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Secondary Storage

Chapter 7

Computing Essentials 2023
O'Leary

Learning Objectives

1. Distinguish between primary and secondary storage.
2. Identify the important characteristics of secondary storage, including media, capacity, storage devices, and access speed.
3. Describe hard-disk platters, tracks, sectors, cylinders, and head crashes.
4. Compare internal and external hard drives.
5. Compare performance enhancements, including disk caching, RAID, file compression, and file decompression.
6. Define optical storage, including compact discs, digital versatile discs, and Blu-ray discs.
7. Define solid-state storage, including solid-state drives, flash memory cards, and USB drives.
8. Define cloud storage and cloud storage services.
9. Describe mass storage, 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.

John Fedele/Getty Images

Storage

Primary storage is:

- Volatile storage
  - Loses content when the computer loses power
- Temporary storage
  - Random Access Memory (RAM)

Secondary storage is:

- Nonvolatile storage
  - Stores programs and data regardless of power
- Permanent storage
  - Permanently saves information for future use

Secondary Storage Characteristics

Media

- Physical material that holds data and programs

Capacity

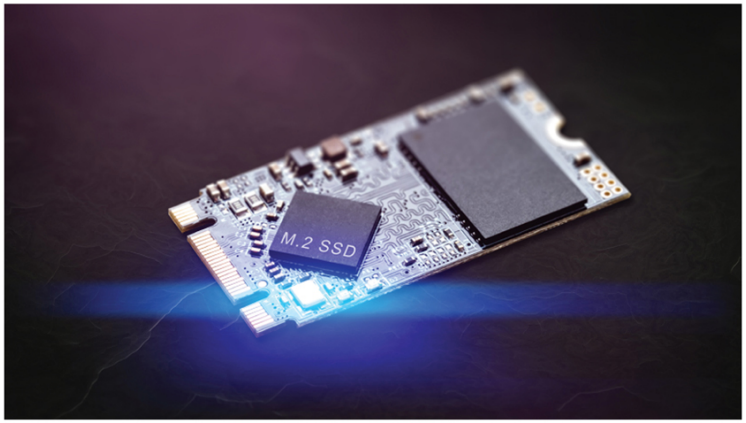
- Measures how much the storage medium can hold

Storage devices

- Hardware that reads data and programs from storage media

Access speed

- Amount of time required to retrieve data from storage



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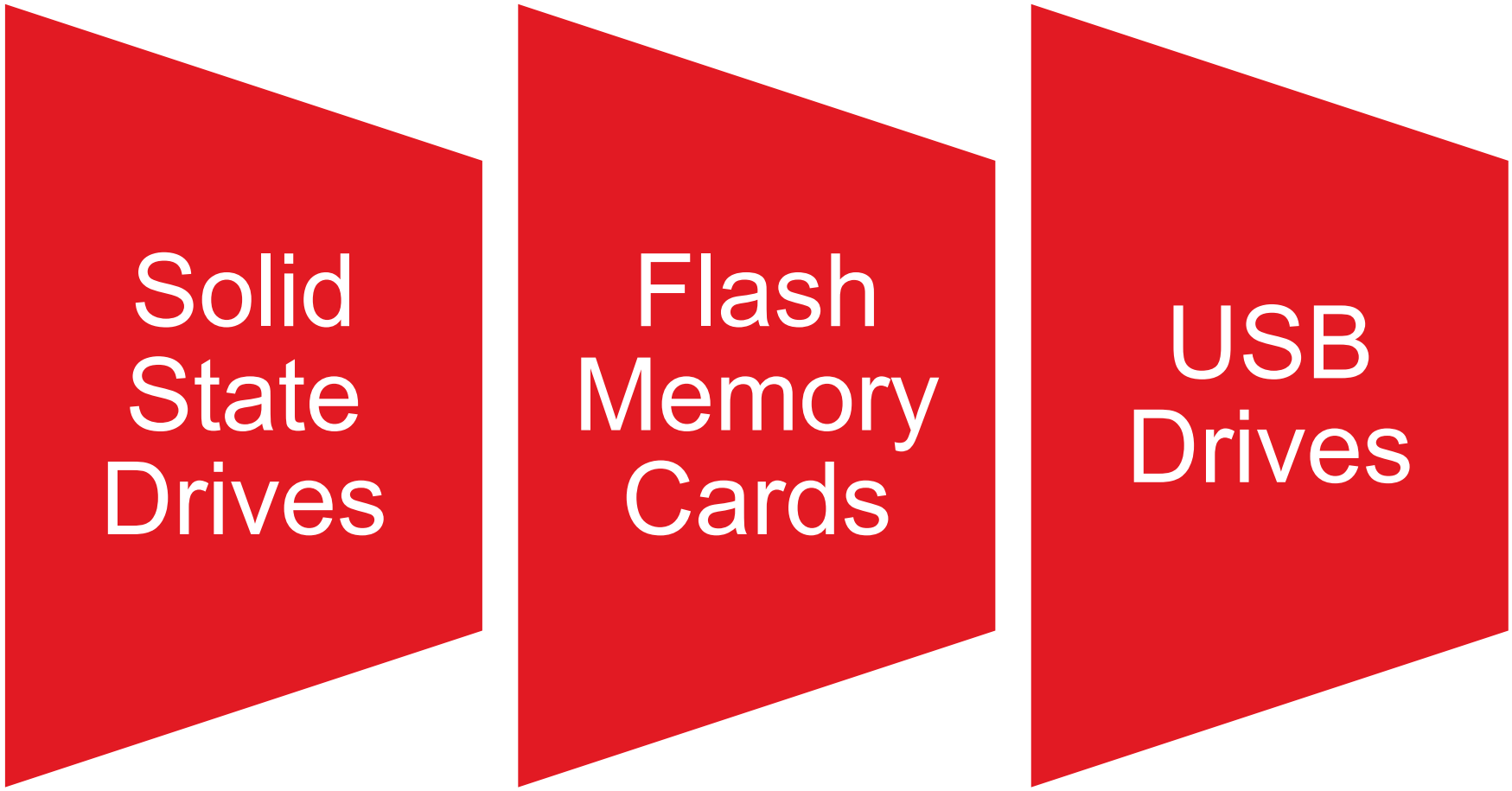
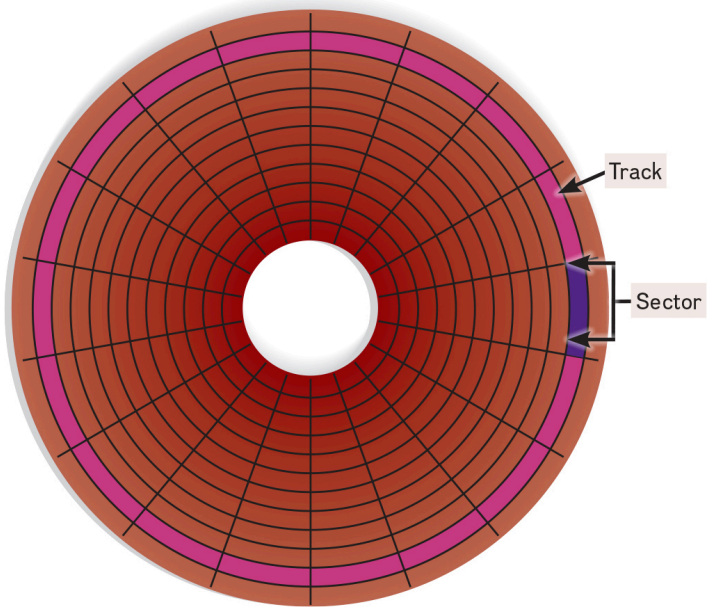
Solid Stage Storage



Hard Disks

Save files by altering the magnetic charges of the disk's surface to represent 1s and 0s

- Use rigid, metallic platters that are stacked one on top of one another
- Store and organize files using tracks, sectors, and cylinders



Types of Hard Disks

- Internal Hard Drive
- External Hard Drive
- Network Drive

Performance Enhancement Techniques

Technique	Description
Disk caching	Users cache and anticipates data needs
RAID	Linked, inexpensive hard-disk drives
File compression	Reduces file size
File decompression	Expands compressed files

Optical Disks

Hold over 128 gigabytes (GB) of data

Use reflected light to represent data

- Lands represent 1s and 0s on the disc
- Pits are bumpy areas on the disc that, when light is reflected, determine the 1s and 0s
- Use tracks and sectors to organize and store files but only use a single track unlike the hard drive

Format	Total Capacity	Description
CD	700 MB	Once the standard optical disc
DVD	4.7 GB	Current standard
BD	50 GB	Hi-def format, large capacity
UHD BD	100 GB	4K Video

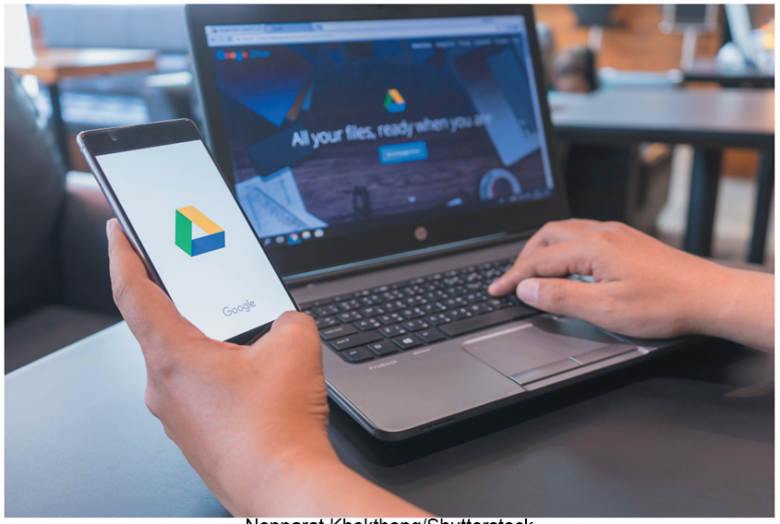
Optical Disk Types

Type	Access	Description
ROM	Read only-memory	Cannot be written to or erased
R	Recordable	Can be written to
RW or RAM	Rewritable or random-access memory	Can be written to and erasable

Cloud Storage

The Internet acts as a “cloud” of servers

- Applications provided as a service rather than a product
- Supplied by servers that provide cloud storage or online storage



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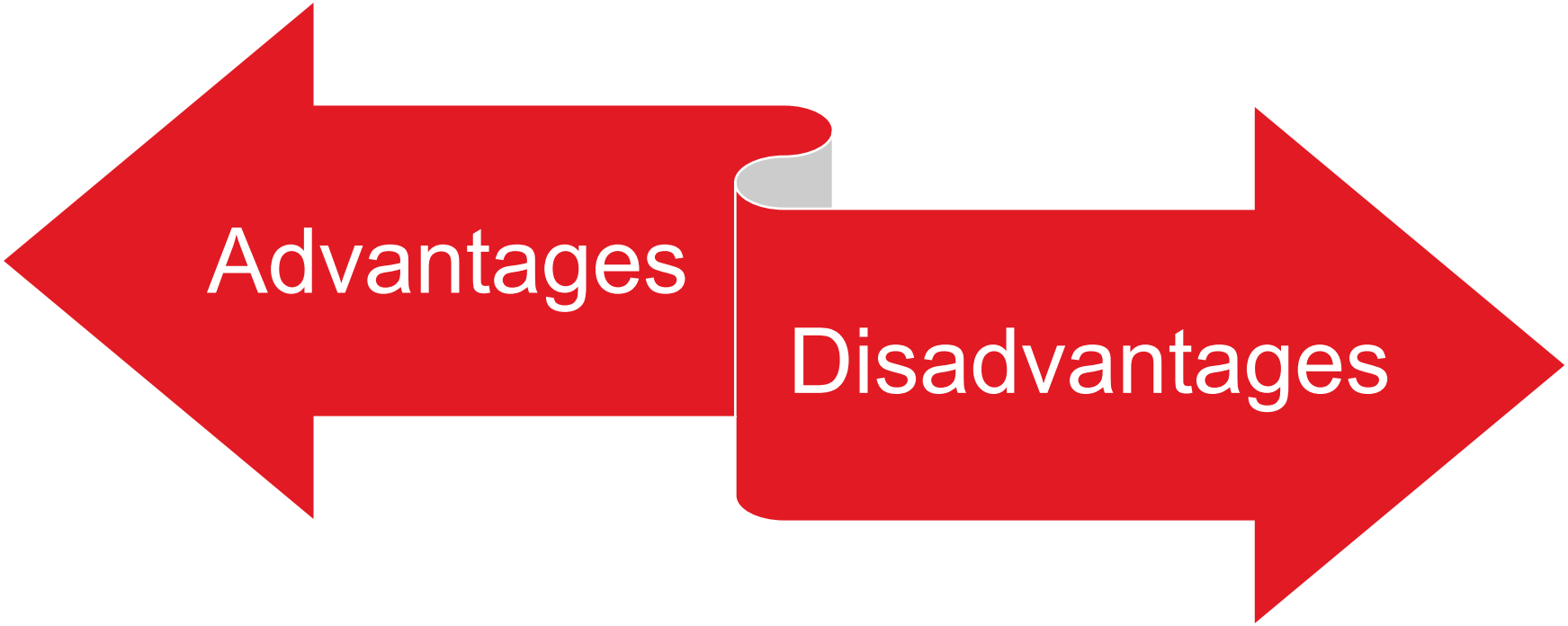
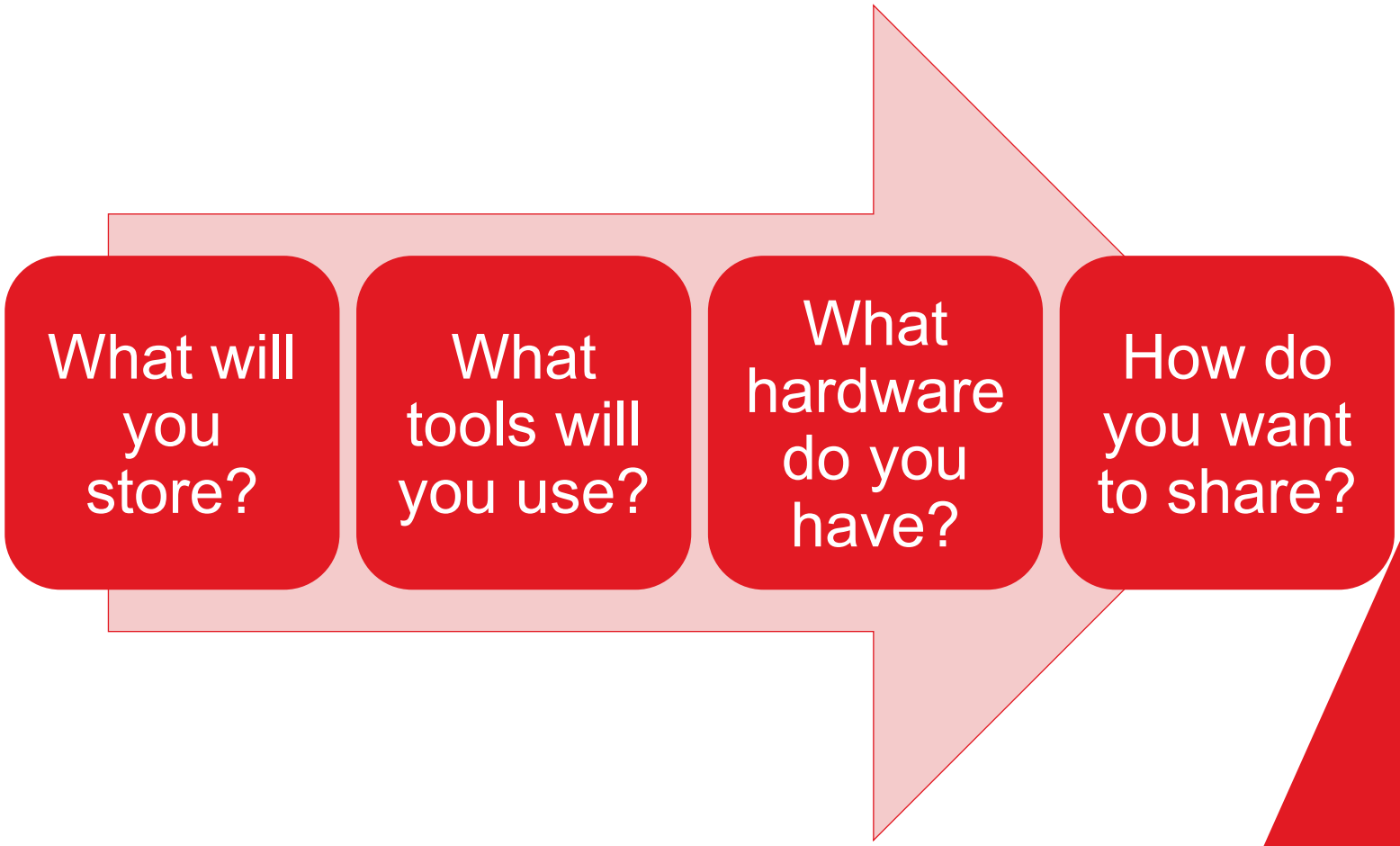
Company	Location
Dropbox	dropbox.com
Google	drive.google.com
Microsoft	onedrive.live.com
Amazon	amazon.com/gp/drive
Apple	icloud.com

Cloud Storage Comparison



Making IT Work for You ~ Cloud Storage

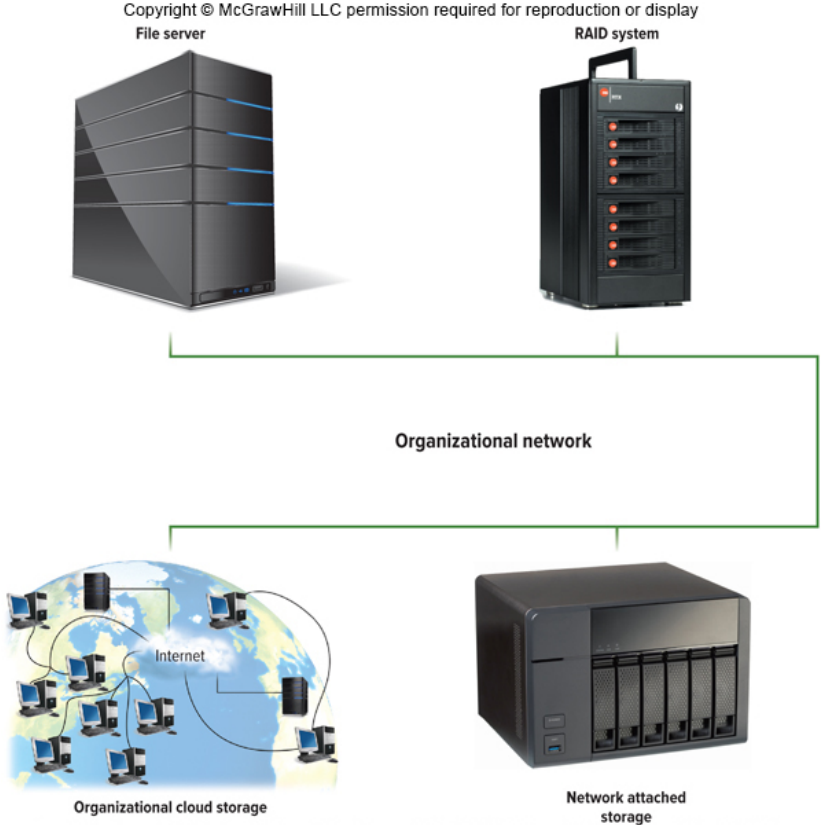
Using a cloud storage service makes it easy to upload and share files with anyone.



Mass Storage Devices

To meet the needs of organizations requiring large amounts of secondary storage requirements

- Enterprise storage system
  - Safe use of data across an organizational network
- Devices include:
  - File servers
  - RAID systems
  - Organizational cloud storage
  - Networked attached storage (NAS)



Storage Area Network (SAN)

Architecture to link remote computer storage devices

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

Disaster recovery specialists are responsible for recovering systems and data after a disaster strikes

General employer requirements

- Bachelor's or associate's degree in computer science or information systems
- Experience in the field and skills in networking, security and database administration
- Communication skills and be able to handle high-stress situations

Annual salary of $70,500 to $87,000

A Look to the Future

Next Generation Storage

- In the future, your photos and videos may be stored using heat, lasers, or even DNA.
- Both magnetic disk manufacturers and flash memory researchers are working on increasing storage without increasing physical size.

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Open Ended Questions

1. Compare primary storage and secondary storage, and discuss the most important characteristics of secondary storage.
2. Discuss hard disks, including density, platters, tracks, sectors, cylinders, head crashes, internal, external, and performance enhancements.
3. Discuss solid-state storage including solid-state drives, flash memory, and USB drives.
4. Discuss optical disks including pits, lands, CDs, DVDs, Blu-ray, and hi def.
5. Discuss cloud computing and cloud storage.
6. Describe mass storage devices, including enterprise storage systems, file servers, network attached storage, RAID systems, organizational cloud storage, and storage area network systems.

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