

Introduction to Information Technology IT111

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Lecture 1 - Introduction to the World of Computers



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Course Topics

- Introduction to information technology and computer types.
- Digital logic and data representation.
- Computer hardware: motherboards, CPU, Input/Output.
- Storage media: Magnetic, Optical, Flash.
- Operating systems.
- Programming languages and database concepts.
- Network fundamentals, Internet and web evolution and applications.
- Ethics and health related issues.

Learning Objectives

1. Explain why it is essential to learn about computers today and discuss several ways computers are integrated into our business and personal lives.
2. Define a computer and describe its primary operations.
3. List some important milestones in computer evolution.
4. Identify the major parts of a personal computer, including input, processing, output, storage, and communications hardware.
5. Define software and understand how it is used to instruct the computer what to do.

Learning Objectives

6. List the basic types of computers, giving at least one example of each type of computer and stating what that computer might be used for.
7. Explain what a network, the Internet, and the World Wide Web are, as well as how computers, people, and Web pages are identified on the Internet.

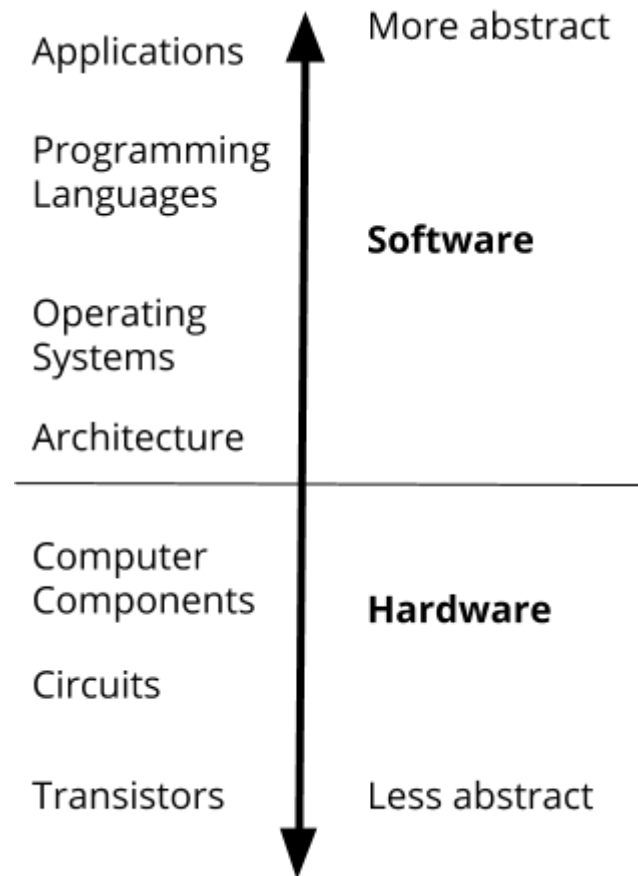
What Is a Computer and What Does It Do?

- Computer: A programmable, electronic device that accepts data, performs operations on that data, and stores the data or results as needed
 - Computers follow instructions, called programs, which determine the tasks the computer will perform
- Basic operations
 - Input: Entering data into the computer
 - Processing: Performing operations on the data
 - Output: Presenting the results
 - Storage: Saving data, programs, or output for future use
 - Communications: Sending or receiving data

Introduction to Computers



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Applications

- Any program you run on your computer
 - Microsoft Word. 
 - Google Chrome. 
 - Note application.
- .exe (Windows) or .app (Mac) file.
- Can use without knowing how it works behind the scenes (**abstraction**).
- Programs are written in **code**, the next layer of abstraction.



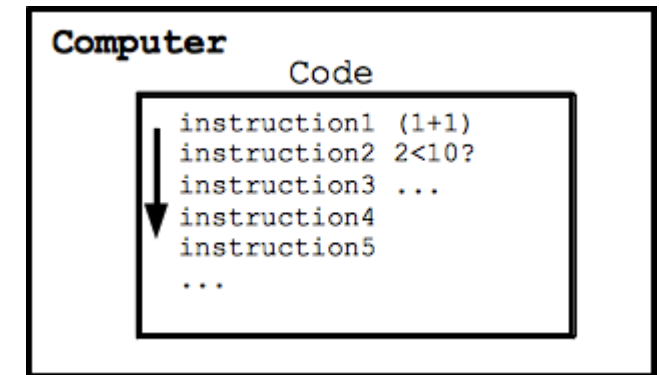
Pros and cons

- **Strengths of Computers:**
 - Very fast (billions of operations per second).
 - Very accurate.
- **Weaknesses of Computers:**
 - Literal.
 - Only simple operations.
 - Addition.
 - Comparison.
 - Equality.



Introduction to Code: How Computers Work

- Code is a series of instructions.
- Each instruction is an operation.
- Computer follows each instruction, one after another.
- Programs are comprised of millions of instructions.



Programming Languages

- Code is written in a **programming language**.
- Gives the "rules" (syntax and commands) for the code.
- What programming languages have you heard of?
- Each has strengths and weaknesses and specializations (just like human languages).
- High-level (closer to how humans think) vs. low-level (closer to computers, but much faster).



The Operating System

- Starts running when the computer "boots up"
- Manager/supervisor:
 - Starting/runs/stopping programs.
 - Manages all shared resources (like **memory**).
 - **No matter how a program ends, all resources must be released.**
- Can run multiple programs at once ("sandboxing").
- Allows a computer to change over time (updates).
- Other responsibilities:
 - File system.
 - Manages windows.
 - Some basic programs.



History of Computer

- The computer was born not for entertainment or email but out of a need to solve a serious number-crunching crisis.
- By 1880, the U.S. population had grown so large that it took more than seven years to tabulate the U.S. Census results.
- The government sought a faster way to get the job done, giving rise to punch-card based computers that took up entire rooms.

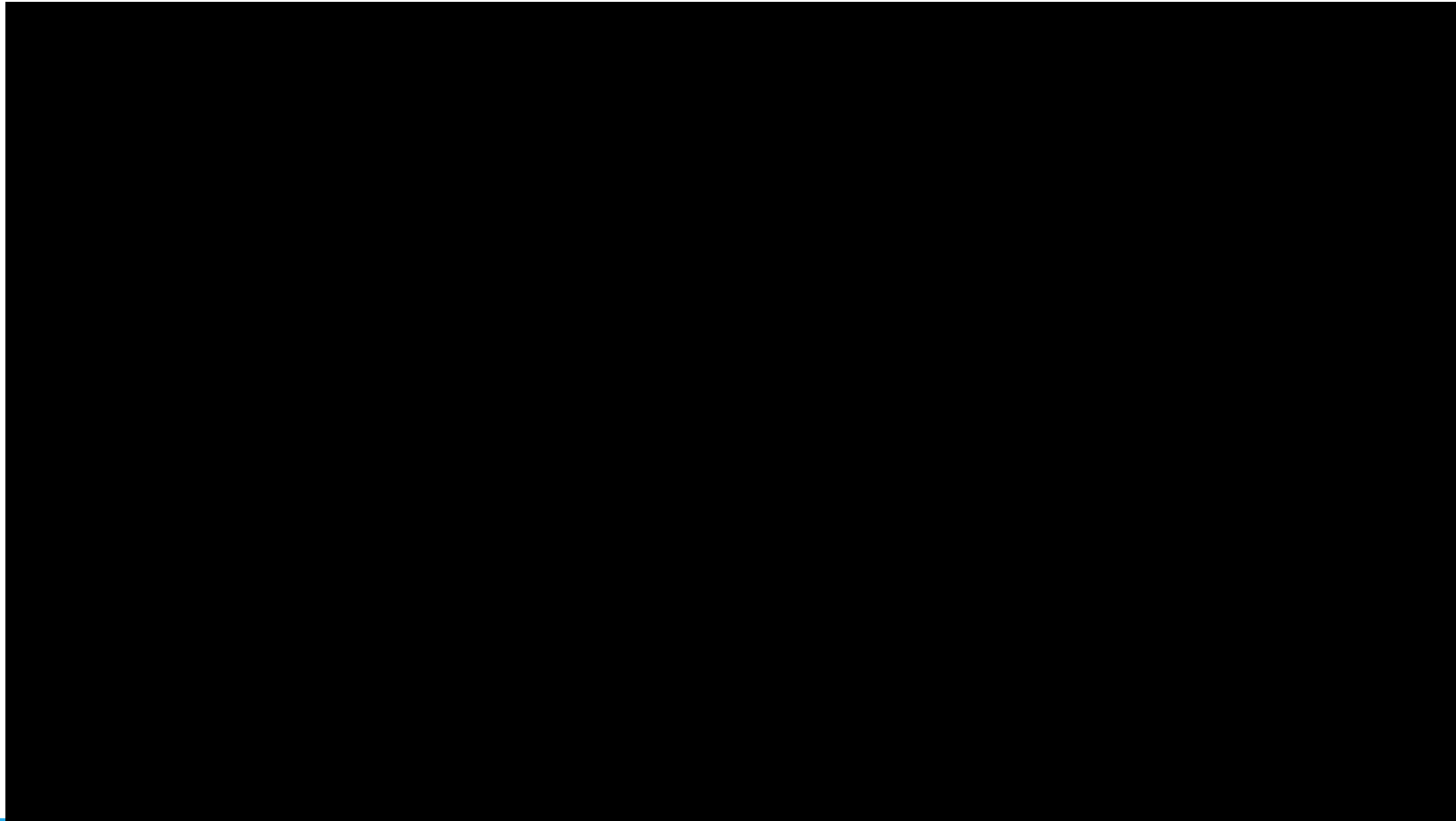
History of Computer

- Today, we carry more computing power on our smartphones than was available in these early models.
- The following brief history of computing is a timeline of how computers evolved from their humble beginnings to the machines of today that surf the Internet, play games and stream multimedia in addition to crunching numbers.

History of Computing



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History of Computer

- **1985:** The first dot-com domain name is registered, years before the World Wide Web would mark the formal beginning of Internet history. The Symbolic Computer Company registers Symbolics.com. More than two years later, only 100 dot-coms had been registered.
- **1996:** Sergey Brin and Larry Page develop the Google search engine at Stanford University.



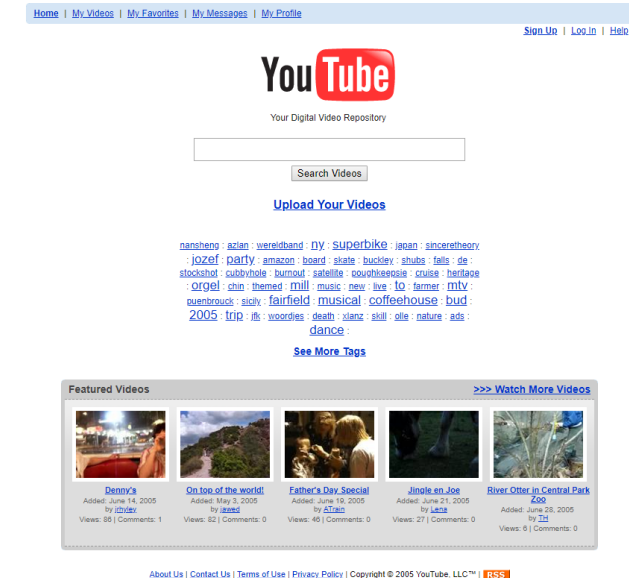
History of Computer

- **1999:** The term Wi-Fi becomes part of the computing language and users begin connecting to the Internet without wires.
- **2004:** Mozilla's Firefox 1.0 challenges Microsoft's Internet Explorer, the dominant Web browser. Facebook, a social networking site, launches.



History of Computer

- **2005:** YouTube, a video sharing service, is founded. Google acquires Android, a Linux-based mobile phone operating system.
- **2007:** The iPhone brings many computer functions to the smartphone.



History of Computer



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- **2009:** Microsoft launches Windows 7, which offers the ability to pin applications to the taskbar and advances in touch and handwriting recognition, among other features.
- **2010:** Apple unveils the iPad, changing the way consumers view media and jumpstarting the dormant tablet computer segment.
- **2012:** Facebook gains 1 billion users on October 4.

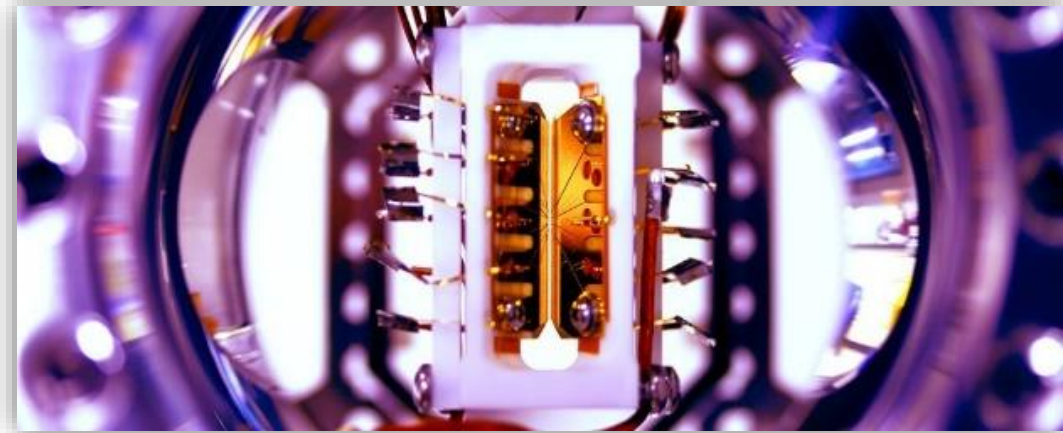


History of Computer



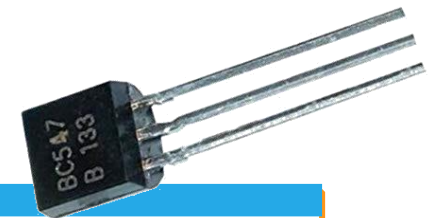
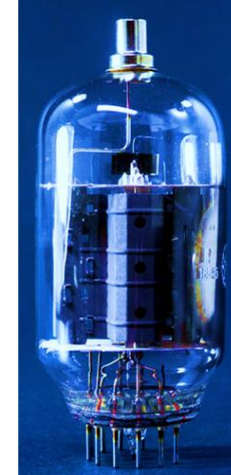
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- **2015:** Apple releases the Apple Watch. Microsoft releases Windows 10.
- **2016:** The first reprogrammable quantum computer was created



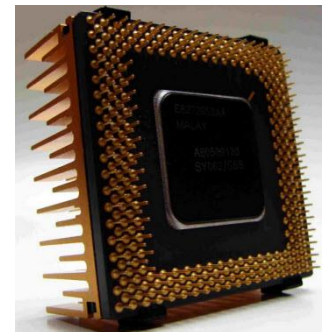
Computers Then and Now

- First-generation computers (1946-1957)
 - Enormous and powered by vacuum tubes.
 - Used a great deal of electricity, and generated a lot of heat.
 - ENIAC and UNIVAC.
- Second-generation computers (1958-1963)
 - Used transistors.
 - Computers were smaller, more powerful, cheaper, more energy-efficient, and more reliable.
 - Punch cards and magnetic tape were used to input and store data.



Computers Then and Now

- Third-generation computers (1964-1970)
 - Used integrated circuits (ICs).
 - Keyboards and monitors introduced.
- Fourth-generation computers (1971-present)
 - Use microprocessors.
 - IBM PC, Apple Macintosh.
 - Use keyboards, mice, monitors, and printers.
 - Use magnetic disks, flash memory, and optical disks for storage.
 - Computer networks, wireless technologies, Internet introduced.



Computers Then and Now

- Fifth-generation (now and the future)
 - Infancy stage.
 - No precise classification.
 - May be based on artificial intelligence (AI).
 - Likely use voice and touch input.
 - May be based on optical computers and utilize nanotechnology.



Hardware

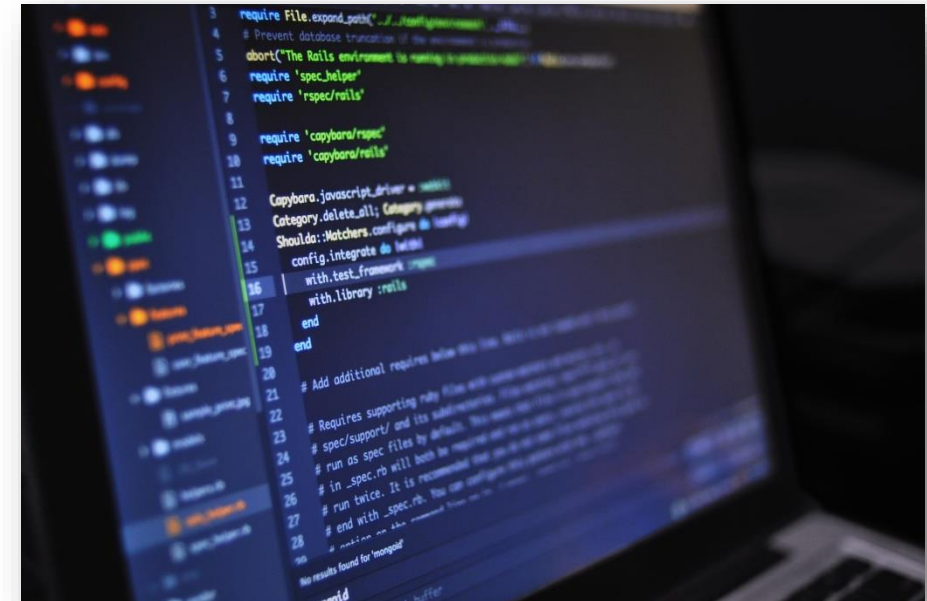
- **Hardware** refers to the physical parts of the computer.

- Internal hardware
 - Located inside the main box (system unit) of the computer.
- External hardware
 - Located outside the system unit.
 - Connect to the computer via a wired or wireless connection.



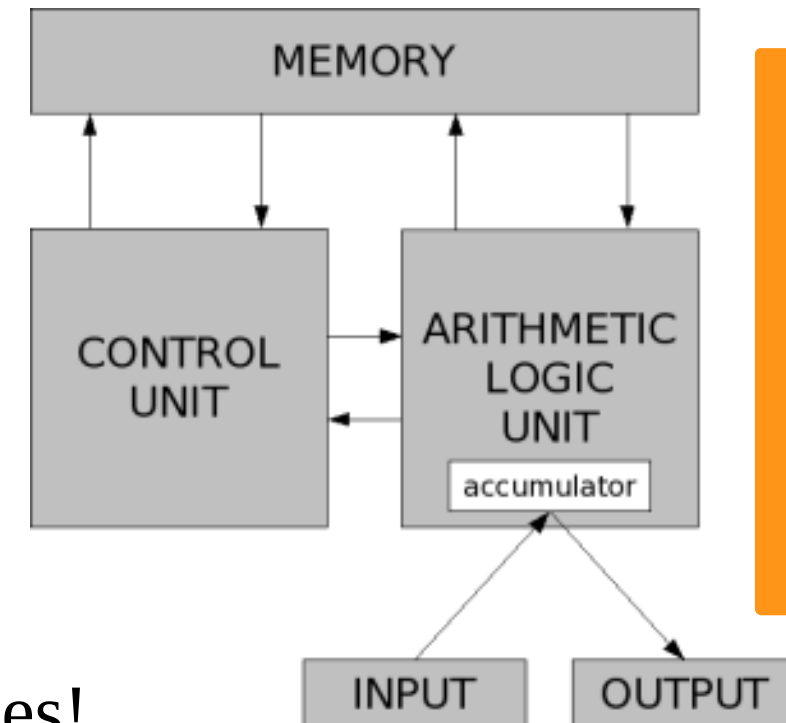
Software

- **Software** refers to the set(s) of instructions given to the computer to execute one or more tasks.
 - Software is sometimes referred to as programs.
 - E.g., Microsoft Office, Firefox.



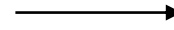
The Von Neumann Architecture

- This describes how a conceptual computing device works:
 - Memory stores data and instructions.
 - Control Unit (CU) obtains and executes instructions.
 - Arithmetic Logic Unit (ALU) does calculations.
 - Input is process of getting data into machine.
 - Output is process of obtaining data from machine.
- Most modern computers are Von Neumann machines!



Parts of a Modern Computer 1/2

Monitor: for displaying output



System Unit: CPU, Memory,
Hard drive,...



Keyboard and Mouse: for input



Parts of a Modern Computer 2/2

- **Central Processing Unit (CPU):** microchip that performs core computation. It usually contains the ALU and CU.
- **Memory (primary storage):** microchips that store data which can be accessed while computer is switched on.
 - **Random Access Memory (RAM)** is volatile and modifiable.
 - **Read-Only Memory (ROM)** cannot be changed.

Parts of a Modern Computer 2/2

- **Hard drive (secondary storage):** store data on magnetic discs permanently i.e., the data is not lost when the computer is switched off.
- **Input/Output devices:** transfers data from operator to machine and vice versa.

Data vs. Information

- Data
 - Raw, unorganized facts.
 - Can be in the form of text, graphics, audio, or video.
- Information
 - Data that has been processed into a meaningful form.
- Information processing
 - Converting data into information.

How The Computer Works



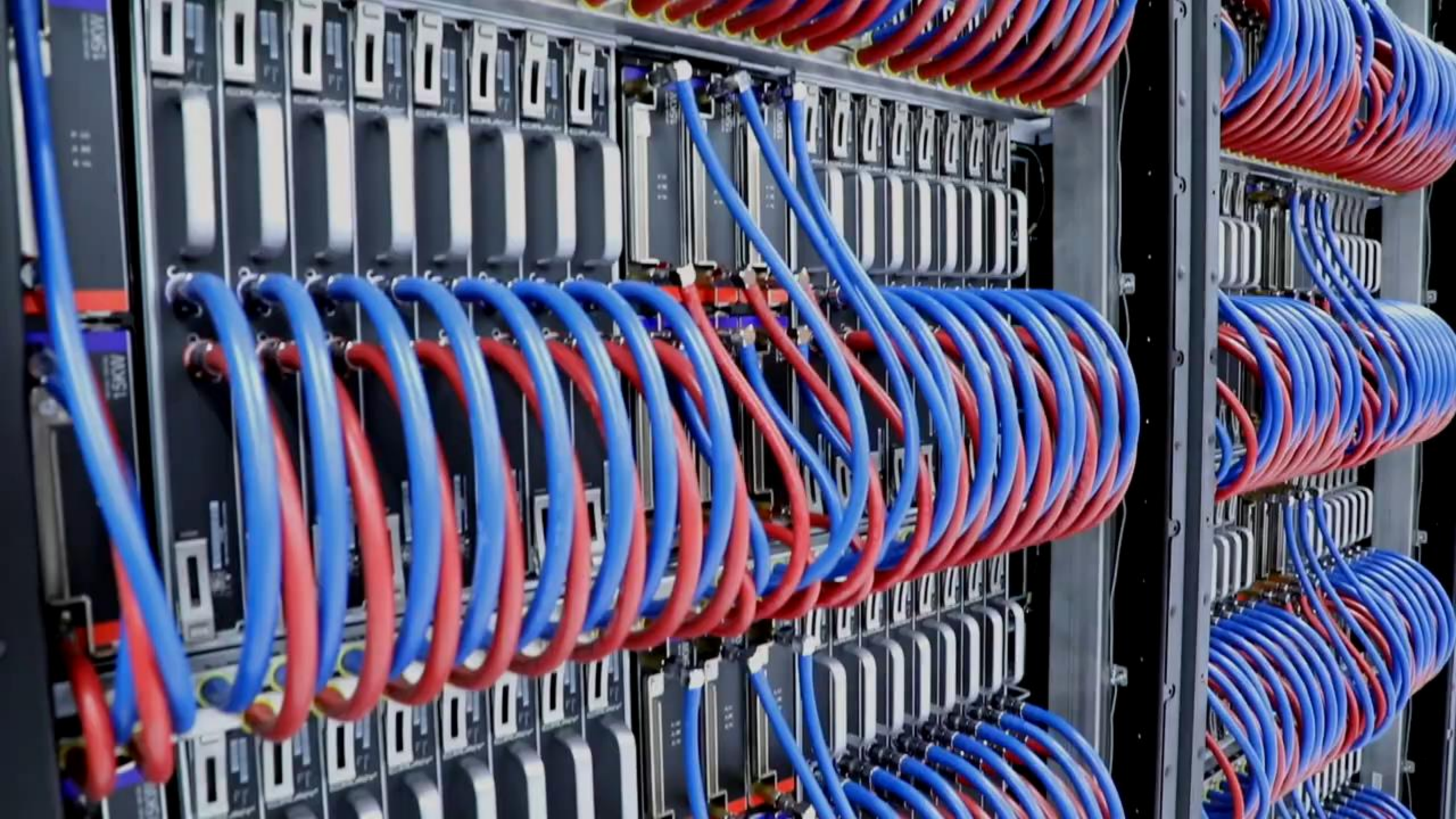
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Types of computers: Supercomputers

- Priced from \$100 million to over \$1 billion.
- High-capacity machines with thousands of processors.
- Multi-user systems.
- Used for Census, weather forecasting, designing aircraft, scientific projects, etc.
- Frontier is the most powerful supercomputer today in 2022 .



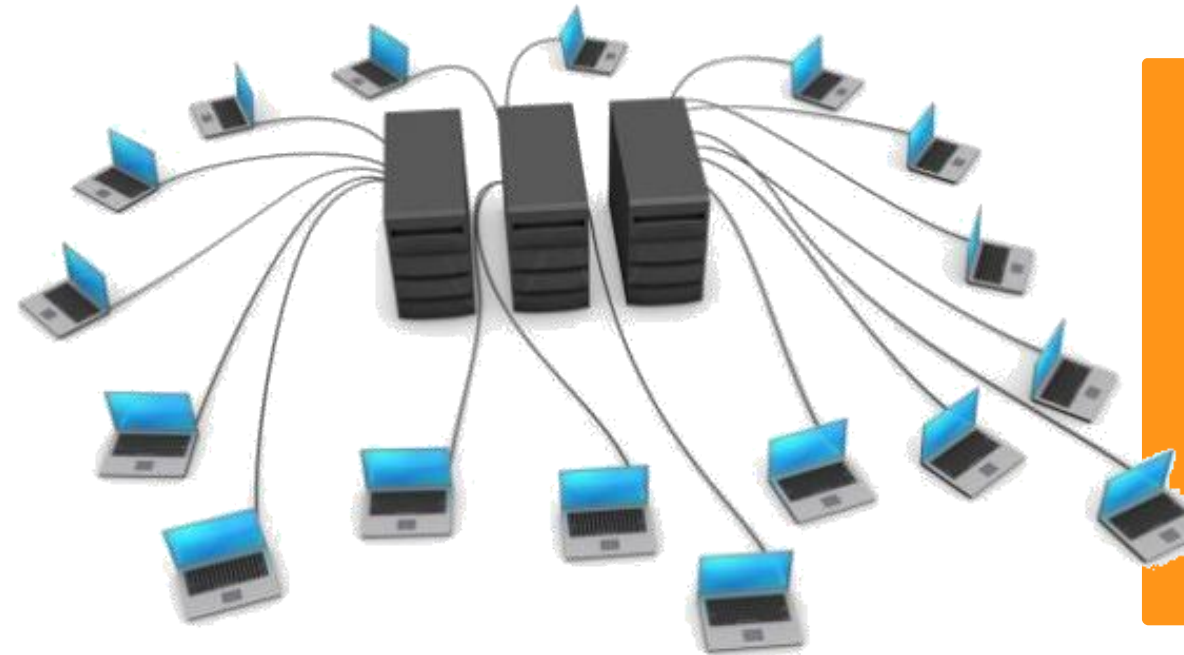


Types of computers: Mainframes



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- Priced from \$5,000 to \$5 million.
- Water-cooled or air-cooled.
- Used by banks, airlines, colleges, and the like for millions of transactions.



Types of computers: Workstations



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Types of computers: Workstations

- Expensive, powerful personal computers.
- Required for scientific, mathematical, engineering, computer-aided design (CAD), computer-aided manufacturing (CAM).
- Used for designing cars, drugs, movie special effects.



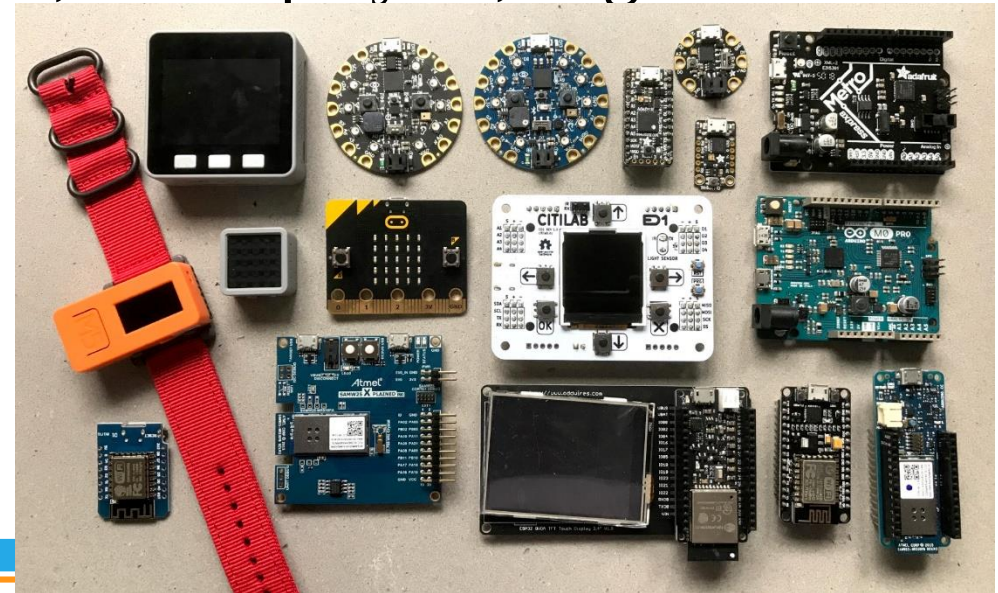
Microcomputers

- Personal computers that cost \$500 to \$5,000.
- Used either stand-alone or in a network.
- Types include: desktop, tower, notebooks (laptops), netbooks, tablets.



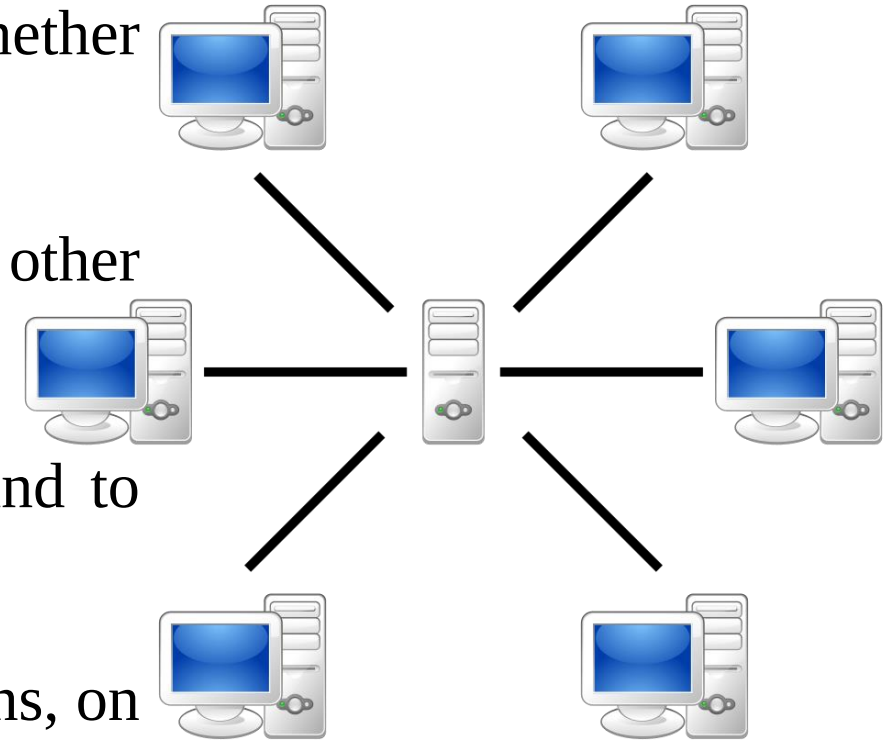
Types of computers: Microcontrollers

- Tiny, specialized microprocessors inside appliances & automobiles.
- They are in microwaves, programmable ovens, blood-pressure monitors, air bag sensors, vibration sensors, MP3 players, digital cameras, keyboards, car systems, etc.



Types of computers: Servers

- The word **server** describes the way a computer—whether mainframe, workstation, or PC—is used.
- A central computer connected (wired or wirelessly) to other computers on a client/server network.
- Purpose: Hold data and programs for clients to access and to supply services for clients.
 - Clients are other computers, such as PCs or workstations, on which users run applications



Computer Networks and the Internet

- Computer network: A collection of computers and other devices that are connected together.
 - Users can share hardware, software, and data
 - Users can communicate with each other
- Network servers: Manage resources on a network
- Clients: Access resources through the network server

Computer Networks and the Internet

- Computer networks exist in many sizes and types
 - Home networks
 - University and small business networks
 - Large corporate
 - The Internet

What Are the Internet and the World Wide Web?

- Internet: The largest and most well-known computer network in the world.
- Individuals connect to the Internet using an Internet service provider (ISP).
- World Wide Web: One resource (a vast collection of Web pages) available through the Internet.
 - Web sites contain Web pages stored on Web servers.
 - Web pages viewed using a Web browser (Internet Explorer, Chrome, Safari, Firefox, Opera, etc.)

Accessing a Network or the Internet

- Internet addresses are used to access resources on the Internet
 - IP address: Numeric address that identifies computers (207.46.197.32).
 - Domain name: Text-based address that identifies computers (microsoft.com).
 - Uniform resource locator (URL): Identifies Web pages (<http://twitter.com/jobs/index.html>).

IP Addresses and Domain Names



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- IP addresses are numeric and unique
- Domain names: Correspond to IP addresses
 - Top-level domains (TLDs) identifies type of organization or its location

ORIGINAL TLDS	INTENDED USE
.com	Commercial businesses
.edu	Educational institutions
.gov	Government organizations
.int	International treaty organizations
.mil	Military organizations
.net	Network providers and ISPs
.org	Noncommercial organizations

NEWER TLDS	INTENDED USE
.aero	Aviation industry
.biz	Businesses
.fr	French businesses
.info	Resource sites
.jobs	Employment sites
.mobi	Sites optimized for mobile devices
.name	Individuals
.pro	Licensed professionals
.uk	United Kingdom businesses

Uniform Resource Locators (URLs)

- URL: Uniquely identifies a Web page
 - Consists of:
 - Protocol or standard being used.
 - Identification of the Web server.
 - Names of folders in which the Web page file is stored.
 - Web page's filename.
- Protocols:
 - Hypertext Transfer Protocol (http://) is typically used to display Web pages (https:// is used for secure Web pages).
 - File Transfer Protocol (ftp://) is often used for file exchange.

Uniform Resource Locators (URLs)



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Why It's Important

- **Technology:** refers to the tools and machines people have invented to make life easier.
- Knowing how technology has influenced business sheds light on new and future industries.

Technology in the Past

- Even the simplest invention, like the plow, had a huge impact on business.
- Before the plow was invented, people had to dig in the earth with their hands.
- Because of the plow, more corn could be planted which meant more corn could be produced.
- Increased corn production meant hiring more people to harvest the corn, selling more corn in the market, and building a corn-selling business.

Modern Technology

- In the past 50 years, electronics revolutionized business and society.
- There is a never-ending demand to make electronic goods smaller, faster, cheaper, and more powerful.
- Computers can store thousands of files electronically, saving time and office space.
- The computer created a boom in nearly all business industries.
- **New Jobs:** The Internet has created a demand for new jobs such as software writers, online writers, and Web page designers.

Virtual Business

- The ease of doing business online has created a boom in new businesses, or **start-ups**.
- This type of business is called a *virtual business*.
- Vocational schools, universities, colleges, and community centers offer technical training or degrees for people interested in expanding their technology skills.
- Technology skills will make you very attractive to an employer.

E-commerce

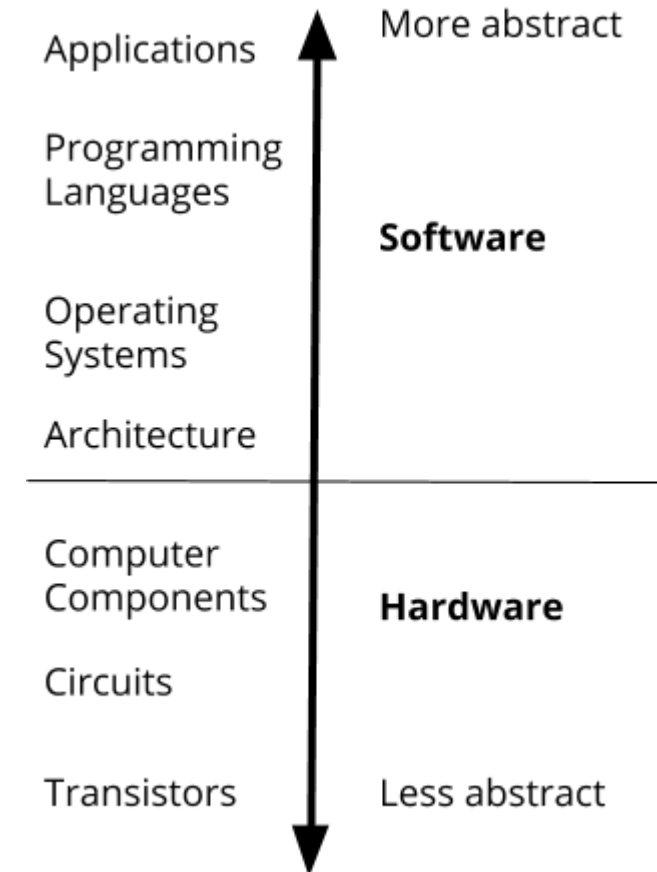
- Electronic commerce, or **E-commerce**, has made it possible for businesses to directly reach customers anywhere in the world.
- **E-commerce** is a disadvantage to the consumer in four major ways:
 - Buying power (overspending).
 - Other charges (shipping).
 - Immediacy (waiting for product).
 - Relying on observation (not being able to see products directly).

Review



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- **Applications:** Any program you run on your computer.
- Programs are comprised of millions of instructions.
- **The Operating System:** Starts running when the computer boots up. Manager/supervisor Can run multiple programs at once .



Review: History

- History

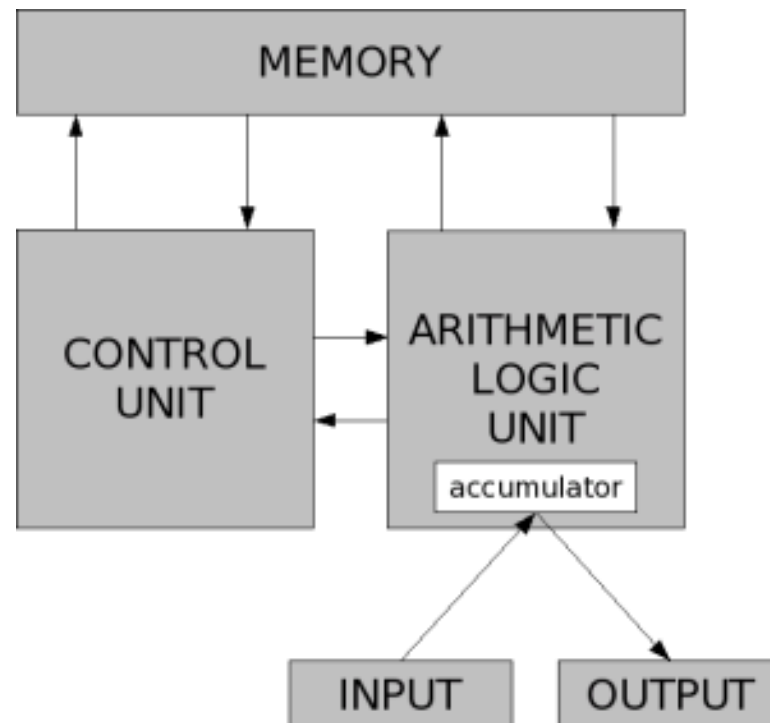
Date	event	Date	event
1985	First Dot-com	2009	Windows 7
1996	Google	2010	iPad
1999	Wi-Fi	2012	1 billion users of Facebook
2004	Facebook - Firefox	2015	Apple Watch
2005	YouTube - Android	2016	Quantum Computer

Review: Generations

- Computers generations:
- First: vacuum tubes.
- Second: transistors.
- Third: ICs, Keyboards and monitors.
- Fourth: microprocessors, printers, mouse, magnetic disks, flash memory, and optical disks, wireless, Internet.
- Fifth: AI, voice and touch, optical computers.

Review: Von Neumann Architecture

- Von Neumann Architecture



- Most modern computers are Von Neumann machines.

Review: Memory

- Random Access Memory (RAM).
- Read-Only Memory (ROM).
- Hard drive.

Review: Types of computers

- **Supercomputers:** (weather forecasting, designing aircraft).
- **Mainframes:** (banks, airlines, colleges).
- **Workstations:** powerful personal computers (designing cars, drugs, movie special effects).
- **Microcomputers:** (desktop, laptops, tablets, mobile).
- **Microcontrollers:** *embedded computers* (microwaves, air bag sensors, MP3 players, digital cameras, keyboards, car systems).
- **Servers:** central computer Hold data and programs for clients.

Review: E-commerce

- ***Virtual Business***: doing business online.
- ***E-commerce*** disadvantage: overspending – shipping – Immediacy-observation.
- ***Data*** is raw facts ***Information*** is meaningful data.

Reference



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