Name: Subhojit Ghimire

Sch Id: 1952160

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Minor-II

Q1. In most multiprogrammed systems, user programs access memory through virtual addresses, while the operating system uses raw physical addresses to access memory. What are the implications of this design on the initation of I/O operations by the user program and their execution by the operating system?

→ The user program specifies a buffer, that exists in the user space and is specified by a virtual address, for data to be transmitted to and from a device. The kernal needs to issue the I/O operation and needs to copy data between the user buffer and its own kernel buffer before or after the I/O operation. In order to access the user buffer, the kernel needs to translate the virtual address provided by the user program to the corresponding physical address within the context of the user program's virtual address space. This translation is performed in software and therefore incurs overhead. Also, if the user buffer is not currently present in physical memory, the corresponding pages need to be obtained from the swap once. This operation might require careful handling and might delay the data copy operation.

Qo2. None of the disk-scheduling disciplines, except FCFS, is truly fair (starvation may occur).

a. Explain why this assertion is true.

b. Describe a way to modify algorithms such as SCAN to ensure fairness.

c. Explain why fairness is an important goal in a time sharing system.

d. Give three or more examples of circumstances in which it is important that the operating system be unfair in serving I/O requests.

→ a. New requests for the track over which the head currently resides can theoritically arrive as quickly as these requests are being serviced.

b. All requests older than some predetermined age could be forced to the top of the queue, and an associated bit for each could be set to indicate that no new request could be moved ahead of these requests. For SSTF, the rest of the queue would have to be reorganised with respect to the last of these old requests.

c. To prevent usually long response times.

d. Paging and swapping should take priority over user requests. It may be desirable for other kernel initiated I/O, such as the writing of file system metadata, to take precedence over user I/O. If the kernel supports real-time process priorities, the I/O requests of those processes should be favoured.