COMPUTERS, DATA AND INFORMATION

CCICOMP

OUTLINE

- What is a computer?
- Data vs Information
- Computer Components
- Computer Types

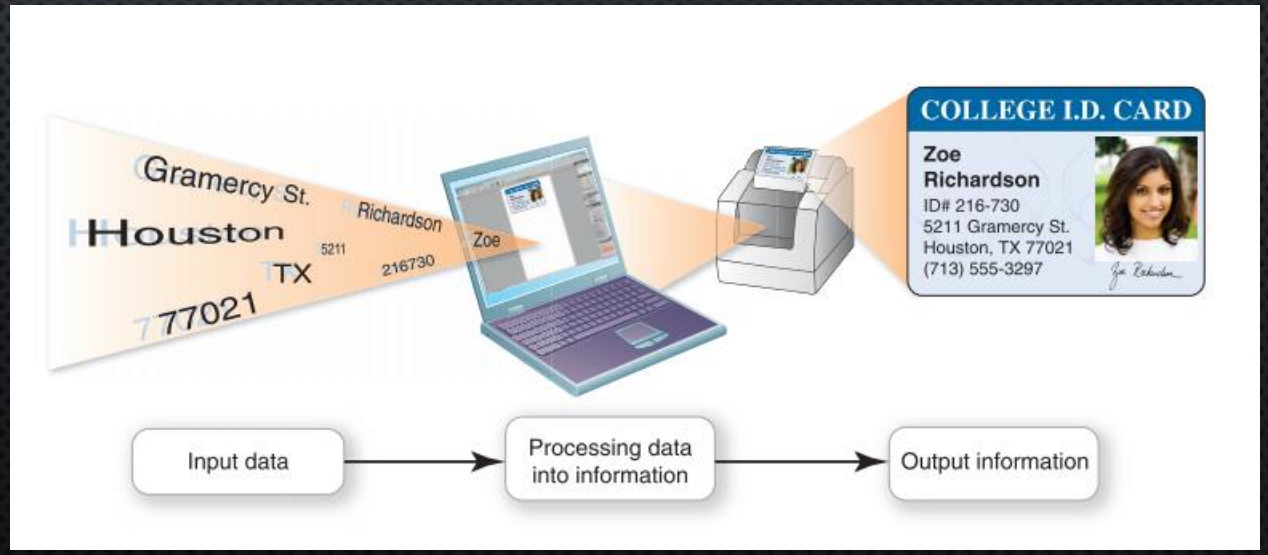
WHAT IS A 'COMPUTER'?

- A **computer** is a data processing device that performs four major functions:
  1. **Input**: It gathers data, or allows users to enter data.
  2. **Process**: It manipulates, calculates, or organizes that data into information.
  3. **Output**: It displays data and information in a form suitable for the user.
  4. **Storage**: It saves data and information for later use.

- These functions can be implemented by many technologies and devices

DATA VS INFORMATION

- **Data** is a representation of a fact, a figure, or an idea
  - Can be a number, a word, a picture, or even a recording of sound.
  - Means little on its own
- **Information** is data that has been organized or presented in a meaningful fashion.
  - Useful to humans
- Computers process (manipulate, calculate, or organize) data into information



DATA REPRESENTATION

- People can understand and manipulate data represented in a variety of forms – numbers, letters, pictures, etc.
- To be manipulated or processed by the brain, external data representations, such as printed text, must be converted to an internal format and transported to the brain's processing "circuitry."
- Computers represent data electrically and process it with electrical switches with 2 states (on / off)
- Computers deal with all sorts of non-numeric data (e.g. strings, images, video), but they are internally still represented by a set of **numeric values**

BINARY

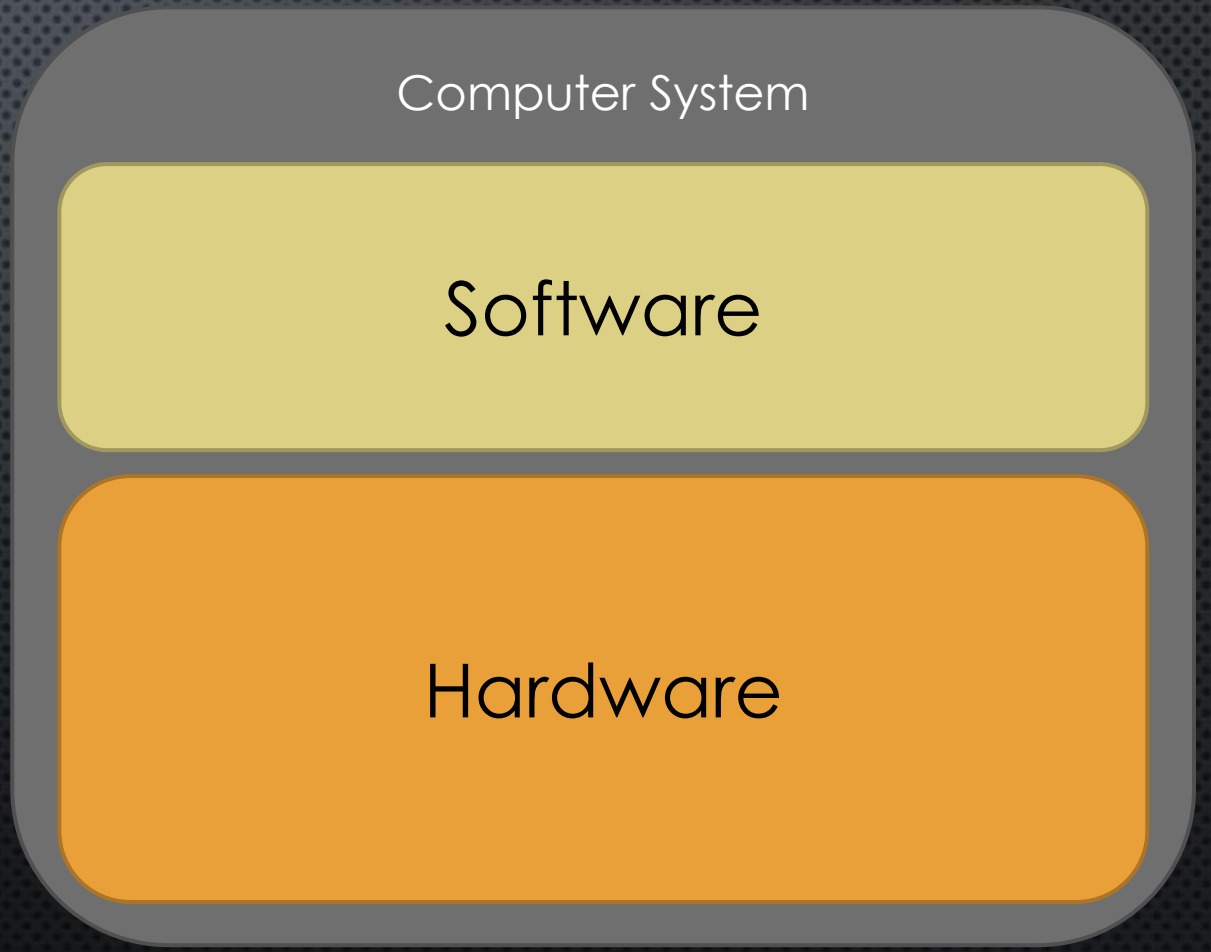
- The 'language' that computers work with to represent and process data is called **binary**
  - All data is represented using a series of 0s and 1s.
  - Each 0 and 1 is a binary digit, or '**bit**'
  - Four binary digits (or bits) combine to create one '**nibble**' – e.g. 1010
  - Two nibbles or eight bits combine to create one '**byte**'. – e.g. 10011100

Terminology	Number of Bytes	Relative Size
Kilobyte	1024 bytes	1 page of plain text
Megabyte	1,048,576 bytes	1 photo taken with a 12 MP phone camera
Gigabyte	1,073,741,824 bytes	A 2-hr movie in high-definition
Terabyte	1,099,511,627,776 bytes	4.6 million books

COMPUTER COMPONENTS

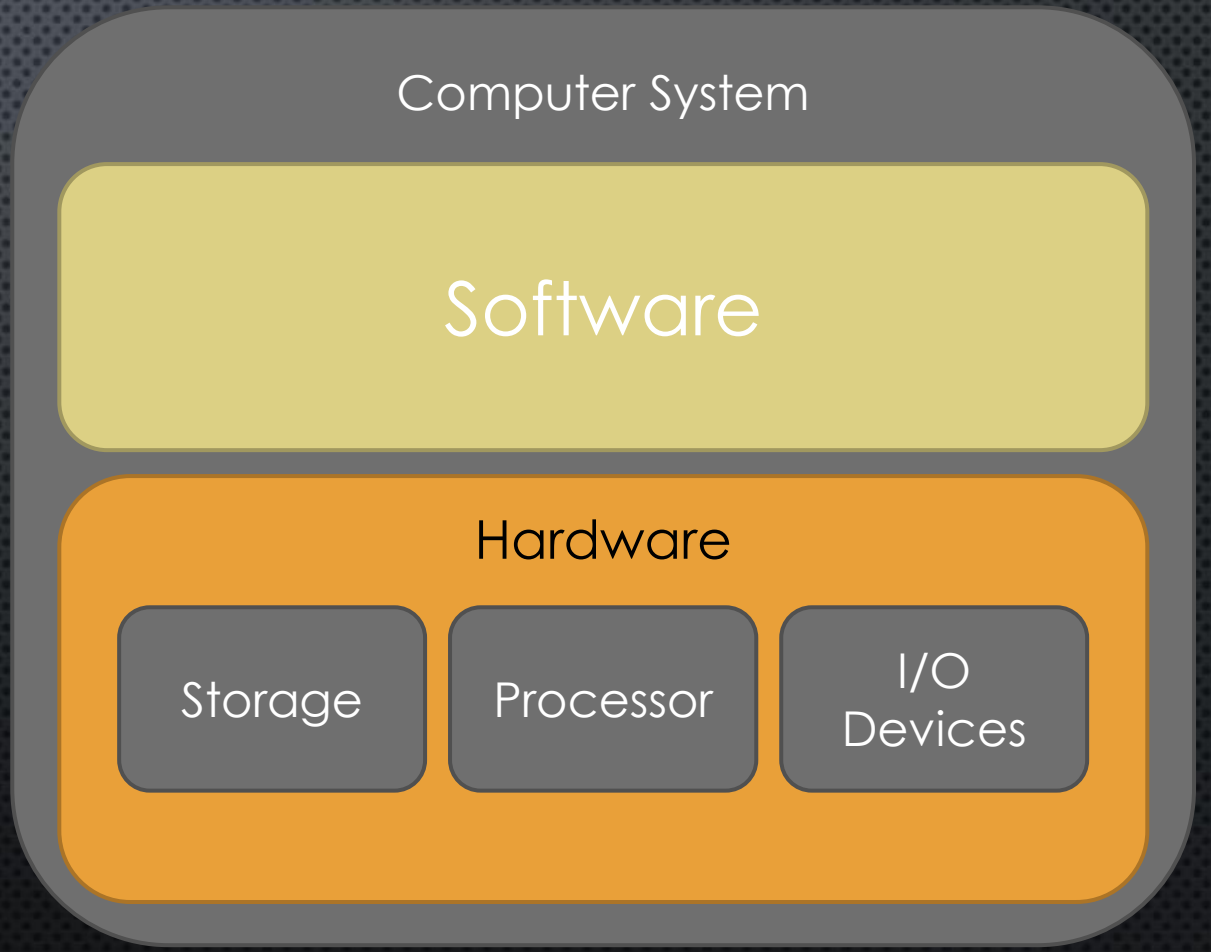
PROCESSING BITS AND BYTES

- A computer uses hardware and software to process data into information
- **Hardware** is any tangible part of the computer you can physically touch
- **Software** is the set of procedures (programs) that enables the hardware to perform different tasks.



COMPUTER HARDWARE

- A computer system's hardware is composed of
  - Processor
  - Storage
  - Input devices
  - Output devices



PROCESSOR

- A **processor** or **Central Processing Unit (CPU)** is the device that performs data manipulation and transformation functions:
  - **Computation** (addition, subtraction, multiplication, and division)
  - **Comparison** (less than, greater than, equal to, and not equal to)
  - **Data movement** between storage, and input/output devices

STORAGE

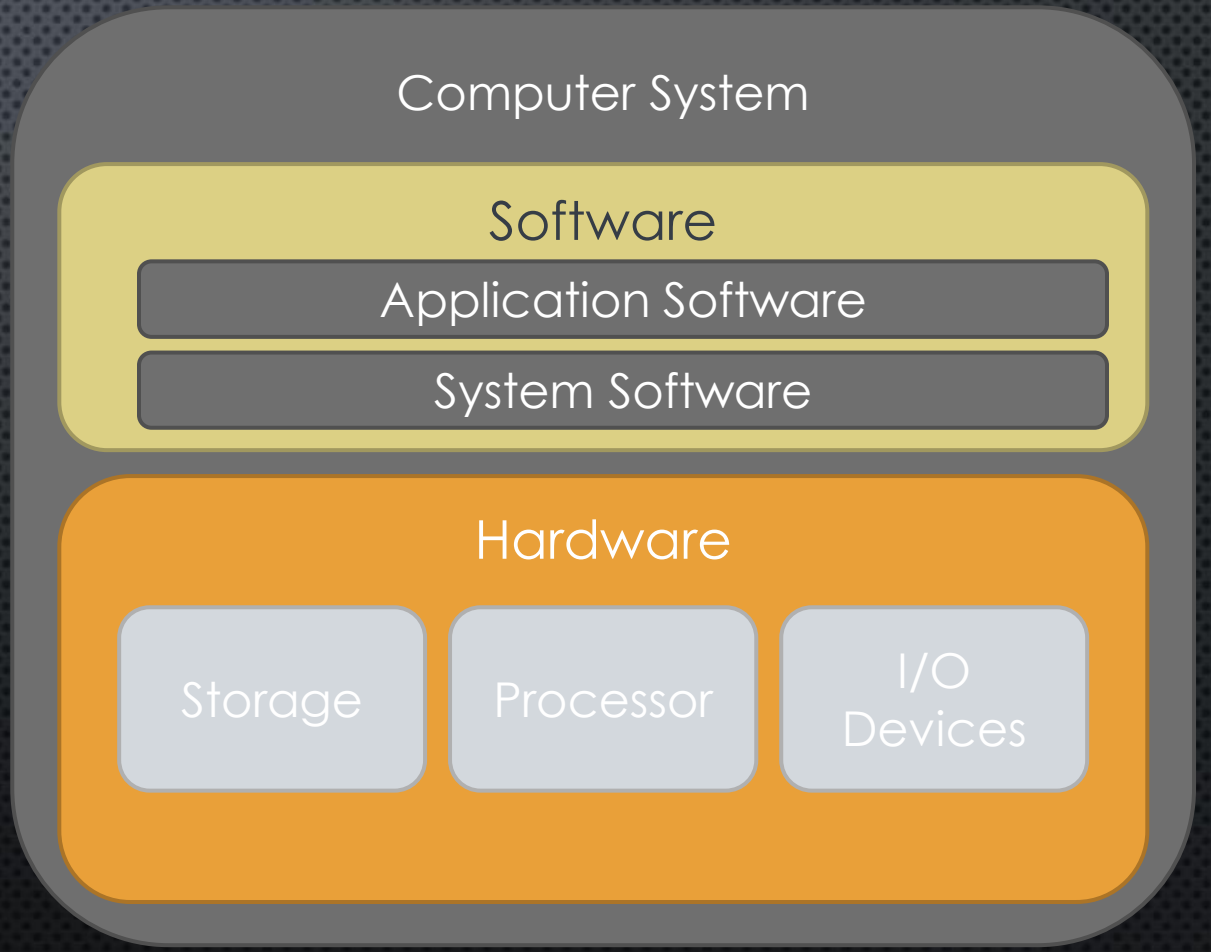
- A computer hold a variety of information:
  - Intermediate processing results of complex processing tasks
  - Data and programs for current or future use
- In general, components used to hold these results, data and programs is called **storage**
  - **Primary storage** holds currently running programs and data needed immediately. They do not hold their contents when the computer is turned off
  - **Secondary storage** hold programs and data that are kept for the long term. They retain their contents even when the computer is off

INPUT / OUTPUT DEVICES

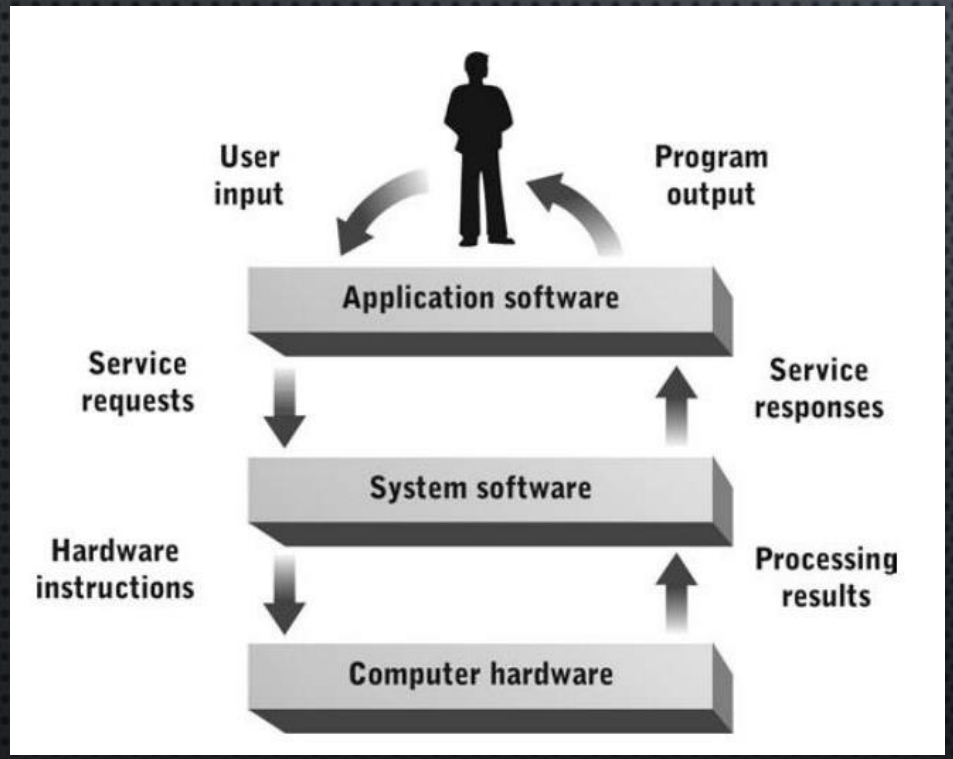
- **I/O devices** or **Peripherals** provide computers with the capability of communicating using sound, text, and graphics for humans and electronic or optical communication for other computers
  - **Input devices** accept input from a person, the environment or another computer and convert it into something the computer can understand
  - **Output devices** send information to another computer or convert electrical signals into a format that a person can understand

COMPUTER SOFTWARE

- Software performs a complex translation process that bridges two gaps:
  - Human native language conversion to binary computer language –
  - Convert a high-level task request from a human to low-level detailed set of instructions for the CPU to produce a result
- Computer software include:
  - Application software
  - System software



SOFTWARE CLASSIFICATIONS



- **Application software** are programs that perform user- or business-specific tasks




- **System software** enable users to control computer hardware and application software



COMPUTER TYPES AND CLASSES

GENERAL PURPOSE COMPUTERS

- Designed to perform a wide variety of functions and operations
- **Personal computers**
  - Are tailored to satisfy the computing needs of one user at a time
  - May be mobile or stationary

Laptops

Desktops / Workstations

Tablets

Mobile Phones

GENERAL PURPOSE COMPUTERS

- **Servers**
  - Are computers or groups of computers that manages shared resources such as and are meant to be used by multiple users at the same time
  - **Mainframes** are often used in businesses to manage large amounts of data commonly execute many computer programs at the same time.
  - **Supercomputers** are specially designed computers that can perform complex mathematical calculations extremely rapidly
  - A **cluster** is a group of similar or identical computers connected together that cooperate to provide services or run a single application
  - A **grid** is a group of connected dissimilar computers that cooperate to provide services or run a shared application

Mainframes

Supercomputers

SPECIAL PURPOSE COMPUTERS

- Computers designed to be task-specific; job is to solve one particular problem
- Dedicated to perform a single task over and over again
- An **embedded computer** is a specially designed computer chip that resides in another device or object to provide them data processing and communication capability

Car Navigation Systems

Gaming consoles

Network Routers

Smart appliances

SUMMARY

- A computer is an automated device for performing computational tasks. It accepts input data from the external world, performs one or more computations on the data, and then returns results to the external world.
- Computers process data into meaningful information
- The language of computers is called binary, which represents any data as a combination of 1's and 0's. Each binary digit is called a bit.
- Computer hardware consist of a central processing unit (CPU), primary storage, secondary storage, and I/O devices
- The role of software is to translate user requests into machine instructions. The two primary types of software are application software and system software.
- Computers may be classified as general purpose, which are designed to perform various types of data processing; and special purpose, which are designed to perform a single specialized task