

IMPLEMENT EDF SCHEDULAR

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• Tasks table

Task Name	Periodicity	Deadline	Execution Time	Repetition in Hyper period
Button_1_Monitor	50ms	50ms	0.022	2
Button_2_Monitor	50ms	50ms	0.022	2
Task_Transmitter	100ms	100ms	0.028	1
Uart_Receiver	20ms	20ms	0.027	5
Load_1_Simulation	10ms	10ms	5	10
Load_2_Simulation	100ms	100ms	12	1

• System hyperperiod :

From the table we can see that the LCM between the tasks is 100ms

So the hyperperiod = LCM (50, 50, 100, 20, 10, 100) = 100ms

• CPU Load:

$$\text{CPU LOAD} = \frac{\text{Total Time}}{\text{HyperPeriod}} * 100$$

$$\text{Total Time} = \sum_{i=1}^6 \text{ExecutionTime}_i * \text{Num of Calls In HyperPeriod}_i$$

$$\text{Total Time} = 0.022 * 2 + 0.022 * 2 + 0.028 * 1 + 0.027 * 5 + 5 * 10 + 12 * 1$$

$$\text{CPU LOAD} = 62.138132 * 100 / 100 = 62.138132\%$$

● Schedulability of the system:

1- Using Rate Monotonic Utilization:

$$U_{rm} = n[2^{(1/n)} - 1] \text{ where } n = \text{number of tasks}$$

$$U_{rm} = 6[2^{(1/2)} - 1]$$

$$U_{rm} = 0.73477$$

If CPU LOAD < U_{rm} ($0.62138 < 0.73477$) .

Then the system is guaranteed schedulable.

2- Using Time Demand Analysis:

Tasks are organized by lowest periodicity which is highest priority.

Load_1_Simulation => Uart_Receiver => Button_1_Monitor => Button_2_Monitor
=> Task_Transmitter=> Load_2_Simulation

▪ Load_1_Simulation (E: 5ms , P: 10ms, D: 10ms) :

$$W(10) = 5m + 0 = 5 ,$$

$W(10) = 5 < 10$ So Load 1 is schedulable

▪ Uart_Receiver (E: 0.027ms, P: 20ms, D: 20ms):

$$W(20) = 0.027 + (20/10) * 5 = 10.027ms$$

$$W(20) = 10.027 < D = 20ms$$

So Uart_Receiver is schedulable

▪ Button_1_Monitor (E: 0.022ms, P: 50ms, D: 50ms) :

$$W(50) = 0.022 + (50/10)*5 + (50/20)*0.027 = 25.2875ms$$

Since $D = 50$ ms , then $W(50) < D$

So Button_1_Monitor is schedulable

▪ Button_2_Monitor (E: 0.022ms, P: 50ms, D: 50ms) :

$$W(50) = 0.022 + (50/10)*5 + (50/20)*0.027 + (50/50)*0.022 = 25.1115ms$$

Since $D = 50ms$ and $W(50) = 25.1115ms$

$W(50) < D$, Button_2_Monitor is schedulable.

▪ Task_Transmitter

$$W(100) = 0.028 + (100/50)*0.022 + (100/50)*0.022 + (100/10)*5 + (100/20)*0.027 \\ = 50.251ms$$

Since $D = 100$ ms and $W(100) = 50.251ms$

$W(100) < D$ Task 3 is schedulable.

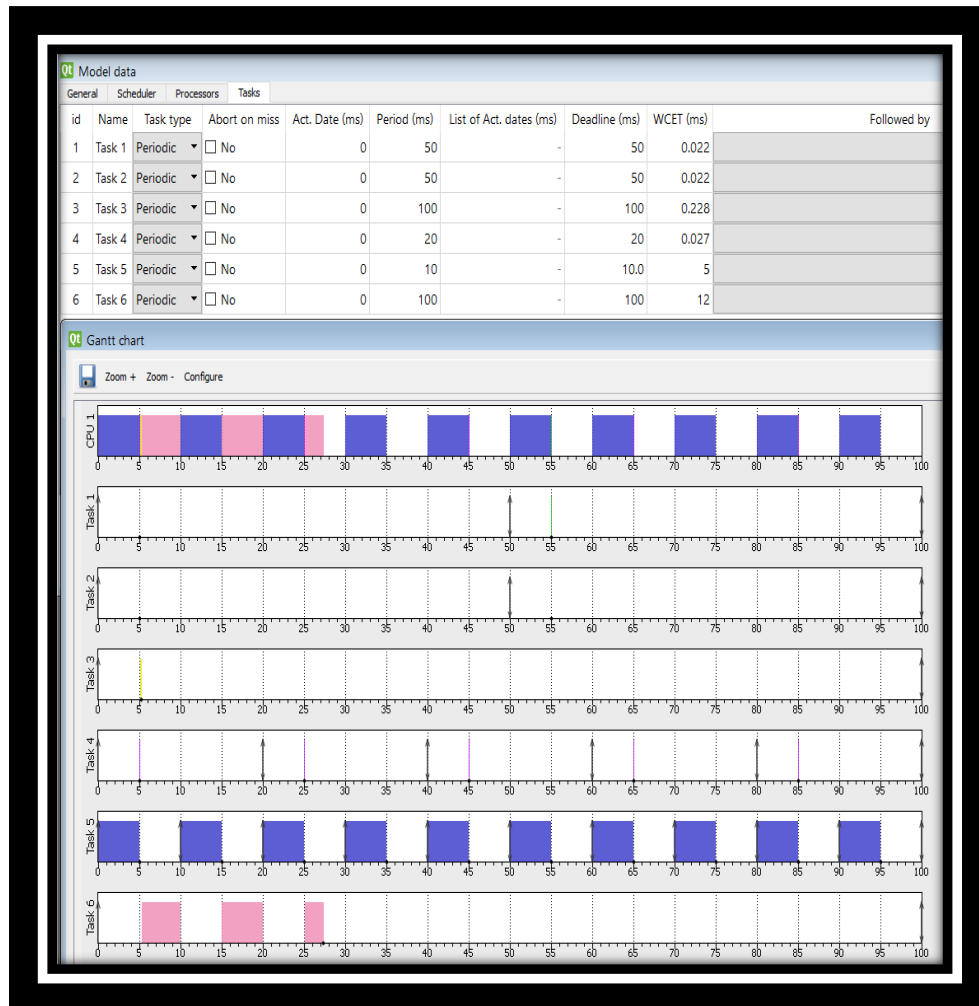
▪ Load_2_Simulation

$$W(100) = 12 + (100/100)*0.028 + (100/50)*0.022 + (100/50)*0.022 + (100/10)*5 + (100/20)*0.027 = 62.251ms$$

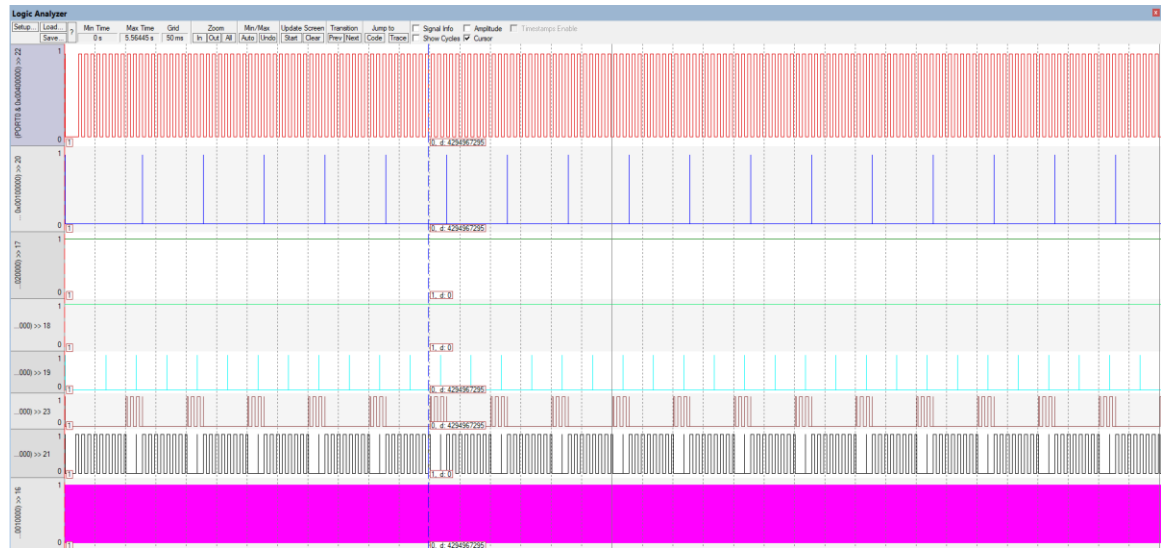
Since $D = 100$ ms and $W(100) = 62.251ms$

$W(100) < D$ Task 6 is schedulable.

• Offline simulator (SIMSO)



- **Keil simulation**



Load_1_Simulator	PIN 22	RED
Uart_Receiver	PIN 20	BLUE
Button_1_Monitor	PIN 17	GREEN
Button_2_Monitor	PIN 18	LIGHT GREEN
Task_Transmitter	PIN 19	LIGHT BLUE
Load_2_Simulator	PIN 23	BROWN
Tick Hook	PIN 16	BLACK
Idle Hook	PIN 21	PINK