

CS314 Operating System Spring 2024

Exercise Questions on March 26th, 2024

EXERCISE #1

Compare the contiguous, linked-list, and index storage-space (sectors) allocation methods for the following three performance metrics: speed, reliability, and storage-space utilization.

	Contiguous	Linked-List	Index
Speed (read an entire file)			
Reliability			
Space Utilization			

Note 1: Compare the three methods by: “best”, “almost best”, “2nd best”, and “worst”.

Note 2: It is possible for more than one method to have the same ranking.

EXERCISE #2

Estimate the overhead of reading an existing data block, using the number of the necessary disk accesses, in a file using the contiguous, linked-list, and index allocation methods for the following cases:

	Contiguous	Linked-List	Index
1st sector			
<i>N</i> -th sector			

Use the following assumptions:

- (1) One data block is the same size of a hard drive sector.
- (2) Reading a sector requires the OS one disk access.
- (3) The index has been loaded to the memory (no disk access needed for accessing the index).
- (4) The directory of the target file has been loaded to the memory (no disk access needed for accessing the file directory).
- (5) For contiguous allocation, the OS can “spot” (= “calculate) the target sector from the 1st sector of a target file.

EXERCISE #3

Estimate the overhead of inserting (adding) a new block, using the number of the necessary disk accesses, in an existing file using the contiguous, linked-list, and index allocation methods for the following cases:

	Contiguous	Linked-List	Index
1st sector			
N -th ($N \leq M$) sector			

Use the following assumptions:

- (1) Use the same assumptions we used for EXERCISE #2.
- (2) The target file consists of M data blocks (M sectors).
- (3) Writing a sector requires the OS one disk access.
- (4) Each file directory fits to a disk sector.
- (5) For the index allocation method, the index fits to a disk sector.

EXERCISE #4

Estimate the overhead of deleting an existing data bock (using “Big-O notation”) from a file using the contiguous, linked-list, and index allocation methods for the following cases:

	Contiguous	Linked-List	Index
1st sector			
N -th ($N \leq M$) sector			

Note: Use the same assumptions we used for EXERCISE #2 and #3.

EXERCISE #5

Compare the contiguous, linked-list, and index storage-space (sectors) allocation methods for access speed.

	Contiguous	Linked-List	Index
Reading a data block			
Inserting a data block			
Deleting a data block			
Reading an entire file			

Note: Compare by specifying: “best”, “almost best”, “2nd best”, “worst”, and “depend”.