project 4

(1) virtual disk

(1.1) 64 blocks

(1.2) 16 bytes/ block

(1.3) range of block numbers: 0..63

(1.4) disk capacity: 64×16 = 1024 bytes

(1.5) disk name: 4 lowercase or uppercase letters

(2) directory

(2.1) single root directory (up to 8 entries, see below)

(3) files

(3.1) up to 8 files

(3.2) up to 32 blocks for data files (32..63)

(3.3) other 32 blocks are for metadata (∅..31)

(3.4) maximum file size = 32 × 16 = 512 bytes

(3.5) file name: 4 lowercase or uppercase letters

(3.6) Open File Table (OFT): up to 4 opened files simultaneously (i.e. size of OFT = 4)
0..3

(4) functions you need to design and implement

a. make_fs()
b. mount_fs()
c. dismount_fs()
d. fs_create()
e. fs_open()
f. fs_close()
g. fs_delete()
h. fs_read()
i. fs_write()
j. fs_get_filesize()
k. fs_lseek()
l. fs_truncate()

(5) functions provided to you

a. make_disk( )

b. open_disk( )

c. close_disk( )

d. block_read( )

e. block_write( )

(6) how to design "make_fs( )" function?

a. use "make_disk( )" to initialize a new disk (i.e. store 0 in each byte on the virtual disk)

b. use "open_disk( )" to make the virtual disk available

c. initialize <u>Superblock</u>, <u>directory</u>, and <u>FAT</u> on disk (See below for disk layout)

d. use "close_disk" to close the disk (i.e. make the virtual disk unavailable)

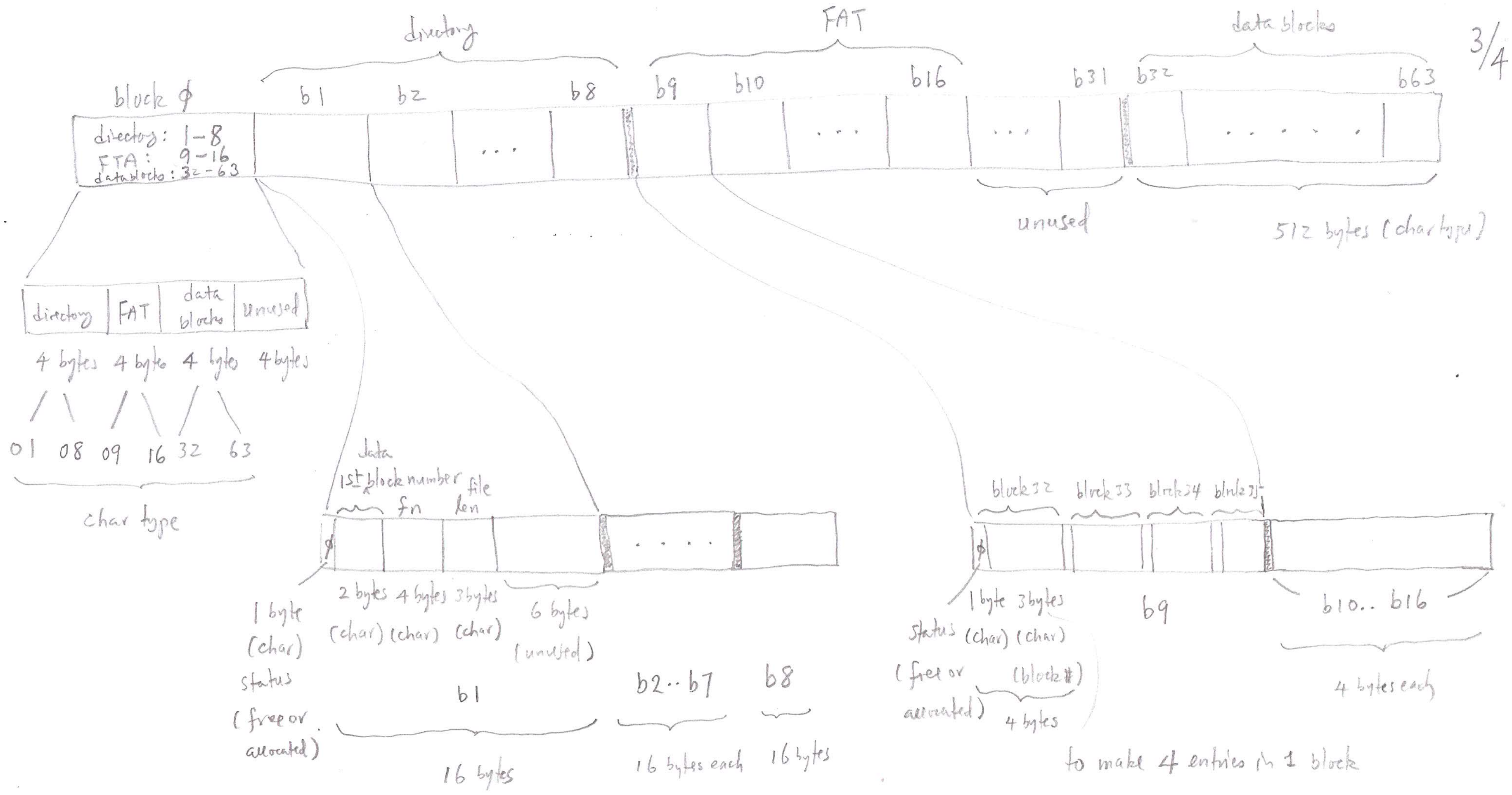
(7) how to design "mount_fs( )" function?

a. use "open_disk" to make the virtual disk available

b. load <u>directory</u> and <u>FAT</u> into memory (use "block_read" to do it)

c. create an <u>OFT</u> in memory

(8) disk layout (see next page)



to make 4 entries in 1 block

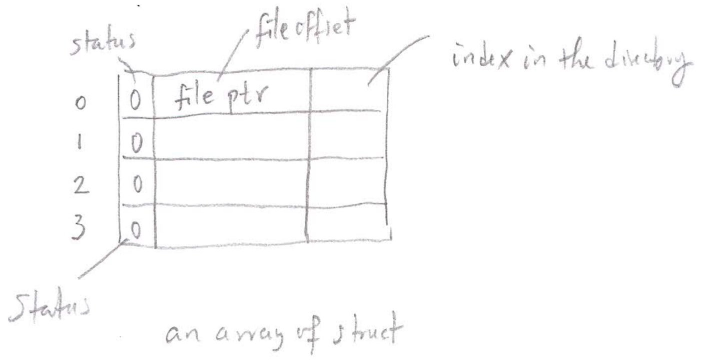
i.e. block numbers 32, 33, 34, 35 in block 9
block number 36, 37, 38, 39 in block 10
⋮
block numbers 60, 61, 62, 63 in block 16

a total of 32 data block numbers

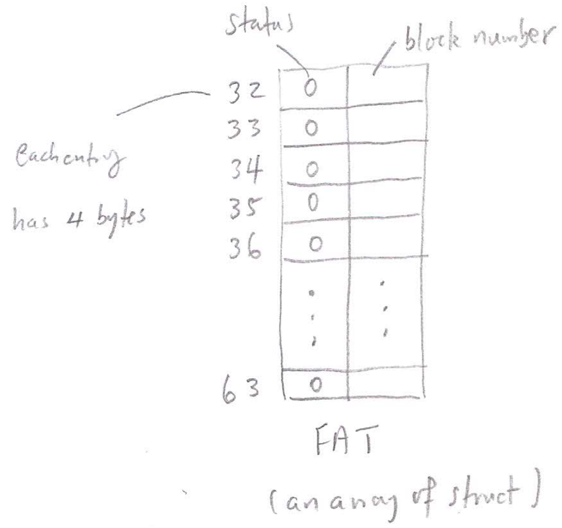
Disk Layout

(9) implementation (for "mount_fs()")

(9.1) OFT (0..3)

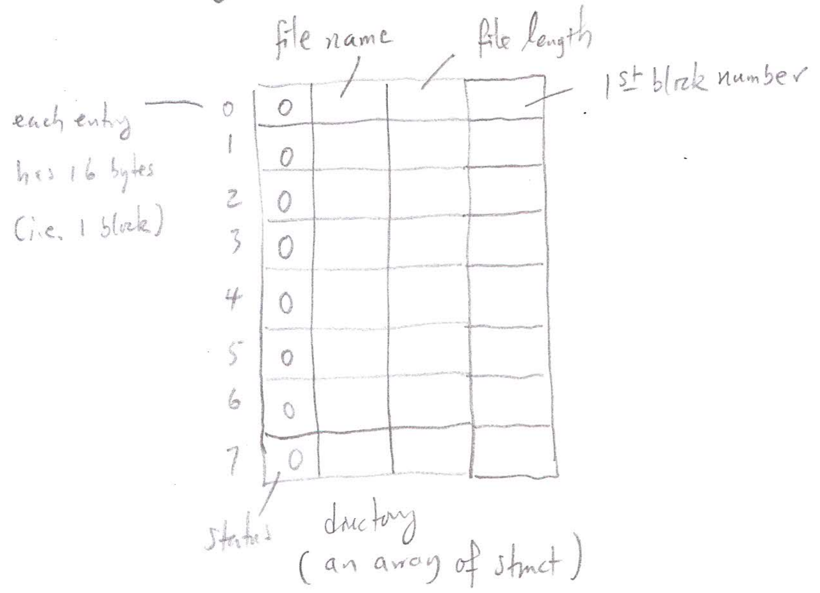


(9.2) FAT (loaded from the virtual disk into memory)



e.g. if blocks 32, 43, and 35 were allocated to a file, then if file ptr/offset = 23, then it is pointing to 23−16 = 7 in $\boxed{\text{block 43}}$

(9.3) directory (loaded from the virtual disk into memory)


file name
file length
1st block number
each entry has 16 bytes (i.e. 1 block)
0
1
2
3
4
5
6
7
status
directory
(an array of struct)