Operating Systems Assignment 1

Divij Singh

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1. The key goals of an operating system are to act as an intermediary between the user and the hardware. It simplifies the usage of the hardware so that it makes the computer more efficient, easy and simple to use.
2. A computer system can be divided into the Hardware (CPU, Memory), Operating System, Application Programs (web browsers, music players), and the Users (humans, other computers).
3. Without an OS, it would be significantly harder to use a computer. You would have to manually perform all the functions that it performs silently, such as allocating resources, simplifying the interface, handling file structures, and so on.
4. The bootstrap program is a program which is run at computer startup. It initializes the operating system kernel, which is what interprets commands from the OS to the hardware.
5. An interrupt is something which stops the current thread of instructions. They are important because it allows the OS to assign priorities for programs and instructions according to the user's needs.
6. Let us call these processes A, B, C, and D. Say the user is currently working on process B. Then they change their focus from B to D. I would interrupt the running of process B, and start the running of process D. The other processes would still run in the background, but priority would be given to the process in focus, that is to say that any instructions and calculations would be done for it first.
7. The device status table is required in order to have a consistent list of where certain data is stored. Without it, the OS would have to search through the entire disk in order to find the needed data.
8. The trade offs are speed, and space. Storing data in the main memory is the fastest method, however there is a low amount of space to store the data. Storing the data in a secondary device, such as RAM, is significantly slower, but there is a comparatively larger space to store the data in.
9. It is not feasible to do so. The reason for this is the small space of storage in the memory, and the fact that the memory is volatile. The index itself would take up a significant amount of space on the memory, and were you to switch off the computer, would be lost.
10. The hierarchy is the preference of storage mediums when using a computer. It is based on speed, cost and volatility of the mediums.
11. The idea behind caching is that any data currently in use is stored in the main memory, so that it can be quickly accessed again. The key disadvantage of a large size is that it would slow down the speed of accessing the cache, be it due to having more entries to search through, or the storage type being slower.
12. The advantages are their increased throughput, economy of scale and their increased reliability. The systems always need to be tightly coupled.
13. The system works via job scheduling. In this, the system organizes programs via factors like runtime, importance, and so on so that there is always some task currently running.
14. Cluster systems work via having multiple individual systems working together. They share data via networks, be it wireless or wired.
15. A process is a pipeline of calculations or instructions to be carried out by the hardware. A program is a collection of such processes, which together run to have some importance to the user.
16. Multiplexing is the concept of sending a collection of instructions in a single stream.
17. It not necessary. The OS would provide access to these files via having a table which stores their locations.
18. It is okay for tertiary storage to be slow, because it is not used at the same rate as primary and secondary storage for processing. Additionally, despite being slow, it provides a massive amount of storage space, and is non-volatile.
19. The key functionalities of the I/O subsystem are memory management, and handling drivers for hardware devices.
20. The kernel uses single, doubly and circular linked lists, binary search trees, hashmaps and bitmaps.
21. The illusion of a single system is important because it allows a simple, single interface for the user to utilize. Two examples from daily life would be something like Google Drive, and video game servers.

22. The idea behind it is being able to run programs meant for another OS within a single OS. It is important because it allows a user to run a program even if they cannot run the other OS, and also simplifies programs by allowing a single OS to be used for all the programs.
23. A client side system is one where a client accesses a set of servers, and transfers data from them. Peer to peer systems run by users interfacing with each others computers. From a scalability perspective, and peer to peer system is better.
24. SaaS -Software as a Service, such as Office 365; Platform as a Service, such as online databases; Infrastructure as a Service, such as Google Drive.
25. Two examples of real time systems would be an Air Traffic Controls System, and a Battery Manager. Process prioritization is important due to the fact that the programs are dependent on physical conditions, and thus are under time constraints.