~~~*Article 1: About Operating System* ~~~

In today's technological era, embedded systems have become an integral part of our daily life. From smart homes to smart cities, embedded systems are everywhere, and they are making our lives easier and more comfortable. Embedded systems are designed to perform specific tasks, and they are often used in applications where reliability and efficiency are critical. One of the crucial components of an embedded system is the operating system. In this article, we aim to provide an overview of the operating system and its various components, emphasizing its importance in managing the computer hardware and its resources.

An operating system is a control program that manages the computer hardware and its resources. It acts as an intermediary between the user and the hardware. The most popular operating systems are Windows, Linux, Macintosh, FreeRTOS, QNX, and others. As far as the system is concerned, the operating system is seen as a manager of resources.

There are several components of a system that an operating system takes care of, including,

- ➢ Process Management
- ➢ Memory Management
- ➢ I/O Management
- ➢ File Management
- ➢ Storage Management
- ➢ Networking
- ➢ Security…

Let's have an overview about on the various components mentioned above.

Fig: Fuctions of Operating System

Image Source: https://www.sitesbay.com/os/os-functions-of-operating-system

Process Management:

Effective process management is a crucial aspect of an operating system. Essentially, a process is a single occurrence of a program that is currently running. Often, multiple processes may be running simultaneously for the same program. Process management handles several key activities, including creating and terminating user and system processes, managing the suspension and resumption of processes, coordinating process synchronization and communication, handling deadlock situations, and performing other related functions.

Memory Management:

Memory management is a crucial element of an operating system that cannot be overlooked. A software program that you compose will be saved in secondary memory. However, for a program to execute, it must be present in the primary memory. The processes involved in memory management include monitoring which section of memory is currently in use and by which process, determining which process to load when memory space is available, and managing memory allocation and deallocation in a dynamic manner as per the system requirements.

I/O Management:

Another crucial element of an operating system is input/output management, which enables users to interact with hardware devices without needing to understand their internal workings. The OS provides a level of abstraction for hardware devices, allowing users to interact with them in a simplified manner. The functions performed by input/output management include creating an abstraction layer for hardware devices, managing main memory, overseeing device driver interfaces, and other related tasks.

File Management:

File management is an important component of an operating system. Files are stored in the secondary memory and saved in a pattern of directories for ease of use. The activities by an OS for file management would include the creation and deletion of files and directories, managing the file system, mapping files onto secondary storage, backing up files in storage media, and others.

Storage Management:

Storage management is another essential component of an operating system. The instructions and data would be placed in the primary storage or cache to be referenced by the running program. There are various levels of file storage, from CPU registers to optical disks. The activities performed by the OS include managing free space in secondary storage devices, allocating storage space during file saving, scheduling requests for memory access, and others.

Networking:

Networking is an indispensable element of an operating system as it plays a crucial role in enabling access to the network hardware and creating a platform for seamless communication between devices. The OS facilitates the establishment and maintenance of network connections, monitors and manages network traffic, and ensures secure data transmission between networked devices. It also provides the necessary protocols and services for efficient data exchange between different systems, such as IP addressing, packet routing, and error detection and correction. Overall, networking in an operating system is a multifaceted domain that encompasses a wide range of functionalities and responsibilities aimed at ensuring seamless and secure network connectivity for all connected devices.

Security:

Security is a critical component of an operating system. The operating system is responsible for ensuring the correct operation of the computer system. To avoid the user from accidentally interfacing with root files or the files that are vital for a system to run, two modes, user and kernel modes, are present. If a computer has various users working on it, then the OS should ensure that the activities and resources of one user are not interfaced with the others and provide security.

The operating system is a vital component of an embedded system, providing a level of abstraction that allows embedded systems to interact with the hardware and resources available to them. The various components of the operating system, such as process management, memory management, I/O management, file management, storage management, networking, and security, all work together to ensure reliable and efficient operation of the embedded system.

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