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TATA CONSULTANCY SERVICES

vILP – CPP – Operating System

Managing Process Part 1

Version 1.1

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1.1 Process Introduction

A process can be defined in many ways, the simplest of them is “A Program in Execution” alternatively it can be defined as:

>> A process is an instance of a program running in a computer with definite life-time and hierarchy.

>> A process is started when a program is initiated (either by a user or by another program).

A process require certain resources to accomplish its intended task, they are

>> CPU time

>> System memory

>> Disk Files

>> I/O devices.

These resources are allocated to the process either when it is created or while it is executing. When a program is executed on system, the system creates a specific environment that contains everything required for the program to run.

1.2 Process control blocks (PCB)

The OS must know all the information about any specific processes in order to manage and control them, the OS maintains a table (an array of structures), called the process table, with one entry per process. These entries are called process control blocks (PCB) -

also known as task control block. This entry contains information about the process' state, its program counter, stack pointer, memory allocation, the status of its open files, its accounting and scheduling information, and everything else about the process that must be saved when the process is switched from ready to running or blocked state so that it can be restarted later with the status it left off. Such information is usually grouped into two categories: Process State Information and Process Control Information. Including these:

Process state:- The state may be new, ready, running, waiting, halted, and so on.

Program counter:- The counter indicates the address of the next instruction to be executed for this process.

CPU registers:- The registers vary in number and type, depending on the computer architecture. They include accumulators, index registers, stack pointers, and general-purpose registers, plus any condition-code information.

CPU-scheduling information:- This information includes a process priority, pointers to scheduling queues, and any other scheduling parameters.

Memory-management information:- This information may include such information as the value of the base and limit registers, the page tables, or the segment tables, depending on the memory system used by the OS.

Accounting information:- This information includes the amount of CPU and real time used, time limits, account numbers, job or process numbers, and so on.

I/O status information:- This information includes the list of I/O devices allocated to the process, a list of open files, and so on.

1.3 Process state

A process may present in one of the following state.

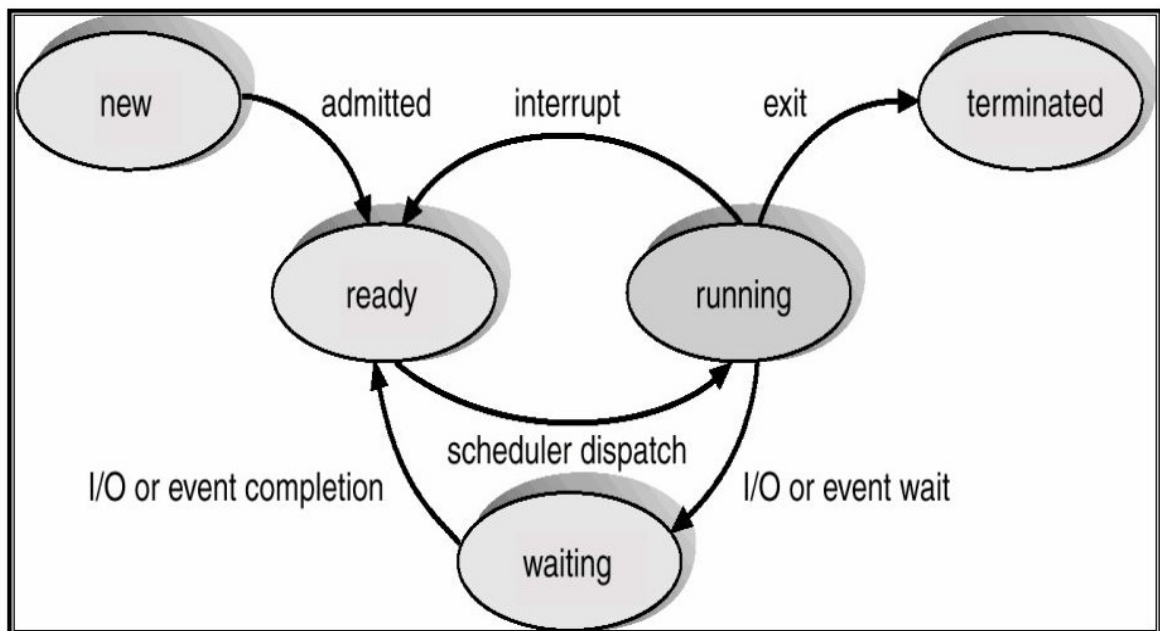
New:- The process is being created or just created.

Ready:- The process is waiting to be assigned/allocated to a processor time.

Running:- Instructions of the process are being executed by processor.

Waiting:- The process is waiting for some other event/process to execute.

Terminated:- The process has finished its execution.



1.4 The command: *ps*

The *ps* (i.e., process status) command is used to provide information about the currently running processes in the system. When *ps* is used without any option four columns of information labeled PID, TTY, TIME and CMD for at least two processes, the shell and *ps* will be visible.

```
[390119 @ INGNRILPORCL] $ ps
```

PID	TTY	TIME	CMD
15982	tty4	00:00:00	sh
18746	tty4	00:00:00	ps
18701	tty4	00:05:33	cat

PID :- The process are identified by a 5 digit number known as PID (Process Identification Number).

TTY :- Is the name of the console or terminal that the user logged into (Stands for terminal type now but originally stood for teletype).

TIME :- Is the amount of CPU time in minutes and seconds that the process has been running.

CMD :- is the name of the command that launched the process.

Few of the options available with *ps* command are :

Options	Descriptions
-A/-e	Provides for all(A:all) including user and system process information
-f	Provides more (f: full) information
-p / -ppid	Select by process ID. Identical to -p and p.
-C	Provides process information related to specific command
--forest	List Processes in a Hierarchy

Consider the output of the following command

```
$ ps aux
```

USER	PID	%CPU	%MEM	VSZ	RSS	TTY	STAT	START	TIME	COMMAND
root	1	0.0	0.0	10372	696	?	Ss	May08	1:06	init [5]
759974	31370	0.0	0.0	0	0	?	Zs	09:59	0:00	[sh]
390119	31678	0.0	0.0	63856	1108	pts/6	R+	09:59	0:00	ps aux
oracle	29168	6.3	0.1	49364	23852	?	Rs	May20	9:10	orcilp
...										

The information that ps aux provides about each process is :

>> Percentage of CPU and memory used by the process,

>> VSZ (virtual size in kilobytes),

>> RSS (real memory size or resident set size in 1024 byte units),

>> Length of time the process been active and the command that initiated the process.

The process state codes include:

D: Uninterruptable sleep;

N: Low priority;

R: Runnable (on run queue);

S: sleeping;

T: Traced or stopped;

Z: defunct (zombie).