Operating Systems
Shortest job first (SJF) scheduling

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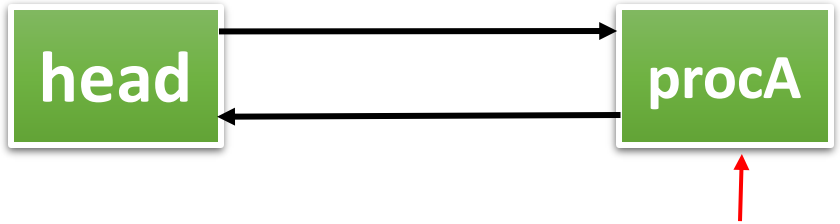
Non-interactive processes with goodness formula

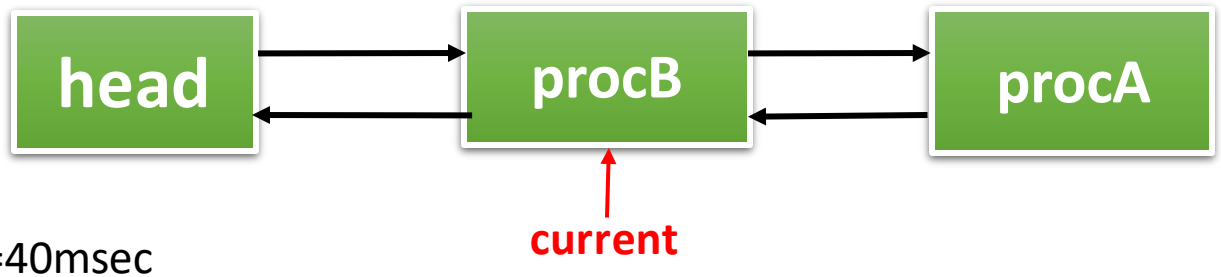
Process A,Type:Non interactive
Spawn time : 10 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0



T=10msec

Process B,Type:Non interactive
Spawn time : 40 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0

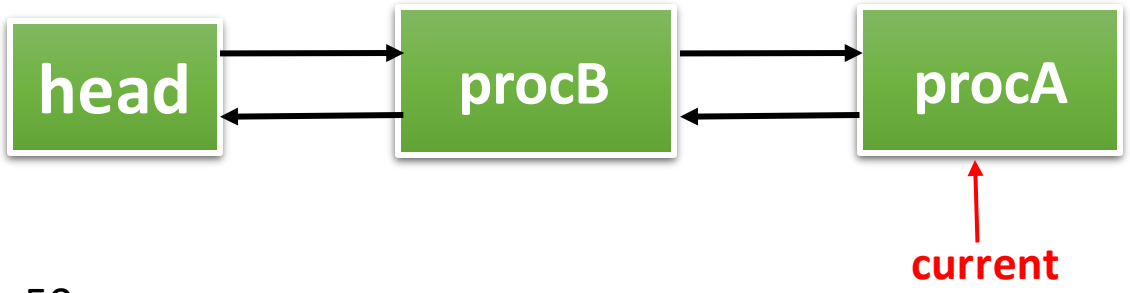
Process A ,Type:Non interactive
Spawn time : 10 msec
Burst=30
Current_expected_burst=0
Previous_expected_burst=0



T=40msec

Process B Type:Non interactive
Spawn time : 40 msec
Burst=10
Current_expected_burst=0
Previous_expected_burst=0

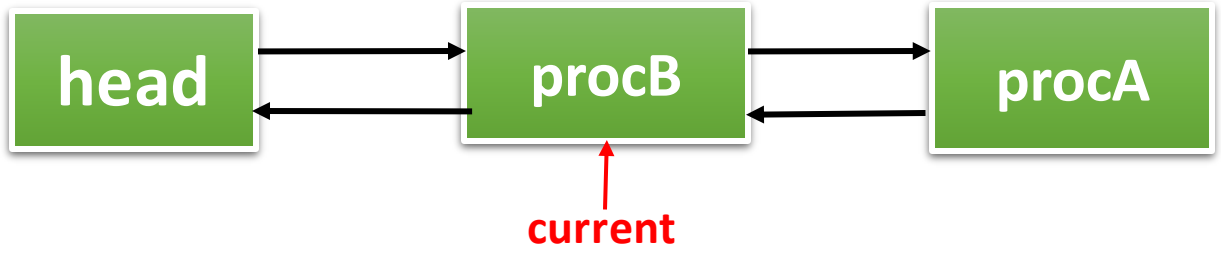
Process A,Type:Non interactive
Spawn time : 10 msec
Burst=30
Current_expected_burst=20
Previous_expected_burst=0



T=50msec

Process B,Type:Non interactive
Spawn time : 40 msec
Burst=10
Current_expected_burst=6.67
Previous_expected_burst=0

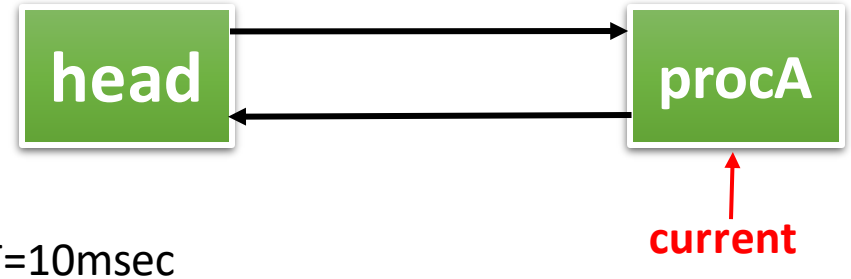
Process A ,Type:Non interactive
Spawn time : 10 msec
Burst=10
Current_expected_burst=20
Previous_expected_burst=20



T=60msec

One non-interactive process and multiple interactive processes with expected burst formula

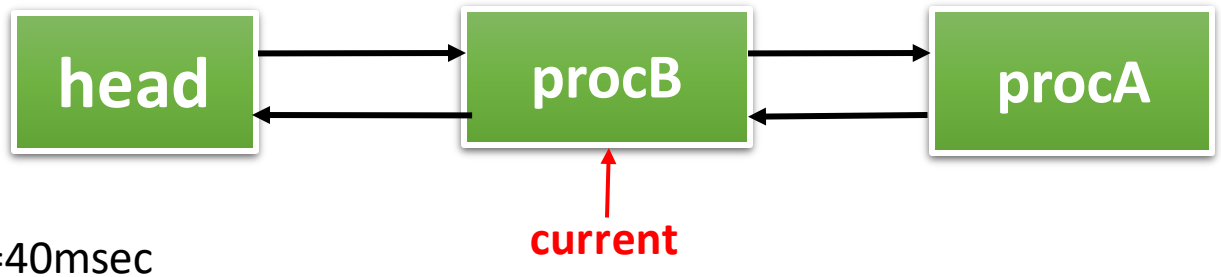
Process A ,Type:Non interactive
Spawn time : 10 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0



T=10msec

Process B,Type:Interactive
Spawn time : 40 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0

Process A ,Type:Non-interactive
Spawn time : 10 msec
Burst=30
Current_expected_burst=0
Previous_expected_burst=0

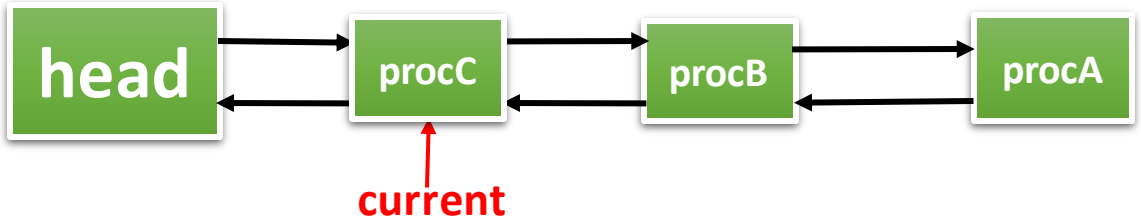


T=40msec

Process C,Type:Interactive
Spawn time : 50 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0

Process B,Type:Interactive
Spawn time : 40 msec
Burst=10
Current_expected_burst=0
Previous_expected_burst=0

Process A,Type: Non-Interactive
Spawn time : 10 msec
Burst=30
Current_expected_burst=20
Previous_expected_burst=0



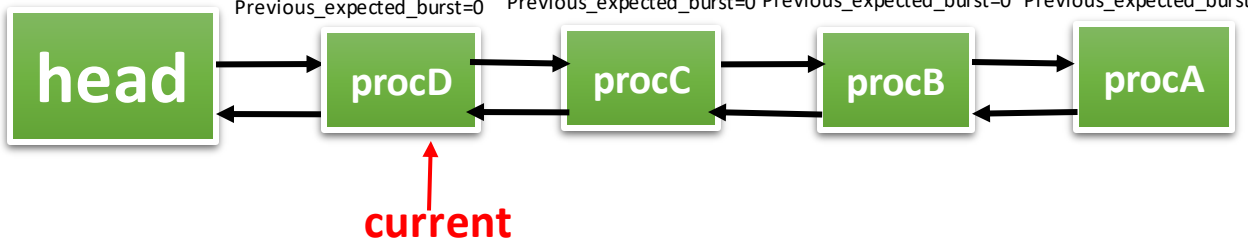
T=50msec

Process D,Type:Interactive
Spawn time : 60 msec
Burst=0
Current_expected_burst=0
Previous_expected_burst=0

Process C,Type:Interactive
Spawn time : 50 msec
Burst=10
Current_expected_burst=0
Previous_expected_burst=0

Process B,Type:Interactive
Spawn time : 40 msec
Burst=10
Current_expected_burst=6.67
Previous_expected_burst=0

Process A,Type:Non-Interactiv
Spawn time : 10 msec
Burst=30
Current_expected_burst=20
Previous_expected_burst=0



T=60msec

SJF algorithm

Shortest job first is a basic scheduling technique.The SJF method is using a prediction method which calculates the expected burst value for all processes in the ready queue and selects the process with the minimum expected burst(lowest remaining execution time).In this project,except from the expected_burst formula,we used the goodness function as criterion for the selection process.SJF can be preemptive or not preemptive(we are using the preemptive SJF scheduling).

Goodness formula : $$Goodness(k)_i = \frac{1 + Exp\_Burst(k)_i}{\min_{m=0}^{N}(1 + Exp\_Burst(m)_i)} * \frac{\max_{m=0}^{N}(1 + WaitingInRQ(m)_i)}{1 + WaitingInRQ(k)_i}$$

Expected burst formula : $$Exp\_Burst_i = \frac{Burst_{i-1} + \alpha * Exp\_Burst_{i-1}}{1 + \alpha}$$

A basic problem of SJF method is the starvation of Compute-Bound(Non Interactive)processes.If a lot of Interactive processes are appearing constantly,the Compute-bound process will never be executed.We solve this problem by using the goodness formula.A basic field of this formula is the waiting_in_ready_queue value computation.Based on the previous example,the Compute-Bound process will wait for some quantum of time inside the ready queue and after the calculation of the goodness formula,the process's goodness value will be smaller.The process that will be selected will be the one with the lowest goodness value,so the Compute-Bound process will not suffer from starvation.Using goodness method , a new problem will be presented.Assuming that inside the ready queue,there are four Non Interactive processes.Because of waiting_in_ready_queue value increase,the running process will be interrupted in each coming quantum.

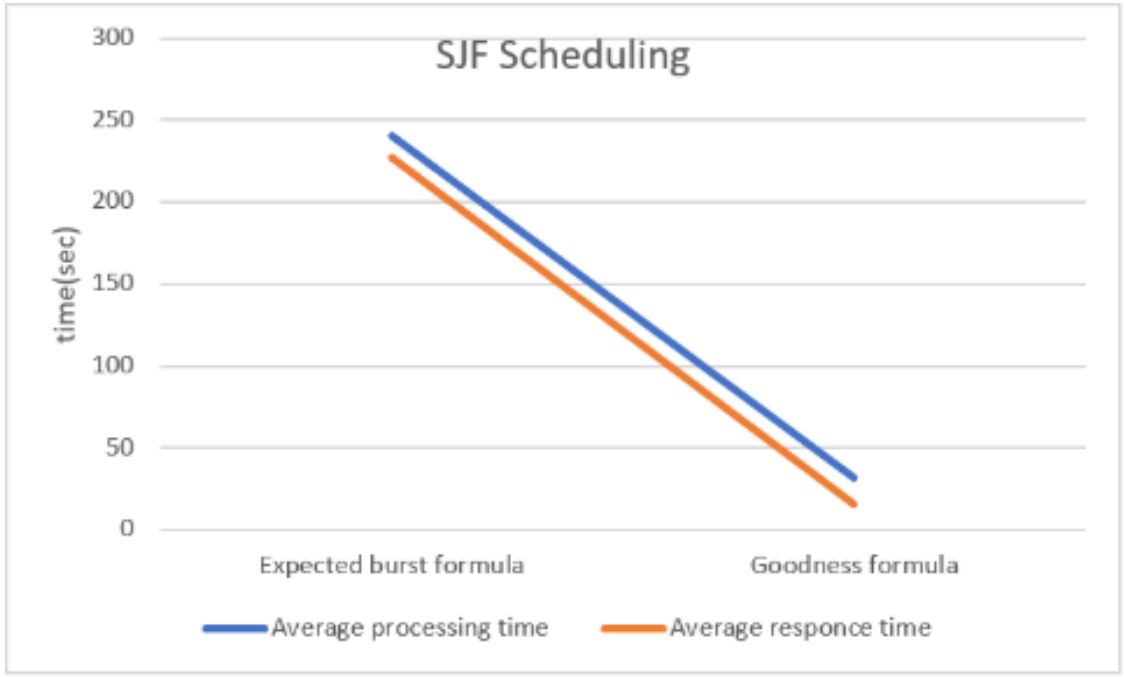
- In the first profile (starvation.conf):

Using expected_burst formula :The interactive process will be selected because they have the lowest expected_burst,so the compute-bound process will not be executed.Exactly,if interactive processes are appearing constantly,the non-interactive process will never be executed.The "starvation" process will not be executed directly,because the waiting_time_in_ready_queue is not computed.The average execution time is 12.5 ms,the average processing time is 240ms.So the average response time is 227 ms.

Using goodness formula :The average execution time is 12.5 ms,the average processing time is 32ms.So the average response time is 19.5 ms.

- In the second profile (noninteractive.conf):

In this profile execution,we notice that using goodness formula,in each quantum arrival,another non interactive process will be selected,and a process can not be executed for more than 1 quantum.



Program execution

To activate expected_burst formula,do not define GOODNESS
To activate goodness formula,define GOODNESS
To enable print_functions,define PRINT_ON
To disable print_functions,do not define PRINT_ON