Secondary Storage

Secondary Storage allows for semi-permanent storage of information.

Benefits of Secondary Storage

By separating storage from the computer, a number of benefits can be derived:

- Space
- Reliability
- Convenience
- Economy

Space

- A diskette can hold the equivalent of 500 printed pages.
- An optical disk can hold the equivalent of 500 books.

Reliability

Data in secondary storage is basically safe.

Sometimes, however, disks do fail.

Convenience

Locating and accessing electronic data is much easier and faster than non-electronic means of storing information.
Together, space-saving, reliability, and convenience lead to cost savings for businesses. These savings are then passed on to customers.

Data is represented as magnetized spots on a disk. A magnetized spot represents a 1 (bit). The absence of a magnetized spot represents a 0 (bit).

Reading data on a magnetic disk means converting the magnetized data into electrical impulses and sending them to the processor. Writing data onto a magnetic disk means to convert electrical impulses from the processor into magnetic spots on the disk.

There are various types of storage media:
- Diskettes
- Hard disks
- Optical disks

Types of Storage Media
Diskettes

Diskettes are made of a flexible mylar disk enclosed in a hard casing.

Advantages of diskettes:
- portability
- easy backup of files
- new software releases

Anatomy of a Diskette

Zip Drives

Iomega’s Zip Drive holds 100 Megabyte disks, seventy times the capacity of traditional diskettes.

Hard Disks

A hard disk is a metal platter coated with magnetic oxide that can be magnetized to represent data.

Benefits of Hard Disks

- Size—more data can be stored on a hard disk than on a diskette.
- Necessary for graphics—larger storage capacity is required for audio, graphic, and video files.
- Faster access

Hard Disks in Groups

RAID (Redundant Array of Inexpensive Disks) uses several small hard disks that work together to increase speed and improve reliability.
Organizing Data on a Disk

There is more than one way to organize data on a disk:

- Sector method
- Cylinder method

Sector Method

In the sector method, each track on a disk is divided into sectors that hold a specific number of characters.

Cylinder Method

Using the cylinder method to organize data on a hard disk, the data is stored vertically within the disk pack.

Optical Disks

An optical disk consists of a disk with a metallic layer. A laser is used to read/write to an optical disk.

Types of Optical Storage Media

The various types of optical storage media include:

- Read-only
- Write-once/read-many
- Magneto-optical
- CD-ROM
- DVD-ROM

Read-Only

These disks can only be read from, not written to. The information stored on dozens of diskettes can be stored on one optical disk.
### Write-once/Read-many

Often referred to as WORM, after data is written on them, these disks become a read-only medium. WORM disks are ideal for securing original versions of valuable documents and data.

### Magneto-optical

A magneto-optical disk combines the ability to write to disk (magnetic disk feature) with a high volume of storage capacity (optical disk feature).

### CD-ROM

CD-ROM stands for compact disk, read-only memory. A CD-ROM is identical to audio compact disks. Up to 660 MB of storage space is available per disk.

### DVD-ROM

DVD stands for digital video disk. A DVD-ROM can store from 4.7 GB (more than seven times that of a CD-ROM) to 17 GB. Such storage capacity is needed for files containing both text, audio, graphics, and video—in other words, multimedia.

### Multimedia

Multimedia is any combination of:
- text
- illustrations
- photos
- narration
- music
- animation
- video

### Additional Multimedia Requirements

- CD-ROM drive, sound card, and speakers
- MPEG, if video will be used
- increased RAM capacity
- high-grade color monitor
- vast amounts of secondary storage capacity
Popular Multimedia Titles

With which multimedia titles are you already familiar?

Magnetic Tape

Tape density refers to the stored number of characters (or bytes) per inch.
In businesses, magnetic tape is usually reserved for backup purposes.

Organizing Stored Data

A lot of planning goes into determining how user data will be received, organized, stored, and later, processed by the computer.

Data: Getting Organized

To be processed by the computer, data is organized into:
- Characters
- Fields
- Records
- Files
- Databases

File Organization

There are three major methods of storing files in secondary storage:
- Sequential
- Direct
- Indexed

Sequential File Organization

In this method, if a particular record is wanted, all prior records must be read before the desired one is reached.
Tape storage is sequential file storage.
Direct File Organization

In this method of organization, the computer does not have to read all preceding records. Disk storage is an example of direct file organization.

Indexed File Organization

A compromise between sequential and direct file organization is the indexed method. In this example, records are stored in sequential manner; and the file also contains an index—a directory which speeds up access to desired record.

Accessing Stored Data

The time needed to access stored data is determined by:

- Seek time
- Head switching
- Rotational delay

Seek Time

This is the time it takes the access arm to get into position over a particular track.

Head Switching

Head switching is the activation of a particular read/write head over a particular track on a particular surface.

Rotational Delay

This is the delay encountered from the time when the access arms and read/write heads are in position until the desired data on the track moves under it.
There are several techniques for processing stored data:
• Batch
• Transactional

In this technique, transactions are collected into batches and processed at a time when the computer is more accessible.

In this method, transactions are handled immediately—fast enough for the result to come back and be acted upon right away.

In the future, storage capabilities will be even greater. This increased storage will benefit law, medicine, science, education, transportation, businesses, the government, and other groups that rely on massive storage of data and quick retrieval.