Computers: Tools for an Information Age

Chapter 6
Storage and Multimedia: The Facts and More

Objectives

- List the benefits of secondary storage
- Identify and describe storage media that are available for personal computers
- Differentiate among the principal types of secondary storage
- Describe how data is stored on a disk
- Discuss the benefits of multimedia
- Explain how data is organized, accessed, and processed

Secondary Storage

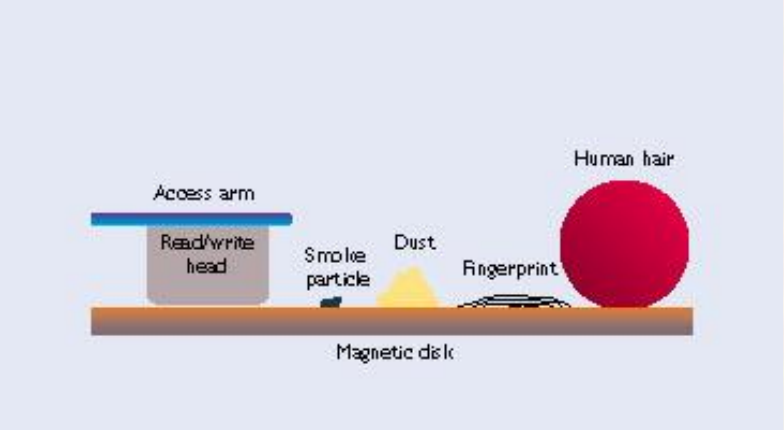
- Separate from the computer itself
- Software and data stored on a semipermanent basis
  - Unlike memory, not lost when power is lost
- Benefits

Magnetic Disk Storage

- Data represented as magnetized spots on surface of spinning disk
  - Spots on disk converted to electrical impulses
- Primary types
  - Diskettes
  - Hard Disks

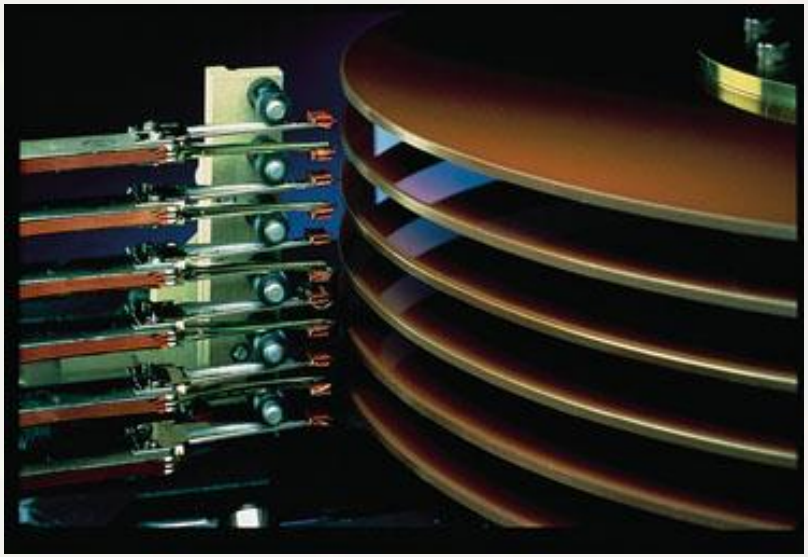
Reading/Writing Data

- Access arm moves read/write head over particular location
- Read/write head hovers a few millionths of an inch above platter
  - If head touches platter, a head crash occurs and data is destroyed
  - Data can be destroyed if head touches miniscule foreign matter on surface of disk



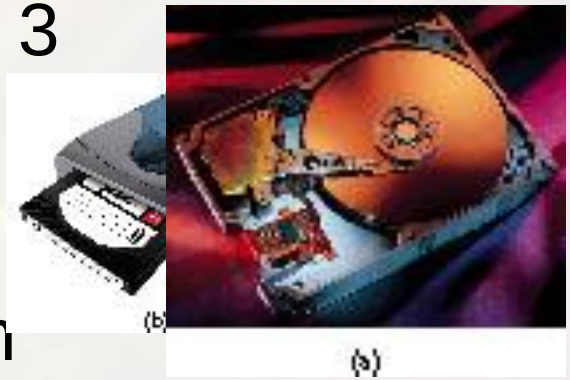
Disk Packs

- Each platter has its own access arm with read/write head
- Most disk packs combine platters, access arms, and read/write head



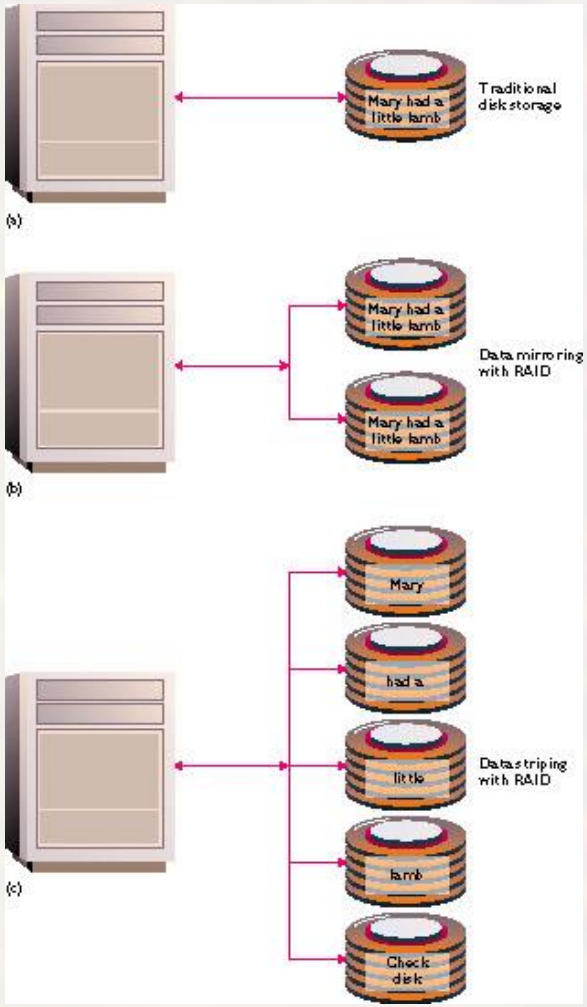
Hard Disks for Personal Computers

- Sealed modules that mount in a 3 ½” bay
- Capacity in gigabytes
- Accessing files much faster than accessing files on diskettes
- Some contain removable cartridges
  - Iomega’s Jaz drive is very popular



Redundant Array of Independent Disks (RAID)

- A group of disks that work together as one
  - Raid level 0 spreads data from a single file over several drives
    - Called data striping
    - Increases performance
  - Raid level 1 duplicates data on several drives
    - Called disk mirroring
    - Increases fault tolerance



How Data Is Organized

- Track
- Sector
- Cluster
- Cylinder

Disk Access Speed

- Access time - the time needed to access data on disk
- Three factors
  - Seek time
  - Head switching
  - Rotational delay
- Once data found, next step is data transfer

Optical Disk Storage

- Provides inexpensive and compact storage with greater capacity
- Laser scans disk and picks up light reflections from disk surface
- Categorized by read/write capability
  - Read-only media - user can read from, but not write to disk
  - Write-once, read-many (WORM) - user can write to disk once
  - Magneto-optical - combines magnetic and optical capabilities

Compact Disks

- CD-ROM - drive can only read data from CDs
  - CD-ROM stores up to 700 MB per disk
  - Primary medium for software distribution
- CD-R - drive can write to disk once
  - Disk can be read by CD-ROM or CD-R drive
- CD-RW - drive can erase and record over data multiple times
  - Some compatibility problems trying to read CD-RW disks on CD-ROM drives

(b)

Digital Versatile Disk (DVD)

- Short wavelength laser can read densely packed spots
  - DVD drive can read CD-ROMs
  - Capacity up to 17GB
  - Allows for full-length movies
  - Sound is better than on audio CDs
- Several versions of writable and rewritable DVDs exist

Multimedia

- Presents information with text, illustrations, photos, narration, music, animation, and film clips
- Not practical until the advent of the optical disk
- Requirements
- Applications

Magnetic Tape Storage

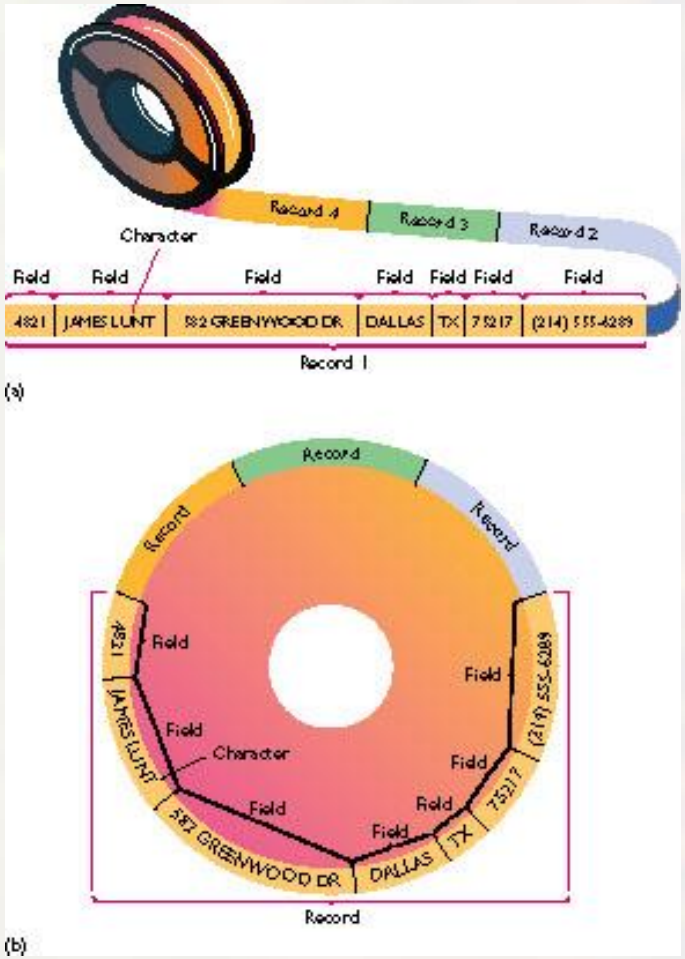
- Tape similar to tape used in music cassettes
- Categorized in terms of density
  - Number of bits per inch stored on tape
- Used primarily for backup of data stored on disk systems

Backup Systems

- Imperative to have copies of important data stored away from the computer
  - Disks occasionally fail
  - Software installation can cause computer to crash
  - Users make mistakes entering data
- Tape is ideal backup medium
  - Can copy entire hard disk to single tape in minutes
  - Backup can be scheduled when you are not going to use the system

Organizing and Accessing Stored Data

- Character
- Field
- Record
- File
- Database



File Plan Overview

- Must devise a plan for placing data on a storage unit
- Key factors
  - Whether users must access data directly (immediately)
  - How data must be organized on disk
  - Type of processing that will take place

File Organization

- Three major methods of organizing data files in secondary storage
  - Sequential
  - Direct
  - Indexed

Hashing Algorithm

- Applies mathematical formula to key to determine disk address of given record
  - Collision occurs when hashing algorithm produces same disk address for two different keys

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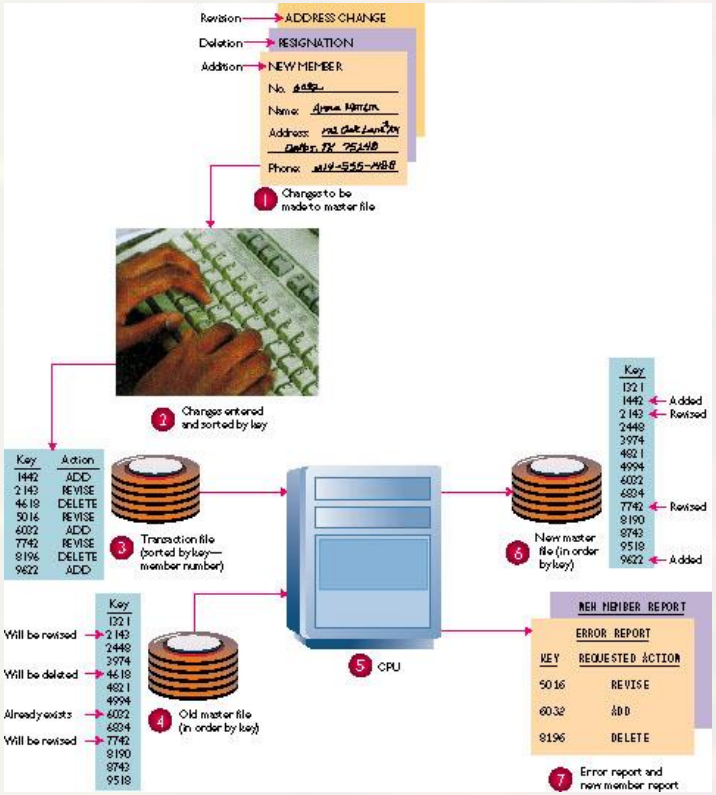
Processing Stored Data

- Transactions processed to update a master file
  - Transactions - a business event such as a sale
  - Master file - data that is updated when a transaction occurs, such as a sales file or inventory file
- Two main methods of processing data
  - Batch processing
  - Transaction processing

Batch Processing

- Transactions collected into groups or batches
  - Batch processed and master file updated when the computer has few users online
- Very efficient use of computer resources
- Master file current only immediately after processing



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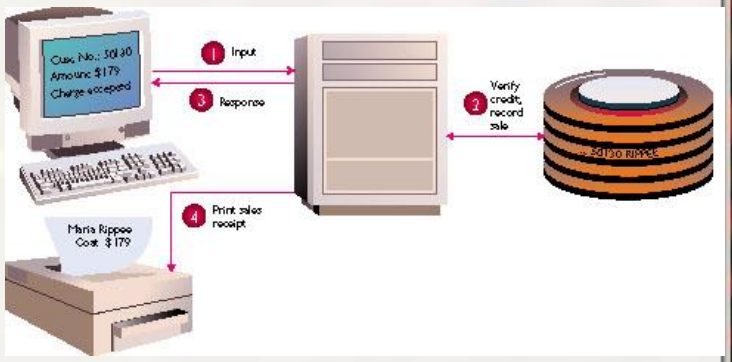
Transaction Processing

- Processing transactions as they occur
  - Also called real-time processing and online processing
  - Terminals must be connected directly to the computer
- Offers immediate updating of master file



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