

Session 1: Overview of computer and IT



FACULTY OF INFORMATION TECHNOLOGY
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Content

- History of Computing
- Categorization of Computers
- Hardware
- Software
- IT and Applications
- IT in Vietnam
- FIT-HCMUS



HISTORY OF COMPUTING



Computers

- The oldest computing device was the Roman abacus
- The most familiar version is the Chinese abacus.

$10^9 10^8 10^7 10^6 10^5 10^4 10^3 10^2 10^1 10^0$



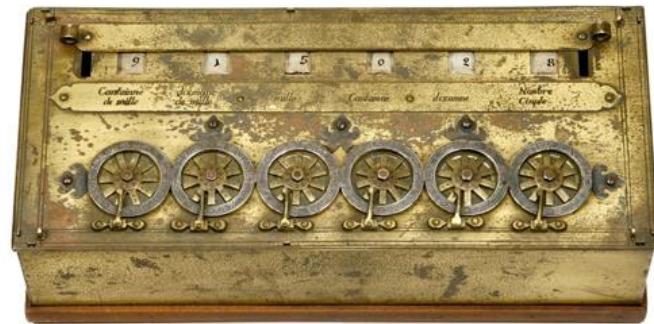
Chinese abacus

Computers

- In 1641, Blaise Pascal (1623 - 1662) built the first mechanical calculator for addition

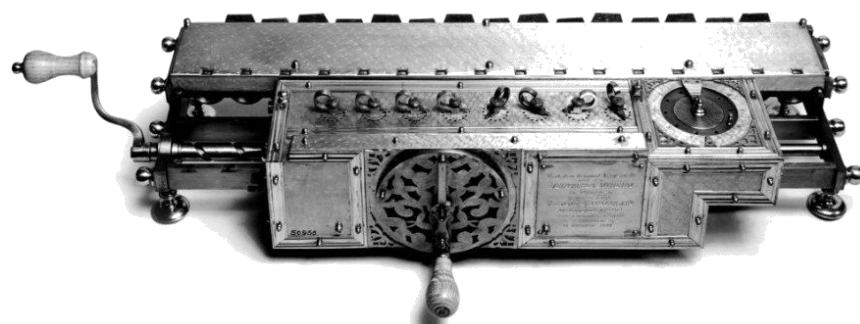


Blaise Pascal



Pascal's mechanical Calculator for addition

- In 1671, Gottfried Leibnitz (1646 - 1716) improved Pascal's calculator for addition, subtraction, multiplication and division.



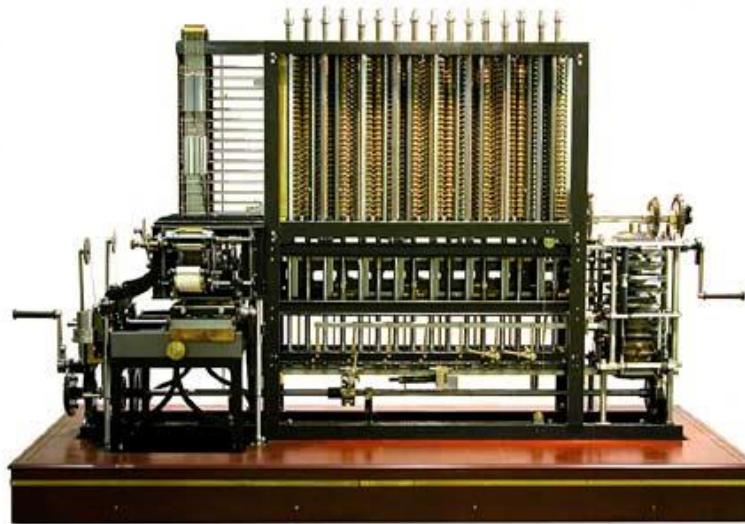
The mechanical calculator Of
Gottfried Wilhelm Leibniz
for addition, subtraction,
multiplication and division.

Computers

- In 1833, Charles Babbage (1792 - 1871) suggested that mechanical calculators should not be developed and proposed computers with external programs (on punched cards).



Charles Babbage



Charles Babbage 's computer



Nguồn : wikipedia

Computers

- punched card

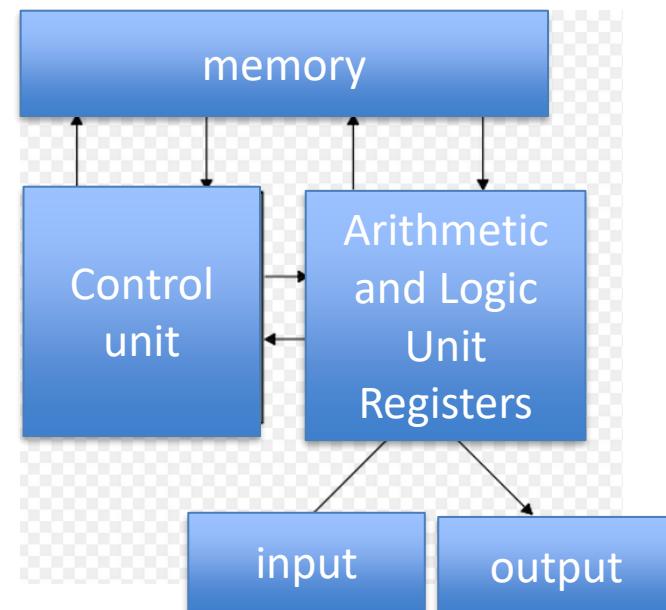


Computers

- In 1945, John Von Neumann introduced a significant principle: the program must be stored in the computers and execute the program's instructions sequentially (one instruction at a time).



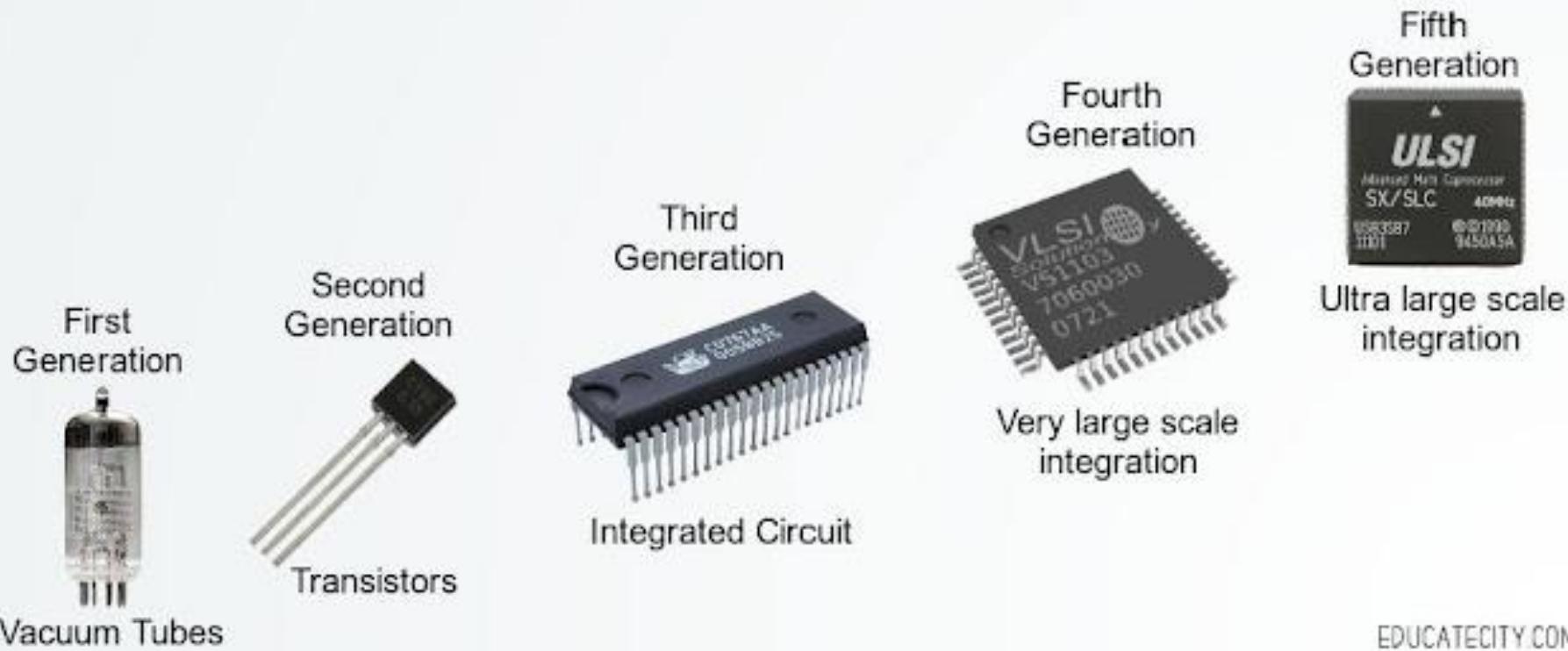
John Von Neumann



The Architecture of J.V. Neumann (1947)
https://vi.wikipedia.org/wiki/John_von_Neumann 8

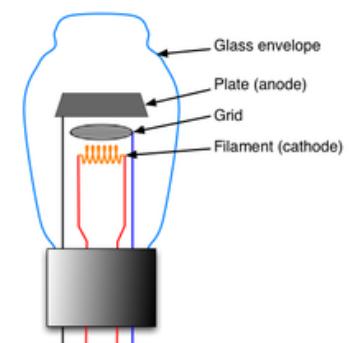
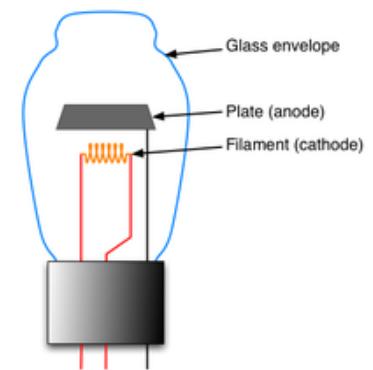
Generations

GENERATION OF COMPUTER



Generations

- First generation (1945 - 1959)
 - Using vacuum tubes
 - ENIAC machine (USA) is 30.5m long, weighs 30 tons, 18000 vacuum tubes, uses punch cards, performs 1900 additions / second, serves for defense purposes (ballistic, making atomic bombs , ...)
 - UNIVAC machine is 10 times faster than ENIAC machine, using more than 5000 vacuum tubes



Further info:

https://www.youtube.com/watch?v=FU_YFpfDqqA



1946
ENIAC

Nguồn : computerhistory.org



1951
UNIVAC

Nguồn : computerhistory.org

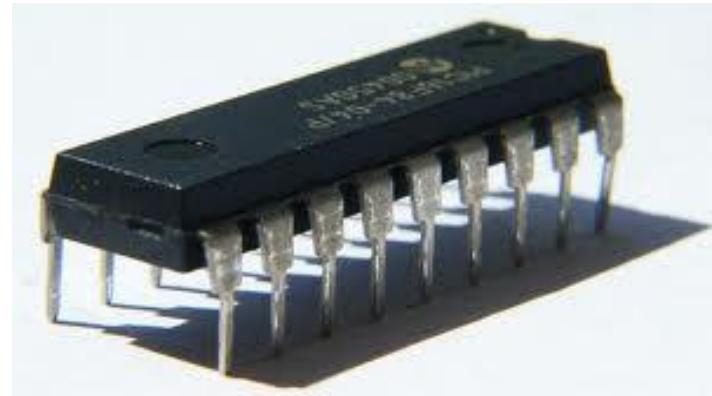
Generations

- Second generation (1960 - 1964)
 - Using semiconductors - transistors (smaller and cheaper, consume less power and generate less heat than vacuum tubes)
 - IBM 7090 reached 2 million calculations / second; participated in Mercury Project (USA) (put the first American astronaut in space); calculated the largest prime number at that time (1961) with 1332 digits
 - M-3, Minsk-1, Minsk-2 (Soviet Union)
 - NNLT: COBOL, FORTRAN



Generations

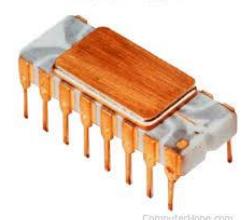
- Third generation (1964 - 1970)
 - Using Integrated Circuit (smaller, faster, cheaper, ...)
 - IBM360 (USA) performs 500,000 additions / second (250 times more than ENIAC)



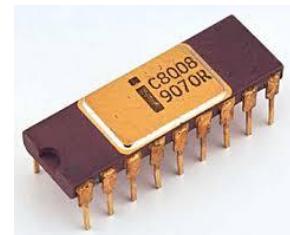
Generations

- Fourth generation (1970 - present)
 - Using large-scale integrated circuit (LSI) and very large-scale integrated circuit (VLSI)
 - Intel 4004 in 1971 (4-bit processor)
 - Intel 8008 in 1972 (8-bit processor)
 - Intel 8086 in 1978 (16-bit processor)
 - Intel Core i7 (1,170,000,000 transistors, 6 cores, 12 threads working simultaneously)
 - Other (Snapdragon 855, Apple A11 Bionic)
 - Parallel processing

Intel 4004



ComputerHope.com





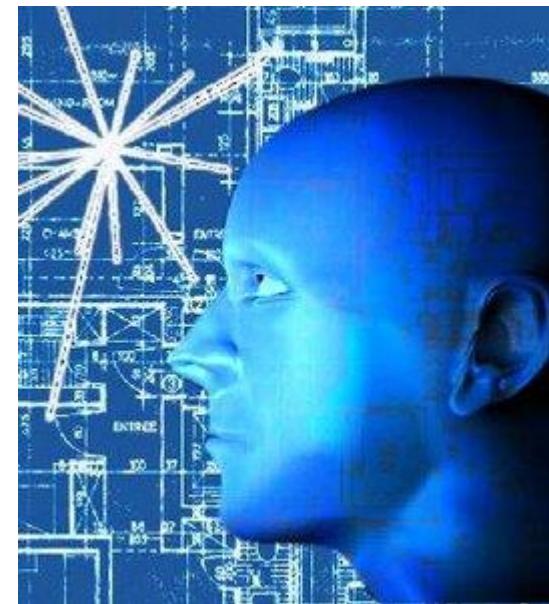
1973
Personal Computer - Micral N.
François Gernelle



1981
IBM PC

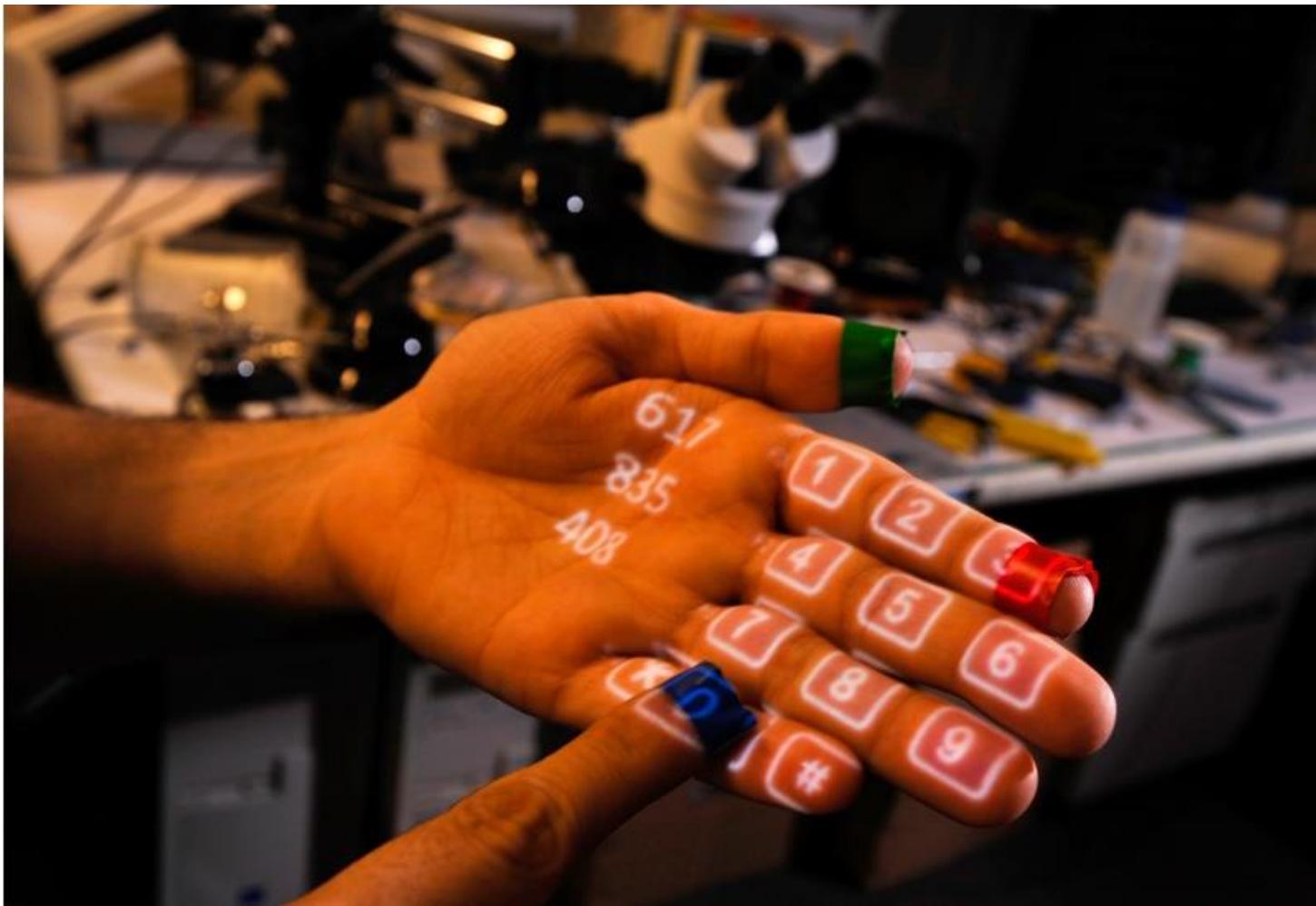
Generations

- Fifth generation (near future?)
 - Working on artificial intelligence
 - Communicating directly with people in natural language,
 - Learning the knowledge
 - Expressing emotions ...



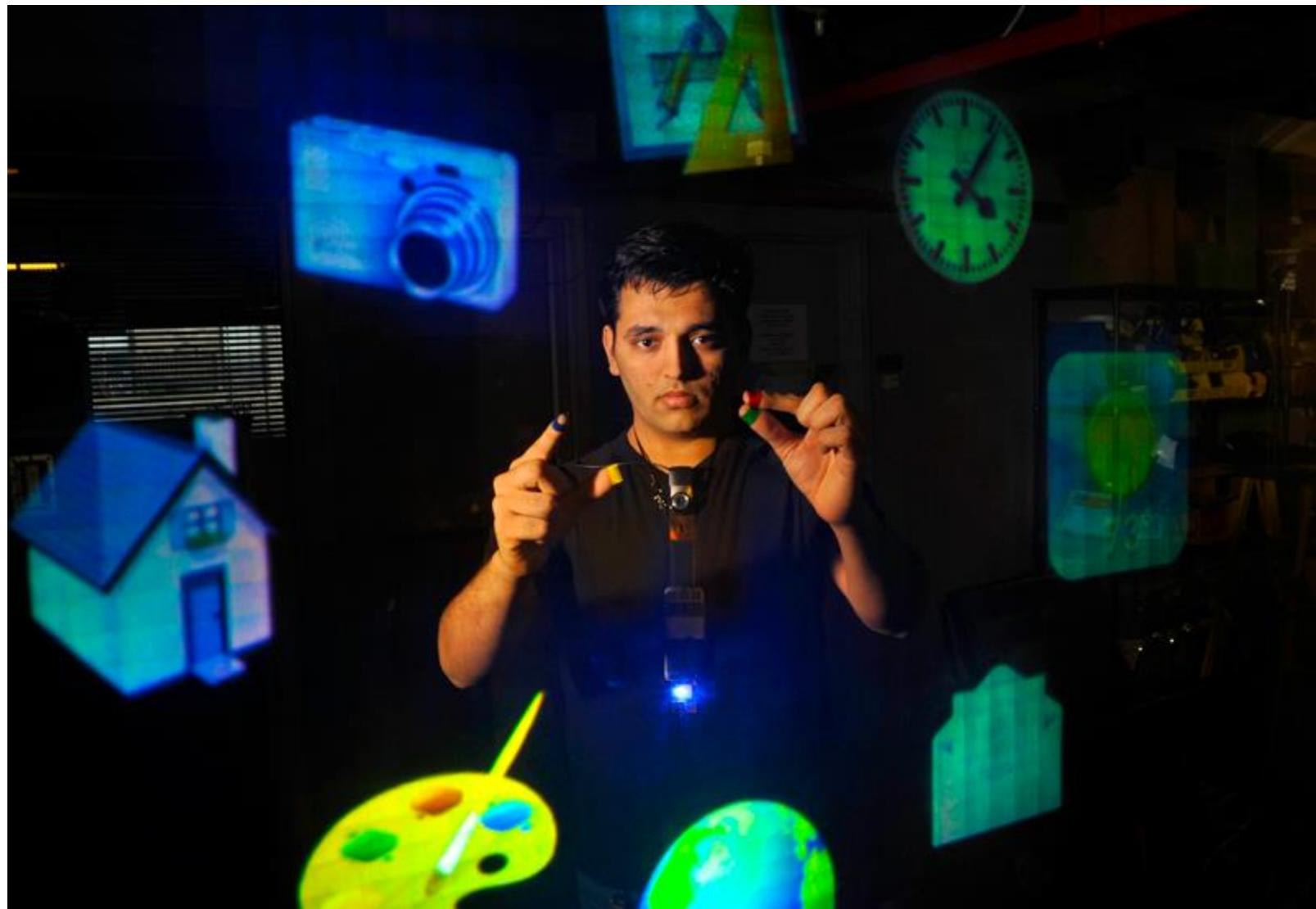
Generations

GENERATION	HARDWARE COMPONENTS	CHARACTERISTICS	COMPUTERS
First Generation (1942-1959)		<ul style="list-style-type: none"> ④ Vacuum Tubes 	<ul style="list-style-type: none"> ④ Machine Language ④ Huge Size ④ Highly Expensive ④ High Consumption of Electricity
Second Generation (1959-1965)		<ul style="list-style-type: none"> ④ Transistors ④ Magnetic Tapes 	<ul style="list-style-type: none"> ④ Batch processing, Multiprogramming OS ④ Expensive ④ FORTRAN, COBOL
Third Generation (1965-1975)		<ul style="list-style-type: none"> ④ Integrated Circuits 	<ul style="list-style-type: none"> ④ Remote processing, time-sharing, Multiprogramming OS ④ Faster, Compact & Cheaper ④ PASCAL PL/I, BASIC, ALGOL-68
Fourth Generation (1975-1988)		<ul style="list-style-type: none"> ④ VLSI Microprocessor circuits 	<ul style="list-style-type: none"> ④ Time-sharing, real-time networks, distributed, GUI OS ④ Faster, Compact & Affordable ④ C, C++, DBASE
Fifth Generation (1988-Present)		<ul style="list-style-type: none"> ④ ULSI Microprocessor circuits 	<ul style="list-style-type: none"> ④ Parallel Processing & Artificial Intelligence technology ④ C and C++, Java, Net



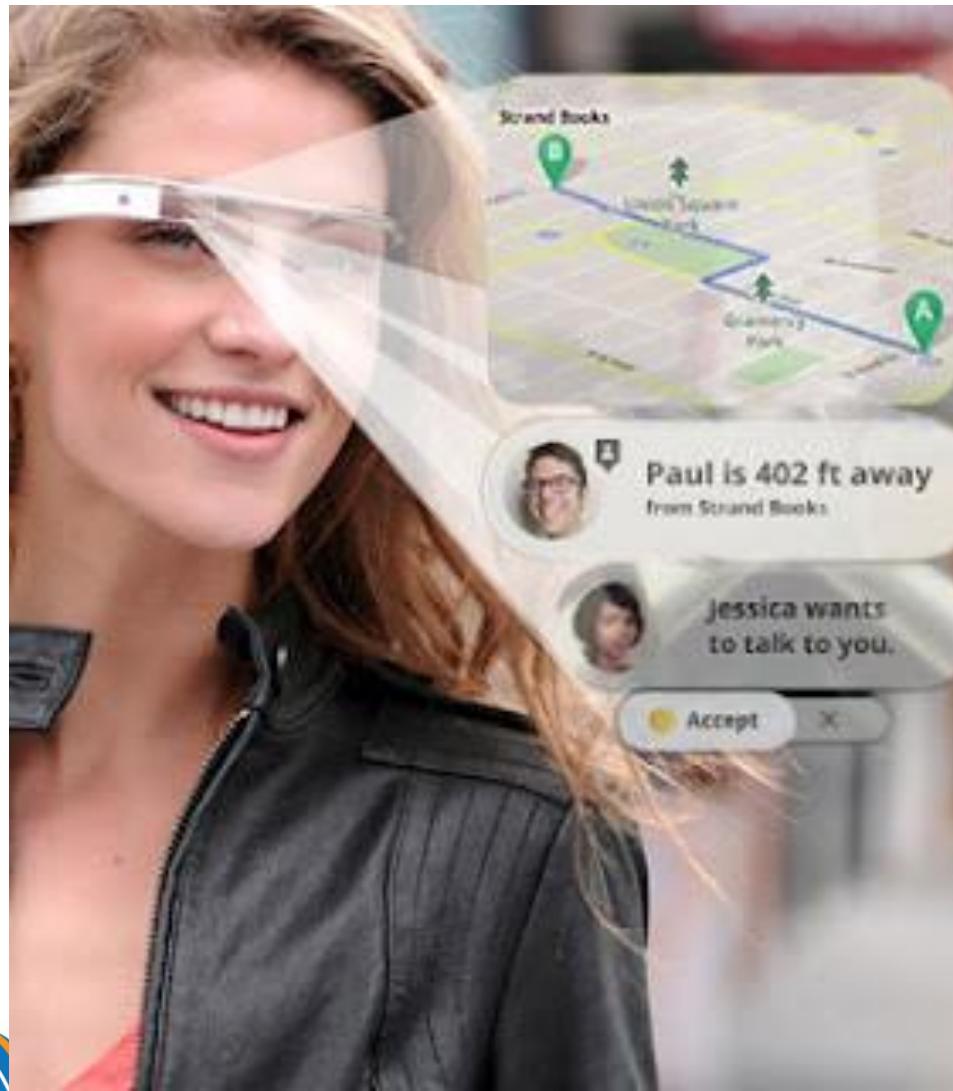














Virtual Reality (VR)



Augmented Reality (AR)



Hologram



Industry 4.0

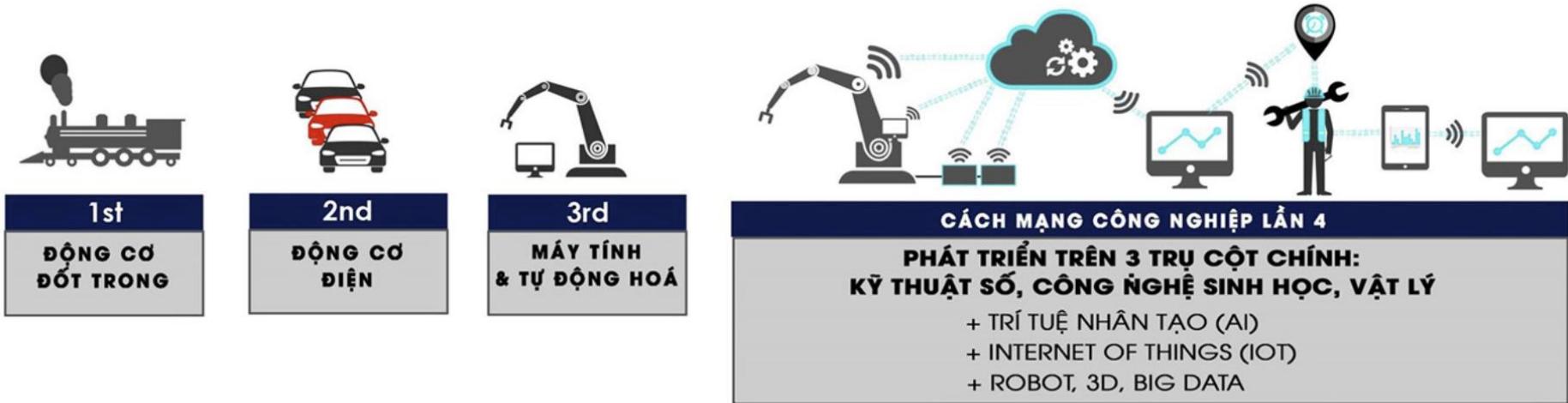
The 1st industrial revolution marked by transition from hand production methods to machines through the use of steam power and water power.

The 2nd revolution took place thanks to the application of electricity for mass production.

The 3rd revolution used electronic and information technology to automate the production.

Now, the 4th Industrial Revolution is a range of new technologies that are fusing the physical, digital and biological worlds, impacting all economies and industries, and even challenging ideas about what it means to be human. (Klaus Schwab)

Industry 4.0



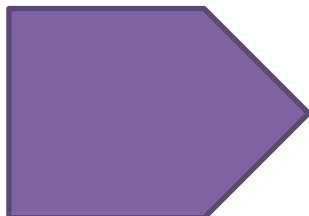
Components of Industry 4.0

- AI - Artificial Intelligence
- IoT - Internet of Things (Everything connected via the Internet)
- 3D technology: Virtual reality, Augmented reality, 3D printing
- Social networks, mobile networks, big data analytics, cloud computing (SMAC: Social, Mobile, Analytic, Cloud)



Industry 4.0

- Which factors will play a decisive role in the 4.0 industrial revolution?



The answer is still ahead,
Maybe they could be inventions of IT!

Discussion question

Most smartphones are able to identify the phone's location by means of GPS. This allows applications to provide location-specific information (such as the local news, local weather, or the presence of businesses in the immediate area) based on the phone's current location. However, such GPS capabilities may also allow other applications to broadcast the phone's location to other parties. Is this good? How could knowledge of the phone's location (thus your location) be abused?



CATEGORIZATION OF COMPUTERS



Supercomputer

- The most powerful today, it is integrated from hundreds to thousands of processors.
- Designed for simulations of global climate change, nuclear explosion, ...



Mainframe

- Designed for multitasking
- Powerful input and output, focusing on processes of big data, such as financial transactions, insurance business, ...



Minicomputer

- Computers are between mainframes and microcomputers



Microcomputer

- Computers are suitable for most users, including three main types:
 - Desktop
 - Laptop
 - Handheld



Desktop



Laptop



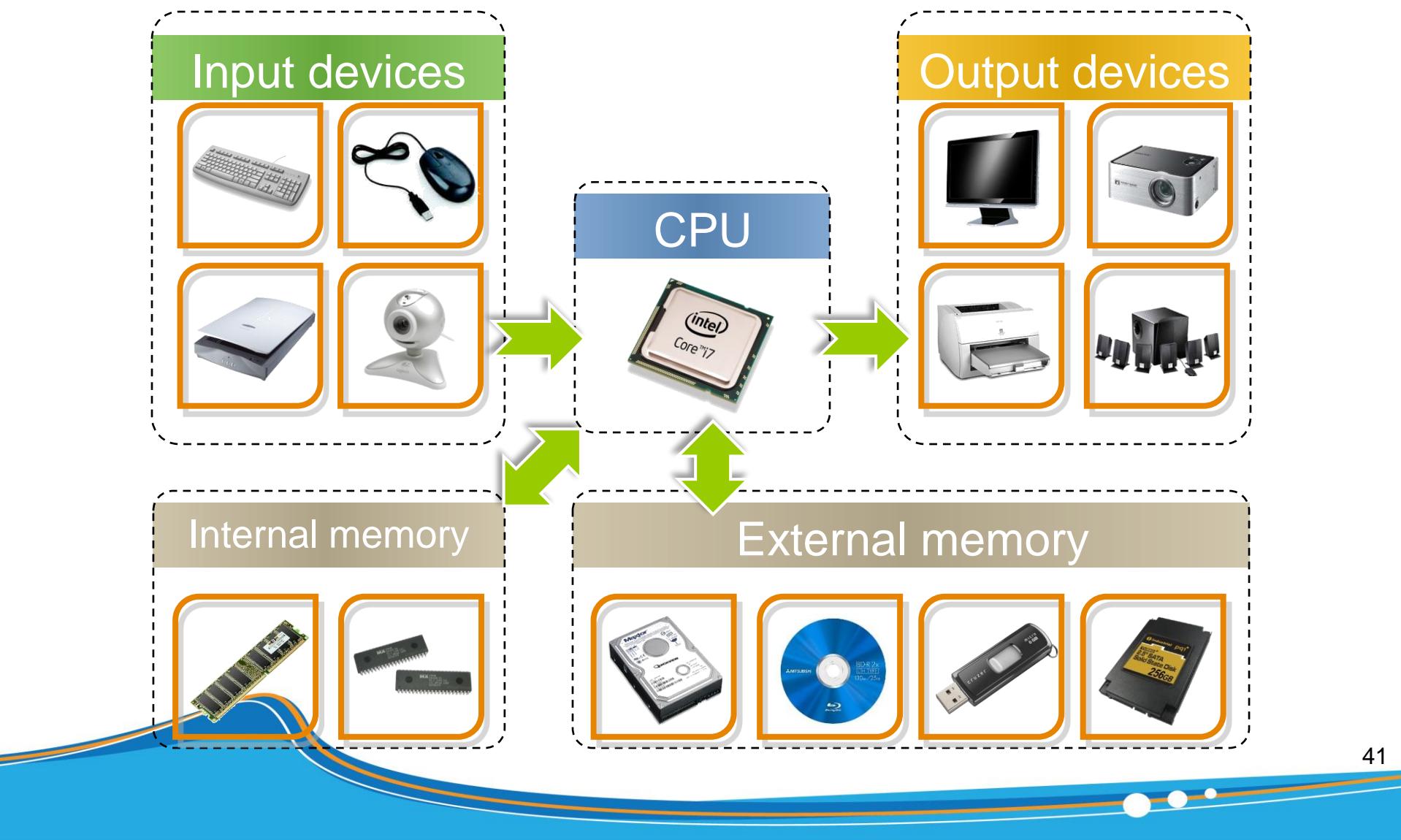
Handheld



COMPUTER ARCHITECTURE - HARDWARE



Computer Architecture



CPU

- Central Processing Unit - CPU
 - The CPU controls all computer operations.
- Include:
 - Control Unit (Control Unit - CU)
 - Arithmetic Logic Unit (ALU)
 - Registers
 - Bus line
 - Clock

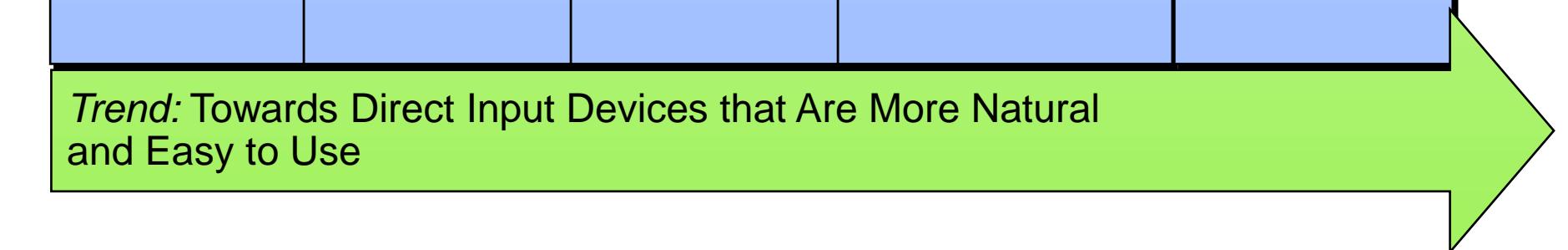


Intel Core i7 CPU

Input Technology Trends

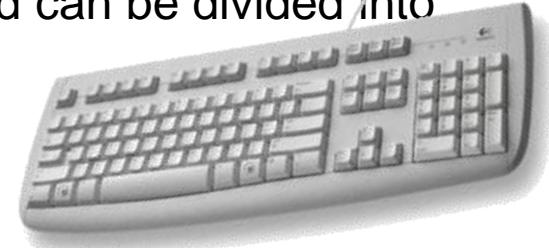
First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation
Punched Cards Paper Tape	Punched Cards	Key to Tape/ Disk	Keyboard Data Entry Pointing Devices Optical Scanning	Voice Recognition Touch Devices Handwriting Recognition

Trend: Towards Direct Input Devices that Are More Natural and Easy to Use



Input Devices

- Keyboard: Standard input device. The keys on a keyboard can be divided into several groups based on their functions:
 - Typing (alphanumeric) keys.
These keys include the same letter, number, punctuation, and symbol keys found on a traditional typewriter.
 - Control keys. These keys are used alone or in combination with other keys to perform certain actions. The most frequently used control keys are Ctrl, Alt, the Windows logo key Picture of the Windows logo key, and Esc.
 - Function keys. The function keys are used to perform specific tasks. They are labeled as F1, F2, F3, and so on, up to F12. The functionality of these keys differs from program to program.
 - Navigation keys. These keys are used for moving around in documents or webpages and editing text. They include the arrow keys, Home, End, Page Up, Page Down, Delete, and Insert.
 - Numeric keypad. The numeric keypad is handy for entering numbers quickly. The keys are grouped together in a block like a conventional calculator or adding machine



Input Devices

- Mouse: A hand-sized device to move the mouse cursor.
- Scanner: Convert documents into digital images.



Mouse



Scanner

Input Devices

- Webcam & Camera: Record images from the real world to your computer.
- Digital Camera: Capture images from the real world and put them on the computer.



Webcam



Digital camera

Input Devices

- Drawing Tablet: Use a stylus to draw on the electronic board
- Barcode Reader (Barcode Reader): Used to read barcodes (encrypted numbers).



Drawing Tablet



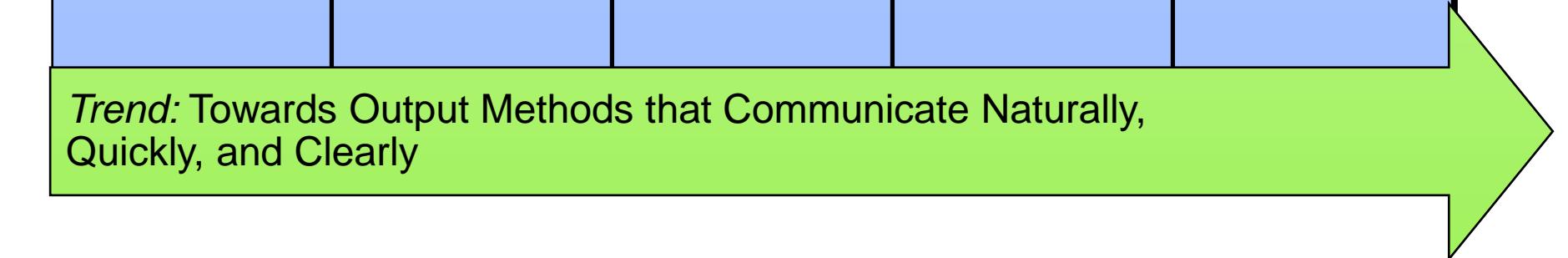
Barcode Reader



Output Technology Trends

First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation
Punched Cards Printed Reports and Documents	Punched Cards Printed Reports and Documents	Printed Reports and Documents Video Displays	Video Displays Audio Responses Printed Reports and Documents	Video Displays Voice Responses Hyperlinked Multimedia Documents

Trend: Towards Output Methods that Communicate Naturally, Quickly, and Clearly



Output Devices

- Monitor: Standard output device
 - Common types: CRT and LCD.
 - Resolutions: 800x600, 1024x768, ...
 - Sizes: 15 ", 17", 19 ", 22" ...



CRT



LCD

Output Devices

- Projector
- Printer
- Speaker



Projector



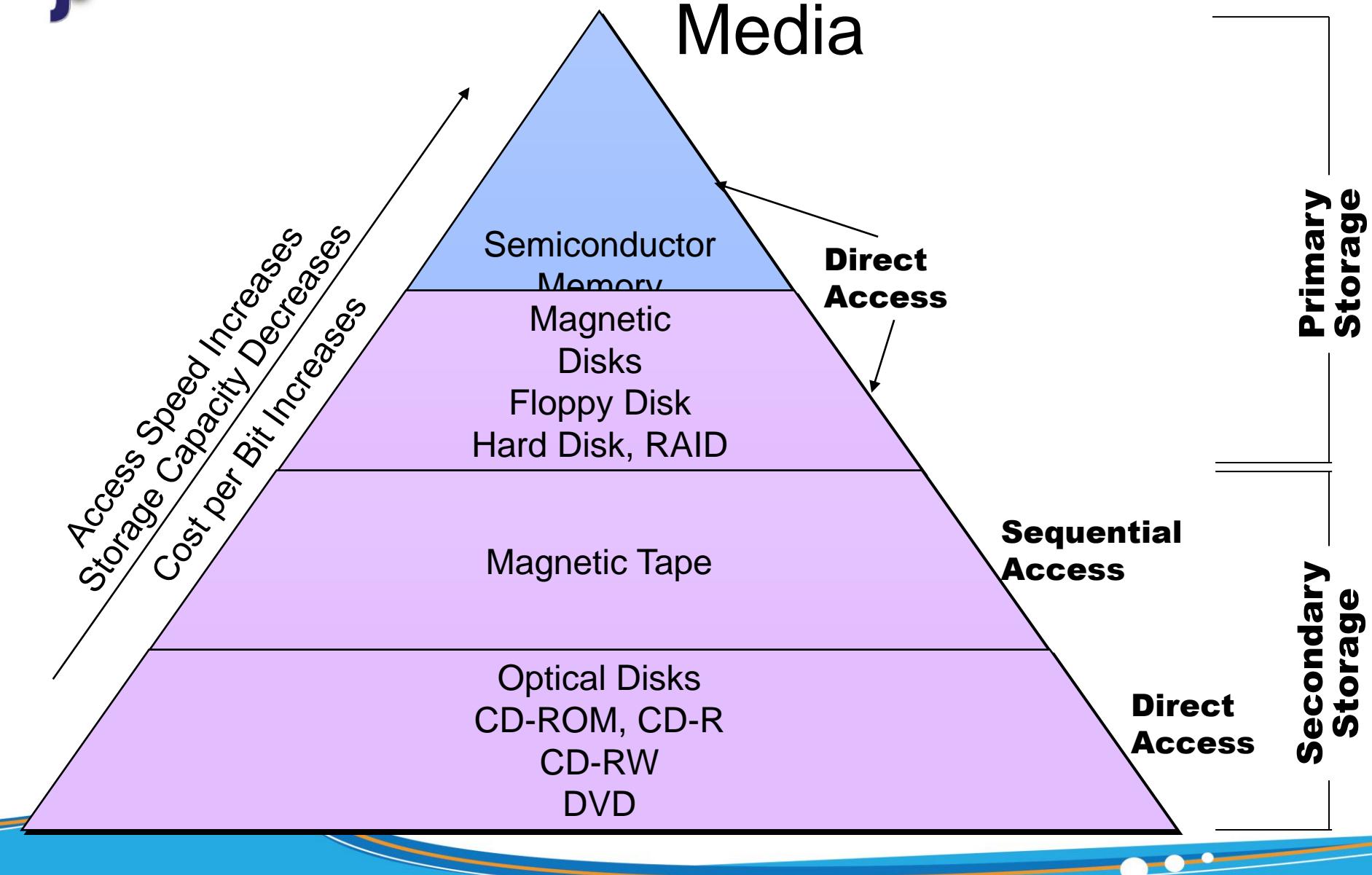
Printer



Speaker

Primary & Secondary Storage

Media





Internal memory

- ROM (Read Only Memory)
 - Storing the system program.
 - Data is always maintained even when the power supply is interrupted.



- RAM (Random Access Memory)
 - Storing data temporarily.
 - Data will be lost when power supply is interrupted

External memory

□ Advantages and disadvantages compared to internal memory

□ Advantages:

- Storage capacity is larger
- High reliability
- Low cost

□ Disadvantages

- Access speed is significantly slower

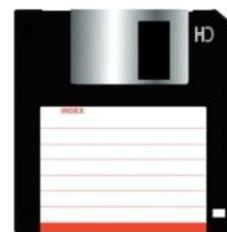
External memory

- Categorization based on technical characteristics:
 - Magnetic system
 - Optical system
 - Flash drive
 - Solid state drive

External memory

□ Magnetic system

- Tape: The first storage device, slow speed, often used to back up data.
- Floppy Disk: slow speed, not long life.
- Hard Disk: Multi-layer, up to TBs capacity, fast speed, long life.



External memory

□ Optical system

- CD (Compact Disk): 700MB.
- DVD disc (Digital Video / Versatile Disk): up to 17GB.
- Some enhancements from DVD:
 - HD DVD / Blu-ray (30 / 50GB)
 - HVD (500GB up to 3.9TB)
 - 5D DVD (10TB)



External memory

□ Flash Drive

- Developed over the last 10 years, eliminating the mechanical properties of magnetic and optical discs.
- The small size, convenient communication via USB (Universal Serial Bus) so it has made the floppy disk no longer exist.
- Common capacity ranges from 8 GB to 32 GB.



External memory

- Solid State Drive
 - Using solid memory to store data.
 - The read speed is 3 times faster, the write speed is 1.5 times faster than the normal hard drive.
 - Low power consumption, suitable for mobile devices.
 - The price is higher than a normal hard drive.
 - The largest capacity in 2010 is 1 TB and costs about \$ 2,200.
 - 1 TB (10-2015) -> 300-400 \$
 - 500 GB (08-2018) -> 100 \$

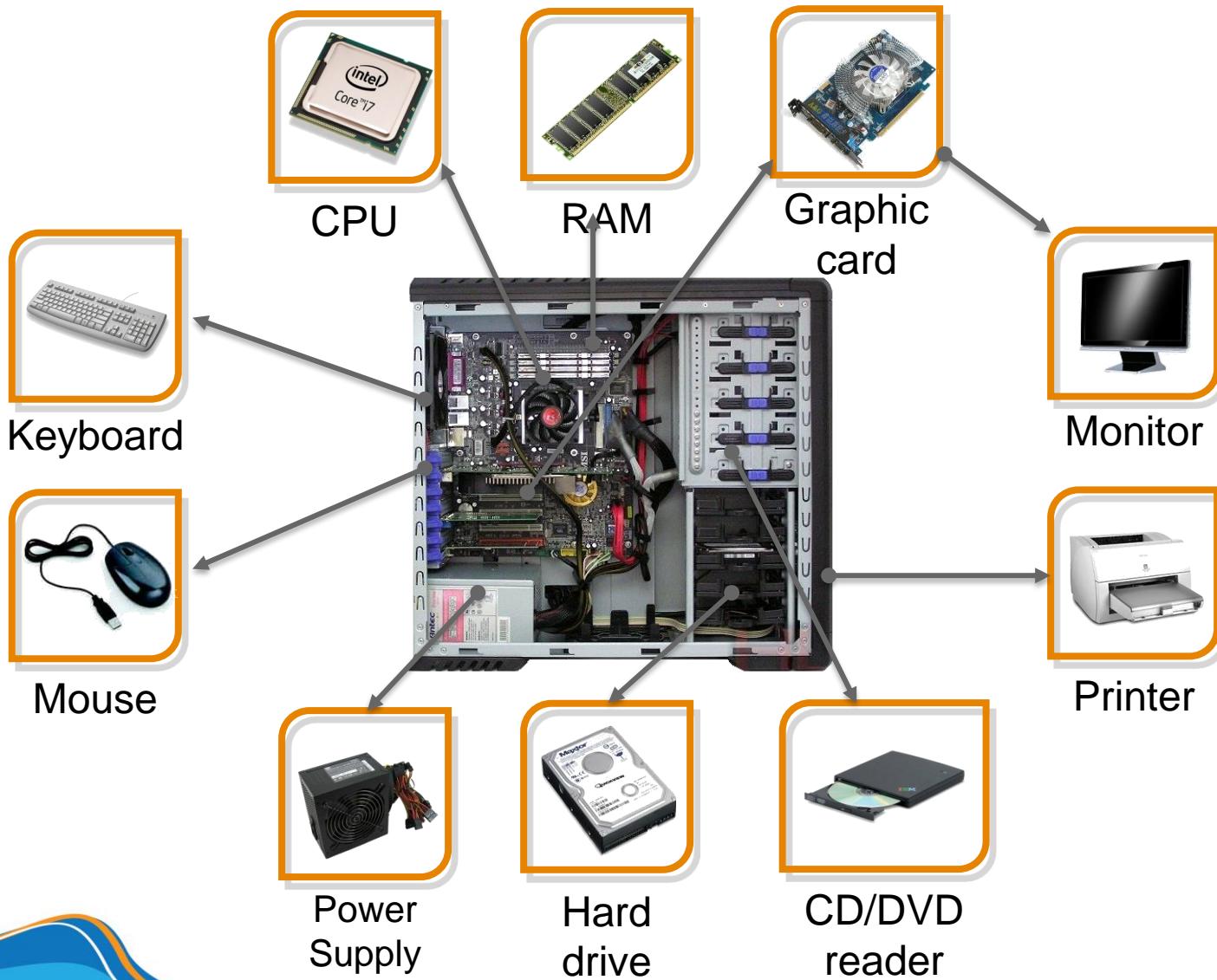


Motherboard

- Motherboard plays an important role and is a bridge for the devices.
- There are many devices mounted on the motherboard such as: computer power, CPU, RAM, control board (graphics, audio, network), hard drive, disk reader (CD, floppy disk), monitor, keyboards, mouse, ...



Inside a PC case



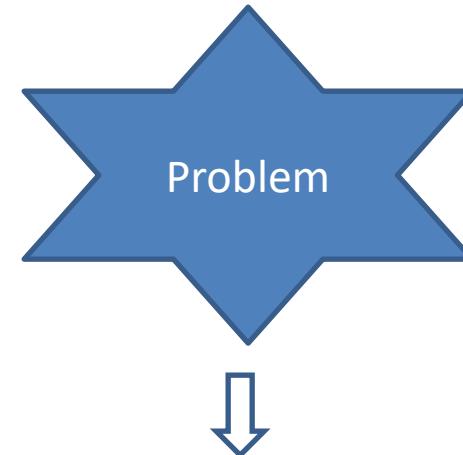


SOFTWARE

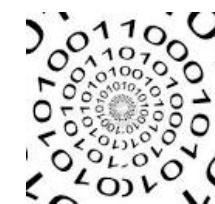


Definition

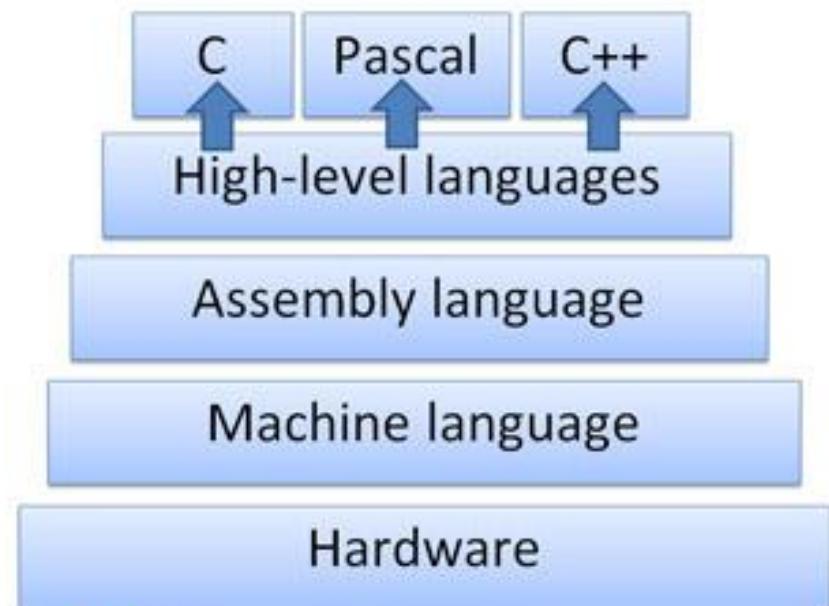
Software is a set of instructions written in a programming language with a syntax to automatically perform certain tasks or solve a certain problem.



If Then ...else
Begin
... End
...



Definition





Categories of Programming Languages

<p><u>Machine Languages</u> Use binary coded instructions 1001 1001 1100 1101</p>	<p><u>High Level Languages</u> Use brief statements Compute $X = Y + Z$</p>	<p><u>Markup Languages</u> Use embedded control codes <H1>First heading</H1> <!ELEMENT Product (#Item manuf)></p>
<p><u>Assembler Languages</u> Use symbolic coded instructions LOD Y ADD Z</p>	<p><u>Fourth Generation Languages</u> Use natural statements SUM THE FOLLOWING NUMBERS</p>	<p><u>Object-Oriented Languages</u> Define objects that contain data and actions Document.write ("Hi There")</p>





Programming Language Rankings

Position	PYPL ranking September 2023	Stack Overflow's Developer Survey 2023
1	Python	JavaScript
2	Java	HTML/CSS
3	JavaScript	Python
4	C#	SQL
5	C/C++	TypeScript
6	PHP	Bash/Shell
7	R	Java
8	TypeScript	C#
9	Swift	C++
10	Objective-C	C

Internet Oriented Languages

- *Hypertext Markup Language (HTML)* is the standard language the Web uses for creating and recognizing hypermedia documents.
 - *Hypertext* (hyperlinks.)
 - *Uniform Resource Locators (URLs)*
- *Dynamic HTML* makes Web pages more like dynamic applications and less like static content.
- *XML (eXtensible Markup Language)* is a language for defining, validating and sharing document formats.
- *Virtual Reality Modeling Language (VRML)* is a file format for describing three-dimensional interactive worlds and objects.

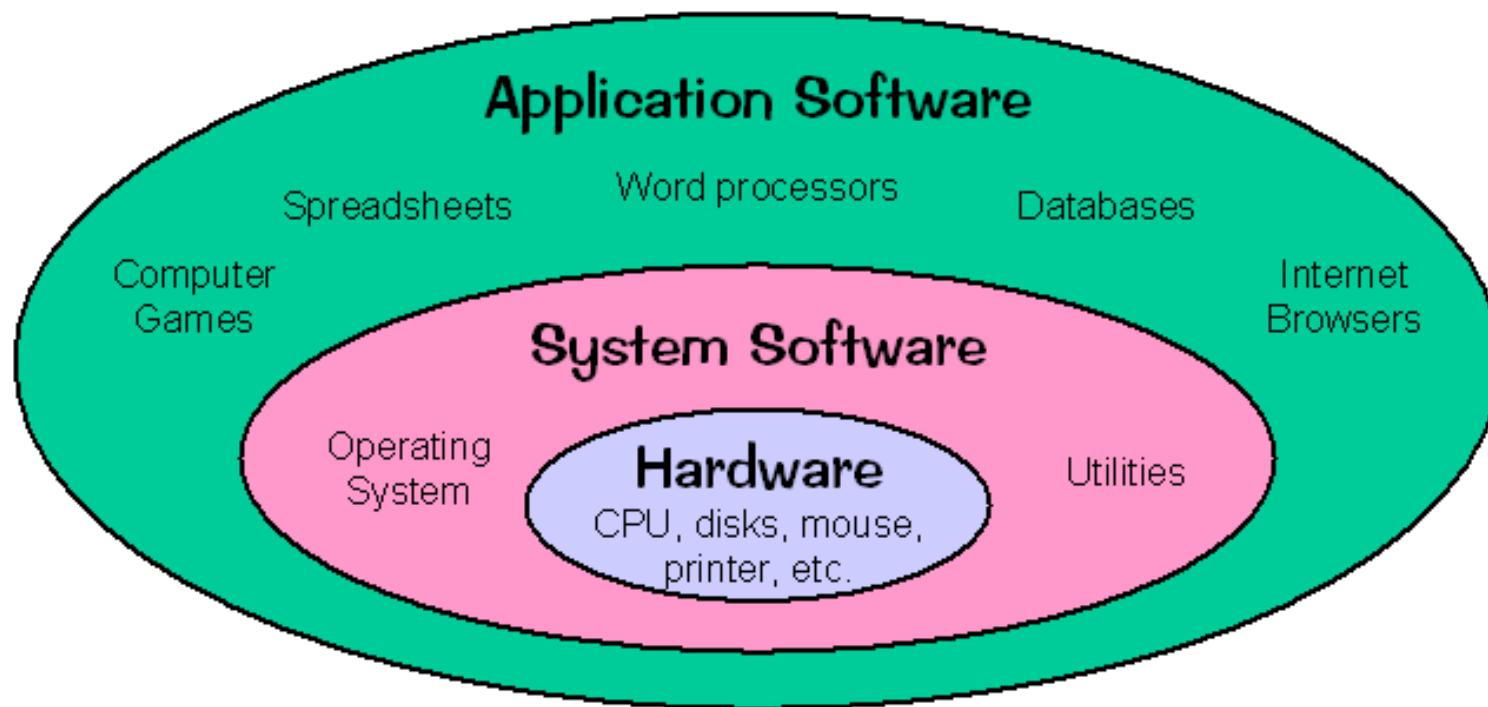
Internet Oriented Languages (cont.)

- **Java** is an object-oriented programming language that gives programmers the ability to develop applications that work across the Internet.
- **JavaScript** is an object-oriented scripting language that allows users to add some interactivity to their Web pages.
- **ActiveX** is a set of technologies that combines different programming languages into a single, integrated Web site.
- **ASP (Active Server Pages)** is a Microsoft CGI-like technology that allows you to create dynamically generated Web pages from the server side using a scripting language.
- **PHP**

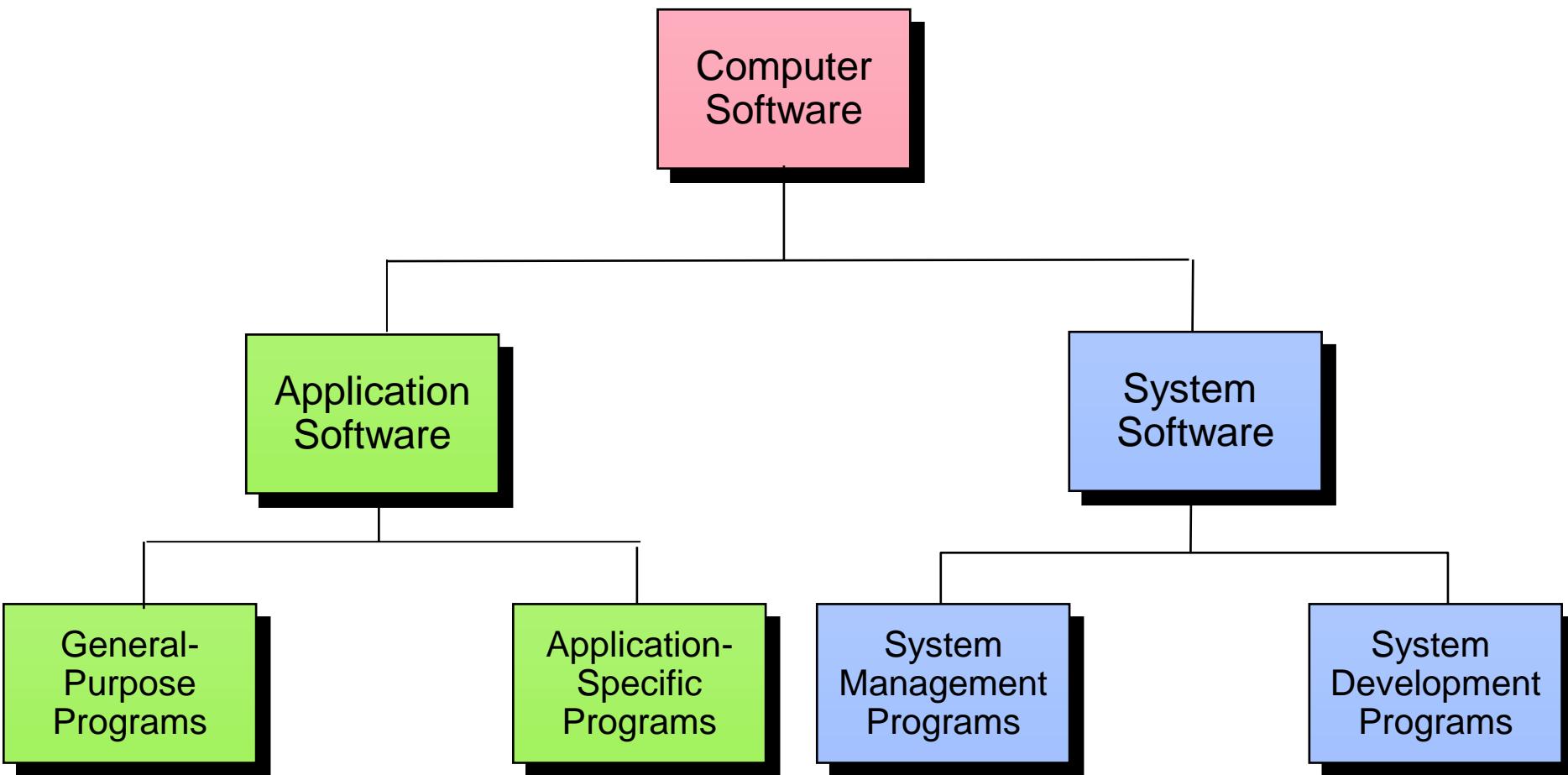
Types of Software

- ***Application software*** - set of computer instructions that directs computer hardware to perform specific processing activities.
 - General Purpose
 - Specific
- ***Systems software*** - controls and supports the computer hardware and its information processing activities between hardware and applications.
 - System control programs
 - System support programs
 - System development programs

Computer Software



Categories of Computer Software



Software Classification

□ System software

- Operating system (OS): Compile, communicate with hardware, communicate with users, manage resources, control devices, etc.
- Windows, Linux, MacOS



Microsoft Windows



Fedora



MacOS



Software Classification

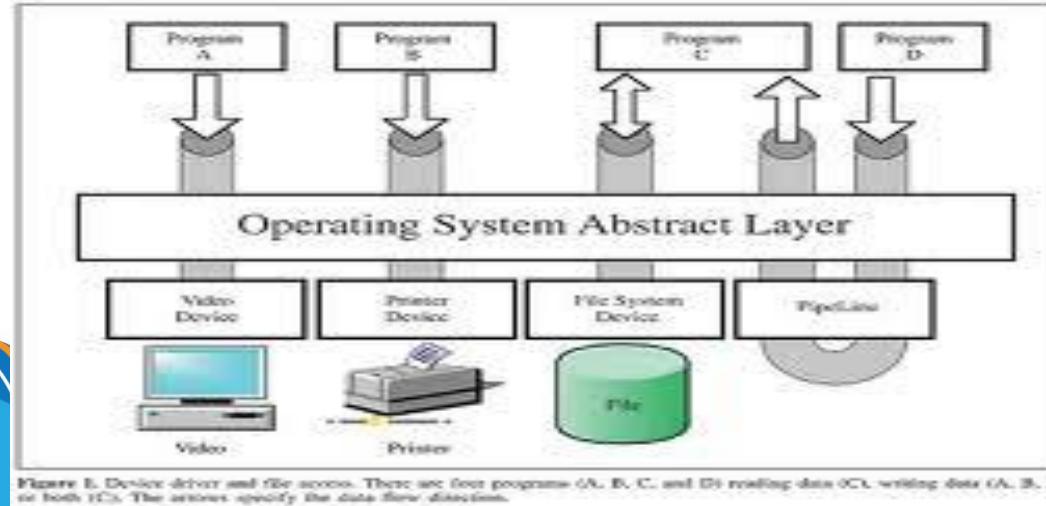
- System software
 - Network software.
 - Database management software (system).



Software Classification

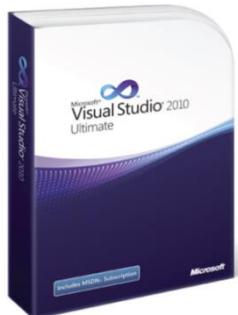
- System software
 - Software for controlling peripheral devices (drivers).

- Drivers are integrated into the system
- Allow programs to interact devices
- Each device may have more drivers corresponding to different operating systems



Software Classification

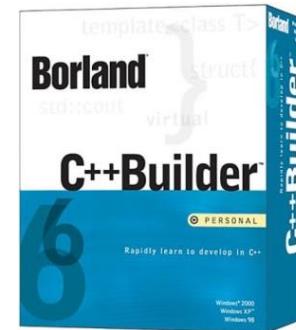
- Software supports developing tools/software
 - Compiler, Interpreter.
 - Debugger.
 - Linkers, Loader.



Microsoft Visual Studio



Eclipse



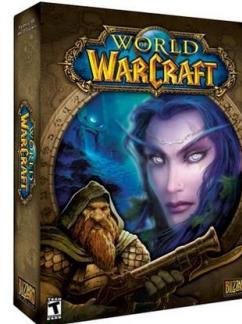
Borland C++ Builder 6

Software Classification

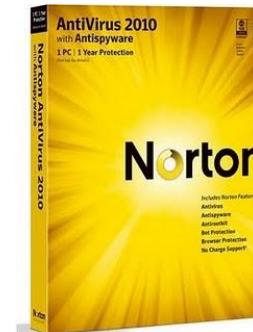
- Application software
 - Working: office applications, business applications, graphic design, ...
 - Entertainment: games, listening to music, watching movies, ...
 - Utility : antivirus, data compression, ...



Microsoft Office



World of Warcraft



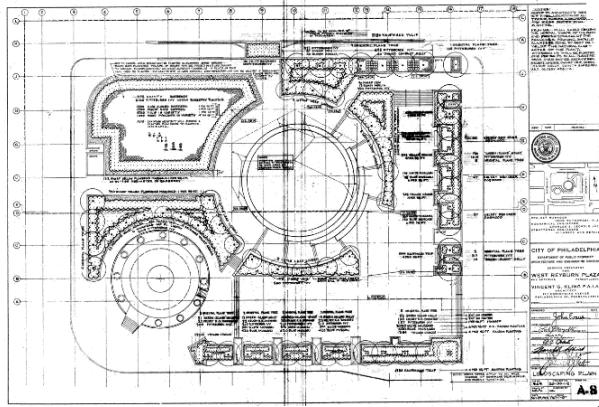
Norton Antivirus



IT AND APPLICATIONS



IT and applications



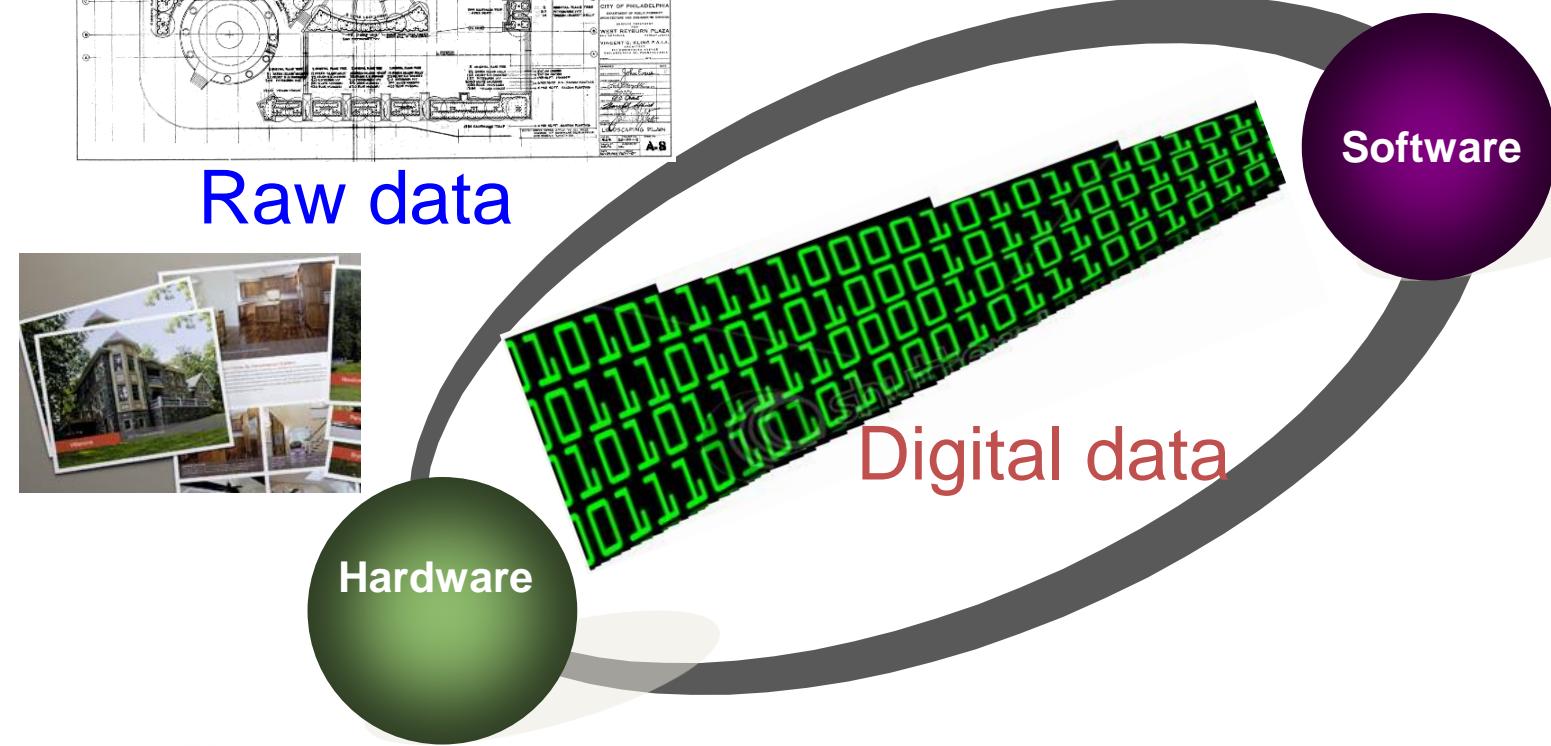
Raw data



Hardware

Digital data

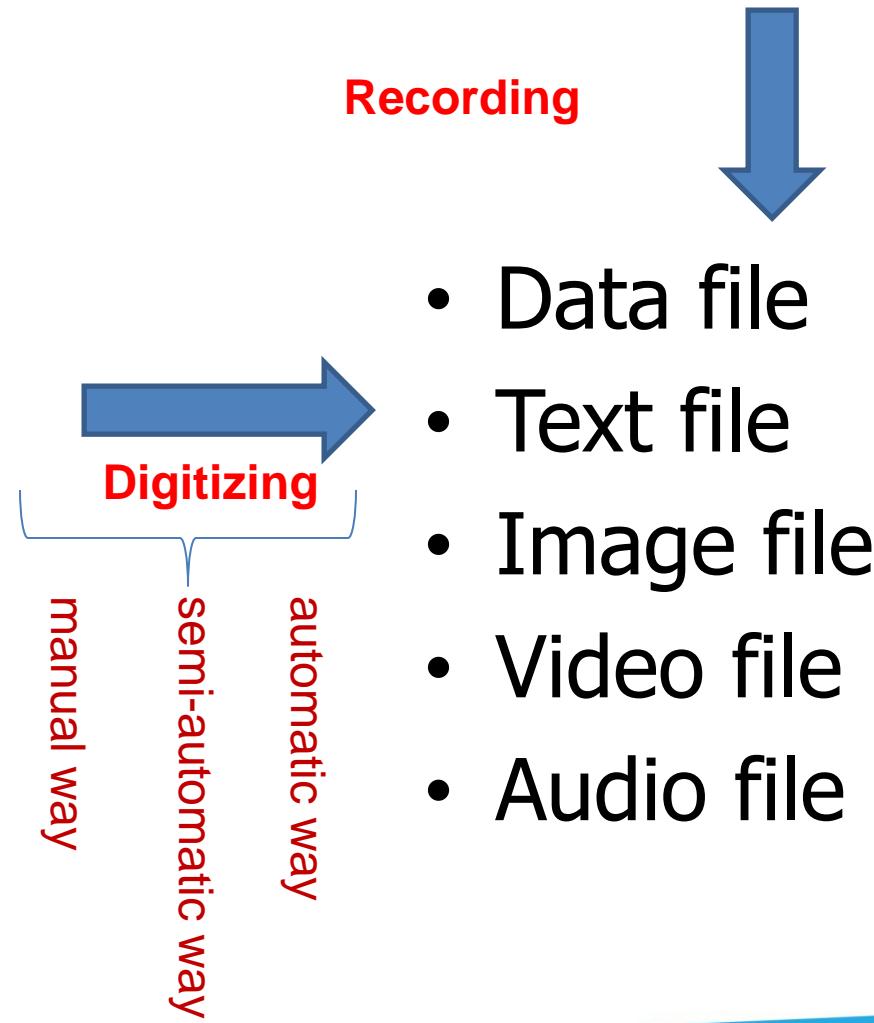
Software



Recording & digitizing data

- Digital devices

- Data
- Text
- Image
- Video
- Audio



Demand for data

- Demand for data storage
- Demand for data search
- Demand for data extraction
- Demand for data visualization
- Demand for data transmission
- Demand for data sharing
- Demand for data security

Data storage



Data search



and



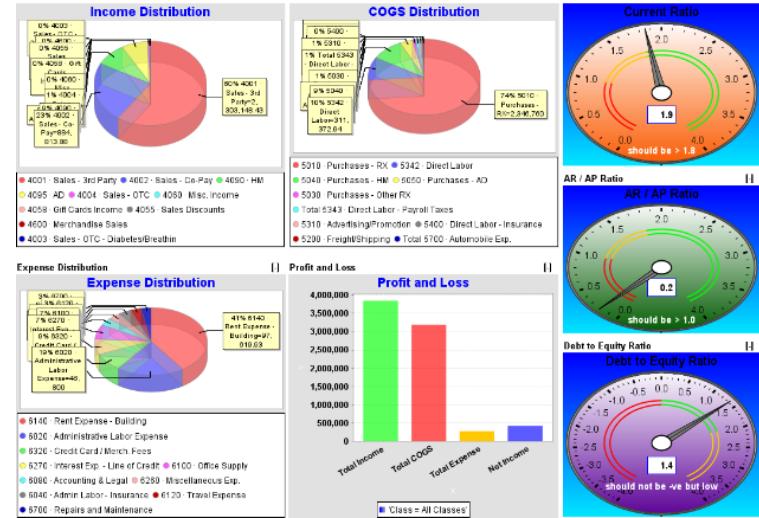
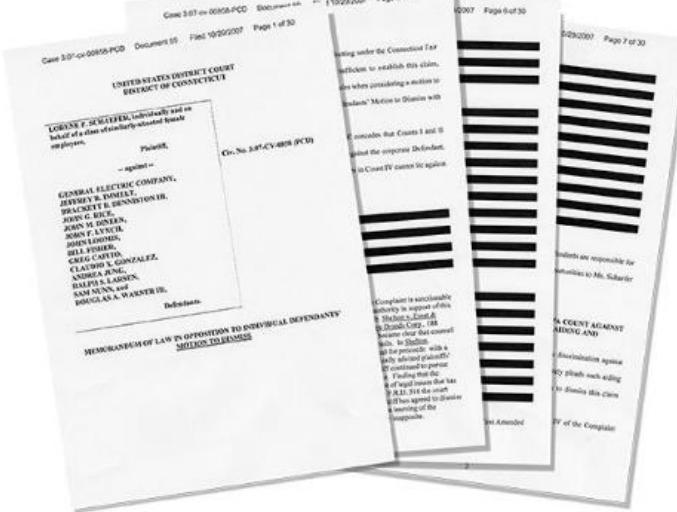
Data extraction

Data extraction is the act or process of retrieving data out of (usually unstructured or poorly structured) data sources for further data processing or data storage (data migration) – source: wiki

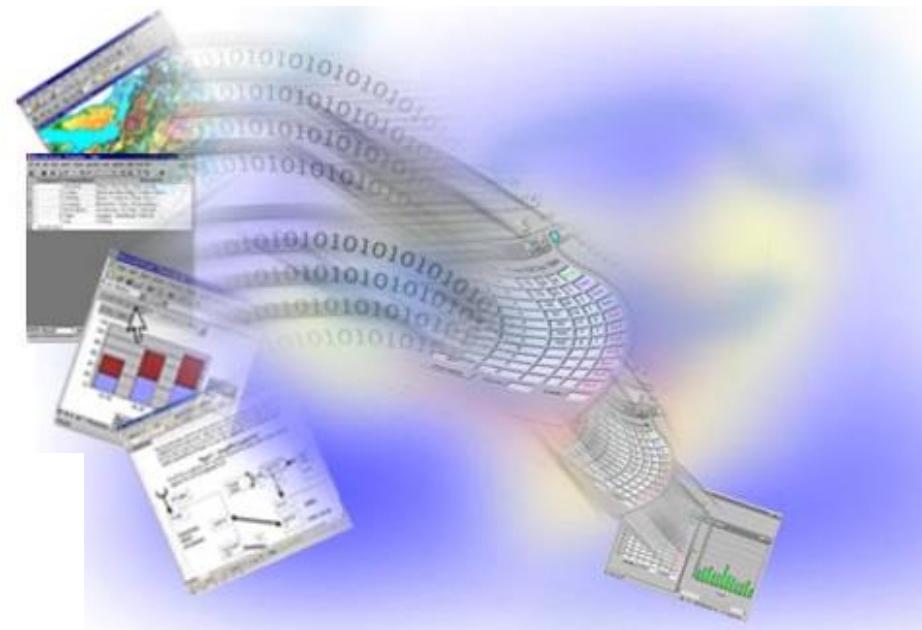
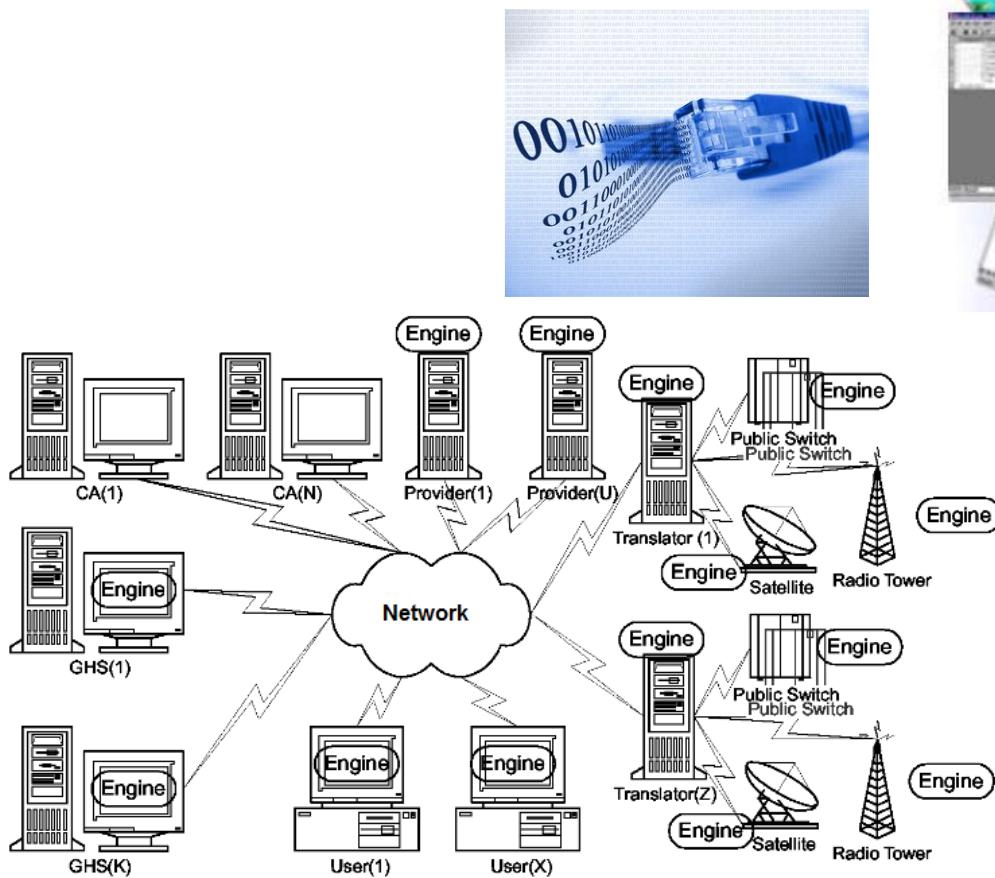


Data visualization

Data visualization is the graphic representation of data. It involves producing images that communicate relationships among the represented data to viewers of the images. This communication is achieved through the use of a systematic mapping between graphic marks and data values in the creation of the visualization. – Source: wiki



Data transmission



Data sharing



Data security





INFORMATION TECHNOLOGY (IT) IN VIETNAM



IT in Vietnam

□ Before 1975

- 1964-1975: The South has the Computer Center used for the US military during the Vietnam War, using the US IBM 360 computer system.
- 1968-1975: The North has Mathematics Department, using the Minsk-22 computer system of the Soviet Union (Russia).

IT in Vietnam



The US IBM 360 computer system



The Minsk-22 computer system of the Soviet Union (Russia).

IT in Vietnam

□ After 1975

- 1976: The Institute of Computational and Control Sciences was established in Hanoi, later renamed to Vietnam IT Institute.
- 1988: Vietnam Association for Information Processing (VAIP) was established.
- 1997: Vietnam officially connects to the internet worldwide.
- 2002: Vietnam Software Association (VINASA) was established.

IT in Vietnam

- List of software industry and IT services (provided by VINASA). VINASA develops this list based on the Japanese Information Technology Skills Standards (ITSS), and The European Certification of Informatics Professionals (EUCIP).

STT	Ngạch	Phân ngạch	Bậc						
			1	2	3	4	5	6	7
1	Kinh doanh	Tư vấn hệ thống thông tin							
2		Tư vấn sản phẩm CNTT							
3		Kinh doanh qua kênh truyền thông							
4	Tư vấn	Tư vấn chuyển đổi nghiệp vụ							
5		Tư vấn công nghệ thông tin							
6		Tư vấn gói sản phẩm							
7		Tư vấn triển khai hệ thống							
8	Kiến trúc CNTT	Kiến trúc ứng dụng							
9		Kiến trúc hạ tầng							
10		Kiến trúc tích hợp							
11	Quản lý dự án	QLDA phát triển phần mềm							
12		QLDA dịch vụ hạ tầng CNTT							
13		QLDA thuê khoán (outsourcing)							
14		QLDA phát triển hệ thống							
15	Hệ thống	An toàn thông tin							
16		Tính toán phân tán							
17		Mạng							
18		Cơ sở dữ liệu							
19		Quản trị hệ thống							
20		Nền tảng hệ thống							
21	Ứng dụng	Gói sản phẩm nghiệp vụ							
22		Hệ thống ứng dụng nghiệp vụ							
23	Phát triển phần mềm	Phần mềm ứng dụng							
24		Phần mềm lớp giữa (middleware)							
25		Phần mềm nền tảng							
26		Kiểm thử phần mềm							
27	Dịch vụ khách hàng	Quản trị trang thiết bị							
28		Phần mềm							
29		Phần cứng							
30	Dịch vụ CNTT	Quản lý hệ thống CNTT							
31		Vận hành hệ thống CNTT							
32		Vận hành quy trình nghiệp vụ (BPO)							
33		Trợ giúp từ xa							



White cell means no existence.



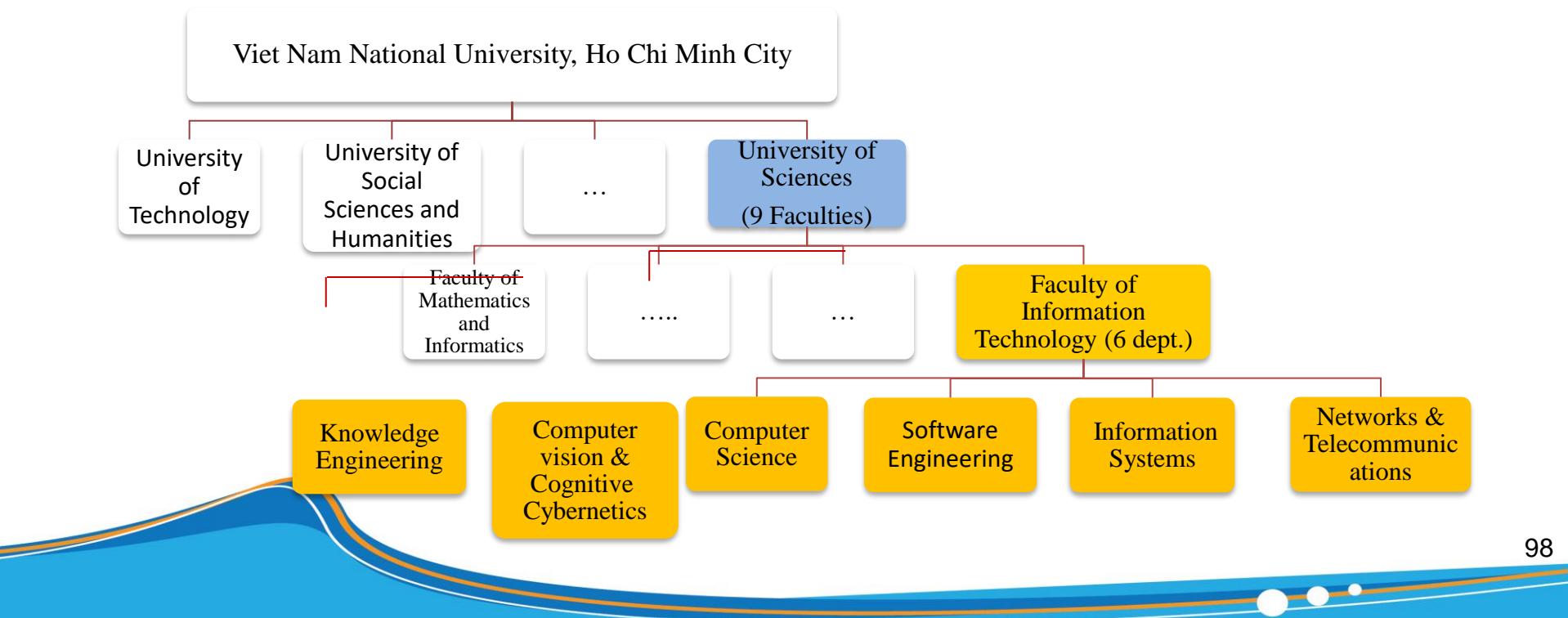
FIT-HCMUS



Introduction to IT faculty

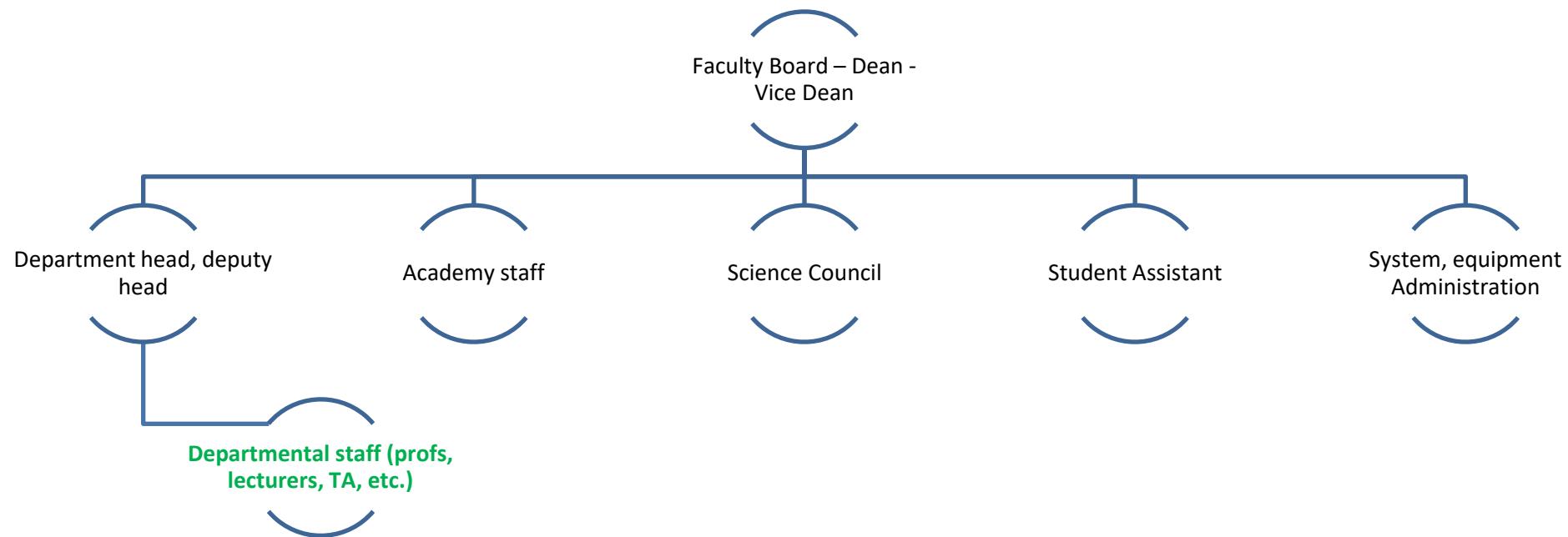
□ History

- Being one of the top 7 IT faculty of Vietnam
- Established in 1995 with the precursor of the computer science department of the Faculty of Mathematics.



Introduction to the IT faculty

□ Organizational chart



Department of Information Systems

- Providing the knowledge for students to implement IS projects, specialized in business applications and data management, etc.
- Focusing on applied technologies in the field of IS such as data modeling, database design, methods of analyzing and designing IS, distributed information systems.
- Research fields:
 - Information retrieval: Text Mining, Indexing Models, Natural Language Processing for IR, Cross Language IR, Question & Answers Systems, Medical Information Retrieval - (Leaded by prof. Ho Bao Quoc and Dr. Le Nguyen Hoai Nam)
 - Mobile IS: Cooperative Caching Method, Location Management, Mobile Databases, Mobile P2P Applications. Internet of Things –(Leaded by Dr. Nguyen Tran Minh Thu)
 - TEL systems, knowledge representation, semantic web, smart services (in education and business) – (Leaded by Dr. Pham Nguyen Cuong)
 - Information and data security: Data Confidentiality, Access Control Mechanisms, User Privacy, Data Privacy – (Leaded by Dr. Pham Thi Bach Huệ)
 - Data mining: Data mining in biomedicine – (Leaded by Dr. Lê Thi Nhàn)

Department of Software Engineering

- Providing knowledge in the development, management and maintenance of software, thereby enabling students to design and implement high quality software products. Graduates of this major will be able to analyze, design, and administrate middle to high-end software projects
- Research fields:
 - Advanced methods in software design, object-oriented programming, teaching support software, cryptography and applications

Department of Computer Networks and Telecommunications

- Providing knowledge in the field of communication between wide area networks, local computer networks and between distributed information systems. Student has a ability to design and implement medium to large computer networks, and communication systems
- Research fields:
 - Advanced network and communication technologies, distributed systems, VoIP, WAP / PKI systems and network security, mobile agent

Department of Computer Science

- Providing advanced knowledge and skills necessary to build integrated applications that are capable of intelligent processing applied in education, training, economics, society, science and technology, natural resource and environmental management. Knowledge includes the foundation of knowledge based systems, human-to-machine interaction, pattern recognition, and data mining.
- Research fields
 - Knowledge base systems, soft calculation, image processing, neural networks, machine learning, pattern recognition, programming evolution, image and signal processing in medicine, semantic web, audio processing

Department of Computer Vision

- Digital image and video processing,
computer vision and robotics

Programs

- Doctor of Philosophy in Computer Science (PhD)
- Master of Science in Computer Science or in Information Systems
- Bachelor of Science in Computer Science
 - Regular fulltime program (1995 – present)
 - Talented/honors fulltime program (2002 - present)
 - Advanced fulltime program (2013 - present)
 - English advanced fulltime program (2006 - present)
 - French advanced fulltime program (1994 - present); from 2010 to double degree with Claude Bernard University - Lyon1 (France)
 - Inter-college program for students who have graduated from IT college
 - Distance learning program (2006 - present)

