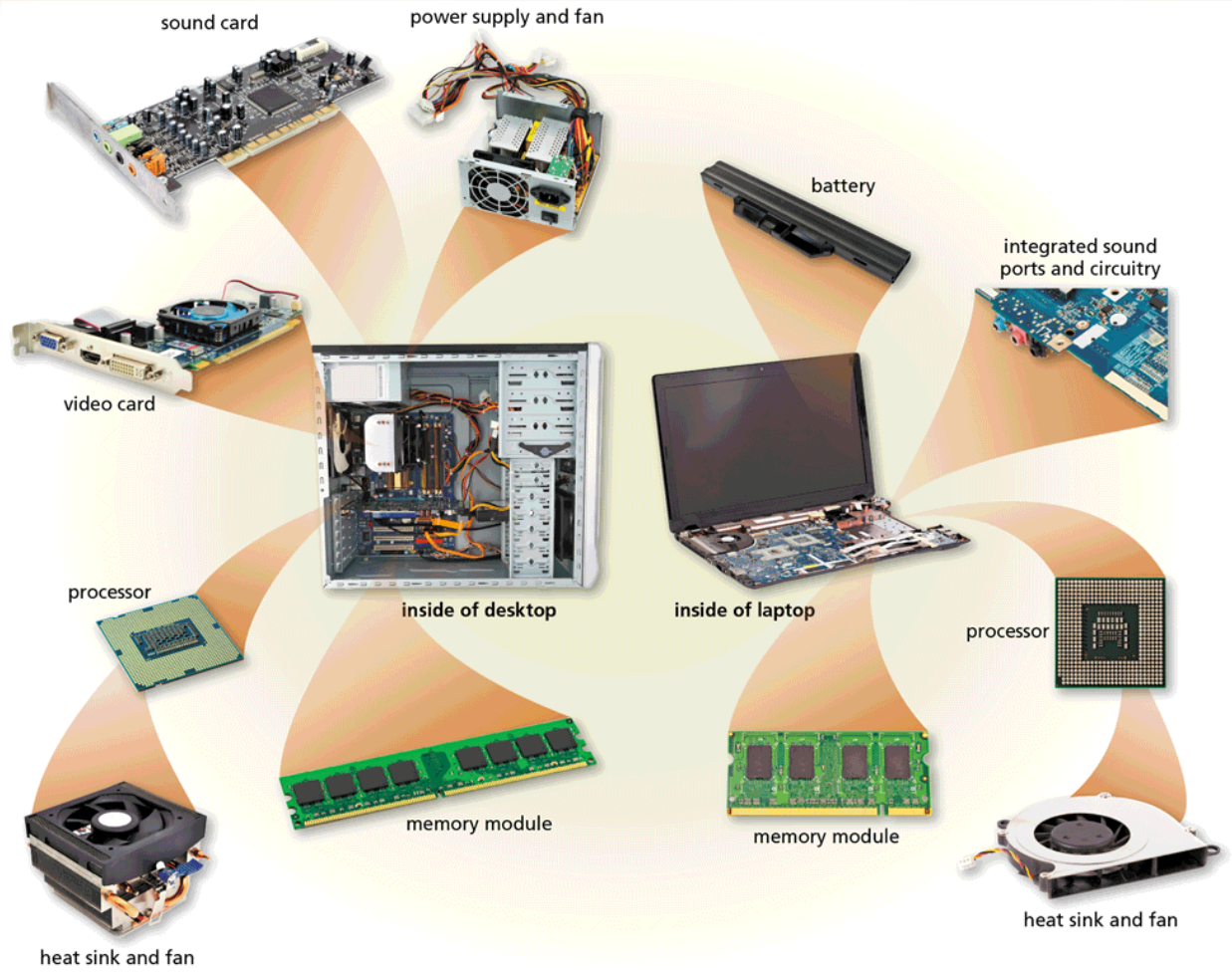
COMPUTING COMPONENTS

Malik Adnan Jaleel

Inside the Case

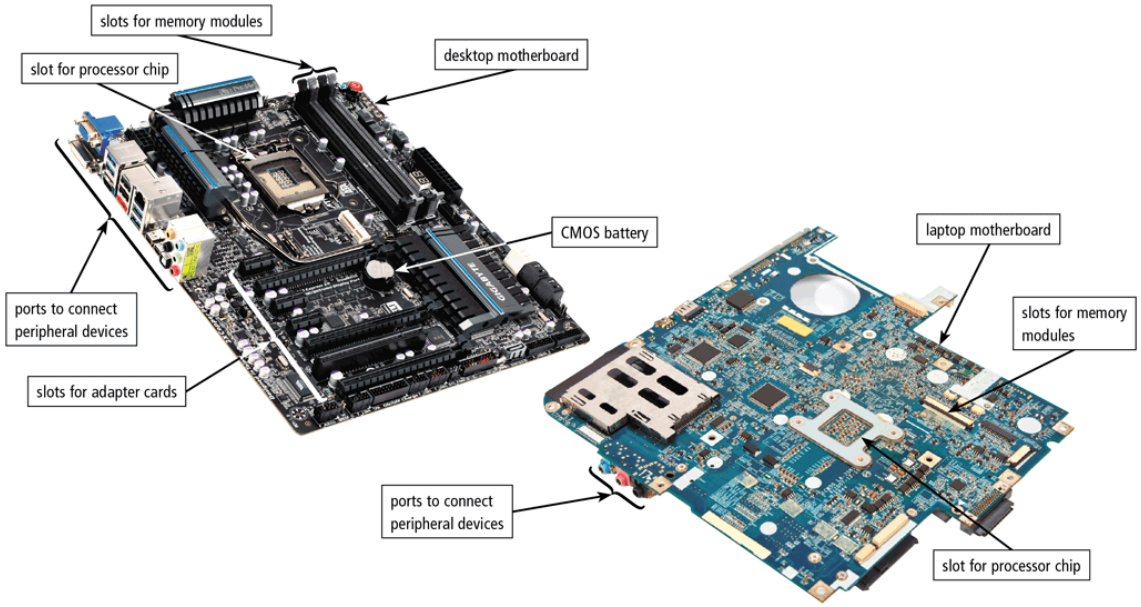
- The case contains and protects the electronics of the computer or mobile device from damage

Inside the Case



Inside the Case

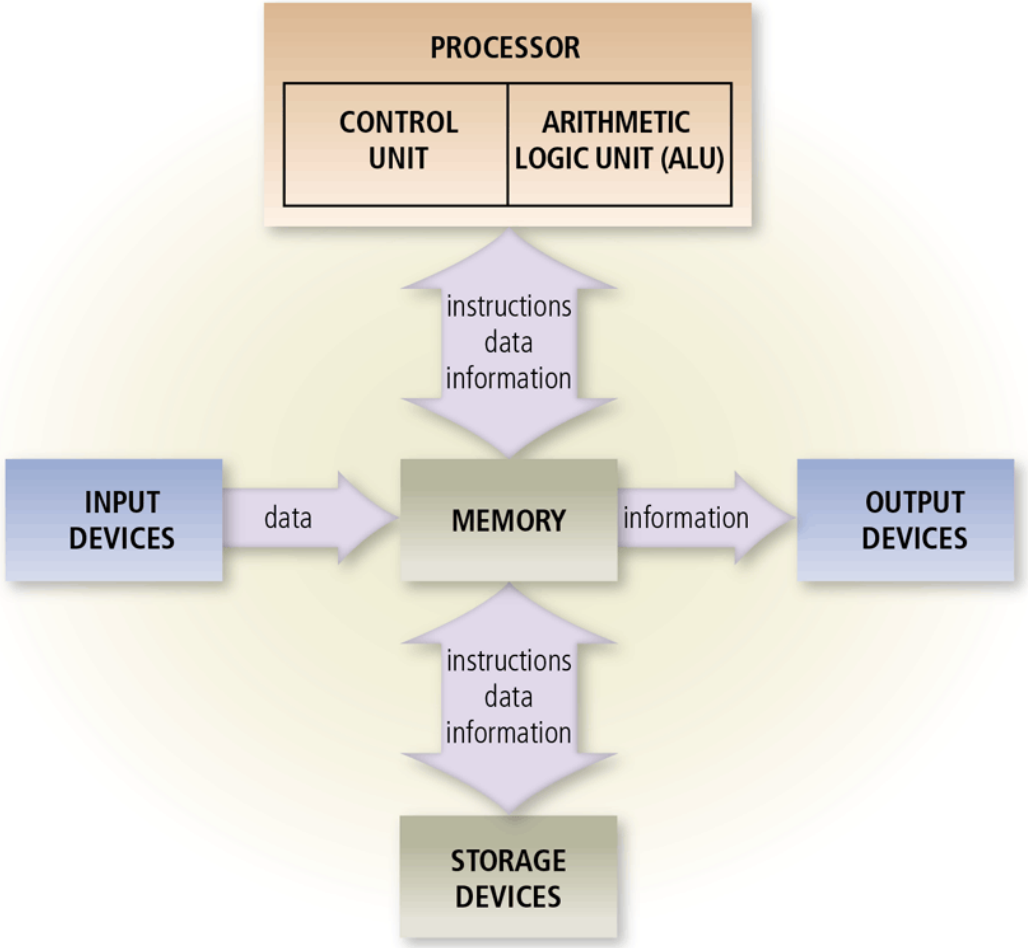
- The **motherboard** is the main circuit board of the computer
  - A computer **chip** contains integrated circuits



Processors

- The **processor**, also called the **central processing unit** (**CPU**), interprets and carries out the basic instructions that operate a computer
- A **multi-core processor** is a single chip with two or more separate processor cores
- Processors contain a control unit and an arithmetic logic unit (ALU)

Processors

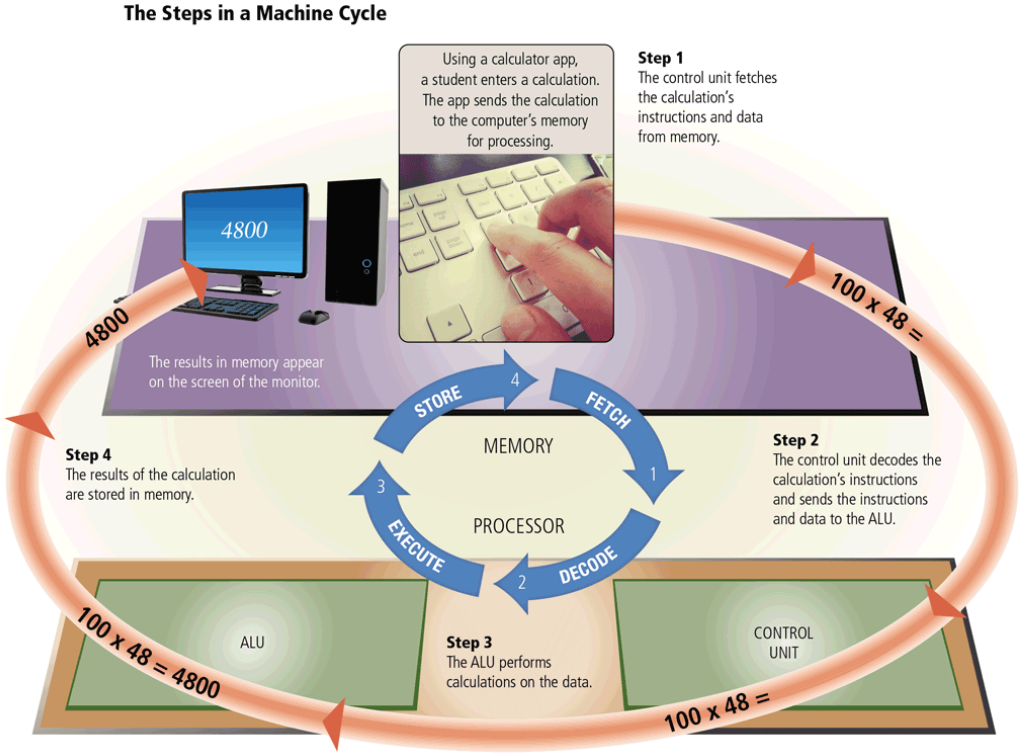

PROCESSOR
CONTROL UNIT
ARITHMETIC LOGIC UNIT (ALU)
instructions
data
information
INPUT DEVICES
data
MEMORY
information
OUTPUT DEVICES
instructions
data
information
STORAGE DEVICES

Processors

- The **control unit** is the component of the processor that directs and coordinates most of the operations in the computer
- The **arithmetic logic unit** (ALU) performs arithmetic, comparison, and other operations

Processors

- For every instruction, a processor repeats a set of four basic operations, which comprise a machine cycle



Processors

The processor contains registers, that temporarily hold data and instructions

The **system clock** controls the timing of all computer operations

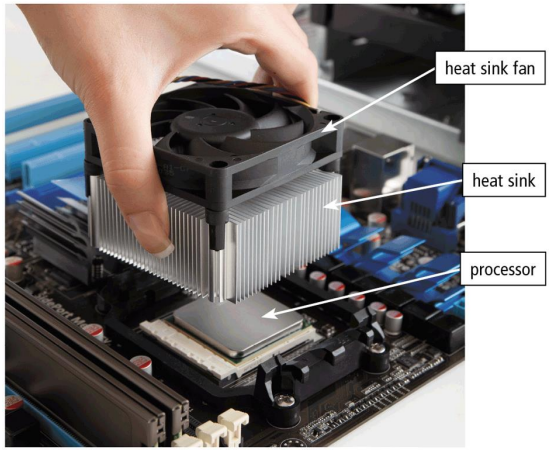
- The pace of the system clock is called the **clock speed**, and is usually measured in **gigahertz** (**GHz**)

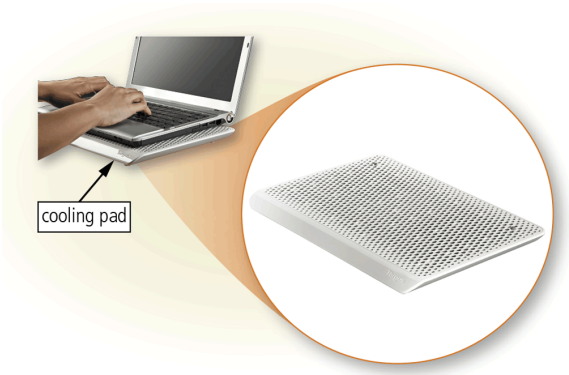
Processors

- The leading manufacturers of personal computer processor chips are Intel and AMD

Processors

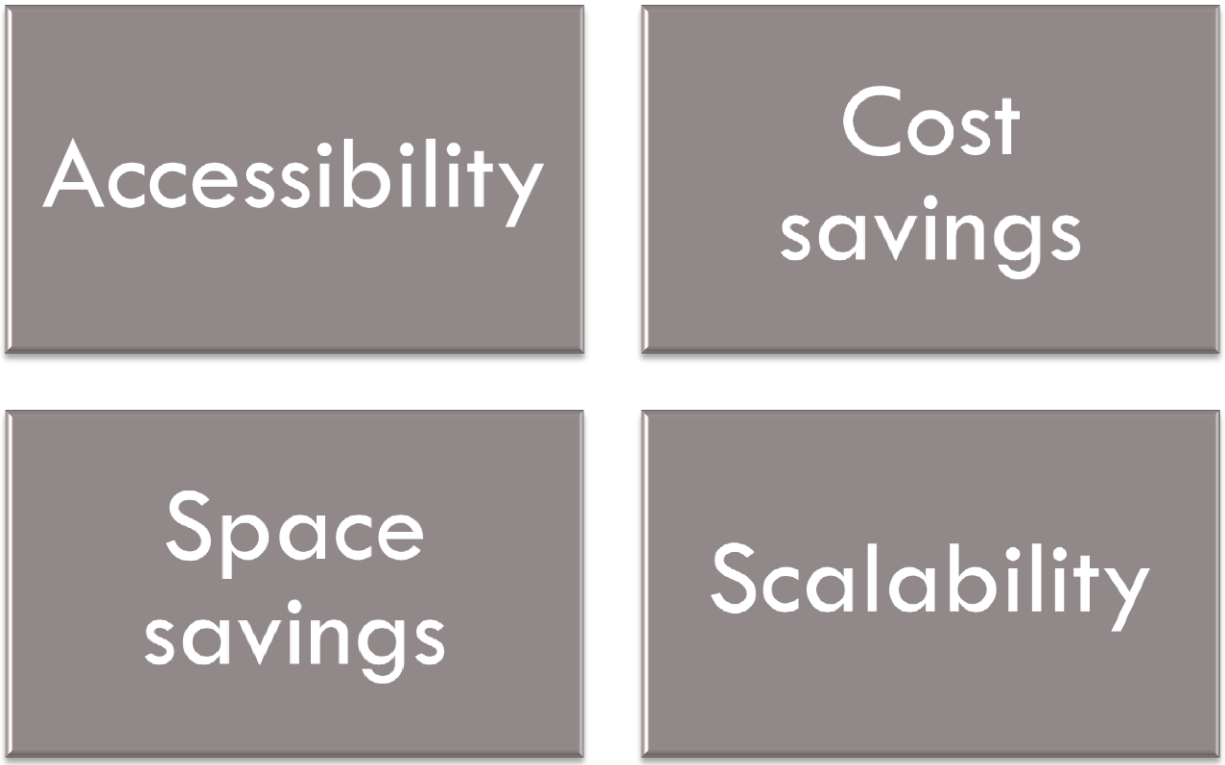
- A processor chip generates heat that could cause the chip to malfunction or fail
- Require additional cooling
  - Heat sinks
  - Liquid cooling technology
  - Cooling pads





Cloud Computing

- Home and business users choose cloud computing for a variety of reasons



Data Representation

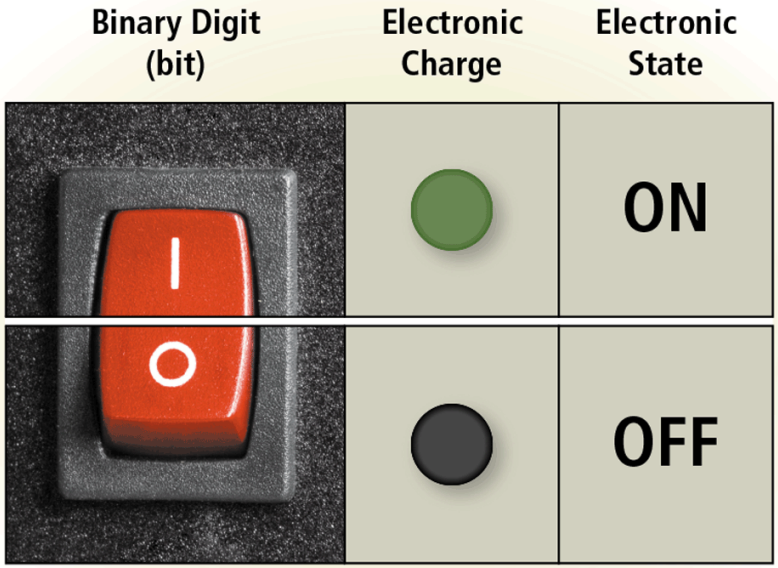
Analog signals are continuous and vary in strength and quality

Digital signals are in one of two states: on or off

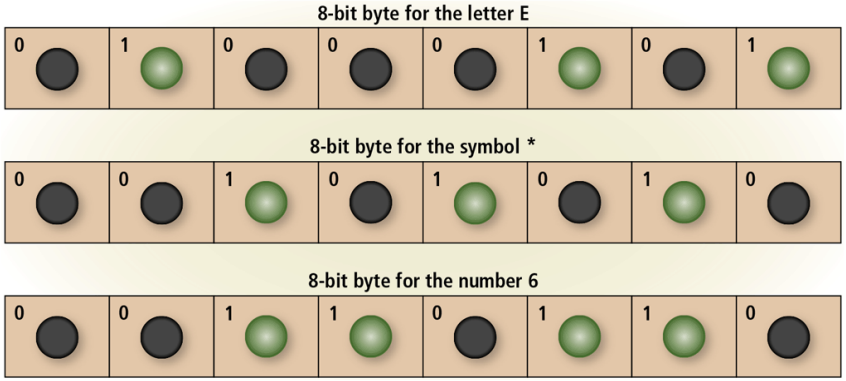
- Most computers are digital
- The **binary system** uses two unique digits (0 and 1)
  - **Bits** and **bytes**

Data Representation

The circuitry in a computer or mobile device represents the on or the off states electronically by the presence or absence of an electronic



Eight bits grouped together as a unit are called a byte. A byte represents a single character in the computer or mobile device



Data Representation

How a Letter Is Converted to Binary Form and Back

Step 1

A user presses the capital letter **T** (SHIFT+T keys) on the keyboard, which in turn creates a special code, called a scan code, for the capital letter **T**.

Step 2

The scan code for the capital letter **T** is sent to the electronic circuitry in the computer.

Step 3

The electronic circuitry in the computer converts the scan code for the capital letter **T** to its ASCII binary code (01010100) and stores it in memory for processing.

Step 4

After processing, the binary code for the capital letter **T** is converted to an image and displayed on the output device.

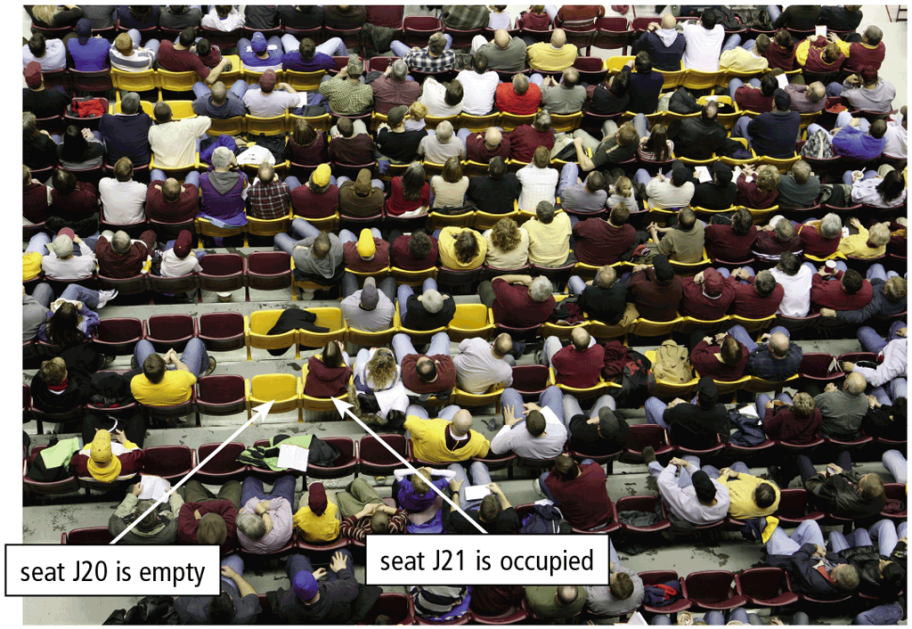
Memory

- **Memory** consists of electronic components that store instructions waiting to be executed by the processor, data needed by those instructions, and the results of processing the data
- Stores three basic categories of items:

The operating system and other programs	Applications	Data being processed and the resulting information

Memory

- Each location in memory has an address
- Memory size commonly is measured in gigabytes (GB) or terabytes (TB)



Memory

- Computers and mobile devices contain two types of memory:

Volatile memory

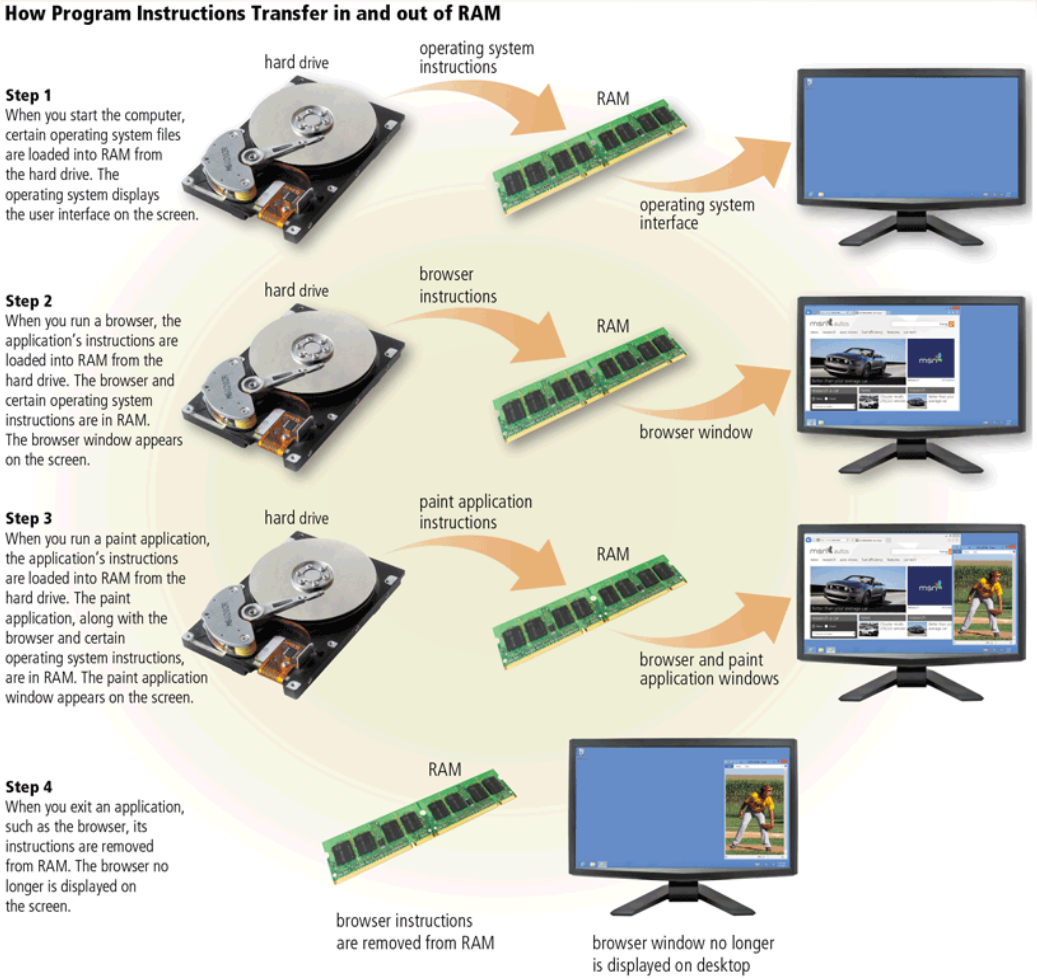
- Loses its contents when power is turned off
- Example includes **RAM**

Nonvolatile memory

- Does not lose contents when power is removed
- Examples include ROM, flash memory, and CMOS

Memory

How Program Instructions Transfer in and out of RAM



Memory

- Two common types of RAM exist:

Dynamic RAM (DRAM)

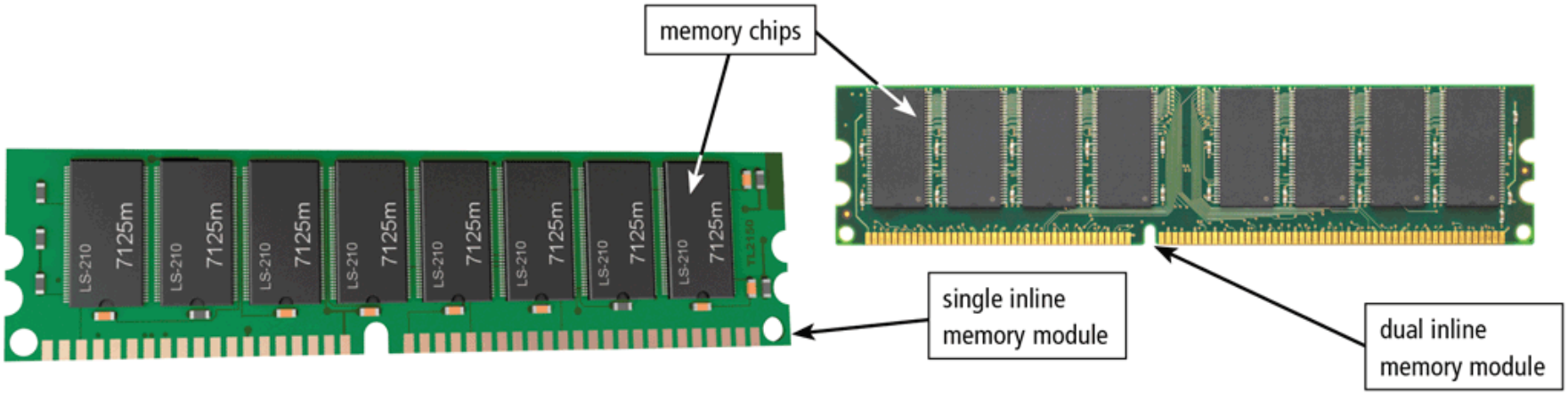
Static RAM (SRAM)

Table 6-1 Common DRAM Variations

Name	Comments
SDRAM (Synchronous DRAM)	• Synchronized to the system clock • Much faster than DRAM
DDR SDRAM (Double Data Rate SDRAM)	• Transfers data twice, instead of once, for each clock cycle • Faster than SDRAM
DDR2	• Second generation of DDR • Faster than DDR
DDR3	• Third generation of DDR • Designed for computers with multi-core processors • Faster than DDR2
DDR4	• Fourth generation of DDR • Faster than DDR3
RDRAM (Rambus DRAM)	• Much faster than SDRAM

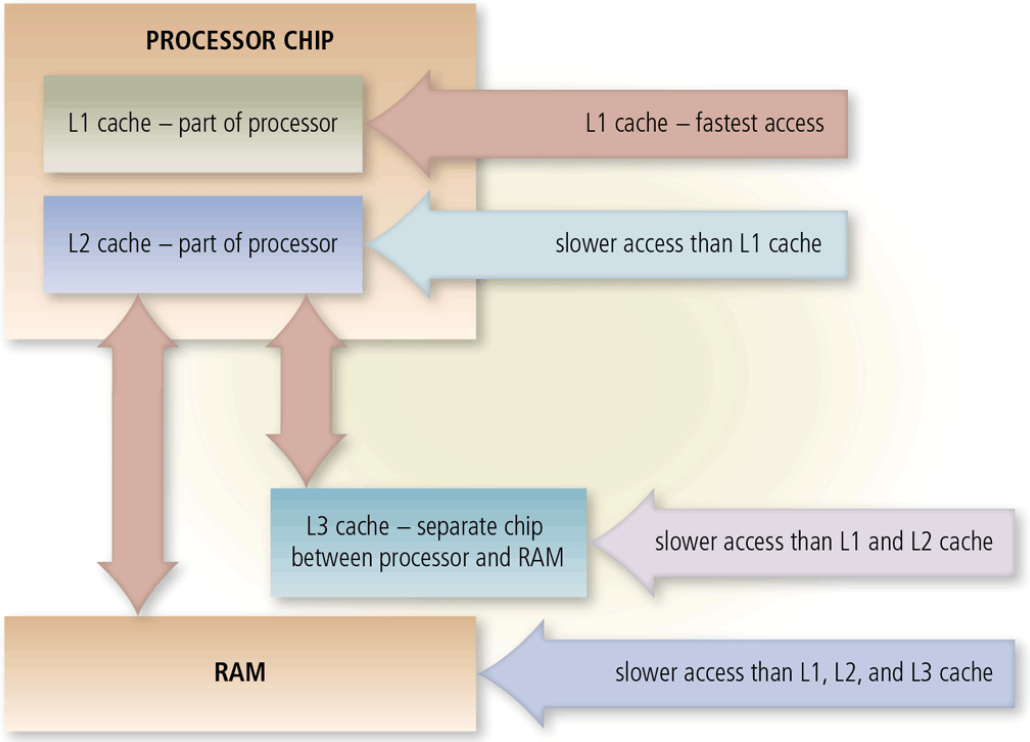
Memory

- RAM chips usually reside on a memory module and are inserted into memory slots



Memory

- **Memory cache** speeds the processes of the computer because it stores frequently used instructions and data



Memory

Read-only memory (**ROM**) refers to memory chips storing permanent data and instructions

- **Firmware**

Memory

- **Flash memory** can be erased electronically and rewritten
  - CMOS technology uses battery power to retain information when when the power to the computer is off

Memory

- **Access time** is the amount of time it takes the processor to read from memory
  - Measured in nanoseconds

Table 6-2 Access Time Terminology

Term	Abbreviation	Speed
Millisecond	ms	One-thousandth of a second
Microsecond	µs	One-millionth of a second
Nanosecond	ns	One-billionth of a second
Picosecond	ps	One-trillionth of a second

Adapters

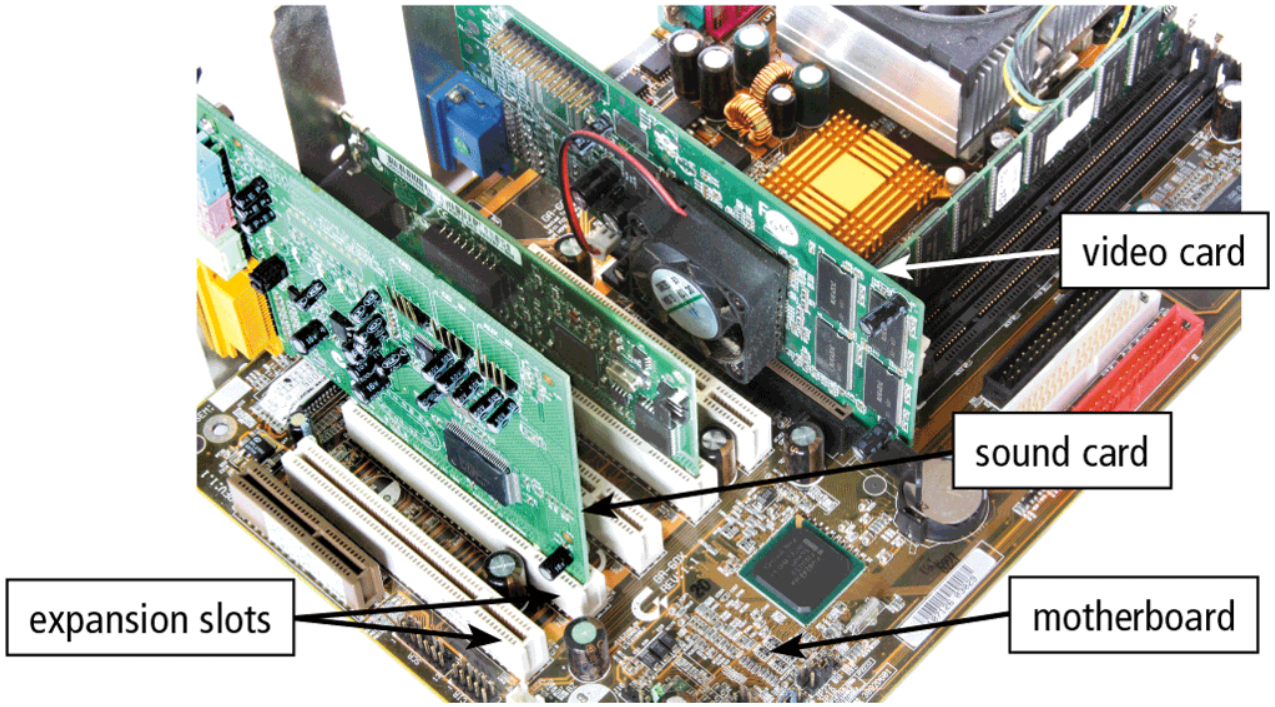
- An **adapter card** enhances functions of a component of a desktop or server system unit and/or provides connections to peripherals
  - Sound card and video card
- An **expansion slot** is a socket on a desktop or server motherboard that can hold an adapter card

Table 6-3 Adapter Cards

Type	Purpose
Bluetooth	Enables Bluetooth connectivity
MIDI	Connects to musical instruments
Modem	Connects to transmission media, such as cable television lines or phone lines
Network	Provides network connections, such as to an Ethernet port
Sound	Connects to speakers or a microphone
TV tuner	Allows viewing of digital television broadcasts on a monitor
USB	Connects to high-speed USB ports
Video	Provides enhanced graphics capabilities, such as accelerated processing or the ability to connect a second monitor
Video capture	Connects to a video camera

Adapters

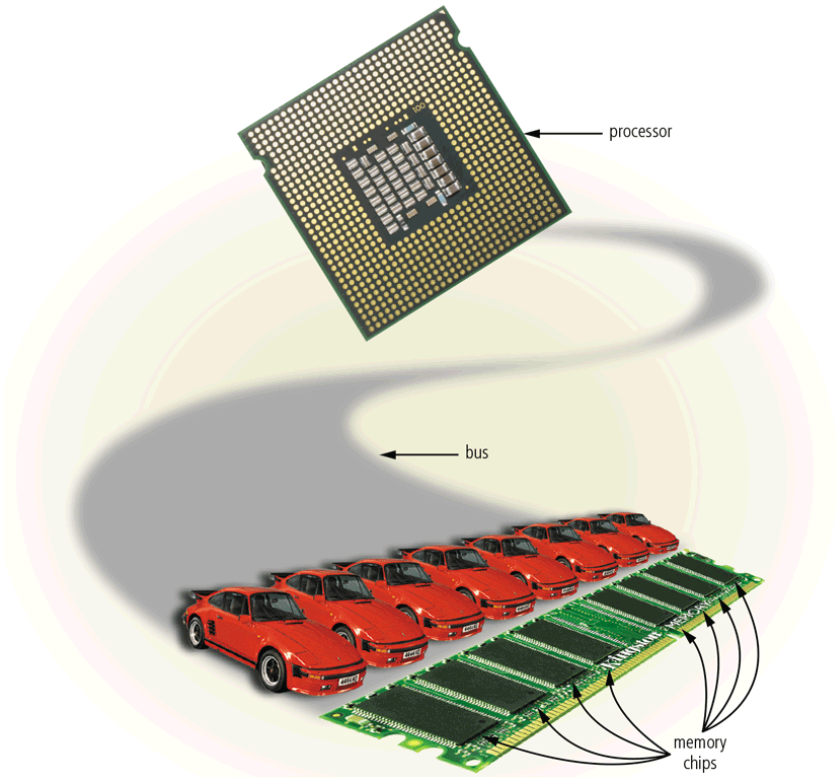
- With **Plug and Play**, the computer automatically can recognize peripheral devices as you install them



Adapters

- A USB adapter enhances functions of a mobile computer and/or provides connections to peripheral devices

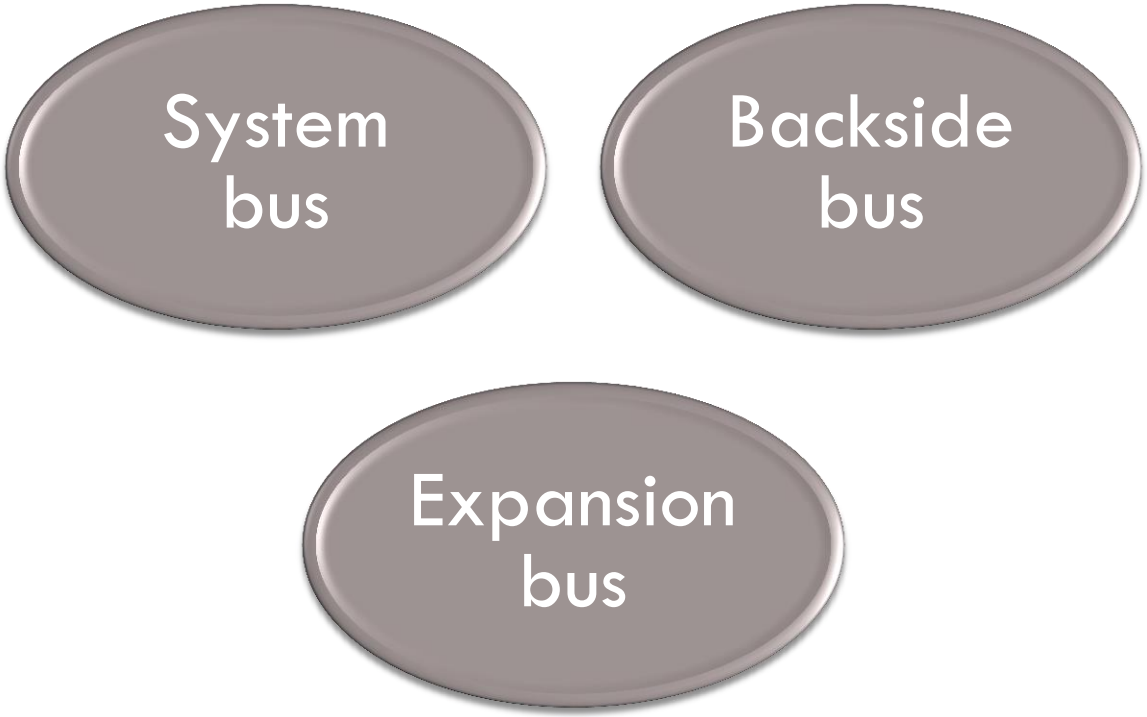
Buses



- A **bus** allows the various devices both inside and attached to the system unit to communicate with one another
  - Data bus
  - Address bus
- **Word size** is the number of bits the processor can interpret and execute at a given time

Buses

- A computer might have these three types of buses:



Power Supply and Batteries

- The **power supply** or laptop AC adapter converts the wall outlet AC power into DC power

Power Supply and Battery

- Mobile computers and devices can run using either a power supply or batteries
- Batteries typically are rechargeable lithium-ion batteries