Chapter 6
Inside Computers and Mobile Devices

Objectives Overview

- Describe the various computer and mobile device cases and the contents they protect
- Describe multi-core processors the components of a processor, and the four steps in a machine cycle
- Identify characteristics of various personal computer processors on the market today, and describe the ways processors are cooled
- Explain the advantages and services of cloud computing
- Define a bit, and describe how a series of bits represents data
- Explain how program and application instructions transfer in and out of memory

See Page 248 for Detailed Objectives

Copyright © Cengage Learning. All rights reserved.
Objectives Overview

- Differentiate among the various types of memory
- Describe the purpose of adapter cards, USB adapters, and ExpressCard modules
- Explain the function of a bus
- Explain the purpose of a power supply and batteries
- Understand how to care for computers and mobile devices

Inside the Case

- The case contains and protects the electronics of the computer or mobile device from damage
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
  – Contain a control unit and an arithmetic logic unit (ALU)
• A multi-core processor is a single chip with two or more separate processor cores
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

---

Figure 6-5
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 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 mats

Cloud Computing

- Home and business users choose cloud computing for a variety of reasons
- Accessibility
- Cost savings
- Space savings
- Scalability
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**

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

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

The system unit contains 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
Two common types of RAM chips exist:

- **Dynamic RAM (DRAM)**
- **Static RAM (SRAM)**

<table>
<thead>
<tr>
<th>Table 6-1: Common DRAM Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>SDRAM (Synchronous DRAM)</td>
</tr>
<tr>
<td>DDR (Double Data Rate DRAM)</td>
</tr>
<tr>
<td>DDR2</td>
</tr>
<tr>
<td>DDR3</td>
</tr>
<tr>
<td>DDR4</td>
</tr>
<tr>
<td>DDR5</td>
</tr>
<tr>
<td>RDRAM (Rambus DRAM)</td>
</tr>
<tr>
<td>RDRAM</td>
</tr>
<tr>
<td>RDRAM</td>
</tr>
<tr>
<td>RDRAM</td>
</tr>
<tr>
<td>RDRAM</td>
</tr>
</tbody>
</table>
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 provides high speeds and consumes little power
Memory

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

<table>
<thead>
<tr>
<th>Table 6-2</th>
<th>Access Time Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>Millisecond</td>
<td>ms</td>
</tr>
<tr>
<td>Microsecond</td>
<td>ps</td>
</tr>
<tr>
<td>Nanosecond</td>
<td>ns</td>
</tr>
<tr>
<td>Picosecond</td>
<td>ps</td>
</tr>
</tbody>
</table>

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 graphics card
- An **expansion slot** is a socket on a desktop or server motherboard that can hold an adapter card

<table>
<thead>
<tr>
<th>Table 6-3</th>
<th>Adapter Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Purpose</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>Enables Bluetooth connectivity</td>
</tr>
<tr>
<td>MIDI</td>
<td>Connects to musical instruments</td>
</tr>
<tr>
<td>Modem</td>
<td>Connects to transmission media, such as cable television lines or phone lines</td>
</tr>
<tr>
<td>Network</td>
<td>Provides network connections, such as to an Ethernet port</td>
</tr>
<tr>
<td>Sound</td>
<td>Connects to speakers or a microphone</td>
</tr>
<tr>
<td>TV tuner</td>
<td>Allows viewing of digital television broadcasts on a monitor</td>
</tr>
<tr>
<td>USB</td>
<td>Connects to high-speed USB ports</td>
</tr>
<tr>
<td>Video</td>
<td>Provides enhanced graphics capabilities, such as accelerated processing or the ability to connect a second monitor</td>
</tr>
<tr>
<td>Video capture</td>
<td>Connects to a video camera</td>
</tr>
</tbody>
</table>
Adapters

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

Adapters

• Adapters for mobile computers are in the form of a removable flash memory device
  – USB adapter
  – ExpressCard module
**Buses**

- A **bus** allows the various devices both inside and attached to the system unit to communicate with each other
  - 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:
  - System bus
  - Backside bus
  - Expansion bus
The power supply or laptop AC adapter converts the wall outlet AC power into DC power.

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

<table>
<thead>
<tr>
<th>Various components inside computers and mobile devices</th>
<th>Types of processors, steps in a machine cycle, and processor cooling methods</th>
<th>Advantages and services of cloud computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>How memory stores data and describes various types of memory</td>
<td>Adapters, buses, power supplies and batteries</td>
<td>Ways to care for computers and mobile devices</td>
</tr>
</tbody>
</table>

---

**Discovering Computers**  
Technology in a World of Computers, Mobile Devices, and the Internet

**Chapter 6**  
Inside Computers and Mobile Devices

Chapter 6 Complete