Technology in Action

Chapter 6
Understanding and Assessing Hardware: Evaluating Your System
To Buy or to Upgrade?

- Things to consider:
  - Moore’s Law
  - Cost of upgrading vs. buying
  - Time to install software and files
  - Needs and wants
Assessing Your Hardware: Evaluating Your System

• Assess the computer’s subsystems
• The subsystems include
  – CPU
  – RAM
  – Storage devices
  – Video
  – Audio
  – Ports
Desktop or Notebook

• Desktop
  – Hard to move around
  – Less expensive
  – Harder to steal
  – Easier to upgrade
  – Difficult to ship (repairs)
  – More powerful

• Notebook
  – Portable
  – More expensive
  – Easily stolen
  – Difficult to upgrade
  – Prone to damage from dropping
  – Less powerful
Evaluating the CPU

• How does the CPU work?
  – Control unit
  – Arithmetic logic unit (ALU)
  – Machine cycle:
    • Fetch
    • Decode
    • Execute
    • Store
  – Speed:
    • MHz vs MFLOPS
    • GHz vs GFLOPS
Evaluating Other CPU Features

• Front side bus (CPU + mem) and cache memory
• Some CPUs are optimized to process multimedia instructions
• Intel CPUs called core duo processors
  – Use less power than dual processors
  – Increase multitasking performance
Upgrading the CPU

• Expensive
• Easy to install
• Must have motherboard compatibility
• Whom to blame???
Evaluating RAM

- Random access memory (RAM):
  - Temporary storage (main memory)
  - Volatile (needs power or forgets)

- Memory modules fit on motherboard
  - Most are called dual inline memory modules (DIMMs)

- Types of RAM:
  - DDR
  - DDR2
  - SRAM
  - DRAM
  - SDRAM
How Much RAM Do You Need?

- Physical memory vs. kernel memory
- Need RAM for system software, productivity software, entertainment, graphics programs

<table>
<thead>
<tr>
<th>Application</th>
<th>Minimum RAM Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Vista Home Basic</td>
<td>512 MB</td>
</tr>
<tr>
<td>MS Office Pro 2007</td>
<td>256 MB</td>
</tr>
<tr>
<td>Internet Explorer 7</td>
<td>128 MB</td>
</tr>
<tr>
<td>iTunes</td>
<td>256 MB</td>
</tr>
<tr>
<td>Microsoft Picture It!</td>
<td>128 MB</td>
</tr>
<tr>
<td>Total RAM Required If Running All Programs Simultaneously</td>
<td>1,280 MB or 1.28 GB</td>
</tr>
</tbody>
</table>
Virtual Memory

- Memory-bound system = performance limited by lack of memory
- Virtual memory = using the disk as an extension of memory
- Page file = pages of 1012 bytes
- Drawback = slower performance
- Increasing RAM will avoid this problem
- Made programming easier
Adding RAM

• Increases system performance
• Things to consider:
  – Type of RAM module-use type recommended by manufacturer unless you have reliable information
  – Amount of RAM:
    • Maximum limit
    • Number of slots
    • Operating system
    • Applications running at the same time
Evaluating Storage

• Types of storage devices:
  – Hard drive-inside system unit
  – Floppy drive
  – Zip disk drive
  – CD/DVD
  – Flash memory

• Nonvolatile storage
The Hard Disk Drive

• Storage capacity is up to 2 terabytes (TB).
• Access time is measured in milliseconds.
• Data transfer rate is measured in megabits or megabytes per second.
• Spindle speed is measured in revolutions per minute (7500-10000 rpm).
How a Hard Disk Works

- Composed of coated platters stacked on a spindle
- Data saved to the disk: pattern of magnetized spots
  - Spots = 1
  - Spaces = 0
- Between platters are read/write heads
- Spots are translated into data
Portable Storage

• Provides the ability to move data from one computer to another
• Portable storage devices:
  – Floppy disk
  – Blu-ray (BD)
  – Flash, jump, thumb, micro drive
  – Flash memory card
  – Portable hard drive-external
Store It Online

- Company provides space on its servers.
- Some sites offer limited free space with option to rent larger amounts.
- Example:
  - Xdrive offers 5 GB free or rent 50 GB for < $10/month.
- Mobile solution—can access anywhere Internet access is available.
- Cloud computing.
Optical Storage

• **Optical media:** Store data as tiny pits “burned” into a disk by a laser
  - CD-ROM, CD-R, CD-RW
  - DVD-ROM, DVD-R, DVD-RW
  - Blu-ray disk

• **Laser**
  - Pits scatter laser light, equaling a 1
  - Nonpitted area reflects laser light, equaling a 0
Upgrading Storage

• Hard drive options:
  – Replace current drive with a larger capacity drive
  – Install an additional hard drive
  – Attach external hard drive (USB)

• Other options:
  – Replace CD ROM with CD-R/RW, DVD-R/RW, or Blu-ray
  – Flash card reader
  – Flash memory drive
Evaluating Video

• Two components:
  – Video card (adapter)
  – Monitor
Video Cards

- Process binary data into images
- Contain memory known as video memory
- Control the number of colors a monitor can display (bit depth)
  - Standard VGA
  - True color (SVGA)
    - 16,000,000 colors
Monitors

• Things to consider:
  – Types: CRT or LCD
  – Size:
    • 15, 17, 19, 21, 30 inch
  – Resolution:
    • Increasing resolution allows more detail to be displayed
  – Dot pitch:
    • .31mm or less
  – Refresh rate:
    • 60 or 75 Hz and higher
LCD Monitors

- Aspect ratio—height to width ratio
- Contrast ratio
- Brightness
- Pixel color response rate
- Side viewing
Evaluating Audio

• Speakers
  – Amplified
  – Not amplified
  – Subwoofer
Evaluating Audio

• Sound cards:
  – Attach to motherboard
  – Process digital data into sounds
  – 3D sound cards
  – Surround sound
    • Dolby Digital EX
    • Dolby Digital Plus
    • Dolby TrueHD=master recording
Evaluating Ports

• Ports are used to connect peripheral devices to the computer.

• Things to consider:
  – Devices you want to use
  – Ports needed for the devices
Types of Ports

• Universal serial bus
• 500 milliwatt power
• USB 3.0 8 gbs
  – USB 2.0
    Transfer speed up to 480 Mbps; hot swapping
  – Up to 127 device daisy chaining
• USB 1.0
  Transfer speed up to 12 Mbps; hot swapping
  – Up to 63 device daisy chaining
  – Hub to expand ports
  – A side wider, B side square
Types of Ports

- FireWire
  - Transfer rate of 400 Mbps; digital cameras
  - Newer FireWire 800 is fastest 800 MBPS
  - 45 Watts
Types of Ports

• Ethernet
  – Fast Ethernet: Transfer rate of 100 Mbps
  – Gigabit Ethernet: Transfer rate of 1000 Mbps
  – Connects computers to networks
Types of Ports

- **DVI**
  - For digital LCD monitors
  - Transfers data up to 4.95 Gbps
- **Super VGA (analog)**
- **S-Video (PC to TV)**
Types of Ports

• Parallel (for printers)
  – Transfers 8 bits of data simultaneously
  – Max speed: 12 Mbps
Types of Ports

• Bluetooth
  – Transfer rate of 1 Mbps to 3 Mbps
  – Radio waves send data over short distances
  – Through walls
Wi-Fi (Wireless Fidelity)

• Covers longer distances than Bluetooth
• Data transfer rate up to 200 Mbps
• Trouble going through walls (microwaves)
• 600 ft with good antenna
Adding Ports

• Expansion cards:
  – New port standards

• Expansion hubs:
  – Enable several devices to be connected to a port
Evaluating System Reliability

• Performance:
  – Is slow
  – Freezes
  – Crashes

• Upkeep and maintenance:
  – System tools
  – Control Panel
  – Update software and hardware drivers
Upkeep and Maintenance

• System tools:
  – Disk Cleanup
  – Add/Remove Programs
  – Disk Defragmenter

• Spyware/adware utilities
Update Software and Hardware Drivers

- **Software:**
  - Automatic updates
  - Patches
- **Hardware:**
  - Download updated drivers
The Last Resort

• If problems persist:
  • Use a restore point
    – Reinstall the operating system
    – Upgrade the operating system to the latest version
The Final Decision

• How closely does your system meet your needs?
• How much would it cost to upgrade your system?
• How much would it cost to purchase a new system?
• Do you deserve to be happy?