Wednesday, October 20, 2021 11:11 AM

Process -

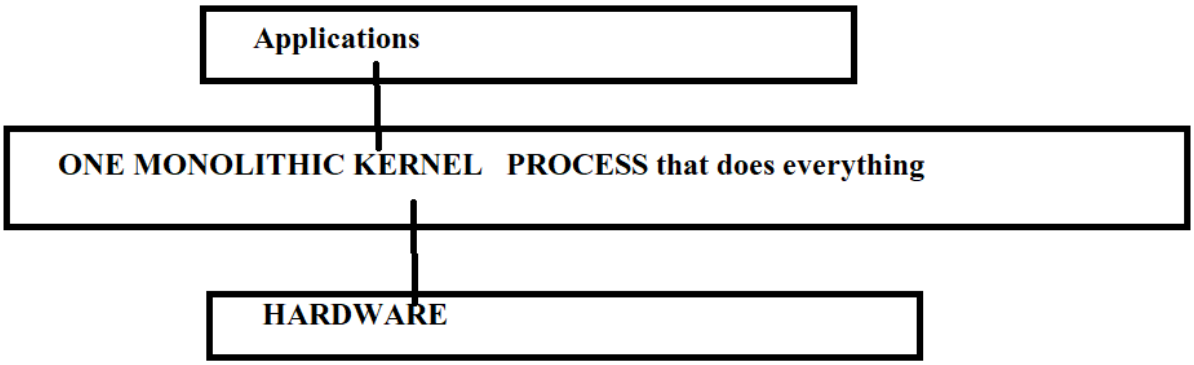
PID ? Process id , in pcb , unique id
PCB = Process Control Block -- info /attributes of process are stored / one per process

Kernel space / User space !

Two Types of Kernels ---

1. Monolithic Kernel --

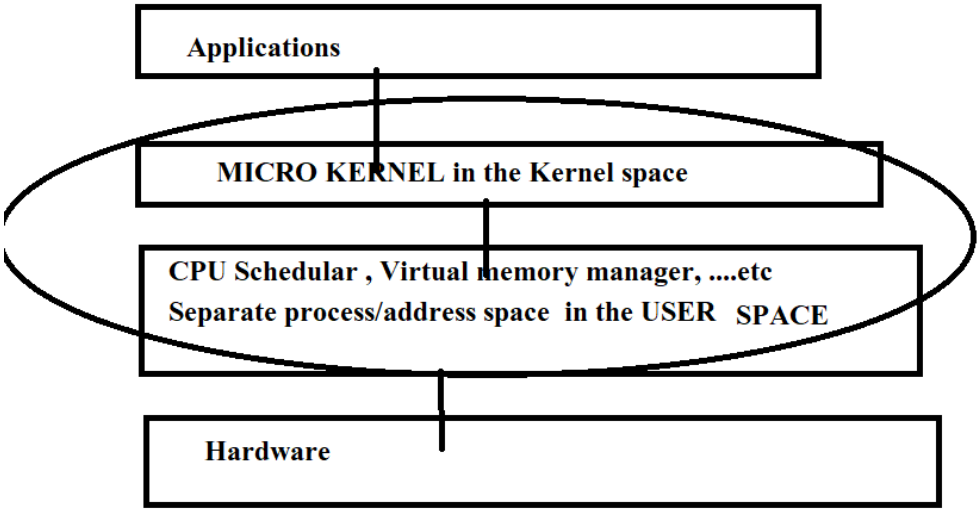
   All kernel features are in ONE KERNEL PROCESS (address space)
   Kernel space contains one kernel process --- the instructions are executed in kernel mode
   Examples ------ Linux , windows 98



   Advantage : As the entire kernel is in one process, speed is improved (FAST)
   Disadvantage : NOT fault tolerant (if there is an exception or error condition at run time - entire kernel hangs/ crashes

2. Micro Kernel

   Basic jobs of Kernel are in Kernel process which is in Kernel SPACE .
   Other features are in separate address spaces , in User SPACE



Advantages of Micro Kernel : Fault Tolerant - because even if a feature crashes still the kernel need not crash
Disadvantage of Micro Kernel : Communication between processes is an OVERHEAD - expensive (time and effort)

Example of Micro Kernel : Mac OS

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3. Hybrid Kernels ---------- the kernel process is bigger than a micro kernel and other error prone features are in user space
   a. Advantage : fault tolerance + less communication

Ex - Windows 10

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Process Life Cycle ----created, ready, running, wait, terminated

What are the transitions from running state ? Wait, ready, terminated
Running ----------??? interrupt----------ready
Running----------???----------wait
Running----------???----------terminated

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HW ----------Answers ---
Software interrupts(exception) --------- divide by 0 ----------due to some actions in the program
Page fault , exceed the limit of data type ---
Hardware interrupt ---------- mouse/keyboard
Maskable ----- ctrl-c ,
Non Maskable ------ Memory corruption , TRAP

https://linux-kernel-labs.github.io/refs/heads/master/lectures/interrupts.html

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Process Scheduling ----------
Why does a process wait in the ready queue ----WAITING for processor(CPU)
number of CPUs 4 : 230 number of processes is SKEWED

Process scheduling algorithm = Some algorithm that should **select** a process from **ready** queue and **allocate** it to the CPU .

The Operating System implements the Algorithm = that module is CPU Schedular / Low Level Schedular / Schedular, Short term schedular

Many process scheduling algorithms !! We will look at some **basic algo** and discuss their PROs and CONs!!!

1. FIFO
2. SJF
3. Priority
4. Round Robin

Factors on which the algorithms will be **judged**

1. Average Wait time
2. Average Turnaround time
3. Throughput
4. Response time

CPU Burst Time = total **time** required to complete ALL CPU instructions in the process
IO Burst Time = total **time** required to complete ALL IO instructions in the process

ALL calculations will consider ONLY CPU-BURST-TIME !!!

1. Wait Time of a process = the total **time** spent by the process in the READY queue
2. Average Wait Time for all processes in the ready queue =
   a. Sum of all Tw / number of processes = (Wt1 + Wt2 + Wt3) /3

   This value LESSER is BETTER !!!

3. Turnaround Time of a process = the total time needed for the process to complete the execution
   Ta = EndTime - ArrivalTime
   Ta = Wt + Tcpu

4. Average Turn around of all processes = sum of all Ta / number of processes
   This Value LESSER is BETTER

5. Throughput of system = total number of processes completed in the UNIT time
   10 process/ sec
   The VALUE HIGHER is BETTER

6. Response Time = it is the time taken by a process to respond to user request .
   Secs
   The VALUE LESSER is BETTER

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1. FIFO , FCFS = algorithm will select the process in the FRONT of the QUEUE
   allocate CPU till process completes

   Advantage --- SIMPLE algorithm
   Disadvantage ------- Hight Tcpu waits ahead of Low Tcpu === Average Ta and Wt are HIGH
   Priority is not considered
   Response time is poor HIGH

Process	Arrival Time	Tcpu
A	0	7
B	2	9
C	1	5

Calculate Average Wt and Ta using FIFO/FCFS algorithm !!!

Ready Queue =

Front A	C	B Rear

GANTT CHART

A gets CPU At 0sec ----upto----7sec	C 7-------12	B 12------21

|-----|----2----3----4----5----6------7---------8-----9----10----11----12---------13-----14---15---16---17---
-18---19----20---21
0 A ends Cends
C starts Bstarts

A	Wt = 0 - 0 = 0	Ta = 7 -0 = 7
B	Wt = 12-2 = 10	Ta = Wt + Tcpu = 10+9 = 19
C	Wt = 7 - 1 = 6	Ta = 6 +5 = 11
Average	0+10+6=16 16/3=5.3333	7+19+11=37 37/3 = 12.3333

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Process	Arrival Time	Tcpu
A	0	3
B	2	5
C	1	10
D	3	3

Calculate Average Wt and Ta using FIFO/FCFS algorithm !!!

GANTT CHART

A 0----3	C 3----13	B 13----18	D 18-----21

Process	Wt = Starttime - arrivaltime	Ta = Wt + Tcpu
A	0-0=0	0+ 3 = 3
B	13-2=11	11+5=16
C	3-1=2	2+10=12
D	18-3=15	15+3=18
Average	0+11+2+15=28 28/4=7	3+16+12+18=49 49/4=12.25

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