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a. # files = # inodes
= 5 × block size / inode size
= 5 × 4kB / 512B
= 40

b. size of file = # block × block size
= (128 − 8) × 4kB = 480 kB

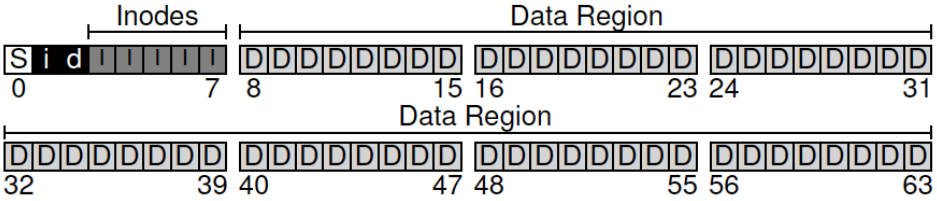
c. imap = # inodes = 40 bit
dmap = # data regions
= 128 − 8 = 120 bit

INF 551 – Spring 2016

Quiz 2: File systems (10 points)

10 minutes

Recall that we have seen a small file system stored in a disk of 64 blocks as shown below.



Now let us consider a new disk with **128** blocks, but the organization of file system on the disk remains the same. In other words, the new disk still has the first 8 blocks storing the superblock, two bitmaps (i-map and d-map) for tracking the free slots for inodes (i-map) and free data blocks (d-map). But the new disk now has additional 64 data blocks, numbered 64 to 127.

Suppose that the disk and file system have the following parameters.

Block size	4KB
Number of blocks on disk	128
Inode size	**512B**
Number of inode blocks	5 (blocks #3 to #7)

d. inode addr.
= addr. of first inode + inode # × inode size
= 3 × 4kB + 12 × 512B
= 18kB

a. [2 points] How many files can the file system store on the disk?
Answer:
5 blocks store inodes: 4KB/block*5=20KB
Inode size=512B
File system can store: 20KB/512B=40 files

b. [2 points] What is the maximum size of a file that can be stored in this file system?
Answer:
Data Region: 128-8=120
Maximum size: 120*4KB=480KB

e. # pointers = block size / pointer size
= 4kB / 2B = 2k = 2048

c. [2 points] How many bits are there in the two bitmaps, i-map and b-map?
Answer:
i-map: 40 inodes * 1bit = 40 bits
b-map: 120 blocks * 1 bit = 120 bits

d. [2 points] If the inumber of a file is 12, where is its corresponding inode located on the disk (i.e., offset)?
Answer:
Offset=inodeStartAddress+inumber*Inode size=12KB+12*512B=18KB

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e. [2 points] Recall that some data block may be used to store pointers. Assume each pointer needs 2 bytes. How many pointers can a data block store?
Answer:
4KB/2Bytes=2048 pointers