OPERATING SYSTEM

L1

What is operating System?

- Interface between user and hardware.
- Software abstracting hardware
- Set of utilities to simplify application development / Execution.
- Control program.
- Acts like a government.

Services of OS

1) User Interface
2) Program Execution **
3) I/O operation.
4) File-System Manipulation
5) Communication (Inter-process Communication).
6) Error Detection
7) Resource Allocation
8) Accounting.
9) Protection and Security.

Goals of OS

- Convenience (user-friendly)
- Efficiency
- Portability.
- Reliability.
- Scalability.
- Robustness.

PARTS OF OS
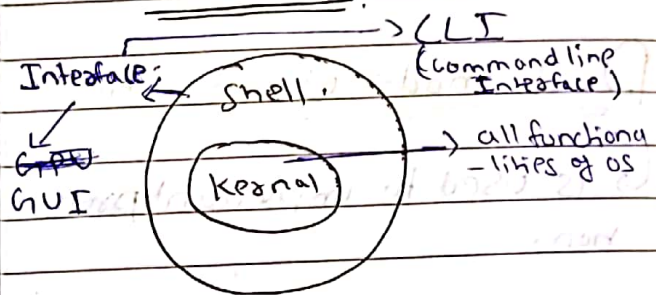
Interface → 1) GUI   2) CLI
           3) Batch Interface.

SYSTEM CALL

There are So many functions inside the kernal; to use those function OS need to call those function, So that it can run and perform some tasks, this call is called System call.
A System call is a way for programs to interact with OS.

Protection in OS

all the process inside the must do their own operation, It Should not affect other process or it should not do some other operation which is not permitted by ~~the~~ each process, to implement this OS gives protection ~~the~~ ~~process~~. to implement this ~~It is already give access to~~ ~~the process th~~
operations already assigned to the process, other than those operation processes ~~de with pot~~

Cannot do other operation.

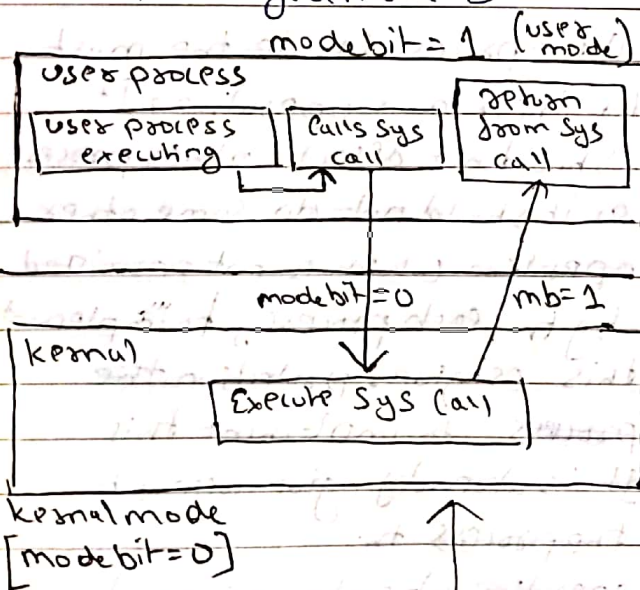## Dual mode of operation

↳ Is used to Implement protec-tion.

2 modes :

1) user mode (mode bit = 1)
When mode bit is 1 the process
can do those operation only which
are assign to it.

if process need those operation
which is not assigned to it, then
it will ask OS to do that operation
for the process. It is implemen-
-ted by changing the mode bit
to 0.

2) Kernal mode (mode bit = 0).
→ System mode
→ Supervisor mode   }↗
→ Privileged mode

mode bit = 1 (user mode)

```
┌─────────────────────────────────────────────┐
│ user process                                │
│  ┌──────────┐   ┌────────┐   ┌─────────┐     │
│  │user process│  │Calls Sys│  │ return  │     │
│  │executing  │   │  call  │   │from Sys │     │
│  │           │   │        │   │  call   │     │
│  └──────────┘   └────────┘   └─────────┘     │
└─────────────────────────────────────────────┘
```

mode bit = 0   mb = 1

```
┌─────────────────────────────────────┐
│ kernal                              │
│         ┌─────────────────┐         │
│         │ Execute Sys call │         │
│         └─────────────────┘         │
└─────────────────────────────────────┘
```

kernal mode
[mode bit = 0]

→ Transmission from user to
   Kernal mode.

TYPES OF Operating System

1] UNI PROGRAMMING OS

OS-allow only one process
to reside in main memory
(RAM)
RAM

```
┌──────────┐
│   OS     │
├──────────┤
│ Process  │
│   P1     │
└──────────┘
```

• Single process
  keep CPU and
  I/o Devices busy
  Simultaneously.
• Not a good CPU
  utilization.

2] MULTI PROGRAMMING OS

OS allow only on multiple
Processes to reside in MM

```
┌──────────┐
│   OS     │
├──────────┤
│  P1      │
│  P2      │
│  P3      │
│  P4      │
│  P5      │
│  P6      │
└──────────┘
```

• Better CPU utilization
  than uni programming.
• Degree of multi-
  programming =)
  no. of running progs
  (processes) in main memory.

=) Degree of multiprogramming
⇒ 6

• As the degree of multiprogramming
Increases CPU utilization is
also increases, upto certain
limit.

a) types of Multiprog. OS

Pre-emptive   Non
                 Pre-emptive.

Non-pre-emphive →

- A process runs on CPU till it wish, it can leave the CPU or when ┌→ Either process termin
  └→ goes for I/o operat^n
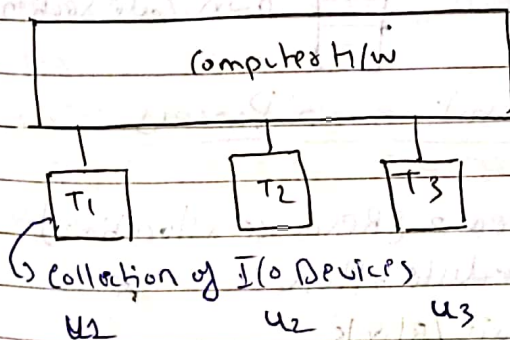- forcefully no other process can take out ~~at~~ these process out of the CPU

Preemphive → force fully other process can take out these processes out of the CPU.

3] MULTI - TASKING OS

Extension of Multiprogramming OS in which processes execute in round - robin fashion

Round robin | P₁ | P₂ | P₃ | P₄ | P₁ | P₂ |...|

all the processes execute ~~in~~ concurr--rently, not parallelly, it is also called time sharing OS.

4] Multi - User OS

```
┌─────────────────────────────┐
│       Computer H/w           │
└─────────────────────────────┘
    │         │         │
  ┌───┐     ┌───┐     ┌───┐
  │ T₁│     │ T₂│     │ T₃│
  └───┘     └───┘     └───┘
```

└→ collection of I/o Devices
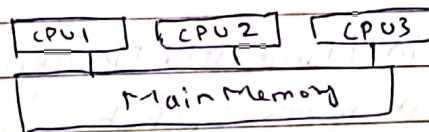 u₁   u₂   u₃

This OS allows multiple User to access single System simultaneously

5] → Multiprocessing OS

This OS is used in computer systems with multiple CPUs.

TYPES →

1) Tightly Coupled
(shared - memory)

```
┌─────┐  ┌─────┐  ┌─────┐
│ CPU1│  │CPU 2│  │ CPU3│
└─────┘  └─────┘  └─────┘
┌─────────────────────────┐
│      Main Memory         │
└─────────────────────────┘
```

2) Loosely Coupled (Distributed) System

```
┌────┐  ┌────┐  ┌────┐
│CPU1│  │CPU1│  │CPU3│
└────┘  └────┘  └────┘
  ↓       ↑       ↓
┌────┐  ┌────┐  ┌────┐
│MM1 │  │MM2 │~~│MM3 │
└────┘  └────┘  └────┘
```
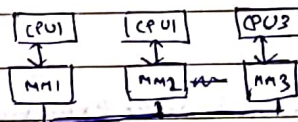
6] → EMBEDDED OS

An OS for embedded Comp Sys.
* Designed for a specific purpose, to increase functionality and reliability for achieving a specific task.
→ User interacting with OS is min.

7) Real TIME OS

Real time OS are used in environ--ment where a large no. of events mostly external to the Comp Sys, must be accepted and processed in a Short time or within certain deadlines.

eg → for rocket launching.

→ Every process has a deadline

TYPES

HARD RTOS	SOFT RTOS
Strict about Deadline	Some relaxa- -tion in Deadline.

8) HAND-HELD DEVICE OS

OS used in Hand held Devices like Smartphones OS, which work only on Smartphones.