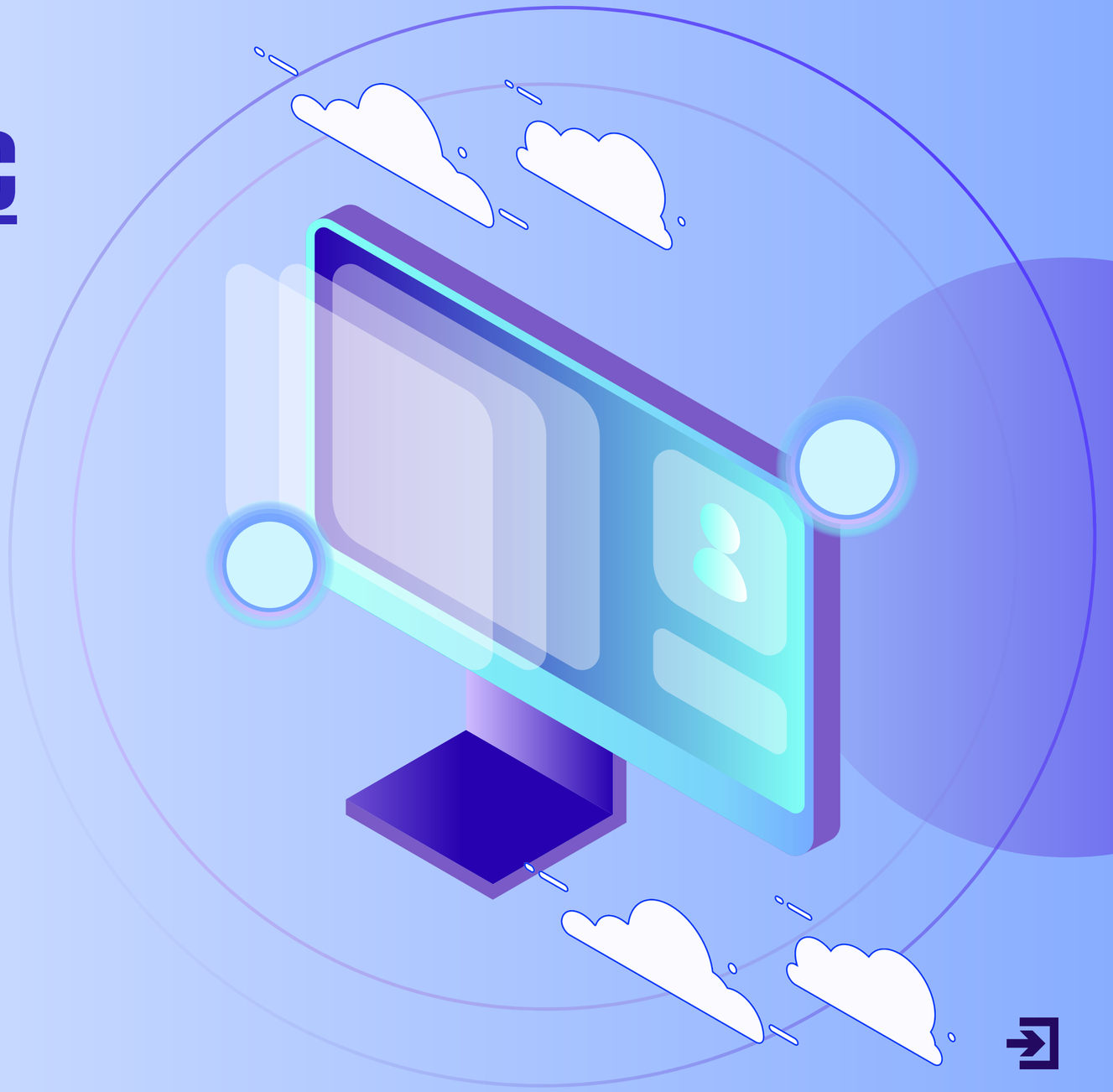
PRESENTATION TOPIC

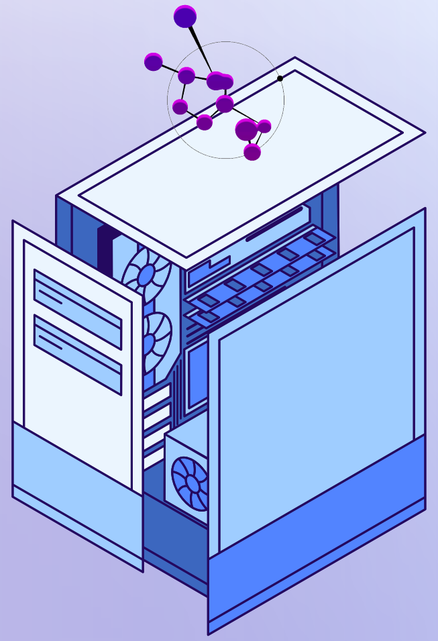
OPERATING SYSTEM STRUCTURES

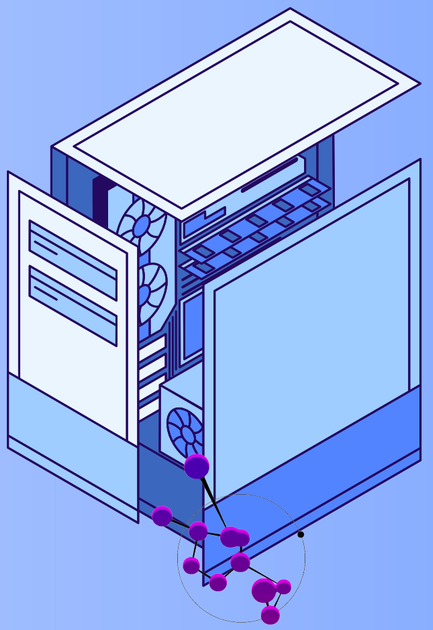
An Overview



Introduction

OPERATING SYSTEM DEFINITION



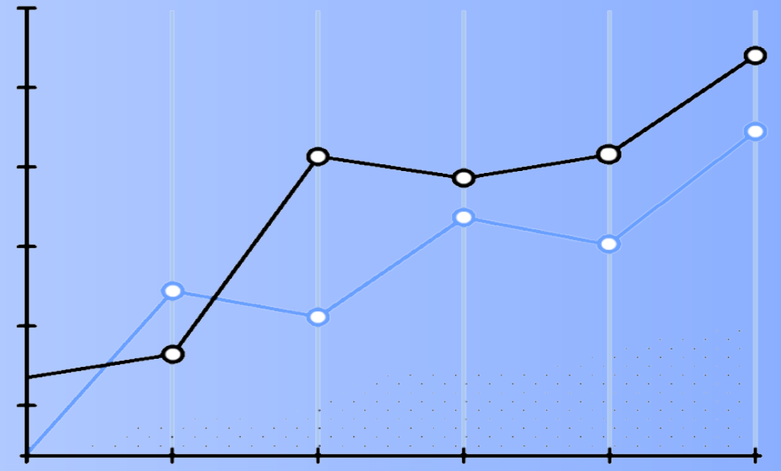


An operating System (OS) is system software that manages hardware and software.

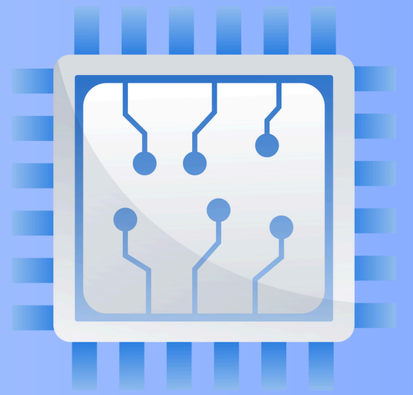
Without an OS, users would have to write complex code to manage hardware directly. The OS simplifies this by providing a stable and consistent interface.

Examples of Operating Systems and Their Market Share Index

Operating System	Market Share (%)	Primary Use Cases
Android	45.68%	Smartphones, Tablets, Smart TVs
Windows	25.75%	Desktops, Laptops
iOS	17.84%	iPhones, iPads
macOS	5.65%	MacBooks, iMacs
Linux	~1.5%	Servers, Desktops, IoT Devices
Others	3.58%	Chrome OS, Unix, etc.



Basic Working of an Operating System



1. **Booting Process (Startup):**
   - When you power on your computer, the BIOS/UEFI initializes hardware.
   - It then loads the OS kernel from the hard drive into RAM (this is called booting).
2. **Kernel Takes Control:**
   - The kernel is the core of the OS—it controls memory, CPU, devices, and system calls.
   - It runs continuously in the background and manages system resources.
3. **User Interaction Begins:**
   - Once the OS is running, it displays a user interface (GUI or CLI).
   - Users can now run applications.

4. Running Applications:

- When you open an app (e.g., browser), the OS:
  - Loads the program into memory.
  - Allocates CPU time and memory.
  - Manages any input/output requests (keyboard, disk, screen).
  - Ensures the app runs securely and doesn't interfere with others.

5. System Resource Management:

- The OS schedules processes, manages files and storage, and handles network connections.
- It uses algorithms to multitask, making the computer responsive.

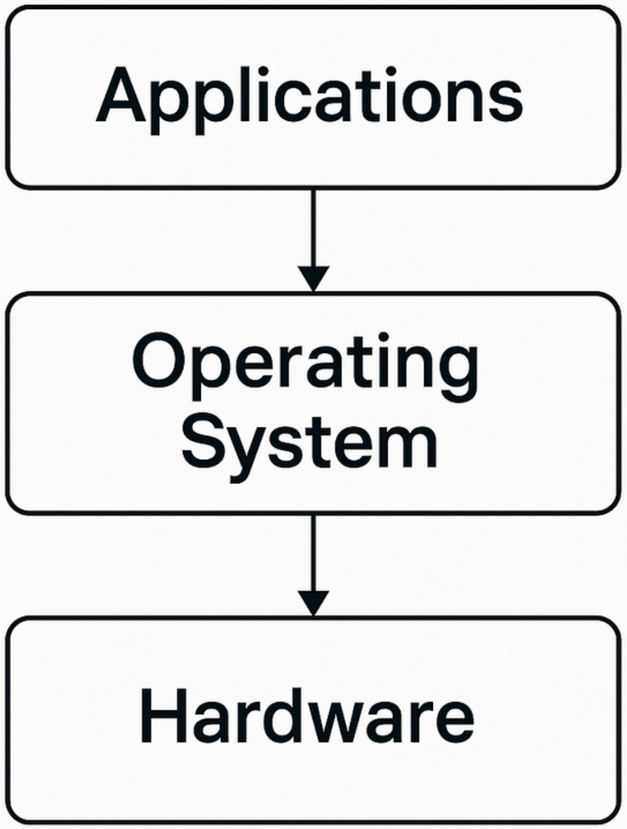
6. Hardware Communication via Drivers:

- The OS uses device drivers to communicate with hardware like printers, GPUs, etc.

7. Shutdown:

- When the system shuts down, the OS safely saves data, stops processes, and powers off the hardware.

OS INTERACTS DIAGRAM



Application interacts with Hardwarware through OS Karnel. Now,What is Karnel?

The kernel is the core part of an operating system. It acts as a bridge between software applications and the computer hardware. It runs in a special, protected area of memory and has complete control over everything in the system.

How the Kernel Works (Simplified):

1. You open an application.
2. The app requests memory and CPU through system calls.
3. The kernel processes these requests, talks to the hardware, and returns the results.
4. The app runs based on the kernel's management of resources.

KEY FUNCTIONS OF A KERNEL:

1. **Process Management**
   - Manages the creation, scheduling, and termination of processes (programs in execution).
2. **Memory Management**
   - Allocates and deallocates memory to programs and ensures they don't interfere with each other.
3. **Device Management**
   - Communicates with hardware devices through device drivers (e.g., keyboard, disk, printer).
4. **File System Management**
   - Manages how data is stored and retrieved on disk.
5. **System Calls and Security**
   - Provides services to user programs via system calls (e.g., read(), write()) and enforces access controls.

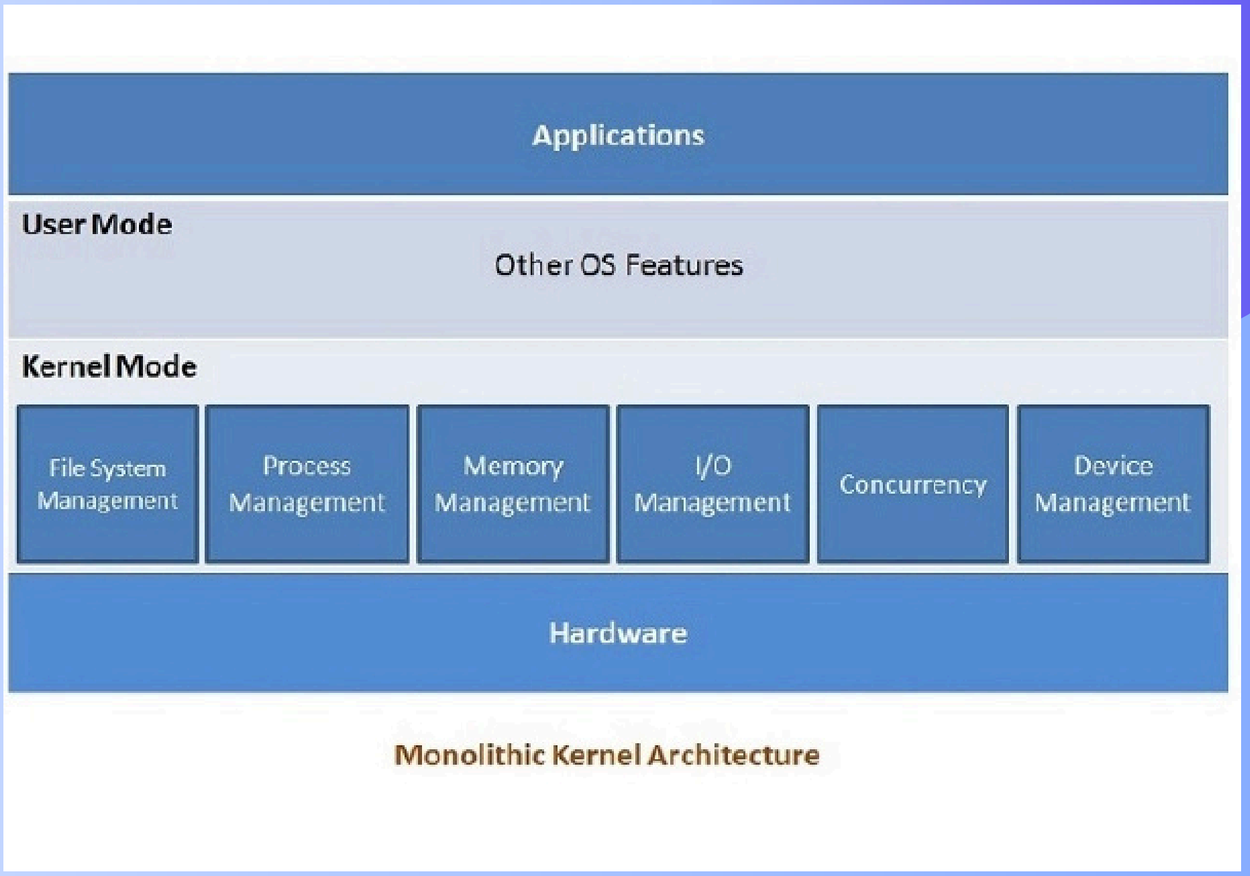
OS SYSTEM STRUCTURES / TYPES OF KARNELS

Operating System (OS) system structures refer to how the components of an OS are organized and interact with each other to manage hardware and provide services to users and applications. There are several types of OS system structures, each with different advantages, disadvantages, and use cases.

1. Monolithic Structure

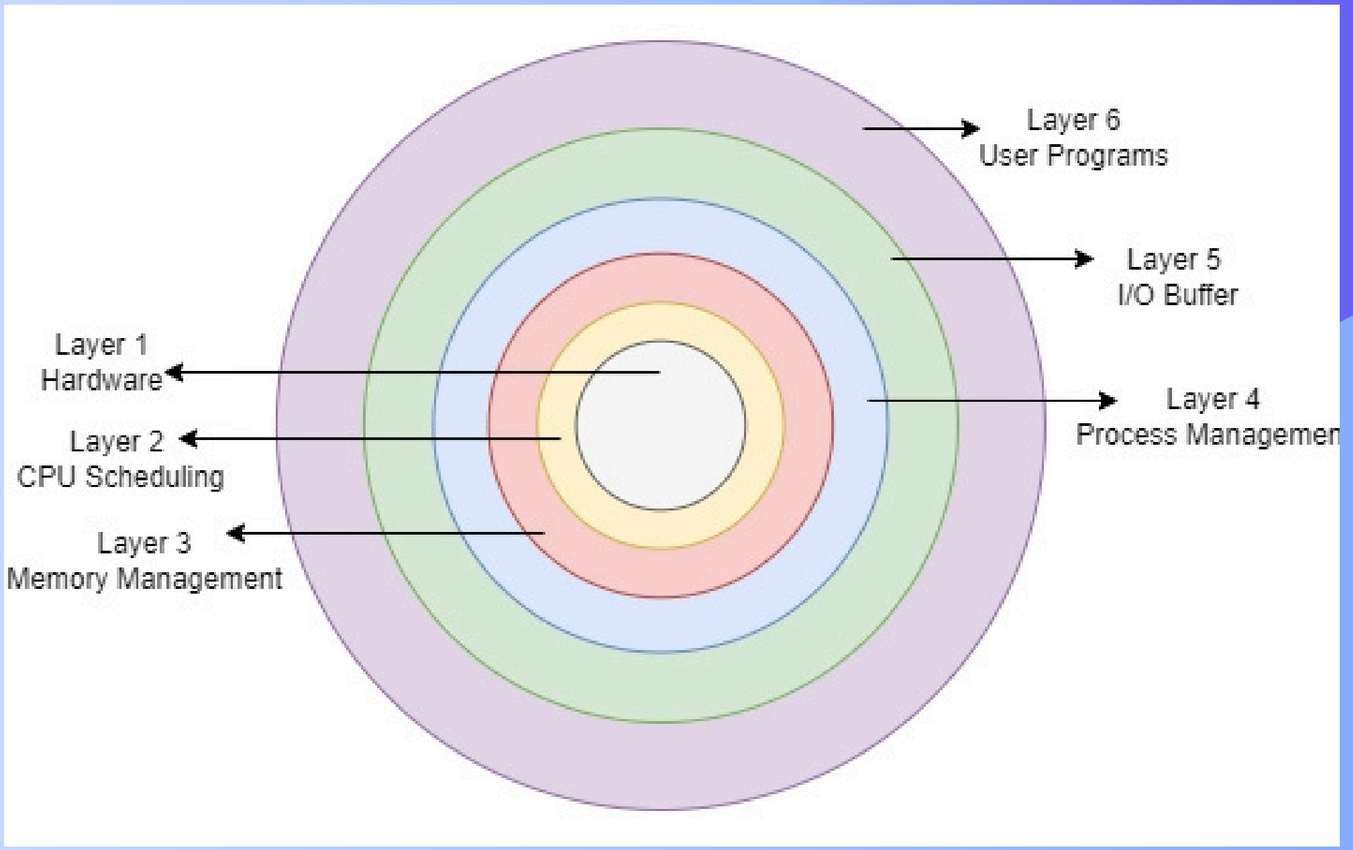
- **Description:** All OS services run in kernel space as one large block of code.

- **Examples:** Unix, Linux (traditional versions)
- **Advantages:**
  - Fast because everything is tightly integrated.
  - Simple design.
- **Disadvantages:**
  - Difficult to maintain and debug.
  - Less secure (a bug in one component can crash the whole system).



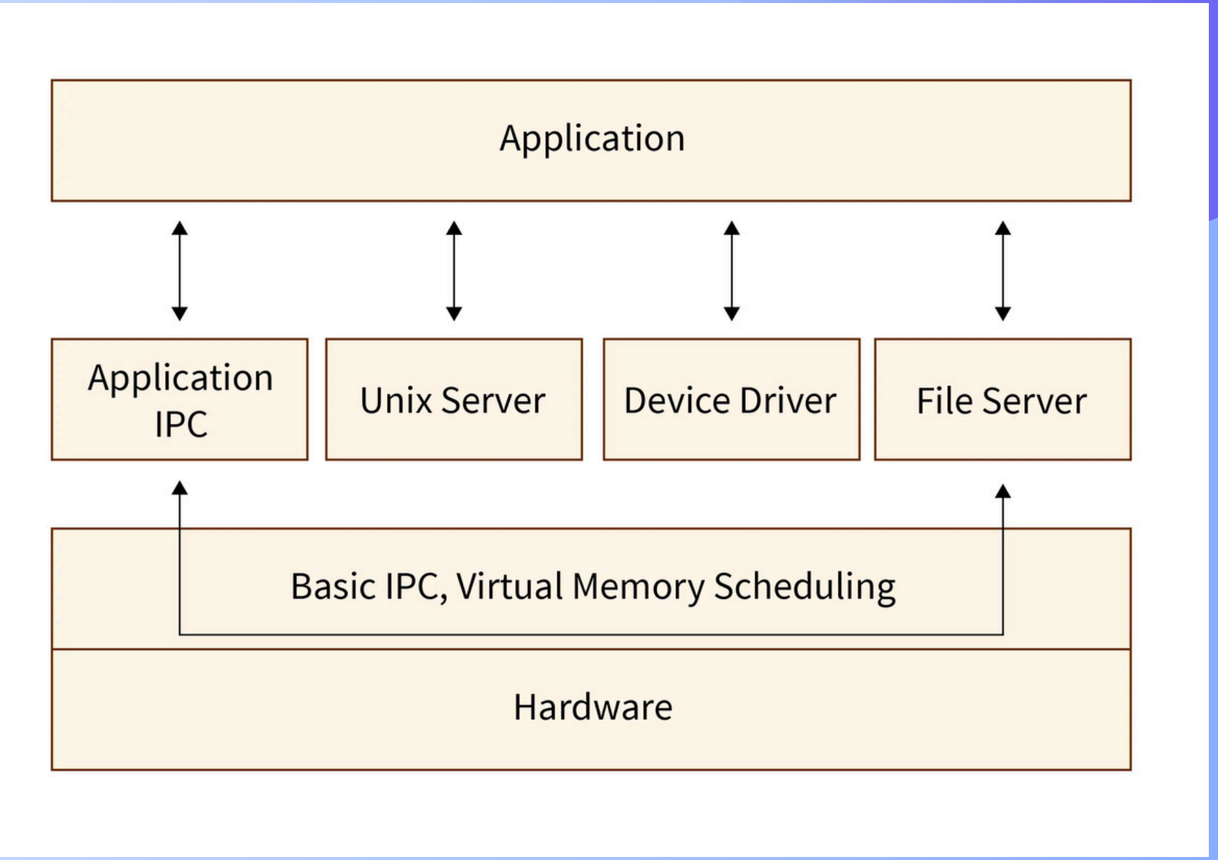
2. Layered Structure

- **Description:**
  OS is divided into layers, each built on top of lower ones.
- **Examples:** THE Operating System
- **Advantages:**
  - Modularity makes debugging and updating easier.
  - Clear separation of concerns.
- **Disadvantages:**
  - Can be less efficient (layer-to-layer communication overhead).



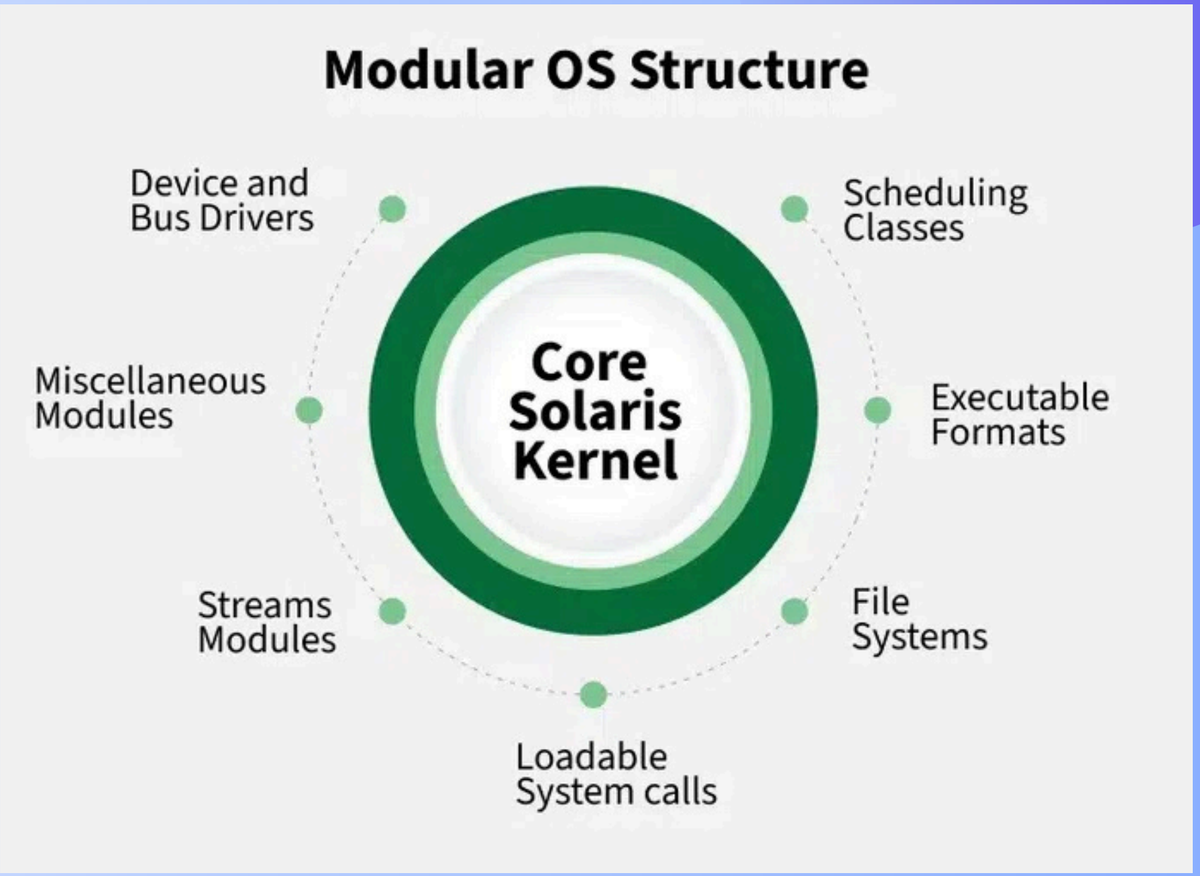
3. Microkernel Structure

- **Description:** Only essential services (like communication and basic I/O) run in the kernel; everything else runs in user space.
- **Examples:** QNX, Minix
- **Advantages:**
  - High modularity and fault isolation.
  - More secure and easier to extend.
- **Disadvantages:**
  - Performance overhead due to more user-kernel mode switches.



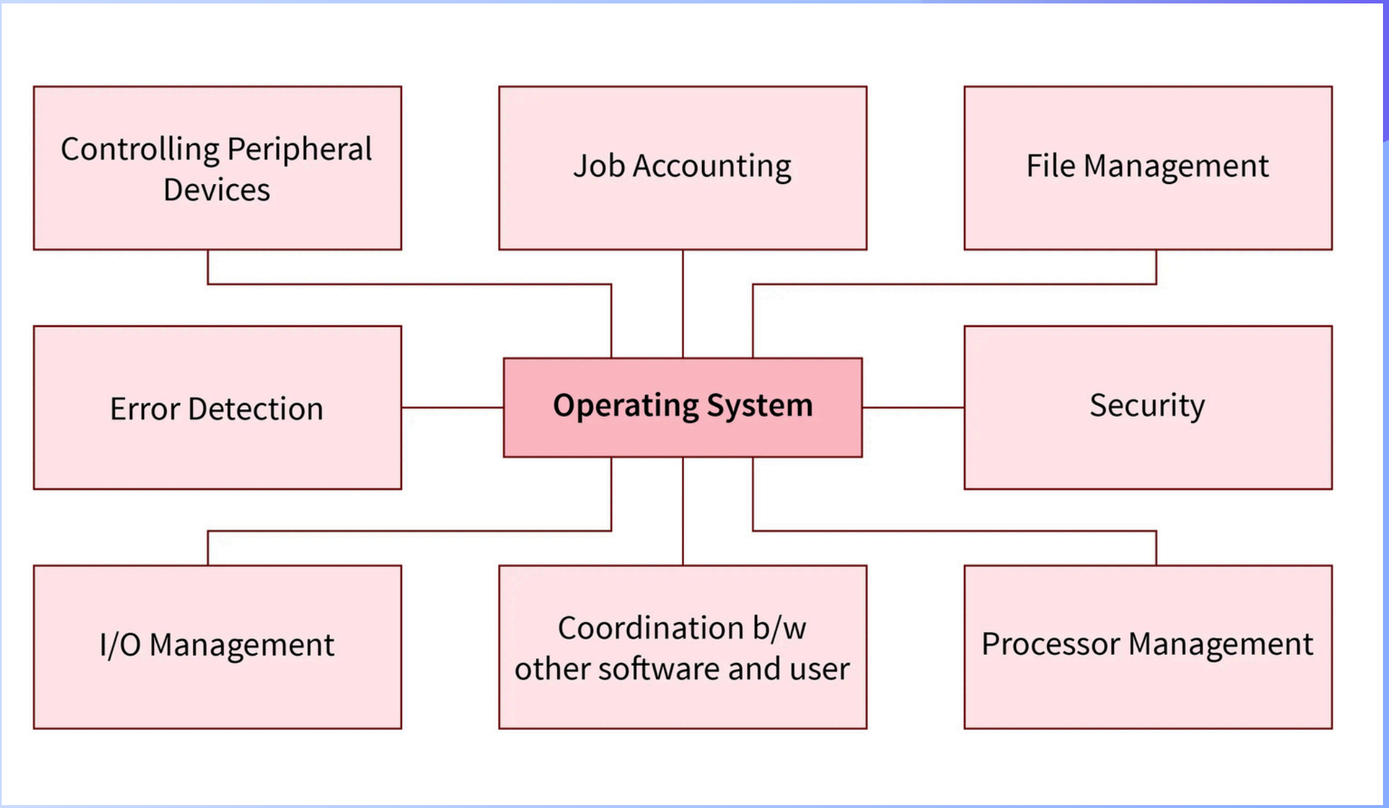
4. Modular Structure

- **Description:** Combines monolithic and microkernel ideas. Core kernel with dynamically loadable modules.
- **Examples:** Modern Linux, Windows NT
- **Advantages:**
  - Flexibility of microkernels with the performance of monolithic systems.
  - Easy to add or update components without rebooting.
- **Disadvantages:**
  - Can become complex if not well managed.



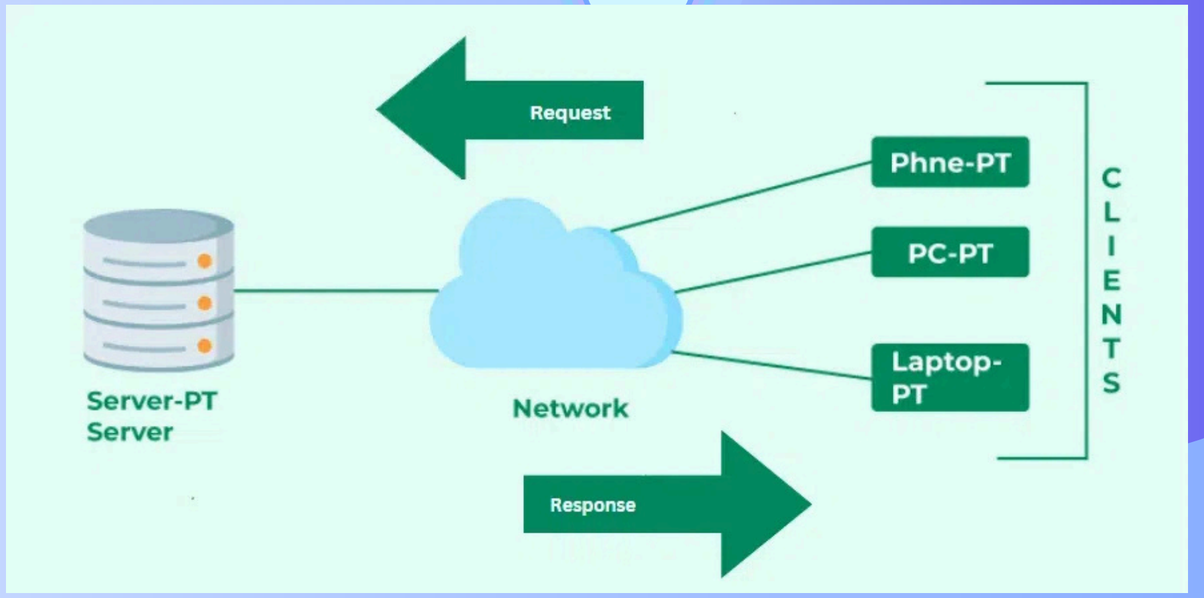
5. Hybrid Structure

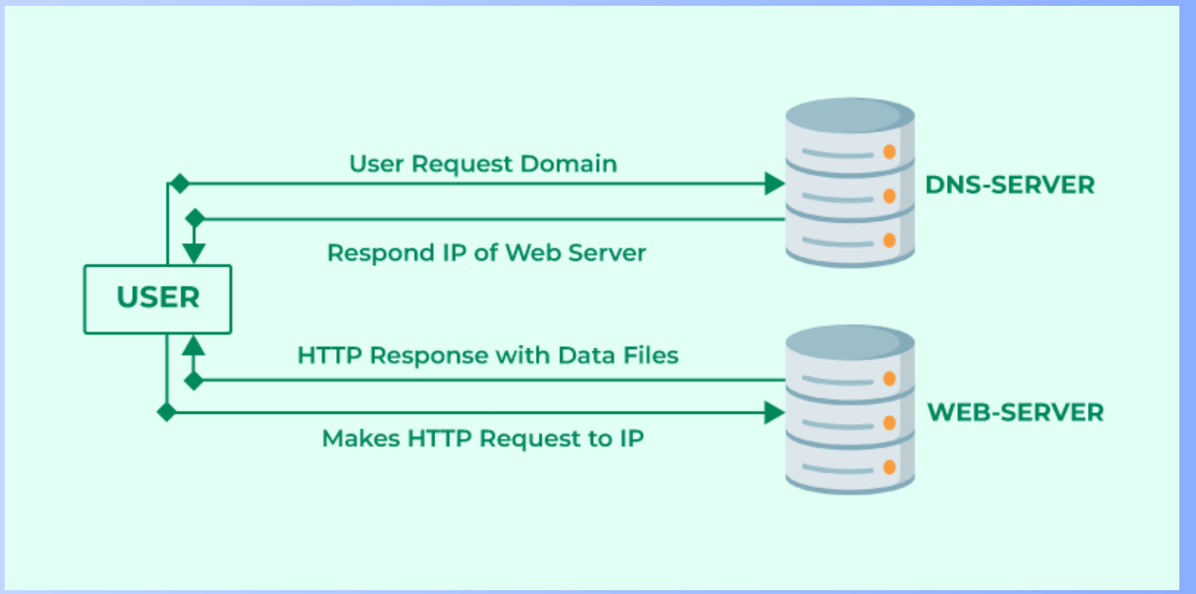
- **Description:** Mixes various OS structures to utilize the strengths of each.
- **Examples:** Windows, macOS
- **Advantages:**
  - Balances performance, security, and flexibility.
- **Disadvantages:**
  - Complexity in design and maintenance.



6. Client–Server Model

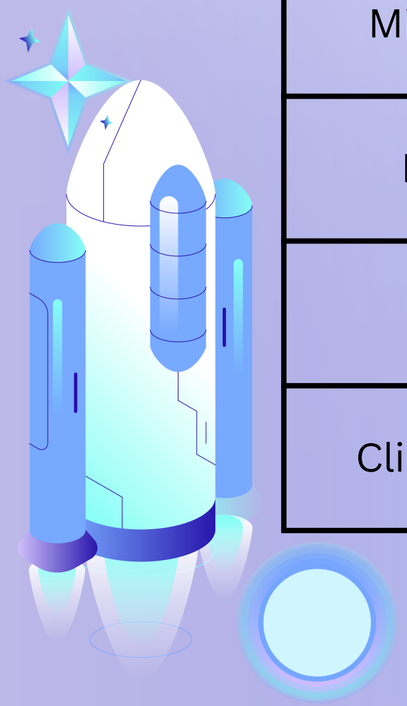
- **Description:** OS services are implemented as server processes; clients request services via messages.
- **Advantages:**
  - High modularity and isolation.
  - Failures are more contained.
- **Disadvantages:**
  - Communication overhead can affect performance.

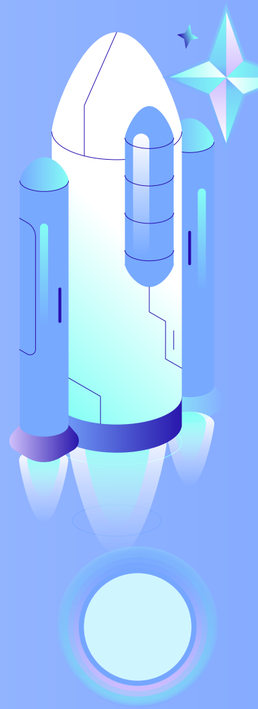




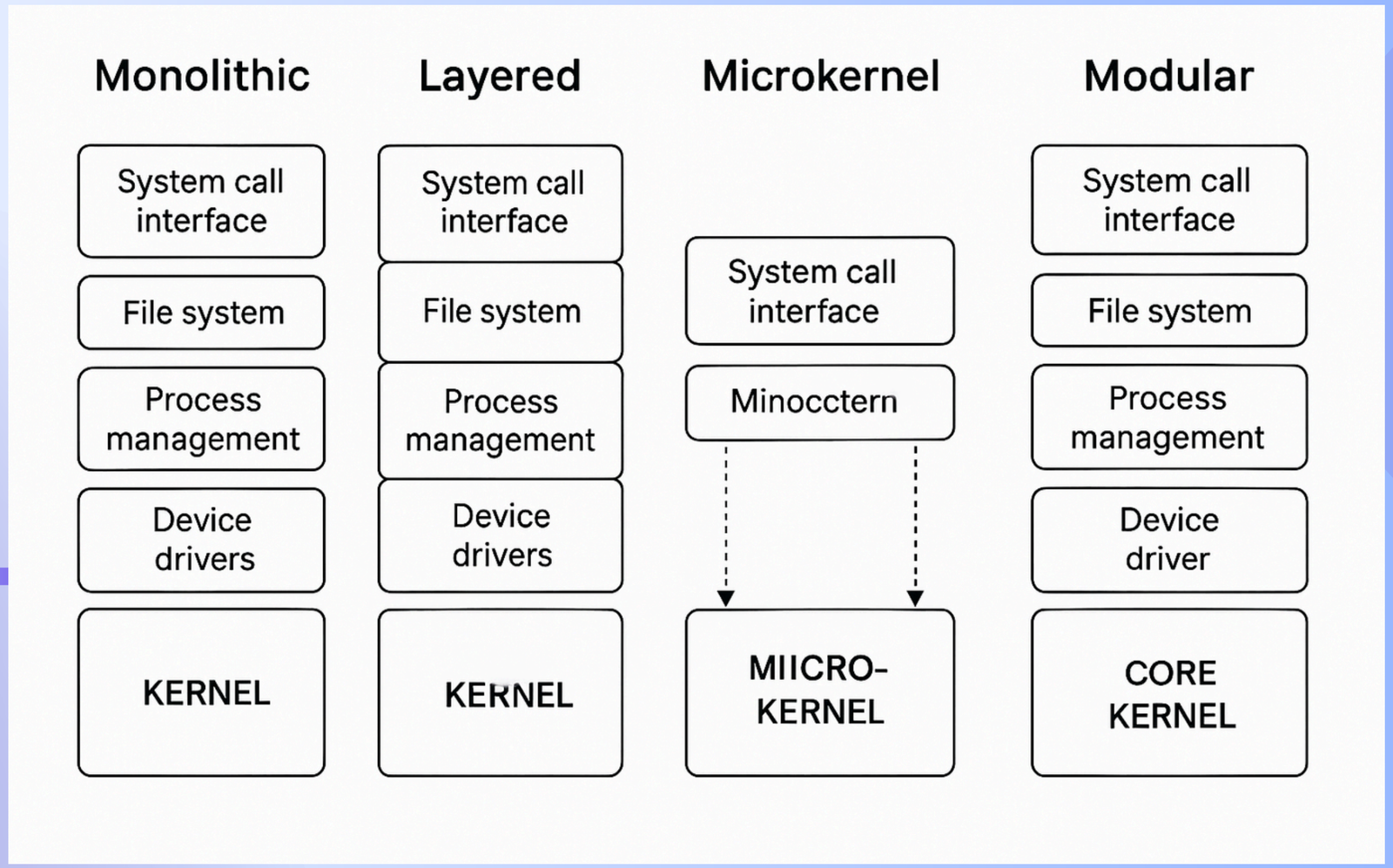
SUMMARY TABLE

Structure	Speed	Modularity	Security	Examples
Monolithic	High	Low	Low	Unix, early Linux
Layered	Medium	Medium	Medium	THE OS
Microkernel	Low	High	High	Minix, QNX
Modular	High	High	Medium	Modern Linux
Hybrid	Medium	High	Medium	Windows, macOS
Client-Server	Low	Very High	High	Networked OS





OS STRUCTURES DIAGRAM



THANK YOU!

Presented By:

1. MIA MD PAPPU- 202322240351
2. ISLAM MD IMRAN- 20232224058
3. PROF. SHEIKH SHOHAN AHMED-202322240361

N.B: IF YOU HAVE ANY QUESTION... PLEASE KEEP IT FOR YOURSELF..
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