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Pre-class Assignment #4

1. What are the four locations identified in the textbook at which operating system functionality can be placed?

    User-level programs

    User-level libraries

    The kernel

    User-level server

2. Briefly explain what each of these three UNIX system calls do:

   fork(): This command creates a complete copy of the parent process.

   exec(): This command creates a new executable image and starts running it.

   Wait(): This command will pause the parent process until the child process has finished running.

3. Can UNIX fork() return an error? If so, why?

    A UNIX fork() can return an error if there is not enough memory to copy the entire process.

4. If there were separate UNIX system calls for exists(), create(), and open(), what could go wrong with

   the following code?

```
if (!exists(name))
    create(name);
fd = open(name);
```

    The problem arises on a multiprocessor system since a user could have created or destroyed the file in between calls but by giving the single system call the ability to test means you can directly access it then instead of coming back later.

5. What is a UNIX pipe?

A UNIX pipe is a kernel buffer with two file descriptors, one for writing and one for reading.

6. What is the purpose of the UNIX select() system call?

Select allows the server to wait for input from any set of file descriptors, and returns the descriptor that has data.

7. What is the producer-consumer communication pattern?

In this structure programs are structured to accept as input the output of other programs.

8. What is the client-server communication pattern?

An alternative model that allows two-way communication between processes, as in client server computing.

9. What is the benefit of having device drivers run in user mode?

The advantage of having a device driver run in user mode is that it allows to kernel to easily restart it instead of crashing the system.

10. What is a microkernel?

The kernel itself is kept small,and instead most of the functionality of a traditional operating system kernel is put into a set of user-level processes, or servers, accessed from user applications via inter process communication.