

Free RTOS EDF Scheduler

Verifying the system Report

- **System Hyper Period :**

The Hyper period is the time after which pattern of Task release times starts to repeat .

Hyper Period = 100ms .

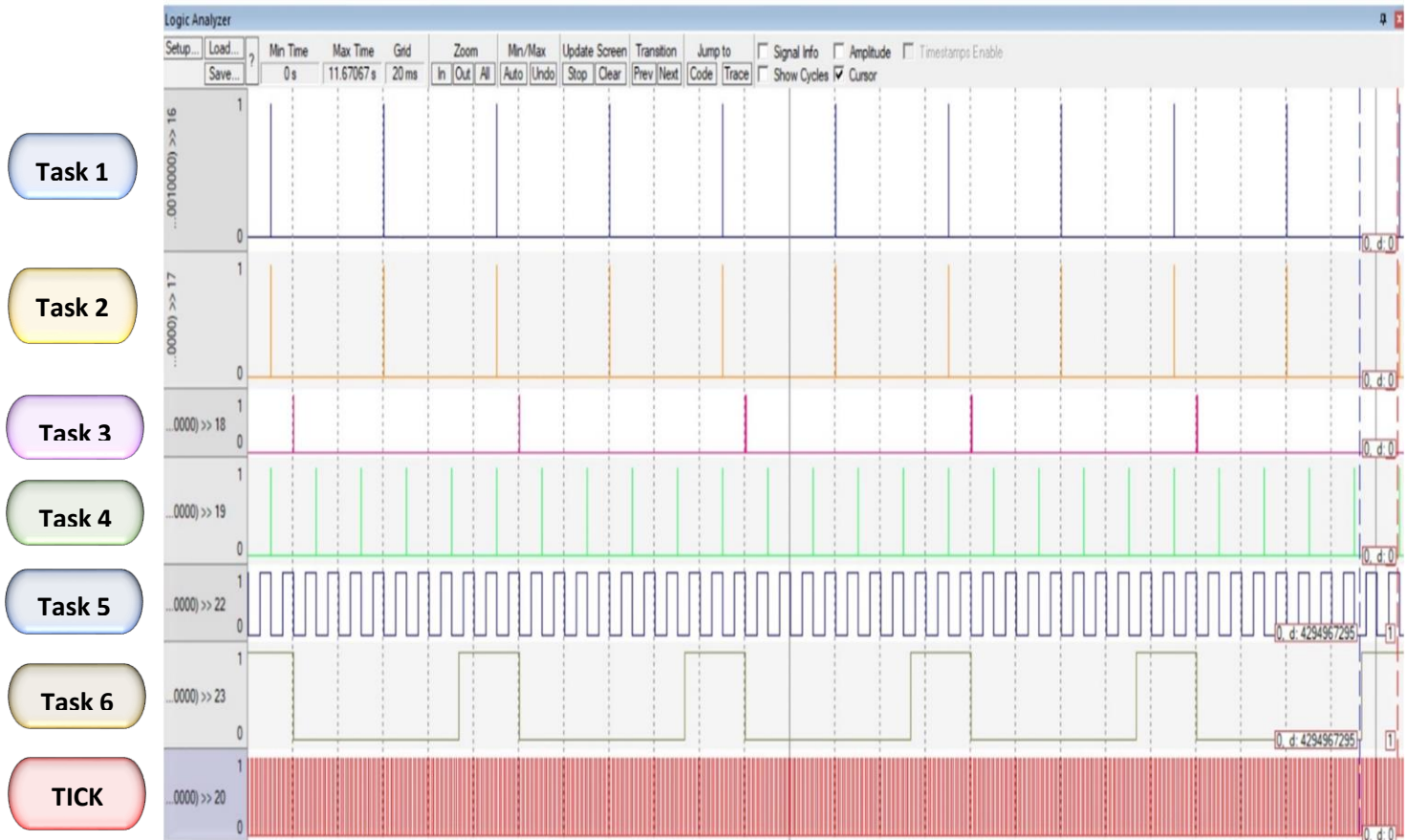
- **CPU load :**

- Task 1 -- > Button_1_Monitor
period : 50ms , deadline :50ms , execution Time : 1.9us
- Task 2 -- > Button_2_Monitor
period : 50ms , deadline :50ms , execution Time : 1.9us
- Task 3 -- > Periodic Transmitter
period : 100ms , deadline :100ms , execution Time : 6.67us
- Task 4 -- > Uart_Receiver
period : 20ms , deadline :20ms , execution Time : 3.3167us
- Task 5 -- > Load 1
period : 10ms , deadline :10ms , execution Time : 5ms
- Task 6 -- > Load 2
period : 100ms , deadline :100ms , execution Time : 12ms

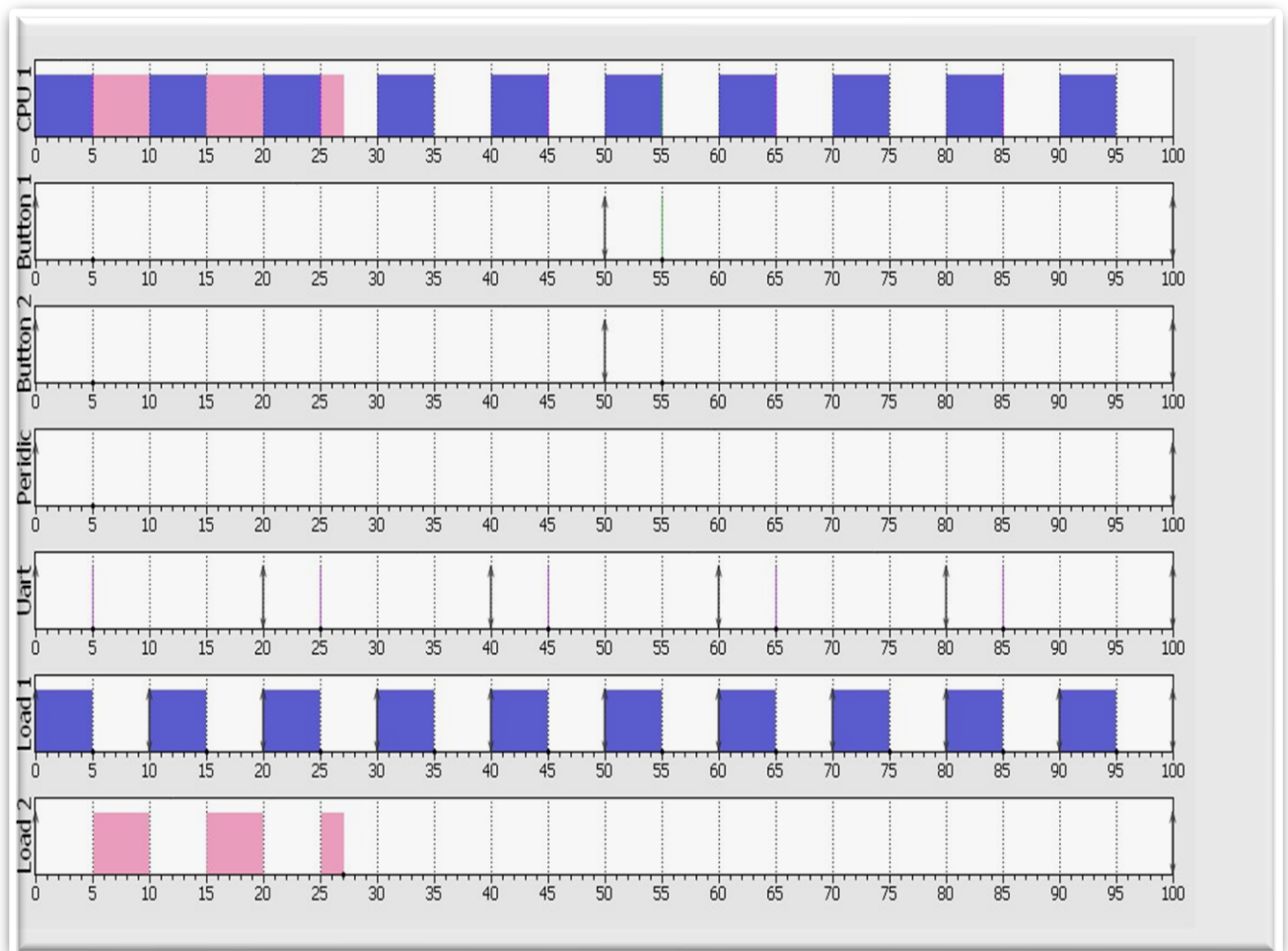
❖ Utilization = Total Execution Time / Hyper Period .

$$U = \frac{([2 * 1.9\mu s] + [2 * 1.9\mu s] + [1 * 6.67\mu s] + [1 * 3.3167\mu s] + [10 * 5000\mu s] + [1 * 12000\mu s])}{100000\mu s} = 62.02 \%$$

- Keil Logic Analyzer :



- Simso offline simulator:



	Total load	Payload	System load
CPU 1	0.6603	0.6603	0.0000
Average	0.6603	0.6603	0.0000

- System Schedulability Using URM :

$$U = \sum_{i=1}^n \frac{C_i}{P_i} \leq n(2^{\frac{1}{n}} - 1)$$

$$\text{Utilization bound} = N (2^{1/N} - 1) = 6 (2^{\frac{1}{6}} - 1) = 0.734$$

$$U = \left[\frac{1.6 \text{ us}}{50 \text{ ms}} \right] + \left[\frac{1.6 \text{ us}}{50 \text{ ms}} \right] + \left[\frac{6.67 \text{ us}}{100 \text{ ms}} \right] + \left[\frac{3.3167 \text{ us}}{20 \text{ ms}} \right] + \left[\frac{5 \text{ ms}}{10 \text{ ms}} \right] + \left[\frac{12 \text{ ms}}{100 \text{ ms}} \right] = 0.62$$

$$\therefore U < URM$$

System Guaranteed Schedulable

- System Schedulability Using Time Demand Analysis :

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

➤ Task 5 --> Load 1

$$W_1(10) = 5\text{ms} + 0$$

$$\therefore w(10) < D = 5 < 10$$

➤ Task 4 --> Uart_Receiver

$$W_2(20) = 0.003167\text{ms} + \left\lceil \frac{20}{10} \right\rceil * 5\text{ms}$$

$$\therefore w(20) < D = 10.003 < 20$$

➤ Task 1 --> Button_1_Monitor

$$W_3(50) = 1.9\text{us} + \left\lceil \frac{50}{10} \right\rceil * 5\text{ms} + \left\lceil \frac{50}{20} \right\rceil * 3.3\text{us}$$

$$\therefore w(50) < D = 25.010 < 50$$

➤ Task 2 --> Button_2_Monitor

$$W_4(50) = 1.9\mu s + \left[\frac{50}{10} * 5\text{ms} + \frac{50}{20} * 3.3\mu s + \frac{50}{50} * 1.9\mu s \right] .$$

$$\therefore w(50) < D = 25.012 < 50$$

➤ Task 3 --> Periodic Transmitter

$$W_5(100) = 6.67\mu s + \left[\frac{100}{10} * 5\text{ms} + \frac{100}{20} * 3.3\mu s + \frac{100}{50} * 1.9\mu s + \frac{100}{50} * 1.9\mu s \right] .$$

$$\therefore w(100) < D = 50.03 < 100$$

➤ Task 6 --> Load 2

$$W_6(100) = 12\text{ms} + \left[\frac{100}{10} * 5\text{ms} + \frac{100}{20} * 3.3\mu s + \frac{100}{50} * 1.9\mu s + \frac{100}{50} * 1.9\mu s + \frac{100}{100} * 6.67\mu s \right] .$$

$$\therefore w(100) < D = 62.03 < 100$$

All tasks are schedulable , and no task miss the deadLine