

A World of Computers

- ❖ What is **computer literacy**?
 - ◆ Knowledge and understanding of computers and their uses
 - ◆ End User Skills
- ❖ Why are computers **important for success**?
 - ◆ Computers are everywhere
 - ◆ Required employment skill
- ❖ What is a **computer**?
 - ◆ Electronic device operating under the control of instructions stored in its own memory
 - ◆ Accepts **data input**: raw facts, figures, and symbols
 - ◆ Processes data into **information output** that is meaningful for people
 - ◆ Produces and stores results for later retrieval
 - ◆ Currently electronics is the fastest technology

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Digital Computer = Binary Processor

- ❖ Computer data is represented and manipulated using the **binary system**
- ❖ Binary = Base 2
- ❖ Each digit in binary is called a **bit**
 - ◆ A bit value can be in one of two states
 - ◆ Represented by 0/1, T/F, On/Off.
- ❖ A group of 8 bits is called a **byte**

0 1 0 0 1 0 1 0

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Data and Information Representation

- ❖ A Computer is a collection of millions of electronic switches (On or Off)
- ❖ A **bit** or binary (base 2) digit has one of two values: 1 or 0
- ❖ A **byte** is a group of 8 bits
- ❖ All information is represented in a computer using binary number data
- ❖ Characters are represented using **ASCII Code** with one byte/character
 - ◆ 'A' = 0100,0001 ◆ '7' = 0011,0111
 - ◆ 'B' = 0100,0010 ◆ ',' = 0010,1100
 - ◆ 'a' = 0110,0001 ◆ '\$' = 0010,0100

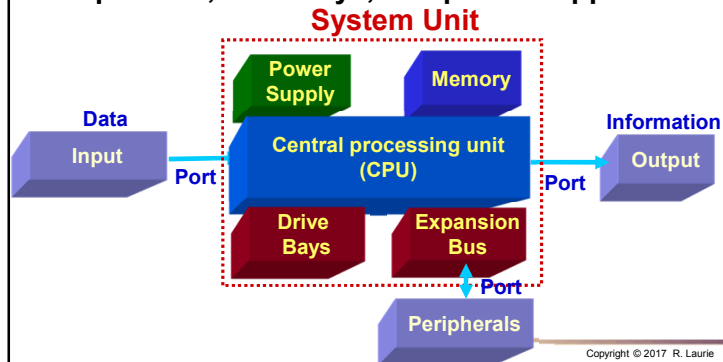
On = 1

Off = 0

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Components of the System Unit

- ❖ 5 major components of computers systems
- ❖ This section focuses on the CPU, Memory, Expansion, drive bays, and power supplies



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Computer Hardware Components

- ❖ **Processor = Central Processing Unit (CPU)**
 - ◆ The electronic component that interprets and executes the program instructions in the computer
- ❖ **Memory = RAM, Cache, ROM**
 - ◆ Memory is fast and temporarily stores instructions and data
 - ◆ **Volatile** = Data loss when power off
- ❖ **Storage = Hard Drive, CD, DVD, Flash Memory Device**
 - ◆ Storage is slower, but permanent stores instructions and data
 - ◆ **Non-Volatile** = Retains data when power off
 - ◆ **Storage device**
 - ◆ Records and retrieves items on storage media
 - ◆ **Storage media**
 - ◆ Physical material on which data and instructions are stored
- ❖ **Network**
 - ◆ **Communications device** that enables computer to send and receive data and instructions to another device via media
 - ◆ **Transmission media** may include cables, telephone lines, cellular radio networks, and satellites

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Categories: Personal Computers

- ❖ A **personal computer** can perform all of its input, processing, output, and storage activities by itself
- ❖ Two popular architectures are the PC and the Apple
 - ◆ **Desktop computer** = Designed so all of the components fit entirely on or under a desk or table



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Mobile Computers and Mobile Devices

- ❖ **Mobile Computer**
 - ◆ Personal computer you can easily carry and fit on lap
 - ◆ Examples include:
 - ◆ Laptop Computer (clam shell)
 - ◆ Notebook computer (clam shell)
 - ◆ Tablet PC
- ❖ **Mobile Device**
 - ◆ Computing device can hold in hand
 - ◆ Examples include:
 - ◆ Smart phones
 - ◆ PDA's
 - ◆ Media Players
 - ◆ Digital Cameras



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Multi-User Computers

❖ These computers are shared by many users

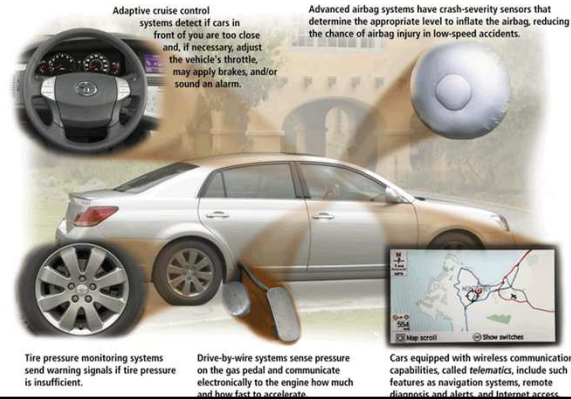
- ◆ Servers control access to network resources and provides centralized storage
- ◆ Web Servers serve web applications and web pages for World Wide Web using Internet
- ◆ Mainframe Powerful, expensive computer that supports thousands of connected users
- ◆ Supercomputer Fastest, most powerful, most expensive computer used for applications requiring complex mathematics



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Embedded Computers

❖ An **embedded computer** is a special-purpose computer that functions as a component in a product



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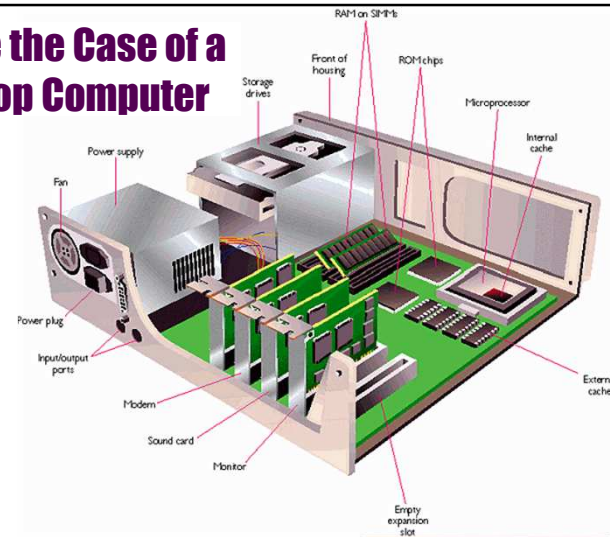
Memory Size and Speed

❖ Storage and memory capacity is expressed in the **number of bytes**

- ◆ 1 KiloByte = 2^{10} or 1024 bytes
 - ◆ 1 MegaByte = 2^{20} or 1,048,576 bytes
 - ◆ 1 GigaByte = 2^{30} or 1,073,741,824 bytes
 - ◆ 1 TeraByte = 2^{40} or 1,099,511,627,776 bytes
- Bus speeds
- ◆ 1 KiloHertz = 10^3 or 1 milliSecond
 - ◆ 1 MegaHertz = 10^6 or 1 microSecond
 - ◆ 1 GigaHertz = 10^9 or 1 nanoSecond

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Inside the Case of a Desktop Computer



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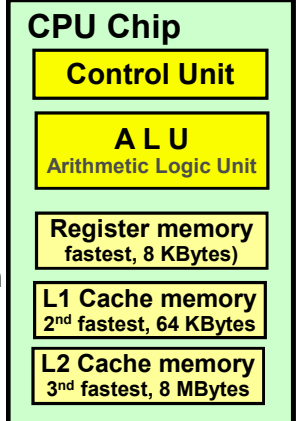
Power Supply

- ❖ What is a **power supply**?
 - ◆ Converts AC Power into DC Electric Power
 - ◆ Fan keeps system unit components cool
- ❖ Over time, the system unit collects dust
 - ◆ The power supply usually draws dust in
 - ◆ Airfilters can help minimize dust
- ❖ **Caution:** Never open a System Unit with power connected!

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The Central Processor Unit (CPU)

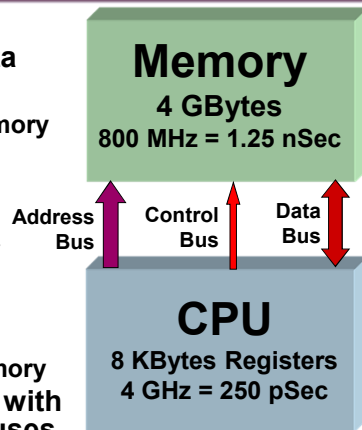
- ❖ The CPU contains 5 major functional components
 - ◆ Control unit
 - ◆ Arithmetic/logic unit (ALU)
 - ◆ Register memory
 - ◆ L1 Cache memory
 - ◆ L2 Cache memory
- ❖ CPU interacts closely with memory
- ❖ Memory, however, is not part of the CPU
- ❖ Called Microprocessor



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RAM & ROM Memory

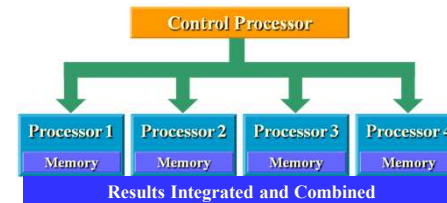
- ❖ Stores program instructions and data
- ❖ **RAM**
 - ◆ Random-access memory
 - ◆ Volatile memory
- ❖ **ROM**
 - ◆ Read-only memory
 - ◆ Non-volatile memory
- ❖ **CMOS**
 - ◆ BIOS = Basic Input/Output System
 - ◆ Battery or Flash Memory
- ❖ CPU communicates with memory via three buses



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Parallel Processing

- ❖ Parallel Processing
 - ◆ Allows parallel activities to occur simultaneously using multiple processors
 - ◆ Single-core processors have one processor on chip
 - ◆ Dual-core processors have two processors on chip
 - ◆ Quad-core processors have four processors on chip
 - ◆ Multi-core processor have ≥ 2 processors on chip



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Volatile and Nonvolatile Storage

❖ How does volatility compare?

- ◆ Memory is **volatile**—holds data and instructions temporarily
- ◆ Storage medium is **nonvolatile**—contents retained when power is off

	Power ON	Power OFF
Volatile		
Screen Display	Display appears	Display disappears
Memory (most RAM) (chips on motherboard)	Data and instructions	Data and instructions erased
Nonvolatile		
Storage Medium (floppy disks, Zip disks, hard disks, CDs)	Contents available to user	Contents retained

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What is Storage?

- ❖ Holds data, instructions, and information for future use
- ❖ Also called secondary storage or auxiliary storage
- ❖ Storage medium is physical material used for storage



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Storage Sizes

❖ What is **capacity**?

- ◆ Number of bytes (characters) a storage medium can hold

Kilobyte (KB)	1 thousand	→ 2^{10} or 1024 bytes
Megabyte (MB)	1 million	→ 2^{20} or 1,048,576 bytes
Gigabyte (GB)	1 billion	→ 2^{30} or 1,073,741,824 bytes
Terabyte (TB)	1 trillion	→ 2^{40}
Petabyte (PB)	1 quadrillion	→ 2^{50}
Exabyte (EB)	1 quintillion	→ 2^{60}
Zettabyte (ZB)	1 sextillion	→ 2^{70}
Yottabyte (YB)	1 septillion	→ 2^{80}

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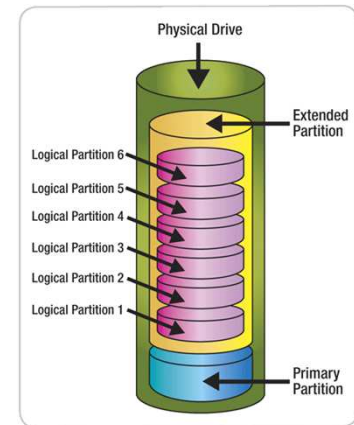
Hard Drive Disk - MBR Partitioning

❖ Hard Drive partitioning

- ◆ Creation of one or more **logical drives** on hard disk
- ◆ The disk stores the information about the partitions in **partition table**
- ◆ Partition editor to create, resize, delete, and manipulate the partitions

❖ MBR = **Master Boot Record**

- ◆ BIOS firmware systems 1983
- ◆ Primary partitions ≤ 4
- ◆ 1 Extended partition can be created instead of primary
- ◆ Many logical partitions within extended partition
- ◆ 32 bits for storing (LBA) **Logical Block Addresses**

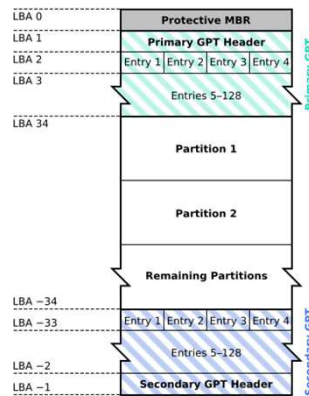


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Hard Drive Disk - GPT Partitioning

- ❖ GUID Partition Table (GPT)
 - ◆ Uses 128 bit globally unique identifiers (GUID)
 - ◆ GPT uses 64-bit values for addressing purposes (Logical Block Addresses or LBA)
 - ◆ Can address 9.4 zettabytes (ZB)
- ❖ Used on most computers sold after 2010 with Windows 8+
 - ◆ Unified Extensible Firmware Interface (UEFI) computer systems utilize GPT typically for hard drive partitioning
- ❖ Partition Formatting
 - ◆ NTFS for Windows > 2000
 - ◆ HFS+ for Mac OSX
 - ◆ exFAT for USB Drives (Mac/Win)

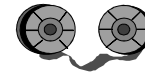
GUID Partition Table Scheme



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Longevity of Digital Storage Media

The physical media on which it is stored has a **limited physical lifetime**



Magnetic tape
Sequential Access 1 yr.



Videotape
Sequential Access 1–2 yrs.



Magnetic disk
Random Access 5–10 yrs.



Optical disk
Random Access 30 yrs.

Microfilm
Sequential Access 300 yrs.

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Optical Disc Storage Capacities

- ❖ CD-ROM, CD-R, CD-R/W
 - ◆ 700 MB per side
- ❖ DVD
 - ◆ 4.7 GB or 4700 MB: single side, single layer
 - ◆ 8.5 GB: single side, double layer
 - ◆ 17 GB: double side, double layer
- ❖ Blu-Ray or BD-ROM
 - ◆ 25 GB: single side, single layer
 - ◆ 50 GB: single side, double layer
 - ◆ 100 GB: double side, double layer
- ❖ Record and R/W
 - ◆ DVD Record has several formats



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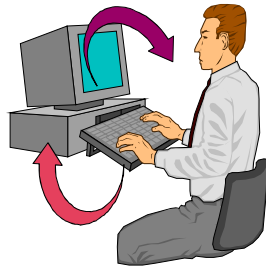
Data Transfer Rates

- ❖ What is the data transfer rate of a CD drive?
 - ◆ 1X: 150 KBps = Music CD play rate
 - ◆ 4X: 4 x 150 KBps = 600 KBps
 - ◆ 24X: 24 x 150 KBps = 3,600 KBps or 3.6 MBps
 - ◆ 48X: 48 x 150 KBps = 7,200 KBps or 7.2 MBps
 - ◆ 75X: 75 x 150 KBps = 11,250 KBps or 12.25 MBps
- ❖ What is the data transfer rate of a DVD drive?
 - ◆ 1xDVD: 1.32 MBps = Video play rate or about 9xCD
 - ◆ 4xDVD: 5.28 MBps = Greater than 36xCD
- ❖ What is data transfer rate of Blu-ray drive?
 - ◆ 1xBluRay: 36MBps

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Computer Input and Output

- ❖ It is from the computers perspective that Input/Output devices are defined
- ❖ **Input data** using input devices such as keyboard or mouse
- ❖ **Output information** that is the result of processing data to output devices like a monitor and printer



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Expansion Slots and Adapter Cards

- ❖ What is an **expansion slot**?
 - ◆ Socket on the motherboard that can hold an adapter card
 - ◆ Plug and Play = the computer automatically configures cards when installed
 - ◆ Desktop computers: PCI, PCIe, AGP, USB
 - ◆ Notebook computers: PC Card, Express Card
- ❖ What are **adapter cards**?
 - ◆ Special function cards installed in expansion slots or a computer
 - ◆ Modem, Network Card, TV-Tuner, MIDI, Memory, and other I/O Cards

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Input Peripheral Devices

Keyboard 	Numeric Keypad 	Pointing Device 	Remote Control 
Joystick 	Touch Screen 	Scanner 	Graphics Tablet 
Microphone 	Digital Camera 	Webcams 	Light Pens 

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Output Peripheral Devices

CRT Monitor 	TFT Monitor 	Laser Printer 	Inkjet Printer 
Dot Matrix Printer 		Speakers 	
Plotters 		Multimedia Projectors 	

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Multifunction Printers

❖ Print Speed

- ◆ Measured in pages per minute (PPM)
- ◆ Personal printers – 20 to 35 ppm
- ◆ Network printers – 30 to 65 ppm
- ◆ Typically Ink-jet

❖ Connection Options

- ◆ USB or Network connection

❖ Multifunction Capabilities

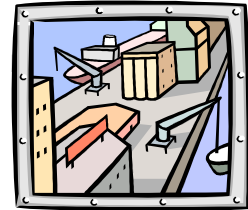
- ◆ Copy, scan, print, fax
- ◆ All-in-ones



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Peripheral Devices Connect via Ports

1. Video Port = connects monitor
2. Keyboard/Mouse Port = PS/2 Port
3. Serial Port = 9 or 25 pins, mouse, modem
4. Parallel Port = 25 holes, LPT1, LPT2
5. Game Port = joystick
6. **USB Ports = Universal Serial Bus**
7. Fire Wire Port = High Speed Port
8. Audio In Port = Microphone
9. Audio Out Port = Speakers
10. MIDI (Musical Instrument Digital Interface) port
11. eSATA port
12. SCSI port
13. IrDA (Infrared Data Association) port
14. **Bluetooth port**
15. **HDMI port (High-Definition Multimedia Interface)**
16. DVI port (Digital Video Interface)



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Networks and the Internet

- ❖ A **network** is a collection of computers and devices connected together via communications devices and transmission media

- ❖ The **Internet** is a worldwide collection of networks that connects millions of businesses, government agencies, educational institutions, and individuals



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Cloud Storage

- ❖ Cloud storage refers to the creation and use of remote servers over Internet for data storage
- ❖ Can share files across multiple Devices
 - ◆ Free Services: Dropbox, Google Drive, iCloud,
 - ◆ Microsoft OneDrive, SpiderOak (secure), iDrive
 - ◆ Advantage: Good for data backup and file sharing
 - ◆ Disadvantages: Requires Internet and security risk
- ❖ **SAAS = Software As A Service**
 - ◆ Utilizes browser for UI user interface
 - ◆ Utilizes cloud storage for storing files
 - ◆ Office SAAS: Zoho, Google Docs, and Office 365



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