CSE3241: Operating System and System Programming

Class-28

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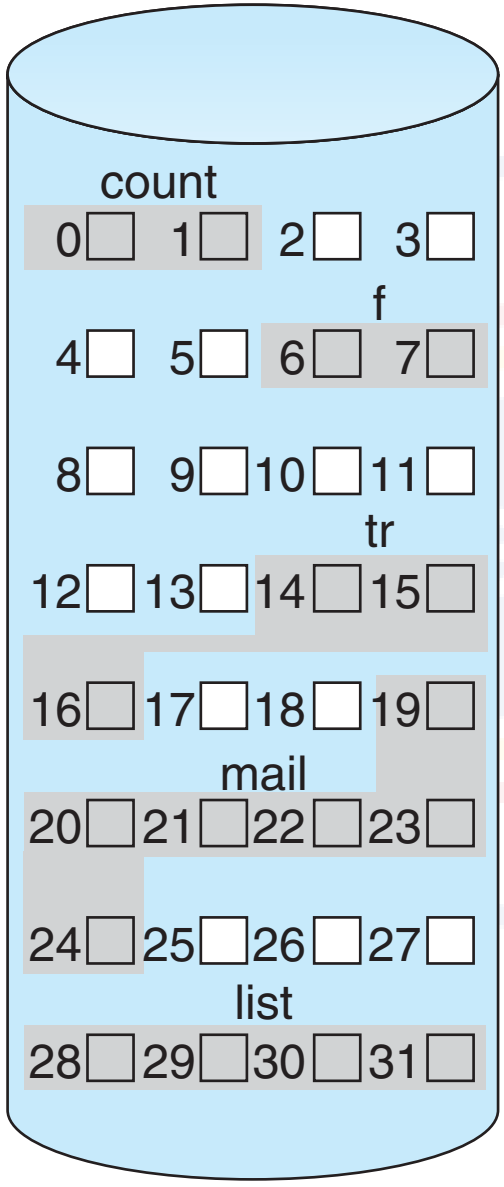
Disk Allocation Methods

- A file is a collection of related information defined by its creator.
- An important task of an OS is to handle files by:
  1. mapping files onto physical devices in order to store them permanently.
  2. organizing files for ease of use.
- During storing files onto secondary storage, OS needs to
  - utilize disk space effectively.
  - access files quickly.
- Three widely used disk allocation methods are:
  1. Contiguous Allocation of Disk Space.
  2. Linked Allocation of Disk Space.
  3. Indexed Allocation of Disk Space.

Contiguous Allocation of Disk Space [1]



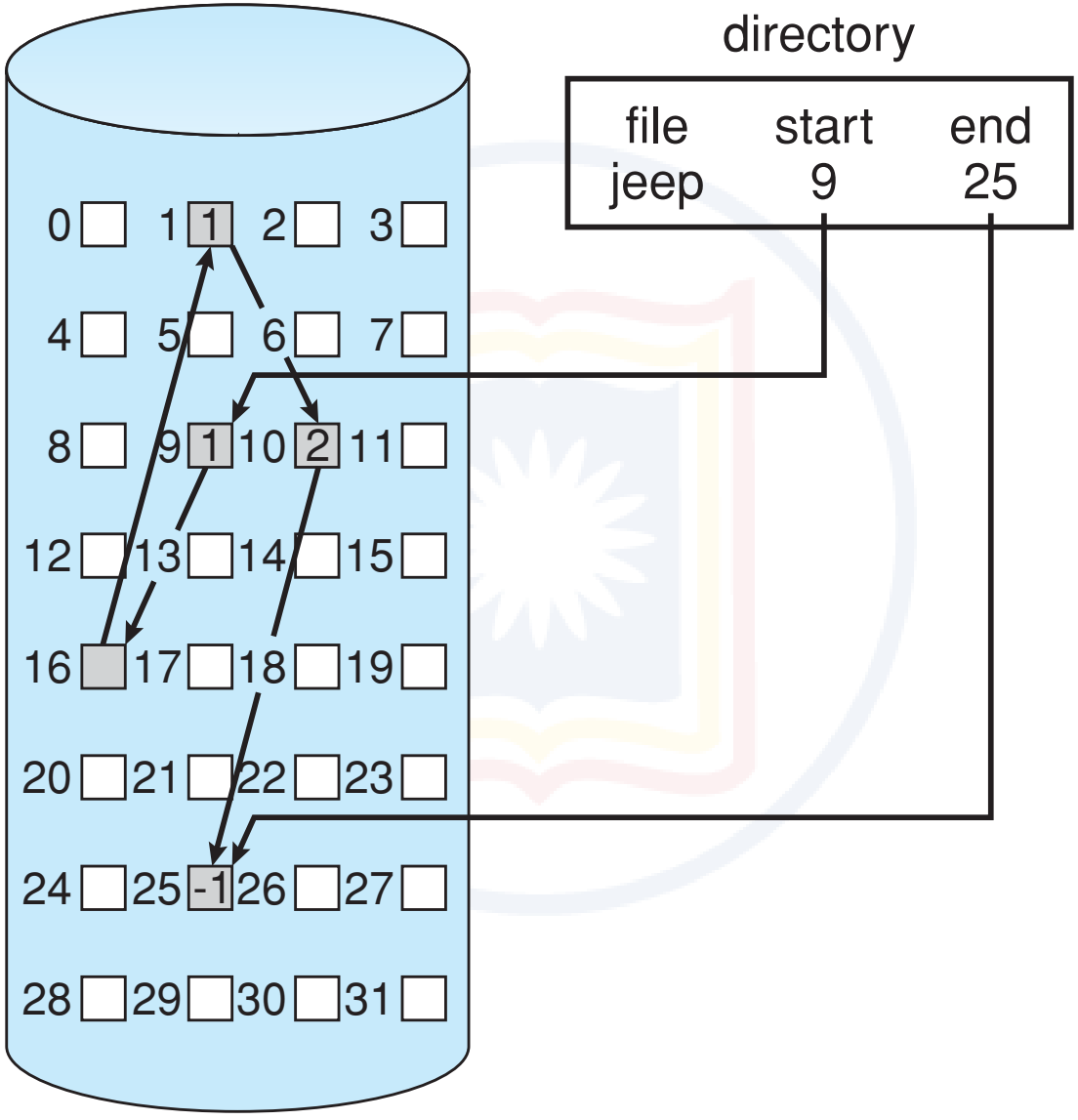
directory

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

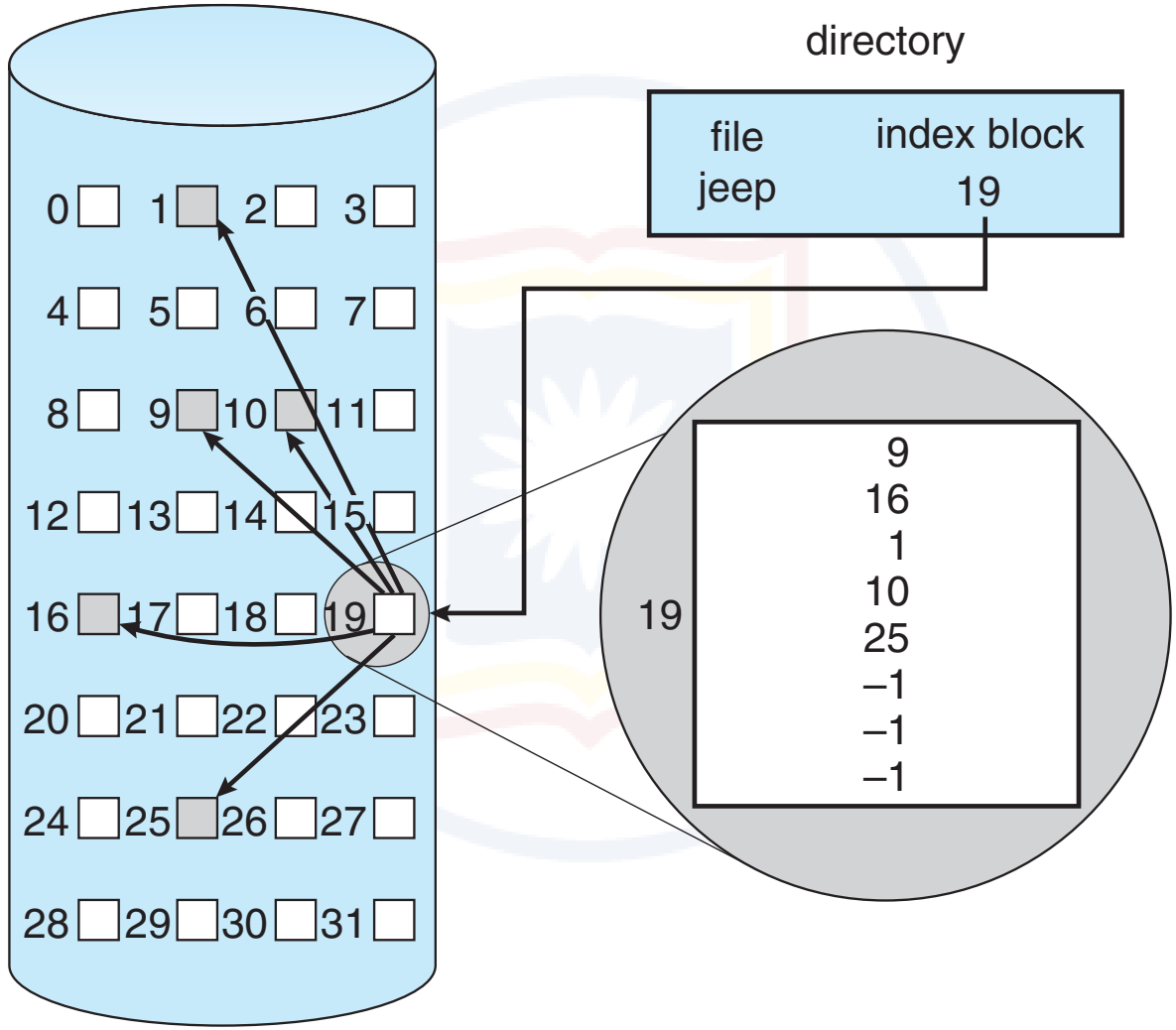
Fragmentation

- Fragments are small parts broken off or separated from something.
- Reducing fragments of memory or disk space is an important task of OS.
- Internal Fragmentation happens for using fixed size blocks/pages for all files/ processes.
- External Fragmentation happens for allocating and deallocating space in asynchronous way:

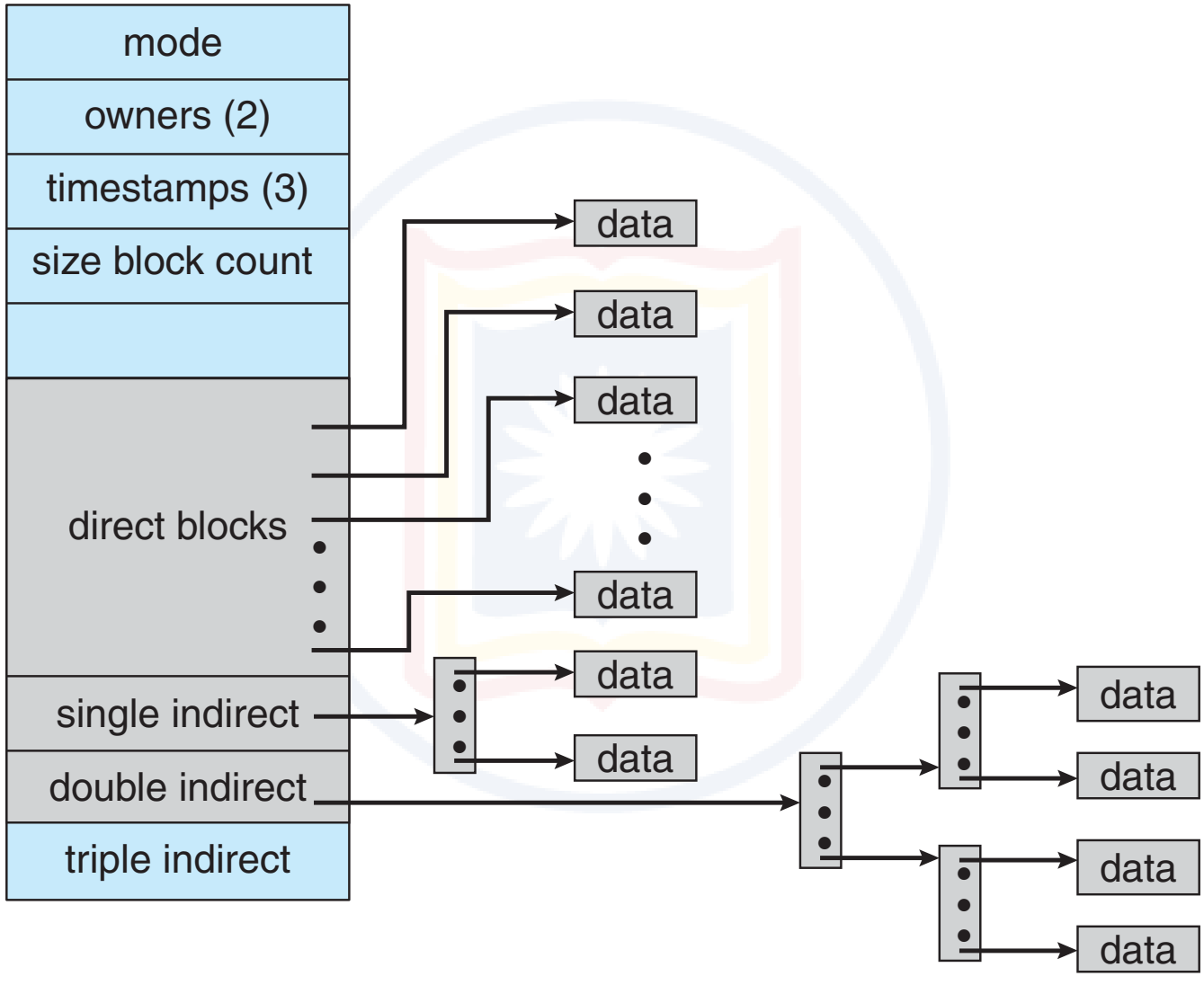
Linked Allocation of Disk Space [1]



Indexed Allocation of Disk Space [1]



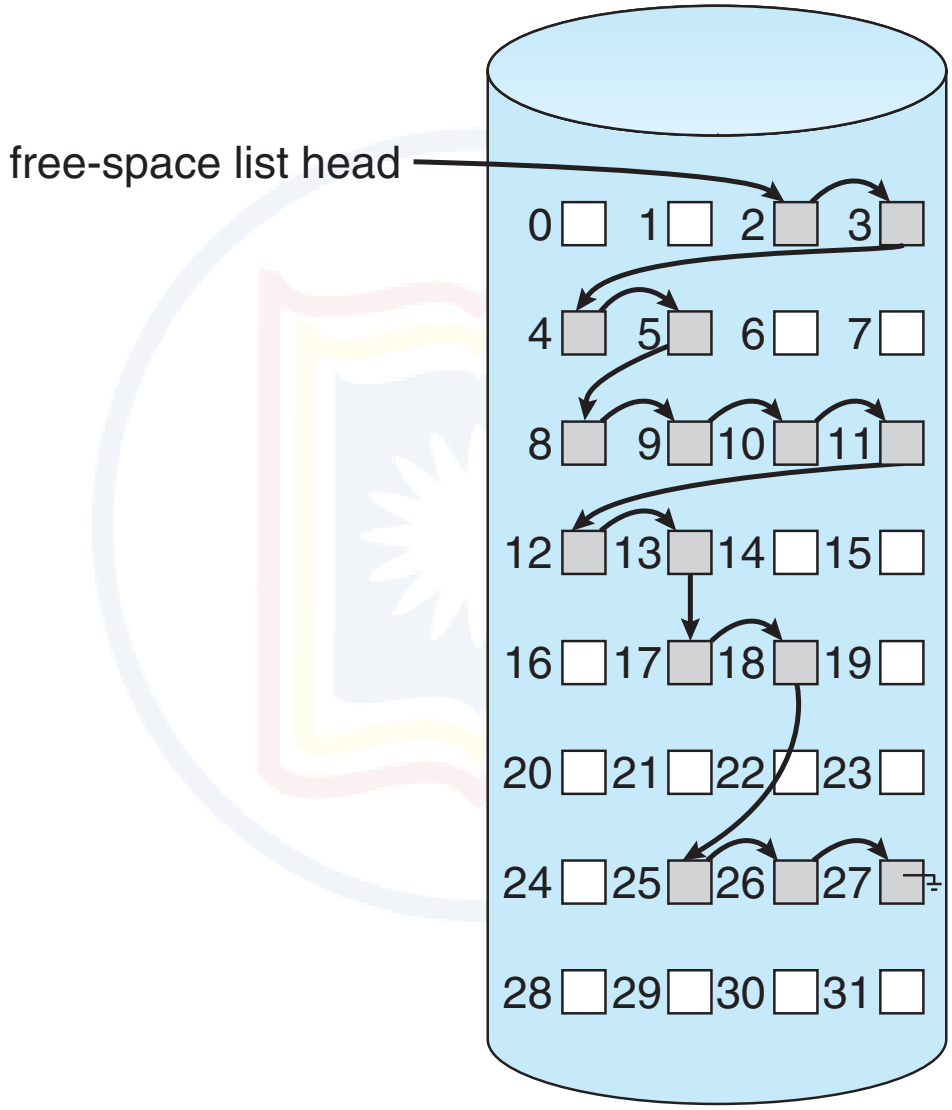
The UNIX inode [1]



Methods of Free Space Management

- Bit Vector:
  - A **bit** vector is used to store the status of each blocks.
  - Each block is represented by 1 bit in the bit vector.
  - If the block is free, it is 1, otherwise 0.
- Linked List
  - the first free block is stored in a special location in the disk & memory.
  - each free block contains the pointer to the next free block.
- Grouping:
  - the first free block will be stored in a special location.
  - the first free block contains pointers of the next **n** free blocks.
  - the **n-th** free block contains pointers of the next **n** free blocks.

Linked free-space list on the Disk [1]



References

P. B. Galvin A. Silbeschatz and G. Gagne.
Operating System Concepts.
John Wiley & Sons, 9 edition, 2012.