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## Homework 2: Exercises 2.8, 2.21, 3.5, 3.12, 3.17

### 2.8

What is the main advantage of the layered approach to system design? What are the disadvantages of the layered approach?

The main advantage of a layered approach system design is the simplicity of construction and debugging. Each layer is selected so that each uses operations and services for only the layers below it. This makes debugging easier since you can debug a layer without any concerns for the systems on top because it only uses the implemented functions below. The main disadvantage to layered approach is appropriately defining the different layers. This requires more careful planning since by definition each layer can only access layers below itself. Another problem with this approach is that it tends to be less efficient than other types. With a layered approach each layer adds overhead to the system call which results in a call that takes longer than a non layered system that can jump to any system it needs to operate.

### 2.21

What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the microkernel approach?

An advantage to microkernel system design is that it makes extending the operating system easier. Any new services added to the users space do not require modification of the kernel and if the kernel does need changes they are fewer since its a smaller kernel. Because of this, microkernel OS designs are easier to port over to other hardware. The way the user programs interact with the microkernel is by message passing. If the client program wants to access a file, it must first interact with the file server. The client program and service never interact directly rather they communicate by exchanging messages with the microkernel. A disadvantage of using microkernels is a drop in performance due to increase system function overhead.

3.5

When a process creates a new process using the fork() operation, which of the following states is shared between the parent process and the child process?

- a. Stack
- b. Heap
- c. Shared memory segments**

3.12

Including the initial parent process, how many processes are created by the program shown in Figure 3.32?

15 processes

3.17

Using the program shown in Figure 3.35, explain what the output will be at lines X and Y.

Since n line x only changes are being made to the child (a copy)

Line X: 0,-1,-4,-9,-16

Line Y: 0,1,2,3,4