

# INTRODUCTION TO COMPUTING

## INTRODUCTION

The world of business has changed dramatically since the introduction of the first modern multipurpose computer over 50 years ago. The ENIAC (Electronic Numerical Integrator and Computer), designed by Drs. Mauchly and Eckert, two American engineers, was set up at the University of Pennsylvania in 1946. This 30-ton machine occupied a thirty-by-thirty room, contained 18,000 vacuum tubes linked by 500 miles of wiring, and could perform 100,000 operations per second. It consumed so much electricity that it dimmed the lights in the section of Philadelphia where it was housed. Thanks to the development of the integrated chip, the computer has evolved into a far smaller, more powerful, and less expensive machine. Today's microcomputer is 3,000 times lighter than the ENIAC, performs 4000 times faster, and costs several million dollars less. Other innovations have made the computer easy enough for a child to use and versatile enough for applications ranging from astrophysics to arcade-style games. As a consequence of their decreasing size and cost, computers can be found today in virtually every corner of American society, from research facilities and corporate headquarters, to schools and homes.

You need only look around a business office to see evidence of the computer revolution. In a large office you might find a variety of computers, ranging in size from a mainframe computer housed in a room of its own, to a palm-sized "personal assistant" tucked into an executive's briefcase. A growing number of professions rely on computers, and accounting is one of them. This introduction will provide you with the fundamentals of computer hardware and software to help you prepare for the material presented in the text.

## WHAT IS A COMPUTER?

When we think of a computer, we generally picture computer hardware: the monitor, the keyboard, and the electronic circuitry contained within the rectangular case. There is more to a computer than this, however. The missing element is software—the instructions that tell the computer how to operate the hardware. All computers must have these two components to function. However, it is software that gives the computer one of its most distinguishing characteristics—the ability to program a single machine to perform many different functions.

In general terms, a computer is a machine operating under the control of instructions stored in its own memory. These operations and instructions enable the computer to receive data from a user (*input*), transform and manipulate the data according to specified rules (*process*), produce results (*output*). Additionally, data, instructions, and information are stored (*storage*) for future retrieval and use. Many computers are also capable of another task: communicating directly with other machines.

A computer is a programmable device that stores, retrieves, and processes data. The term "computer" was originally given to humans (human computers) who performed numerical calculations using mechanical calculators, such as the abacus and slide rule. The term was later given to a mechanical device as they began replacing the human computers. Today's computers are electronic devices that accept data (input), process that data, produce output, and store (storage) the results.

Below is a picture of a computer with each of the main components. In the picture below, you can see the desktop computer, flat-panel display, speakers, keyboard, and mouse. We've also labeled each of the input devices and output devices.



## WHAT PARTS ARE NEEDED FOR A COMPUTER TO WORK?

A computer does not require all the components mentioned above. However, a computer cannot function without having at the very minimum the parts listed below.

Processor - Component that executes instructions from the software and hardware.

Memory - Temporary primary storage for data traveling between the storage and CPU.

Motherboard (with onboard video) - Component that connects all components.

Storage device (e.g., hard drive) - Slower secondary storage that permanently stores data.

However, if you had a computer with only the minimum parts above, you would be unable to communicate with it until you connected at least one input device (e.g., keyboard). Also, for you to see what is happening, you would need at least one output device (e.g., monitor).

## TYPES OF COMPUTERS

When talking about a computer or a "PC," you are usually referring to a desktop computer found in a home or office. Today, however, the lines of what makes a computer are blurring. Below are all the different examples of what is considered a computer today.

### Examples and types of computers



Desktop computer



Laptop



Netbook



Hybrid



Tablet



Smartphone

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## HARDWARE

Physical structure that houses a computer's processor, memory, storage, communication ports and peripheral devices. Each of these components (called devices) have a different

purpose, which may be either accepting inputs, storing data or sending outputs.

For example, a mouse and a microphone are input devices used to record user activities and transform them into data that is transmitted to the system unit. A hard disk is a storage unit where data is stored and accessed by other devices.

A monitor or a speaker are output devices that transform processed data into (respectively) video and audio signals.

Usually, the core components that represent the bare minimum that allow a computer to function are:

**Processor (CPU)**

The component that processes and executes inputs received from hardware and software.

**Motherboard**

A mainboard that provides basic connection between all the other hardware components and devices (internal and external).

**Memory (RAM)**

A temporary data storage space that stores the information the CPU is actively using.

**Storage device**

A storage device where data is stored on a permanent basis. It's slower but less volatile than the RAM.

**Power supply unit**

That's pretty self-explanatory: without power, no electronic device can work!

**SOFTWARE**

All parts of a computer that are not strictly physical, such as data, programs, applications, protocols, etc., are broadly defined as "software." Although software has no material form, it is no less critical to receive information, encode, store and process it.

Computer software includes all executable and non-executable data, such as documents, digital media, libraries, and online information. A computer's operating system (OS) and all its applications are software as well.

A computer works with software programs that are sent to its underlying hardware architecture for reading, interpretation and execution.

Computers are classified according to computing power, capacity, size, mobility and other factors, as personal computers (PC), desktop computers, laptop computers, minicomputers, handheld computers and devices, mainframes or supercomputers.

## **DEFINITION - WHAT DOES OPERATING SYSTEM (OS) MEAN?**

An operating system (OS), in its most general sense, is software that allows a user to run other applications on a computing device.

The operating system manages a computer's software hardware resources, including:

Input devices such as a keyboard and mouse.

Output devices such as display monitors, printers and scanners.

Network devices such as modems, routers and network connections.

Storage devices such as internal and external drives.

The OS also provides services to facilitate the efficient execution and management of, and memory allocations for, any additional installed software application programs.

If several programs are running at the same time (such as an Internet browser, firewall, and antivirus), the OS will allocate the computer's resources (memory, CPU, and storage) to make sure that each one of them receives what is needed to function.

While it is possible for a software application to interface directly with hardware, the vast majority of applications are written for an OS, which allows them to take advantage of common libraries and not worry about specific hardware details.

In this regard, the OS acts as a comprehensive framework with which all applications can interact in a consistent way, vastly simplifying the whole development process.

Examples for OSs include:

Android

iOS

Mac OS X

Microsoft Windows

And Linux

Some operating systems were developed in the 1950s, when computers could only execute one program at a time. Later in the decade, computers included many software programs, sometimes called libraries, which were linked together to create the beginning of today's operating systems.

The OS consists of many components and features. Which features are defined as part of the OS vary with each OS.

## **THREE EASILY DEFINED OPERATING SYSTEM COMPONENTS**

### **Kernel**

This provides basic-level control over all of the computer hardware devices.

Main roles include reading data from memory and writing data to memory, processing execution orders, determining how data is received and sent by devices, such as the monitor, keyboard and mouse; and determining how to interpret data received from networks.

Monolithic kernels have a simpler design and consist of a single code that communicates with all hardware and software.

Microkernels implement user and kernel services in different address spaces, reducing their size, but forcing the use of message passing to execute services.

### **User Interface (UI)**

This component allows interaction with the user, which may occur through graphical icons and a desktop or through a command line.

The UI is further divided into Command Line Interface (CLI), consisting of a text-based interface where advanced users can prompt specific commands by typing them, and a Graphical User Interface (GUI).

The latter is a visual interface that allows the end user to issue commands by interacting with symbols, icons, and menus using an input device such as a mouse or touchpad.

### **Application Programming Interfaces (API)**

This component allows application developers to write modular code.

An API defines how other systems or components can use a certain application.

# THE USE OF COMPUTING IN OUR DAILY LIFE

## Banks and financial

Computers play a significant role in handling all of the world's money. Below are examples of how computers are used in the financial market and places dealing with money.

**ATM** - When you make a withdraw from an ATM, you are using a computer.

**Digital currency** - When depositing money in a bank, it is stored as a digital record. A computer keeps track of how much money is in your account.

**Trading** - Stocks and commodities are traded using computers. In fact, today there are even thousands of computers using advanced algorithms that handle trading without needing humans.

## Business

Business is another big sector for computers and most money earned and spent is done using a computer. Below are some of the examples of how computers are used in business.

**Register** - If the business deals with selling goods to a consumer (e.g., a grocery store), a cash register, which is a computer, is used to complete transactions.

**Workers computer** - Many businesses assign each employee a computer that allows them to produce work and solve problems for the company.

**Server** - If the business uses computers, connects to the Internet, or handles e-mail and files, a server is used to help manage everything.

## Communication

Today's communication around the world is almost all digital and handled by computers. Below are examples of how computers are used in the communication industry.

**Smartphone** - If you have a smartphone, you have a computer in your pocket.

**E-mail** - More electronic mail (e-mail) is sent today than postal mail (snail mail), and computers handle all creation and distribution of that e-mail.

**VoIP** - All voice over IP communication (VoIP) is handled and done by computers.

**Computer-assisted speech** - Those who are disabled or cannot speak can use a computer to help them communicate. For example, Stephen Hawking uses a computer to communicated.

**Voice recognition** - Voice recognition uses a computer to translate recorded audio into text or other data.

## Defense and military

Many technologies (e.g., GPS and the Internet) were initially created or started with a defense-related purpose. Today, computers are still an important aspect of the defense industry.

**Encryption** - Secure communication is vital in the defense industry and computers encrypt communications that should remain secret.

**GPS** - Using computers with GPS allows the military to track people and equipment and is still used today.

**Computer-aided flight** - Many of today's jets and other aircraft require computers to fly and operate.

**Drones** - A drone is either autonomous or remotely driven and uses computers to operate.

## Education

As computers evolve, so does how computers are used in the education field. Below is a list of how a computer can be used in education.

**Internet** - Connecting a student to the Internet gives him or her access to an endless supply of knowledge. As mentioned later, the Internet would not be possible without computers.

**Learning** - Computers can also be used to help design and create a more visual learning experience for students. Using electronic whiteboards with computers can also benefit a student by giving them a more hands-on experience.

**Writing** - Although reports can still be done using pen, pencil, or even a typewriter, a computer makes it easier to write, format, save, share, and print reports.

**Keep records** - Computers track students scores, identify struggling students, and create a final report.

**Testing** - Computers can assist students and teachers with the testing process by stepping the student through a series of questions and keep track of the results.

## Internet

Without computers, the Internet would not exist. Below are a few examples of how computers help run the Internet.

**DNS** - When you type in a URL like <https://www.computerhope.com/>, a DNS translates it into an IP address, which directs the computer to the server.

**Web server** - Every web page requires a web server or computer capable of receiving and sending requests when someone wants to view a web page.

**Programs** - A computer is also needed to run scripts and programs. For example, a search engine, shopping cart, or forum are all examples of programs that need a computer.



**Services** - Other services like e-mail, FTP, and SSH also require a computer or are daemons on the web server.

## Medical

The medical field is another place where computers are vital and used every day. Below are examples of how computers help those in the medical field.

**Medical records** - More and more medical records are being digitally stored. Storing these files digitally allow for quick access and transfer of medical information so doctors can know your history.

**Monitoring** - Computers help with monitoring a patient and can alert staff in the case of an emergency.

**Research** - A lot of the medical research is computer assisted. Without the assistance of a computer, it would either not be possible or take too long to be viable.

**Diagnosis** - Computers can assist in the diagnosis of a patient, from gathering a patient's history and conditions to comparing that information against a database of existing information.

**Surgery** - Although most surgery is still done with humans, it is becoming more practical and accessible for computer robot-assisted surgery. After being programmed, these robots can make surgery more accurate, faster, and less prone to human errors.

## Transportation

Computers also play an important part in transportation. Below are a few examples of how computers help the transportation field.

**Cars** - Most may not realize it, but all modern cars today have multiple computers that help control and manage the vehicle.

**Traffic lights** - The traffic lights that help control traffic are all run by computers.

**GPS** - Cars that include a GPS mapping system have computers for display and calculating routes.

**Airplanes** - The airplanes that help transport millions of people and goods every year are filled with computers that help control the plane.

**Public transportation** - Train, bus, subway, and all forms of public transportation are highly dependent on computers to manage traffic flow, monitor operation, and handle payments.

**Self-driving cars** - Although relatively new, self-driving cars are becoming increasingly popular and rely on a computer to make all decisions on how to drive.

## Multimedia

Computers also play a significant role in video and audio. Below are examples of how computers are used in the film and audio industry.

**Editing** - Once a movie, video, song, or audio track is created a computer can edit that media instead of having to manually make cuts to the film or audio track.

**CGI** - Computer animation and CGI has become a norm in big budget films. To create these effects computers and sometimes server farms are used.

**Manipulation** - Computers can manipulate pictures, video, and audio. For example, someone could use Adobe Photoshop to add or remove elements from an image.

**Recording and playback** - Computers can also be used to assist in the recording of audio tracks and then selectively playback each audio track.

**Creation** - Computers can also be used to help in creating new multimedia content. For example, creating 3D animation, 3D model, or a techno audio track can be done on a computer. After creating a 3D model, a 3D printer could also be used to build a product.

**TV, DVD, media players** - Today's Smart TVs, DVD players, DVRs, etc., contain simple computing circuitry to connect the device to the Internet, run apps, and more.

## Robot

The industry of robotics is exploding and computers once again play an important role in controlling robots. Below are examples of how computers help control robotic machinery.

**Control** - Computers are what help control robotics. For example, without a computer, a robotic arm would not know where to place a part.

**Learning** - Computers can take the input given by a robot and take that information to help learn and adapt to new conditions.

### Simulations

Some problems are so complex that it would be impossible for humans to calculate or would take too long to calculate. Computers help solve these complex problems in a timely fashion.

**Weather prediction** - Earth has an extremely complex weather system, and computers gather all of the variables and create weather reports.

**Product simulations** - Before some products go into development, computers simulate how they would work in the real world. By creating a simulation, a company or government agency can make adjustments before the product goes into development.

**Big data simulation** - With cheap data storage companies can now store a massive amount of data. With this big data, a computer can find unknown patterns.

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