CS3510 - Operating Systems
Assignment-I

1) User Mode is where all the programs execute. These programs **wouldn't** have the access to RAM or underlined hardware. If the User-mode programs **require** any access to the hardware it calls the ***system APIs***. Whereas in Kernel mode the CPU ***can*** access any memory reference and hardware. Authorizing the control over interrupts can only be done in Kernel Mode. There are some specialized instructions which can be only executed in Kernel Mode. As a result, the CPU has **very little capability** to run in the User Mode, thereby ensuring the security of important resources.

2) (A) Set value of timer: **Privileged**

The timer controls the Scheduling. It is the duty of the OS to ensure that the timer is set to be interrupted before transferring the control to any other program code. Hence any instruction that modifies the content of the timer is a privileged instruction.

(B) Read the Clock: **Unprivileged**

Since any process must be able to read the clock, this instruction must be unprivileged. Reading the clock can't interfere with any of the user or kernel programs.

(C) Clear Memory: **Privileged**

Clearing memory erases the code and data of the processes running on the OS. Hence clearing memory should be privileged as the user may accidentally erase some important program codes.

(D) Issue a Trap Instruction: **Unprivileged**

If it was a privileged instruction, it wouldn't have been possible for processes to execute a **syscall.** Hence Issuing a Trap is unprivileged.

3) The two difficulties I think that are possible are:

1. Such operating systems cannot be changed and it will be almost impossible to upgrade such operating systems. This is dangerous as if we find any bug we will not be able to fix it.
2. The user's entire passwords and other credentials must be stored in an unsecured and unprotected memory since it cannot be stored in the protected memory.

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