Computers Are Data Processing Devices

• A computer’s five functions:
  • Inputs data
  • Stores data
  • Does arithmetic (add, subtract, multiply, divide)
  • Outputs data
  • Makes decisions
Data vs. Information

• Data: Representation of a fact, figure, or idea
• Information: Organized, meaningful data
Bits and Bytes: Storing data in a computer

• Bit
  – Binary digit
  – 0 or 1

• Byte
  – 8 bits

• Each letter, number, and character = a string of eight 0s and 1s
# How Much Is a Byte?

<table>
<thead>
<tr>
<th>Name</th>
<th>Abbreviation</th>
<th>Number of Bytes</th>
<th>Relative Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>B</td>
<td>1 byte</td>
<td>Can hold one character of data.</td>
</tr>
<tr>
<td>Kilobyte</td>
<td>kB</td>
<td>1,024 bytes ($2^{10}$ bytes)</td>
<td>Can hold 1,024 characters or about half of a double-spaced typewritten page.</td>
</tr>
<tr>
<td>Megabyte</td>
<td>MB</td>
<td>1,048,576 bytes ($2^{20}$ bytes)</td>
<td>Can hold approximately 768 pages of typed text.</td>
</tr>
<tr>
<td>Gigabyte</td>
<td>GB</td>
<td>1,073,741,824 bytes ($2^{30}$ bytes)</td>
<td>Approximately 786,432 pages of text; 500 sheets of paper is approximately 2 inches, so this represents a stack of paper 262 feet high.</td>
</tr>
<tr>
<td>Terabyte</td>
<td>TB</td>
<td>1,099,511,627,776 bytes ($2^{40}$ bytes)</td>
<td>This represents a stack of typewritten pages almost 51 miles high.</td>
</tr>
<tr>
<td>Petabyte</td>
<td>PB</td>
<td>1,125,899,906,842,624 bytes ($2^{50}$ bytes)</td>
<td>The stack of pages is now 52,000 miles high, or approximately one-fourth the distance from the Earth to the moon.</td>
</tr>
<tr>
<td>Exabyte</td>
<td>EB</td>
<td>1,152,921,504,606,846,976 bytes ($2^{60}$ bytes)</td>
<td>The stack of pages is now 52 million miles high, or just about twice the distance between the Earth and Venus.</td>
</tr>
<tr>
<td>Zettabyte</td>
<td>ZB</td>
<td>1,180,591,620,717,411,303,424 bytes ($2^{70}$ bytes)</td>
<td>The stack of pages is now 52 billion miles high, some 20 times the distance between the Earth and Pluto.</td>
</tr>
</tbody>
</table>
Computer Software

- **Software**: Programs that enable hardware to perform different tasks, or anything at all useful
  - **Application software** — word processing, spreadsheets, email, games
  - **System software** — operating system and utility programs of the operating system
Computer Hardware

Input

Storage

Processing

Output
Input Devices

• Devices used to enter information or instructions into the computer
  – Keyboard
  – Mouse/pointing device
  – Stylus
  – Scanner
  – Digital camera
  – Microphone
Keyboards

• The QWERTY layout is standard on most PCs. (Christopher Sholes typewriter, 1867)
• Enhanced keyboard features include number, function keys, and navigation keys.
• Ergonomic keyboards
Dvorak Keyboards
(Dvorak, U of W, 1912)

• Put the most commonly used keys on “home keys”
• Reduce the distance of finger stretches
Specialty Keyboards

- Notebook keyboard
- PDA stylus
- Tablet PCs
- Wireless keyboard
Mice (pointing devices)

- **Optical mouse**
  - Needs no mouse pad
  - Doesn’t need cleaning
  - Is more expensive

- **Trackball**
  - Easier on wrists
  - Stays stationary on desk

- **Wireless**
  - Uses radio or micro waves
New Mouse Features

• Instant viewer
• Shrinks all windows currently open to thumbnail-size images so that you can see everything open on your desktop at a glance

• Magnifier
• Customizable buttons
• Web search
Other Input Devices

• Scanners
  – Text
  – Images
  – Bar codes

• Digital cameras
  – Images
  – Video
Other Input Devices

- EPOS Digital Pen—write on paper and captured on thumb drive for conversion to text document
- Webcam
  - Live video
Inputting Sound

- Microphones are used for:
  - Podcasts
  - Video-conferencing
  - Internet phone calls
  - Speech recognition
  - **Happy birthday email**
Input Devices for the Physically Challenged

• Visual impairments
  – Voice recognition
  – Keyboards with large keys
  – On-screen keyboards

• Motor control issues
  – Special trackballs
  – Head-mounted devices
  – Foot activated mouse
Output Devices

• Send processed data out of the computer
  – Monitors
  – Printers
  – Speakers/headphones

• Output devices make:
  – Soft copy (video, sounds, control signals)
  – Hard copy (print)
Monitor Types

• CRT (Cathode-Ray Tube=TV tube)
  – Less expensive
  – Uses much more space
  – Uses more energy
  – Offers better viewing angles
  – Legacy technology

• LCD (Liquid Crystal Display)
  – More expensive
  – Uses far less space
  – More energy efficient
  – Less viewable from an angle
Key Monitor Features

- Screens are grids made up of millions of pixels (picture element=dots).
- LCDs: Liquid crystal is sandwiched between two transparent layers to form images.
- CRTs: Pixels are illuminated by an electron beam that passes back and forth across the screen.
LCD Quality Factors

- Resolution (pixels per inch)
- Passive-matrix (less $) vs. active-matrix (more $) display
- Viewing angle
- Contrast ratio
- Brightness
- Response time
LCD vs. CRT

• LCD monitors:
  – Take up less space
  – Are generally brighter
  – Cause less eyestrain
  – Use less energy
  – Emit less electromagnetic radiation
  – Weigh less

• CRT monitors:
  – Used to offer more resolutions
  – Used to produce better color and clarity
Other Video Output

• Touch-screen monitors or light pen
  – Double as both input and output devices

• Projectors
  – Project a computer image to a large screen for sharing with large groups
Printers

• Impact printers
  – Dot-matrix
  – Makes carbon copies

• Nonimpact printers
  – Inkjet
  – Laser

• Specialty printers
  – Multifunction
  – Plotters
  – Thermal printers
Nonimpact Printers

- **Inkjet**
  - Less expensive device
  - Print high-quality color images cost effectively

- **Laser**
  - More expensive device
  - Faster printing speed
  - Less expensive per page in B&W
  - Color lasers are becoming less expensive
Banners

Affordable, custom-made banners from FedEx Office Print & Ship Centers® attract customers’ attention and communicate your message effectively.

Indoor Banners

These high-quality banners are perfect for announcements, parties, tradeshows and point-of-purchase displays.

Prices start at $119.99

Learn More

Outdoor Banners

Made of materials more suited for outdoor use. Whether you are calling attention to an event promotion, grand opening or community event these outdoor banners are made to shine.

Prices start at $134.99

Learn More

Durable Cut Vinyl Banners

These durable banners are constructed to withstand the elements over time without sacrificing brilliance. Economical and long-lasting banner options to deliver high definition imagery at leasings and hirings, outdoor promotions and parades.

Prices start at $99.99
Choosing a Printer

- Speed (pages per minute -- ppm)
- Resolution (dots per inch -- dpi)
- Color output
- Memory
- Use and cost
- Cost of consumables (ink, paper)
Outputting Sound

- Speakers and headphones
The System Unit

- Box that contains the central electronic components of the computer:
  - CPU/RAM/motherboard
  - Expansion cards
  - Power supply
  - Storage devices
The Front Panel

- Power control
- Drive bays
- Memory card reader
- Productivity ports
Power Controls

• Power-on button: Turns on system, should not be used to turn it off

• Other options:
  – Sleep mode—saves in memory
  – Hibernation—saves on disk
  – Warm boot
Drive Bays

• **Internal** drive bays:
  – Cannot be accessed from outside the system
  – Are reserved for internal hard drives

• **External** drive bays:
  – Can be accessed from outside the system
  – CD or DVD drives
  – Floppy and zip drives
Hard Disk Drive

- Permanent (nonvolatile when power lost) storage
- Erasable, rewritable
- Internal—inside system unit
- External versions—sits on desk
Costco Feb 2010

**Featured Items**

- **Seagate FreeAgent™ Desk 1.5TB External Hard Drive**
  - Price: $139.99

- **AcomData pureDrive 1TB External Hard Drive**
  - Price: $129.99

- **AcomData PureDrive 1TB External Hard Drive**
  - Price: $109.99

- **Seagate FreeAgent™ Desk 1TB External Hard Drive**
  - Price: $114.99

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1-15 of 15 products  
**Sort by:** price high to low  
GO

- **Western Digital 8TB ShareSpace Network Raid Hard Drive**
  - Price: $999.99

- **LaCie 5big 5TB Network RAID Hard Drive**
  - Design by...
  - Price: $829.99

- **Seagate 4TB 440 Network Attached Storage Server**
  - Price: $779.99

- **Seagate 2TB 420 Network Attached Storage Server**
  - Price: $529.99
IBM announces massive NAS array for the cloud

By Lucas Mearian

February 11, 2010 12:01 AM

Computerworld - IBM announced an enterprise-class network attached storage (NAS) array today that is capable of scaling to 14 petabytes under a single name space.
Flash Drives/Flash Memory

• Flash drives (jump drives, thumb drive, micro drive)
  – Newer storage alternative
  – Plug into USB ports
• Flash memory cards
  – Slide into slots in the system
# Storage Media Capabilities

## Table of Storage Media Capabilities

<table>
<thead>
<tr>
<th>STORAGE MEDIUM</th>
<th>CAPABILITIES</th>
<th>STORAGE CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Drive</td>
<td>Read and write</td>
<td>External: as much as 2 terabytes (TB)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal: as much as 750 GB</td>
</tr>
<tr>
<td>CD</td>
<td>Read only</td>
<td>700 MB</td>
</tr>
<tr>
<td>CD-RW</td>
<td>Read and write</td>
<td></td>
</tr>
<tr>
<td>CD+RW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVD</td>
<td>Read only</td>
<td>4.7 GB (for single-side, single-layer DVDs)</td>
</tr>
<tr>
<td>DVD-RW</td>
<td>Read and write</td>
<td>9.4 GB (for single-side, dual-layer DVDs)</td>
</tr>
<tr>
<td>DVD+RW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blu-ray (BD)</td>
<td>Read and write</td>
<td>27 GB (for single-layer discs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 GB (for dual-layer discs)</td>
</tr>
<tr>
<td>Flash memory</td>
<td>Read and write</td>
<td>16 GB or more</td>
</tr>
<tr>
<td>cards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash drive</td>
<td>Read and write</td>
<td>16 GB or more</td>
</tr>
</tbody>
</table>
On the Back

- Ports for peripherals
- Types of ports:
  - Serial and parallel
  - Audio and video
  - USB
  - FireWire
- Connectivity
  - Ethernet
  - Modem
Inside the System Unit

• Essential electronic components used to process data
• Types of components:
  – Power supply
  – Hard disk drive
  – Motherboard
  – CPU
  – Expansion cards
The Motherboard

- CPU
- RAM
- Expansion cards and slots
- Built-in components

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Central Processing Unit (CPU)

• Referred to as the “brains” of the computer
• Controls all functions of the computer
• Processes all commands and instructions
• Can perform billions of tasks per second
Memory Module

- Also called the **Main Memory**
- Random access memory (RAM)
- Stores instructions and data
- Temporary (volatile on loss of power) storage
- Operates in nanoseconds
Expansion Cards

- Usually called Controllers
- Add functions
- Provide new connections for peripheral devices
- Common types:
  - Sound
  - Modem
  - Video (VGA)
  - Network (NIC)
Specialty Computers

- Mainframes
- Minicomputers
- Supercomputers
- Embedded computers
Setting It All Up: Ergonomics

• Ergonomics: minimizing injury or discomfort while using the computer

• Steps to follow:
  – Position monitor correctly.
  – Use adjustable chair.
  – Assume proper position while typing.
  – Take breaks.
  – Ensure adequate lighting.
### Ergonomics and Mobile Devices

#### Mobile devices present ergonomic challenges

<table>
<thead>
<tr>
<th>Ergonomic “Disease”</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackberry thumb</td>
<td>Thumb typing without breaks or stretching can cause DeQuervains’ tendinitis/tendonitis in the thumbs.</td>
</tr>
<tr>
<td>iPod deafness</td>
<td>Listening through ear buds for prolonged periods at a volume of 80 decibels or more can cause deafness.</td>
</tr>
<tr>
<td>Cellular blindness</td>
<td>Extended viewing on tiny screens can cause eye strain and/or dry eyes.</td>
</tr>
<tr>
<td>Laptop thighs</td>
<td>Resting a laptop directly on your lap for extended periods of time can result in 1st and 2nd degree burns.</td>
</tr>
<tr>
<td>Laptop shoulder</td>
<td>Large, heavy, one-strap laptop bags can result in neck, shoulder, and back pain and/or strain.</td>
</tr>
</tbody>
</table>