# File-System

# File Structure

- None - sequence of words, bytes

- Simple record structure
  - Lines
  - Fixed length
  - Variable length

- Complex Structures
  - Formatted document
  - Relocatable load file

- Can simulate last two with first method by inserting appropriate control characters.

- Who decides:
  - Operating system
  - Program

# Access Methods

- Sequential Access
  *read next*
  *write next*
  *reset*
  no *read after last write*
  *(rewrite)*

- Direct Access
  *read n*
  *write n*
  *position to n*
  *read next*
  *write next*
  *rewrite n*

  *n* = relative block number

# File Access

- Sequential access
  - read all bytes/records from the beginning
  - cannot jump around, could rewind or forward
  - convenient when medium was magnetic tape
- Random access
  - bytes/records read in any order
  - essential for database systems

# Methods for Accessing Files

- *Sequential* access

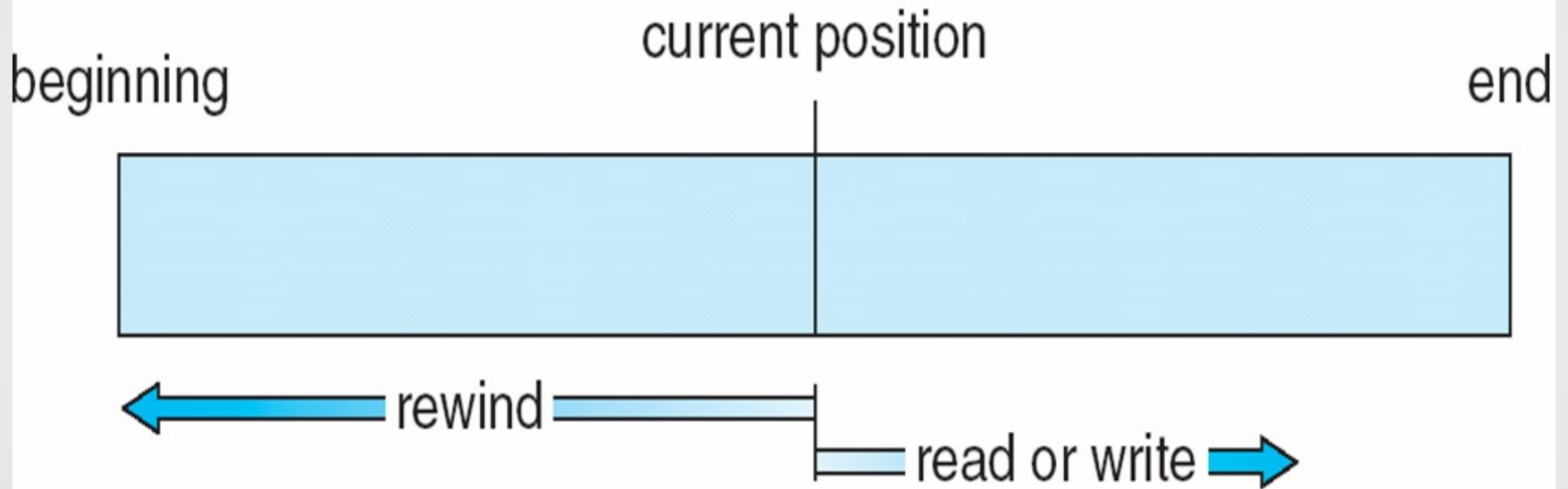- *Random* access

- *Keyed* (or indexed) access

# Sequential Access Method

- The simplest access method.

- Information in the file is processed in order, one record after the other.

- Reads and writes make up the bulk of the operations on a file.

- A read operation-**read next**-reads the next portion of the file and automatically advances a file pointer, which tracks the I/O location.

- The write operation-**write next**-appends to the end of the file and advances to the end of the newly written material (the new end of file).

# Sequential Access Method

- Read all bytes or records in order from the beginning

- Writing implicitly truncates

- Cannot jump around

    - Could possibly rewind or back up

- Appropriate for certain media or systems

    - Magnetic tape or punched cards

    - Video tape (VHS, etc.)

    - Unix-Linux-Windows pipes

    - Network streams

# Sequential-access File

# Random Access Method

Bytes/records can be read in any order

Writing can

- Replace existing bytes or records
- Append to end of file
- Cannot insert data between existing bytes!

*Seek* operation moves current file *pointer*

- Maintained as part of "open" file information
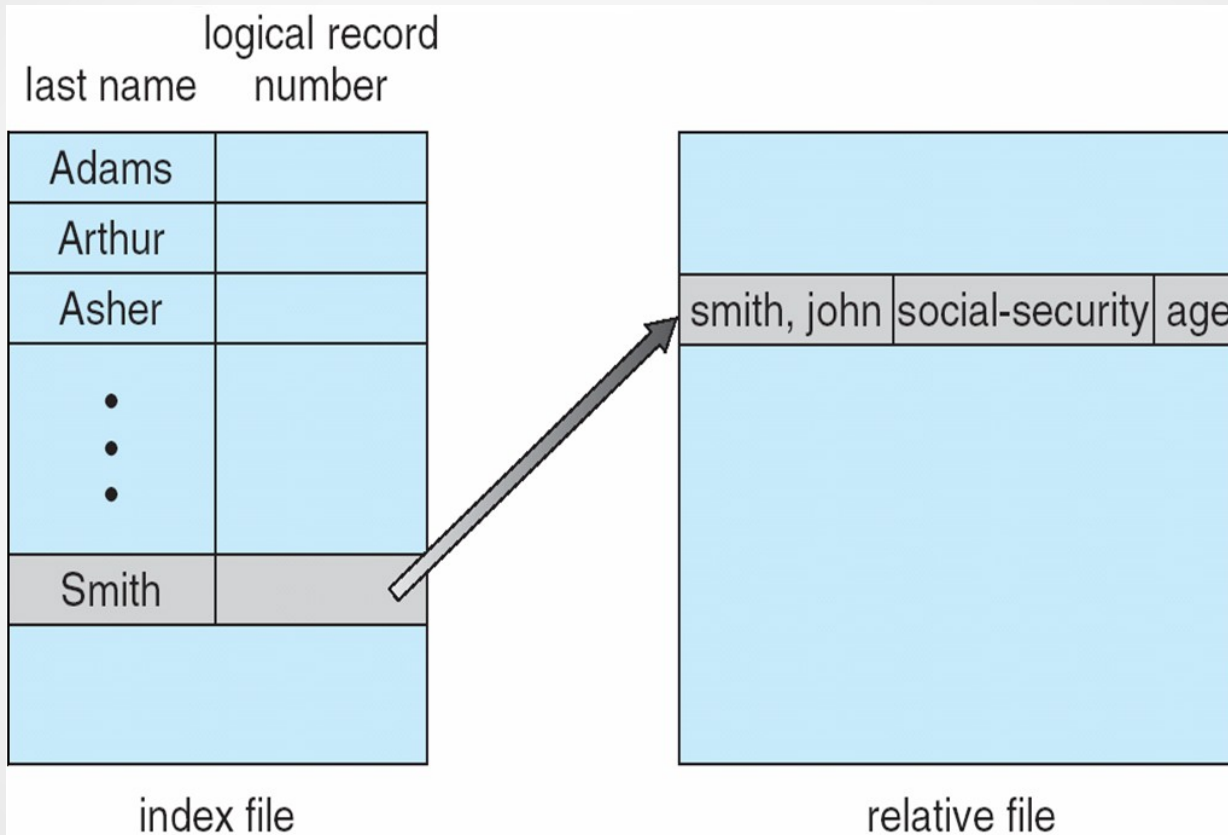- Discarded on close

Typical of most modern information storage

- Data base systems
- Randomly accessible multi-media (CD, DVD, etc)

# Keyed (or indexed) Access Methods

- Access items in file based on the contents of (part of) an item in the file

- Provided in older commercial operating systems (IBM ISAM)

- (Usually) handled separately by modern database systems

# Example of Index and Relative Files

# Typical File-system Organization/Structure