

platters, rotate  
each has r/w head



top view: cylinders divided into sectors of fixed size

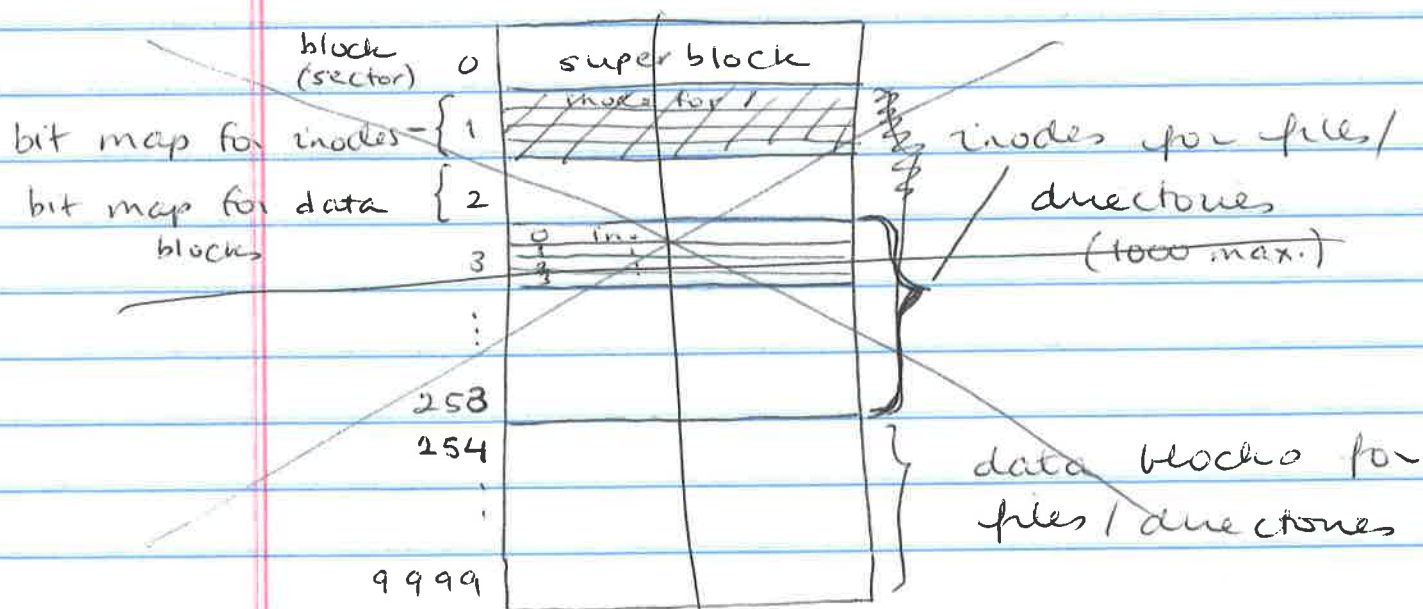
abstract a NUM\_SECTORS = 10,000. sectors  
each of size SECTOR\_SIZE = 512 bytes.

Disk is kept in memory, but can be saved to disk, i.e. a file

Once saved can load the file system from the file (write all 512K bytes)

Max. file size = 30 blocks

block = sector = 512 bytes



## Data Structures on Disk

### - superblock

- in well known location
- only a "magic number" in our superblock
- when initialize FS, write magic # into superblock
- when initialize FS from file, check that superblock contains the magic #

### - to keep track of files and directories:

#### - inode contains

$$\begin{cases} \text{file size (int)} = 4 \text{ bytes} \\ \text{file type (int)} = 4 \text{ bytes} \\ \text{"pointers" to data of file (array of 30 int)} \end{cases}$$

$$32 \times 2 = 64$$

$$32 \times 4 = 128$$

- if regular file then data is file

- if directory, then data is a list of files/dir in the directory

→ 512 bytes block can contain

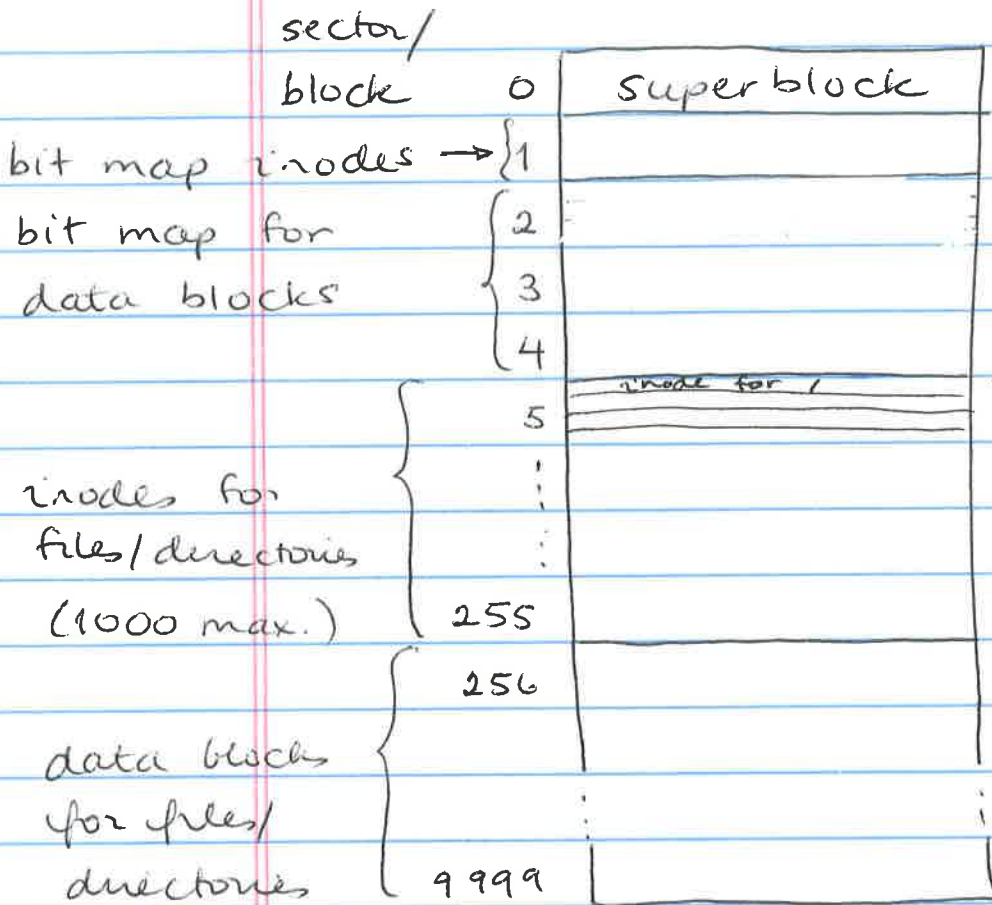
$$512/64 = 8 \text{ or}$$

$$512/128 = 4 \text{ inodes}$$

### - limit of 1000 files/directories

$$1000/8 = 125 \text{ blocks}$$

$$1000/4 = 250 \text{ needed for inodes}$$



\* randomly corrupt 1%  
certain blocks (100  
of them); i.e set them  
as allocated - cannot  
be used to hold data

} first set of inodes



cast.cc  
program

$$\begin{array}{r} 100 \dots 0 \\ \hline \underbrace{\hspace{10em}}_{999} \end{array}$$

1224, 375 bits

$$\underbrace{10,000}_{\text{max}} - \underbrace{200}_{\text{inodes}} - \underbrace{5}_{\text{superblock + bit maps}} = 9795 = \text{need } 1225 \text{ byts}$$

$$1225 / 512 \text{ bytes/sector} = 2.39$$

need 3 blocks to hold bit maps

- directory format

name (16 bytes)	4 byte inode = 20 bytes

or pad  
each ent  
32 bytes  
 $512/32 =$   
director

$$512/20 = 25.6$$
$$25 \times 20 = 500$$

pad out to 512 bytes

on pad  
each entry to  
32 bytes then

$$512/32 = 16$$

directory  
entries per block

All paths are absolute, i.e., full path from root is given

/a/b/c/

max. len of single file/dir name = 16 bytes  
including '\0'

max. len of path = 256 bytes

- file names : allowed characters
  - alphabetic (mixed case)
  - dot
  - dash
  - \_ underscore
  - numeric 0..9