WEEK 1 - PART 3

HARDWARE VS SOFTWARE

LINNAEUS UNIVERSITY

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HARDWARE VS SOFTWARE

What is a computer?
A computer is an electronic device capable of processing and storing data according to instructions. Computers consist of hardware components that work together with software - such as the operating system.
Computers come in various forms, from desktop computers to laptops, tablets, and smartphones to embedded systems. Technically, if you have a Smart TV, that is a computer. Software, on the other hand, runs on hardware.

At its core, a computer is built with general-purpose hardware capable of performing basic operations, such as arithmetic calculations and data storage. The hardware does not inherently know what specific tasks it should perform.

Instead, computers are designed to be programmable, relying on software instructions - code - to dictate their operations.

Programmability refers to the ability of a computer to be directed or controlled through code, allowing its behavior to be changed according to new requirements or needs. This capability enables the modification or creation of software applications to control the computer's operations. Unlike specialized hardware that is designed to perform a single, fixed function, a programmable computer can execute a diverse array of tasks depending on the instructions it receives.

By writing code, users can direct the computer on how to handle specific functions or processes. In each case, the same computer hardware is utilized, but the software code dictates how it performs these specific tasks.

This ability to reprogram and customize tasks based on code, independent of changes to the hardware, is what makes computers powerful and indispensable tools across various domains.

WHAT IS HARDWARE?

Hardware refers to the physical components of a computer system that can be seen and touched. **It encompasses all the physical components that, when combined, make up a computer or electronic device.**
We will focus on the essential aspects to provide an overview and help you feel confident when reviewing technical specifications, researching information online, or discussing the hardware of a computer in general.

PROCESSORS, CPUS & CORES

Processor is a more general term that can refer to any component or unit in a computer that processes data. While it commonly refers to the CPU, it can also include other types of processing units like GPUs (Graphics Processing Units) in some contexts.

The Central Processing Unit, CPU is the brain of the computer.
It controls one or more cores, which are individual processing units responsible for executing instructions. The CPU manages and coordinates tasks by directing the cores on how to execute instructions, and manages data flow between the cores and other computer components.
While the cores handle the actual processing of tasks, they rely on the CPU to coordinate their operations and integrate with the rest of the system.
The CPU has a cache, which is a small, fast memory that stores frequently used data.

Cores are composed of billions of microscopic transistors, which act as switches to control the flow of electrical signals and enable complex computations.

Modern CPUs often have multiple cores, enabling them to perform several tasks at once. Each core can handle multiple tasks simultaneously using a technology called multithreading, which lets a single core act like multiple virtual cores. This means a CPU can manage as many tasks as there are cores and even more if it supports multithreading.

GRAPHICS CARDS & GPU

The graphics card is a key component that helps your computer render and display images, videos, and games.

It is an add-in board (AIB), meaning it is a separate piece of hardware that you can install into your computer. It fits into a specific slot on the computer's motherboard – a large circuit board that connects and allows communication between all the computer's parts.
This slot makes it easy to add or replace the graphics card as needed.

Inside the graphics card is the **Graphics Processing Unit (GPU)**, which is the main component and a specialized processor designed specifically for handling graphics tasks.

The GPU handles the heavy lifting of graphics processing, distinguishing itself from the CPU by being optimized for rendering - the process of generating visual images or animations from detailed 2D or 3D digital information.

The GPU works with its own memory, known as video RAM (VRAM), to store and manage visual data efficiently. The graphics card also includes connectors for monitors and cooling systems to keep it operating smoothly.

The CPU sends digital data to the graphics card, where the GPU processes this data, renders images and videos, and then converts the processed information into pixels displayed on your screen.

HARD DRIVE

The hard disk, also known as the hard drive, is where a computer stores its long-term data, such as the operating system, software applications, and personal files.

The term "hard drive" is short for "hard disk drive” - they refer to the same thing. You might come across any of these terms: "hard disk," "hard disk drive," or simply "hard drive."

Unlike temporary memory, which is used for quick access to data while the computer is running and loses its contents when the power is off, **the hard drive retains information even when the computer is turned off.** This makes the hard drive essential for long-term storage, ensuring that your data, including system files, documents, and media, remains intact and accessible over extended periods.

The storage capacity of digital devices, such as hard drives, solid-state drives, and other forms of storage media, is commonly measured in gigabytes (GB).

When you save files on a computer or a storage device, their sizes are measured in megabytes or gigabytes. For example, a high-resolution image might be a few megabytes, while a high-definition movie could be several gigabytes in size.
A device with a capacity of 500 GB can hold approximately 500 billion bytes of data, which translates to a vast amount of information, including thousands of photos, hundreds of hours of video, or countless documents and applications.

Traditional Hard Disk Drives (HDDs) use mechanical spinning disks to store and retrieve data. Data is recorded on rotating magnetic platters, and read/write heads move across these platters to access the data. This mechanical approach allows HDDs to offer large storage capacities at lower costs but makes them more susceptible to physical damage and wear. Additionally, the mechanical nature results in slower data access speeds compared to newer technologies.

Solid State Drives (SSDs), on the other hand, use flash memory technology instead of mechanical parts. SSDs rely on flash memory chips, similar to those in USB flash drives or memory cards, to store data. The absence of moving parts in SSDs results in several advantages.

SSDs offer faster performance, enhanced durability, energy efficiency, and quiet operation. Their instantaneous read/write capabilities result in significantly quicker data access and file transfer rates.

Additionally, SSDs are more durable because they have no moving parts, making them less prone to physical damage from shocks or vibrations, making them makes them particularly reliable for portable devices. SSDs are also more energy-efficient, consuming less power which leads to longer battery life in laptops and reduced overall energy use.

While HDDs remain cost-effective for large storage needs, SSDs provide superior performance, durability, and efficiency.

MOTHERBOARD

The motherboard, also known as the mainboard or circuit board, serves as the central platform of a computer, akin to a Lego baseplate that supports and connects various components. It provides the foundation where essential hardware pieces are installed and interlinked, ensuring the computer operates smoothly.

The motherboard serves as the central hub of a computer, **connecting and coordinating all its hardware components.** At its core, it houses several crucial components. The CPU socket is where the central processing unit (CPU) is installed. RAM slots hold memory modules (RAM) that provide temporary storage for data actively used by the CPU. Expansion slots, accommodate additional cards like graphics cards, sound cards, and network cards, enhancing the system's functionality.

The motherboard also includes various connectors for peripherals. External connectors provide ports for devices like hard drives, USB devices, keyboards, mice, and audio equipment. **Internal connectors link to internal components such as storage drives (HDDs or SSDs).**

Data transfer on the motherboard is managed through a network of electrical pathways known as the bus system, which is composed of physical pathways (wires or traces).
The bus system ensures efficient and accurate communication between the CPU, RAM, and other components, and serves as the **medium through which data travels.**

The chipset, a collection of integrated circuits that include various controllers and interfaces located on the motherboard, acts as a traffic controller. These ICs, which contain numerous tiny components such as transistors and resistors, perform essential functions.
They regulate data flow, ensuring efficient communication, resource allocation, and coordination.

ICs synchronize data transfers and operations, and input/output (I/O) operations that manage communication between the motherboard and connected peripherals or storage devices.

The motherboard connects to the power supply unit (PSU) through specific power connectors, distributing power to various components and ensuring each part receives the correct voltage.

Finally, the motherboard's firmware, known as BIOS (Basic Input/Output System) or UEFI (Unified Extensible Firmware Interface), contains the initial instructions for hardware initialization and system startup. It enables the motherboard to detect and interact with installed hardware, preparing the system for the operating system to load.

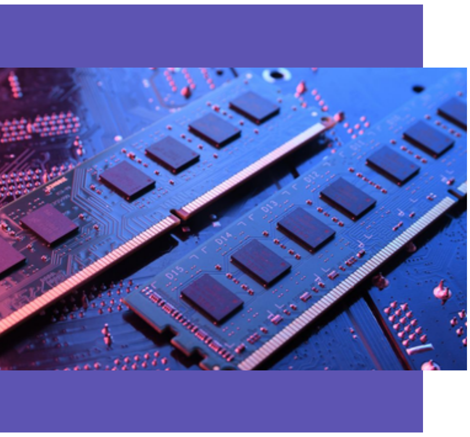
RAM

RAM (Random Access Memory) is the computer's short-term memory, serving as a high-speed workspace for the CPU (Central Processing Unit).

RAM temporarily holds data that the CPU needs to access quickly while performing tasks. Imagine you've copied a piece of text on your phone - it stays on the clipboard so you can easily paste it into different apps or documents without having to copy it again.

Similarly, RAM keeps the data you and the system are currently using, such as files, instructions for running applications, and system processes, allowing for rapid access and smooth performance. This temporary storage enables the CPU to retrieve and process information swiftly, significantly enhancing the computer's performance for tasks such as running applications and managing active processes.

However, **RAM is volatile memory**, meaning it loses its contents when the computer is turned off or restarted. Once the power is disconnected, any data in RAM is lost, so it is used solely for short-term data storage during active use. RAM is crucial for a computer's performance, providing fast access to data and instructions needed for various tasks. **When you open a program—whether it's a web browser, word processor, or game—the necessary data and instructions are loaded into RAM**, allowing the CPU to quickly process this information.



RAM also manages active processes by holding data for tasks currently being executed. If you have multiple applications open, each one uses a portion of RAM to operate effectively.

Additionally, **RAM supports system operations** by helping the operating system handle resources, manage background processes, and maintain performance, including managing files and processing input from peripherals.

However, if the available RAM becomes fully utilized, performance can significantly degrade. **The system may experience slowdowns, lag, or delays, and applications might crash or freeze due to insufficient memory to hold the necessary data and instructions.**

NETWORKING HARDWARE

To enable a computer to connect to networks and the internet, several key hardware components come into play. These include Network Interface Cards (NICs), wireless adapters, routers, switches, and modems.
Each component plays a specific role in establishing and managing network connectivity.

Network Interface Cards (NICs)

Also known as network adapters or network cards, NICs are essential for connecting a computer to a network. They convert digital data from the computer into a format suitable for transmission over the network and vice versa. NICs implement the necessary **protocols and standards for network communication**. Common standards include Ethernet for wired connections and Wi-Fi for wireless connections.

Some NICs are integrated directly onto the computer's motherboard, while others are available as expansion cards that can be inserted into slots on the motherboard. NICs typically feature connectors such as Ethernet ports or wireless antennas, enabling both physical and wireless connections to the network.

Wireless Adapters

A wireless adapter, or wireless network interface controller (wireless NIC), allows a computer or device to connect to a wireless network like Wi-Fi. This component provides flexibility by eliminating the need for physical cables and enables network connectivity through wireless signals.

NIC vs. Wireless Adapter

If you use a wired Ethernet connection, you only need a NIC. If you use a wireless connection, you only need a wireless adapter.
Most modern devices have integrated NICs and wireless adapters, allowing users to choose their preferred connection method - some systems come with both, allowing users to switch between wired and wireless connections. You typically don’t need both a NIC and a wireless adapter simultaneously unless you want the option to switch between an Ethernet cable and Wi-Fi.

Routers

Routers act as gateways that connect multiple devices within a Local Area Network (LAN) or link a LAN to the internet.

They typically have several ports for connecting devices like computers, smartphones, and printers.

The router manages communication with the internet by directing data traffic and using **Network Address Translation (NAT)** to allow multiple devices to share a single public IP address. It also includes security features, such as built-in firewalls, to protect the network from unauthorized access and potential threats. Many routers offer wireless connectivity, enabling devices to connect via Wi-Fi.

Modems

A modem (short for modulator-demodulator) connects a computer or network to an internet service provider (ISP) via various types of communication lines, such as telephone lines, cable systems, or fiber optics. It **modulates and demodulates** signals to enable data transmission over these channels, thus providing internet access.

INPUT/OUTPUT

There are other hardware components necessary - input devices and output devices are essential components that enable users to interact with a computer.

Input devices allow users to enter data and commands, while output devices enable the computer to convey information back to the user.

Input Devices include keyboards, mice, and microphones. Keyboards are used to input text and commands into the computer, and mice are pointing devices that allow users to navigate and interact with the computer's graphical user interface (GUI). Microphones count as input devices - used for voice input, enabling voice commands, audio recordings, and communication in applications like video conferencing. Webcams are an example of another input device, capturing video input for video conferencing, streaming, and recording.

Output Devices include monitors and speakers. Monitors display visual output from the computer, such as the operating system interface, applications, and multimedia content. Speakers output audio from the computer.

These input and output devices work together to support user interaction with the computer. **Input devices capture and send data to the system, while output devices provide feedback and display information.**

WHAT IS SOFTWARE?

Software refers to the programs and instructions that run on a computer, enabling it to perform specific tasks and functions.
Software can be broadly classified into two primary categories: system software and application software.

System software is designed to manage and control the hardware components of a computer, providing a platform for other software to run.

System software acts as an intermediary between the user and the hardware, allowing interaction and control over the computer's functions.

System software includes the operating system (OS) as a primary component. The operating system manages the computer's hardware resources, facilitates communication between hardware and software, and provides a platform for application software to run.

System software also encompasses other utility programs and tools that support the OS in managing hardware, software, and system resources.

Key examples of system software include operating systems like Windows, macOS, and Linux.

Application software refers to programs developed to perform specific tasks or provide specific functionalities for end-users. This type of software is designed to meet various user needs and purposes, such as word processors, web browsers, and photo editors.

OPERATING SYSTEMS

The primary role of an operating system is to manage and coordinate the activities and resources of the computer. This includes handling tasks such as memory management, process scheduling, input/output operations, and file system management.

By doing so, the operating system ensures that a user can run multiple applications efficiently without them interfering with each other.

The OS is the entire suite of software that includes the kernel, along with other components like system libraries, user interfaces, utilities, and applications.

Operating systems provide the overall framework and services that enable users and applications to interact with the computer system, managing both hardware and **higher-level functions.**

KEY FUNCTIONS OF THE OS

The operating system (OS) is fundamental to a computer, serving as the backbone that manages its resources and provides a stable environment.

It allocates and deallocates resources such as CPU time, memory space, and disk storage as needed by different applications and processes, ensuring optimal performance and preventing conflicts.

The OS also organizes, stores, and manages data on storage devices, handling file directories, permissions, and the retrieval and updating of data.

It oversees the creation, scheduling, and termination of processes, supporting multitasking by efficiently managing the CPU to allow multiple applications to run simultaneously.

Most modern operating systems provide a user interface, which can be graphical (GUI) or **command-line (CLI)**, allowing users to interact with the computer. For input management, the OS deals with devices such as keyboards, mice, and microphones.

It employs device drivers—specialized software that communicates directly with hardware devices to translate signals into data that the OS and applications can understand. When an input device sends data, it triggers an interrupt signal to the OS, which pauses its current tasks to address the input, processes it, and then resumes normal operations, ensuring real-time processing.

The OS also uses buffers—temporary storage areas—to hold input data while it is being processed, helping manage data flow and improve efficiency.

For output management, the OS handles devices like monitors and speakers. It uses drivers similar to those for input devices, sending data to the appropriate driver to produce the desired output. In visual output, the OS interacts with graphics drivers to render images, text, and other elements, ensuring correct formatting and display. The OS also manages file access, determining how data is read from and written to storage devices such as hard drives and SSDs.

It organizes files in a hierarchical structure and handles file permissions to ensure secure access. Communication between devices is managed through input/output scheduling, where the OS uses algorithms to handle **I/O operations** efficiently and fairly, prioritizing urgent tasks or batching similar requests.

Error handling and recovery are critical functions of the OS.
It monitors I/O operations for errors, such as hardware malfunctions or corrupted data, using error-checking mechanisms to identify and report issues. **In the event of an error, the OS can attempt recovery strategies such as retrying the operation, notifying the user, or using backup data to minimize disruption.**

Whether on a personal computer, mobile device, or server, the operating system ensures that all components work together harmoniously, enabling users to perform tasks efficiently and effectively.

THE KERNEL

The kernel is the core component of an operating system (OS), managing the system's hardware and software resources at the most fundamental level. It is the **lowest-level software** that interacts directly with the computer's hardware. As the **central element** of the OS, the kernel provides essential services for all other parts of the system, ensuring that applications run effectively. **The OS is built around the kernel**, with various utilities, libraries, and applications relying on it for functionality. It acts as an intermediary between hardware and software, handling critical tasks such as resource allocation and process management.

The kernel is responsible for managing hardware resources including the CPU, memory, and storage. It efficiently allocates these resources across multiple processes and manages their creation, scheduling, and termination, thus supporting multitasking. Additionally, the kernel oversees memory management, ensuring that each process receives the necessary memory while preventing conflicts. **It communicates with hardware through device drivers to handle input and output operations.** Applications interact with the kernel via **system calls**, which are mechanisms that allow programs to request the OS to perform tasks like **reading or writing files.**

The kernel directly accesses hardware devices such as the CPU, memory, and disk drives through device drivers, sending and receiving commands to perform tasks like reading or writing data. It manages CPU scheduling by deciding which processes get to use the CPU and for how long, ensuring fair and efficient distribution of CPU time. Memory management involves allocating RAM to processes, managing virtual memory, and swapping data between RAM and disk. The kernel also responds to hardware interrupts, which are signals from devices indicating that they need attention. It pauses ongoing processes to address these interrupts and then resumes normal operations.

Additionally, the kernel handles **low-level I/O operations**, managing data transfer between the system's memory and peripheral devices, and converting raw hardware data into a format usable by applications. **An operating system cannot function without a kernel, as it is essential for managing hardware resources and executing system-level operations.** Without the kernel, the OS would lack the necessary mechanisms to handle processes, memory, and device interactions, rendering the system inoperative. **The kernel operates in a privileged mode, known as kernel mode, with full access to hardware resources and system memory.**

While the kernel manages low-level hardware interactions and resource management, the OS provides a user-friendly environment. It facilitates user and application interaction through graphical or command-line interfaces and supports various utilities and applications, making the system accessible and functional for everyday use.

Imagine a computer system as a restaurant.

The Kernel is like the kitchen staff who handle the cooking and manage the ingredients. They work directly with the core tasks of preparing food.

The Operating System represents the entire restaurant operation, including the kitchen staff (kernel), waitstaff, menu, dining area, and reservation system. The OS encompasses everything that makes the restaurant run smoothly and interact with customers.

The kernel is a crucial part of the OS, but the OS includes additional elements that create a complete system for users and applications. The kernel performs essential functions, while the OS provides the full set of tools and interfaces needed for a functional computing environment.

UNIX

Unix is a pioneering operating system that originated in the 1970s at Bell Labs. **Designed for flexibility and power, Unix introduced revolutionary concepts as a general-purpose, multi-user operating system. It is renowned for its stability, efficiency, and hierarchical file system.**

Unix introduced the concept of small, single-purpose programs that could be combined to perform complex tasks. **This modular approach,** often referred to as the "Unix philosophy," emphasizes simplicity and reusability. Each program does one thing well and can be combined with other programs.
It was one of the first operating systems to provide efficient **multitasking, allowing multiple processes to run simultaneously.** It also supported multi-user functionality, where multiple users could access and use the system concurrently without interfering with each other's processes.

Unix introduced a hierarchical file system structure, where files are organized in a tree-like directory structure.
The hierarchical file system model has been widely adopted by other operating systems, providing a clear and organized way to manage files and directories.

Unix introduced a robust **permission model, where files and resources are protected by read, write, and execute permissions** for users and groups, helping enforce security and control access to system resources.

This permission model has been adopted and adapted by many other operating systems, providing a foundational approach to file and resource security.

Unix's influence extends widely across the landscape of operating systems, and many **modern systems are either directly derived from Unix or heavily inspired by its design principles.**

OPERATING SYSTEMS -BASIC INTRODUCTION

LINUX

Linux is a Unix-like operating system created to offer a free and open-source alternative to Unix. **It adheres to many of Unix's core design principles, including modularity and multi-user capabilities, and utilizes a similar file system structure, command-line interface, and multitasking features.**
Linux is also celebrated for its
open-source nature, flexibility, and strong security.

This design makes Linux a powerful and flexible platform. Over time, Linux has become a **major operating system used across servers, desktops, and embedded systems.** It operates under an open-source model, allowing users to inspect, modify, and distribute the source code. This open-source nature has led to the development of various distributions, each tailored for specific uses, such as Ubuntu for general use, CentOS for servers, and Kali Linux for penetration testing.

The Linux kernel, the core component of all distributions, manages hardware resources like the CPU, memory, and peripherals, while different distributions may use customized versions of the kernel to optimize performance for their particular needs.

Linux is widely used in server environments due to its stability, scalability, and robust networking features. Additionally, Linux's lightweight and customizable nature makes it suitable for embedded systems and IoT devices.

macOS

Apple's macOS, formerly known as Mac OS X, is built on a Unix-based foundation and provides a graphical user interface over this Unix core. It incorporates elements from Unix-like systems, combining the robustness of Unix with a user-friendly experience. As a proprietary system developed by Apple Inc., **macOS is designed to run exclusively on Apple hardware, including Mac desktops and laptops. The tight integration between Apple's hardware and software enhances performance and usability and security** - macOS benefits from a controlled ecosystem, with Apple overseeing both hardware and software. macOS is popular among consumers for personal computing due to its intuitive interface and seamless integration with other Apple products, such as iCloud and Apple Music. It is particularly favored by creative professionals for tasks such as graphic design, video editing, and music production, thanks to applications like Final Cut Pro and Logic Pro. macOS is valued for its ecosystem integration and the benefits it provides to developers using Apple's software development tools. **To develop applications for macOS or iOS, you must use a Mac, as Apple's development environment, including Xcode, is only available on macOS.**

WINDOWS

Windows, developed by Microsoft Corporation, is a proprietary operating system **designed to run on a broad range of hardware configurations, from personal computers to enterprise servers. It is known for its versatility and extensive software ecosystem**, supporting a wide variety of commercial and free applications.

Windows offers different versions tailored for various needs, such as Windows 11 for consumer desktops and laptops, Windows Server for enterprise environments, and Windows IoT for embedded systems. **It is the most widely used operating system for personal computing** and is prevalent in both home and office environments.

Windows excels in compatibility, supporting a vast array of hardware and peripherals, making it a preferred choice for diverse hardware needs. Windows has the largest software ecosystem, with extensive support for both commercial and free applications. This includes a wide range of productivity tools, games, and specialized software.

The operating system is also dominant in the gaming sector due to its support for numerous game titles and gaming peripherals. **Despite historical security challenges, Microsoft has significantly enhanced Windows security with features like Windows Defender, BitLocker for disk encryption, and frequent security updates.** Windows continues to be a **leading platform due to its extensive software compatibility and broad user base**, addressing a wide range of computing needs.

OS CONSIDERATIONS FOR PROGRAMMERS

Developing applications for macOS or iOS generally requires a macOS machine and Xcode, Apple's exclusive integrated development environment.

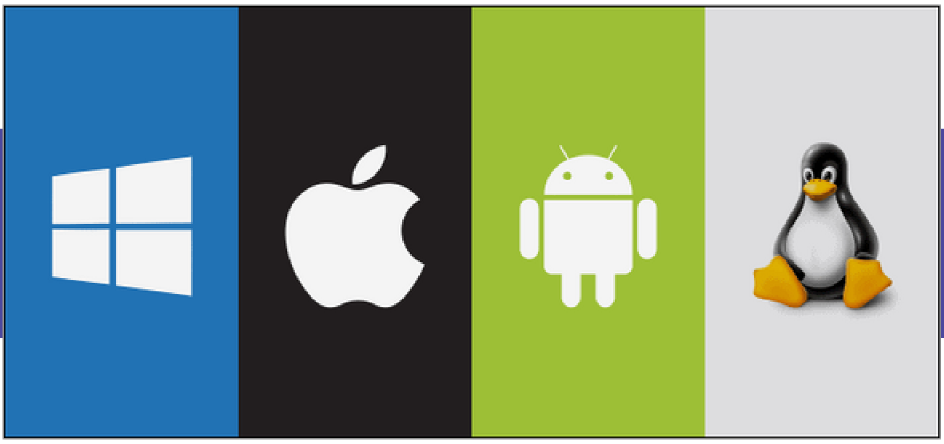
This setup ensures that applications are built and tested in an environment identical to the deployment target. On the other hand, Linux provides a seamless development experience for applications intended for Linux environments, facilitating compatibility and testing. Using Linux ensures smooth integration in an environment similar to the one in which the application will be deployed. On Linux, the terminal is a versatile command-line interface that allows users to execute a variety of commands for system management and **automation**, utilizing **shells** like Bash and Zsh.

In macOS, the terminal provides similar functionality, leveraging its Unix-based foundation. It supports Unix commands and scripts, with shells like Bash, enabling efficient system control and development while integrating smoothly with the graphical environment.

Windows supports a broad range of development tools and has extensive software compatibility. **However, deploying applications from Windows to other environments, such as Linux servers, may necessitate additional adaptation.** Although Windows offers built-in development resources, **developers often need to enhance their setup with extra software to fully replicate the development capabilities found in macOS or Linux.** Windows development environments include tools like **Visual Studio and Visual Studio Code, while package managers such as Chocolatey and Scoop assist in managing software packages similarly to Unix-based systems.** Windows includes **Command Prompt** for **basic command-line operations** and **PowerShell** for more advanced **scripting** and **automation tasks**. PowerShell integrates deeply with Windows and supports complex tasks, although its syntax and utilities differ from Unix-based shells like Bash . **Commands and scripts from Unix-based systems might not translate directly to Windows command-line interfaces**, requiring further modifications.

The extensive market share of Windows provides broad software compatibility, offering access to a vast array of applications, tools, and libraries.

Windows' diverse ecosystem, however, requires additional considerations for cross-platform development and compatibility.
Running Windows on a Mac is feasible through virtualization, though installing macOS on a Windows machine is restricted by Apple's licensing policies. Linux, being open-source, can be installed on various devices, including PCs and Macs. Each operating system has unique strengths, and the choice depends on specific development needs, software requirements, and deployment goals.



GLOSSARY & DEFINTIONS

PROTOCOLS AND STANDARDS FOR NETWORK COMMUNICATION

Rules and conventions that govern how data is transmitted and received over a network.

NETWORK ADDRESS TRANSLATION (NAT)

Allows multiple devices on a local network to share a single public IP address for accessing the internet, improving security and reducing IP address usage

MODULATES AND DEMODULATES

Converts digital signals to analog signals (modulation) for transmission and converts them back to digital signals (demodulation) for reception.

SYSTEM LIBRARIES / LIBRARIES

Collections of pre-written code that programs can use to perform common tasks, simplifying development and ensuring consistency.

UTILITIES

System management tools that perform maintenance and optimization tasks, such as disk cleanup and virus scanning.

HIGHER-LEVEL FUNCTIONS

Advanced operations built on basic system functions, providing more complex capabilities such as file management and network communication.

ALLOCATES AND DEALLOCATES RESOURCES

involves assigning necessary resources like CPU time and memory to processes and freeing them when no longer needed

INPUT/OUTPUT SCHEDULING

Manages the order and priority of I/O operations to ensure efficient and fair access to resources like disk drives and network interfaces.

I/O OPERATIONS

Actions that transfer data to and from peripheral devices like hard drives, keyboards, and network cards.

LOWEST-LEVEL SOFTWARE

The kernel, which interacts directly with hardware, managing resources and providing essential services for higher-level operations.

SYSTEM CALLS

Programmed requests from applications to the OS for performing tasks like accessing hardware, file operations, and process management.

READING OR WRITING FILES

Operations involving accessing data on storage devices, allowing applications to store and retrieve information as needed.

LOW-LEVEL I/O OPERATIONS

Direct interactions with hardware to perform tasks like reading from or writing to storage devices or communication ports.

SHELLS

Command-line interfaces that allow users to interact with the OS by typing commands, often used for automation and system management.

COMMAND-LINE INTERFACES (CLIS)

Text-based interfaces that allow users to interact with the operating system by typing commands, often used for performing system administration tasks, running scripts, and managing files efficiently.

VISUAL STUDIO AND VISUAL STUDIO CODE

Integrated development environments (IDEs) from Microsoft that provide tools for coding, debugging, and deploying applications across various platforms.

PACKAGE MANAGERS

Software tools that automate the process of installing, updating, and managing software packages, simplifying software maintenance.

SOFTWARE PACKAGES

Bundles of software applications or libraries that are distributed together for ease of installation and management.

COMMAND PROMPT FOR BASIC COMMAND-LINE OPERATIONS

Windows tool that allows users to execute commands, run scripts, and manage files through a text-based interface.

POWERSHELL

more advanced command-line interface and scripting language for Windows, offering powerful tools for automating system administration tasks and managing configurations.

SCRIPTING

Writing scripts, which are sequences of commands, to automate tasks and streamline workflows, often used in system administration and software development.

AUTOMATION

Using scripts or software to perform tasks automatically, reducing manual effort and increasing efficiency in processes.

HARDWARE - VISUAL GLOSSARY

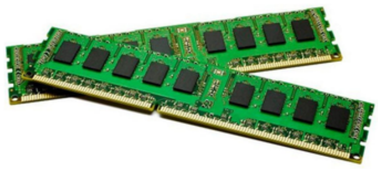
CPU

GRAPHICS CARD

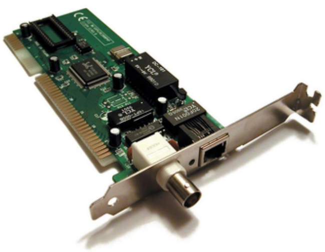
MOTHERBOARD

HARD DRIVE

SSD



RAM



NIC

WIRELESS ADAPTER

MODEM

ROUTER