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# Review on Process Optimization in Operating System

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## Abstract:

Process management is the core part of operating system. It's duty is creation of process, it's scheduling, synchronization and ending of all processes.

A process is set of instructions or a program that executes or become active then the processes gets ready and PID i.e process id is allocated to each process and further function are being done. It helps in proper use of CPU, and helps to maintain the work load. This review paper includes all the aspects of process management that includes states of processes, algorithms for scheduling their communication and handling of still or locked situations.

*Keywords* — **Process, operating system, schedule, locked, communication, synchronization still.**

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## I. INTRODUCTION

Operating system is a system or a core part of computer system which acts as a connection between users and the hardware. In which process management is the most important part which handles all the functions related to process. A process is set of instructions that become active after it is ready for execution.

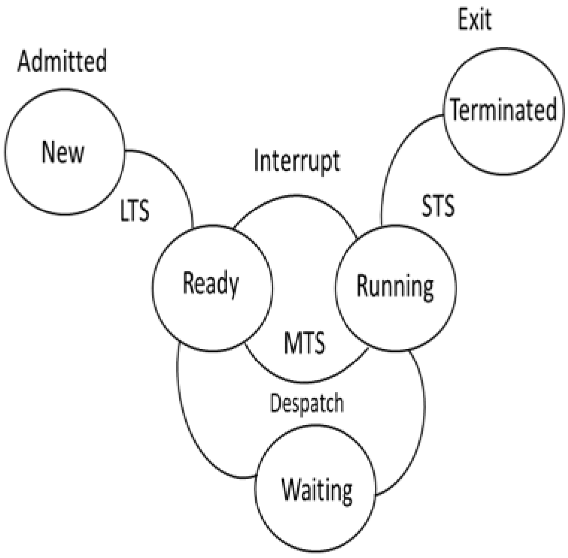
It helps in multitasking where multiple processes run or executes parallely. This paper reviews all the fundamental concepts of process management including process states, different algorithms, synchronization, locks, other examples and it's applications.

## II. PROCESS CONCEPT

A process is dynamic, set of instructions that includes counter, register, variables etc that becomes active when the executions begins.

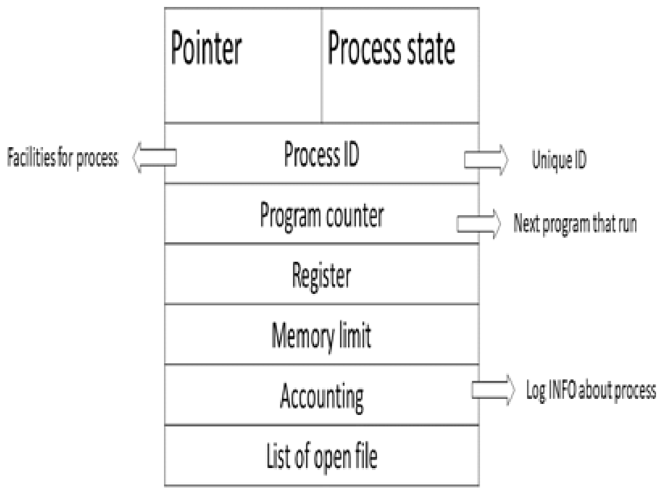
### *A. Process States*

Process consists of different stages that includes mainly new, ready, running, waiting, terminated.



## III. PROCESS CONTROL BLOCK (PCB)

It functions and handles the each process-related functions or their information like process ID, its states, registers, schedulers, file transfer or functional info, priorities, etc.



PCB Diagram

### B. *Context Switching*

It includes switching of CPU from one process to another which requires saving the state of old process and loading the same state for new process is called context switching.

## IV. PROCESS SCHEDULING

It is the system or concept that handles and schedules processes in different ways like
1.LTS
2.STS
3.MTS.

- Long Term Scheduler:

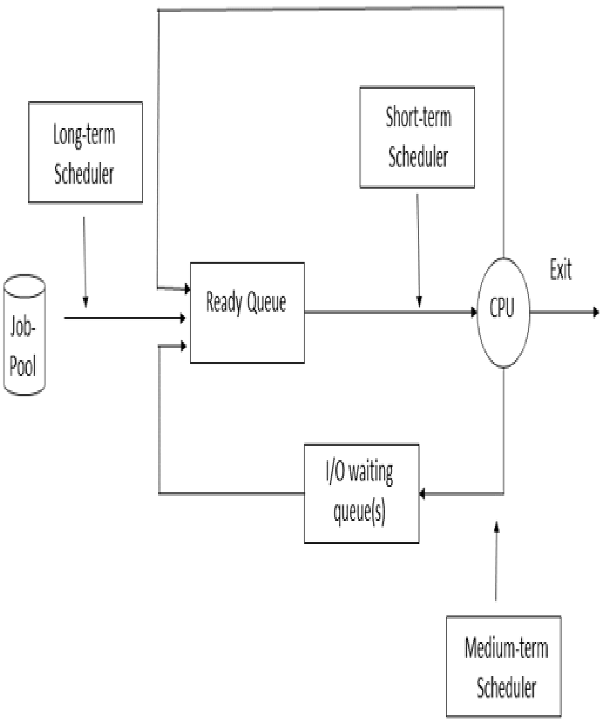
It is the one type of scheduler that decides which process from job secondary storage(ROM) are transferred or send to main memory (RAM) into ready queue.

- Short Term Scheduler:

It decides which process is ready from ready queue for execution and allocates the CPU next.

- Medium Term Scheduler:

It decides which process should temporarily removes or suspends from main memory to secondary memory it is also known as swapping of process in or out.



***Scheduling Algorithms:*** Scheduling algorithms helps to manage the execution of processes transferred to the CPU. It also supports in better throughput, proper time and CPU utilization.

- ***First Come First Serve (FCFS)***
- ***Shortest Job Next (SJN)***
- ***Priority level Scheduling***
- ***Cyclic Execution (r.r)***
- ***Multilevel Feedback queue scheduling***

| **Algorithm** | **Avg. waiting time** | **Throughput** | **Fairness** | **Avg. response time** |
|---|---|---|---|---|
| FCFS | High | Low-Medium | Low | High |
| SJF | Low | High | Low-Medium | Low |
| Priority Scheduling | Depends on priorities | Variable | Low | Variable |
| R.R | Depends on time quantum | Medium-High | High | Low |
| Multilevel Queue | Depends on queue policies | Variable | Variable | Variable |

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## V. INTER PROCESS COMMUNICATION (IPC)

Inter-Process Communication (IPC) is a refers to important technique or part of the operating system that enables efficient communication between multiple processes to share data among each other. It enables efficient communication between processes and efficient simultaneous working on same computer hardware or different systems.

### *A. Methods of IPC:*

1. **Shared memory:**

In this two or multiple processes exchange their data or information through a sharing part or region through which they can perform operations like read, write etc data from this region.

It includes two types of buffers that can be used:

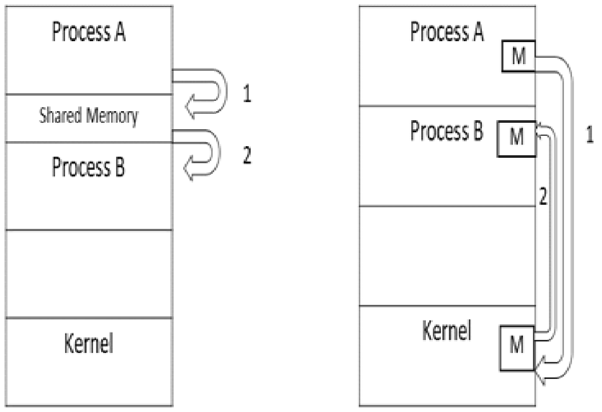
1. Unbounded buffer: - This buffer place is a temporary storage part of data between processes that has no limit on its size.
2. Bounded buffer :- This type of buffer has a behaviour of sharing the resources between the processes with a fixed size memory.

**2. Message passing:**

In this model, the data or information is transferred or exchanged in the form of message through kernel.

There are two types of message passing:

1. Direct communication :- In this type of communication each process that wants to communicate with other processes must explicitly name the recipient or senders name in the communication process or call.
2. Indirect communication :- in this type of communication the message is send by using a intermediary like mail box or ports that is used for exchanging of messages.



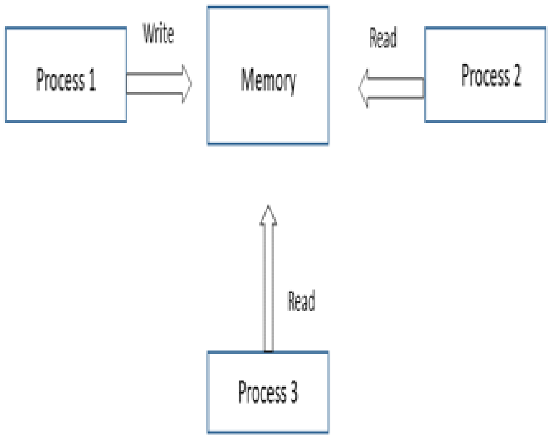
Shared Memory and Message Passing

## VI. PROCESS SYNCHRONIZATION

Process synchronization is the mechanism of operating system in which multiple processes or threads can run or execute simultaneously, parallely preventing interference between each other when sharing different resources.

It ensures execution of each process in proper order and maintains integrity of data or information and provides security of data by preventing data loss and deadlocks.

It is important to maintain consistency of data, preventing losses and making execution of process in a sequential, orderly manner.



## VII. DEADLOCK IN PROCESSES

A deadlock is a condition in operating system in which either two or multiple processes gets stuck or they are unable to process further because each process is waiting for a specific resource that is with the another process in a group.

This condition occurs because every process holds a specific resource while another process simultaneously request for a resource which is not free or available at that time which leads to increase in waiting time of all processes to complete.

1. **Mutual Exclusion:-**

In this type, no another process will execute simultaneously when the another process is executing in same part.

2. **Hold and Wait:-**

In this, at least one resource can hold and waits to grap another additional resources that are currently with the other processes.

3. **No Preemption:-**

Once the resource is in the CPU it cannot be breaked or forcefully removed from a process that holds them.

4. **Circular Wait:-**

It includes a chain of processes in which each process is waiting for a resource that is acquired by the next process in chain, with last process waiting for the resource acquired by the first.

## VIII. CONCLUSIONS

Process management is the crucial part of operating system. It ensures proper functioning of each process their execution, creation, scheduling, communication among them, handling of locking situations when utilizing different resources.

The review depicts concept of process, managing of process control block(PCB), context switching, scheduling algorithm, schedulers, inter process communication (IPC), synchronization of process and management of deadlocks.

By visualizing real-world operating systems like Windows and Linux, process management makes efforts to be more advanced in schedulers, virtualization, reducing complexity, cloud-based platforms for storage and security concerns.

Thus, process management look after overall management and functioning of processes efficiently, reliably, simultaneously and securely.

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