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Topic: EDF schedular with FreeRTOS

Contents

Table of timing

task	Periodicity	Deadline	Occurrence during hyperperiod	Execution time
Button 1	50ms	50ms	2	30us
Button 2	50ms	50ms	2	30us
Periodic transmitter	100ms	100ms	1	94us
UART	20ms	20ms	5	140us
Load 1	10ms	10ms	10	5ms
Load 2	100ms	100ms	1	12.5ms

System hyperperiod:

Hyperperiod of any system is the least common multiplier for all the periodicities of the tasks

Hence, hyperperiod here is 100 ms

CPU load:

Utilization = total execution time/hyperperiod

Utilization = 2(30u)+2(30u)+1(94u)+5(140u)+10(5m)+1(12.5m)/(100m)

Utilization = 63.414%

System Schedulability

- ## Rate monotonic

- Utilization = 63.414%

- Number of tasks= 6

U < n(2 ^(1/n) – 1)

If yes then system is schedulable

0.63 < 0.73

system is schedulable

- ## Time demand

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{P_k} \right\rceil e_k$$

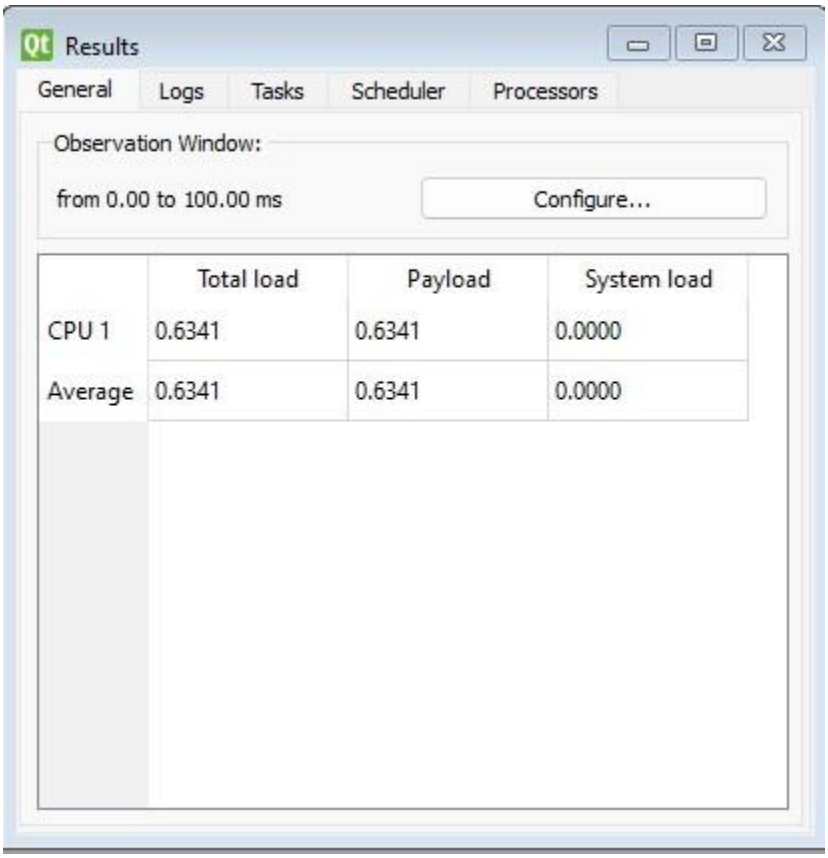
Worst case is in the time 100ms

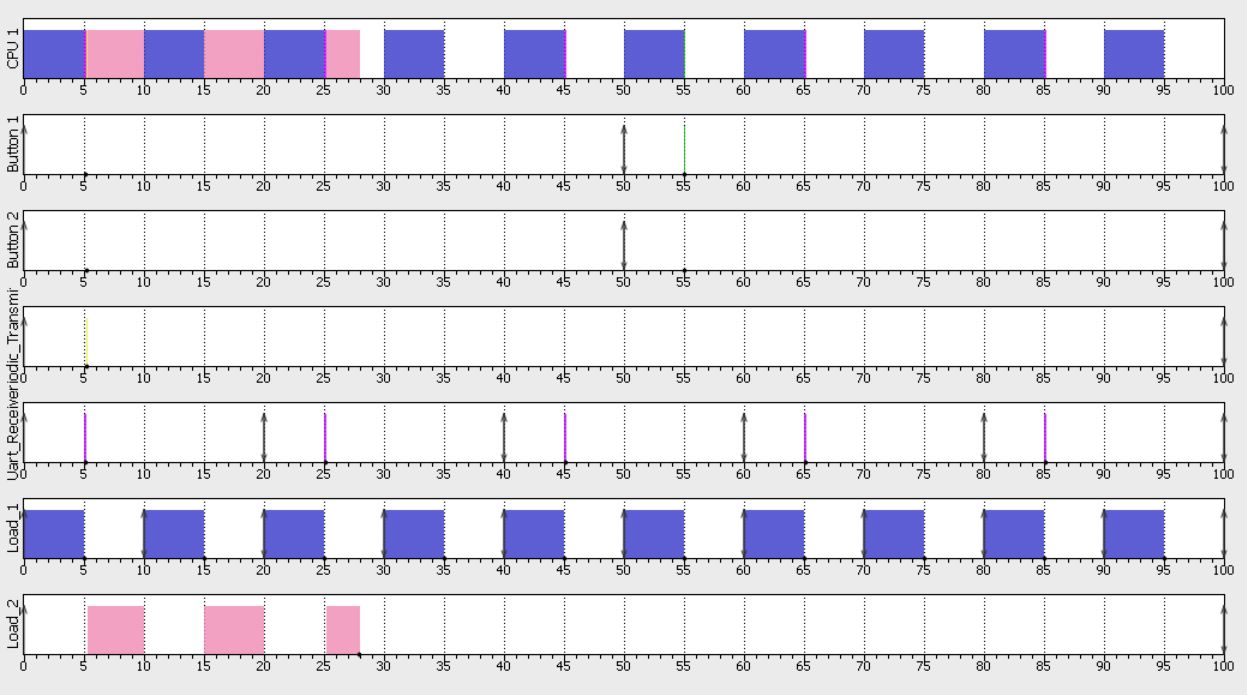
After sorting the table , we will do analysis for the 6 tasks by sorting them ascendingly on periodicity

Task	Equation and result	schedulable?
Load 1	W1(10)=5m+0=5m 5<10	yes
UART	W2(20)=140u+(20/10)5m=10.14m 10.14<20	yes
Button 1	W3(50)=30u+(50/20)140u+(50/10)5m= 25.31m 25.31<50	yes
Button 2	W4(50)=30u+(50/50)30u+(50/20)140u+(50/10)5m=25.34m 25.34<50	yes
Periodic	W5(100)=(100/50)30u+(100/50)30u+(100/20)140u+(100/10)5m+94u =50.914m 50.914<100	yes
Load 2	W6(100)=(100/50)30u+(100/50)30u+(100/20)140u+(100/10)5m+94u+12.5= 63.414m 63.414<100	yes

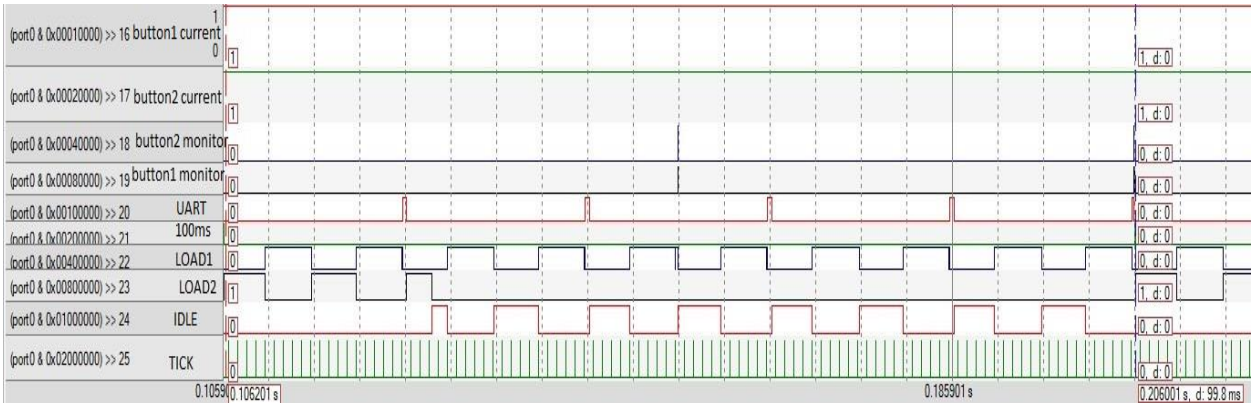
Screen shoots from simulators

Simso




CPU 1
Button 1
Button 2
Uart_Receiver
periodic_Transmi
Load_1
Load_2

Keil


(port0 & 0x00010000) >> 16 button1 current
(port0 & 0x00020000) >> 17 button2 current
(port0 & 0x00040000) >> 18 button2 monitor
(port0 & 0x00080000) >> 19 button1 monitor
(port0 & 0x00100000) >> 20 UART
(port0 & 0x00200000) >> 21 100ms
(port0 & 0x00400000) >> 22 LOAD1
(port0 & 0x00800000) >> 23 LOAD2
(port0 & 0x01000000) >> 24 IDLE
(port0 & 0x02000000) >> 25 TICK
0.106201 s
0.185901 s
0.206001 s, d: 99.8 ms