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**OPERATING SYSTEM**

**CHAPTER 02**

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# OPERATING SYSTEM SERVICES:

1. User Interface: The operating system provides a user interface for users to interact with the computer system, such as a command-line interface, graphical user interface (GUI), or web interface.
2. Program Execution: The operating system loads and executes programs, manages the memory and CPU resources used by programs, and provides a mechanism for programs to terminate their execution.
3. I/O Operations: The operating system manages input/output (I/O) operations, such as reading from and writing to files, communicating with devices, and managing network connections.
4. File System Manipulation: The operating system manages file systems, including creating, deleting, and manipulating files and directories, as well as managing access to files and ensuring data integrity.
5. Communication: The operating system provides mechanisms for inter-process communication (IPC) and network communication, such as pipes, sockets, and message queues.
6. Error Detection: The operating system detects and handles errors that occur during program execution, such as hardware errors, memory access violations, and software errors.
7. Resource Allocation: The operating system manages the allocation of system resources, such as memory, CPU time, and I/O devices, to processes and users.
8. Accounting: To keep track of which users use how much and what kinds of computer resources.
9. Protection and Security: The operating system provides mechanisms for protecting system resources from unauthorized access and ensuring the security of the system and its data. This includes user authentication, access control, and encryption.

Overall, these operating system services are essential for providing a platform for running applications and managing the resources of a computer system.

# OPERATING SYSTEM/USER INTERFACES

User interfaces are an essential part of an operating system. Two primary types of interfaces are command-line interfaces (CLI) and graphical user interfaces (GUI). A CLI uses text input, and users execute commands by entering them at a prompt. A GUI is a visual interface that allows users to interact with the operating system using graphics, icons, and windows. Both interfaces have their advantages and disadvantages, and modern operating systems usually provide both. Additionally, some operating systems offer alternative interfaces, such as touch interfaces or voice recognition.

# SYSTEM CALLS:

System calls are interfaces between user-level applications and the operating system. They allow user-level applications (processes) to request services from the operating system, such as allocating memory, accessing files, or opening network connections.

System calls are the only entry points for the kernel system.

# WHY DO YOU NEED SYSTEM CALLS

* Reading and writing from files demand system calls.

If a file system wants to create or delete files, system calls are required.

System calls are used for the creation and management of new processes.

Network connections need system calls for sending and receiving packets.

Access to hardware devices like scanner, printer, need a system call.

## Types of System Calls

Process Control: These system calls are used to create, manage, and terminate processes. They include operations such as creating new processes, waiting for processes to finish, and terminating processes.

File Manipulation: These system calls are used to create, read, write, and delete files and directories. They include operations such as opening and closing files, reading and writing data to files, and creating and deleting directories.

Device Manipulation: These system calls are used to manage hardware devices such as printers, disks, and network interfaces. They include operations such as opening and closing device drivers, reading and writing data to devices, and controlling device settings.

Information Maintenance: These system calls are used to retrieve and set system information such as time, date, and system configuration. They include operations such as getting and setting the time, getting and setting user and group IDs, and getting system configuration information.

Communications: These system calls are used to allow processes to communicate with each other, either on the same system or over a network. They include operations such as creating and using sockets, establishing network connections, and sending and receiving data over a network.

# OPERATING SYSTEM STRUCTURES

Operating system structures are monolithic, layered, and microkernel.

1. Monolithic - Simple Structure: This structure combines all operating system services and functions into a single executable file, making it relatively simple but difficult to maintain.
2. Layered Structure: This structure divides the operating system into layers, with each layer providing a specific set of services and functions. Higher-level layers call upon lower-level layers to perform more basic tasks, making it more modular and easier to maintain than the monolithic structure.
3. Microkernel: This structure divides the operating system into a small minimalistic kernel and a set of separate user-level services that run outside the kernel. This structure provides increased flexibility and modularity, as well as improved security and reliability.