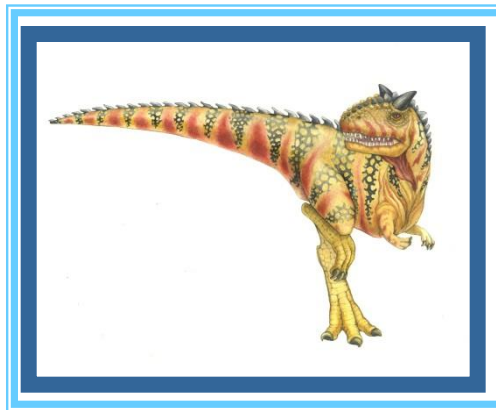
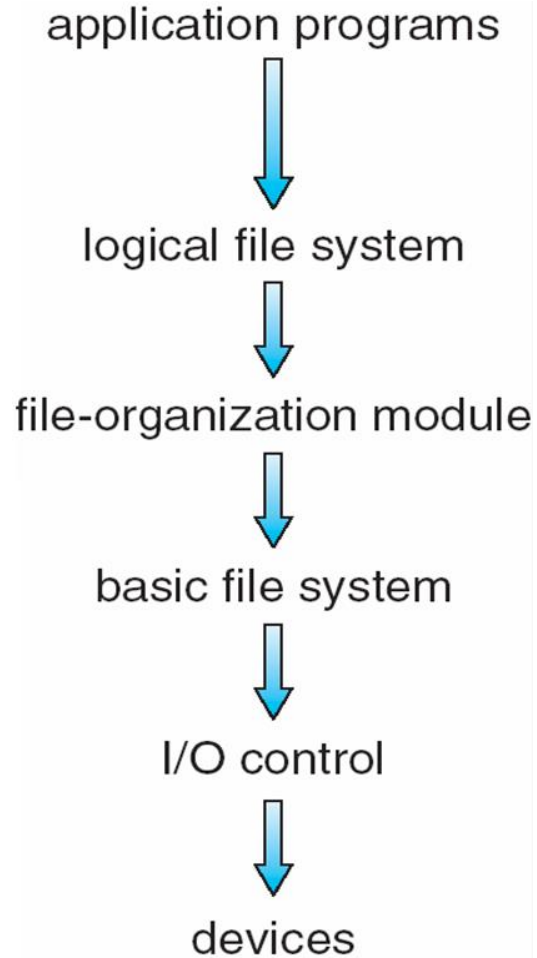


Chapter 12: File System Implementation





Layered File System and File Control Block

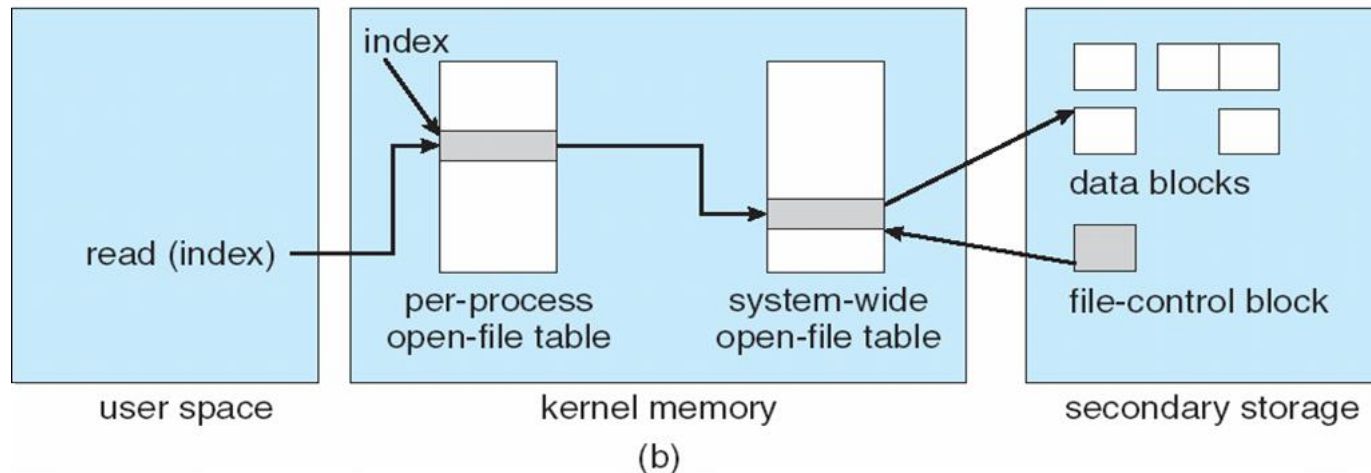
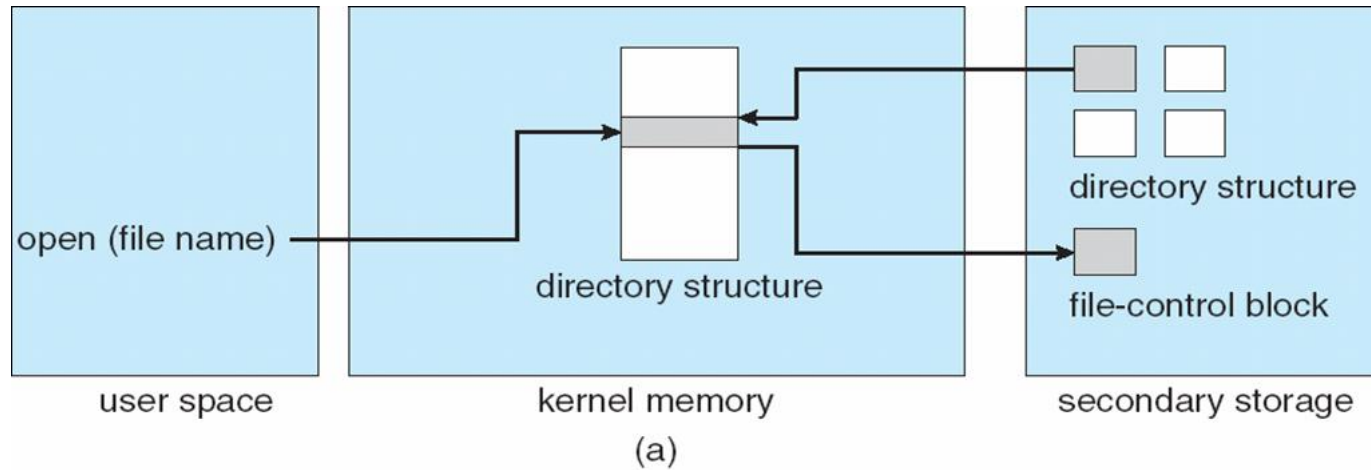


file permissions
file dates (create, access, write)
file owner, group, ACL
file size
file data blocks or pointers to file data blocks





In-Memory File System Structures





Directory Implementation

- **Linear list** of file names with pointer to the data blocks.
 - simple to program
 - time-consuming to execute

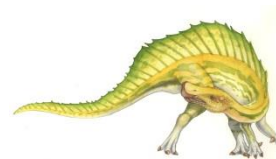
- **Hash Table** – linear list with hash data structure.
 - decreases directory search time
 - **collisions** – situations where two file names hash to the same location
 - fixed size





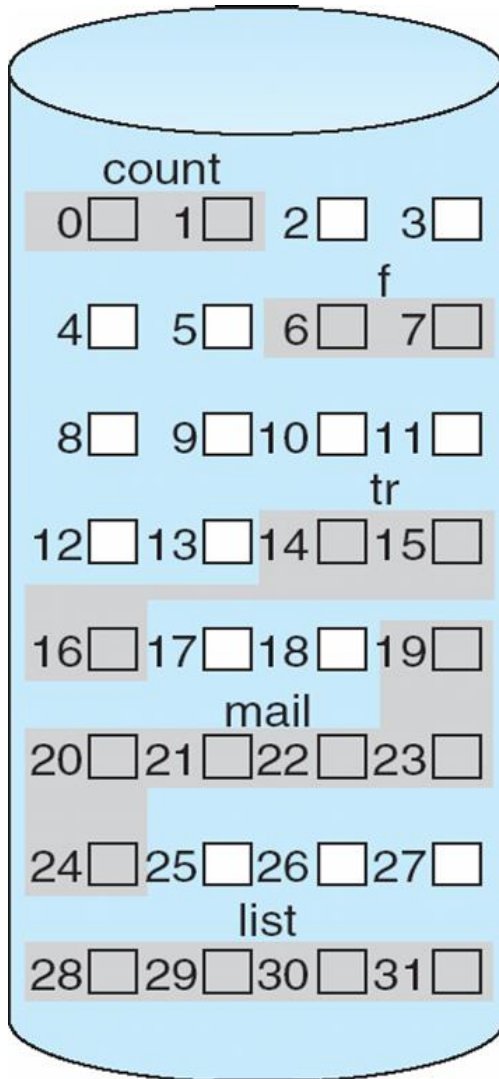
File Allocation Methods

- An allocation method refers to how disk blocks are allocated for files:
 - **Contiguous allocation**
 - **Linked allocation**
 - **Indexed allocation**





Contiguous Allocation of Disk Space



directory

file	start	length
count	0	2
tr	14	3
mail	19	6
list	28	4
f	6	2





Contiguous Allocation

- Each file occupies a set of contiguous blocks on the disk
- + Simple – only starting location (block #) and length (number of blocks) are required
- + Random access
- - Wasteful of space (dynamic storage-allocation problem)
- - Files cannot grow





Extent-Based Systems

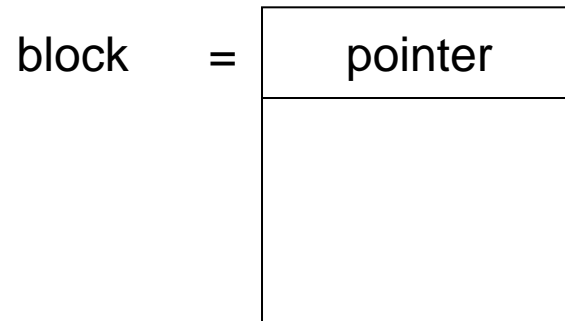
- Many newer file systems (I.e. Veritas File System) use a modified contiguous allocation scheme
- Extent-based file systems allocate disk blocks in **extents**
- An **extent** is a contiguous block of disks
 - Extents are allocated for file allocation
 - A file consists of one or more extents.





Linked Allocation

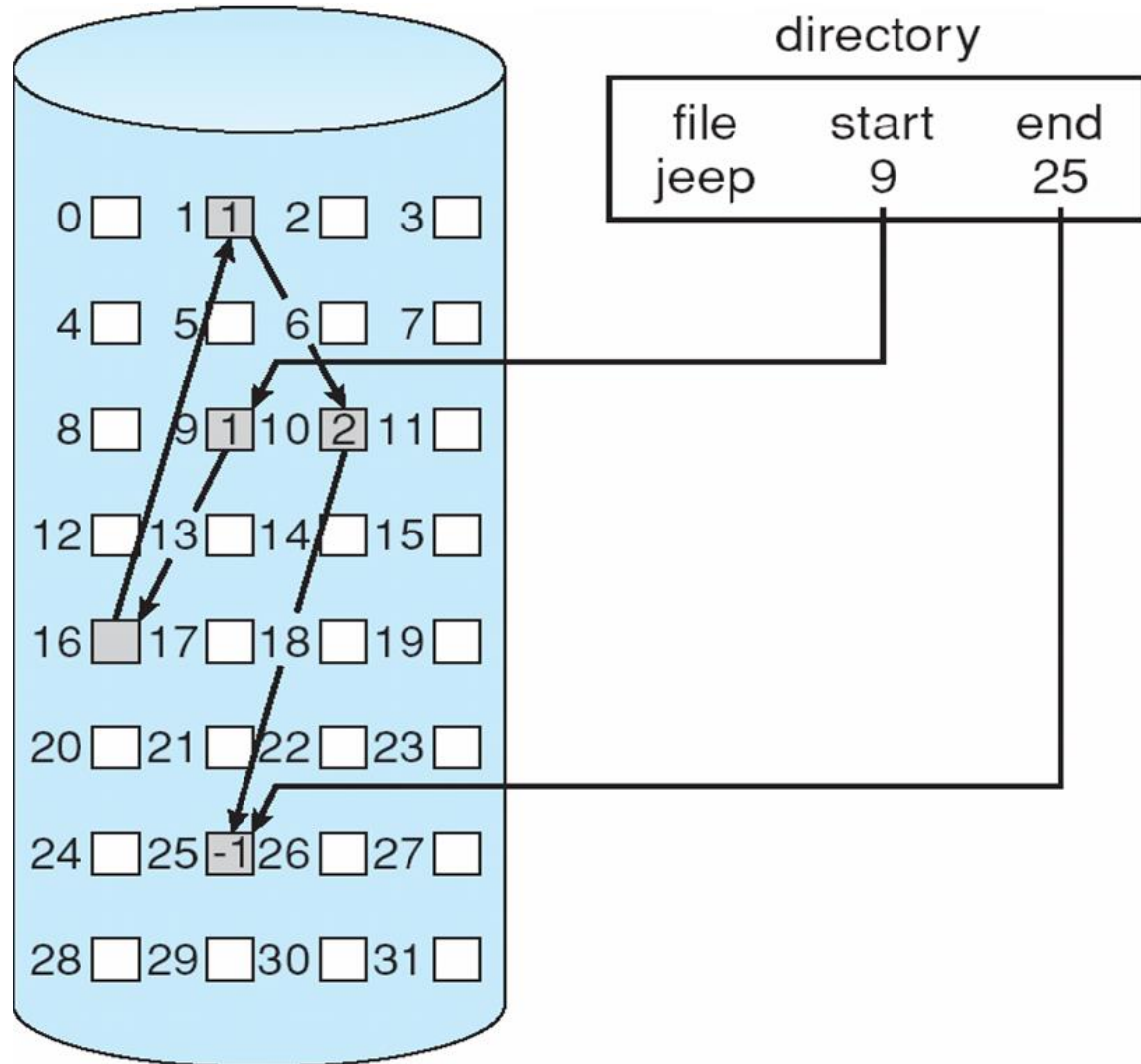
- Each file is a linked list of disk blocks: blocks may be scattered anywhere on the disk.





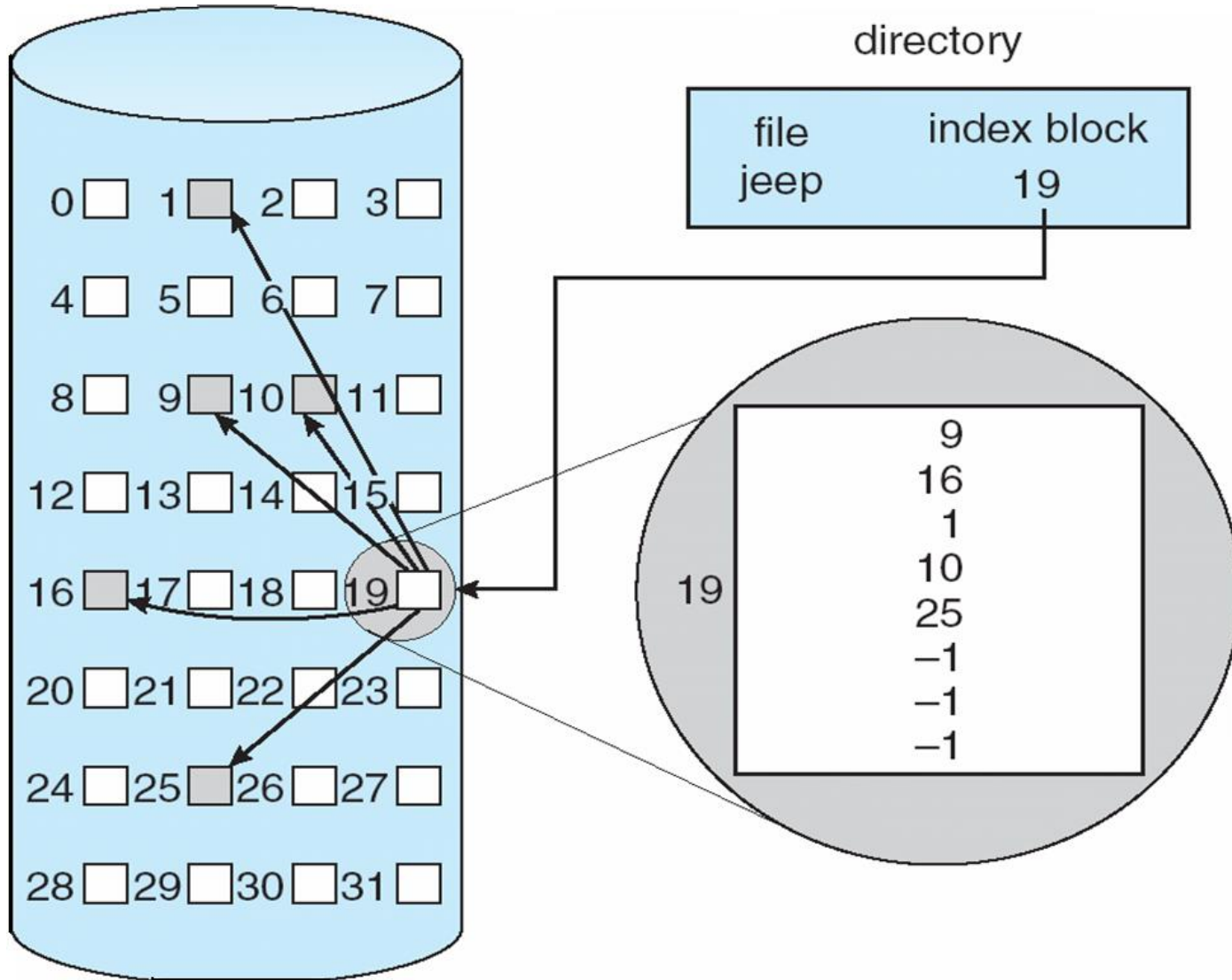
Linked Allocation (Cont.)

- + Free-space management system – no waste of space
- - No random access





Example of Indexed Allocation





Indexed Allocation

- - Need index table
- + Random access
- +/- Dynamic access without external fragmentation, but have overhead of index block.





Free-Space Management (Cont.)

- Bit map requires extra space

- Example:

block size = 2^9 bytes

disk size = 2^{39} bytes (512 gigabyte)

$n = 2^{39}/2^9 = 2^{30}$ bits (or ~125M bytes)



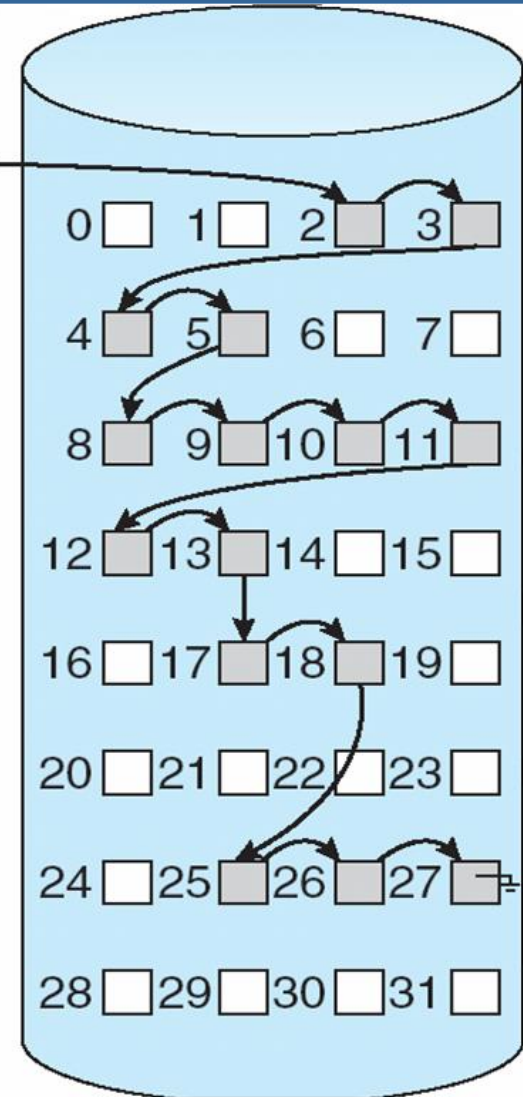


Linked Free Space List on Disk

Linked list (free list)

- Cannot get contiguous space easily
- corruption
- +No waste of space

free-space list head



End of Chapter 12

