Verifying the system implementation

There are 3 methods:

1. Analytically
2. SISMO
3. Using Keil

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TASK	PERIODICTY	EXECUTION TIME
BUTTON 1	50	13.5 us
BUTTON 2	50	13.6 us
PERIODIC TX	100	18.7 us
UART RX	20	21.3 us
LOAD 1	10	5 ms
LOAD 2	100	12 ms

Method 1: Analytically:

- Hyper Period = LCM (50 , 50 , 100 , 20 , 10 , 100)
  = 100 ms

- CPU Load = (E1 + E2 + E3 + E4 + E5 + E6) / H =
  $$\frac{13.5us*2 + 13.6us*2 + 18.7us*1 + 21.33us*5 + 5ms*10 + 12ms}{100}$$
  = 62.179 %

- System Schedulability:

  - **Rate motonic method:**

    $$U \leq n[2^{\frac{1}{n}} - 1]$$

    Urm = $n[2^{\frac{1}{n}} - 1] = 6\left[2^{\frac{1}{6}} - 1\right] = 0.7347$

    U = $\sum \frac{C_i}{P_i} = \frac{13.5\ us}{50} + \frac{13.6\ us}{50} + \frac{18.7\ us}{100} + \frac{21.33\ us}{20} + \frac{5\ ms}{10} + \frac{12\ ms}{100} = 0.6217$

    >> U < URM

    >> The system is guaranteed schedulable

➢ Time Demand Analysis:

$$w_i(t) = e_i + \sum_{k=1}^{i-1} [\frac{t}{p_k}] e_k \quad for\ 0 < t < p_i$$

Tasks according to priority:

1) Load 1 Task:

w(1) = 5+0 = 5ms

w(10) = 5+0 = 5ms

w(10) < D = 10

Task is schedulable #

2) UART RX Task:

w(1) = 21.33 us + (1/10)*5 ms = 0.5213

w(5) = 21.33 us + (5/10)*5 ms = 2.5213

w(10) = 21.33 us + (10/10)*5 ms = 5.213

w(20) = 21.33 us + (20/10)*5 ms = 10.021

w(20) < D = 20

Task is schedulable #

3) BUTTON 1 TASK:

w(1) = 13.5 us + (1/10)*5 ms
+ (1/20)*21.33 us = 0.515

w(50) = 13.5 us + (10/10)*5 ms
+ (50/20)*21.33 us = 5.066

w(50) < D = 50

Task is Schedulable #

4) BUTTON 2 TASK:

w(50) = 13.6 us + (50/10)*5 ms
+ (50/50)*13.5 us + (50/20)*21.33 us
= 25.08

w(50) < D = 50

Task is Schedulable #

5) PERIODIC TX TASK

w(100) = 18.7 us + (100/50)*13.5 us
+ (100/50)*13.6 us + (100/10)*5 ms
+ (100/20)*21.33 us = 50.179

w(100) < D = 100

Task is Schedulable #

6) LOAD 2 TASK:

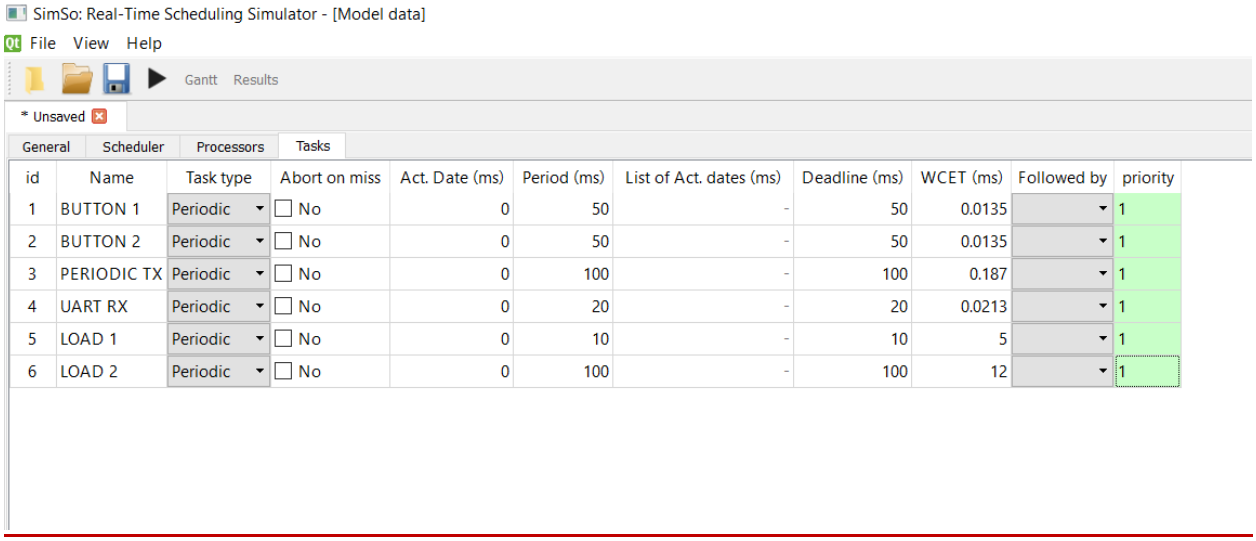
w(100) = 12 ms +(100/100)*18.7 us
+(100/50)*13.5 us + (100/50)*13.6 us +
(100/10)*5 ms + (100/20)*21.33 us

= 62.179

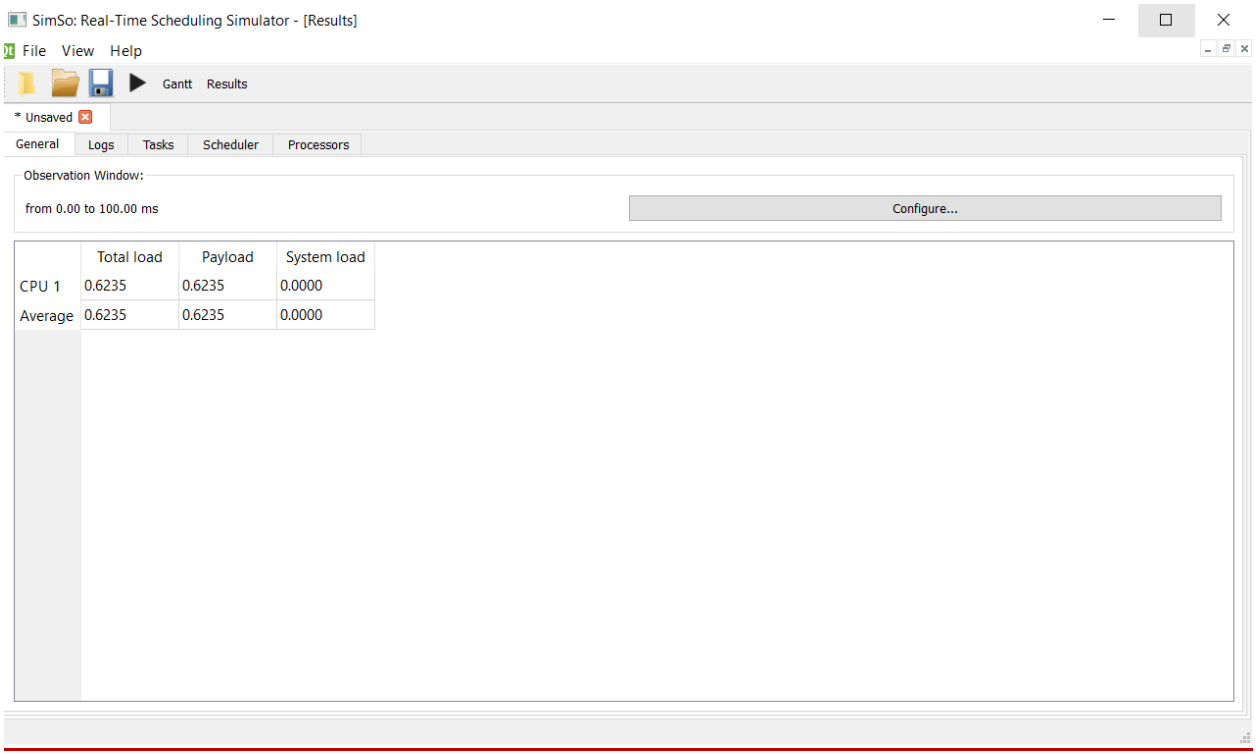
w(100) < D = 100
Task is Schedulable #

>> The system is guaranteed schedulable

Method 2: SIMSO:

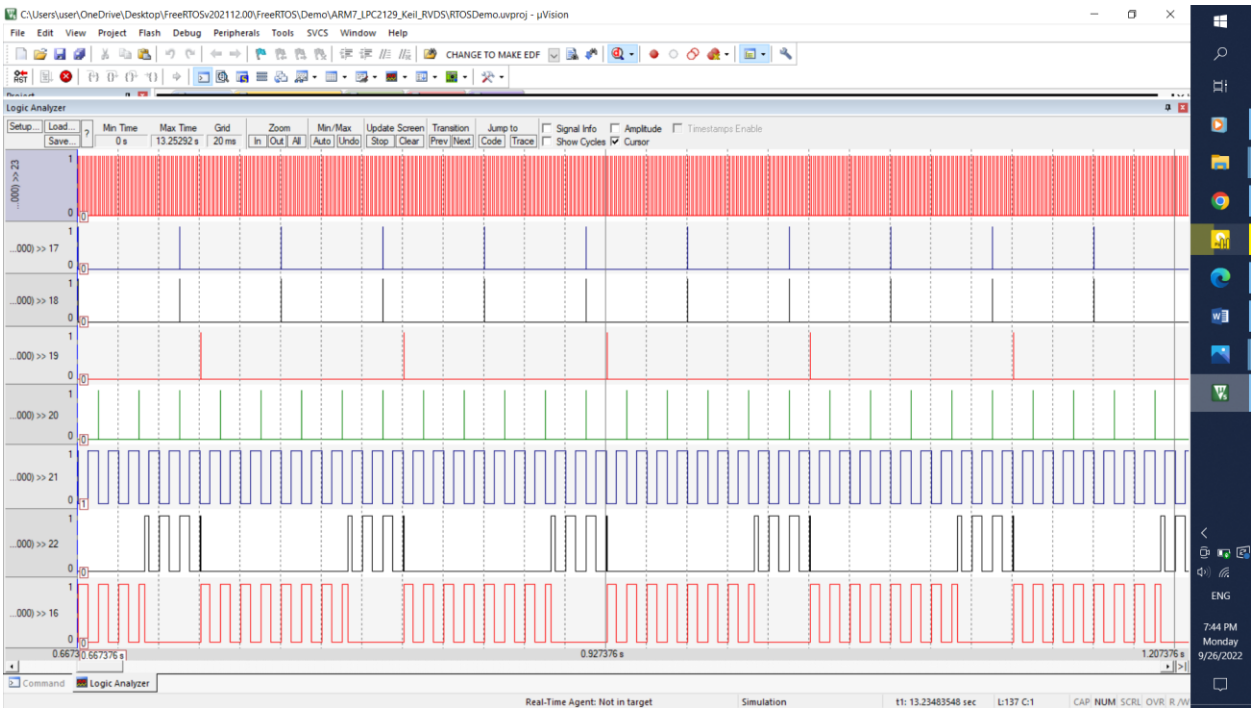


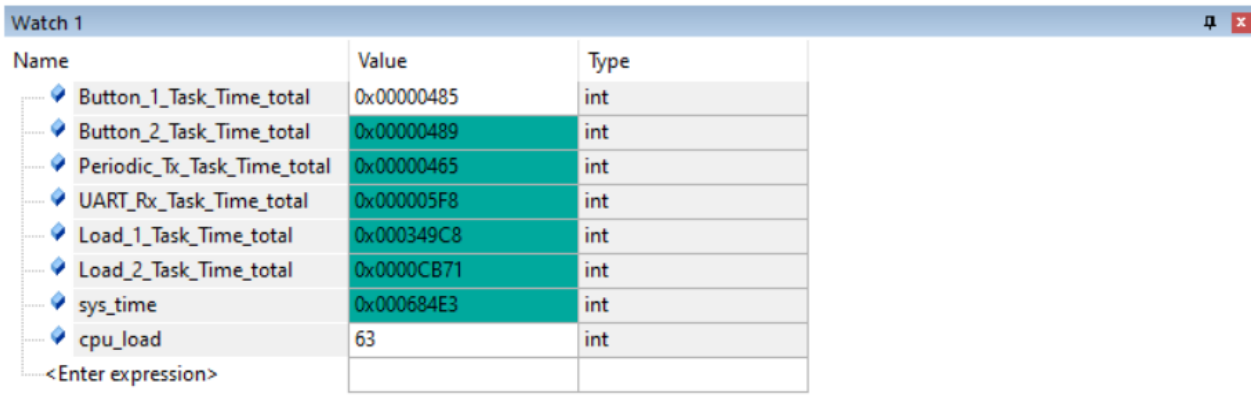
id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	priority
1	BUTTON 1	Periodic	No	0	50	-	50	0.0135		1
2	BUTTON 2	Periodic	No	0	50	-	50	0.0135		1
3	PERIODIC TX	Periodic	No	0	100	-	100	0.187		1
4	UART RX	Periodic	No	0	20	-	20	0.0213		1
5	LOAD 1	Periodic	No	0	10	-	10	5		1
6	LOAD 2	Periodic	No	0	100	-	100	12		1


SimSo: Real-Time Scheduling Simulator - [Results]
File View Help
Gantt Results
* Unsaved
General Logs Tasks Scheduler Processors
Observation Window:
from 0.00 to 100.00 ms
Configure...
Total load Payload System load
CPU 1 0.6235 0.6235 0.0000
Average 0.6235 0.6235 0.0000


SimSo: Real-Time Scheduling Simulator - [Gantt chart]
File View Help
Gantt Results
* Unsaved
Zoom + Zoom - Configure
CPU 1
BUTTON 1
BUTTON 2
PERIODIC
UART RX
LOAD 1
LOAD 2

Method 3: Using Keil:





Comment: The three methods gives almost identical Results which indicates to a successful Implementation to an EDF scheduler.