

CSc 360

Operating Systems

File System Implementation

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Review

- File system interfaces
 - file
 - directory
 - file system
- Again, in this course, we are more interested in designing and implementing --- file systems!

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File system organization

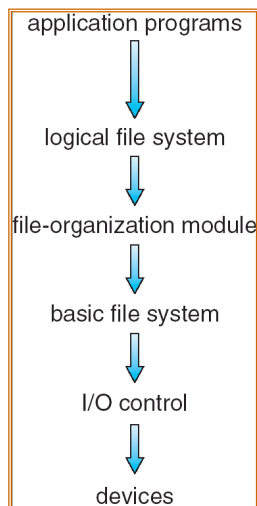
- Sector: e.g., 512 bytes
- Block
 - data blocks
 - control blocks
 - boot, partition, (root) directory, file control blocks
- Access blocks
 - logical block address
 - physical block address: disk geometry

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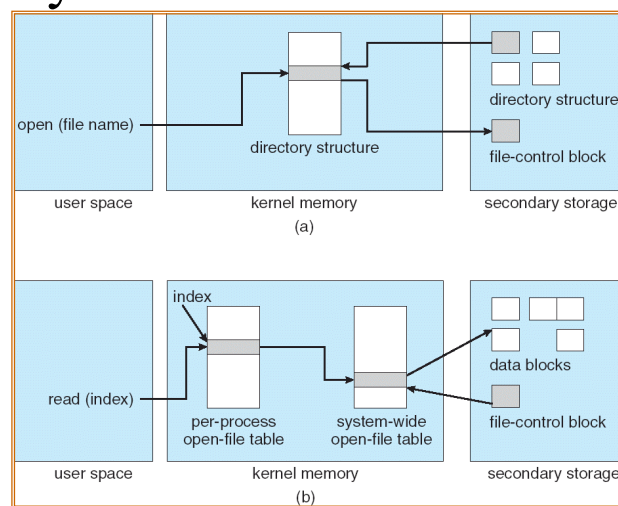
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File system structures



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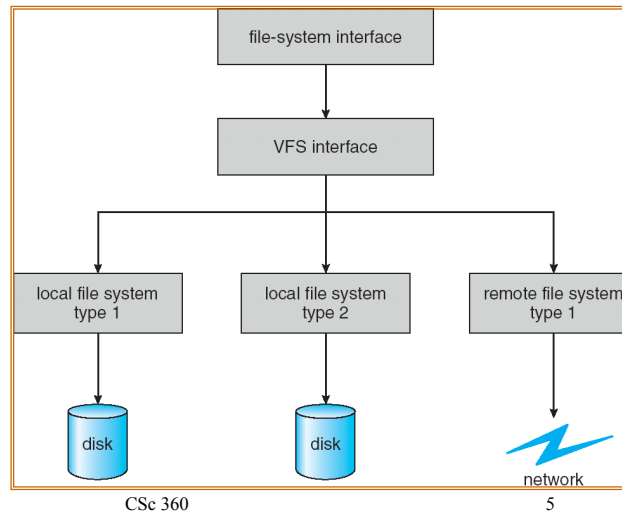


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Virtual file systems

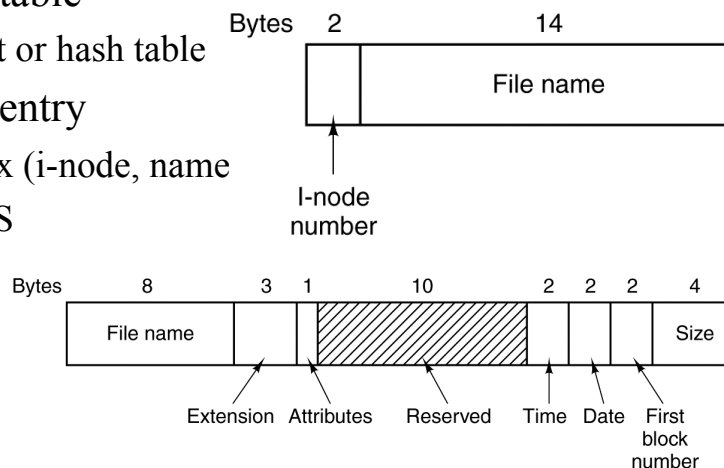
- OO design
 - same API to different file systems
 - e.g., open(), read(), write(), etc



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Implementing directory

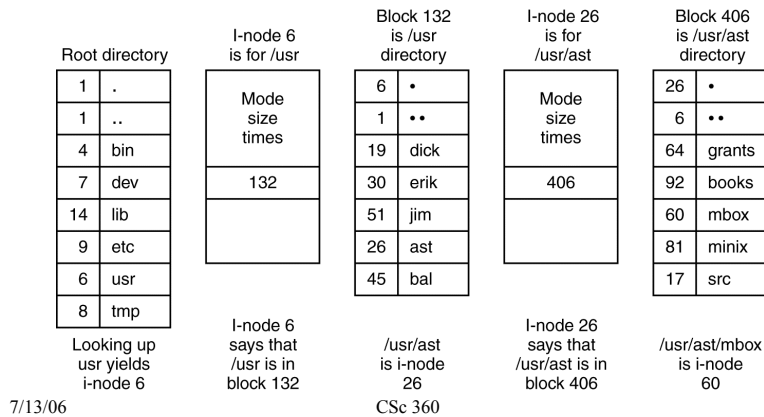
- Directory table
 - linear list or hash table
- Directory entry
 - e.g., Unix (i-node, name)
 - e.g., DOS



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Traversing directory hierarchy

- Unix: /usr/ast/mbox

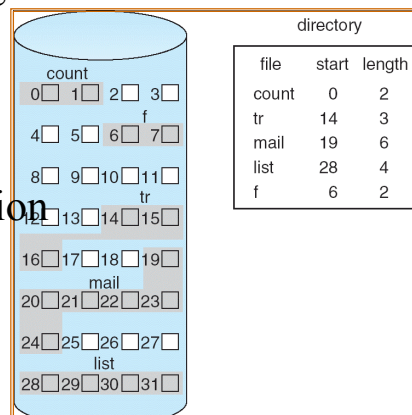


Allocating blocks

- Contiguous allocation
 - address of the first block, length
 - random access
 - difficult to expand
 - fragments
- Modified contiguous allocation
 - e.g., extent-based allocation

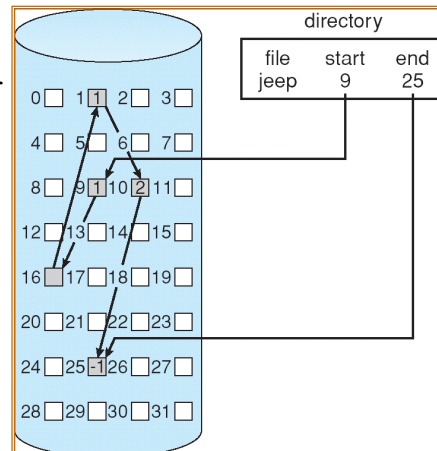
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Linked allocation

- Linked list
 - address of the first block
 - each block has a next pointer
 - next == -1, end of block list
 - easy to expand
 - no direct random access
- Modified linked list
 - e.g., cluster-based allocation

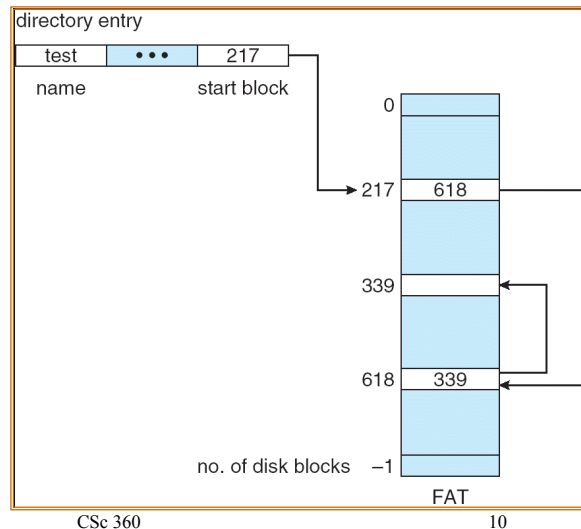


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File allocation table

- FDT
 - first block address
- FAT
 - linked list of addresses
 - can be cached
 - random access



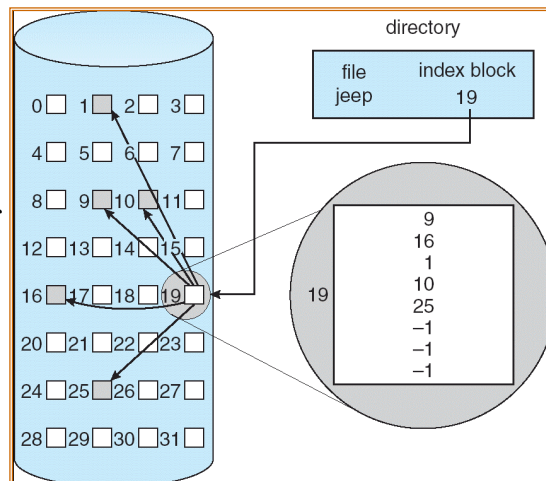
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Indexed allocation

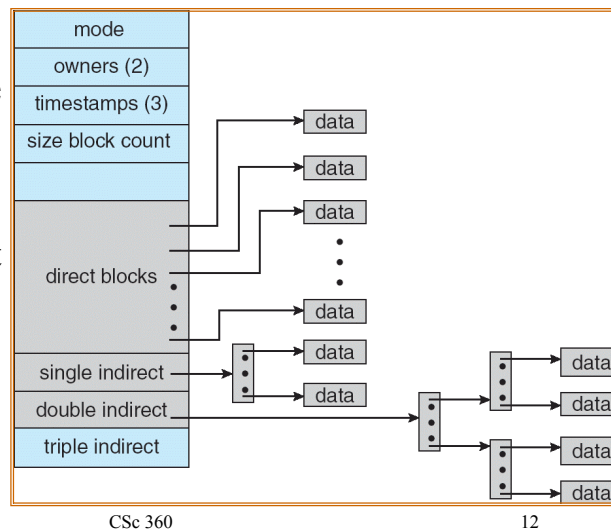
- Index block
 - a list of pointers
 - random access
 - easy to expand
 - limited by the size of index block



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Indirect index

- E.g., Unix i-node
 - 12 direct index
 - 1 single indirect
 - 1 double indirect
 - 1 triple indirect
 - 4KB block



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This lecture

- File systems implementation
 - file system structures
 - directory implementation
 - block allocation
- Explore further
 - how to support long file name?

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Next lecture

- More on file system implementation
 - read OSC7Ch11

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