

CS460 - Assignment 1

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1 Question 1.1

Three main purposes of an OS:

1. Run programs
2. Interface with hardware
3. Store data and manage resources

2 Question 1.2

Main differences between mainframes and PCs:

1. Ease of use vs. resource utilization
2. PC's should be responsive to the user
3. Mainframes should be efficient computation machines

3 Question 1.3

Steps to run a program on dedicated machine:

1. Load bootstrap program from ROM
2. Initialize the system registers
3. Load the program into memory
4. Run the program

4 Question 1.7

Distinguishing kernel mode from user mode allows the use of privileged instructions to be run in a controlled manner and not maliciously by a user. Certain locations in memory could be controlled this way so that ordinary users cannot mess with it.

5 Question 1.8

Should be privileged: a, c, e, f, g

6 Question 1.13

a) Two security problems:

- 1 One user could possibly interfere with another user's processes
- 2 One user could intercept device data and learn personal information about other users (credit cards, etc.)

b) Probably, it might cause the system to be less accessible due to security measures, though.

7 Question 1.17

Symmetric processors all perform the same tasks within the OS, there is no master-slave hierarchy. In asymmetric processing, one processor is the master and delegates tasks to its slave processors.

Advantages:

1. Allows programs to be processed in parallel, which can result in massive speed-ups.
2. Makes it easier to run multiple programs concurrently with less context-switching.
3. Provides a way to increase computation power without optimizing processors themselves, but simply adding more to the system.

Disadvantage: Programming easily parallelizable software can be a real challenge and in some cases unintuitive.

8 Question 1.23

- a) CPU interfaces with the device by: setting up buffers, pointers, and counters for the I/O device.
- b) CPU knows when the operations are complete when the device driver generates an interrupt upon completion.
- c) This process could interfere with user programs if said program also needs to utilize a busy device. It might seem as though the device is slow or broken if it can not be accessed how it normally would.

9 Question 1.30

Definitions of types of operating systems:

- a) Batch: Rather than a single user the computer at a time, multiple people queue programs to run and the OS does them each at a time.
- b) Interactive: Provides direct communication between the user and the system (i.e. using input devices such as a mouse and keyboard).
- c) Time sharing: The CPU executes multiple jobs by switching among them, fast enough that it should be undetectable to the user.
- d) Real time: A system is considered real time when there are certain time constraints that it must abide by. Known tasks must be consistently finished by an exact amount of time with no exceptions.
- e) Network: Network operating systems provide features such as file sharing or communication across a network.
- f) Parallel: Allows programs being run to be computed on multiple CPUs concurrently.
- g) Distributed: Collection of physically separate, possibly heterogenous, computer systems that are networked to provide the users with access to the various resources the system maintains.
- h) Clustered: When multiple systems are somehow connected together to jointly provide computational power. Generally, the systems are connected together on a LAN for communication.

- i) Handheld: Operating systems designed for use on devices small enough to be held in a hand. Usually an embedded system specifically designed to facilitate ease of use on a small screen with limited input capability.