COMP 3411

Assignment 8

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1. **What is a disk partition?**
   Subdivisions of the disk - also known as slices. It's a way to divide a physical storage device into multiple sections, each of which can be used to store data and operate independently. Created for organization, multi-boot systems, and data protection from the OS.

2. **File and directory attributes**
   a. **List the 7 basic file attributes associated with a file and OS.**
      Name, Identifier (ID), Type, File Location, Size, Protection (Read/Write permits), Time/Date/User ID (for protection and security)

   b. **List the 6 operations that you can perform on a directory.**
      Search for a file, Create a file, Delete a file, Rename a file, List a directory, Traverse the file system

3. **File identification and types**
   a. **What is the purpose of the file identifier?**
      Unique tag (number) that identifies a file (or directory) within a file system. Provides a way for the OS to uniquely reference and manage files even if their name/locations change.

   b. **How are file types used by the OS?**
      OS looks at the file type - segment after the '.' (myfile.type) and then acts accordingly. The following table represents what each type does and how the OS interacts with them:

File Type	Usual Extension	Function
Executable	exe, com, bin, or none	Ready-to-run machine language program
Object	obj, o	Compiled machine language, not linked
Source Code	c, cpp, java, py	Source code in various languages
Batch	bat, sh	Commands to the command interpreter
Text	txt, doc	Textual data, documents
Word Processor	wp, doc, rtf	Various word processor formats
Library	lib, a	Libraries of routines for programmers
Print or View	ps, pdf, jpg	ASCII or binary file in a format for printing or viewing
Archive	arc, zip, tar	Related files grouped into one file sometimes compressed for archiving or storage
Multimedia	mp3, mp4, avi	Binary file containing audio or A/V info

4. **Sequential files**
    a. **How is data stored in a sequential file?**
       Information is stored in order, one record after the other in a continuous sequence. Moving back and forth is allowed, however, jumping to other records is not allowed.

    b. **What operations can be performed on sequential files?**
        i. **read next -** reads the next portion of the file and automatically advances a file pointer, which tracks the I/O location
        ii. **write next -** appends to the end of the file and advances to the end of the newly written material (the new end of file)
        iii. **reset -** reset/move pointer back to the beginning of a file

5. **Direct access files**
    a. **What operations can be performed on direct access files?**
       File is fixed length of logical records n.
       n = index relative to the beginning of the file, it is not the address of the block
        i. **read n -** reads from block number n from the file (read next is still available)
        ii. **write n -** writes to block number n of the file (write next is still available)
        iii. **position to n -** moves pointer to block n
        iv. **rewrite n -** rewrites the data in block n

    b. **What is the function of an index when used with a direct access file?**
       An index serves as a pointer to the various blocks. It helps to quickly locate a record within a file, enabling direct access to the desired data. This prevents having to scan the entire file to find it.

6. **File implementation**
    a. **Describe the purpose of the open-file table.**
       Tracks which files are open.

    b. **What is the difference between a mandatory lock and an advisory lock?**
       Two different mechanisms used to control access to shared resources in a multi-process environment.
       Mandatory - access is denied depending on locks held and requested
       Advisory - processes can find status of locks and decide what to do
       Essentially, mandatory locks are enforced by the OS and ensure string compliance with locking rules, while advisory locks are suggested guidelines that rely on processes voluntarily adhering to the locks for proper coordination.

c. **How could file sharing be secured using a file protection scheme?**
    i.   Implement Access Lists that define who can access a file and what actions they can perform (read, write, execute, etc)
    ii.   Implement User IDs to identify users, allowing permissions and protections to be per-user
    iii.   Implement Group IDs, allowing users to be in groups and allocating certain permits to different groups

7. **For each allocation method (Contiguous, Linked, and Indexed allocation) show how a file of 11 blocks would be allocated on disk. The disk is represented as 30 blocks with blocks 0, 4, 9, 17 and 29 already allocated. You must show the entire data structure for each allocation method as part of your answer.**

Contiguous

0	1	2
3	4	5
6	7	8
9	10	11
12	13	14
15	16	17
18	19	20
21	22	23
24	25	26
27	28	29

Linked (start 20 → end 3)

0	1	2
3 (-1 end of file)	4	5
6	7	8 (go to 11)
9	10	11 (go to 12)
12 (go to 13)	13 (go to 24)	14
15	16	17
18	19	**20 (go to 8)**
21	22	23
24 (go to 25)	25 (go to 26)	26 (go to 27)
27 (go to 28)	28 (go to 3)	29

Indexed   (Index block 19)   **Pointers in Block 19**

0	1	2	**21** (1st block)
3	4	5	**22** (2nd block)
6	7	8	**24** (3rd block)
9	10	11	**6** (4th block)
12	13	14	**26** (5th block)
15	16	17	**2** (6th block)
18	19	20	**1** (7th block)
21	22	23	**8** (8th block)
24	25	26	**3** (9th block)
27	28	29	**11** (10th block)

Pointers in Block 19:
- **21** (1st block)
- **22** (2nd block)
- **24** (3rd block)
- **6** (4th block)
- **26** (5th block)
- **2** (6th block)
- **1** (7th block)
- **8** (8th block)
- **3** (9th block)
- **11** (10th block)
- **13** (11th block)
- **-1** (end of file)
- **-1** (end of file)
- **-1** (end of file)