EDF schedular

1 Verifying tasks

- T_1: Button_1_Monitor (P=50, C=0.012, D=50).
- T_2: Button_2_Monitor (P=50, C=0.012, D=50).
- T_3: Periodic_Transmitter (P=100, C=0.013, D=100).
- T_4: Uart_Receiver (P=20, C=0.012, D=20).
- T_5: Load_1_Simulation (P=10, C=5, D=10).
- T_6: Load_2_Simulation (P=100, C=12, D=100).

2 Hyper Period

The hyper period is the least common multiplier of all tasks' periodicities, $H = 100\ ms$.

3 Calculating CPU load

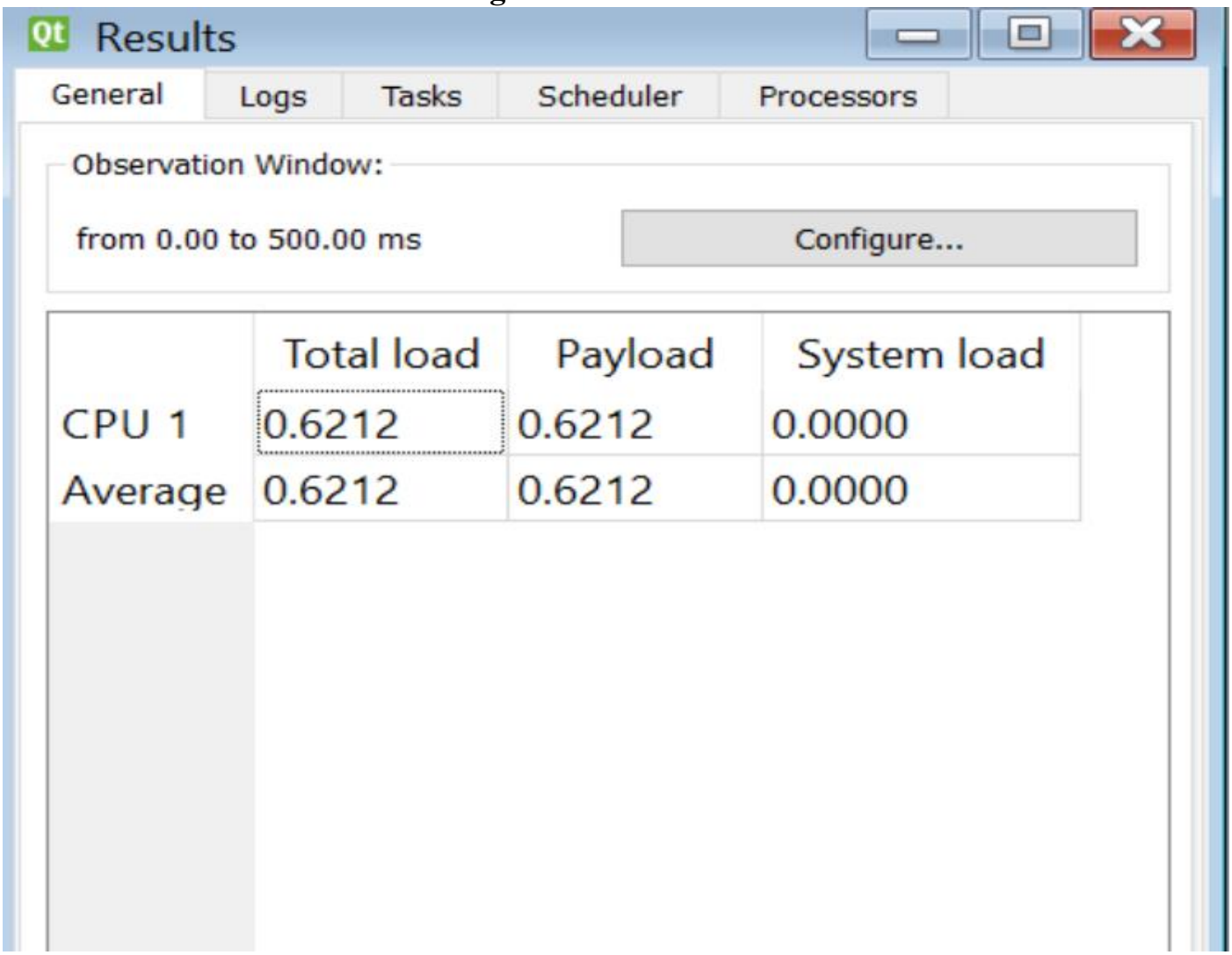
CPU load or Utilization (U) is the percentage of time of executing tasks in the hyper period to the hyper period.

3.1 Analytical method

$U = \sum_{i=1}^{n} (PHi) \times C_i/H$

$= ((100\ 50\ ) \times 0.012 + (100\ 50\ ) \times 0.012 + (100\ 100) \times 0.013 + (100\ 20\ ) \times 0.012 + (100\ 10\ ) \times 5 + (100\ 100) \times 12\ )/\ 100 = 0.621 = 62.1\%$

3.2 Offline simulation method using SimSo



4 Schedulability check

Assuming the given set of tasks is scheduled using a fixed priority rate-monotonic scheduler then the verifying tasks' priorities will be:

$p_1 = 2$
$p_2 = 2$
$p_3 = 1$
$p_4 = 3$
$p_5 = 4$
$p_6 = 1$

4.1 Utilization rate-monotonic URM method

$URM = n\,(2_{(n1)} - 1) = 6\,(2_{(1\,6)} - 1) = 0.7347 = 73.47\%$
$U = \sum C_i / P_i = 0.012/50 + 0.012/50 + 0.013/50 + 0.012/20 + 5/10 + 12/100 = 0.621 = 62.1\%$

As $U < URM$ and $U < 100\%$ then these tasks are guaranteed schedulable.

4.2 Time demand method

Tasks are checked in order depending on their priorities. The time required for

each task is calculated from $W_i(t) = C_i + \sum$	$(P_i/t) \times C_i$

as t is the deadline of this task.

4.2.1 T_5 checking

T_5: (P=10, C=5, D=10).
Time required = 10.
Time provided: $W_5(10) = 5 + 0 = 5 < 10$ (schedulable).

4.2.2 T_4 checking

T_4: (P=20, C=0.012, D=20).
Time required =20.
Time provided: $W_4(20) = 0.012 + (20/10) \times 5 = 10.012 < 20$ (schedulable).

4.2.3 T_1 and T_2 checking

T_1: (P=50, C=0.012, D=50).
T_2: (P=50, C=0.012, D=50).

As both tasks have the same deadline then we can't predict which one will execute first but as both of them has the same execution time so if the last executed one of them is schedulable whatever each one is the first and each is the last then both of them are schedulable.

$W_{1,2}(50) = 0.012 + (50\ 10) * 5 + (50\ 20) * 0.012 + (50\ 50) * 0.012 = 25.06 < 50$ (schedulable).

4.2.4 T_3 and T_6 checking

T_3: (P=100, C=0.013, D=100).
T_6: (P=100, C=12, D=100).

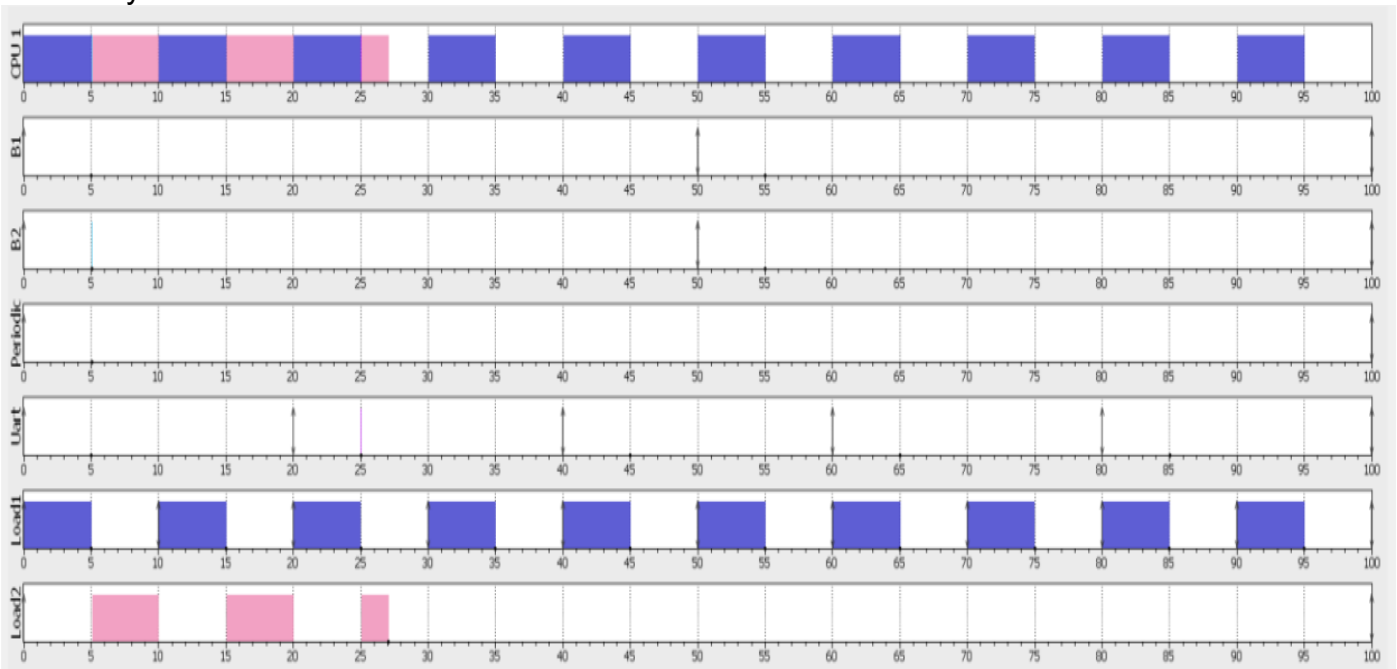
As both tasks have the same deadline then we can't predict which one will execute first and the two tasks have different execution times so every task will be treated to be the last executed one as a worst-case scenario.

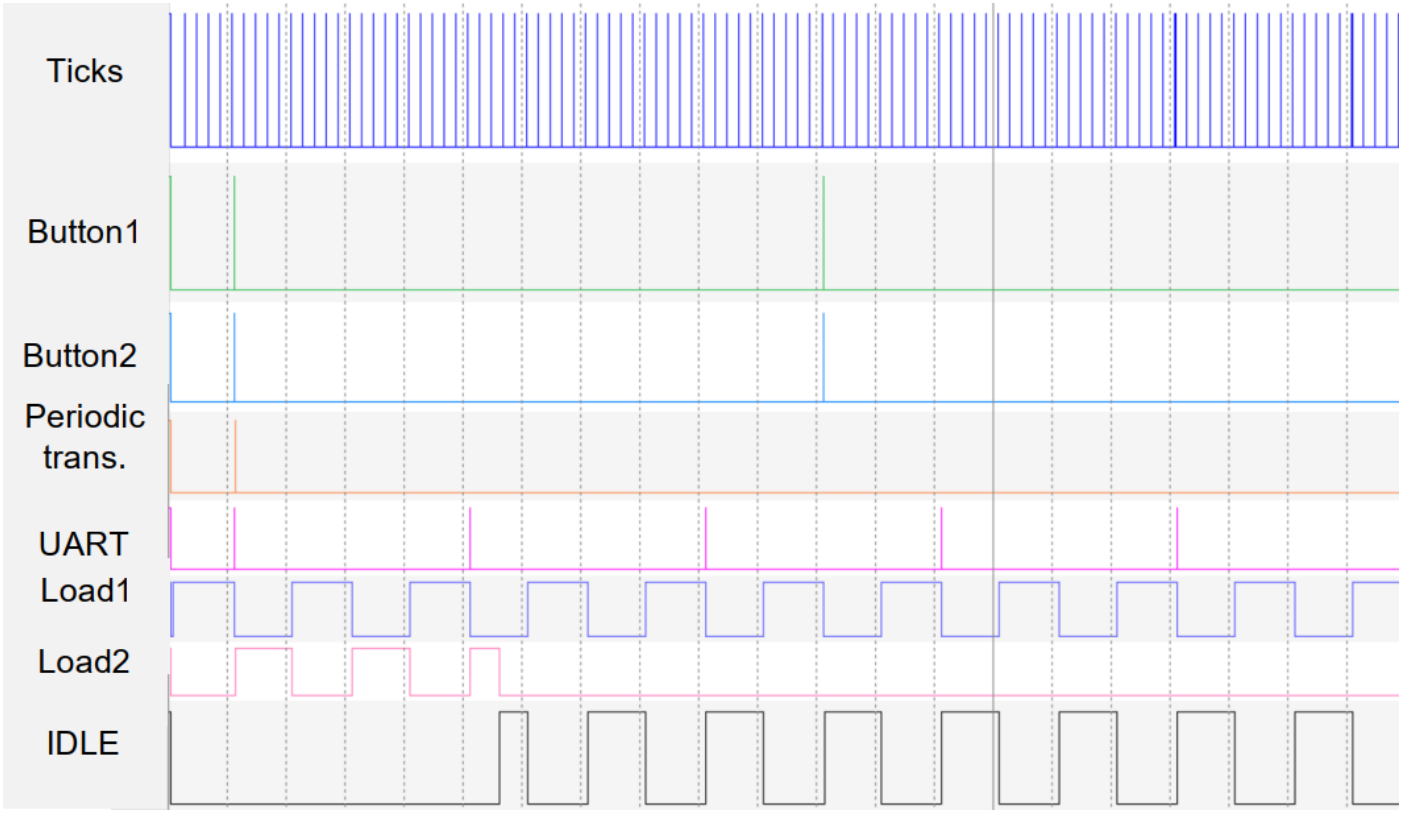
$W_3(100) = 0.013 + (100/10) * 5 + (100/20) * 0.012 + (100/50) * 0.012 + (100/50) * 0.012 + (100/100) * 0.013 = 62.108 < 100$ (schedulable).

$W_6(100) = 12 + (100/10) * 5 + (100/20) * 0.012 + (100/50) * 0.012 + (100/50) * 0.012 + (100/100) * 0.013 = 62.108 < 100$ (schedulable).

4.3 Conclusion

The analytical results are the same as SimSo results as all tasks meet their deadlines




Ticks
Button1
Button2
Periodic trans.
UART
Load1
Load2
IDLE