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CSE 4300 HW 1

1. The main activities of file system management in an operating system are: organizing files into directories, access control to determine who can access what, creating and deleting files and directories, providing primitives to manipulate files and directories, and backup files onto stable storage media.
2. The two modes of CPU operation are user mode and kernel mode. The purpose of these two modes is to allow the OS to protect itself and system components, by having some instructions only able to executed in kernel mode.
3. Device controllers cause interrupts to inform CPU’s that they have finished their operation. A trap is an software-generated interrupt caused by and error or user request. In general, traps are a type of interrupt caused by software, while interrupts in general can be cause by hardware or software. Traps can be generated by user created programs, when they contain errors, such as division by zero, requests for operating service, infinite loops, or attempts to modify the operating system.
4. Clustered systems are similar to multiprocessor systems in that work is distributed, but rather than between cores on a processor, clustered systems have multiple systems working together. To provide a high-availability service which survives failures, clustered systems require a storage-area network, and either asymmetric or symmetric clustering. In the former, one machine is on hot-standby mode, and in the latter, multiple nodes run different applications, monitoring each other.
5. In asymmetric multiprocessing, each processor is assigned a different task, and there are “boss” and “worker” processors, where some processors distribute work to others. In symmetric multiprocessing, each processor performs all tasks in parallel. Multiprocessor systems have the advantages of increased throughput, economy of scale, and increased reliability due to there being more components that can fail before the system ceases functioning.
6. The operating system is responsible for creating and deleting system and user processes, suspending and resuming processes, providing mechanisms for process synchronization, providing mechanisms for process communication, and providing mechanisms for deadlock handling.
7. System calls are a programming interface to the services provided by the OS. The major categories are process control (e.g. create/terminate processes), file management (e.g. create/delete files), device management (e.g. request/release devices), information maintenance (e.g. get/set time or date), communications (e.g. create/delete communication connection, send or receive messages from client to server), and protection (e.g. control access to resources).
8. The benefits of microkernel use are that it is easier to extend a microkernel, it is easier to port the operating system to new architectures, it is more reliable, and it is more secure.
9. The advantages of a layered approach are that construction, debugging , and system verification are much simpler. Because it is built in layers, if one layer is debugged, its correct functioning can be assumed while the next layer is debugged. The downsides are that it can be difficult to determine how to define layers in a useful way, memory usage can be inefficient since layers don’t work together, and that performance can be negatively affected, with more overhead due to redundant system calls.
10. Separation of policy and mechanism are desirable because it allows for maximum flexibility if policy decisions are to be changed later.