# Secondary Storage

Chapter 8

# Competencies (Page 1 of 2)

- Distinguish between primary and secondary storage.
- Discuss the important characteristics of secondary storage, including media, capacity, storage devices, and access speed.
- Describe hard disk platters, tracks, sectors, and head crashes.
- Compare internal and external hard drives.
- Discuss performance enhancements including disk caching, RAID, file compression, and file decompression.

# Competencies (Page 2 of 2)

- Define optical storage including compact, digital versatile, and high-definition discs.

- Define solid-state storage, including solid-state drives, flash memory, and USB drives.

- Define cloud storage and cloud storage services.

- Discuss mass storage devices, enterprise storage systems, and storage area networks.

# Introduction

- Data storage has expanded from text and numeric files to include digital music files, photographic files, video files, and much more.

- These new types of files require secondary storage devices with much greater capacity.

- In this chapter, you learn about the many types of secondary storage devices including their capabilities and limitations.

# Storage

- **Primary storage**
  - Volatile storage
  - Temporary storage
  - Random Access Memory (RAM)

- **Secondary storage**
  - Nonvolatile storage
  - Permanent storage
- **Secondary storage characteristics**
  - Media
  - Capacity
  - Storage devices
  - Access speed

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# Secondary Storage Devices

- Provides permanent or nonvolatile storage

- Data and programs can be retained after the computer has been shut off

- Most desktop microcomputer systems have both hard and optical disk drives

# Hard Disks

- Use rigid, metallic platters that are stacked one on top of one another

- Store and organize files using tracks, sectors, and cylinders

- Large capacity (terabytes)

- Susceptible to head crash

- Two types of hard disks:
  - Internal Hard Disk
  - External Hard Disks

- Performance enhancements
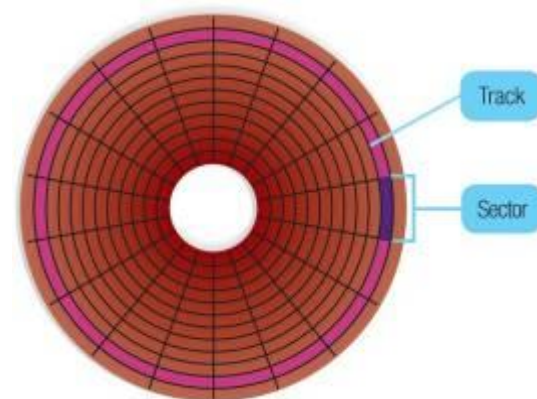
# Optical Disks

- Hold over 100 gigabytes (GB) of data

- Attributes

  - Lands

  - Pits

- Three types

  - Compact Disc (CD)

  - Digital Versatile Disc (DVD)

  - Blu-Ray (Hi-Def) Disc

# Solid-State Storage

- ## Solid–state drives (SSDs)
  - No moving parts
  - Faster and more durable than hard disks



- ## Flash memory cards
  - Widely used in computers, cameras, and portable devices such as mobile phones and GPS navigation systems

- ## USB Drives (or Flash Drives)
  - Connect to USB port
  - Capacity of 1 GB to 256 GB

# Cloud Computing

- Cloud computing is where the Internet acts as a "cloud" of servers
  - Applications provided as a service rather than a product
  - Supplied by servers
- Google Apps
- Mint.com

# Cloud Storage Services



| Focus | Company | Location |
|-------|---------|----------|
| Individual | Dropbox | www.dropbox.com |
| Individual | iBackup | www.ibackup.com |
| Individual | Microsoft | www.skydrive.com |
| Business | Amerivault | www.amerivault.com |
| Business | Box.net | www.box.net |
| Business | Mozy | www.mozy.com |

# Making IT Work for You
# Cloud Storage

- Using a cloud storage service makes it easy to upload and share files with anyone.
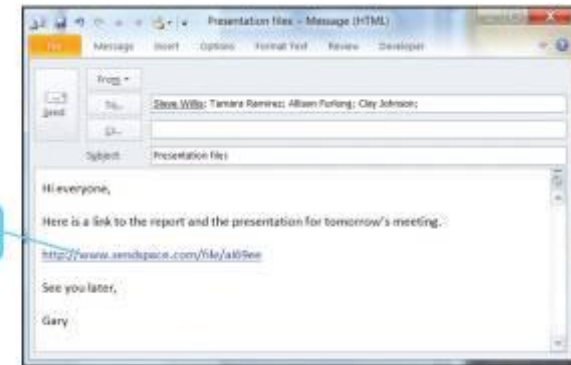
# Mass Storage Devices

- Large amounts of secondary storage called mass storage

- An enterprise storage system strategy ensures efficient and safe use of data across an organizational network  Devices include:

  - File servers
  - Networked attached storage (NAS)
  - RAID systems
  - Tape libraries
  - Organizational cloud storage

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# Enterprise Storage Systems



File server

RAID system

Tape library

Organizational network

Organizational cloud storage

Network attached storage
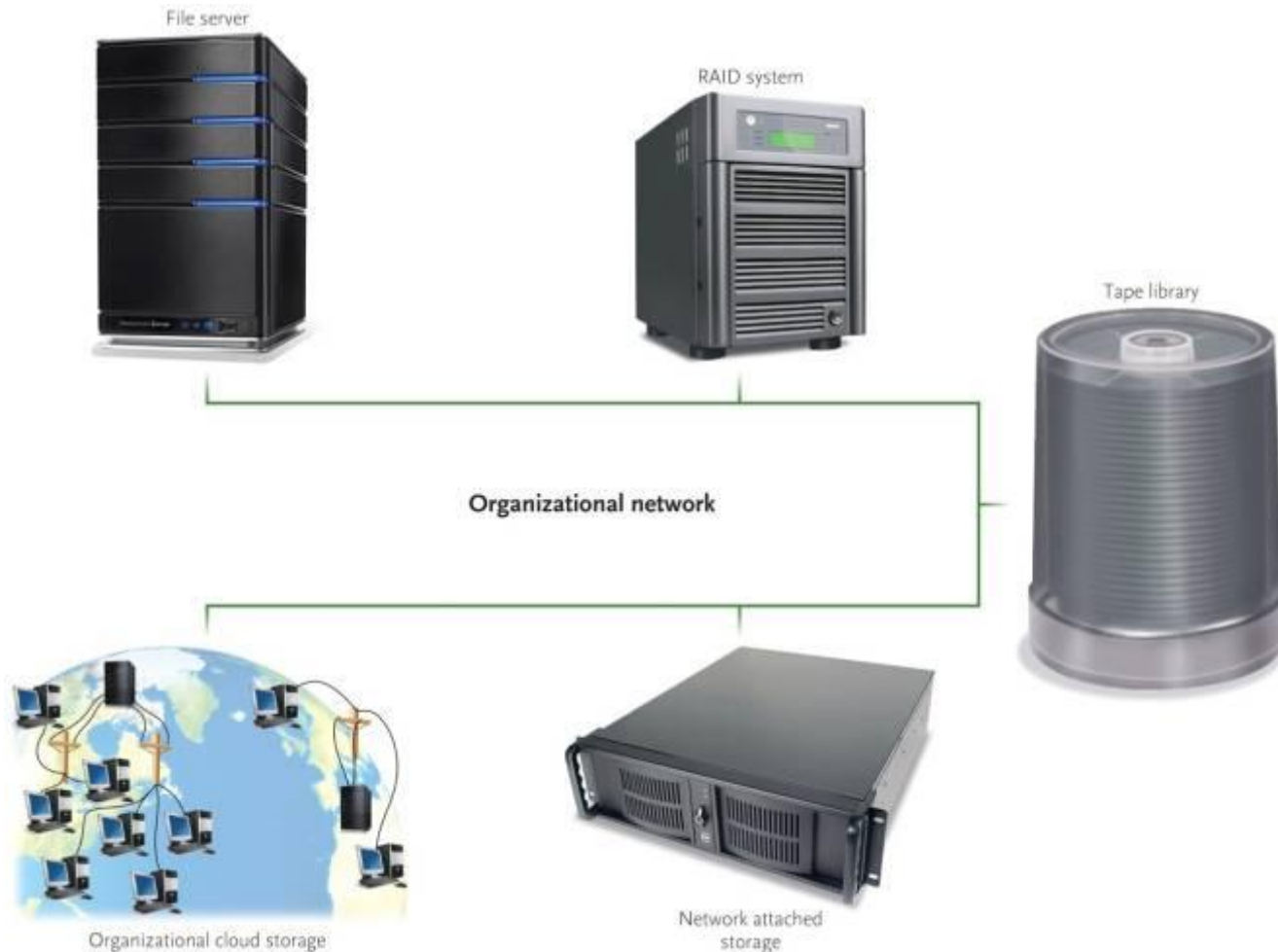
# Storage Area Network (SAN)

- Architecture to link remote computer storage devices, such as enterprise storage systems, to computers such that the devices are available as locally attached drives

- User's computer provides file system, but SAN provides disk space

- House data in remote locations and still allow efficient and secure access

# Careers In IT

- Software engineers analyze users' needs and create application software

- General employer requirements

  - Bachelors degree in computer science

  - Extensive knowledge of computers and technology

  - Communication and analytical skills

- Annual salary of $63,000 to $98,500

# A Look to the Future
# Your Entire Life Recorded on a Single Disk

- Future secondary storage disks will eventually store terabytes (TB) or petabytes (PB)

  - Your entire life captured in digital video on a single disc

  - Currently developing programs that can scan photos and videos for a particular person's face

# Open-Ended Questions (Page 1 of 2)

- Compare primary storage and secondary storage and discuss the most important characteristics of secondary storage.

- Discus hard disks including density, platters, tracks, sectors, cylinders, head crashes, internal, external, and performance enhancements.

- Discuss optical disks including pits, lands, CDs, DVDs, Blu-ray, and hi def.

# Open-Ended Questions (Page 2 of 2)

- Discuss solid-state storage including solid-state drives, flash memory, and USB drives.

- Discuss cloud computing and cloud storage.

- Describe mass storage devices including enterprise storages systems, file servers, network attached storage, RAID systems, tape libraries, organizational cloud storage, and storage area network systems.