OPERATING SYSTEMS

CPU Scheduling _ 2

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Non-Preemptive Priority Scheduling (NPPS)
Preemptive Shortest Remaining Time First (SRTF)

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Scheduling Criteria

- **CPU utilization** – keep the CPU as busy as possible
- **Throughput** – # of processes that complete their execution per time unit
- **Turnaround time** – amount of time to execute a particular process (performance metric)
- **Waiting time** – amount of time a process has been waiting in the ready queue
- **Response time** – amount of time it takes from when a request was submitted until the first response is produced, not output (for time-sharing environment)

Scheduling Algorithm Optimization Criteria

- Maximize CPU utilization
- Maximize throughput
- Minimize turnaround time
- Minimize waiting time
- Minimize response time

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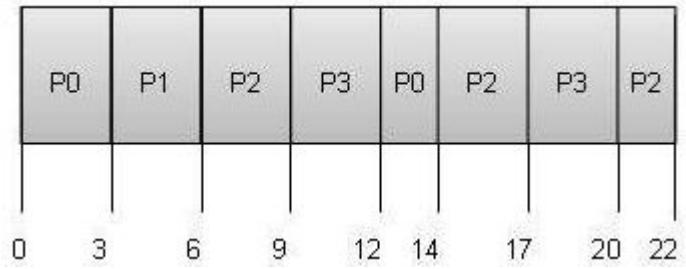
Sample Schemas and Tools for solving Scheduling Problems

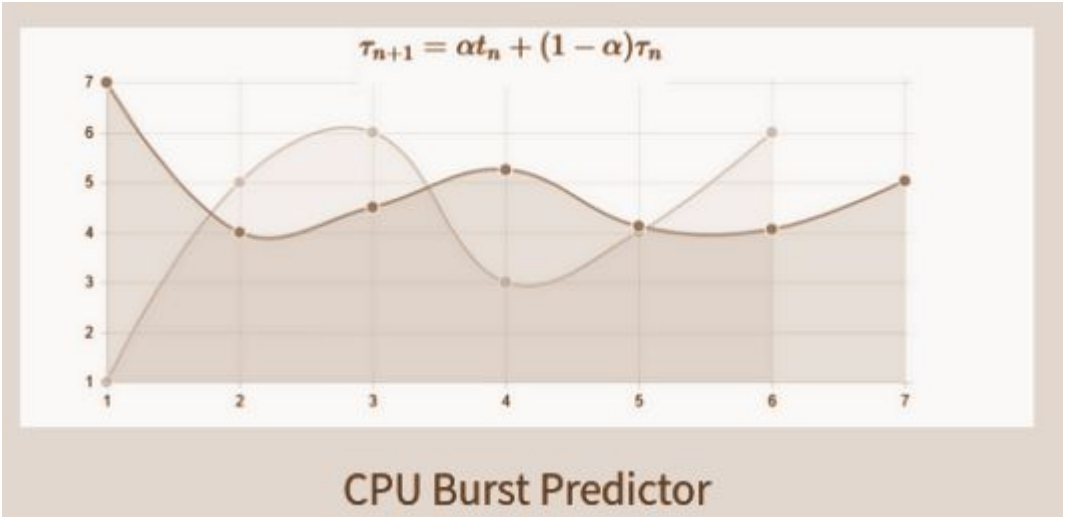
Process	Arrival Time	Execute Time	Service Time

Process	Execution time	Arrival time

Process	Arrival Time	Execution Time	Priority	Service Time

GANTT Chart





Sample Schemas and Tools for solving Scheduling Problems

Arrival Time: Time at which the process arrives in the ready queue.

Completion Time: Time at which process completes its execution.

Burst Time: Time required by a process for CPU execution.

Turn Around Time: Time Difference between completion time and arrival time.

Turn Around Time = Completion Time – Arrival Time

Waiting Time(W.T): Time Difference between turn around time and burst time.

Waiting Time = Turnaround Time – Burst Time

Non-Preemptive Priority Scheduling (NPPS)

Characteristics of Non-Preemptive Priority Scheduling

A CPU algorithm that schedules processes based on priority.

- In **Non-Preemptive Priority** scheduling, a number is assigned to each process that indicates its priority level.
- **Lower** the **number**, **higher** is the **priority**.
- Non-Preemptive Priority Scheduling is another type of technique which is commonly used to schedule processes in batch operating systems.
- In Non-Preemptive Priority Scheduling there is a priority assigned to each process and processes are executed according to their priority and since it is non-preemptive so a process can't be preempted by another process in the midst of execution of a process.
- In this type of scheduling algorithm, if a newer process arrives, that is having a higher priority than the currently running process, then the currently running process will be allowed to complete its execution, then new decision is taken
- At the time of taking decision based , If two jobs having the same priority are ready, it works on a SJF/SJN, in case of contention, FIFO is used, if contention still exist then apply PES University subscript method
- However, in case of contention, one has to explain how the contention is resolved if one is following other non-standard method

Non-Preemptive Priority Scheduling (NPPS)

Advantages of Non-Preemptive Priority Scheduling

- Easy to use scheduling method
- Processes are executed on the basis of priority so high priority does not need to wait for long which saves time
- This method provides a good mechanism where the relative important of each process may be precisely defined.
- Suitable for applications with fluctuating time and resource requirements.

Disadvantages of Non-Preemptive Priority Scheduling

- If the system eventually crashes, all low priority processes get lost.
- If high priority processes take lots of CPU time, then the lower priority processes may starve and will be postponed for an indefinite time.
- This scheduling algorithm may leave some low priority processes waiting indefinitely.
- A process will be blocked when it is ready to run but has to wait for the CPU because some other process is running currently.
- If a new higher priority process keeps on coming in the ready queue, then the process which is in the waiting state may need to wait for a long duration of time.

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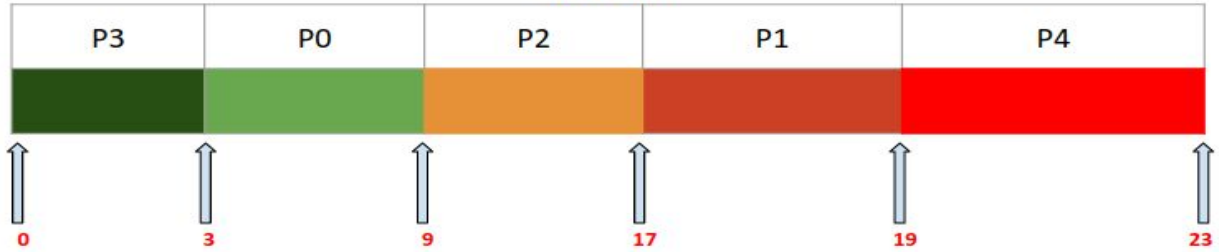
Non-Preemptive Priority Scheduling (NPPS)

Using the below given Process Table, applying Non-preemptive Priority Scheduling Algorithm. Find the following by drawing appropriate GANTT Chart

1. Waiting Time (WT) for each process
2. Turn Around Time (TAT) for each process
3. Response Time (RT) for each process
4. Average Response Time (ART)
5. Average Waiting Time (AWT)
6. Average Turnaround Time (ATAT)

GANTT Chart



Process Table			
Process ID	Arrival Time	CPU Burst	Priority
P0	2	6	1
P1	5	2	2
P2	1	8	1
P3	0	3	1
P4	4	4	4

Process ID	Arrival Time	Response Time	Waiting Time	Turn Around time
CIP	Omnipresent	Omnipresent	Omnipresent	Omnipresent
P0	2	3-2=>1	3-2=>1	9-2=>7
P1	5	17-5=>12	17-5=>12	19-5=>14
P2	1	9-1=>8	9-1=>8	17-1=>16
P3	0	0	0	3-0=>3
P4	4	19-4=>15	19-4=>15	23-4=>19
Average	2.4	7.2	7.2	11.8
Remarks	AAT	ART	AWT	ATAT

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Non-Preemptive Priority Scheduling (NPPS) - Practice Problem

Using the below given Process Table, applying Non-preemptive Priority Scheduling Algorithm. Find the following by drawing appropriate GANTT Chart

1. Waiting Time (WT) for each process
2. Turn Around Time (TAT) for each process
3. Response Time (RT) for each process
4. Average Response Time (ART)
5. Average Waiting Time (AWT)
6. Average Turnaround Time (ATAT)

GANTT Chart

Process Table			
Process ID	Arrival Time	CPU Burst	Priority
P0	1	11	100
P1	1	6	72
P2	21	3	1
P3	17	14	1
P4	11	27	71

Process ID	Arrival Time	Response Time	Waiting Time	Turn Around Time
CIP	Omnipresent	Omnipresent	Omnipresent	Omnipresent
P0				
P1				
P2				
P3				
P4				
Average				
Remarks	AAT	ART	AWT	ATAT

Preemptive Shortest Remaining Time Scheduling (SRTF)

Characteristics of Preemptive Shortest Remaining Time Scheduling (SRTF)

- **SRTF**, Which Stands for **Shortest Remaining Time First** is a scheduling algorithm used in Operating Systems, which can also be called as the preemptive version of the **SJF/SJN scheduling algorithm**.

- The process which has the least processing time remaining is executed first. As it is a preemptive type of schedule, it is claimed to be better than SJF scheduling Algorithm.

Preemptive Shortest Remaining Time Scheduling (SRTF)

Advantages of Preemptive Shortest Remaining Time Scheduling (SRTF)

- SRTF is optimal and guarantees the minimum average waiting time.
- It provides a standard for other algorithms since no other algorithm performs better than it.

Disadvantages of Preemptive Shortest Remaining Time Scheduling (SRTF)

- It cannot be implemented practically since burst time of the processes cannot be known in advance.
- It leads to starvation for processes with larger burst time.
- Priorities cannot be set for the processes.
- Processes with larger burst time have poor response time.

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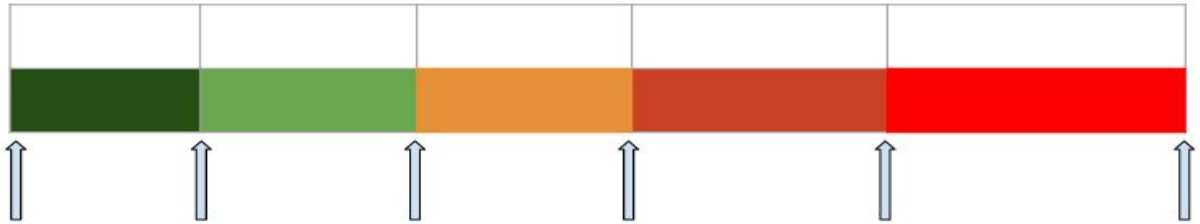
Preemptive Shortest Remaining Time First Scheduling (SRTF)

Using the below given Process Table, applying Preemptive Shortest Remaining First (SRTF) Scheduling Algorithm. Find the following by drawing appropriate GANTT Chart

1. Waiting Time (WT) for each process
2. Turn Around Time (TAT) for each process
3. Response Time (RT) for each process
4. Average Response Time (ART)
5. Average Waiting Time (AWT)
6. Average Turnaround Time (ATAT)

GANTT Chart



Process Table			
Process ID	Arrival Time	CPU Burst	Priority
P0	1	16	1
P1	0	21	2
P2	1	8	1
P3	0	13	1
P4	1	14	4

At the time of taking decision, apply only the desired algorithm even in the presence of extra information in this case like priority, it applies to all the similar problems,use information only if it is applicable, else treat it as not applicable. In case of contention apply standard method or else give your view own explanation on using a non-standard method

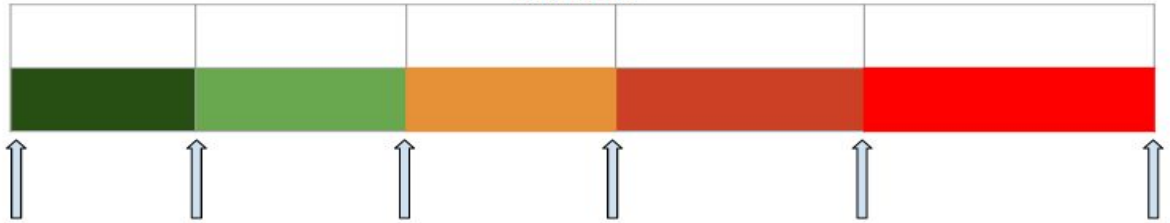
Process ID	Arrival Time	Response Time	Waiting Time	Turn Around time
CIP	Omnipresent	Omnipresent	Omnipresent	Omnipresent
P0				
P1				
P2				
P3				
P4				
Average				
Remarks	AAT	ART	AWT	ATAT

Preemptive Shortest Remaining Time First Scheduling (SRTF) - Practice Problem

Using the below given Process Table, applying Preemptive Shortest Remaining First (SRTF) Scheduling Algorithm. Find the following by drawing appropriate GANTT Chart

1. Waiting Time (WT) for each process
2. Turn Around Time (TAT) for each process
3. Response Time (RT) for each process
4. Average Response Time (ART)
5. Average Waiting Time (AWT)
6. Average Turnaround Time (ATAT)

GANTT Chart



Process Table			
Process ID	Arrival Time	CPU Burst	Priority
P0	10	16	1
P1	20	21	2
P2	30	18	1
P3	40	12	1
P4	50	14	4

At the time of taking decision, apply only the desired algorithm even in the presence of extra information in this case like priority, it applies to all the similar problems,use information only if it is applicable, else treat it as not applicable. In case of contention apply standard method or else give your view own explanation on using a non-standard method

Process ID	Arrival Time	Response Time	Waiting Time	Turn Around time
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P0				
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Average				
Remarks	AAT	ART	AWT	ATAT

THANK YOU

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