Implementing EDF Scheduler Report

Mohamed Hossam Mohamed

mhoss786@gmail.com

1-   System Hyperperiod

Task	Periodicity
Button 1 Monitor	50
Button 2 Monitor	50
Periodic Transmitter	100
Uart Receiver	20
Load 1 Simulation	10
Load 2 Simulation	100

$Hyperperiod = Least\ common\ multiplier\ (50, 50, 100, 20, 10, 100)$

$Hyperperiod = 100ms$

2-   CPU Load

Task	Execution Time	Occurrence During Hyperperiod
Button 1 Monitor	25 uS	2
Button 2 Monitor	25 uS	2
Periodic Transmitter	90 uS	1
Uart Receiver	100 uS	5
Load 1 Simulation	5 ms	10
Load 2 Simulation	12 ms	1

$$U = ((25\mu*2)+(25\mu*2)+(90\mu100)+(100\mu*5)+(5m*10)+(12m) \text{ / 100ms}) \times 100\%$$
=**62%**

3-   System Schedubility

1- Using Rate Monotomic Utilization Bound

$U \leq n(2^{n1} - 1)$

And U = 0.62

$$Urm = 6\ (2^{1/6} - 1) = 0.7348\ 'Therefore,$$

$$U < Urm$$

The system is feasible (Schedulable).

Using Time Demand Analysis

$$wi(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{P_{tk}} \right\rceil e k$$

Critical Instant = 100ms

Task	Execution Time	Periodicity
Button 1 Monitor	25 uS	50
Button 2 Monitor	25 uS	50
Periodic Transmitter	90 uS	100
Uart Receiver	100 uS	20

Load 1 Simulation	5 ms	10
Load 2 Simulation	12 ms	100

For Task 1 : Load 1 Simulation (E: 5ms , P: 10ms, Provided Time=10ms)

$$w_1(10) = 5m + 0 = 5 \text{ , } w(10) = 5 < 10$$

Therefore, Task 1 : Load 1 simulation is schedulable

For Task 2 : Uart Receiver (E: 100us , P: 20ms, Provided Time=20ms)

$$w_2(20) = 100\mu + (20/10)\ 5m = 10.\ 03\ ms \qquad , w(20) = 10.\ 03 < 20$$

Therefore, Task 2 : Uart Receiver is schedulable

For Task 3 : Button 1 Monitor (E: 25us , P: 50ms, Provided Time=50ms)

$$w_3(50) = 25\mu + (50/10)\ 5m + (50/20)\ 100\mu = 25.\ 059\ ms \text{ , } w(50) = 25.\ 059 < 50$$

Therefore, Task 3 : Button 1 Monitor is schedulable

For Task 4 : Button 2 Monitor (E: 25us , P: 50ms, Provided Time=50ms)

$$w_4(50) = 25\mu + (50/10)\ 5m + (50/20)\ 100\mu + (50/50)25\mu = 25.\ 087\ ms$$

Therefore, Task 4 : Button 2 Monitor is schedulable $w(50) = 25.\ 087 < 50$

For Task 5 : Periodic Transmitter (E: 90 us , P: 100ms, Provided Time=100ms)

$$w_5(100) = 90\mu + (100/10)\ 5m + (100/20)\ 100\mu + (100/50)25\mu + (100/50)25\mu = 50.\ 359\ ms$$

Therefore, Task 5 : Periodic Transmitter is schedulable $w(100) = 50.359 < 100$
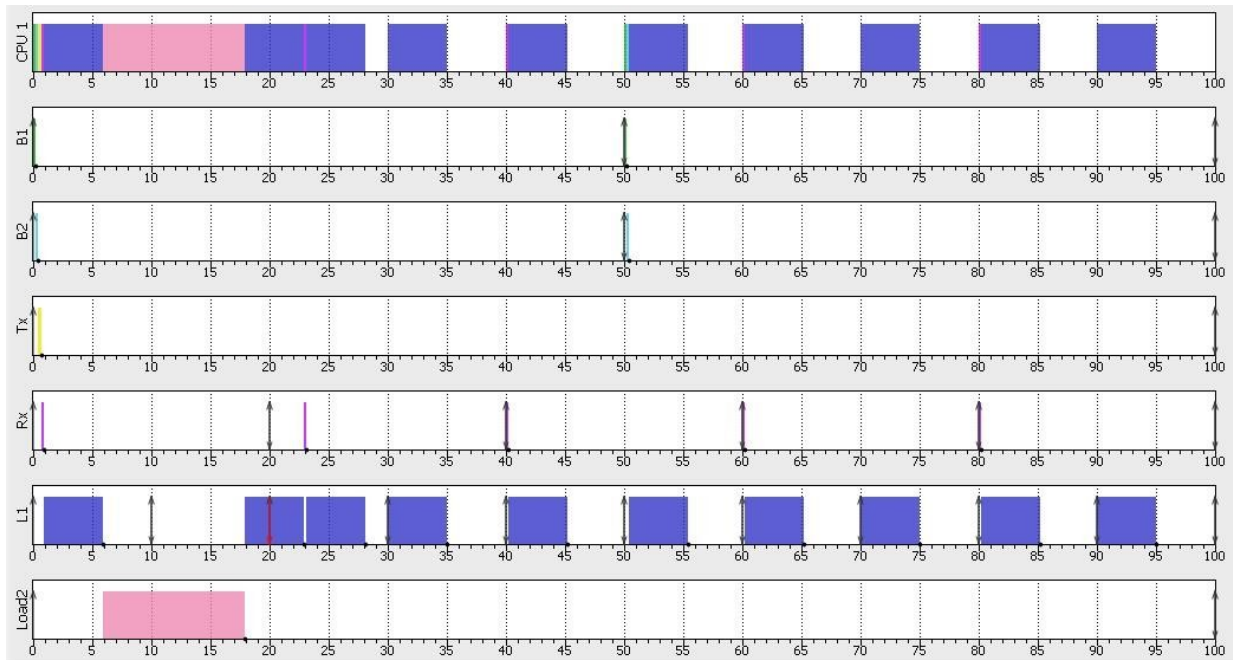
For Task 6 : Load 2 Simulation (E: 12ms , P: 100ms, Provided Time=100ms)

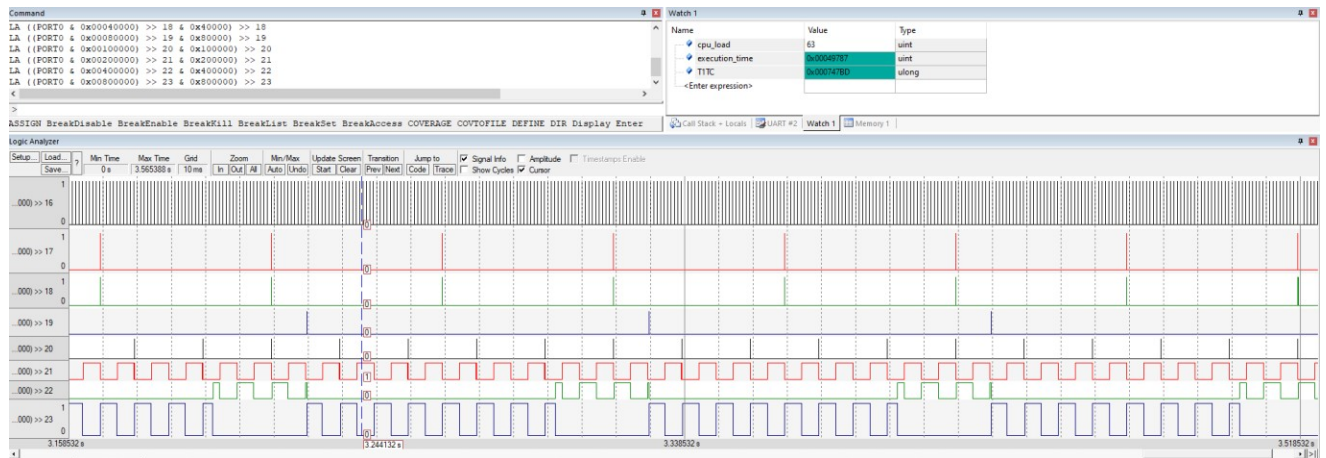$w_6(100) = 12m + (100/10)5m + (100/20)100\mu + (100/50)25\mu + (100/50)25\mu + (100/100)90\mu$

Therefore, Task 6 : Load 2 Simulation is schedulable $w(100) = 62.452 < 100$

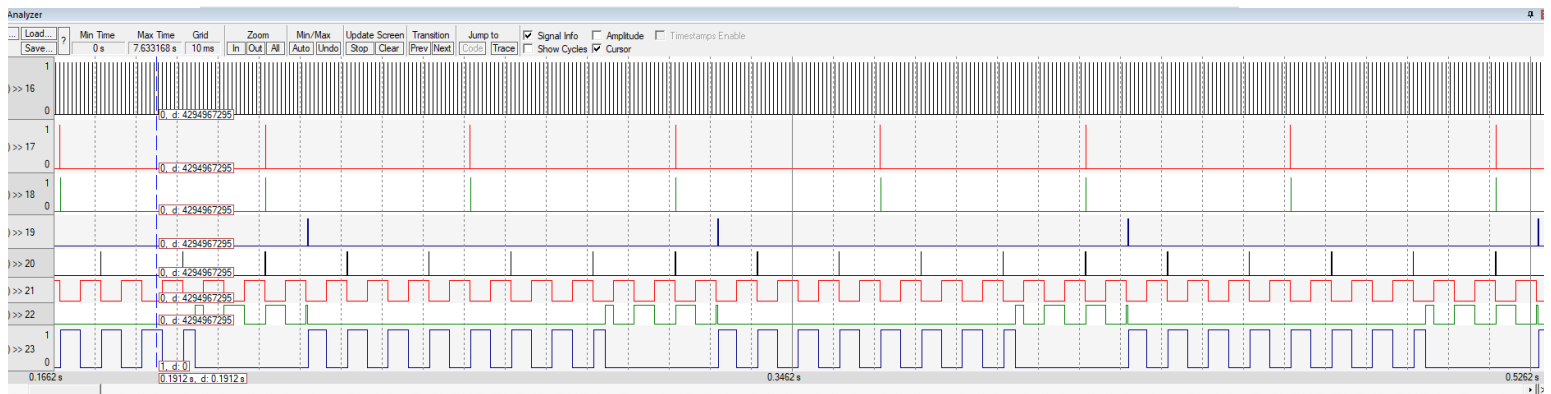Therefore, System is Scheduble.

4-   SIMSO Offline Simulator

5-   Kiel Simulation

Therefore, EDF scheduler is a suitable scheduling policy for such tasks. As it keeps the system feasible, on the other hand Fixed priority rate monotonic scheduling policy does not keep this system feasible as tasks keep missing deadlines.