**Classification and Functions of Operating System (OS)**

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An operating system (OS) is a vital piece of software that controls and manages the hardware resources of a computer, offers services to software programs, and acts as a bridge between users and the computer's hardware. (Jaeger, 2022). The following are explanations of how operating systems are categorized and what they do.

**Classification of operating system**

In classifications, the operating system involves various classifications and these include (Stefenon, 2022).

Single-User and Multi-User: Operating systems can be categorized based on the number of users they support. Single-user Operating systems are designed for a single user, while multi-user operating systems support multiple users concurrently, often in a time-sharing fashion.

Single-Tasking and Multi-Tasking: Single-tasking operating systems allow only one program to run at a time, while multi-tasking operating systems enable concurrent execution of multiple programs, improving resource utilization and user productivity.

Systems having a single CPU (Central Processing Unit) or many CPUs, known as multi-processor systems, are both capable of running operating systems and improving performance and dependability.

Distributed operating systems: These operating systems coordinate activities and resources over a network of computers, enabling seamless collaboration.  
Network Operating system Designed for networked environments, these operating systems provide features like file sharing, print services, and communication between networked devices

Real-Time and General-Purpose: Real-time operating systems are designed for systems where timely response to events is critical, such as industrial control systems and robotics, while general-purpose operating systems like Windows and Linux are suitable for a wide range of applications.

Mobile operating systems are designed with touch interfaces, power efficiency, and app administration in mind. They are optimized for mobile devices like smartphones and tablets.

Embedded operating: These are compact operating systems used in embedded systems like appliances, automotive systems, and IoT (pieces of hardware such as sensors, actuators, guardges, appliances, or machines that are programmed for a certain application and can transmit data over the internet or other networks) devices.  
 Server operating system: They prioritize stability, dependability, and effective resource usage for hosting services and applications. They are optimized for server hardware.

Desktop operating systems are made for workstations and personal computers, and they offer a user-friendly interface for a variety of applications.

Each type of operating system serves specific needs and requirements, and the choice of operating system depends on the intended use and computing environment.

**Functions of operating system**

In reference to various functions of the operating system, the most important functions include (Oikonomou, 2022)**.**

Process Management: The operating system creates, schedules, and terminates processes (programs in execution). It manages the allocation of CPU time, memory, and other resources to ensure efficient multitasking. Memory Management: The operating system oversees the allocation and deallocation of memory, ensuring that programs have access to the necessary memory resources. This includes virtual memory management to abstract physical memory from software.

File System Management: Operating systems control the storage, retrieval, and management of files and directories. They manage storage media, access control, and file permissions.

Controlling input and output devices, including keyboards, mouse, printers, and storage devices, is known as device management. To allow for communication between software and hardware, they offer device drivers.

User Interface: Operating systems offer user interfaces, including command-line interfaces (CLI) and graphical user interfaces (GUI), to interact with the computer system and execute commands or launch applications.  
Access control and security are implemented by operating systems to safeguard data and resources. This incorporates firewall capabilities, user authentication, authorization, and encryption.

Networking: Operating systems for networked and distributed systems support network communication, connection management, protocol management, and data transfer.  
 Error Handling and Logging: Operating systems monitor system health and log errors or issues for troubleshooting and maintenance purposes.  
Backup and recovery techniques are offered by certain operating systems to protect data and system configurations in the event of failures or disasters.  
Resource Allocation: The operating system optimizes resource usage by managing CPU, memory, and peripheral device allocation to ensure fair and efficient utilization.

Task scheduling: The operating system schedules tasks and processes to maximize system utilization and responsiveness.

Inter-process communication: It gives processes a way to talk to one another and share information when it's necessary.

System Monitoring and Performance Optimization: They monitor system performance, and resource usage, and provide tools for optimization and troubleshooting.  
The ability to operate numerous virtual machines (VMs) on a single physical machine is made possible by the virtualization technology that some operating systems allow.  
Utility Programs: OSs come with various utility programs like disk cleanup, backup, and system maintenance tools to help users manage their systems  
 In conclusion, these functions and classifications collectively make an operating system a critical component of modern computing systems, enabling users to interact with hardware and software in a seamless and efficient manner. Various operating systems, including those for servers, embedded systems, and personal computers, are designed to satisfy certain demands.

**Reference**

Jaeger, T. (2022). Operating system security. Springer Nature.

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