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**CE521 - Real-time Systems and Programming**

**Homework Assignment #1**

**Due day: 2/13/2022**

**Instruction:**

1. **Push the answer sheet to Github**
2. **Overdue homework submission could not be accepted.**
3. **Takes academic honesty and integrity seriously (Zero Tolerance of Cheating & Plagiarism)**
4. Keeping in mind the various definitions of operating system, consider whether the operating system should include applications such as web browsers and mail programs. Argue both that it should and that it should not, and support your answers.

**Answer –**

Considering the way operating system is defined, coupling applications like mail programs and web browser makes more sense than getting a raw computer without preinstalled applications.

For example, an industry wishes to buy PCs with Windows pre-installed. Now given a choice to buy a package with licensed windows bundled with a set of applications like mail programs and browsers or a windows old home edition without any applications, both in almost same prices, its more sensible to buy the professional edition with application, saves time to install basic applications, gives authentication guarantee and saves money.

On contrary to including applications with OS, can apparently crash the operating system. Function of operating system to provide the basic platform for application such as web browser and mail services i.e act as an intermediate interface between user and system is violated.

1. How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security) system?

**Answer –**

The rudimentary or fundamental form of protection in system can be distinguished when control over the interrupts is enabled or disabled only when CPU is in kernel mode. Only a specific or limited set of instructions can be executed in kernel mode.

Hardware devices are more accessible while execution of program in kernel mode as compared to user mode. This limits the capability of user mode enabling the protection of system.

1. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.
   1. What are two such problems?

**Answer –**

1. Another user privacy – accessing(modify /recreate) their data and controlling user’s processes .

2.Fraudulant use of other accounts corrupting private data or denying access to their computer processes, data etc.

* 1. Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.

**Answer –**

We can never completely ensure about security in a time-shared machine and a dedicated machine as we can never be sure that our software doesn’t have bugs. Which automatically depletes the possibility of a safe and secure machine and prevention of sharing data and allocate resources.

1. Describe a mechanism for enforcing memory protection to prevent a program from modifying the memory associated with other programs.

**Answer –**

The two basic problems regarding programs that are prevented by memory protection are, protecting user programs from each other and secondly OS from user programs.

They may be solved by same protection mechanism or may need different for each.

It is possible to view the user-system interface as a standardized "plug-and-socket", where each time the scheduler changes user programs, it "unplugs" the one which was running and "plugs in" the next.

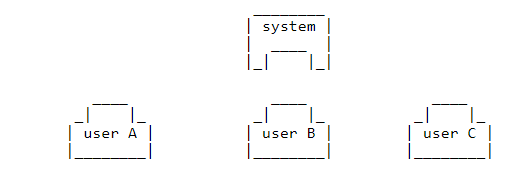


Fig: A plug-and-socket view of the user-system interface.

Some systems rely on software for main memory protection. There are two ways this can be done: First, all user code can be run by an interpreter; in this case, user programs are never reduced to machine code. The other alternative is to use compilers which guarantee that user programs will never access anything illegal. On such a system, users may never directly write machine code, and the supported languages must all prevent any improper manipulation of pointers. Many of the classic machines built by Burroughs (now Unisys) rely on this approach to protection.

1. Describe some of the challenges of designing operating systems for mobile devices compared with designing operating systems for traditional PCs.

**Answer –**

The challenges faced while designing an operating system for mobile devices as compared to OS for traditional PCs besides a core kernel, middleware must be designed in mobile operating system to support a set of software frameworks that provide additional services to application developers. Different from using a physical keyboard and mouse, mobile devices need to features a touch screen and let user interact with the system by pressing and swiping fingers across the screen. Mobile operating systems must balance the performance with battery life. Mobile operating system must have a good support for external peripheral devices like GPS, HDMI which is essential for mobile devices. Mobile OS must consider the limited resources since the mobile devices are much smaller compared with PC.