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Project: Implementing EDF Scheduler

Analytical Methods

Tasks	Period	Execution Time	Number of occurrences in hyperperiod
Button_1_Monitor	50 ms	2.1 us	2
Button_2_Monitor	50 ms	2.1 us	2
Periodic_Transmitter	100 ms	55.7 us	1
UART_Receiver	20 ms	21 us	5
Load_1_Simulation	10 ms	5 ms	10
Load_2_ Simulation	100 ms	11.84 ms	1

1-Hyperperiod

Hyperperiod is the least common multiplier of all Periods= 100 ms

2-CPU Load

CPU Load= sum (tasks execution time * Times of task running during period)/period time

= [(0.0021*2) + (0.0021*2) +(0.055*1) +(0.021*5) +(5*10) +(11.84*1)]/100=62.01%

3-System schedulability

A-using Rate Monotonic utilization bound

$$U = \sum_{i=1}^{n} \frac{C_i}{P_i} \leq n(2^{\frac{1}{n}} - 1)$$

U = Total Utilization
C = Execution time
P = Periodicity
N = Number of tasks

R.H.S (URM) = n [2 ^ (1/n) - 1] = 6 [2 ^ (1/6) - 1] = 0.7347=73.47%
L.H.S (U) = CPU load =62.01%

Since U < URM (50.2% < 73.47%) then, System is Schedulable.

B- Using Time Demand Analysis

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k \quad for\ 0 < t \le p_i$$

W = Worst response time
E = Execution time
P = Periodicity
T = Time instance

T1{P:50, E:2.1us, D:50}
T2{P:50, E:2.1us, D:50}
T3{P:100, E:55.7us, D:100}
T4{P:20, E:21us, D:20}
T5{P:10, E:5ms, D:10}
T6{P:100, E:11.84ms, D:100

Reordering our tasks based on priorities

Tasks		Period	Execution Time	Priority
Button_1_Monitor	T1	50 ms	2.1 us	1
Button_2_Monitor	T2	50 ms	2.1 us	1
Periodic_Transmitter	T3	100 ms	55.7 us	0
UART_Receiver	T4	20 ms	21 us	2
Load_1_Simulation	T5	10 ms	5 ms	3
Load_2_ Simulation	T6	100 ms	11.84 ms	0

T5 =W (10) = 5+0 = 5 ms < 10 ms
Load 1 Simulation task is schedulable

T4 =W (20) = 0.021+(20/10) *5 = 10.021 < 20 MS
UART_Receiver task is schedulable.

T1 =W (50) = 0.0021+(50/10) *5+(50/20) * 0.021 = 25.0546 <50
Button 1 Monitor task is schedulable.

T2 =W (50) =0.0021+(50/10) *5+(50/20) * 0.021+(50/50) * 0.0021=25.0567<50

Button 2 Monitor task is schedulable.

T3 =W (100) = 0.0557+(100/10) *5+(100/20) * 0.021+(100/50) * 0.0021+(100/50) * 0.0021=50.1691 <100

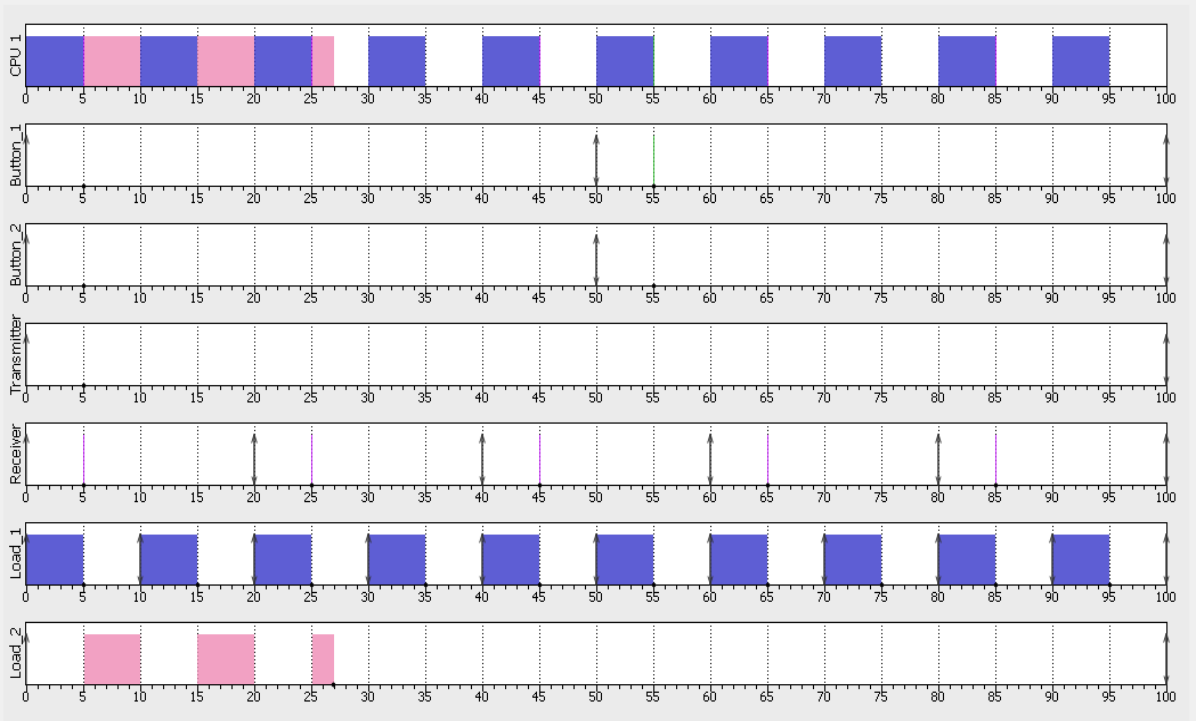
Periodic Transmitter task is schedulable.

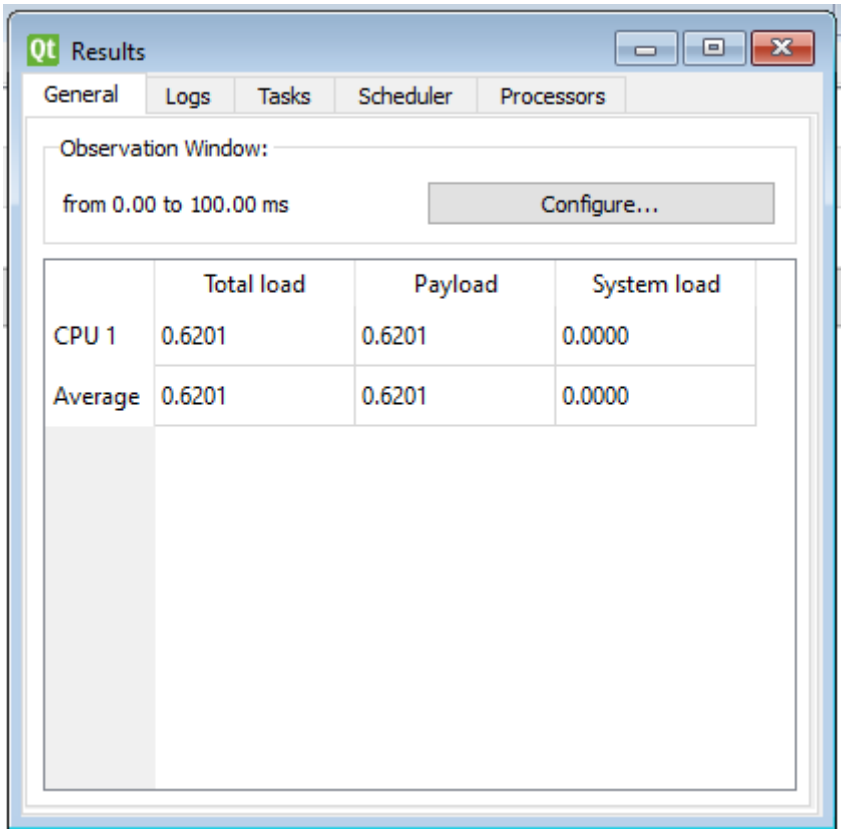
T6 =W (100) = 11.84+(100/10) *5+(100/20) * 0.021+(100/50) * 0.0021+(100/50) * 0.0021+(100/100) *0.0557=62.0091 <100

Load 2 Simulation task is schedulable.

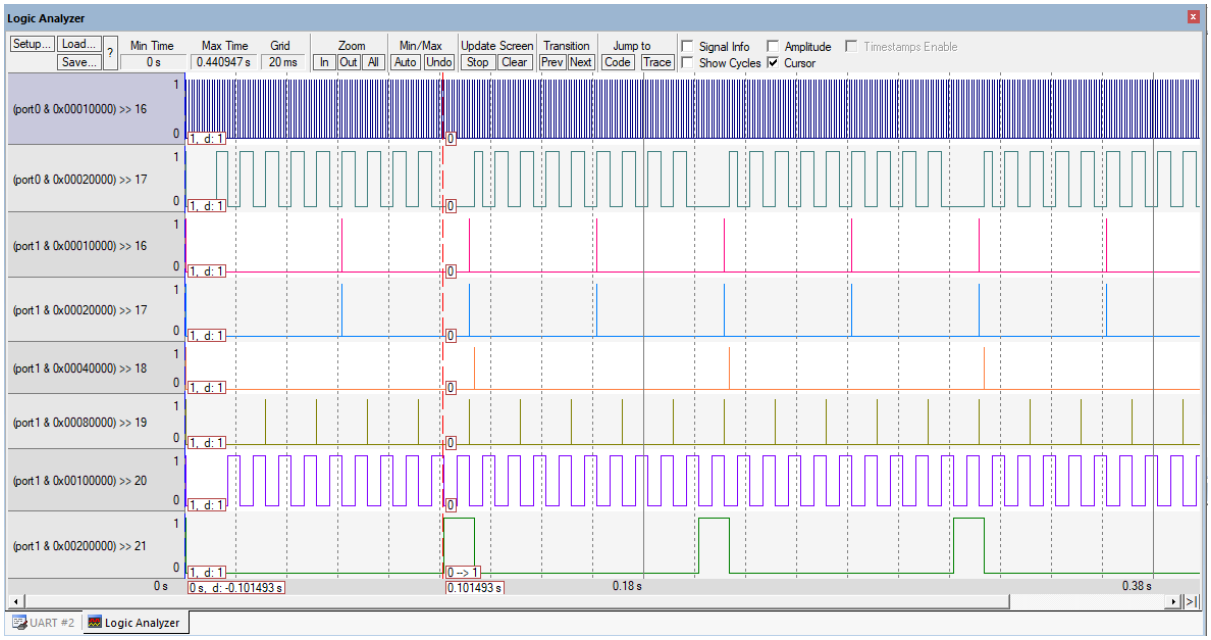
Then, System is Schedulable.

SEMSO




Results
General
Logs
Tasks
Scheduler
Processors
Observation Window:
from 0.00 to 100.00 ms
Configure...
Total load
Payload
System load
CPU 1
0.6201
0.6201
0.0000
Average
0.6201
0.6201
0.0000

Keil


Logic Analyzer
Setup...
Load...
Save...
Min Time
Max Time
Grid
Zoom
Min/Max
Update Screen
Transition
Jump to
Signal Info
Amplitude
Timestamps Enable
Show Cycles
Cursor
(port0 & 0x00010000) >> 16
(port0 & 0x00020000) >> 17
(port1 & 0x00010000) >> 16
(port1 & 0x00020000) >> 17
(port1 & 0x00040000) >> 18
(port1 & 0x00080000) >> 19
(port1 & 0x00100000) >> 20
(port1 & 0x00200000) >> 21
0.18 s
0.38 s
UART #2
Logic Analyzer