

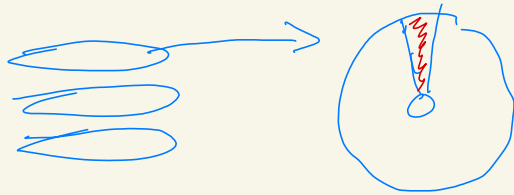
1. Filesystems

\$ cat ~/foo/bar.txt

Files:

User: named bytes/data
on h/w storage

Fs: group of disk blocks

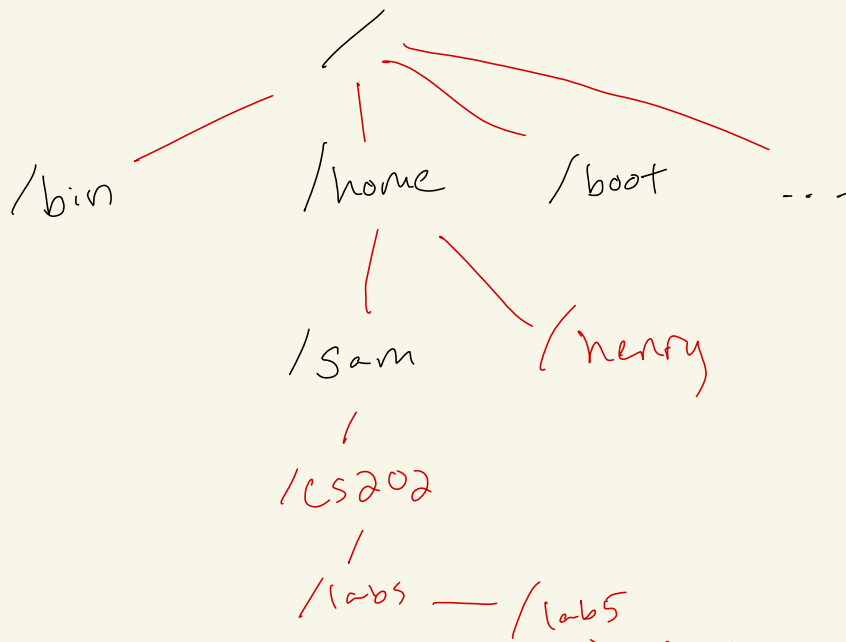


FS (Filesystem):

- a way to organize + store data on storage devices
- provides hierarchical structure for files and directories

Storage devices?

disk image, usb/flashdrive, etc.



Key abstractions:

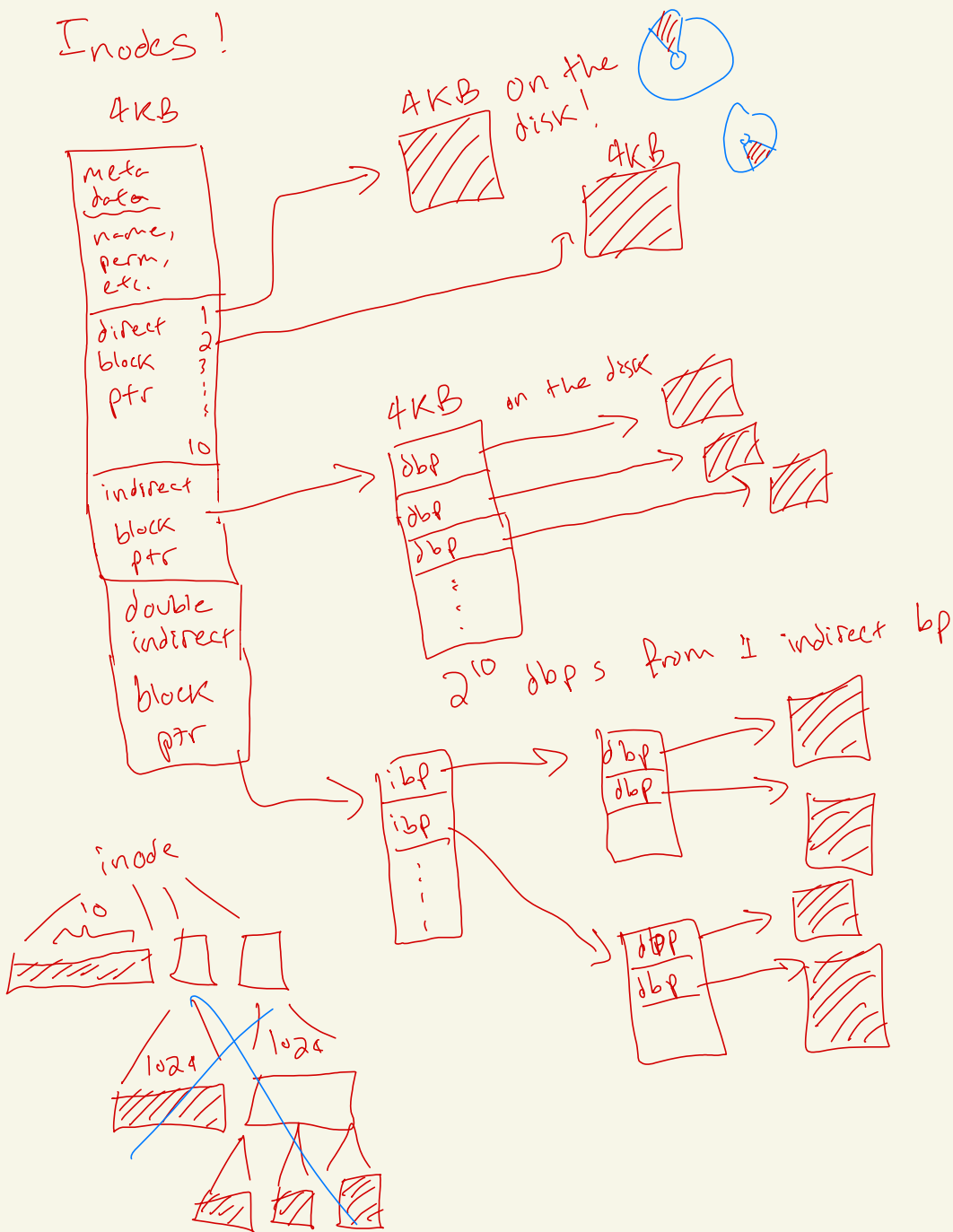
File: collection of data
 Can contain text, images, etc.

Filename: a string used to identify
 and locate files in a
 user-friendly way

Directory: special file which contains
 other files

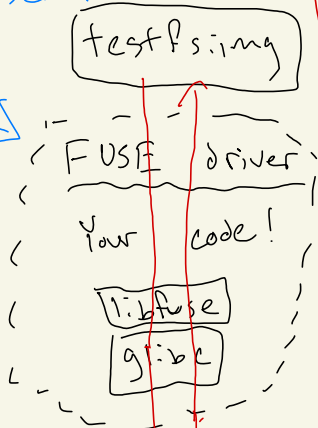
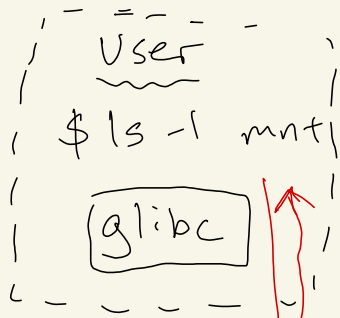
How to Implement?

Inodes!



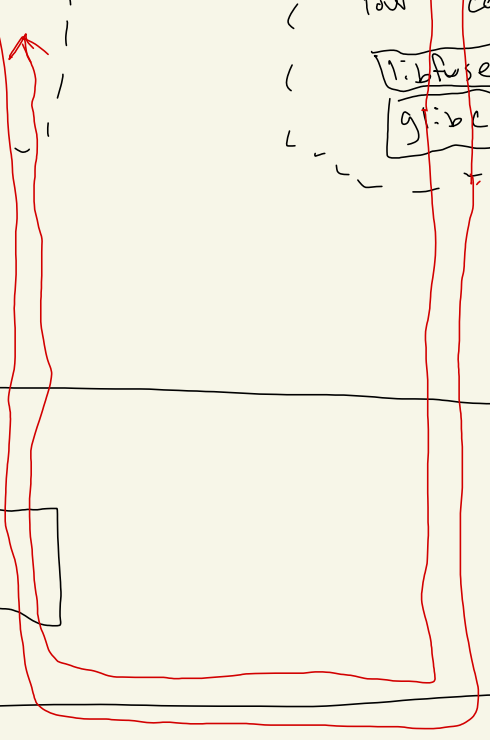
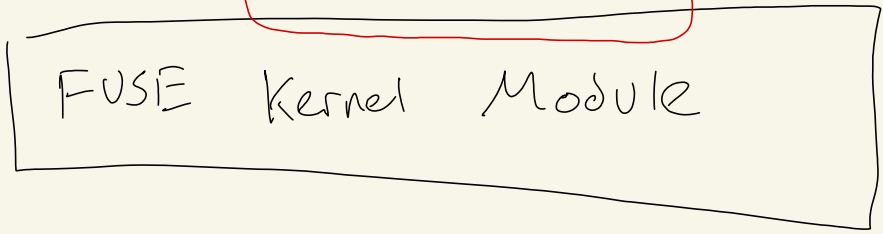
FUSE: Filesystem in Userspace

H/W (disk)



User Space

Kernel



How many disk blocks for
a file that is

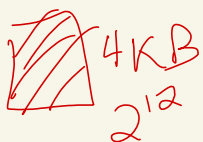


a) 2^{20} B? (1MB)

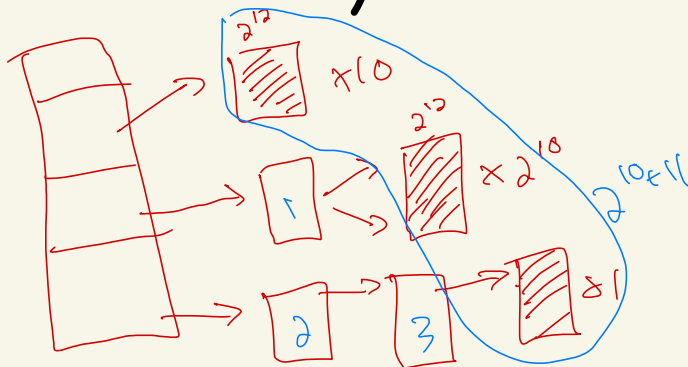
2^8 data blocks
($2^8 \cdot 2^{12} = 2^{20}$)

+ 1 indirect block

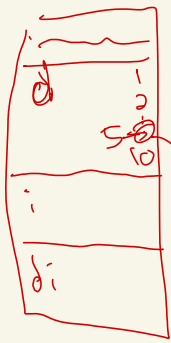
$2^8 + 1$ disk blocks



b) $(2^{10} + 1)2^{10}$ B



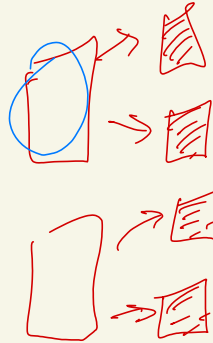
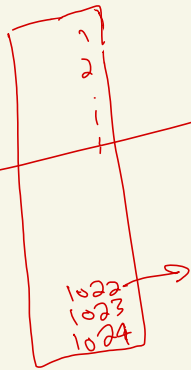
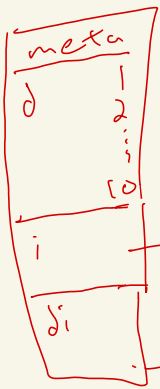
Total: $2^{10} + 14$
(plus our inode)



Find the slot for the 5th data block of a file



What about the 1032nd data block?



$N_{\text{DIRECT}}: 10$

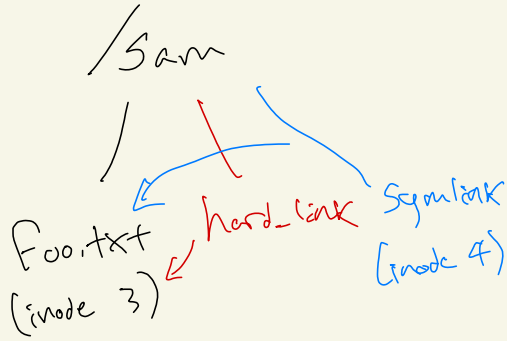
$N_{\text{INDIRECT}}: 10 + 2^{10} = 1034$

$N_{\text{DOUBLE}}: 10 + 2^{10} + 2^{10}(2^{10})$
 $= 2^{20} + 2^{10} + 10$

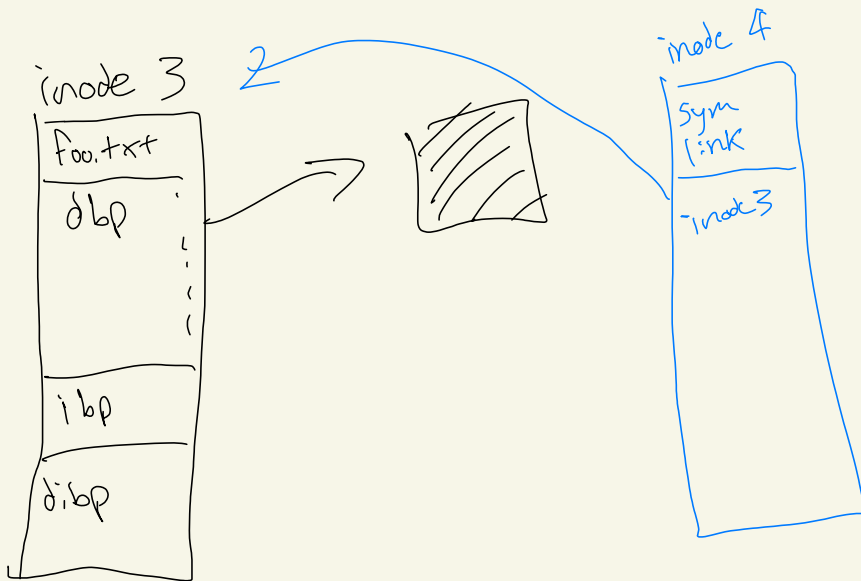
Directory : special file

/sam:

inode 2	
meta	
dir = true	
name	i#
foo.txt	3
hard link	3



\$ cat /sam/foo.txt



bitmap:

uint_32 []

└─┬─┘
might be something else
but it is definitely 4 bytes (32 bits)

bitmap[0] → 010.....10
└──────────────────┘
32 bits