Operating System:
File Allocation Methods

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File

A file is a named collection of related information that is recorded on secondary storage.

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File Allocation Methods

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Question

Disk block address = 14 bits

Each disk block size = 1KB

Maximum size of a file = ? = size of disk = $2^{14} * 1KB$

= 16 MB

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File Allocation Methods

1. Contiguous Allocation
2. Linked Allocation
3. Indexed Allocation

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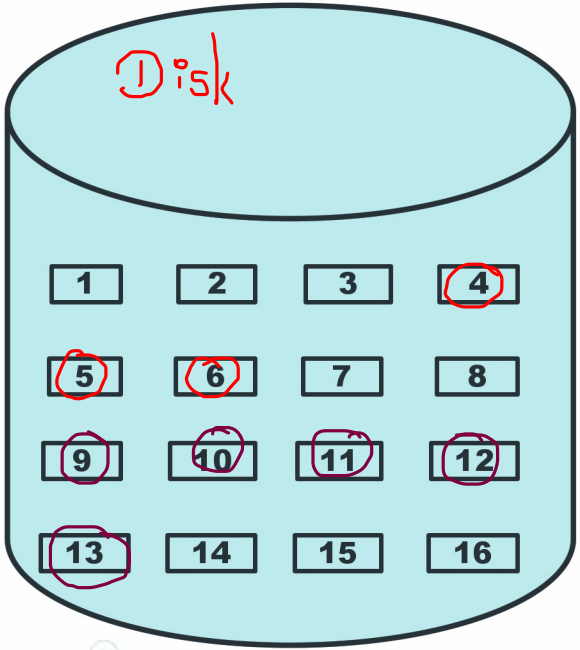
Contiguous Allocation



File allocatⁿ table

File name	start block no.	no. of blocks
abc.doc	4	3
xyz.pdf	9	5

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Contiguous Allocation

Performance:

1. Fragmentation: Internal, External
2. Increase in File size: Inflexible
3. Type of access: Sequential, Random/direct

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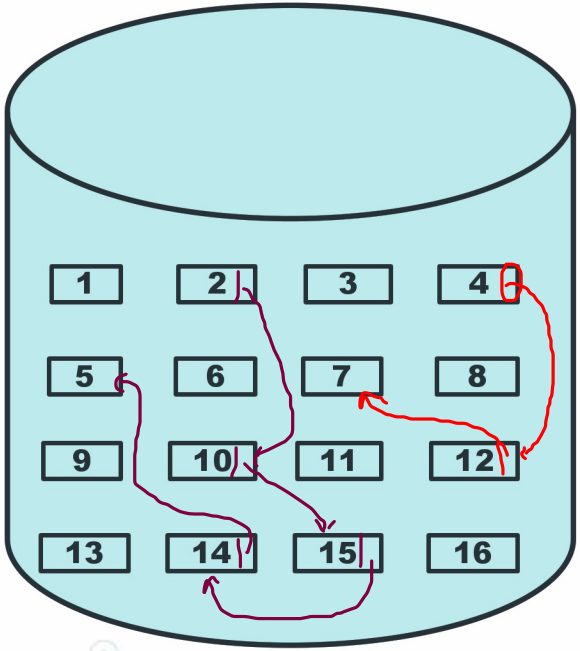
Linked Allocation



File allocation table

file name	start block no.	last block no.
abc.doc	4	7
xyz.pdf	2	5

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Linked Allocation

Performance:

1. Fragmentation: Internal
2. Increase in File size: Flexible
3. Type of access: Sequential

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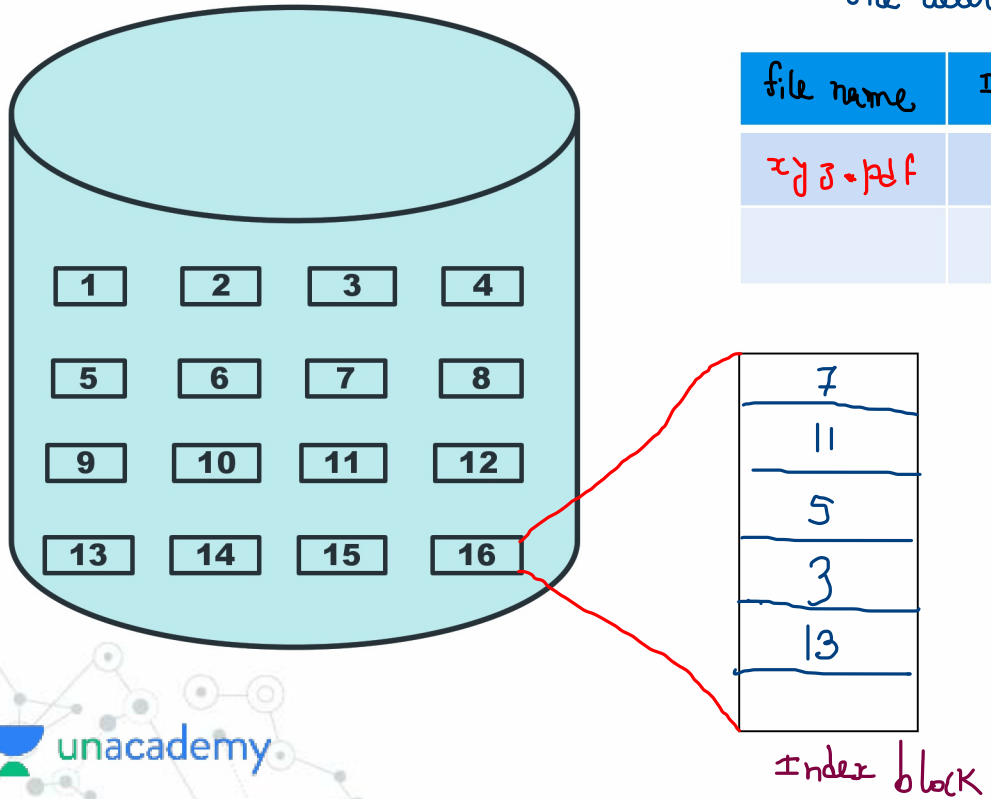
Indexed Allocation



file allocation table

file name	Index block
xyz.pdf	16

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Indexed Allocation

Performance:

1. Fragmentation: Internal
2. Increase in File size: Flexible
3. Type of access: Sequential, Random/direct

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Question

Disk block address = 16 bits $= 2^{16}$ blocks

Disk block size = 1KB

Index block = 1KB

Maximum file size? $= 2^{9} * 1KB = 512KB$

no. of index entries in a single block $= \frac{1KB}{2B}$

$= 512$

$= 2^{9}$

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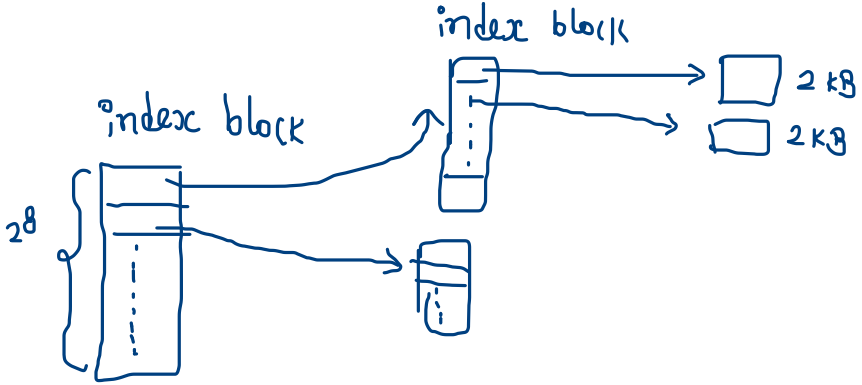
2 level indexing

one block no. = 64-bits = 8B

block size = 2kB

max file size = ?



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no. of index entries in a single block $= \frac{2kB}{8B}$

$= 256$ or 2^8

$= 2^8 * 2^8 * 2kB = 2^{27} B = 128\ MB$ Ans

Master Boot Record

A master boot record (MBR) is a special type of boot sector at the very beginning of partitioned computer mass storage devices.

- Contains the information regarding how and where the OS is located in the hard disk so that it can be booted in the RAM.

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Unix I-node Structure

The inode (index node) is a data structure in a Unix-style file system that describes a file-system object such as a file or a directory.

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Unix I-node Structure

The inode (index node) is a data structure in a Unix-style file system that describes a file-system object such as a file or a directory.

- Each inode stores the attributes and disk block locations of the object's data.
- The number of Inode limits the total number of files/directories that can be stored in the file system.

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Unix I-node Structure

The Inode contains the following information:

1. Administrative information (permissions, timestamps, etc.)
2. A number of direct blocks (typically 12) that contains to the first 12 blocks of the files
3. A single indirect pointer that points to a disk block which in turn is used as an index block, if the file is too big to be indexed entirely by the direct blocks
4. A double indirect pointer that points to a disk block which is a collection of pointers to disk blocks which are index blocks, used if the file is too big to be indexed by the direct and single indirect blocks.
5. A triple indirect pointer that points to an index block of index blocks of index blocks

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Unix I-node Structure

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Question GATE-2019

The index node (inode) of a Unix-like file system has 12 direct, one single-indirect and one double-indirect pointer. The disk block size is 4 kB, and the disk block addresses 32-bits long. The maximum possible file size is (rounded off to 1 decimal place) ___4.0___ GB?

no. of disk indexes in a single block $= \frac{4\,kB}{4B} = 2^{10}$

max file size $= (12 * 4kB) + 2^{10} * 4kB + 2^{10} * 2^{10} * 4kB$

$\simeq 4.0\ GB$

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Disk Scheduling

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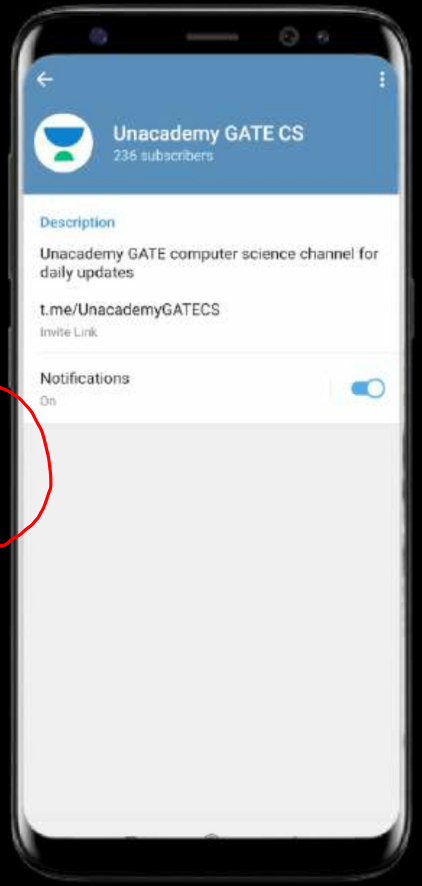

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