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CSIS 1800: Introduction to Computer Science and Information Systems

Chapter number: 11 File Systems and Directories

Assignment number: 11

1. How can an operating system make use of the file types that it recognizes?

File types allow the operating system to operate on the file in ways that make sense for that file. They also usually make life easier for the user. The operating system keeps a list of recognized file types and associates each type with a particular kind of application program. In an operating system with a graphical user interface (GUI), a particular icon is often associated with a file type as well. When you see a file in a folder, it is shown with the appropriate icon in the GUI. That makes it easier for the user to identify a file at a glance because now both the name of the file and its icon indicate which type of file it is. When you double-click on the icon to open the program, the operating system starts the program associated with that file type and loads the file.

1. How does an operating system keep track of secondary memory?

The operating system keeps track of secondary memory in two ways:

* It maintains a table indicating which blocks of memory are free or available for use.
* For each directory, it maintains a table that records information about the files in that directory.

To create a file, the operating system finds enough free space in the file system for the file content, puts an entry for the file in the appropriate directory table, and records the name and location of the file.

To delete a file, the operating system indicates that the memory space previously used by the file is now free and removes the appropriate entry in the directory table.

1. What does it mean to open and close a file?

* The operating systems require that a file be opened before read and write operations are performed on it. The operating system maintains a small table of all currently open files to avoid having to search for the file in the large file system every time a subsequent operation is performed.
* To close the file when it is no longer in active use, the operating system removes the entry in the open file table.

1. Compare and contrast sequential and direct file access.

|  |  |
| --- | --- |
| **Sequential File Access** | **Direct File Access** |
| The technique in which data in a file is accessed in a linear fashion. | The technique in which data in a file is accessed directly, by specifying logical record numbers. |
| Files are processed in sequential order. | Files are processed in any order. |
| For records needing to be accessed in sequential order, sequential file access technique is much faster. | For records needing to be accessed in random order, direct file access technique is much faster. |
| File pointer moves only in one direction. | File pointer moves in any direction |
| Takes longer to access a particular record because it is processed sequentially. | Takes less time to access a particular record because it is processed directly. |

1. How does UNIX implement file protection?

File protection settings in the UNIX operating system are divided into three categories. Under each category you can determine whether the file can be read, written, and/or executed. Under this mechanism, if you can write to a file, you can also delete the file.

* Owner usually has the strongest permissions regarding the file, often the creator of the file.
* Group, simply a list of users to whom the permissions apply.
* World, permissions that apply to anyone who has access to the system. Because they give access to the largest number of users, they are usually the most restricted.
* Using this technique, the permissions on a file can be shown in a 3 × 3 grid:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Read** | **Write/Delete** | **Execute** |
| **Owner** | Yes | Yes | No |
| **Group** | Yes | No | No |
| **World** | No | No | No |

1. Given the following file permission, answer these questions.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Read** | **Write/Delete** | **Execute** |
| **Owner** | Yes | Yes | Yes |
| **Group** | Yes | No | No |
| **World** | Yes | No | No |

1. Who can read the file?

|  |
| --- |
| **Owner** |
| **Group** |
| **World** |

1. Who can write or delete the file?

|  |
| --- |
| **Owner** |
| **Group** |

1. Who can execute the file?

|  |
| --- |
| **Owner** |

1. What do you know about the content of the file?

Only the owner has access to execute the file and hence access to the content of the file.

1. What is the minimum amount of information a directory must contain about each file?

A directory must contain the following information about each file.

* File Name
  + Stored with its extension to indicate whether the file type.
* File Location
  + Address or path.
* File Extension
  + Expressed by a dot (.) following file name indicating file type.
* File Size
  + Varies for each file.
* Date Created
  + Tracks file creation date.
* Date Last Modified
  + Tracks modification dates.

Use the following list of cylinder requests in Exercises 8 through 10. They are listed in the order in which they were received: 12, 25, 1, 101, 66, 50, 75, 88, 33, 85, 15, 5.

1. Calculate the order (and show the results of the calculations) in which these requests are handled if the FCFS algorithm is used. Assume that the disk is positioned at cylinder 50.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First Come First Served Algorithm | | | | | | | | | | | | |
| Head moves to cylinders as they come | | | | | | | | | | | | |
| Cylinder = 50 🡪 | 12 | 25 | 1 | 101 | 66 | 50 | 75 | 88 | 33 | 85 | 15 | 5 |

1. Calculate the order (and show the results of the calculations) in which these requests are handled if the SSTF algorithm is used. Assume that the disk is positioned at cylinder 50.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Shortest Seek Time First Algorithm | | | | | | | | | | | | |
| Head moves to closest cylinder based on its current position | | | | | | | | | | | | |
| Cylinder = 50 🡪 | 50 | 66 | 75 | 85 | 88 | 101 | 33 | 25 | 15 | 12 | 5 | 1 |
|  | 0 | 16 | 9 | 10 | 3 | 13 | 68 | 8 | 10 | 3 | 7 | 4 |

1. Calculate the order (and show the results of the calculations in which these requests are handled if the SCAN algorithm is used. Assume that the disk is positioned at cylinder 50 and the read/write heads are moving toward the higher cylinder numbers.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCAN Algorithm | | | | | | | | | | | | |
| Head moves out toward platter edge, then in toward spindle… | | | | | | | | | | | | |
| Cylinder = 50 🡪 | 50 | 66 | 75 | 85 | 88 | 101 | 33 | 25 | 15 | 12 | 5 | 1 |
|  | 0 | 16 | 9 | 10 | 3 | 13 | 68 | 8 | 10 | 3 | 7 | 4 |

Reference:

1. Computer Science Illuminated, Nell Dale and John Lewis, Fourth Edition, Chapter 11.