

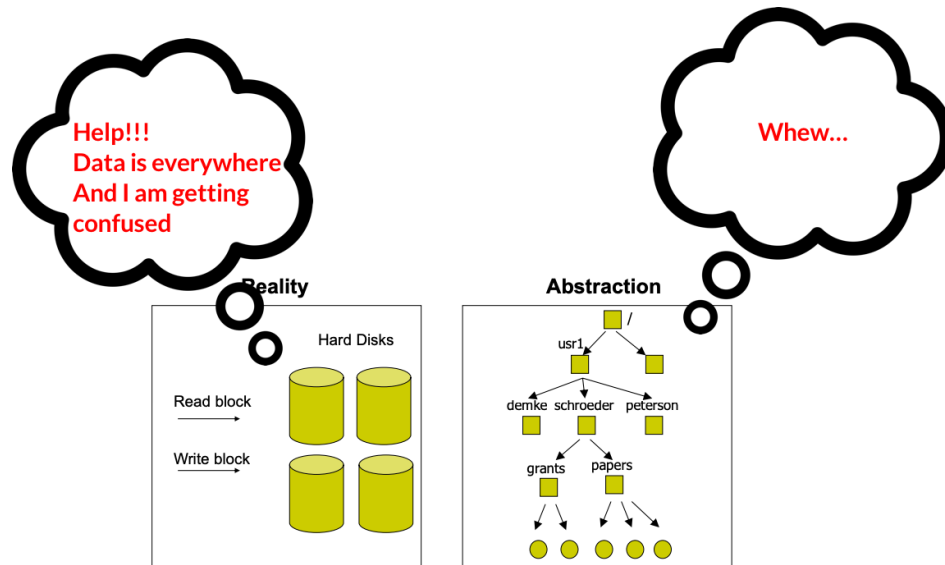
CSC369 Week 8 Notes

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May 28, 2020

- 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 Jersey: 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

References:

- 1) Tanenbaum AS, Bos H. 2015. Modern Operating Systems. 4th Edition. New Jersey: Pearson Education, Inc.

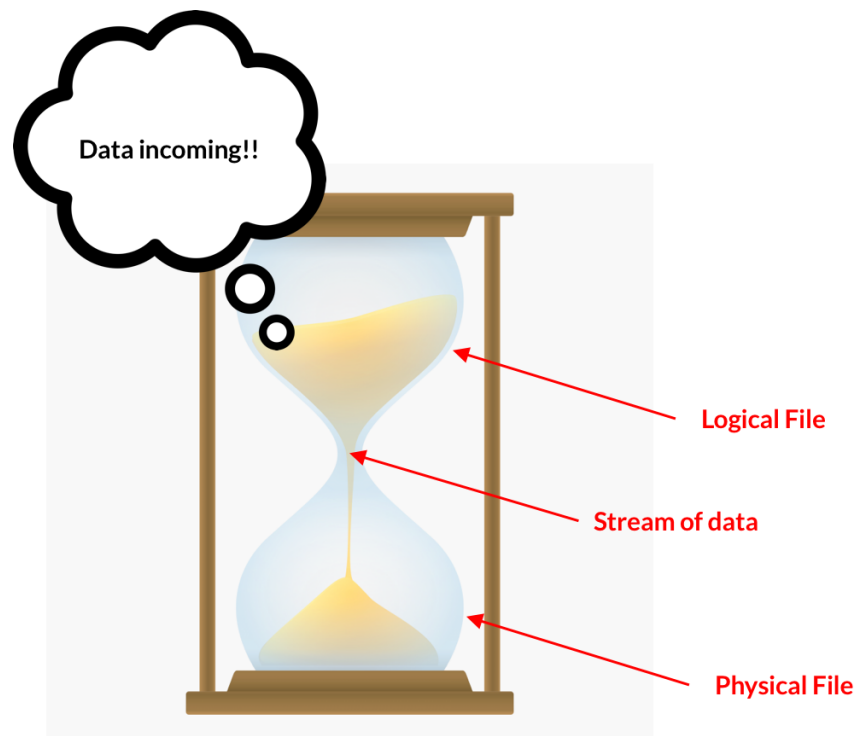
- Directories

- 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 convenient 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");
```

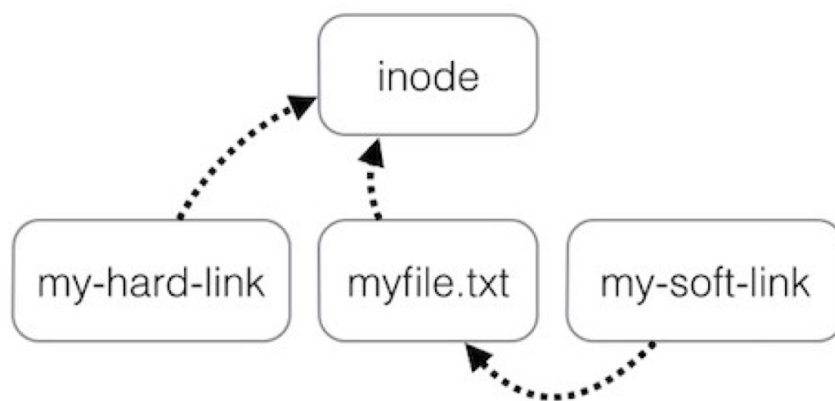
Here, output is the logical file and sample.txt is the physical file



Refernces:

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

- Symbolic vs Hard Links



Andrew, Medium

– Inode

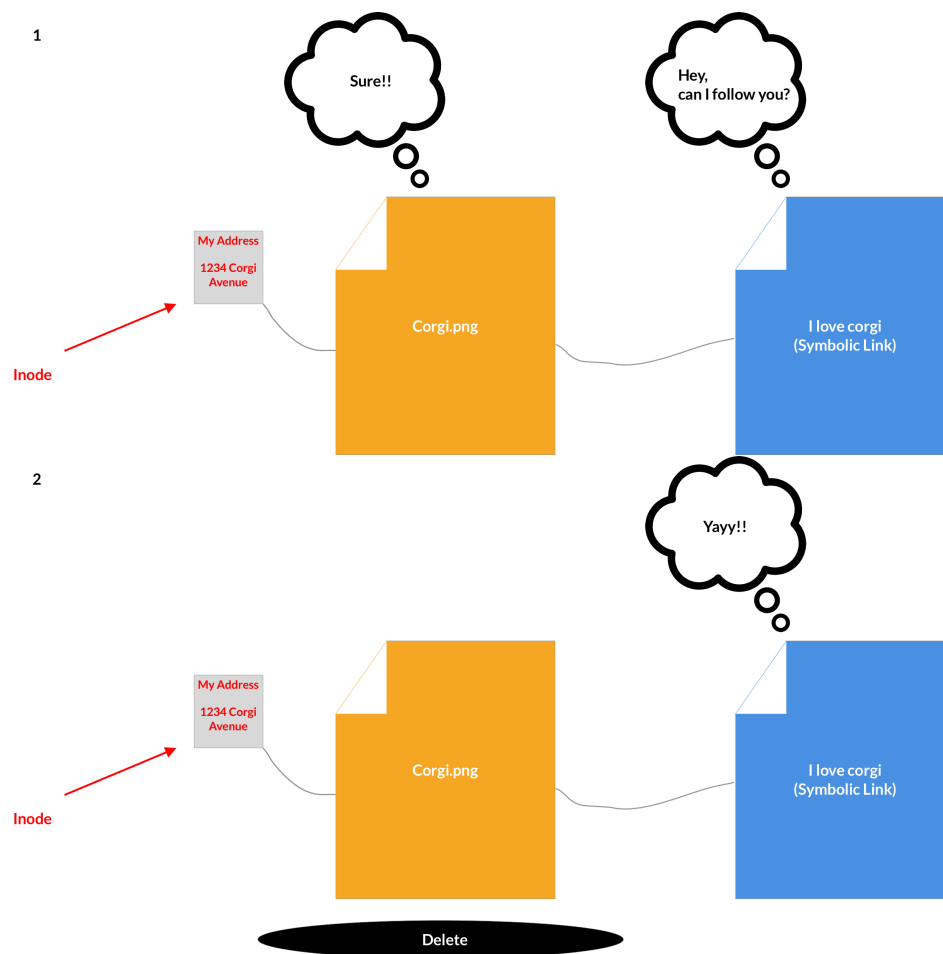
- * Is a database structure in a UNIX-style file system that describes a file system object such as a file or a directory ^[1]
- * Contains disk block location of the object's data ^[1]
- * Is a numerical equivalent of a full address ^[2]

– **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



3

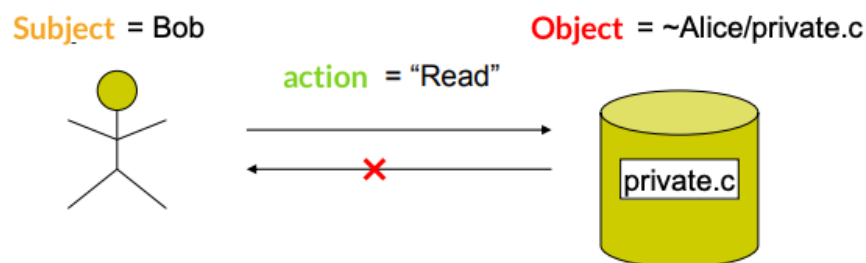


Refernces:

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

- Protection

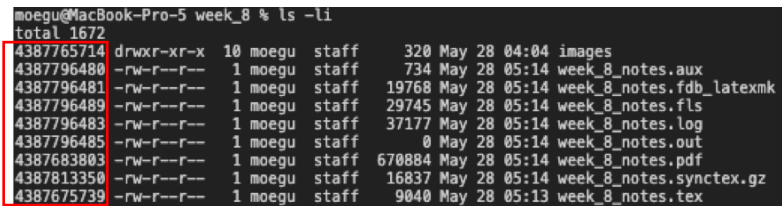
- File systems implement some kind of protection system
 - * Who can access a file
 - * How they can access it
- Protection system dictates whether given **action** by a given **subject** on a given **object** should be allowed
 - * You can read and/or write your files, but others cannot
 - * You can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



```
moegu@MacBook-Pro-5 week_8 % ls -li
total 1672
4387765714 drwxr-xr-x  10 moegu  staff   320 May 28 04:04 images
4387796480 -rw-r--r--    1 moegu  staff    734 May 28 05:14 week_8_notes.aux
4387796481 -rw-r--r--    1 moegu  staff  19768 May 28 05:14 week_8_notes.fdb_latexmk
4387796489 -rw-r--r--    1 moegu  staff  29745 May 28 05:14 week_8_notes.fls
4387796483 -rw-r--r--    1 moegu  staff  37177 May 28 05:14 week_8_notes.log
4387796485 -rw-r--r--    1 moegu  staff     0 May 28 05:14 week_8_notes.out
4387683803 -rw-r--r--    1 moegu  staff 670884 May 28 05:14 week_8_notes.pdf
4387813350 -rw-r--r--    1 moegu  staff  16837 May 28 05:14 week_8_notes.synctex.gz
4387675739 -rw-r--r--    1 moegu  staff   9040 May 28 05:13 week_8_notes.tex
```

inode number :)

- * Describes where on the disk the blocks for a file are placed
 - It's like a full address
- * 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 Jersey: Pearson Education, Inc.

- File Buffer Cache