SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

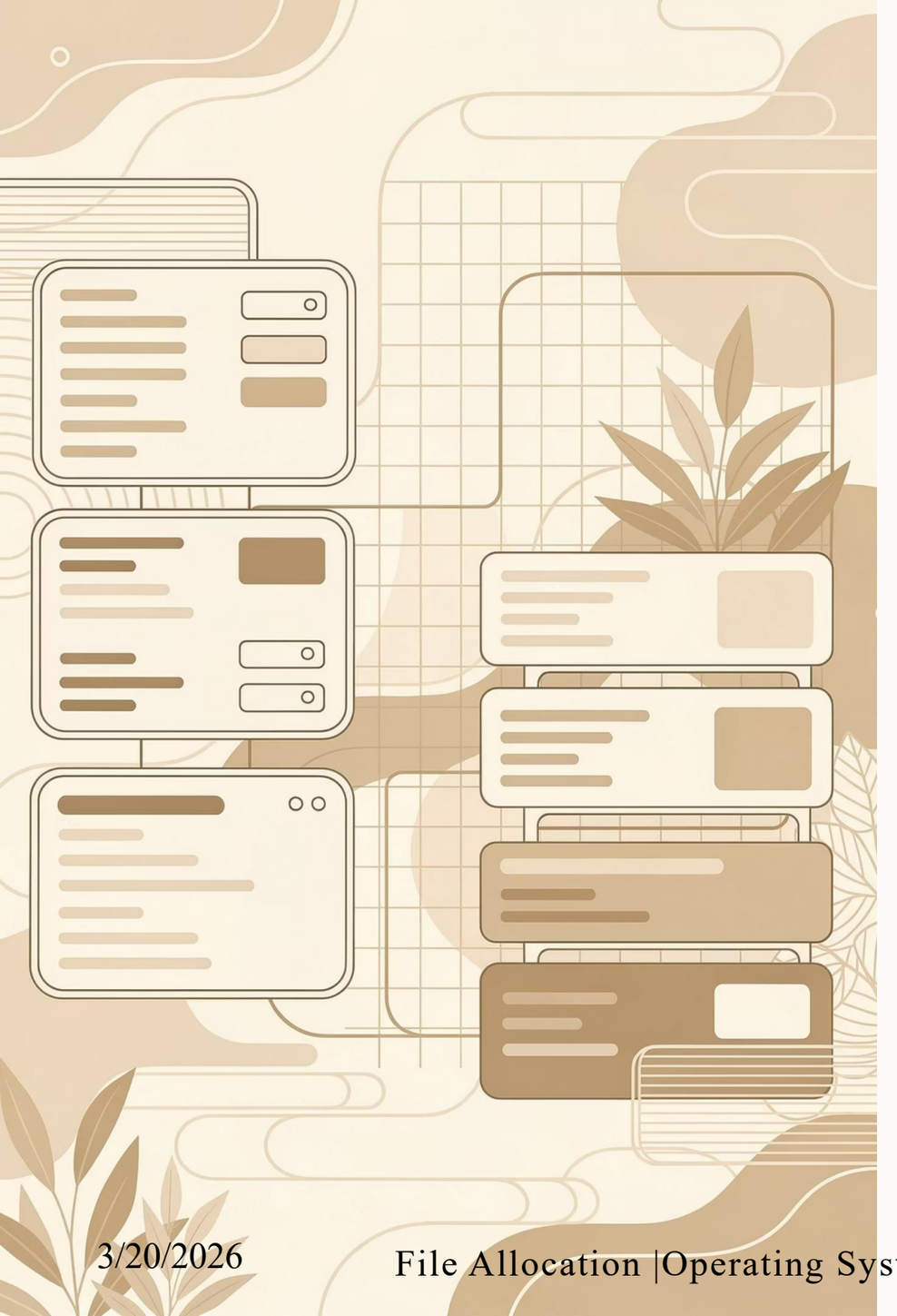
Department of Computer Science and Engineering

23CST206–OPERATING SYSTEMS AND VIRTUALIZATION

B.E- CSE /IV SEMESTER

UNIT – III MEMORY MANAGEMENT

Topic 6:File Allocation

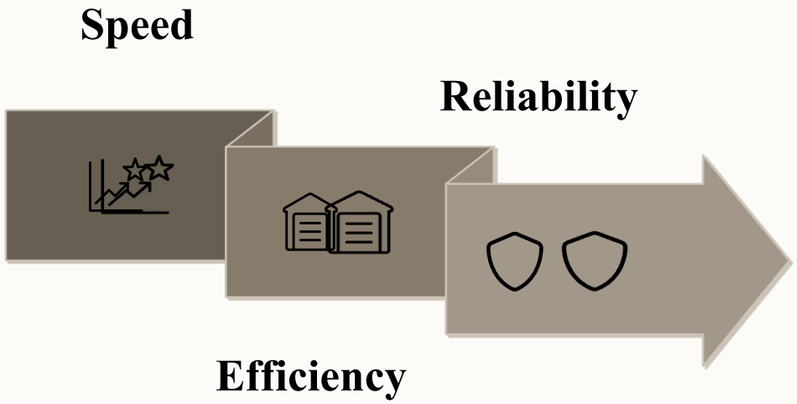


File Allocation Methods in Operating System

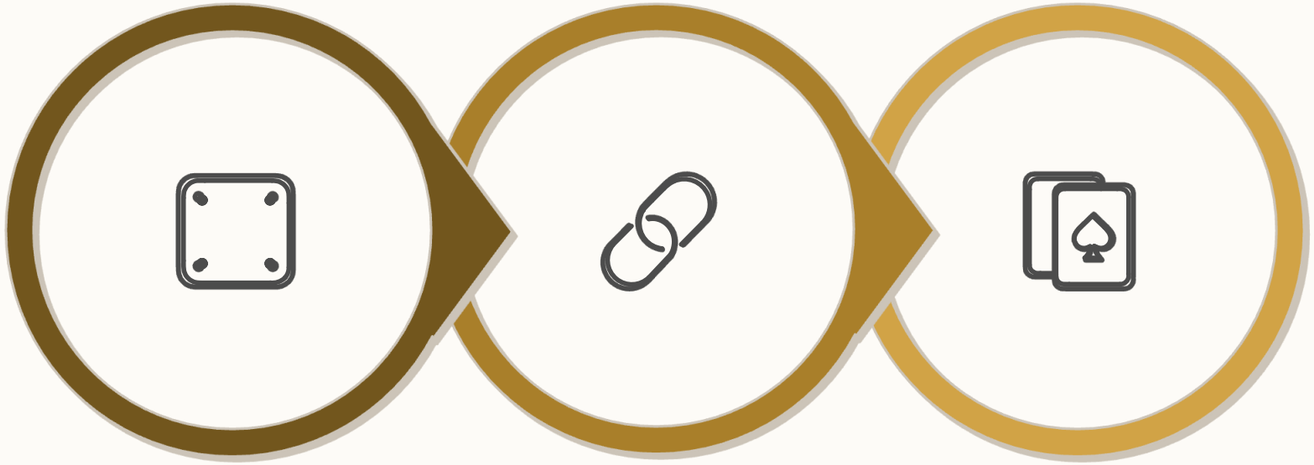
Understanding File Allocation

File allocation methods determine how disk blocks are assigned to files on secondary storage.

An efficient allocation method improves access speed, space utilization, and reliability of the file system.



Three Major Allocation Methods



Contiguous Allocation

Linked Allocation

Indexed Allocation

METHOD 1

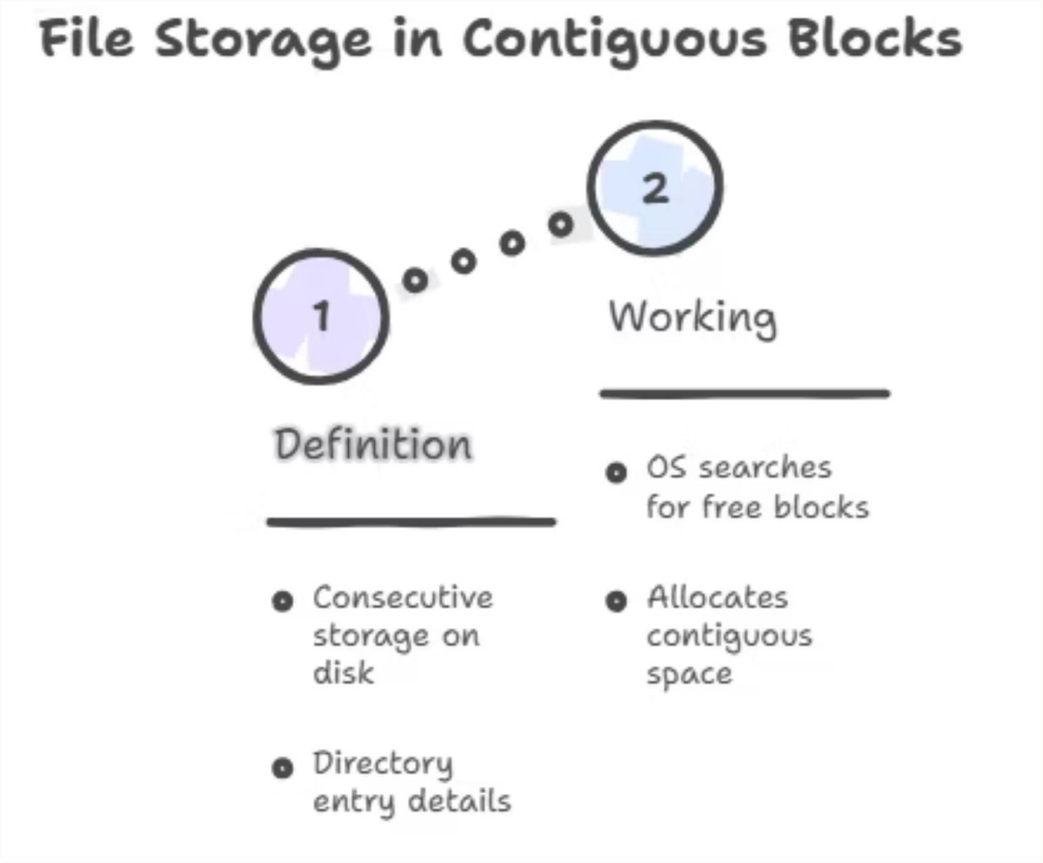
Contiguous Allocation

Definition

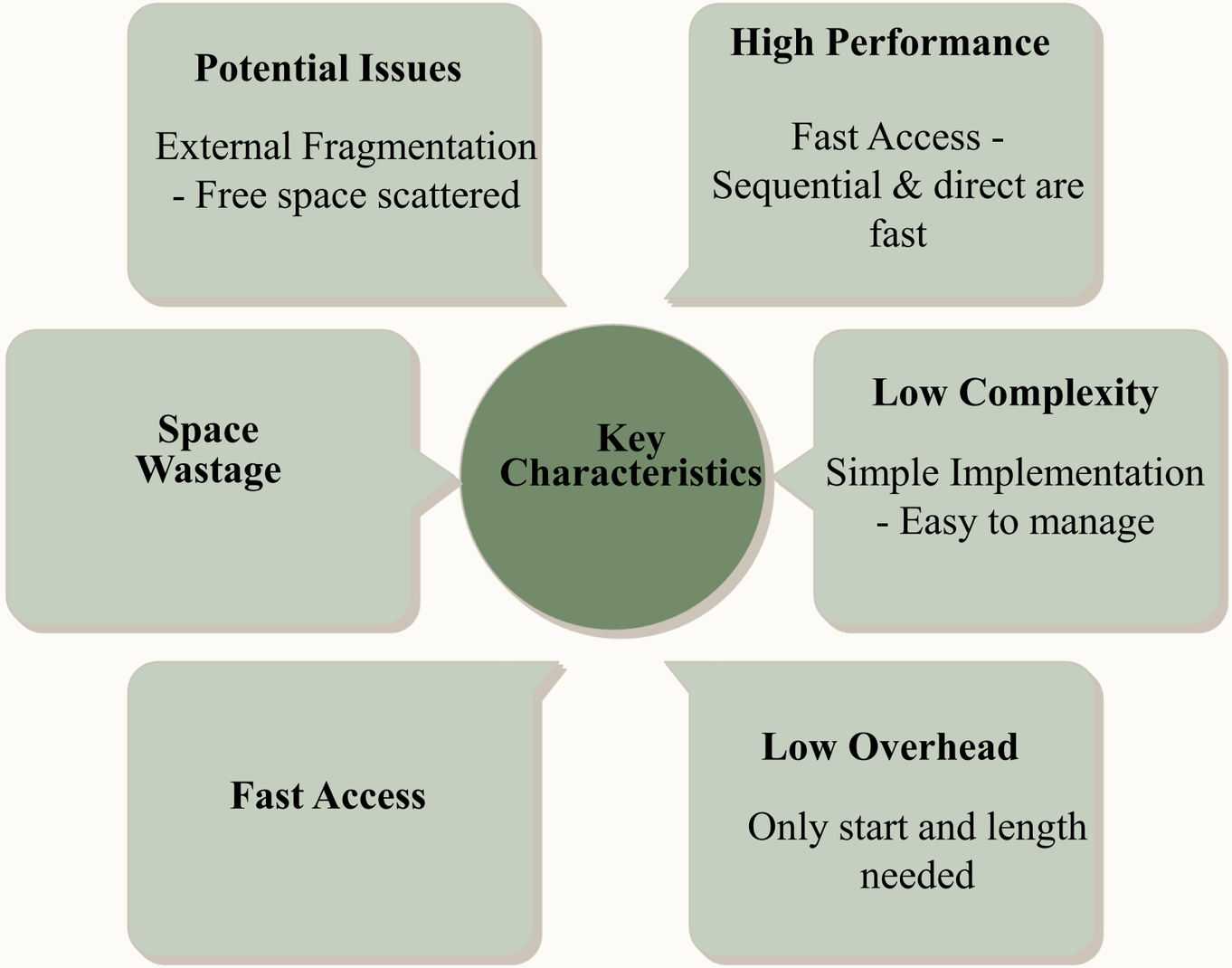
All blocks of a file are stored consecutively on the disk. The directory entry contains starting block address and length (number of blocks).

Working

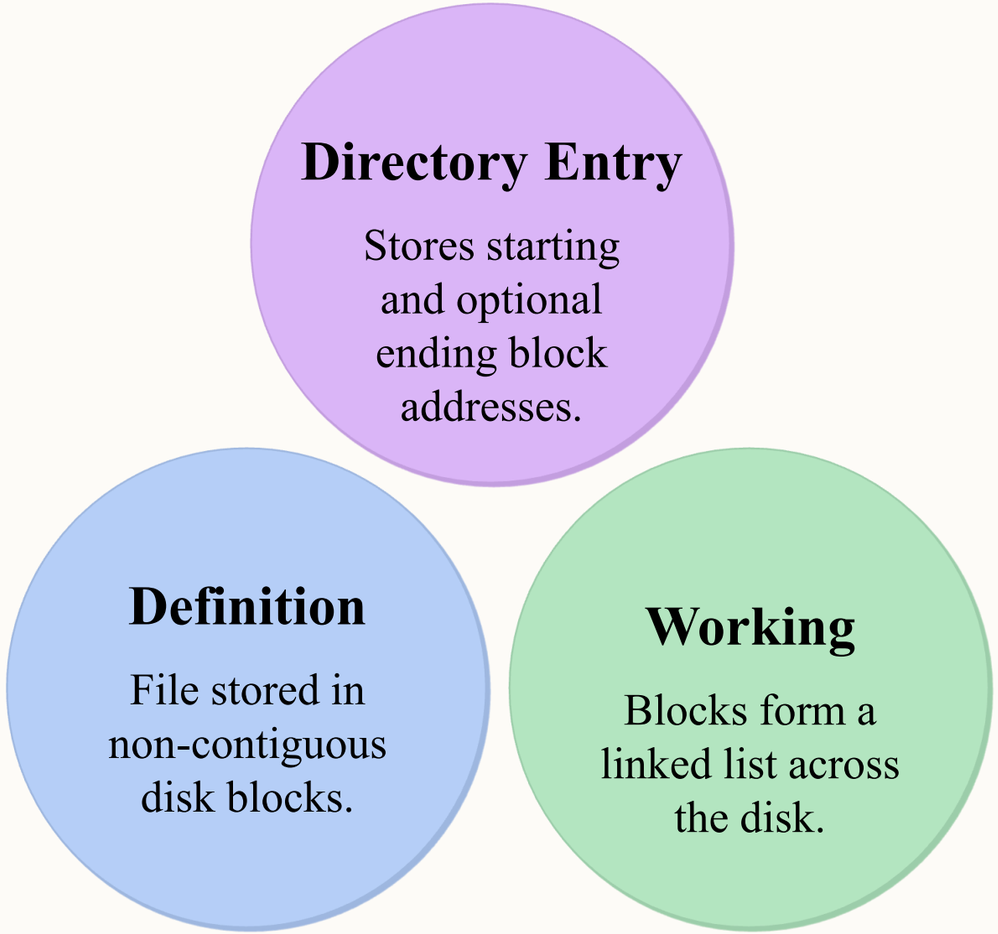
When a file is created, the operating system searches for a sequence of free contiguous blocks and allocates them to the file.



Contiguous Allocation: Trade-offs



Linked Allocation

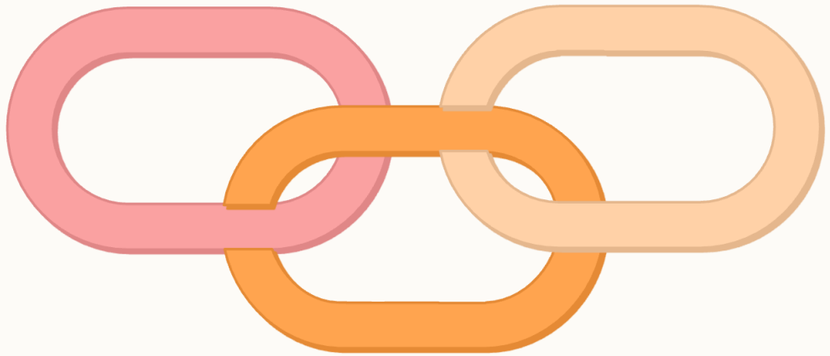


METHOD 3

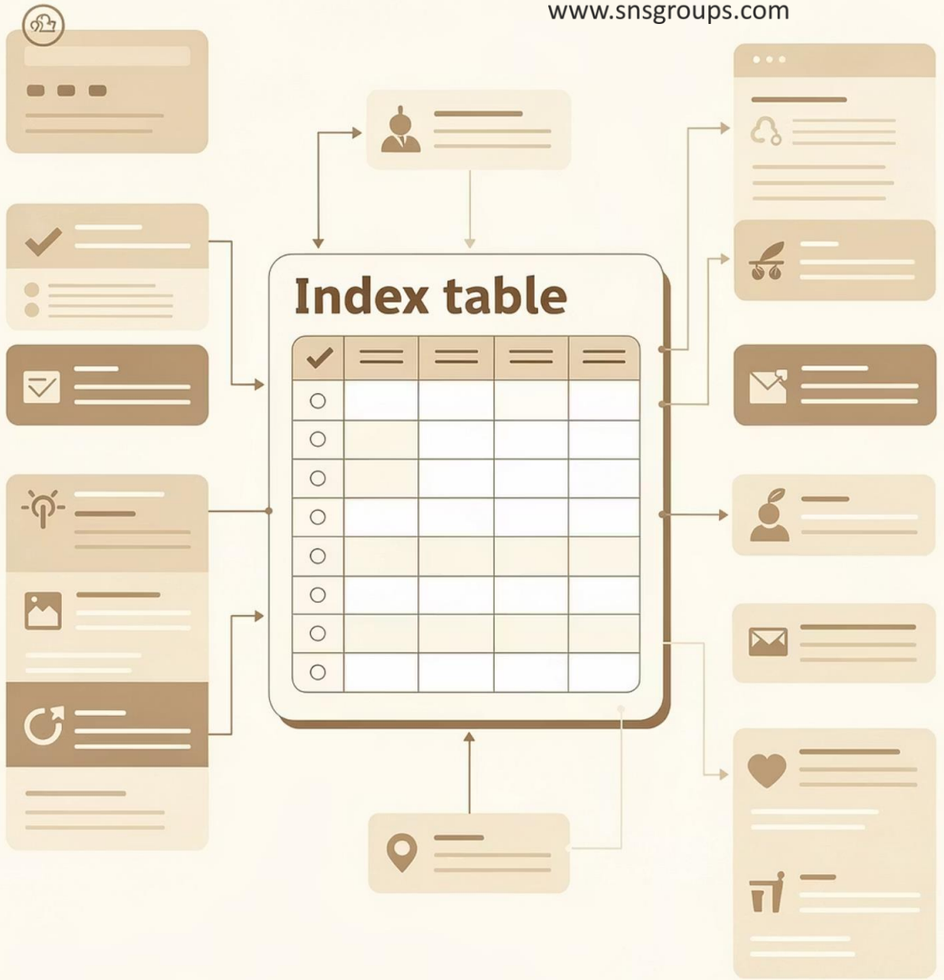
Indexed Allocation

Each file has a separate index block that contains all the addresses of the file's data blocks. The directory entry contains the address of the index block.

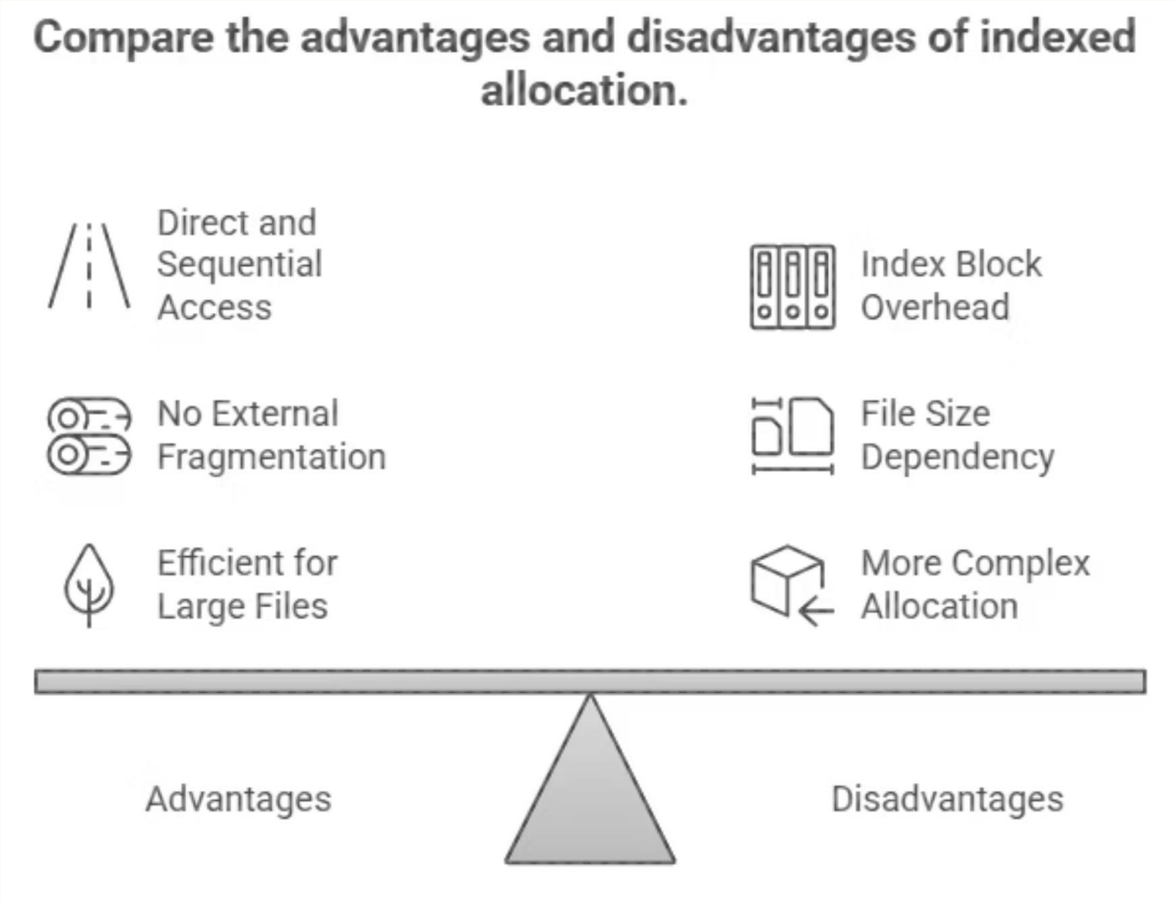
File Creation **Block Placement**

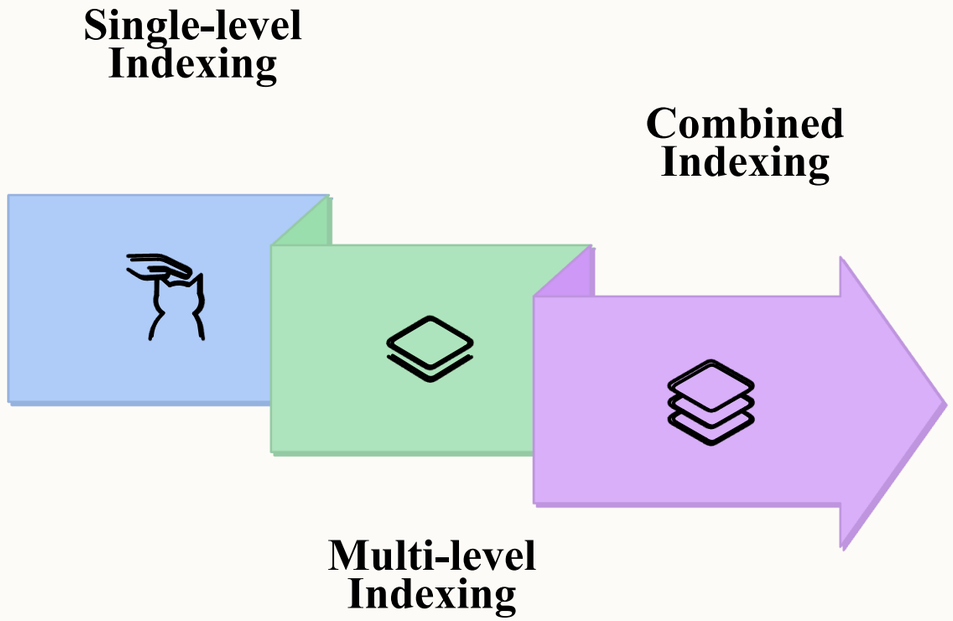


Index Storage

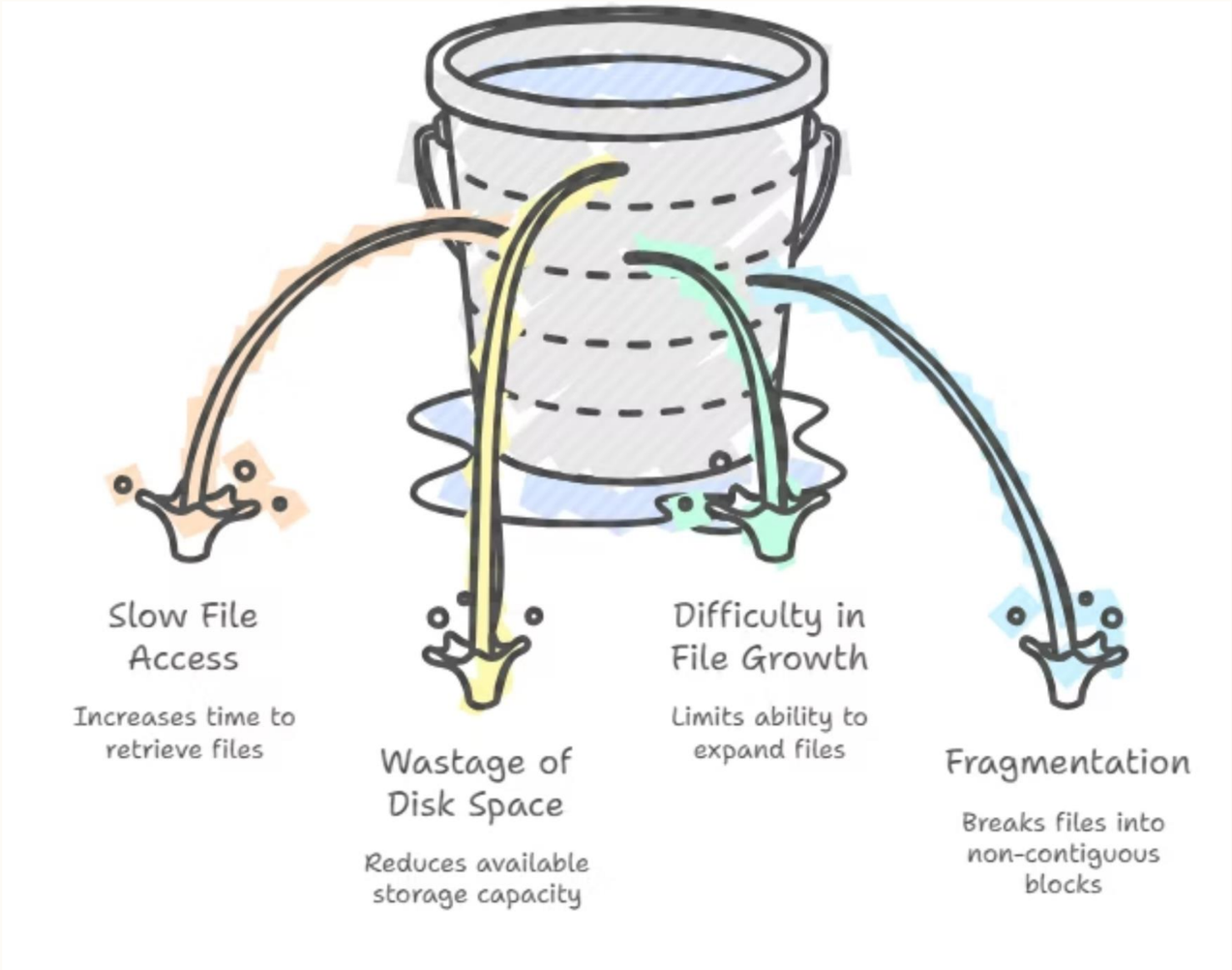


Indexed Allocation: Analysis





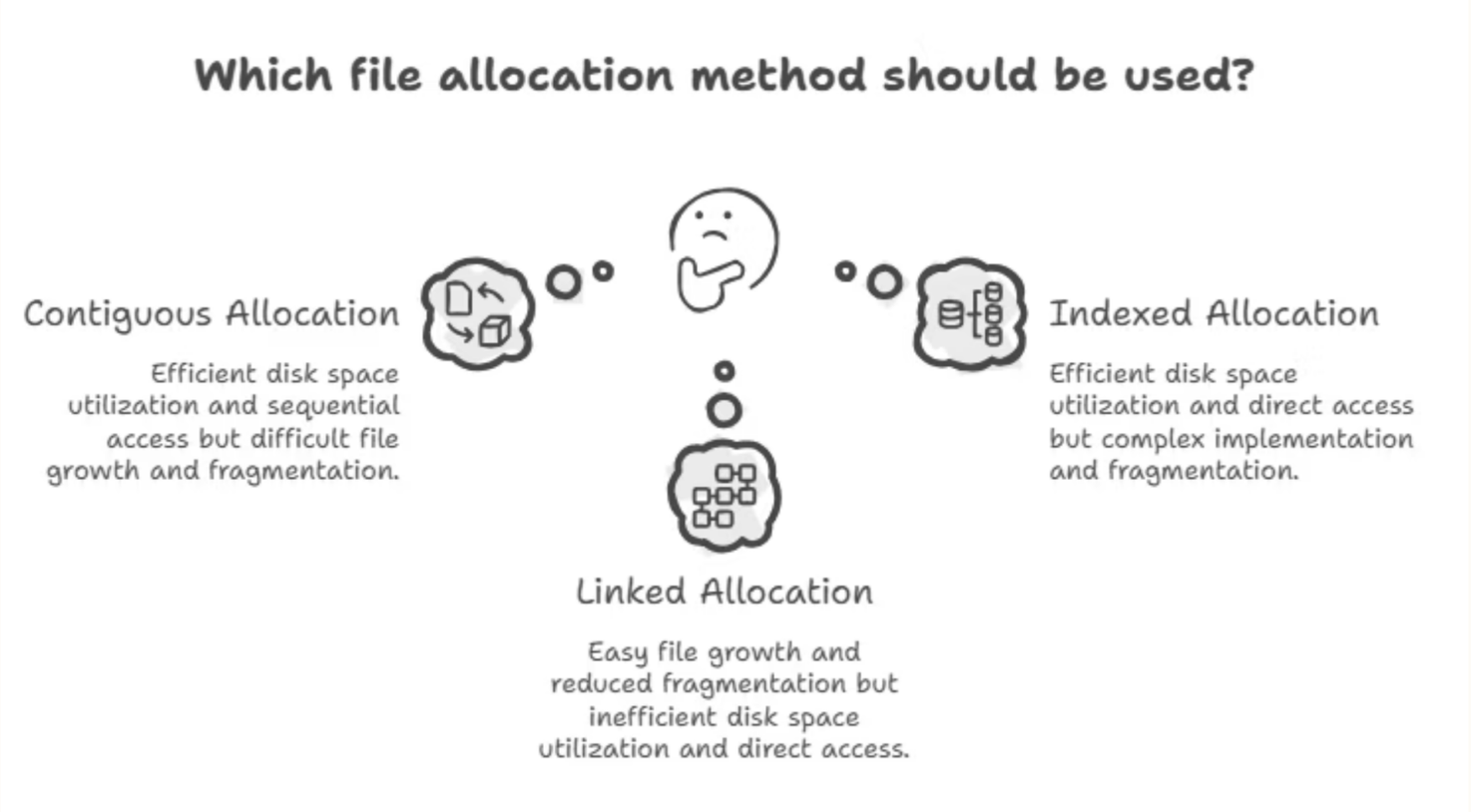
Problem Statement



DEFINE

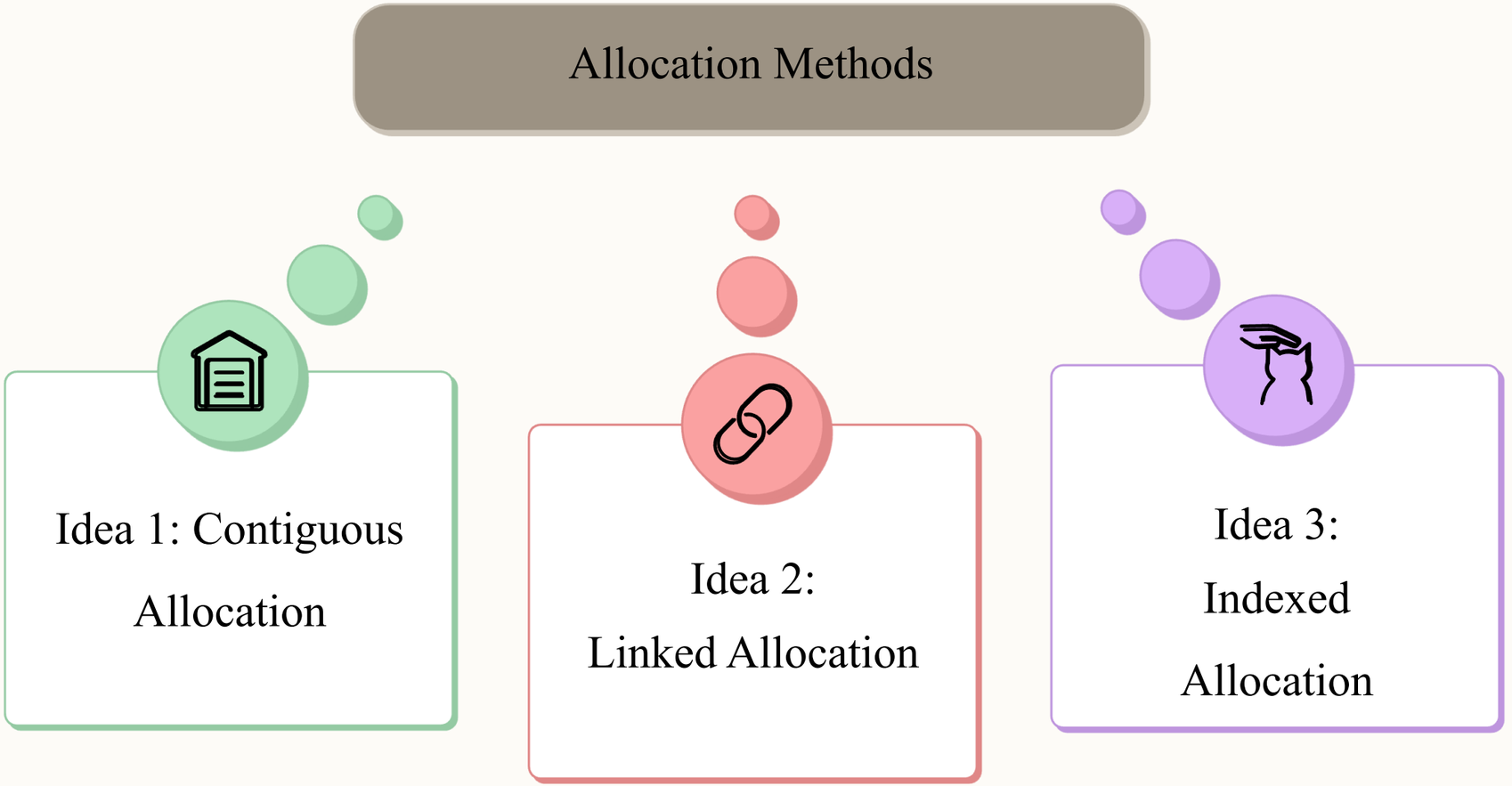
Understanding the Problem

File allocation methods define how disk blocks are assigned to files. The main requirements of a good file allocation strategy are:

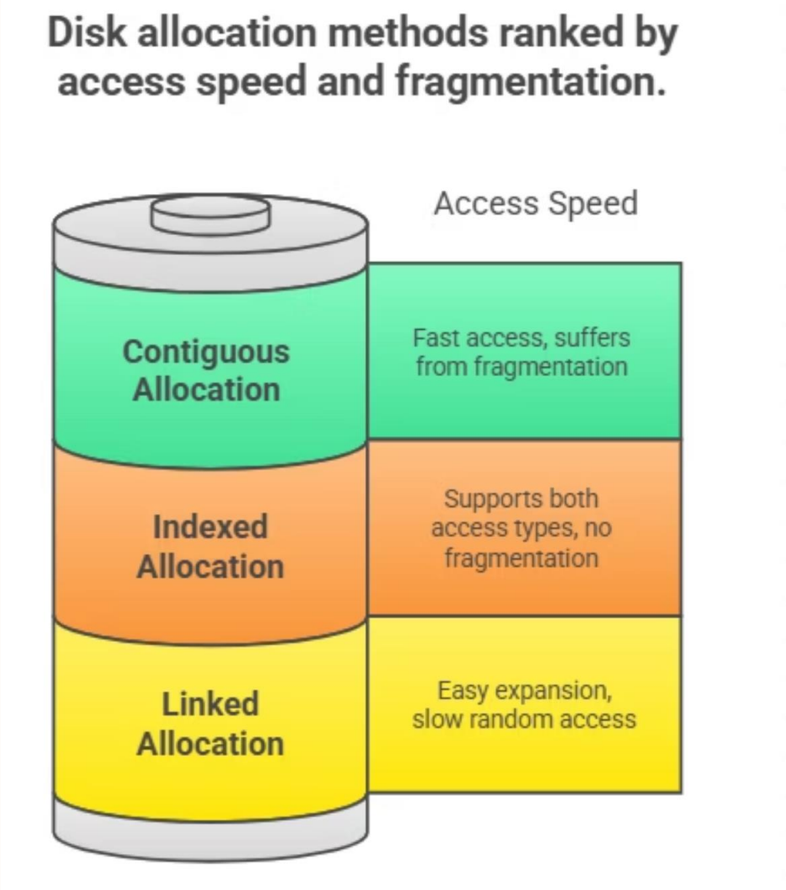


IDEATE

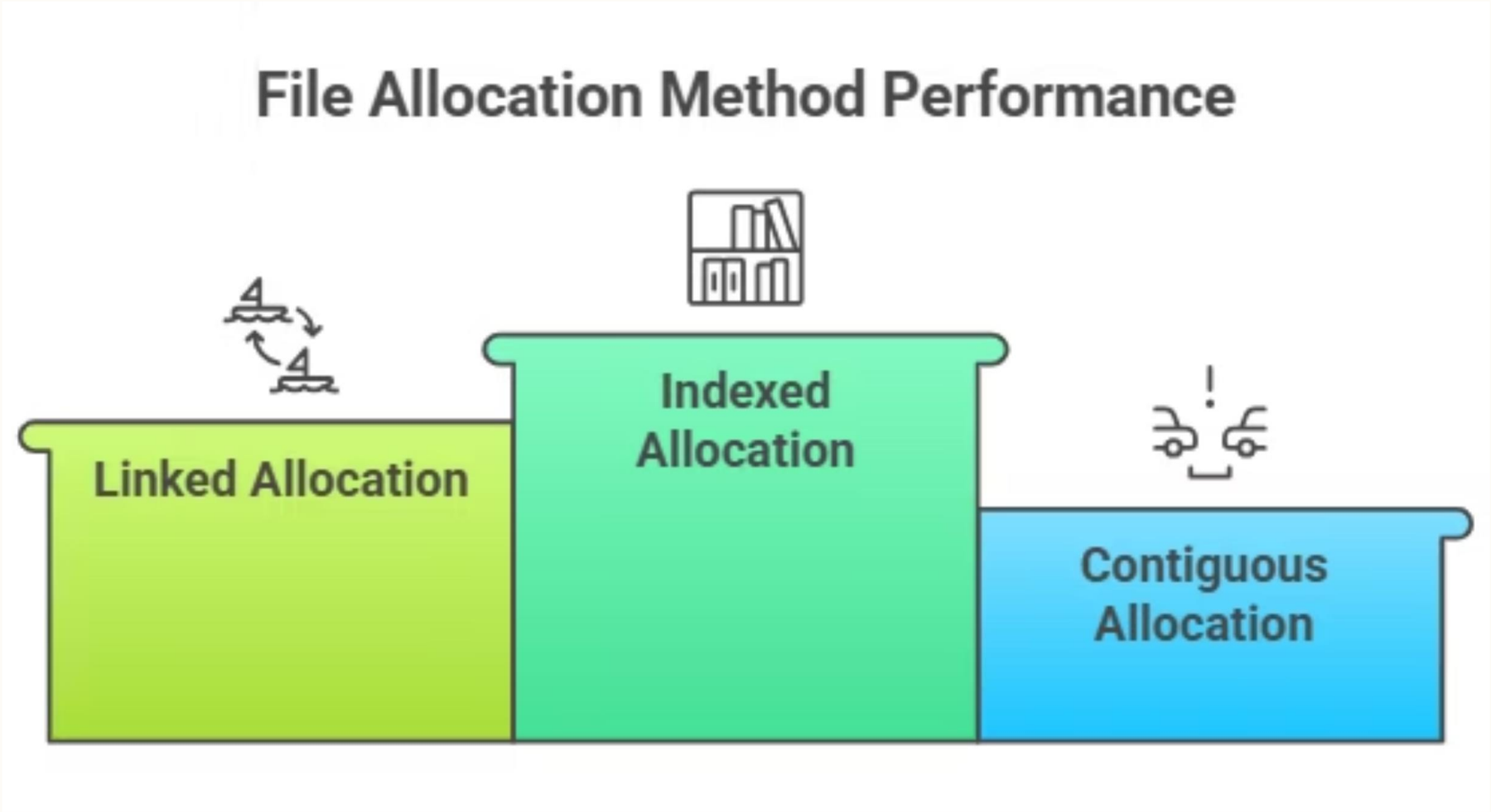
Possible Solutions



Implementation Concepts



Evaluation Results



CHALLENGE

File Allocation Puzzle

An operating system uses a disk with blocks numbered from 0 to 19. Three files A, B, and C are stored using different allocation methods.

File A

Occupies disk blocks 5 to 9 continuously

File B

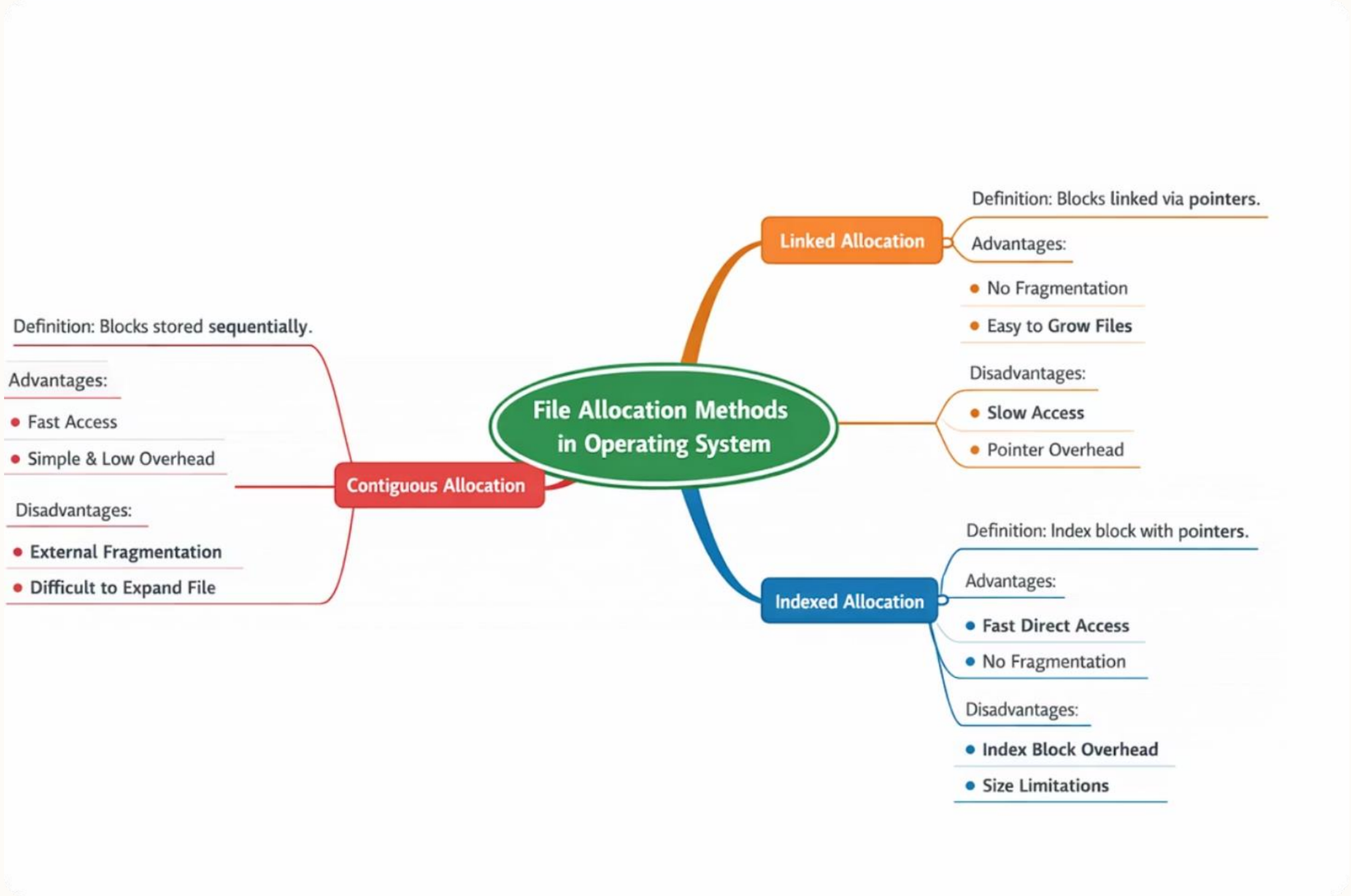
Uses blocks in this order: 2 → 14 → 6 → 18

File C

Has index block at block 3. Index contains pointers to data blocks 1, 7, 10, and 15

Tasks (Think and Solve)

1. Identify which file allocation method is used for File A, File B, and File C
2. If block 6 becomes corrupted, which file will be partially or fully inaccessible, and why?
3. Which file allows the fastest direct access to its third data block? Explain your reasoning


File Allocation Methods in Operating System
Linked Allocation
Definition: Blocks linked via pointers.
Advantages:
No Fragmentation
Easy to Grow Files
Disadvantages:
Slow Access
Pointer Overhead
Contiguous Allocation
Definition: Blocks stored sequentially.
Advantages:
Fast Access
Simple & Low Overhead
Disadvantages:
External Fragmentation
Difficult to Expand File
Indexed Allocation
Definition: Index block with pointers.
Advantages:
Fast Direct Access
No Fragmentation
Disadvantages:
Index Block Overhead
Size Limitations