CS380 Lab Assignment

Today's Assignment:

In Section 2.3 of the textbook 'Operating System Concepts' the authors describe the topic of **System Calls**. System calls provide an interface to the services made available by an operating system. They described a program that copies the contents of one file to a destination file. This program works by first prompting the user for the name of the source and destination files. The full extract is given below. Write this program in Java. Be sure to include all necessary error checking, including ensuring that the source file exists.

Before we discuss how an operating system makes system calls available, let's first use an example to illustrate how system calls are used: writing a simple program to read data from one file and copy them to another file. The first input that the program will need is the names of the two files: the input file and the output file. These names can be specified in many ways, depending on the operating-system design. One approach is for the program to ask the user for the names of the two files. In an interactive system, this approach will require a sequence of system calls, first to write a prompting message on the screen and then to read from the keyboard the characters that define the two files. On mouse-based and icon-based systems, a menu of file names is usually displayed in a window. The user can then use the mouse to select the source name, and a window can be opened for the destination name to be specified.

This sequence requires many I/O system calls. Once the two file names are obtained, the program must open the input file and create the output file. Each of these operations requires another system call.

There are also possible error conditions for each operation. When the program tries to open the input file, it may find that there is no file of that name or that the file is protected against access. In these cases, the program should print a message on the console (another sequence of system calls) and then terminate abnormally (another system call). If the input file exists, then a new output file must be created. There may already be an output file with the same name. This situation may cause the program to abort (a system call), or it could be possible to delete the existing file (another system call) and create a new one (another system call). Another option, in an interactive system, is to ask the user (via a sequence of system calls to output the prompting message and to read the response from the terminal) whether to replace the existing file or to abort the program.

Now that both files are set up, a loop is entered that reads from the input file (a system call) and writes to the output file (another system call). Each read and write must return status information regarding various possible error conditions. On input, the program may find that the end of the file has been reached or that there was a hardware failure in the read (such as a parity error). The write operation may encounter various errors, depending on the output device (no more disk space, printer out of paper, and so on). Finally, after the entire file is copied, the program may close both files (another system call), write a message to the console or window (more system calls), and finally terminate normally (the final system call). The process is illustrated in Figure 1.

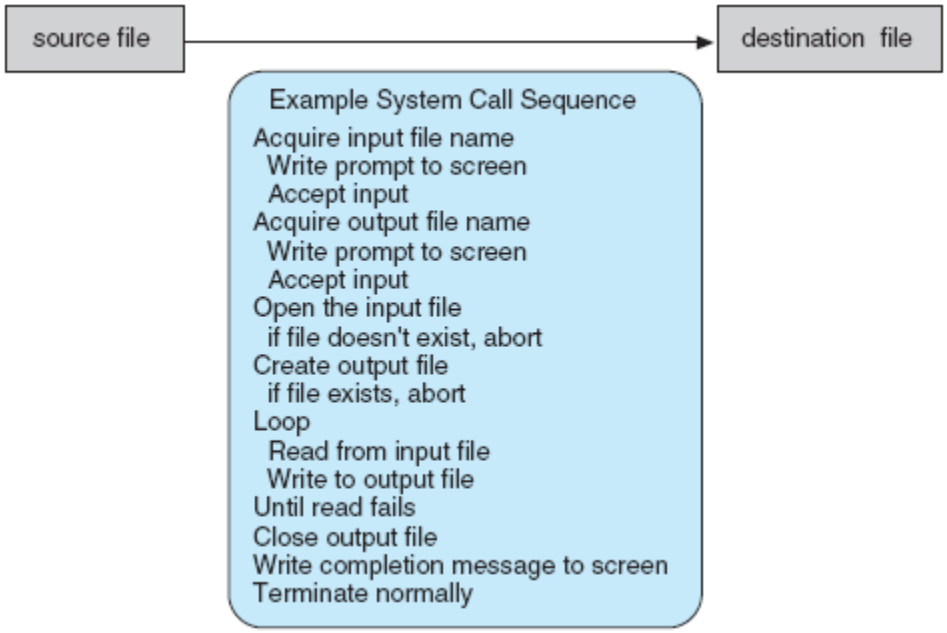

Figure 1 Sequence of System calls to copy data from one file to another

Even simple programs may make heavy use of the operating system. Frequently, systems execute thousands of system calls per second. Most programmers never see this level of detail, however. Typically, application developers design programs according to an application programming interface (API) so they can ignore this detail.

Assignment Submission Instructions:

Submit your completed assignment through Moodle. You should submit (1) a zip file containing your Java code, and (2) screenshots showing your code running (the output from running your code).

Assignment submission deadline is indicated on Moodle. Penalties will be imposed on late submissions.