CSC369 Week 8 Notes

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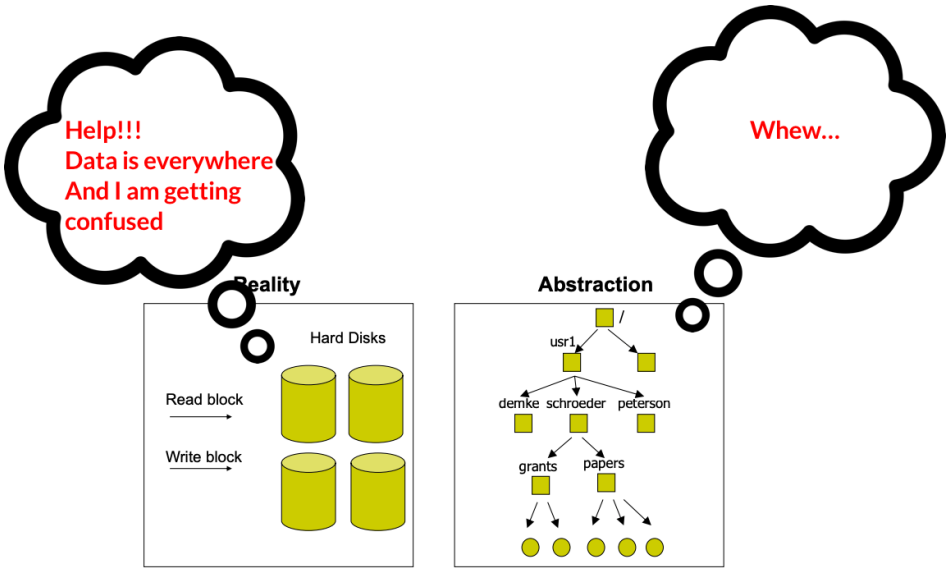
- File Systems
  - Is the part of operating system dealing with files [2]
  - Controls how data is stored and retrieved. [1]
    - Without a file system, data placed in a storage medium is one large body of data with no way to tell where it stops and the next begins



Refernces:

1) Wikipedia: File Systems, link
2) Tanebaum AS, Boss H. 2015. Modern Operating Systems. 4th Edition. New Jersy: Pearson Education, Inc.

- File Concept
  - Files

    * Are logical units of information created by processes [1]
    * Is named collection of data with some attributes
        1. Name
        2. Owner
        3. Location
        4. Size
        5. Protection
        6. Creation Time
        7. Time of Last Access

Refernces:

1) Tanebaum AS, Boss H. 2015. Modern Operating Systems. 4th Edition. New Jersy: Pearson Education, Inc.

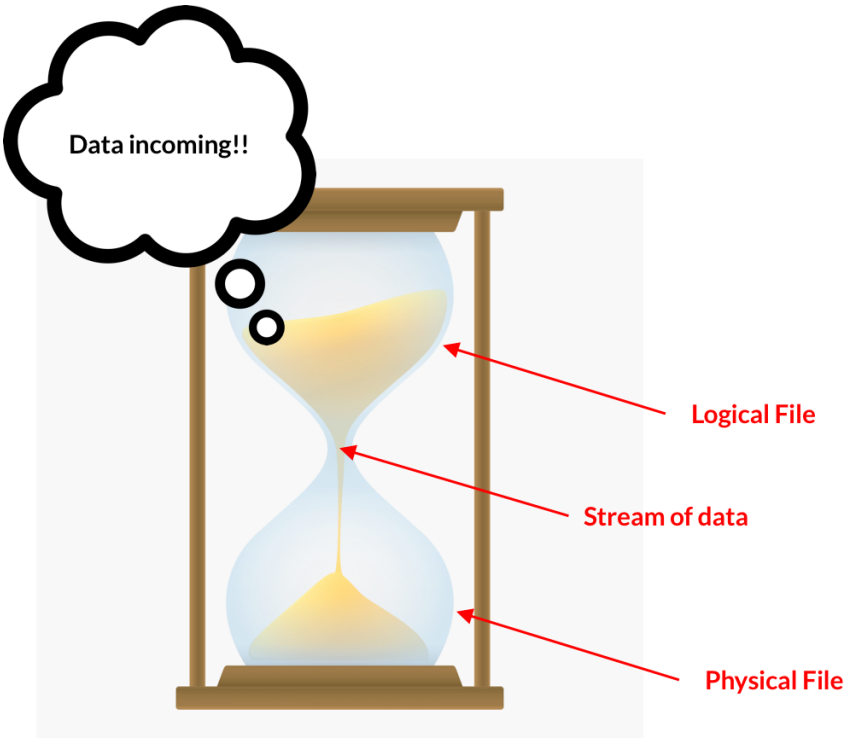
- Directories
    - Are file system files for maintaining the structure of the file system [1]
    - Serves multiple purposes
        * *All* → Stores information about files (owner, permission, etc)
        * *Users* → provides a structured way to organize files
        * *File System* → provides a convinent naming interface that allows the implementation to separate **logical file** organization from **physical file** placement on the disk

            · **Logical files:** Is a channel that connects the program to the physical file (Stream) [2]
            · **Physical files:** A collection of bits stored in the secondary storage [2]

            Example:

            FILE* output;
            output = fopen("sample.txt", "w");

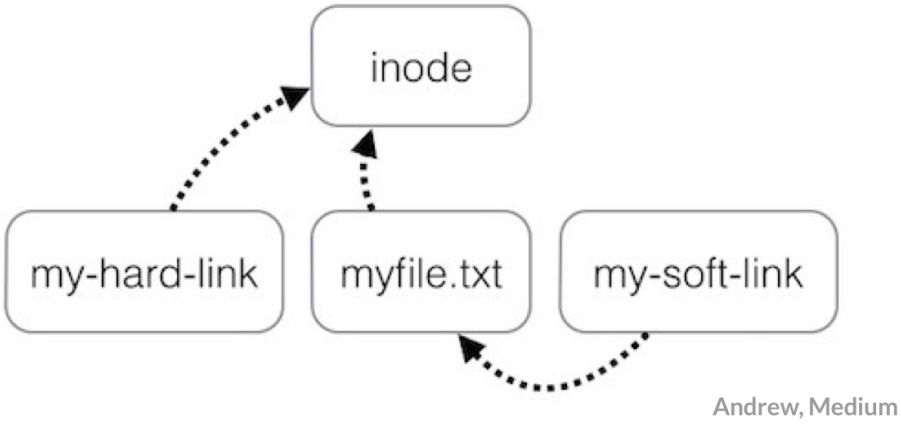
            Here, output is the logical file and sample.txt is the physical file



Refernces:

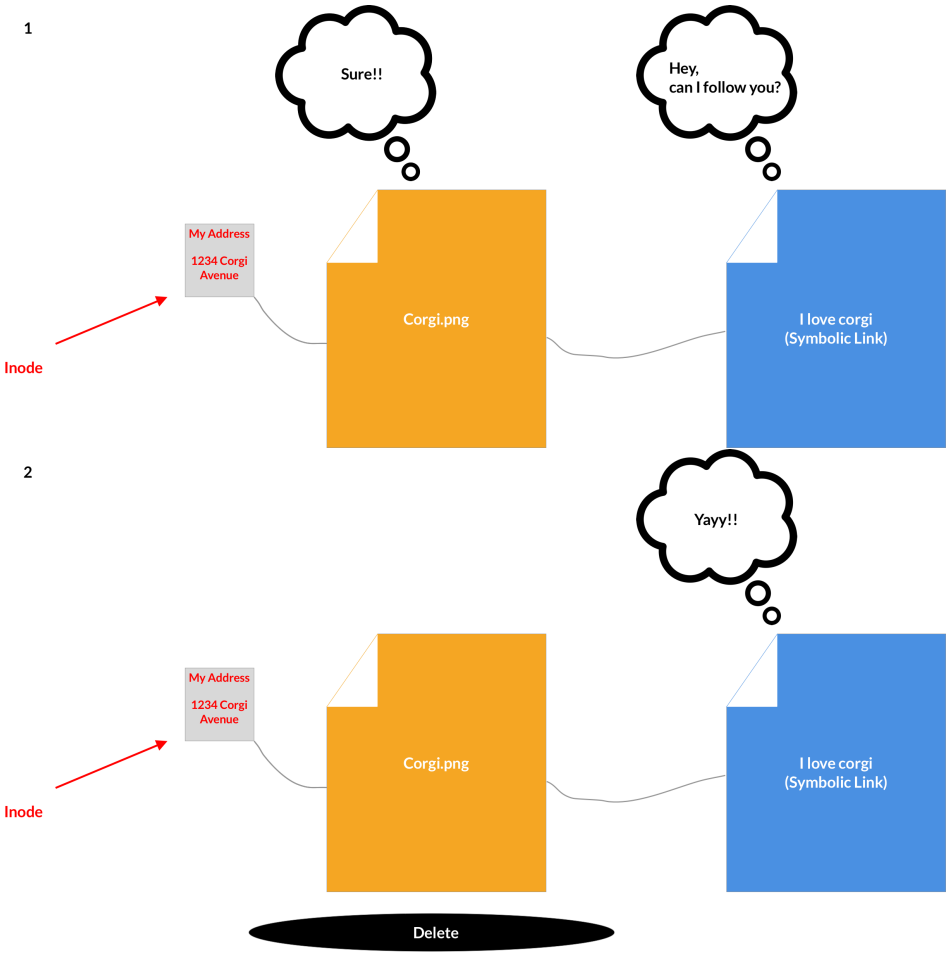
1) Tanebaum AS, Boss H. 2015. Modern Operating Systems. 4th Edition. New Jersy: Pearson Education, Inc.
2) Kumar, S. (2010). *File structures* [PowerPoint Slides]. Slide Share link

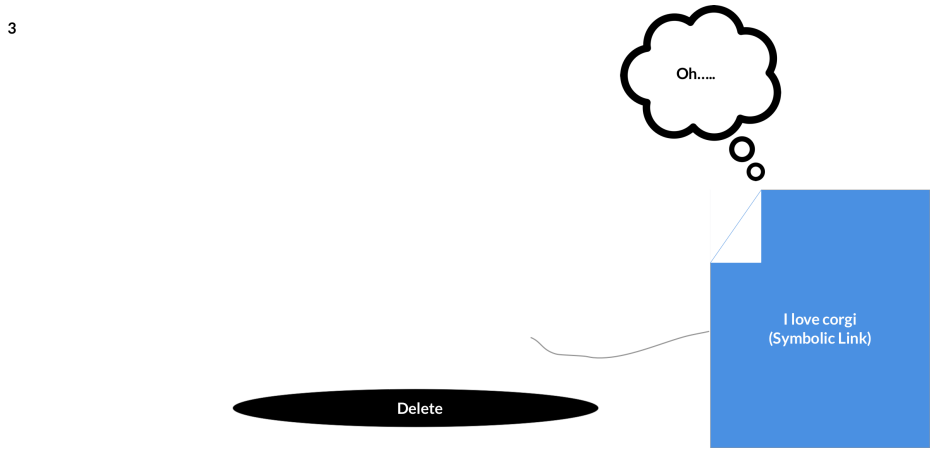
- Symbolic vs Hard Links



  - **Inode**

    - Is a database structure in a UNIX-style file system that describes a file system object such as a file or a directory [1]
    - Contains disk block location of the object's data [1]
    - Is a numerical equivalent of a full address [2]
- **Symbolic Link:**
    - Is directory entry containing "true" path to the file
    - Is a shortcut that reference to a file instead of inode value [2]
- **Hard Link:**
    - Is a direct reference to a file via its inode [2]
    - Is second directory entry identical to first

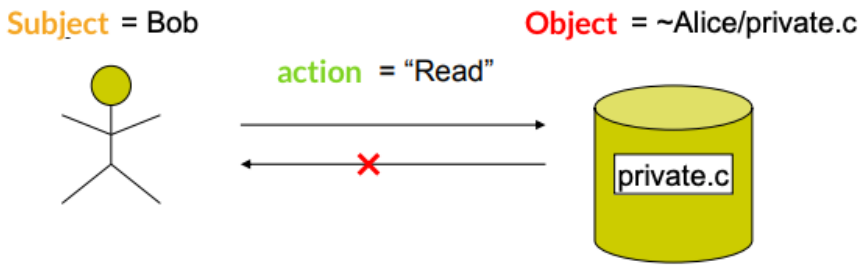




Refernces:

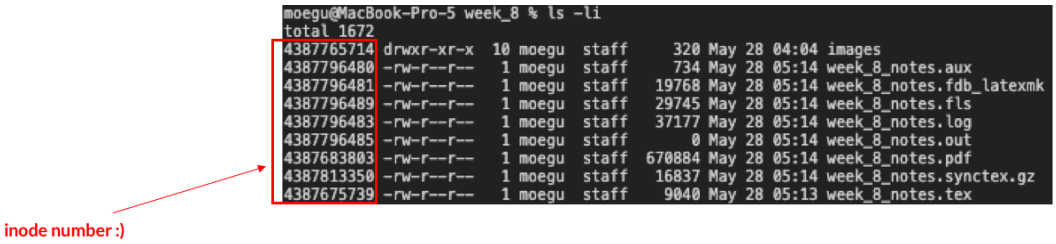
1) Wikipedia: inode, link
2) Andrew. (2018, January 16). *Hard links and Symbolic links — A comparison.* Medium. link

- Protection
  - File systems implement some kind of protection system
    - Who can access a file
    - How they can access it
  - Protection system dictates whether given **action** by a given **subject** on a given **object** should be allowed
    - You can read and/or write your files, but others cannot
    - You can read "etc/motd", but you cannot write it



- Unix Inodes and Path Search
  - Unix Inodes

* Is what we see on typing 'ls -li' command in terminal



* Describes where on the disk the blocks for a file are placed
* inode information is loaded to main memory [1]
  - Only for the corresponding files that are open
  - NOT all are loaded

Refernces:

1) Tanebaum AS, Boss H. 2015. Modern Operating Systems. 4th Edition. New Jersy: Pearson Education, Inc.

- File Buffer Cache
  - Reads information from disk only once and then stores retrieved file blocks in memory until no longer needed [1]
    * Because reading from disk is slow
    * Is common to read same part of disk multiple times

    Example:

    1. Reading email message, read the message for an edit, and read the message again when copying to folder

Refernces:

1) Linux System Administrators Guide: Chapter 6. Memory Management, link