Home work - Set1

August 29, 2017

1. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.
   (a) What are two such problems?
   (b) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.
2. What is the main difficulty that a programmer overcomes in writing an operating system for real tme environment?
3. Which of the following instructions should be priviledged?
   (a) Set value of timer
   (b) Read the clock
   (c) Clear memory
   (d) Issue a trap instruction
   (e) Access I/O device
4. What is the purpose of interrupts? What are the differences between a trap and an interrupt? Can traps be generated intentionally by a user program? If so, for what purpose?
5. Direct memory access is used for high-speed I/O devices in order to avoid increasing the CPU execution load.
   (a) How does the CPU interface with the device to coordinate the transfer?
   (b) How does the CPU know when the memory operations are complete?
   (c) The CPU is allowed to execute other programs while the DMA controller is transferring data. Does this process interfere with the execution of the user programs? If so, describe what forms of interference are caused.
6. An OS provides a system call for requesting allocation of memory. An experienced programmer offers the following advice : " If your program conyains many requests for memory, you can speed up the execution by combining all these requests into a single system call". Explain why this is so.

7. Programs being serviced in a multiprogramming system are named $P_1.....P_m$, where m is the degree of multiprogramming, such that priority of program P_i > priority of program P_{i+1} . All programs are cyclic in nature, with each cycle containing a burst of CPU activity and a burst of I/O activity. Let b^i_{cpu} and b^{io}_{cpu} be the CPU and I/O bursts of program P_i. Comment on the validity of the following statement:

   (a) CPU idling occurs if $b^{io}_h > \sum_{j \neq h} b^j_{cpu}$, where P_h is the highest priority of the program.

8. A time-sharing system services n processes. It uses a time slice of δ CPU seconds, and requires t_s CPU seconds to switch between processes. A real-timeapplication requires t_c seconds of CPU time, followed by an I/O operation that lasts for t_io seconds, and has to produce a response within t_d seconds. What is the largest value of δ for which the time-sharing system can satisfy the response requirements of the real time application?