Validation Report

RTOS EDF Scheduler

Contents

Analytical Data

Hyperperiod

LCM[Periodic Transmitter, UART Receiver, Button_1_Monitor, Button_2_Monitor, Load_1_Simulation, Load_2_Simulation]

LCM[100 , 20, 50, 50, 10, 100] = 100 ms

Execution Time of Tasks Using Keil Logic Analyzer

Periodic_Transmitter -> 0.02 ms

UART_Receiver -> 0.017 ms

Button_1_Monitor -> 0.014 ms

Button_2_Monitor -> 0.014 ms

Load_1_Simulation -> 5 ms

Load_2_Simulation -> 12 ms

CPU LOAD

$$= \frac{Total\ Execution\ Time\ in\ a\ Hyperperiod}{Hyperperiod}$$

$$U = \frac{(0.02*5)+0.017+(0.014*2)+(0.014*2)+(5*10)+12}{100} * 100 = 62\%$$

Checking System Schedulability against URM

$$U \leq U_{rm}$$

$$U_{rm} = n\left(2^{\frac{1}{n}} - 1\right) = 6\left(2^{\frac{1}{6}} - 1\right) = 75\%$$

$$62\% \leq 75\%$$

Hence, the system is schedulable

Time Analysis

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

Where:

w_i is the processor time demand.

p_k is the periodicity of the task

e_k is the execution time of task k for all higher priority tasks

Load_1_Simulation

$$w_i = 5ms + 0 = 5\ ms$$

$$5ms < 10\ ms\ (task\ deadline)$$

Hence, the task is schedulable

Load_2_Simulation

$$w_i = 12\,ms + \frac{100}{10} * 5 + \frac{100}{50} * 0.014 + \frac{100}{50} * 0.014 + \frac{100}{100} * 0.02 + \frac{100}{20} * 0.017$$
$$= 62\,ms < 100\,ms\ (task\ deadline)$$

Hence, the task is schedulable

Button_1_Monitor

$$w_i = 0.014 + \frac{50}{10} * 5 = 25.14\,ms$$
$$22.14\,ms < 50\,ms\ (task\ deadline)$$

Hence, the task is schedulable

Button_2_Monitor

$$w_i = 0.014 + \frac{50}{10} * 5 = 25.14\,ms$$
$$22.14\,ms < 50\,ms\ (task\ deadline)$$

Hence, the task is schedulable

Periodic_Transmitter

$$w_i = 0.02 + \frac{100}{10} * 5 + \frac{100}{50} * 0.014 + \frac{100}{50} * 0.014 + \frac{100}{20} * 0.017 = 50.16\,ms$$
$$50.16\,ms < 100\,ms\ (task\ deadline)$$

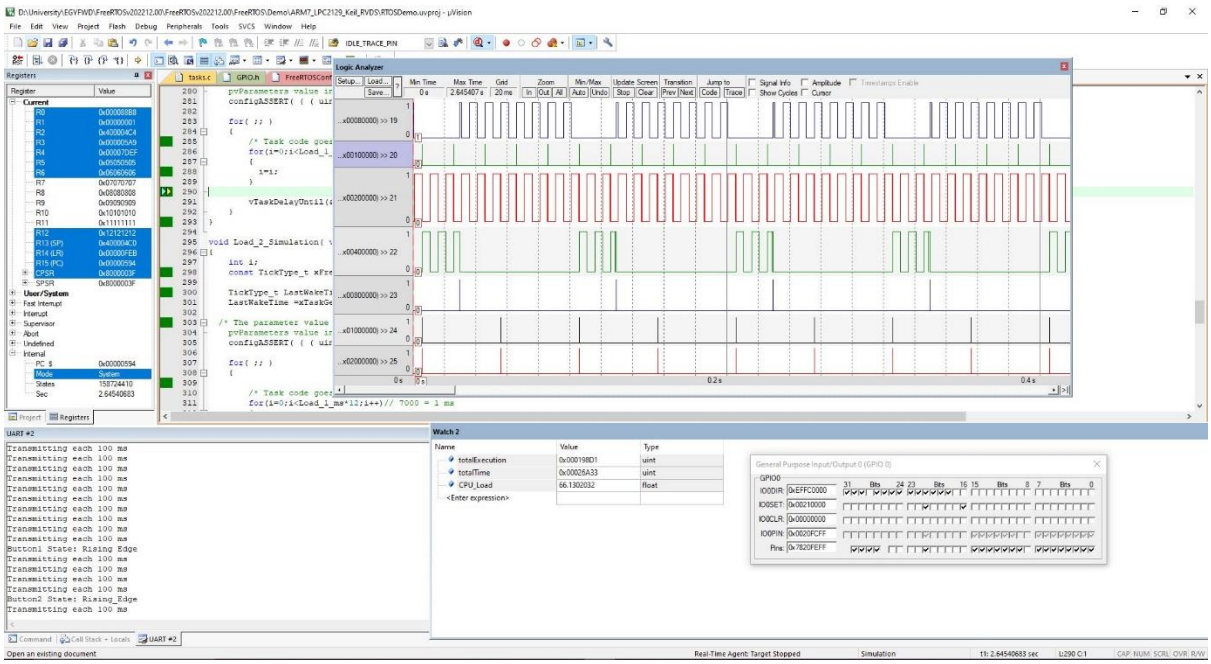
Hence, the task is schedulable

UART_Receiver

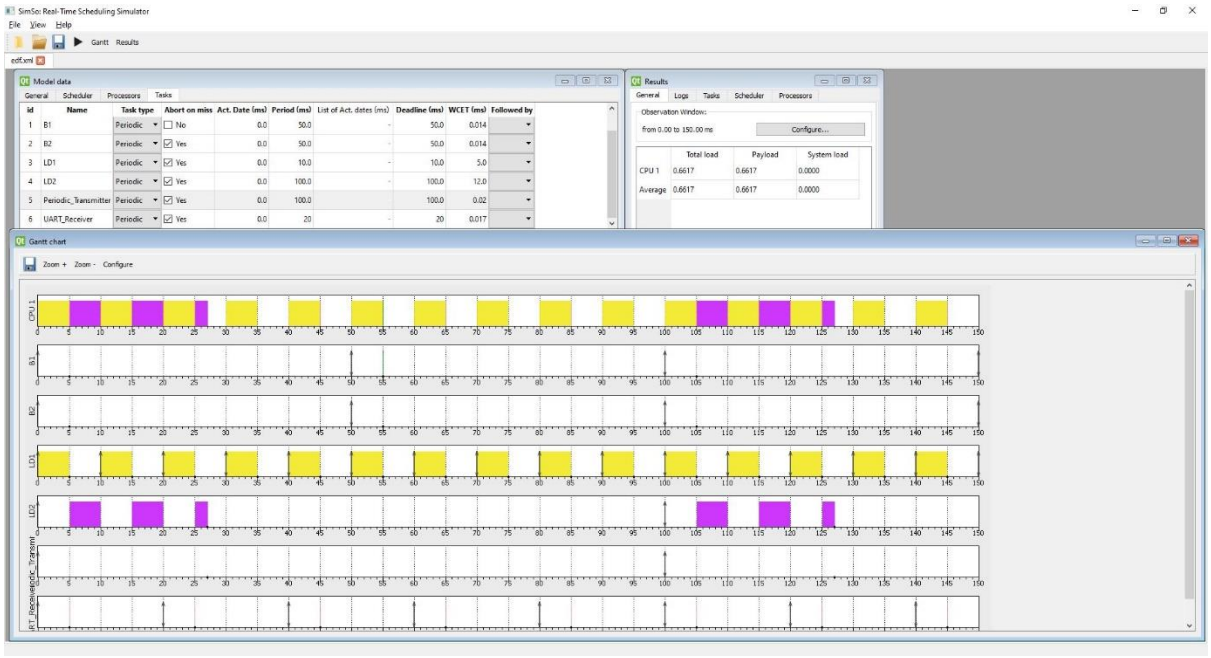
$$w_i = 0.017 + \frac{20}{10} * 5 = 10.17\,ms$$
$$10.17\,ms < 20\,ms\ (task\ deadline)$$

Hence, the task is schedulable

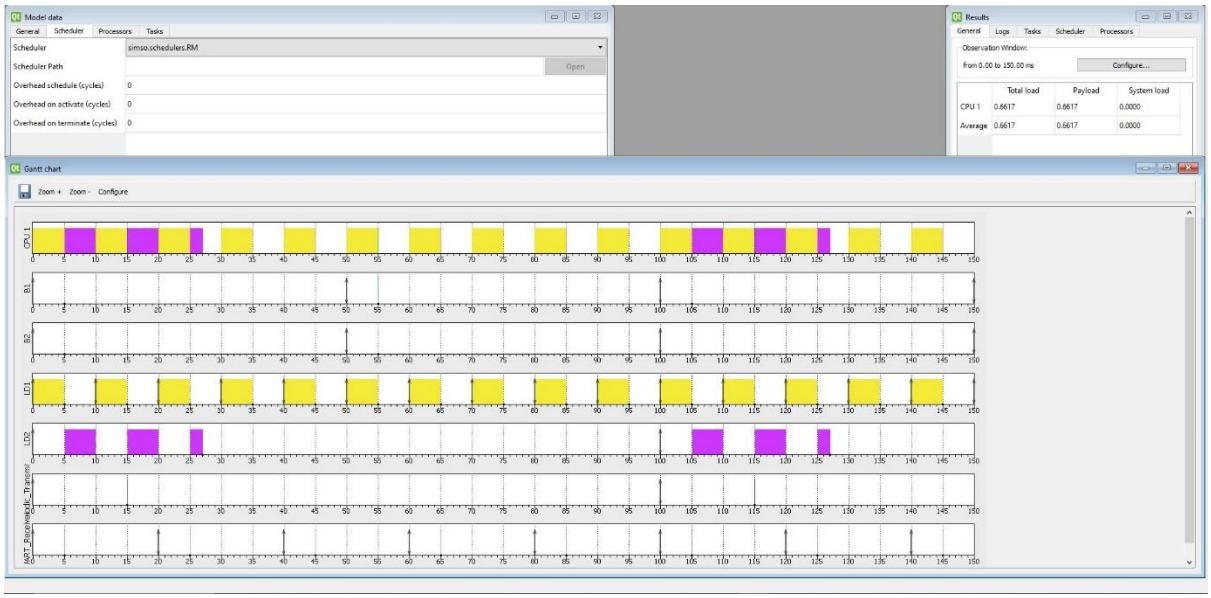
Keil Simulation Result



SIMSO EDF



SIMSO RM



Comment

According to the analytical results the system is perfectly feasible and schedule

These results were validation through the simso and keil simulation too

The EDF scheduler works perfectly fine in this case and there are no tasks missing their deadline.