UTTARANCHAL UNIVERSITY

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Premnagar-248007, Dehradun, Uttarakhand, INDIA

ASSIGNMENT COVER PAGE

Name of Student:	**Adarsh**
Batch:	**July 2023**
Program:	**Bachelors of Computer Applications (OL)**
Subject & Code:	**Operating Systems, OBCA-233**
Semester:	**3rd**
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NECESSARY INSTRUCTIONS

1. Cover Page must be filled in Capital Letters. All Fields of the Form are compulsory to be filled.
2. The assignment should be written / computer typed on A4 size paper and it should be neat and clearly readable.
3. The cover page should be stapled at the front of each and every assignment.
4. Incomplete Assignments will not be accepted.

QUESTION :

Enumerate Space allocation methods. Discuss their advantages and disadvantages.

ANSWER :

Space Allocation Methods in File Systems:

Space allocation in file systems refers to the way disk space is managed and allocated for storing files. The primary space allocation methods are:

1. Contiguous Allocation:

Description:
- Files are stored in contiguous blocks on the disk.

- The file system maintains the starting block and the length of the file.

Advantages:
- Simple to implement.

- High performance for sequential access, as all blocks are located together.

- Easy to calculate the physical address of a file block.

Disadvantages:
- External Fragmentation: Free space gets scattered, making it hard to find a large enough contiguous block.

- File Size Limitation: Files cannot grow beyond the available contiguous space.

- Requires defragmentation to improve space utilization.

2. Linked Allocation:

Description:
- Each file is a linked list of disk blocks. Each block contains a pointer to the next block.

Advantages:
- No external fragmentation.

- Files can grow dynamically as needed.

- Efficient use of disk space.

Disadvantages:
- Sequential Access Only: Random access is slow, as the system must traverse the list to find specific blocks.

- Pointer Overhead: Each block requires additional space for the pointer.

- Susceptible to pointer corruption, which can make the file inaccessible.

3. Indexed Allocation

Description:
- Each file has an index block containing pointers to all the disk blocks used by the file.

Advantages:

- Supports random access, as any block can be accessed directly through the index.

- No external fragmentation.

- Files can grow without rearranging disk blocks.

Disadvantages:
- Index Overhead: Requires additional disk space for the index block.

- Limited File Size: The number of pointers in the index block limits the maximum file size (can be mitigated using multi-level indexing).

4. Multilevel Indexed Allocation

Description:
- Uses a hierarchy of index blocks, where an index block may point to other index blocks or data blocks.

Advantages:
- Allows support for very large files.

- Efficient use of disk space for smaller files with direct pointers.

Disadvantages:
- Increased complexity in implementation.

- Overhead for accessing blocks due to multiple levels of indexing.

5. Extent-Based Allocation

Description:

- Files are allocated in extents, which are contiguous blocks of disk space. A file may have multiple extents.

Advantages:
- Reduces fragmentation compared to purely contiguous allocation.

- Good performance for sequential access.

- Supports dynamic file growth by adding extents.

Disadvantages:
- Can lead to external fragmentation over time.

- Complexity in managing extents, especially for large files with many non-contiguous extents.

Conclusion:

Each space allocation method has its trade-offs. The choice of method depends on the specific requirements of the file system, such as the need for random vs. sequential access, file size flexibility, and space utilization efficiency.