. **Operation:** Once installed, the driver helps the computer and the device to work together smoothly.

Real-Life Analogy: TV Remote Control

Think of a device driver like a TV remote control:

- **TV (Device):** It can change channels, adjust the volume, and more, but it needs instructions.
- **Remote Control (Driver):** Sends the correct signals to the TV to perform these actions.
- **You (Computer):** You decide what you want to watch or adjust and use the remote control to tell the TV.



A Plug and Play (PnP) device automatically configures itself when connected to a computer, simplifying installation and use.

When installing a new device, always check for the latest driver updates to ensure compatibility and optimal performance.

Tidbits

The first operating system was created in the 1950s for IBM computers and was called GM-NAA I/O.

5.3 Application Software

Application software refers to programs designed to perform specific tasks for users, ranging from productivity and creativity to entertainment and education. These software applications utilize the capabilities of the underlying operating system and hardware to fulfill user needs effectively. Here are some common types of application software along with their functionalities and class activities:

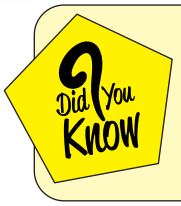
5.3.1 Commonly used application software

5.3.1.1 Word Processing Software

Word processing software is a type of application software used for creating, editing, formatting, and printing documents. These software programs are essential tools for writing letters, reports, essays, and other text-based documents. Word processors offer a variety of features that enhance the writing and editing process, making it easier for users to produce professional-quality documents.

Examples of Word Processing Software:

- **Microsoft Word:** Available on Windows and macOS, Microsoft Word is one of the most widely used word processors. It offers a range of features including text formatting, spell check, grammar check, and the ability to insert images, tables, and charts.
- **Google Docs:** A web-based word processor available on any operating system with internet access. Google Docs allows for real-time collaboration, where multiple users can edit a document simultaneously. It also integrates with other Google services.
- **Apple Pages:** Available on macOS and iOS, Apple Pages provides a user-friendly interface with powerful tools for creating beautiful documents. It includes templates, design tools, and easy integration with other Apple products.
- **LibreOffice Writer:** Available on Windows, macOS, and Linux, LibreOffice Writer is a free and open-source word processor. It offers a robust set of features similar to Microsoft Word, making it a great alternative for users who prefer open-source software.



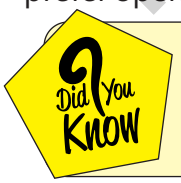
AI-based tools like Grammarly and Microsoft Editor are revolutionizing word processing by providing advanced grammar, style, and tone suggestions. These tools help users write more clearly and effectively by offering real-time feedback and corrections.

5.3.1.2 Spreadsheet Software

Spreadsheet software is a type of application software used for organizing, analyzing, and storing data in tabular form. Spreadsheets consist of a grid of cells arranged in rows and columns, where users can input data, perform calculations, and create charts. This software is essential for tasks such as budgeting, financial analysis, data management, and statistical analysis.

Examples of Spreadsheet Software:

- **Microsoft Excel:** Available on Windows and macOS, Microsoft Excel is one of the most widely used spreadsheet programs. It offers powerful features including complex formulas, pivot tables, and a variety of chart options.
- **Google Sheets:** A web-based spreadsheet available on any operating system with internet access. Google Sheets allows for real-time collaboration, where multiple users can edit a spreadsheet simultaneously. It also integrates with other Google services.
- **Apple Numbers:** Available on macOS and iOS, Apple Numbers provides a user-friendly interface with strong visualization tools for creating visually appealing spreadsheets. It includes templates and easy integration with other Apple products.
- **LibreOffice Calc:** Available on Windows, macOS, and Linux, LibreOffice Calc is a free and open-source spreadsheet program. It offers a robust set of features similar to Microsoft Excel, making it a great alternative for users who prefer open-source software.



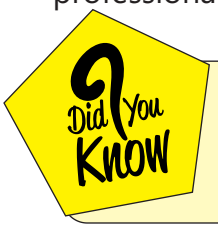
AI-based tools in spreadsheet software, such as Microsoft's Ideas in Excel and Google Sheets' Explore feature, help users analyze data by providing insights, suggesting formulas, and creating charts automatically.

5.3.1.3 Graphic Design Software

Graphic design software is a type of application software used for creating, editing, and managing visual content. These programs provide tools for drawing, painting, photo editing, and creating illustrations, making them essential for designers, artists, and anyone involved in visual media. Graphic design software is used in various industries, including advertising, web design, publishing, and multimedia production.

Examples of Graphic Design Software:

- **Adobe Photoshop:** Available on Windows and macOS, Adobe Photoshop is one of the most popular graphic design programs. It offers powerful tools for photo editing, digital painting, and graphic design.
- **Adobe Illustrator:** Available on Windows and macOS. Adobe Illustrator is a vector graphics editor used to create logos, illustrations, and scalable graphics that maintain quality at any size.
- **CorelDRAW:** Available on Windows and macOS, CorelDRAW is a vector graphics editor known for its user-friendly interface and robust feature set, ideal for creating professional graphics and layouts.
- **GNU Image Manipulation Program (GIMP):** Available on Windows, macOS, and Linux, GIMP is a free and open-source graphic design program. It offers many features similar to Adobe Photoshop, making it a great alternative for users who prefer open-source software.
- **Canva:** A web-based graphic design tool accessible on any operating system with internet access. Canva provides an easy-to-use interface with a wide range of templates and design elements, making it perfect for beginners and professionals alike.



AI-based tools in graphic design software, such as Adobe Sensei in Photoshop and Illustrator, help designers by automating repetitive tasks, suggesting design elements, and enhancing images with advanced algorithms.

Summary

- Software systems include all the programs and applications that enable us to perform specific tasks on a computer.
- The primary objective of software as a system is to manage hardware resources and provide a platform for applications to run smoothly.
- System software manages the hardware and basic system operations, while application software helps users perform specific tasks.
- The main functions of system software include managing hardware resources, providing a user interface, and running applications.
- Utility software enhances system performance and ensures security and maintenance, and device drivers, which facilitate communication between hardware devices and the operating system.
- In business, application software streamlines operations, improves productivity, and enhances communication.
- In education, application software enhances the learning experience, improves administrative efficiency, and facilitates communication between teachers, students, and parents.

EXERCISE

Multiple Choice Questions (MCQs)

1. What is the primary function of an operating system?
   (a) To create documents
   (b) To manage hardware resources and provide a user interface
   (c) To perform calculations (d) To design graphics
2. Which software is used to enhance system performance and security?
   (a) Operating system (b) Utility software
   (c) Application software (d) Device drivers
3. What role do device drivers play in a computer system?
   (a) Manage files
   (b) Facilitate communication between hardware devices and the operating system
   (c) Create presentations
   (d) Enhance graphics performance
4. Which of the following is an example of application software?
   (a) Microsoft Word (b) BIOS (c) Disk Cleanup (d) Device Manager
5. What is the main purpose of a spreadsheet software?
   (a) To edit text documents (b) To organize and analyze data
   (c) To create visual content (d) To enhance system security
6. How does utility software differ from application software?
   (a) Utility software manages hardware, while application software performs specific tasks for users.
   (b) Utility software creates documents, while application software manages hardware.
   (c) Utility software performs specific tasks for users, while application software manages hardware.
   (d) Utility software is free, while application software is paid.
7. Which type of software would you use to design a logo?
   (a) Operating system (b) Spreadsheet software
   (c) Graphic design software (d) Utility software
8. What is the function of system software?
   (a) To facilitate communication between hardware and software
   (b) To perform specific tasks for the user
   (c) To create visual content
   (d) To organize and analyze data
9. Why are operating system updates important?
   (a) They increase screen brightness (b) They add more fonts
   (c) They enhance security and fix bugs (d) They improve battery life

10. What is a common task you can perform using word processing software?
    (a) Create and edit text documents
    (b) Manage hardware resources
    (c) Enhance system performance
    (d) Organize and analyze data

Short Questions

1. Define system software and provide two examples.
2. Explain the primary functions of an operating system.
3. What is utility software and why is it important?
4. Describe the role of device drivers in a computer system.
5. Differentiate between system software and application software with examples.
6. What are the main functions of spreadsheet software?
7. How can graphic design software be used in the field of education?
8. What is the significance of data backups and how can they be performed?

Long Questions

1. Discuss the importance of system software in a computing system.
2. Describe the roles of operating systems, utility software, and device drivers, providing examples of each.
3. Explain the differences between system software and application software.
4. Describe the process of using utility software to optimize system performance and maintain security. Provide detailed steps and examples of common utility tools.
5. Explain how to install, update, and troubleshoot device drivers for hardware components.
6. Discuss the main functions of commonly used application software, such as word processing, spreadsheet, presentation, and graphic design applications.