Discovering Computers

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

Chapter 8

Digital Storage

Objectives Overview

Differentiate between storage and memory

Describe the characteristics of internal hard disks

Identify uses of external hard disks and RAID

Describe the benefits of solid-state drives

Differentiate among various types of memory cards and USB flash drives

See Page 336
for Detailed Objectives

Objectives Overview

Discuss the benefits and uses of cloud storage

Describe characteristics of and differentiate among types of optical discs

Explain types of enterprise storage

Identify uses of magnetic stripe cards, smart cards, RFID tags, and microfilm and microfiche

See Page 336
for Detailed Objectives

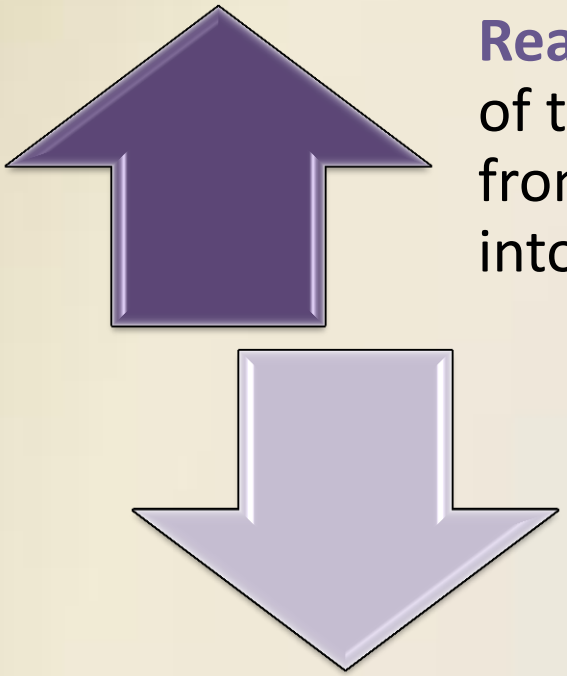
Storage

A storage medium is the physical material on which a computer keeps data, information, programs, and applications

Cloud storage is another storage option, in which the actual online storage media used is transparent to the user

Storage

- A **storage device** is the hardware that records and/or retrieves items to and from storage media



Reading is the process of transferring items from a storage medium into memory

Writing is the process of transferring items from memory to a storage medium

Storage

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Figure 8-1

Storage

- **Capacity** is the number of bytes a storage medium can hold

Table 8-1 Terms Used to Define Storage

Storage Term	Approximate Number of Bytes	Exact Number of Bytes
Kilobyte (KB)	1 thousand	2^{10} or 1,024
Megabyte (MB)	1 million	2^{20} or 1,048,576
Gigabyte (GB)	1 billion	2^{30} or 1,073,741,824
Terabyte (TB)	1 trillion	2^{40} or 1,099,511,627,776
Petabyte (PB)	1 quadrillion	2^{50} or 1,125,899,906,842,624
Exabyte (EB)	1 quintillion	2^{60} or 1,152,921,504,606,846,976
Zettabyte (ZB)	1 sextillion	2^{70} or 1,180,591,620,717,411,303,424
Yottabyte (YB)	1 septillion	2^{80} or 1,208,925,819,614,629,174,706,176

Pages 336 and 338
Table 8-1

Storage

- Items on a storage medium remain intact even when you turn off a computer or mobile device

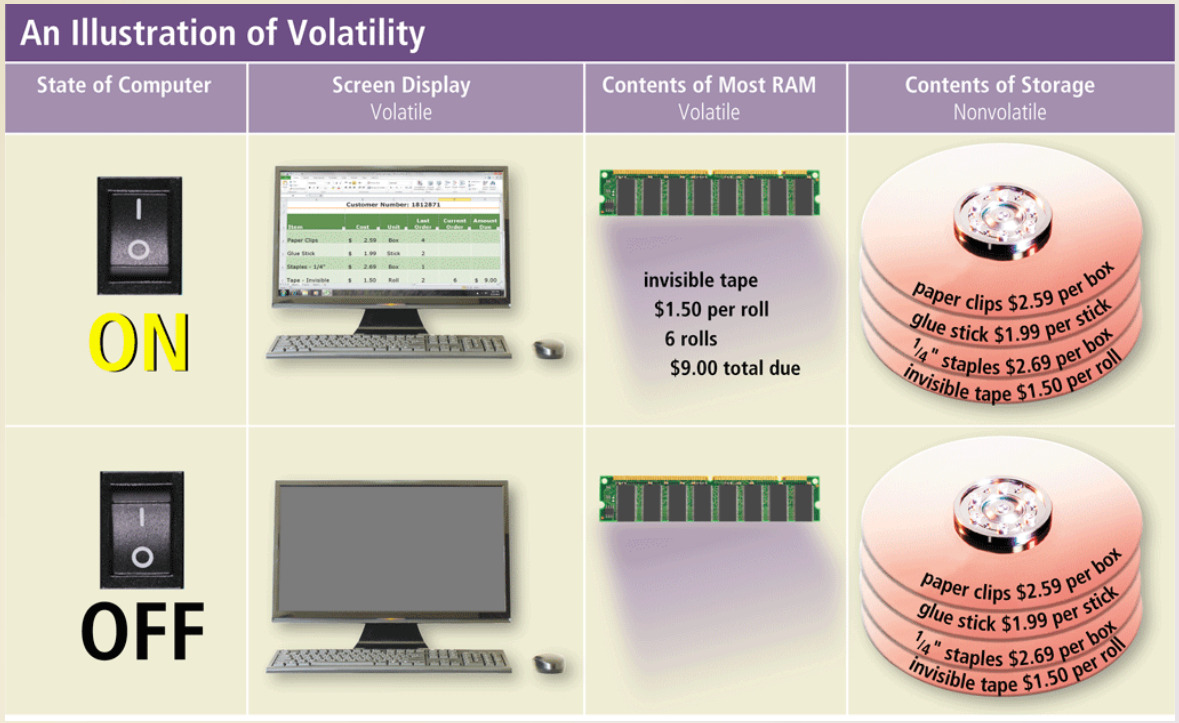

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Figure 8-2

Storage

- **Access time** measures:
  - The amount of time it takes a storage device to locate an item on a storage medium
  - The time required to deliver an item from memory to the processor

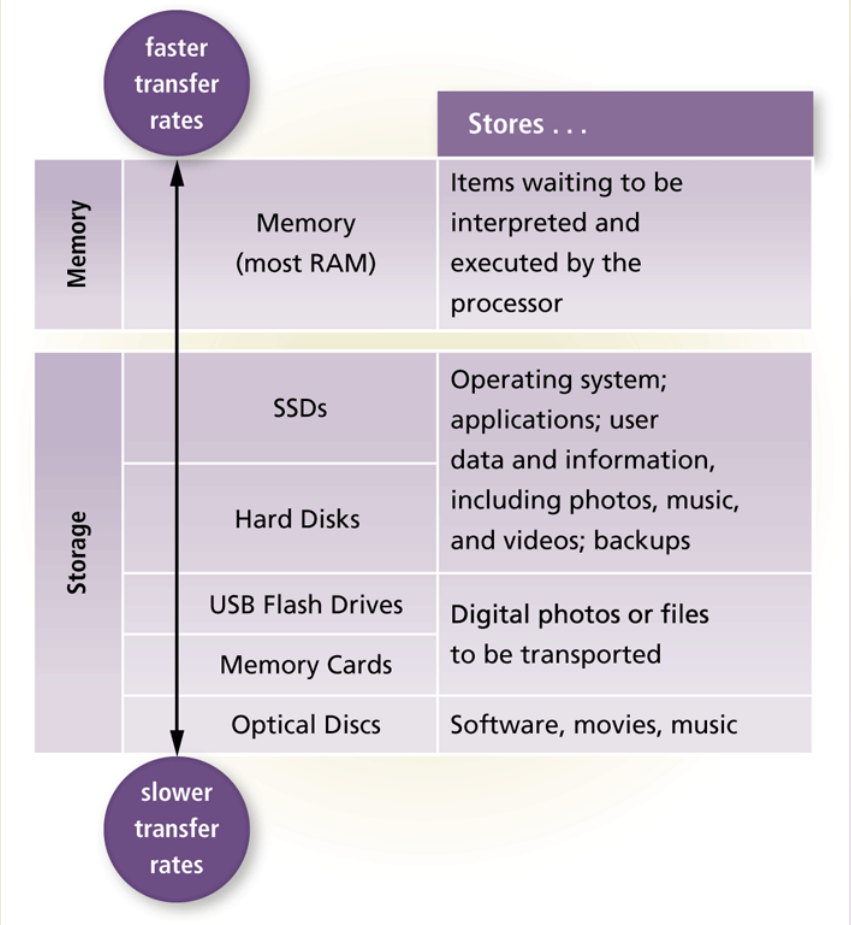

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Figure 8-3

Hard Disks

- A **hard disk** contains one or more inflexible, circular platters that use magnetic particles to store data, instructions, and information

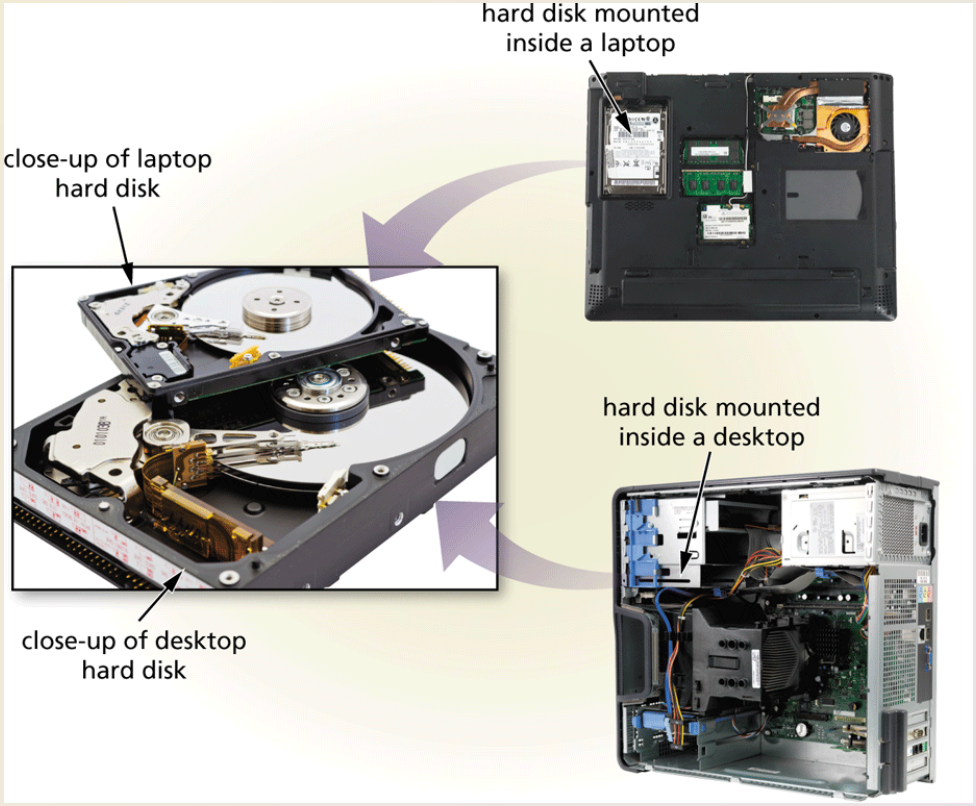

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Figure 8-4

Hard Disks

- Hard disks can store data using longitudinal recording or perpendicular recording

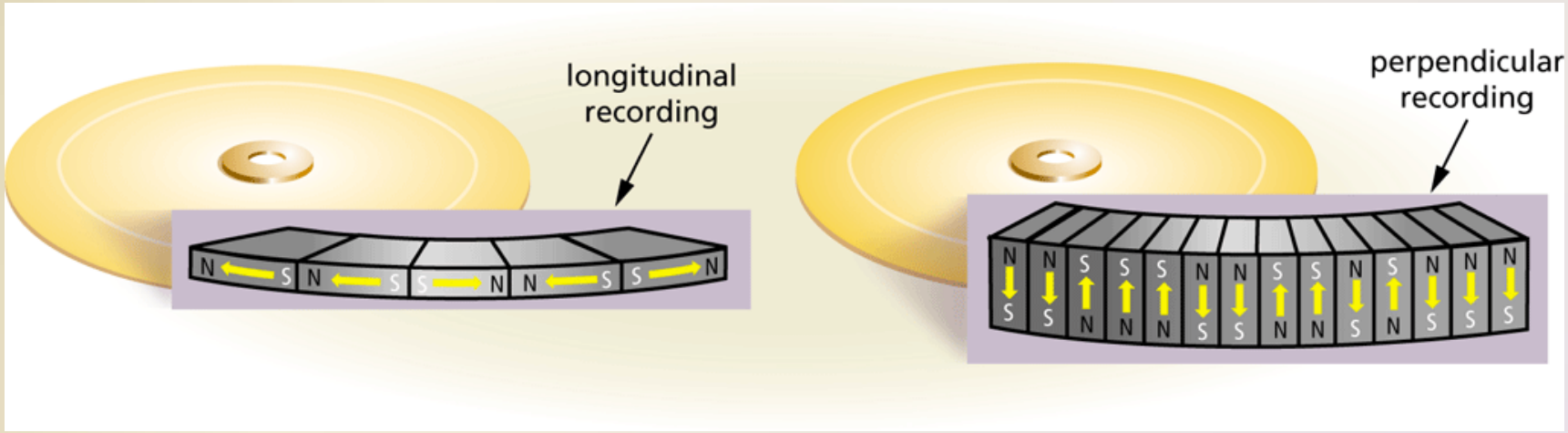

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Figure 8-5

Hard Disks

- **Formatting** is the process of dividing the disk into tracks and sectors

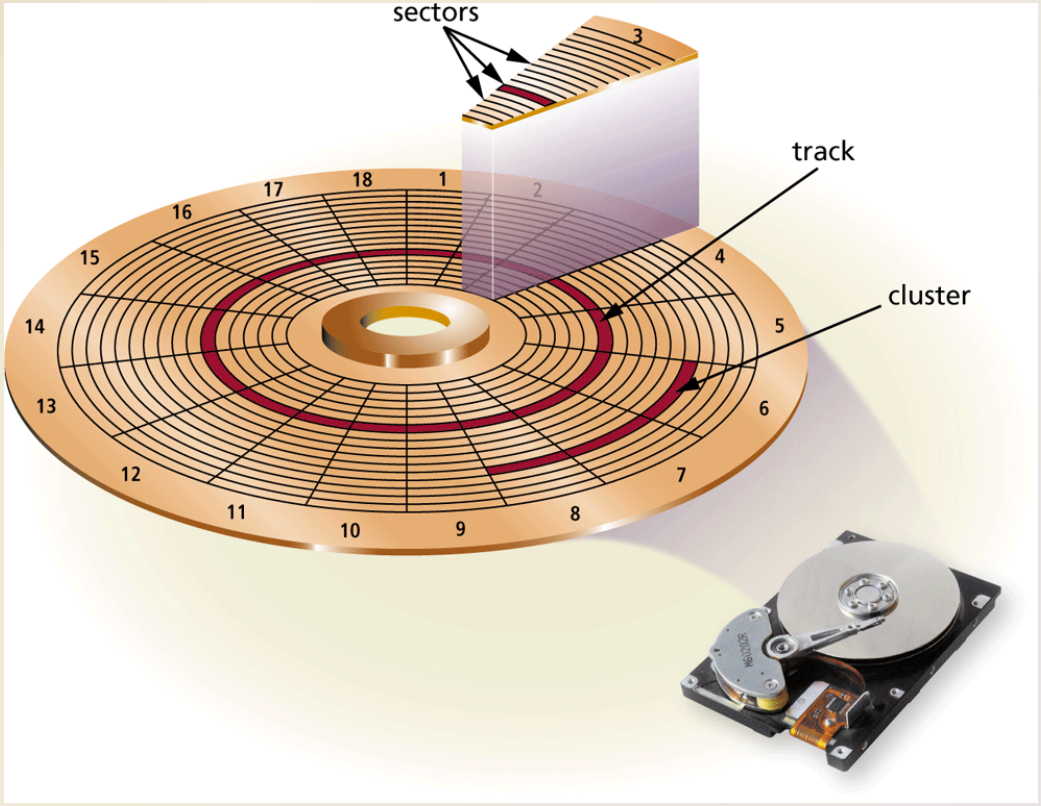

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Figure 8-6

Hard Disks

- Characteristics of a hard disk include:

Tracks

Sectors

Platters

Form factor

Read/write head

Revolutions per minute

Hard Disks

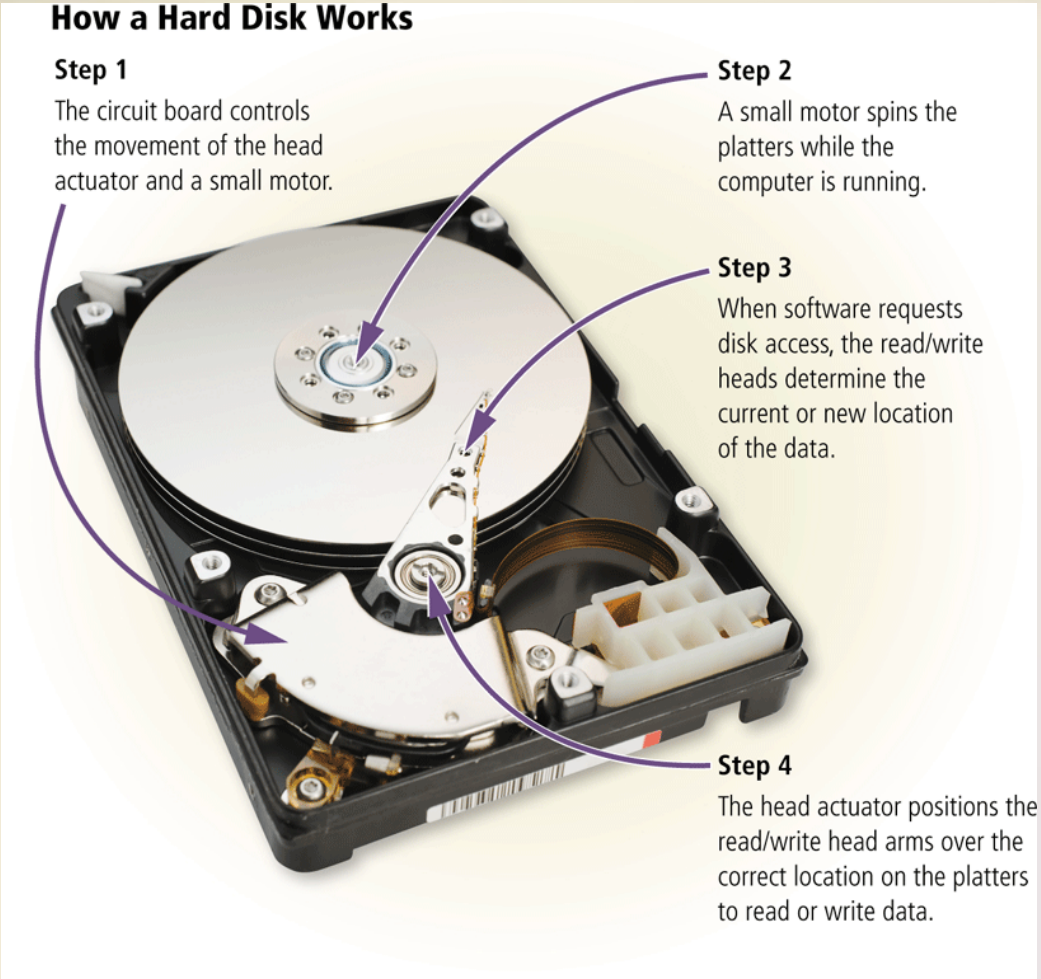

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Figure 8-7

Hard Disks

- A head crash occurs when a read/write head touches the surface of a platter
- Always keep a backup of your hard disk

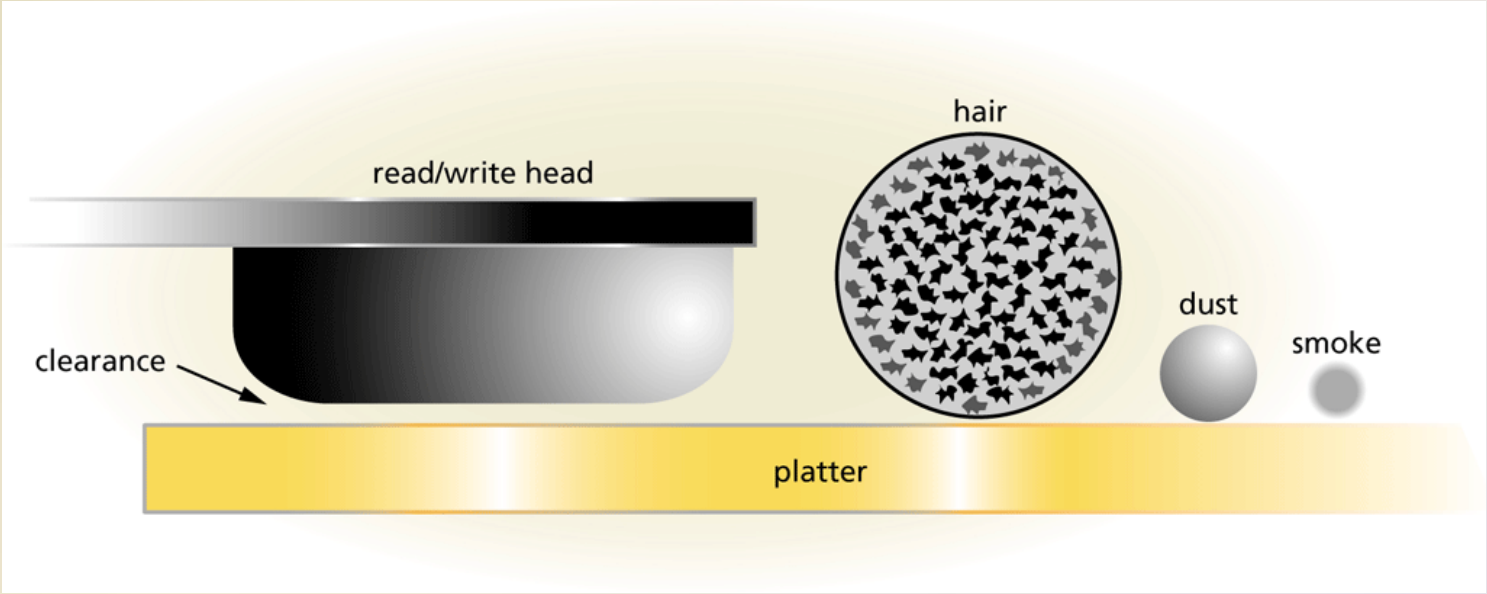

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Figure 8-8

Hard Disks

- Disk cache, sometimes called a buffer, consists of a memory chip(s) on a hard disk that stores frequently accessed data, instructions, and information
- The larger the disk cache, the faster the hard disk

Hard Disks

- **RAID** (redundant array of independent disks) is a group of two or more integrated hard disks

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Figure 8-9

Hard Disks

- An **external hard disk** is a separate freestanding storage device that connects with a cable to a USB port or other port on a computer or mobile device

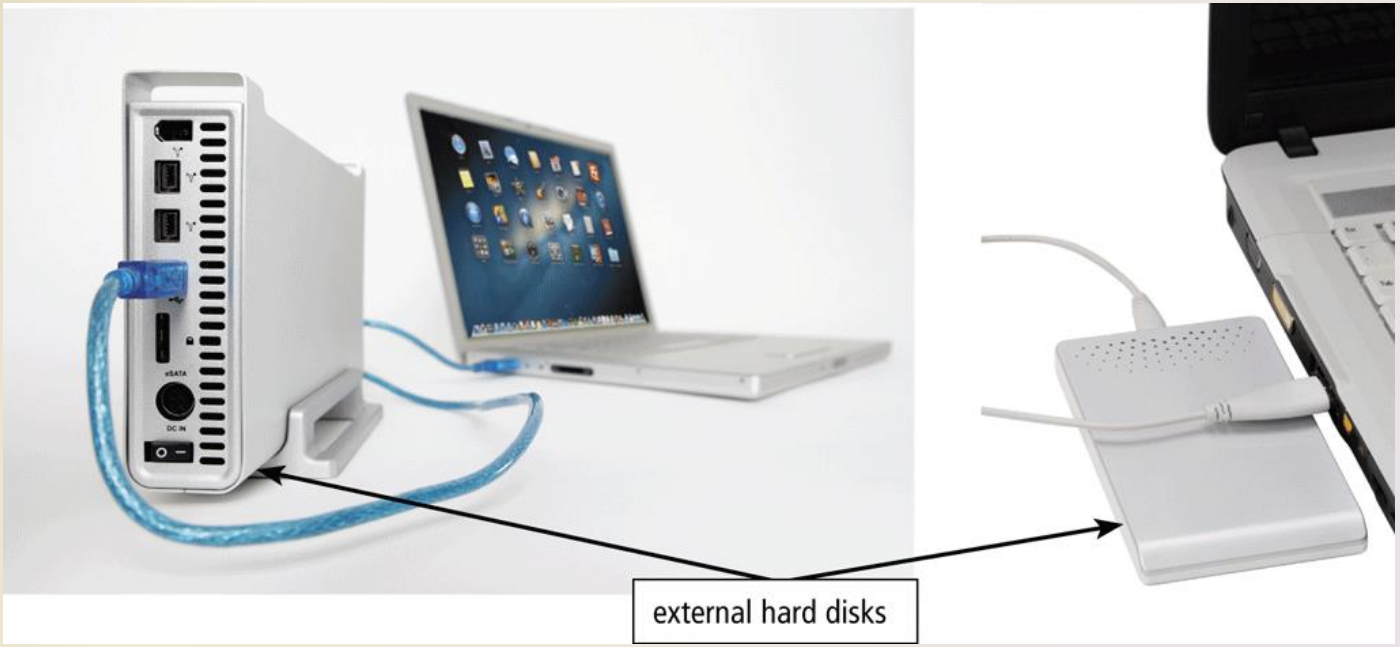

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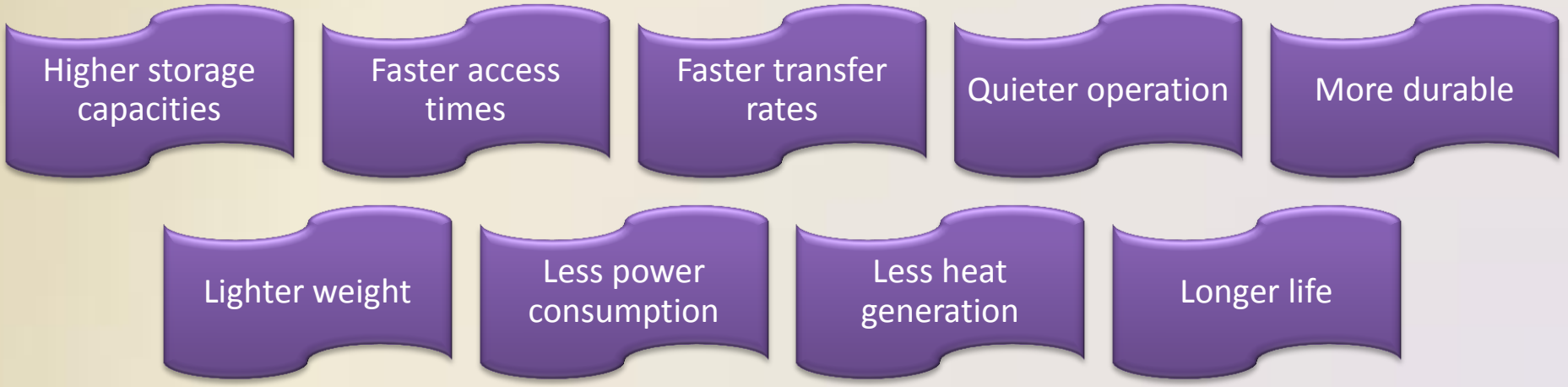
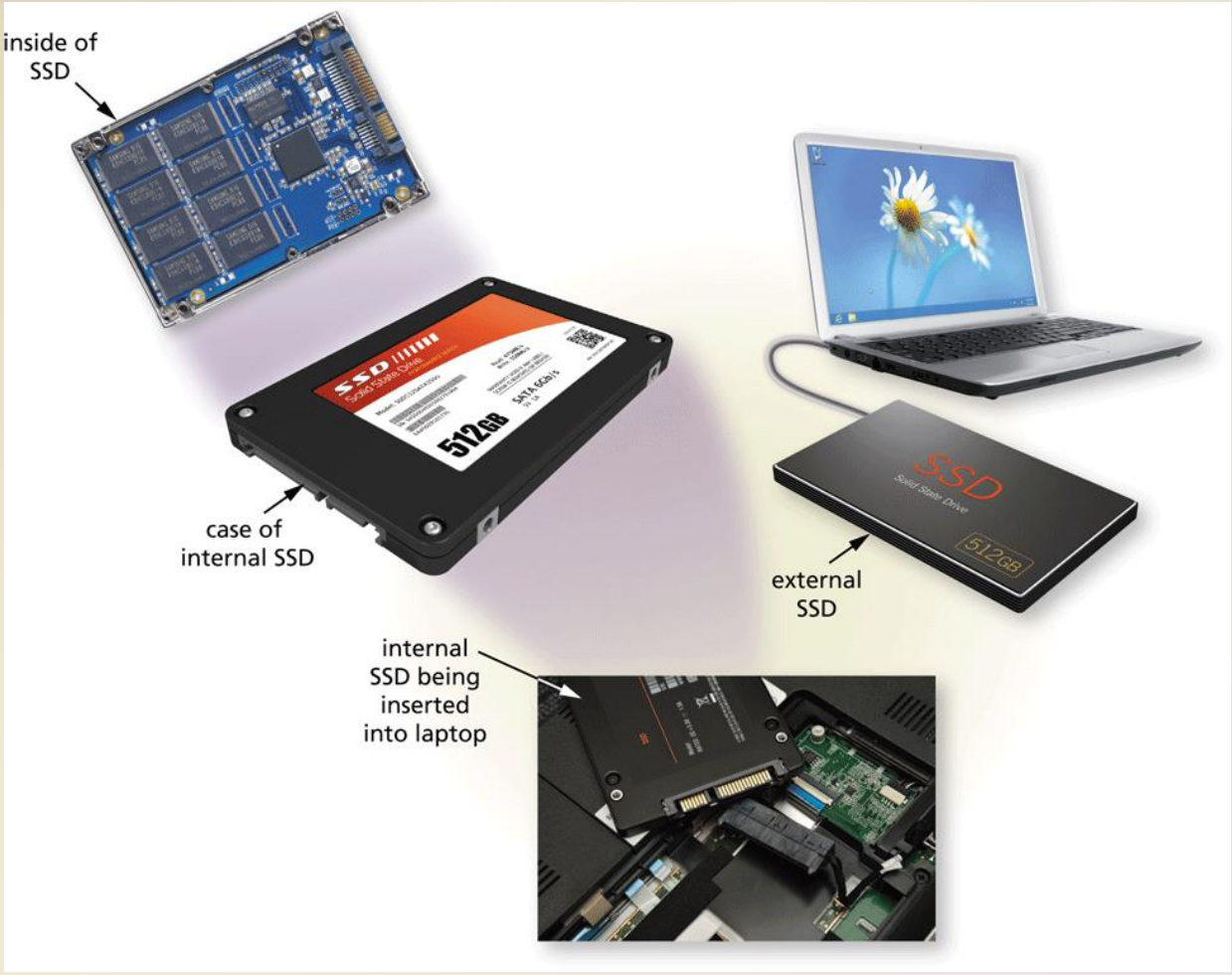
Figure 8-10

Flash Memory Storage

- Flash memory chips are a type of solid state media and contain no moving parts
- An **SSD** (**solid state drive**) has several advantages over magnetic hard disks:



Flash Memory Storage



Flash Memory Storage

- A **memory card** is a removable flash memory device that you insert and remove from a slot in a computer, mobile device, or card reader/writer

CF	**SDHC**	**SDXC**	**miniSD**	**microSD**
microSDHC	**microSDXC**	**xD Picture Card**	**Memory Stick PRO Duo**	**M2**

Flash Memory Storage

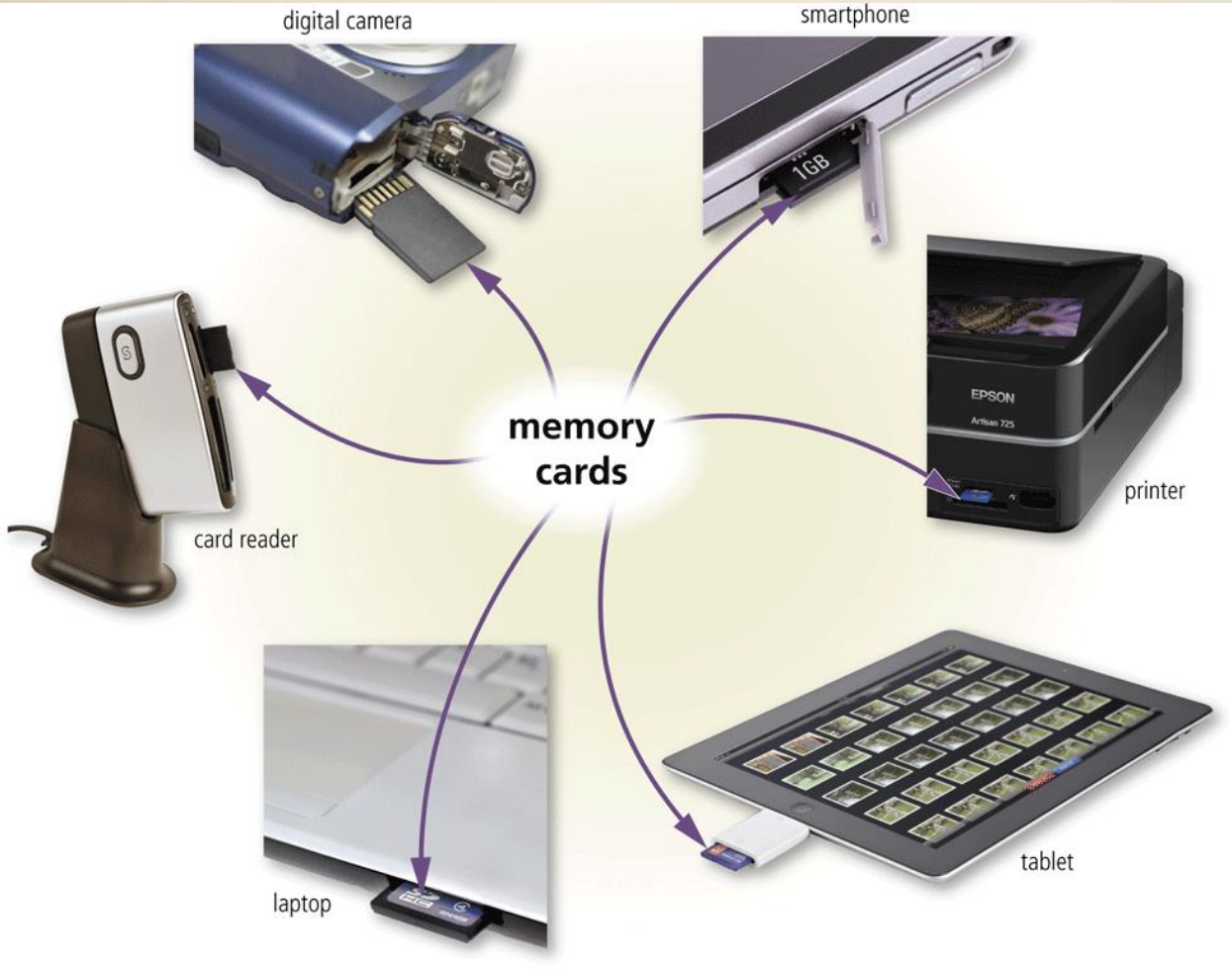


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Figure 8-12

Flash Memory Storage

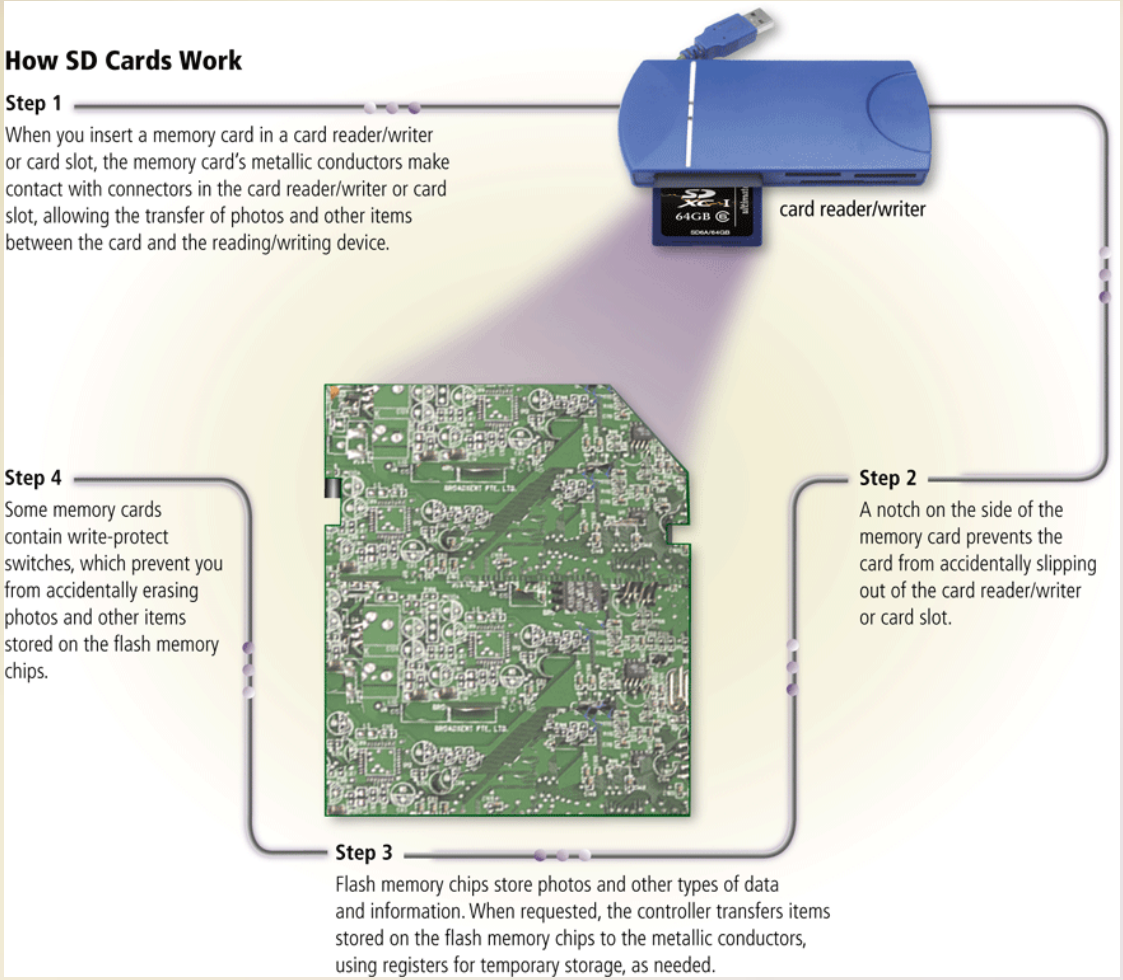

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Figure 8-13

Flash Memory Storage

- **USB flash drives** plug into a USB port on a computer or mobile device

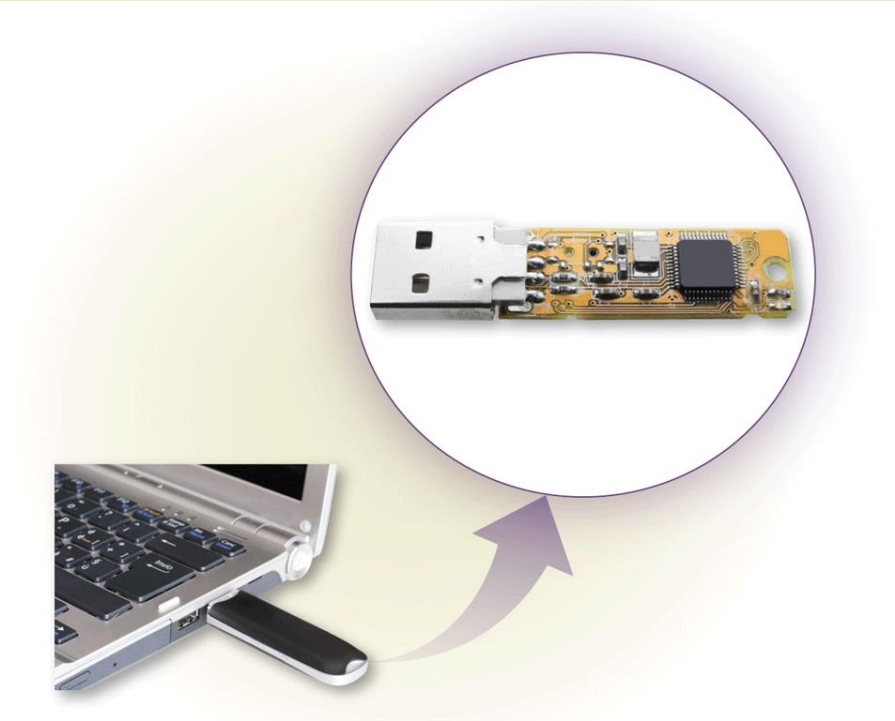

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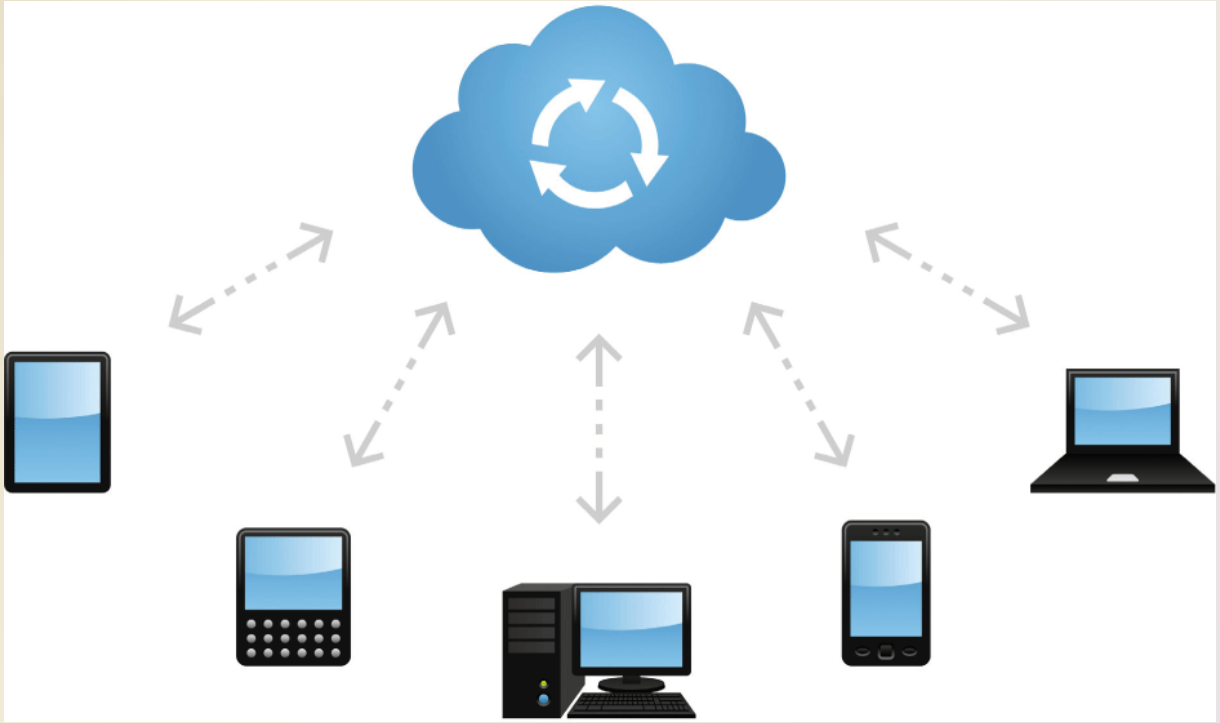
Figure 8-14

Cloud Storage

- **Cloud storage** is an Internet service that provides storage to computer or mobile device users



Optical Discs

- An **optical disc** consists of a flat, round, portable disc made of metal, plastic, and lacquer that is written and read by a laser

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Figure 8-15

Optical Discs

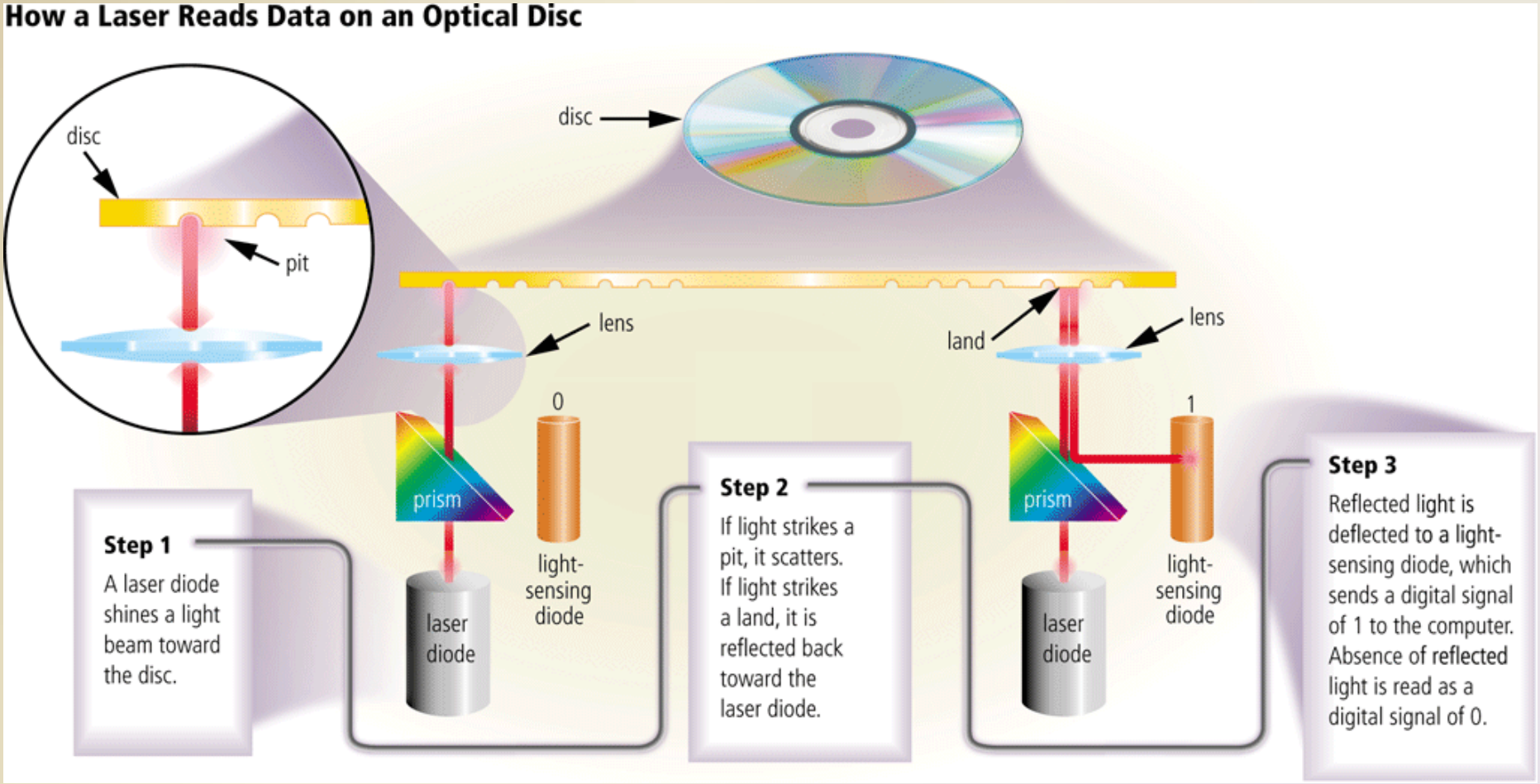

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Figure 8-16

Optical Discs

- Optical discs commonly store items in a single track that spirals from the center of the disc to the edge of the disc
- Track is divided into evenly sized sectors

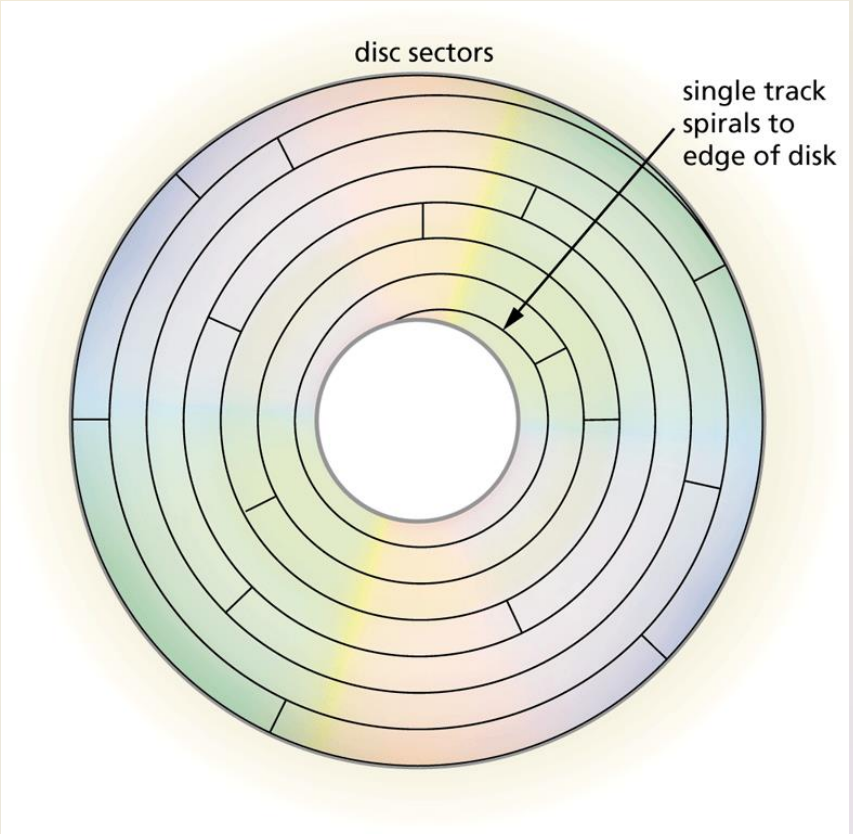

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Figure 8-17

Optical Discs

A **CD-ROM** can be read from but not written to

- Single-session disc

A **CD-R** is an optical disc on which users can write once, but not erase

A **CD-RW** is an erasable multisession disc

Optical Discs

A **DVD-ROM** is a high-capacity optical disc on which users can read but not write on or erase

A **DVD-R** or **DVD+R** are competing DVD-recordable WORM formats, on which users can write once but not erase

DVD-RW, **DVD+RW**, and **DVD+RAM** are high-capacity rewritable DVD formats

Enterprise Storage

- Enterprise hardware allows large organizations to manage and store data and information using devices intended for heavy use, maximum efficiency, and maximum availability
  - RAID duplicates data, instructions, and information to improve data reliability

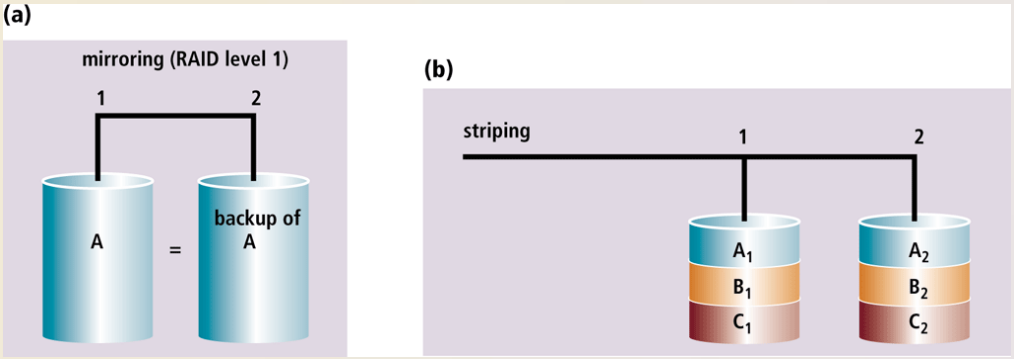

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Figure 8-19

Enterprise Storage

- **Network attached storage** (**NAS**) is a server that is placed on a network with the sole purpose of providing storage to users, computers, and devices attached to the network

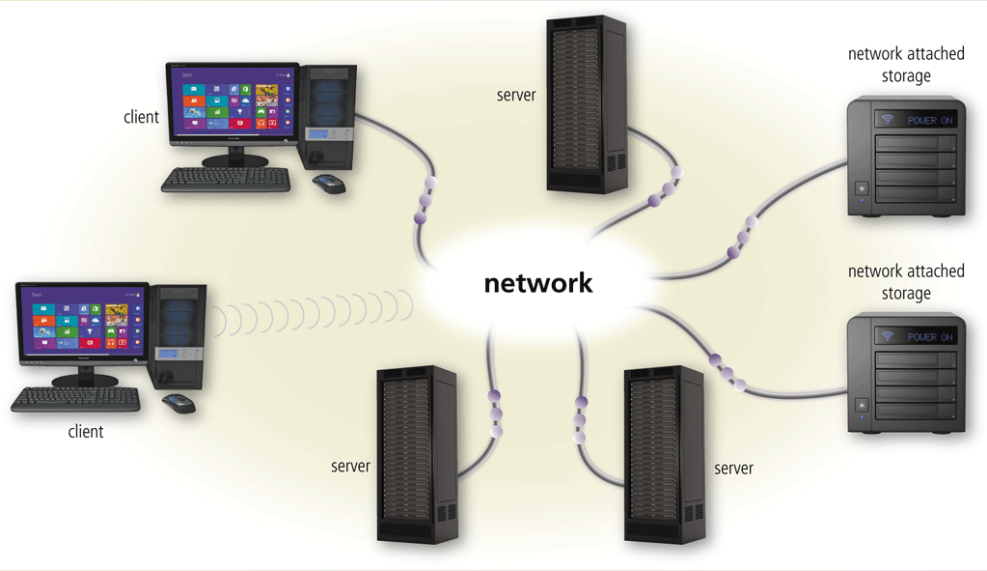

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Figure 8-20

Enterprise Storage

- A **storage area network** (**SAN**) is a high-speed network with the sole purpose of providing storage to other attached servers

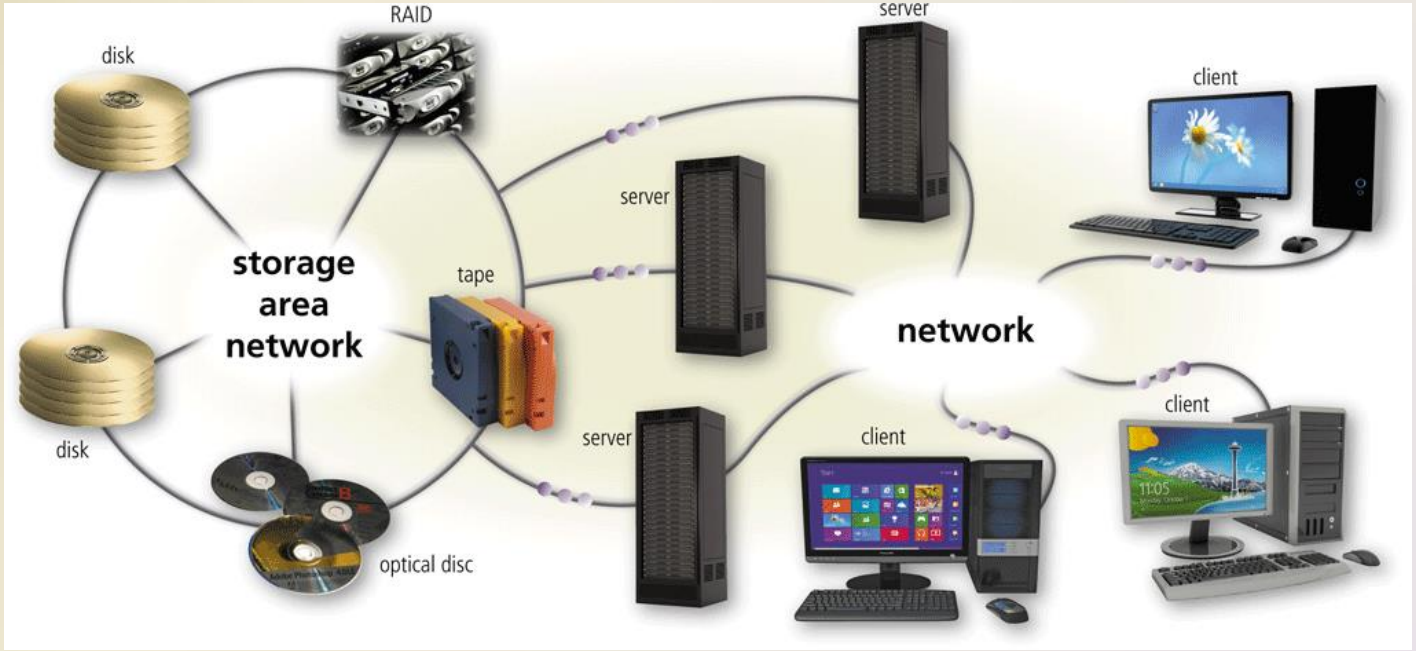

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Figure 8-21

Enterprise Storage

- **Tape** is a magnetically coated ribbon of plastic capable of storing large amounts of data and information
- A tape drive reads and writes data and information on a tape

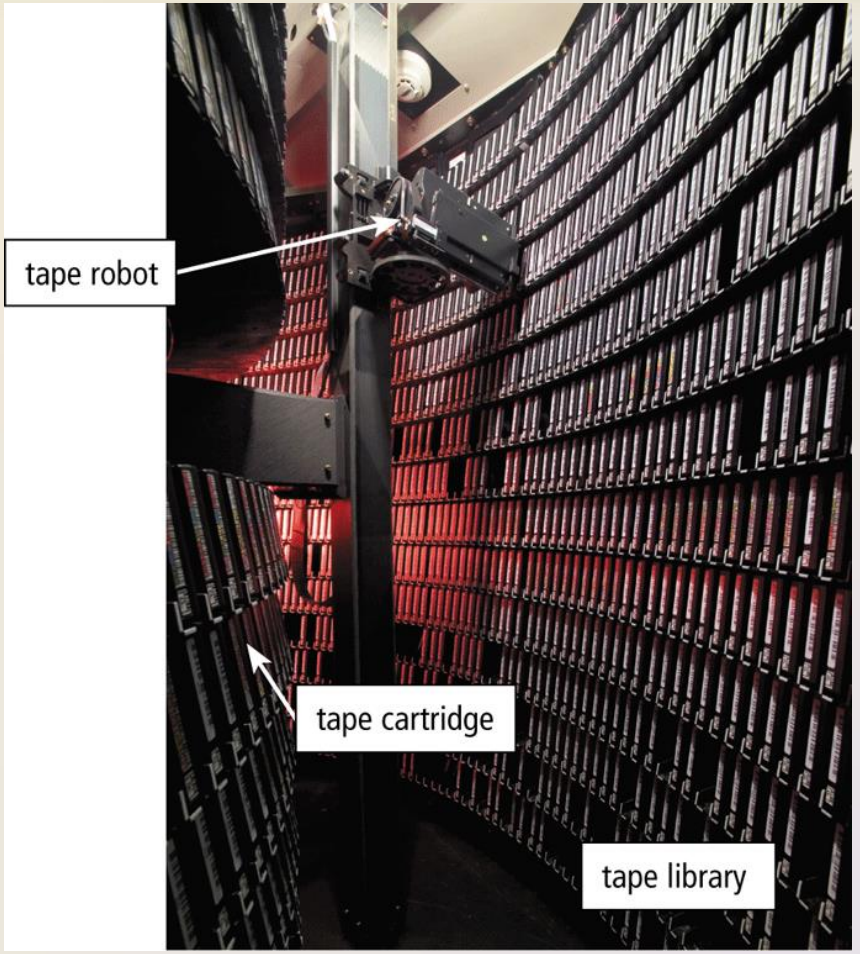

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Figure 8-22

Other Types of Storage

- A **magnetic stripe card** contains a magnetic stripe that stores information
- A **smart card** stores data on an integrated circuit embedded in the card

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Figure 8-24

Other Types of Storage

- The **RFID tag** consists of an antenna and a memory chip that contains the information to be transmitted via radio waves
- An RFID reader reads the radio signal and transfers the information to a computer or computing device

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Figure 8-25

Other Types of Storage

- **Microfilm** and **microfiche** store microscopic images of documents on a roll or sheet film

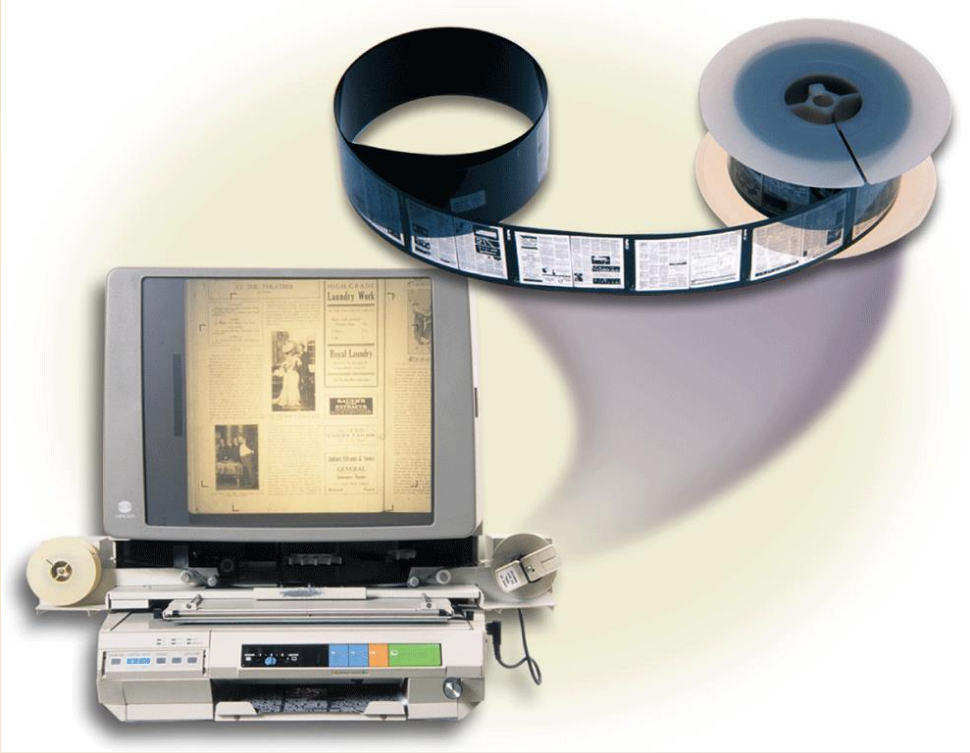

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Figure 8-26

Summary

- Variety of storage options
- Storage capacity and storage access times
- Characteristics of hard disks, RAID, and external hard drives
- Various types of flash memory storage
- Advantages and various uses of cloud storage
- Characteristics of optical discs
- Enterprise storage options

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Chapter 8

Digital Storage

Chapter 8 Complete