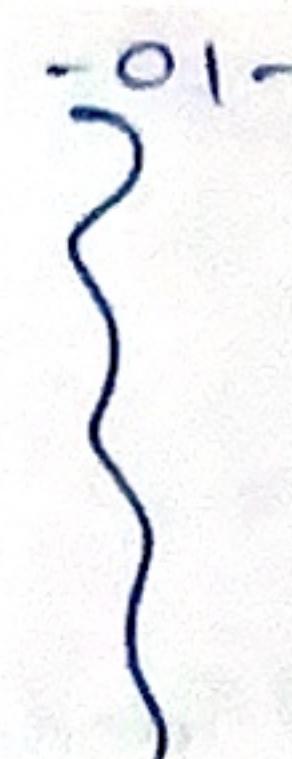


System's view of OS  
resource allocator  
control program



User's view of OS  
ease of use  
resource utilization

OS = Kernel  
System programs (not necessarily part of the kernel)  
application programs (all programs not associated with the operation of the system)

After giving the power to pc;

① Power Supply Unit (PSU) checks and sends a **Power Good Signal** to the motherboard.

② CPU starts execution from predefined memory location **0xFFFF0** (**Magic address**), which hardcoded.

\* JMP instruction \* jumps to the entry point of BIOS/UEFI  
The BIOS is mapped to the TOP of the 1MB address space. (0xF0000 - 0xFFFF)

### ③ BIOS

• 16-bit Real Mode.

1. Run POST (Power-On Self-Test)

checks CPU, RAM, GPU, Storage & peripherals.

2. Initializes **IVT** at **0x0000** (**RAM**) (Interrupt Vector Table)

Table containing pointers to Interrupt Service Routines (ISRs).  
size = 1KB each entry is 4 bytes.

(IVT allows software to interact with hardware via interrupts during the POST)

3. Hardware detection (HDD, SSD, USB, CD-ROM)

for each device, issues INT 0x13 calls. if the device responds correctly, it is marked as bootable.

4. Boot device selection.

follows a boot order and to scan devices for a valid MBR Master Boot Record.

If an MBR is found;

First 512 bytes of the boot device

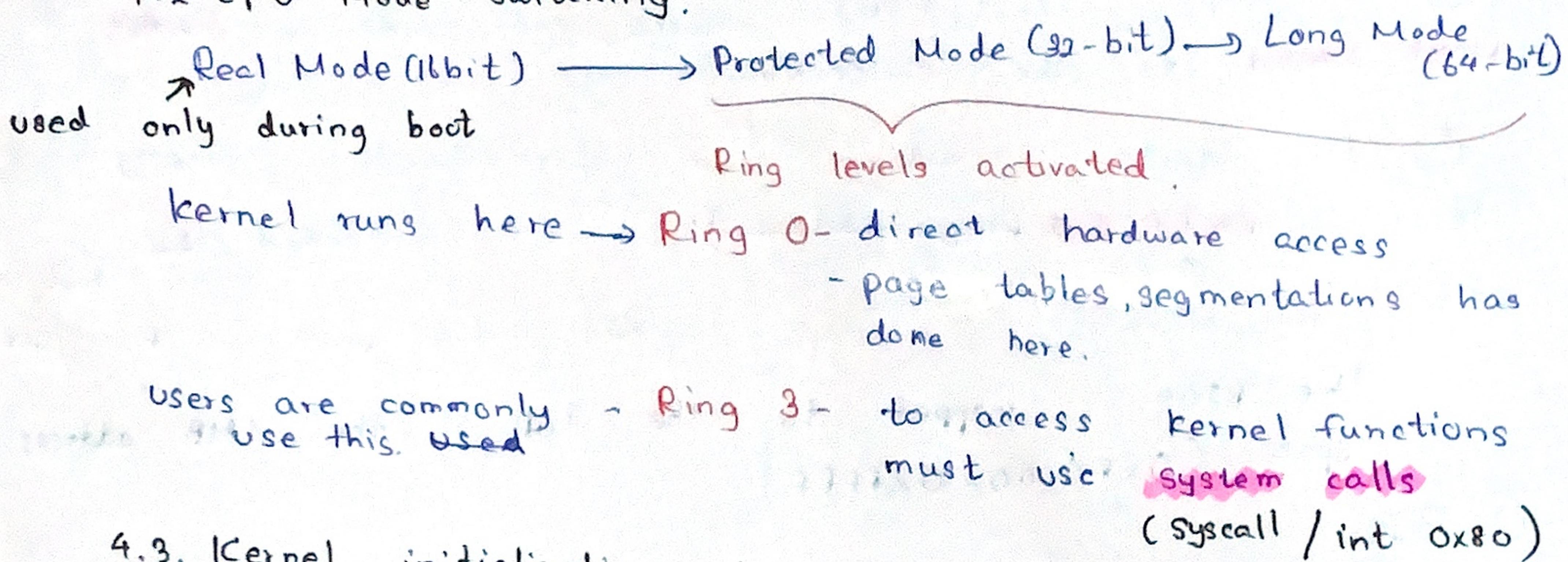
- 446 bytes - Bootloader code
- 64 bytes - partition table ( $16 \times 4$ )  $4 = \text{no of partitions}$
- 2 bytes - Magic number **0x55AA** (boot signature)

This indicates that this is the boot sector.  $\uparrow$  little endian format.

#### ④ Kernel Loading & Initialization.

##### 4.1 Kernel Loading

##### 4.2 CPU Mode switching.



##### 4.3. Kernel initialization steps.

- \* Hardware Abstraction Layer initializes CPU, memory & devices.
- \* Mounts root file system

- \* Starts the **first user-space process**

#### ⑤ User space Initialization

In Linux kernel directly executes **init**

**Init** → mounts file system (`/proc`, `/sys`, `/dev`)

Starts critical services like networking, logging.

Launches a login prompt.

Windows - `smss.exe`  
Linux - `Init` {  
Systemd  
(Modern)  
PID 1