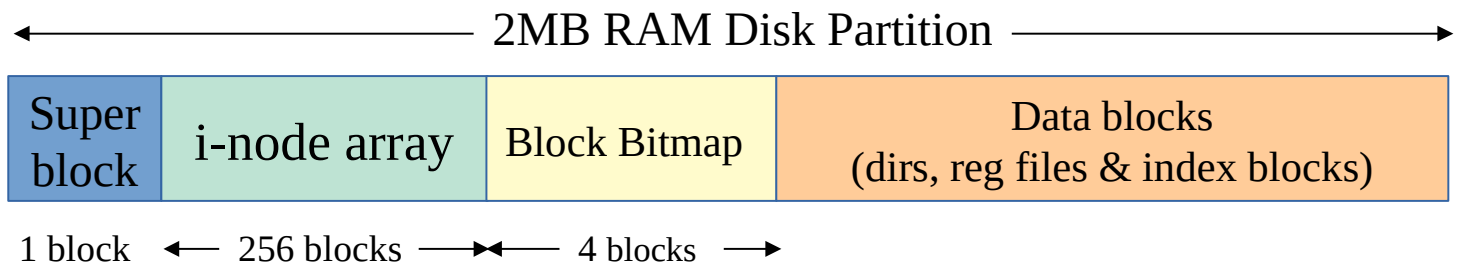
Filesystem Data structures (for DISCOS assignment)



- Ramdisk block – 256 bytes
- Index node (a.k.a. i-node) – 64 bytes
- Block bitmap – 1 bit per data block (e.g., 0 = free, 1 = allocated)

- Regular file – holds arbitrary data (text or binary)
- Directory file – holds directory *entries* for its position in *tree*

- Directory entry – 16-bytes: [filename, i-node #]
- Filename – null-terminated string padded to 14-bytes
- Index node # – 2-byte index into the i-node array

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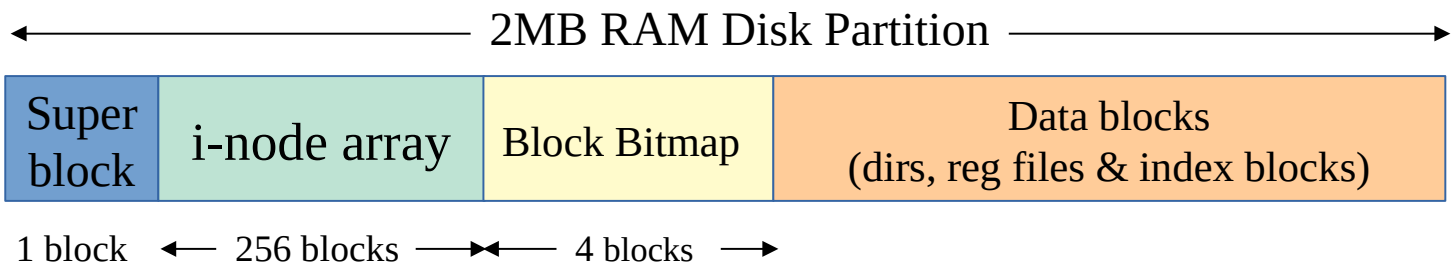
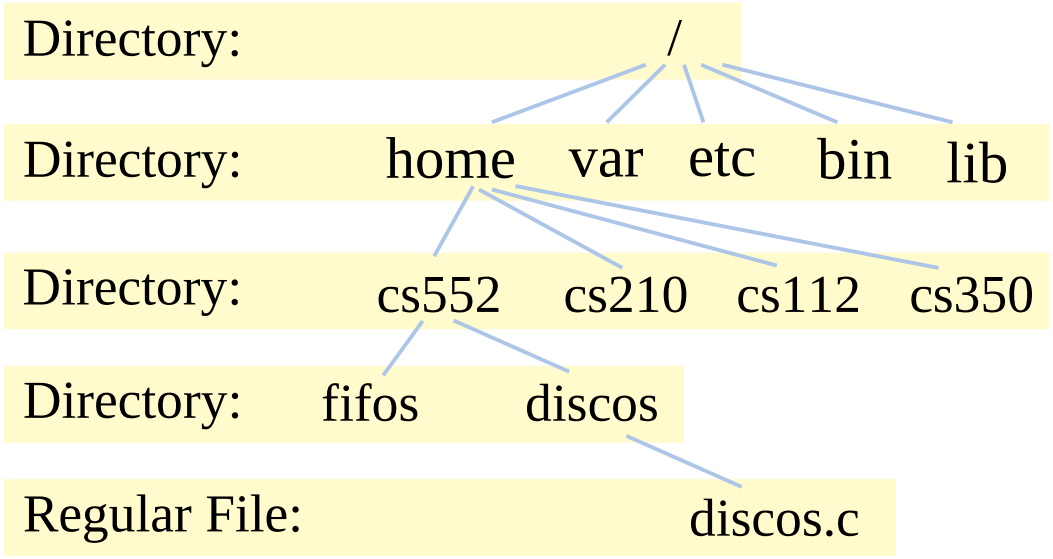


- Example tree:
  - *Pathname – /home*/cs552/discos/discos.c



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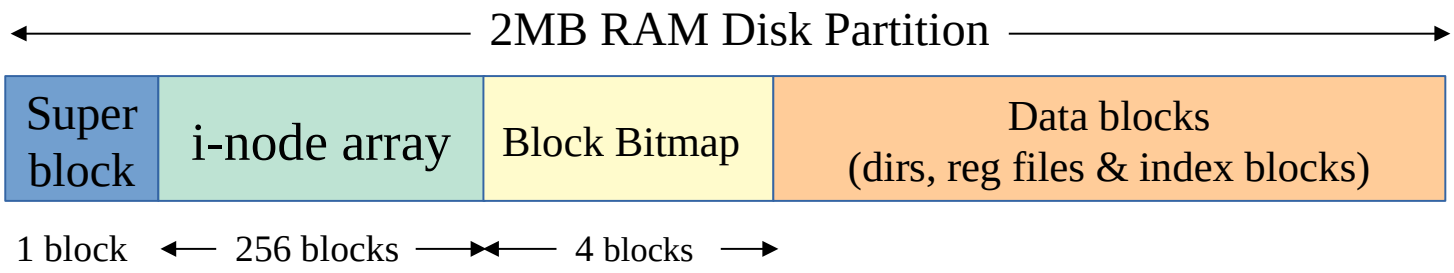

- index node – contains information about a file (one node per file, 64-bytes)
  - For project:
    - *type* – either “dir” or “reg” (4-bytes)
    - *size* – current file size in bytes (4-bytes)
    - *location* – identifies block storing file contents (40-bytes)
    - *access rights* – default=*read-write*, optional=*read-only*, *write-only*

- Superblock – contains meta-information about partition
  - # free blocks
  - # free index nodes
  - Other information of your choosing (e.g., location of 1st data block)

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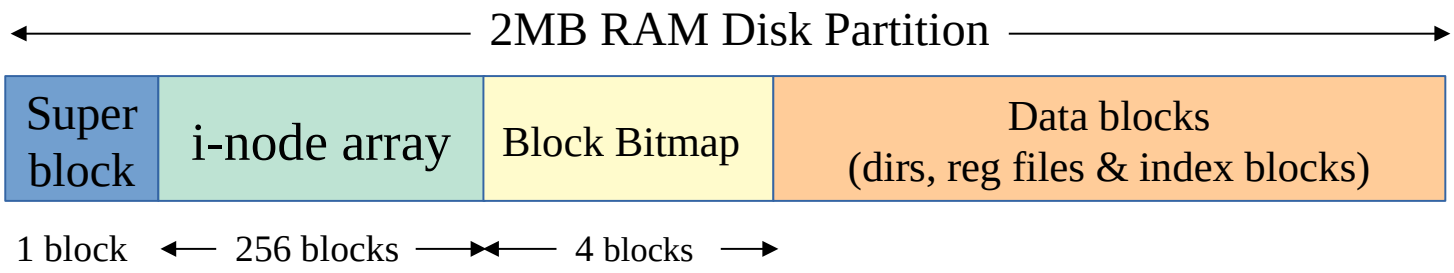

- Filesystem is implicitly a tree rooted with directory named "/" having i-node 0
  - "/" is 1st (zeroth) entry in i-node array
  - Each file is allocated an integer number of disk blocks (no block sharing)
- *location* attribute in i-node:
  - 10 block pointers, 4-bytes per pointer (40-bytes total)
  - 1st 8 pointers – direct block pointers
  - 9th pointer – single-indirect
  - 10th pointer – double-indirect

- Max file size: $256*8 + 256*64 + 256*64^2 = 1067008$ bytes
  - can fit in 2MB partition
- What about maximum number of files?
  - Total i-nodes: 256 blocks*256/64 = 1024 (1023 files discounting "/")

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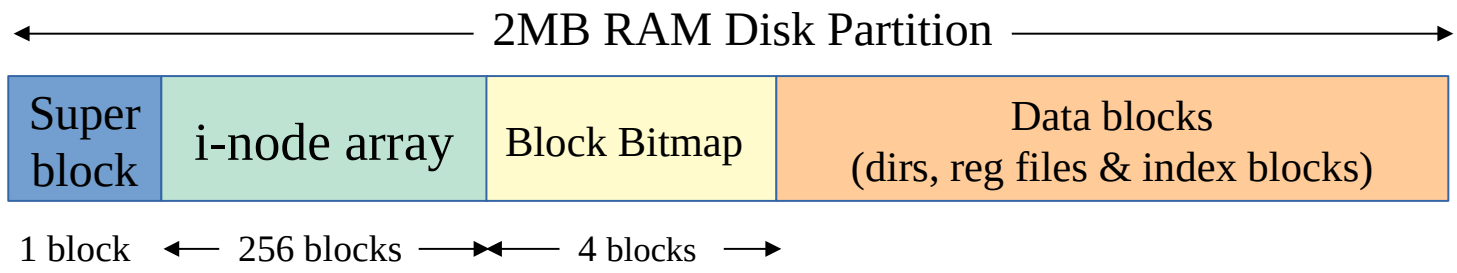
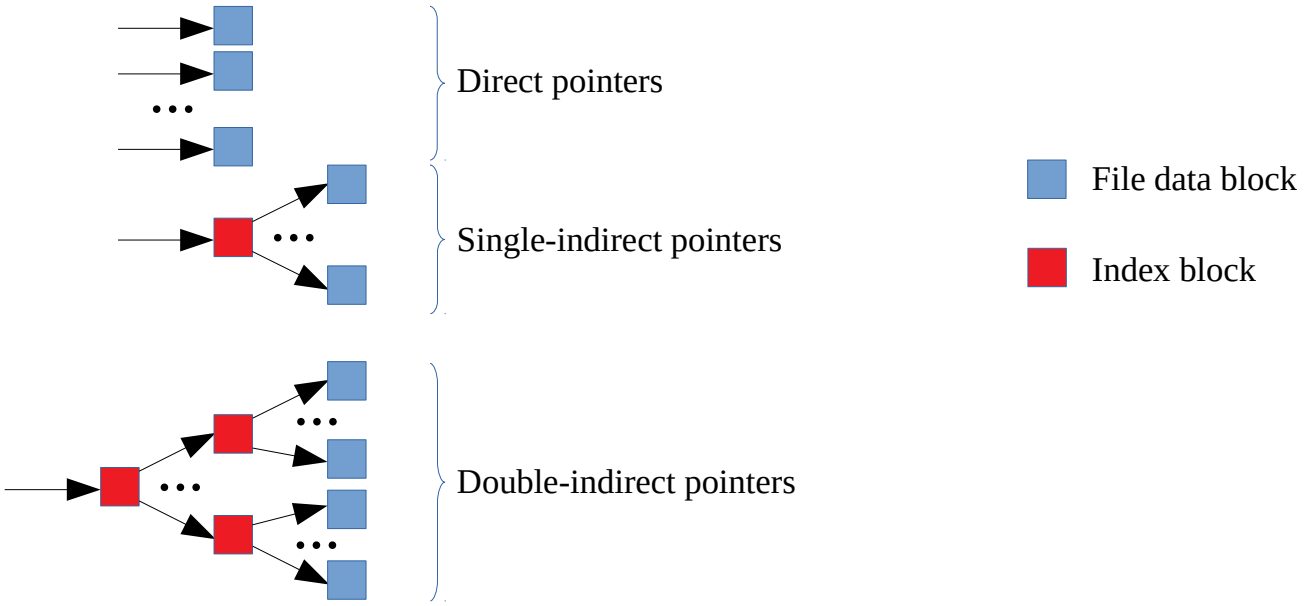


- I-node *location* attribute – Direct, single-indirect, double-indirect block pointers:



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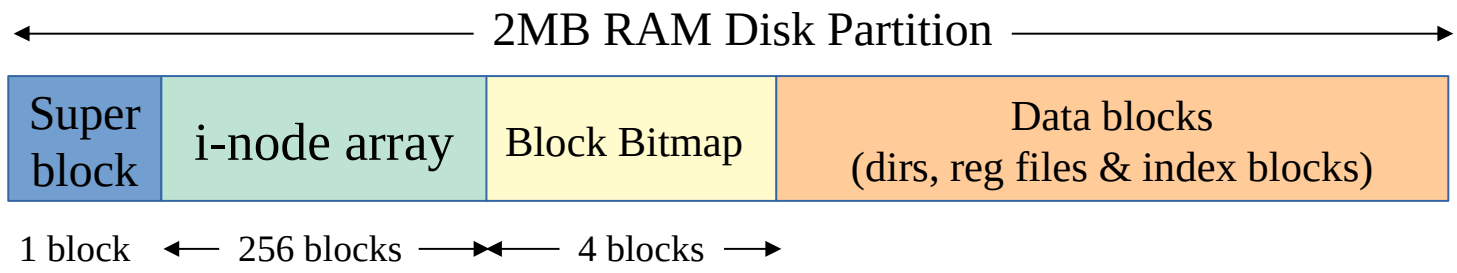

- Open files – need a table of open file descriptors
  - Table per process (Linux)
  - Table per thread (if using FIFOS)

- Need to implement file operations:
  - *rd_creat, rd_mkdir, rd_open, rd_close, rd_read, rd_write, rd_lseek, rd_unlink, rd_chmod*

Filesystem Data structures (for DISCOS assignment)