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# **Operating System**

## Ⅰ.Basic Concepts of Operating System

Before introducing the operating system, I would like to define the operating system first. A more common definition, and the one that we usually follow, is that the operating system is the one program running at all times on the computer—usually called the kernel. for example, An operating system is similar to a government. Like a government, it performs no useful function by itself. It simply provides an environment within which other programs can do useful work. From the computer’s point of view, the operating system is the program most intimately involved with the hardware. In this context, we can view an operating system as a resource allocator.

## ⅡHistory of Operating System

The history of operating systems is in a sense the history of computers. On February 14, 1946, ENIAC, the world's first general-purpose computer, was born at the University of Pennsylvania in the United States. In 1956, the world's first recognized batch operating system GM-NAA I/O was born. In 1964, IBM Corporation of the United States released the general-purpose operating system IBM System/360. In 1969, Bell Labs employees Ken Tompson and Dennis Ritchie, who had participated in the Multics project, developed the UNIX operating system based on assembly language. In 1991, Finnish programmer Linus Torvalds released the Linux operating system. The design of Linux refers to the Minx operating system, and now it has become one of the most successful and widely used open source operating systems in the world. In 2001, Apple released the Mac OS X operating system. The core operating system of Mac OS X is Darwin, which is a Unix-like operating system.

## ⅢTypes of Operating System

1.MS-DOS. This operating system is a single-user single-task operating system, and its main features are low system overhead and high operating efficiency, and it is suitable for microcomputers. But it also has some obvious disadvantages, that is, it cannot exert hardware capabilities, lacks support for databases and network communications, has no general application program interface, and has an unfriendly user interface.

2.Windows. This operating system is the most popular and most used operating system on computers worldwide. It is a proprietary closed-source operating system developed by Microsoft Corporation in the United States. It has a wide range of ready-to-use built-in and third-party software, and has a higher presence and compatibility in work, business and industry. However, the Windows operating system is more vulnerable to security attacks, and it is difficult for users to solve complex faults of advanced technical errors and troubleshooting problems. Since it is a closed source code and its source code is not available to users, it may be very difficult and challenging to fix heavier technical errors and problems.

3.UNIX( Uniplexed Information and Computing System). This operating system was born in 1969 and has a history of more than 50 years. It has evolved from a very simple operating system to an advanced, powerful, and widely used operating system, and has become the de facto standard for multi-user, multi-tasking operating systems. UNIX OS consists of two parts, the system program and the kernel. The kernel is located under the system call interface and above the hardware resources. It provides file system, CPU scheduling, memory management and other system functions. All functions are provided by a layer.

4.Linux. Linux is open source and free, anyone can download and use it without paying, and there are multiple distributions to choose from. It has the advantages of high stability and fluency. Linux is a system with strict authority control. In normal use, the root user is generally not used. Even if there are malicious scripts, it will not cause major damage to the system, and the number of viruses in Linux is also very small. Since the Linux system is open source, everyone can download its source code for customization.

## ⅣThe Application Field of The Operating System

According to the application field, the operating system is divided into three types: desktop operating system, server operating system and embedded operating system.

1. embedded operating system. The embedded operating system is responsible for the allocation of all software and hardware resources of the embedded system, task scheduling, control and coordination of concurrent activities. It must reflect the characteristics of the system where it is located, and be able to achieve the functions required by the system by loading and unloading certain modules. At present, the operating systems widely used in the embedded field include: embedded real-time operating system µC/OS-II, embedded Linux, Windows Embedded, VxWorks, etc., as well as Android and iOS used in smart phones and tablet computers.

2.desktop operating system. The desktop operating system basically works according to the commands issued by people on the keyboard and mouse, and does not have strict requirements on the timing of human actions and responses. From the perspective of the application environment, the desktop operating system is oriented to various complex and changeable applications.

3.server operating system. Server operating systems generally refer to operating systems installed on large computers, such as Web servers, application servers, and database servers, etc., which can realize direct control and management coordination of computer hardware and software. The operation of any computer is inseparable from the operating system, and the server is the same. Server operating systems are mainly divided into four genres: Windows Server, Netware, Unix, and Linux.

## ⅤFunctions of Operating System

1.Processor Management Functions. The first is the process control function: create a process for the job, revoke (terminate) the completed process, and control the state transition of the process during operation. The second is the function of process synchronization, which is to coordinate the operation of multiple processes (including threads). The third is the process communication function. The task of this function is to realize the information exchange between the processes that cooperate with each other.

2.memory management function. Memory management includes two aspects, one is memory allocation and the other is memory protection. As for the memory allocation, it could allocate memory space for each program, improve memory utilization, minimize unavailable memory space (fragmentation), and allow running programs to apply for additional memory space to meet the needs of dynamic growth of programs and data. Memory protection ensures that each user program runs only in its own memory space without interfering with each other, does not allow user programs to access the programs and data of the operating system, and does not allow user programs to be transferred to other non-shared user programs to execute.

3.Device management function. It includes functions such as buffer management, device allocation and device handling, and virtual devices.

4.file management function. Manage user files and system files to facilitate the use of users and ensure the security of files. File storage space management, directory management, file read/write management, file sharing and protection.

5.System security function. This function includes a number of technologies: authentication technology, such as identity authentication; password technology, such as data encryption technology; access control technology, there are two ways: the setting of user access rights and the setting of file attributes; Antivirus software.

6.Network functions and services.The first is network communication, which is used to achieve error-free data transmission between the source host and the target host, such as establishing and tearing down communication links, transmission control, error control, and flow control. The second is resource management, that is, implementing effective management of shared resources (software and hardware) in the network, coordinating the use of shared resources by users, and ensuring data security and consistency. Typical shared hardware resources include hard disks, printers, etc., and software resources include files and data. The other is application interoperability, that is, in an Internet network composed of several different network interconnections, application interoperability functions must be provided to achieve information interoperability and information interoperability.

## ⅥSummary

In such an information age as we are now, we are dealing with operating systems everywhere in our lives, from the remote controls we usually use, the embedded operating systems in the buttons, to the desktop operating systems in our mobile phones and computers, to the With the server operating systems we use to solve problems and get information from the internet, it's no exaggeration to say that we live in a world of different operating systems.