

EDF Sheduler With FreeRTOS Report

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Tasks

| Tasks | Periodicity (ms) | Deadline (ms) | Execution Time (ms) | Occurrence in Hyper-Period |
|-------------------------------|------------------|---------------|---------------------|----------------------------|
| Task 1 – Button 1 Monitor | 50 | 50 | 0.015 | 2 |
| Task 2 – Button 2 Monitor | 50 | 50 | 0.015 | 2 |
| Task 3 - Periodic Transmitter | 100 | 100 | 0.15 | 1 |
| Task 4 – UART Receiver | 20 | 20 | 0.015 | 5 |
| Task 5 – Load 1 | 10 | 10 | 5 | 10 |
| Task 6 – Load 2 | 100 | 100 | 12 | 1 |

- Hyper-Period equals 100 ms
- Execution Time is calculated from Kiel simulation and Logic analyzer
- CPU Utilization = $\frac{0.015*9 + 0.15 + 12 + 5*10}{100} = 62.285\%$

System Schedulable

- **Utilization Rate Monotonic**
 - $U = \sum_{i=1}^n \frac{C_i}{P_i} = \frac{0.015}{50} + \frac{0.015}{50} + \frac{0.015}{20} + \frac{0.15}{100} + \frac{12}{100} + \frac{5}{10} = 62.285\%$
 - $URM = n \left(2^{\left(\frac{1}{n} \right)} - 1 \right); n = 6; URM = 73.477\%$
 - $U < URM \rightarrow \text{System is Schedulable}$

- Time Demand

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

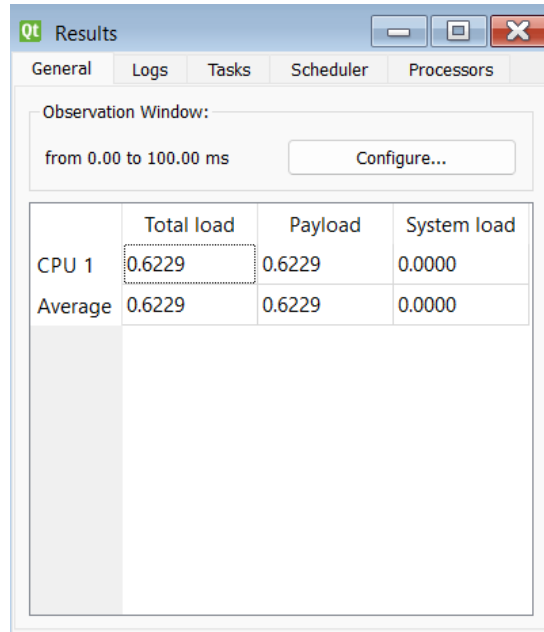
Task

Schedulable?

| | | |
|----------------------|---|-----|
| Load 1 | $W_5(10) = 5 + 0 = 5$ | Yes |
| UART | $W_4(20) = 0.015 + \left(\frac{20}{10}\right) * 5 = 10.015$ | Yes |
| Button 1 Button 2 | $W_{1,2}(50) = 0.015 * 2 + \left(\frac{50}{20}\right) * 0.015 + \left(\frac{50}{10}\right) * 5 = 25.0675$ | Yes |
| Periodic Load 2 | $W_{3,6}(100) = 0.15 + 12 + \left(\frac{100}{50}\right) * 0.015 + \left(\frac{100}{50}\right) * 0.015 + \left(\frac{100}{20}\right) * 0.015 + \left(\frac{100}{10}\right) * 5 = 62.285$ | Yes |

- Comment

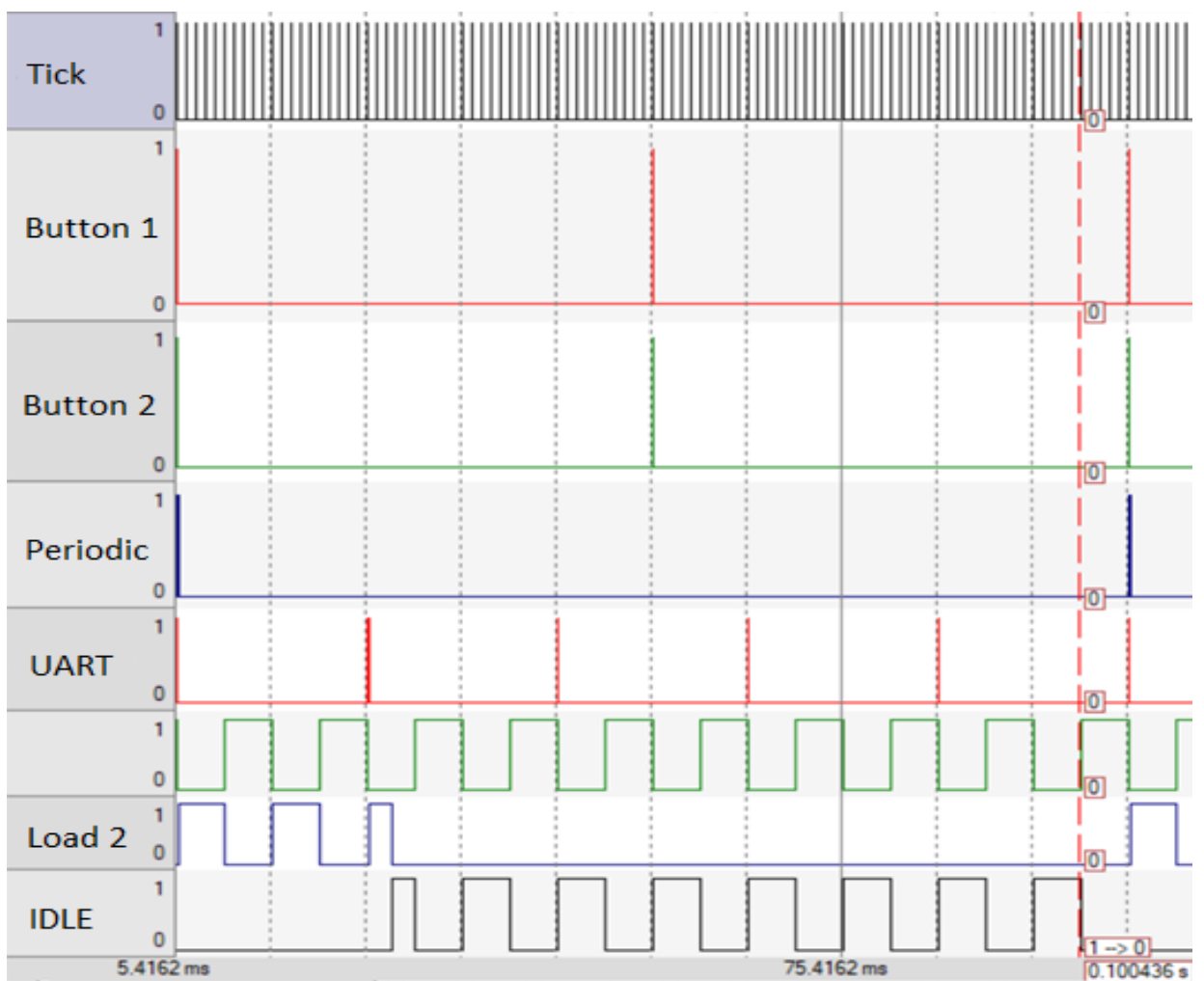
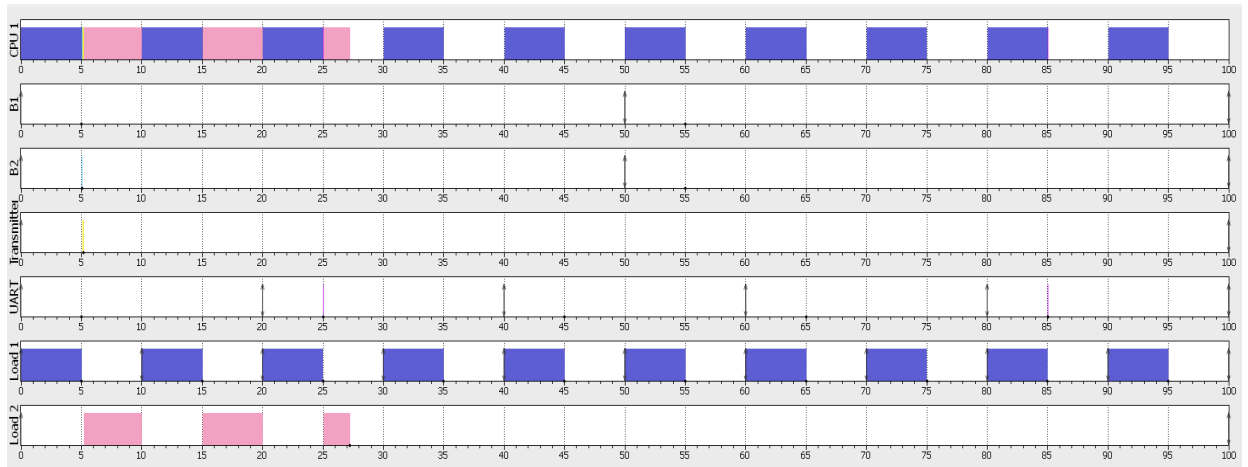
The analytical results are the same as SimSo results as all tasks meet their deadlines.



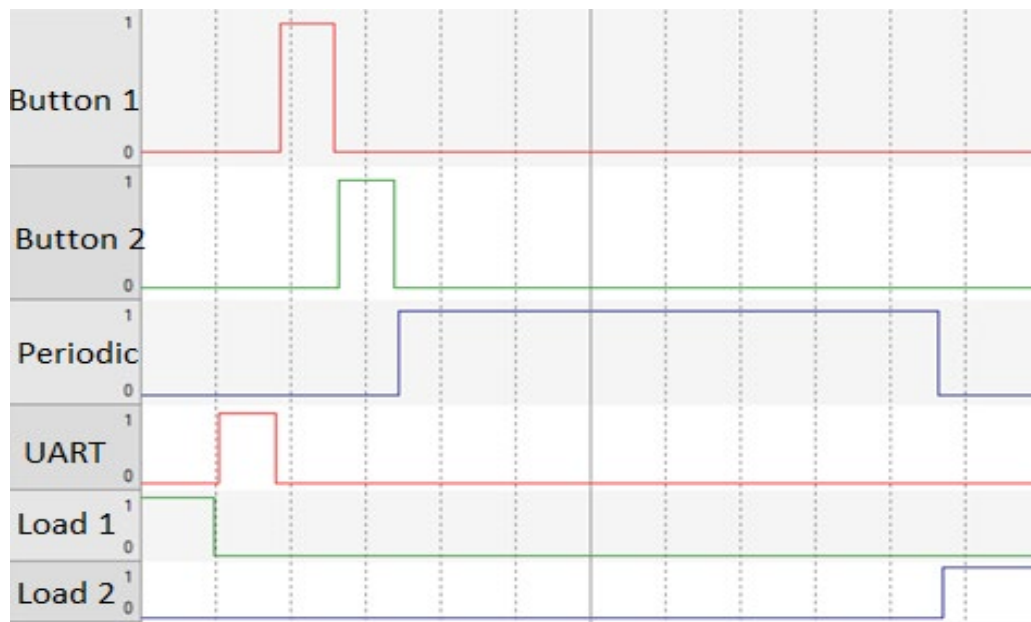
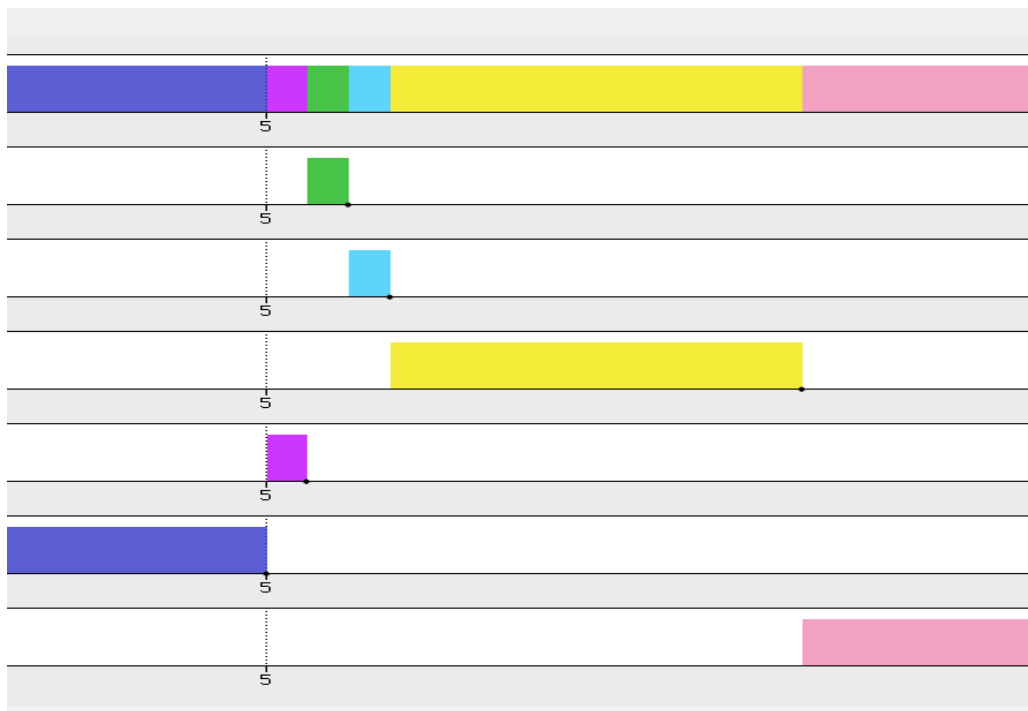
| | Total load | Payload | System load |
|---------|------------|---------|-------------|
| CPU 1 | 0.6229 | 0.6229 | 0.0000 |
| Average | 0.6229 | 0.6229 | 0.0000 |

Online Vs Offline Simulators

- **Screenshots over Hyper-Period – 100ms**



- **Zoomed Screenshots at 5 ms, Due to small execution time of tasks**



- **Comment**

As shown that the two charts are completely identical and the EDF scheduler is implemented successfully, and all tasks behave as expected without missing any deadlines.