12.S Practical Solutions

Activity 1: File Systems General Questions

In a sequential access file, data is organized and stored in a sequential order, with records stored one after another. Each new record is appended to the end of the file. Whereas in a random access file, data is organized and stored in a way that allows direct access to any record within the file. Records can be accessed randomly, without the need to traverse through the entire file. When working with file systems, understanding the differences between sequential and random access file structures is essential. Sequential and random access are two different methods of organizing and accessing data within files, each with its own advantages and considerations.

A. Examples of file types:

Sequential Access - Print the contents of a file.

Random Access - Print the information stored in index *i* - found by using an index or hash to locate the information.

B. Consider a system that supports 5,000 users. Suppose that you want to allow 4,990 of these users to be able to access one file. How would you specify this protection scheme in UNIX?

The access control mechanism in UNIX that is appropriate for solving this problem is groups. A group could be used in two different ways to solve this problem:

1) Create a group and assign the 4,990 users to it. Then change the file's group to this group and assign the appropriate group permissions to that file. 2) Create a group and assign the 10 users who are not supposed to have access to this file. Then change the file's group to this group and assign access permissions to that file to the public and more limited access permissions to the group.

These two methods have their own advantages and drawbacks. A reason to prefer #1 might be that, while UNIX's protection mechanisms are designed to keep users from gaining extra privileges (gaining root access or gaining another group's privileges), they are not designed to prevent users from voluntarily reducing their own privileges, so using a group to forbid access to a file may not be a perfect solution.

C. What are the advantages and disadvantages of providing mandatory locks instead of advisory locks whose usage is left to users' discretion?

In many cases, separate programs might be willing to tolerate concurrent access to a file without requiring the need to obtain locks and thereby guaranteeing mutual exclusion to the files. Mutual exclusion could be guaranteed by other program structures such as memory locks or other forms of synchronization. In such situations, the mandatory locks would limit the flexibility in how files could be accessed and might also increase the overheads associated with accessing files.

D. What do the following permission values mean: 0761, 0777, 0555, 0007 and 0707?

Permission Value	Owner Access	Group Access	Public Access
0761	Read/Write/Execute	Read/Write/-	-/-/Execute
0777	Read/Write/Execute	Read/Write/Execute	Read/Write/Execute
0555	Read/-/Execute	Read/-/Execute	Read/-/Execute
0007	-/-/-	-/-/-	Read/Write/Execute
0707	Read/Write/Execute	-/-/-	Read/Write/Execute

Activity 2 & 3: Copy a File plus Timer

A sample solution can be downloaded **here (https://canvas.qut.edu.au/courses/16677/files/4583112?wrap=1) (https://canvas.qut.edu.au/courses/16677/files/4583112/download?download_frd=1)** .

Activity 4: Create a 10 megabyte file.

This may be created any number of ways. Some options include:

```
truncate -s 10M sample.txt
head -c 10485760 /dev/zero > def.txt
dd if=/dev/urandom of=ghi.txt bs=10485760 count=1
```

Activity 5: Modify your program to read multiple bytes into a buffer, then write them all out.

A sample solution can be downloaded **here (https://canvas.qut.edu.au/courses/16677/files/4583115?wrap=1) (https://canvas.qut.edu.au/courses/16677/files/4583115/download?download_frd=1)** .

Activity 6: Binary Copy

A sample solution can be downloaded **here (https://canvas.qut.edu.au/courses/16677/files/4583114?wrap=1) (https://canvas.qut.edu.au/courses/16677/files/4583114/download?download_frd=1)** .

Activity 7: Bank Manager

A sample solution can be downloaded **here (https://canvas.qut.edu.au/courses/16677/files/4583113?wrap=1) (https://canvas.qut.edu.au/courses/16677/files/4583113/download?download_frd=1)** .