Christopher Mai
chrmai1
cs421_1
hw1p2

1.16: Identify which of the functionalities listed below need to be supported by the operating system for (a) handheld devices and (b) real-time systems.

Real-Time Systems: requires not only that the computing results be correct, but, also that the results be produced within a specfied deadline period.

a) Batch programming

A batch system is one in which jobs are bundled together with the instructions necessary to allow them to be processed without intervention. Neither handheld devices or real-time programming systems use this.

b) Virtual Memory

Virtual memory is used to give programs the illusion of contiguous disk space. Depending on your handheld device virtual memory may or not be required to run well. Most updated handhelds, like smartphones, use virtual memory to make up for the limited hardware that fits into the small devices. Real-time systems, such as microwaves, cd players do not require virtual memory. some of the more advanced machines which use a real-time OS such as Robotic arms used in construction may find virtual memeory to be useful.

c) Time Sharing

no to real-time. no to handheld. Handheld devices are solo use only, as such time-sharing is unnecessary. Real-time systems are generally automated requiring very little user input as such it seems silly to use time-sharing for such machines.

1.23: Direct memory access is used for high-speed I/O devices in order to avoid increasing the CPU's execution load.

a) How does the CPU interface with the device to coordinate the transfer?

The cpu writes the address of the command block to the DMA controller. the command block contains a pointer to the source of the transfer, a pointer to the destination of the transfer, and a count of the number of bytes to be transferred.

b) How does the CPU know when the memory operations are complete?

The DMA controller interrupts the CPU.

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? Yes, while the DMA controller is transferring data it's making use of the memory bus. While this is happening the CPU is prevented from accessing main memory although it still has access to the level 1 and level 2 caches. This is called cycle stealing, while it does prevent the cpu from accessing main memory using the DMA to transfer files is an overall gain to system performance.

Cycle Stealing page 564

2.21: What is the main advantage of the microkernel approach to system design? How do user programs and system services interact in a microkernel architecture? What are the disadvantages of using the microkernel approach.

The main advantage of the microkernel approach is that the kernel is much smaller as a result of nonessential components from the kernel and implementing them differently. This is powerful because adding new services do not require altering the kernel allowing the OS to port across various hardware designs. Programs and system services communicate with the client program by utilizing message passing. Communication is indirect, ie, accessing a file requires communicating with the file server. The main disadvantage of the microkernel is that performance is poor due to the increased amount of overhead as a result of the separation of the kernel and services.