IT2164/IT2561 Operating Systems

**Tutorial 10**

**File Management**

Attempt the following questions before you attend tutorial.

1. What are the THREE types of disk allocation methods? For each, list the advantages and disadvantages.
   1. Contiguous
      1. Advantages
         1. Easy to implement
         2. Support fast sequential and direct access
         3. Minimal disk seek time
      2. Disadvantages
         1. Suffers from external fragmentation
         2. Difficult to manage files without knowledge of file size or if file size changes frequently
   2. Link
      1. Advantages
         1. Disk space need not be contiguous
         2. No external fragmentation
         3. No need to declare file size, file size can grow as long as there is space
      2. Disadvantages
         1. Inefficient for direct access
         2. Extra space required for pointer
         3. Suffers from reliability problem if one of the pointers is corrupted
         4. Suffers from internal fragmentation (specifically for last block)
   3. Index
      1. Advantages
         1. Support efficient direct access
         2. No external fragmentation
         3. No need to declare file size, file size can grow as long as there is space
      2. Disadvantages
         1. Extra space required for index block
         2. Index block may be wasted for small files
         3. Suffers from internal fragmentation (specifically for fixed size blocks)
2. Suppose a UNIX disk block will hold 2048 disk addresses and a block is of size 4KB. Given that a UNIX disk block has 12 direct pointers, and one pointer for each of the single, double and triple indirect pointer blocks, calculate the following :
   1. the maximum-sized file using only direct pointers;
   2. the maximum-sized file using direct and single-indirect pointer capability;
   3. the maximum-sized file using the above plus double-indirect pointer capability;
   4. the maximum-sized file using the above plus triple-indirect pointer capability.

* Direct:
  + 12 blocks x 4KB/block = 48KB
* 1-level indirect:
  + 48KB + 2K x 4KB = 48KB + 8MB
* 2-level indirect:
  + 48KB + 8MB + 2K(2K(4KB)) = 48KB + 8MB + 16GB
* 3-level indirect:
  + 48KB + 8MB + 16GB + 2K(2K(2K(4KB))) = 48KB + 8MB + 16GB + 32TB

Tutorial 10 Page 1 of 1