EDF Scheduler Implementation with FreeRTOS

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Q1 Analytical Analysis:

System Hyperperiod:

Task	Periodicity
Button1	50
Button2	50
Periodic Transmitter	100
Uart_rx	20
Load1	10
Load2	100

Hyperperiod = LCM (50,50,100,20,10,100) = 100 ms

CPU Load:

Task	Periodicity	No of occurrences	Execution time
Button1	50	2	18.2 us
Button2	50	2	18.2 us
Periodic Transmitter	100	1	98 us
Uart_rx	20	5	20 us
Load1	10	10	5 ms
Load2	100	1	12 ms

U = ((18.2 us * 2) + (18.2 us * 2) + 98 us + (20 us * 5) + (5 m * 10) + 12 ms)/100 ms × 100% = 62.27%

System Schedulability:

Using Rate Monotonic: Urm = n(2^1/n – 1) ,

 n: no of tasks

Urm = 6(2^1/6-1) = 0.7347

Since U < Urm

Therefore, The System is schedulable.

Using Time Demand:

Load1: w1 = 5ms + 0 = 5ms < 100ms, so this task is schedulable.

Uart1_rx: w2 = 20us + (20/10)*5ms = 10ms < 100ms, so this task is schedulable.

Button1: w3 = 18.2us + (50/10)*5ms + (50/20)*20us = 25ms < 100ms, so this task is schedulable.

Button2: w4 = 2*18.2us + (50/10)*5ms + (50/20)*20us = 25ms < 100ms, so this task is schedulable.

Periodic Transmitter: w5 = 98.us + (100/10)*5ms + (100/20)*20us + 2*(100/50)*18.2 = 50.27ms < 100ms, so this task is schedulable.

Load2: w6 = 12ms + (100/10)*5ms + (100/20)*20us + 2*(100/50)*18.2 + (100/100)*98us = 62.27ms < 100ms, so this task is schedulable.
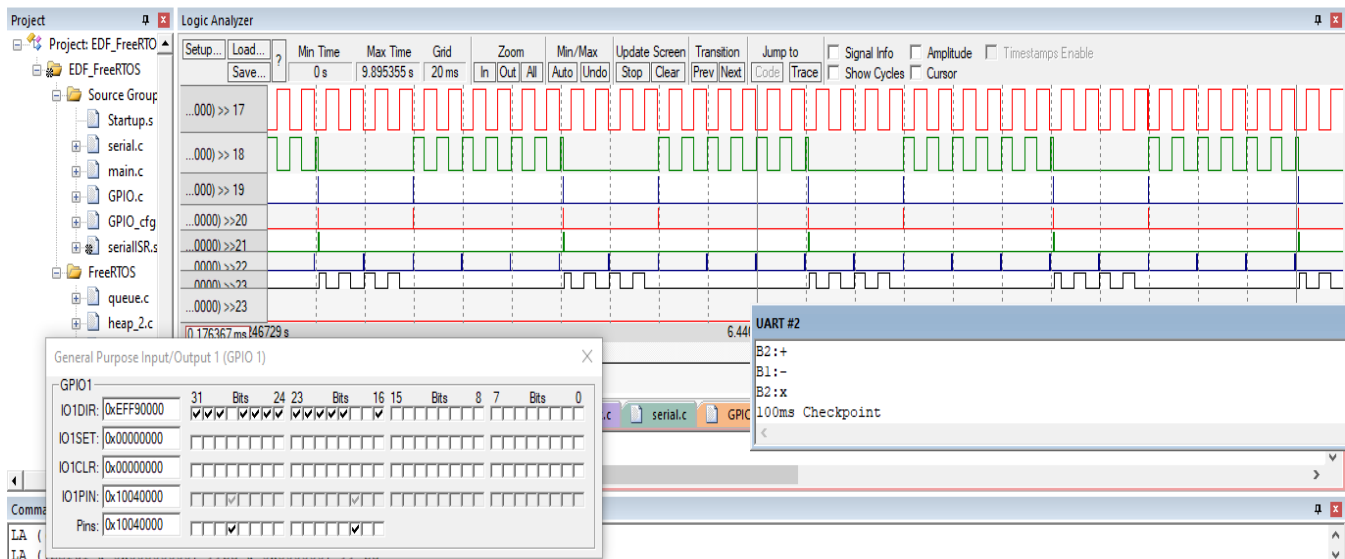
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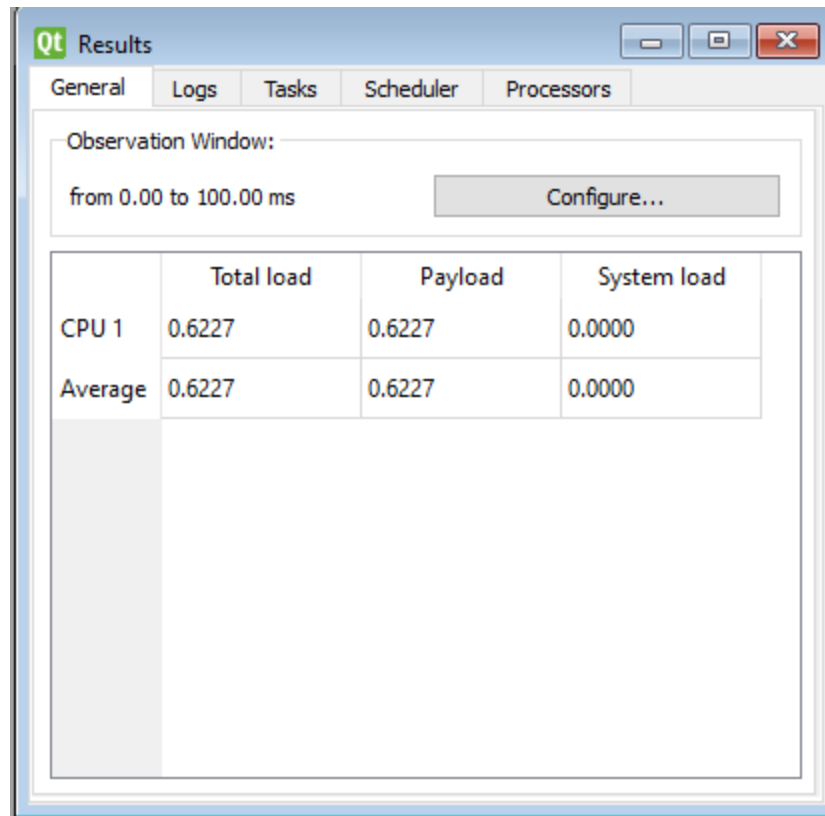
Q2 Simulations:

Keil:

CPU usage time

Name	Value	Type
cpu_load	85	int
task1_Time	163657	int
sys_time	302718	int

Simulation

Simso:

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	priority
1	BT1	Periodic ▾	☐ No	0.0	50.0	-	50.0	0.0182	▾	0
2	BT2	Periodic ▾	☐ No	0.0	50.0	-	50.0	0.0182	▾	0
3	TX	Periodic ▾	☐ No	0.0	100.0	-	100.0	0.098	▾	0
4	RX	Periodic ▾	☐ No	0.0	20.0	-	20.0	0.02	▾	0
5	L1	Periodic ▾	☐ No	0.0	10.0	-	10.0	5.0	▾	0
6	L2	Periodic ▾	☐ No	0.0	100.0	-	100.0	12.0	▾	0

General   Scheduler   Processors   Tasks

Qt Results

General | Logs | Tasks | Scheduler | Processors

Observation Window:

from 0.00 to 100.00 ms   Configure...

	Total load	Payload	System load
CPU 1	0.6227	0.6227	0.0000
Average	0.6227	0.6227	0.0000

Gantt chart: