EDF Scheduler

23/9
FWD RTOS

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1.Analytical Calculations

- *"Button_1_Monitor":*   *Task 1: {P = 50, E=13.3, D = 50}*
- *"Button_2_Monitor":*   *Task 2: {P = 50, E=13.3, D = 50}*
- *"Periodic_Transmitter":*   *Task 3: {P = 100, E=20.3, D = 100}*
- *"Uart_Receiver":*   *Task 4: {P = 20, E=15.5, D = 20}*
- *"Load_1_Simulation":*   *Task 5: {P = 10, E=5000, D = 10}*
- *"Load_2_Simulation":*   *Task 6: {P = 100, E=12000, D = 100}*

1.1 CPU load

1.1.1 Hyperperiod = 100ms

$$\frac{(2*13.3)\ + (2*13.3) + (1*20.3) + (5*15.5) + (10*5000) + (1*12000)}{100000} = 62.161\%$$

1.2 Rate-monotonic utilization

$$U = \frac{13.3}{50000} + \frac{13.3}{50000} + \frac{20.3}{100000} + \frac{15.5}{20000} + \frac{5000}{10000} + \frac{12000}{100000} = 0.6239$$

$$Urm = 6*\left(2^{\frac{1}{6}} - 1\right) = 0.7347$$

The system is schedulable because 0.73 > 0.62

1.3 Time demand analysis

1.3.1 Time demand for task 1:

$$w(1) = 13.3 + 0$$
$$w(50000) = 13.3 + 0$$
$$13.3 < 50000$$

T1 is schedulable

1.3.2 Time demand for task 2

$$w(1) = \frac{1}{50000}13.3 + 13.3$$
$$w(50000) = \frac{1}{50000}13.3 + 13.3$$
$$26.6 < 50000$$

T2 is schedulable

1.3.3 Time demand for task 3:

$$w(1) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + 20.3$$

$$w(100000) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + 20.3$$
$$46.9 < 100000$$

T3 is schedulable

1.3.4 Time demand for task 4:
$$w(1) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + 15.5$$
$$w(20000) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + 15.5$$
$$62.4 < 20000$$

T4 is schedulable

1.3.5 Time demand for task 5:
$$w(1) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + \frac{1}{20000}15.5 + 5000$$
$$w(10000) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + \frac{1}{20000}15.5 + 5000$$
$$5062.4 < 10000$$

T5 is schedulable

1.3.6 Time demand for task 6:
$$w(1) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + \frac{1}{20000}15.5 + \frac{1}{10000}5000 + 12000$$
$$w(100000) = \frac{1}{50000}13.3 + \frac{1}{50000}13.3 + \frac{1}{100000}20.3 + \frac{1}{20000}15.5 + \frac{1}{10000}5000 + 12000$$
$$17062.4 < 100000$$

T6 is schedulable

2.Simso result

2.1 Implementing our tasks

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	TASK T1	Periodic ▼	☐ No	0	50.0	-	50.0	0.0133	▼	0
2	TASK T2	Periodic ▼	☐ No	0	50.0	-	50.0	0.0133	▼	0
3	TASK T3	Periodic ▼	☐ No	0	100.0	-	100.0	0.0203	▼	0
4	TASK T4	Periodic ▼	☐ No	0	20.0	-	20.0	0.1505	▼	0
5	TASK T5	Periodic ▼	☐ No	0	10		10	5.0	▼	0
6	TASK T6	Periodic ▼	☐ No	0	100.0	-	100.0	12.0	▼	

Edit data fields…

Remove selected task(s)   Add task   Generate Task Set

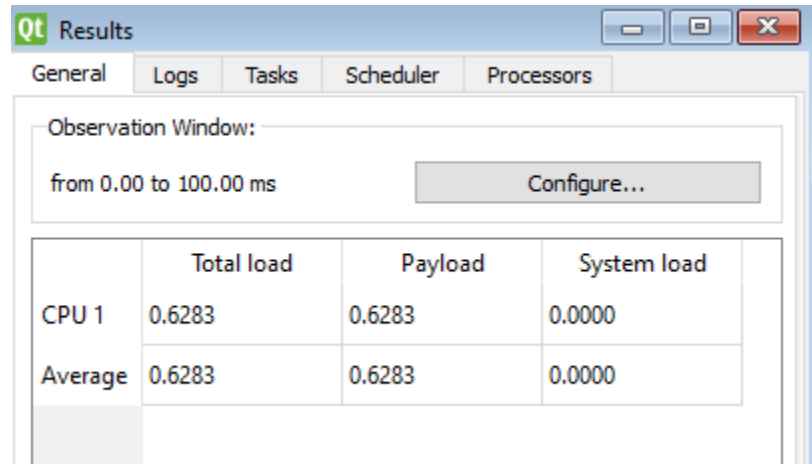*Figure 1Tasks implementation in simso*
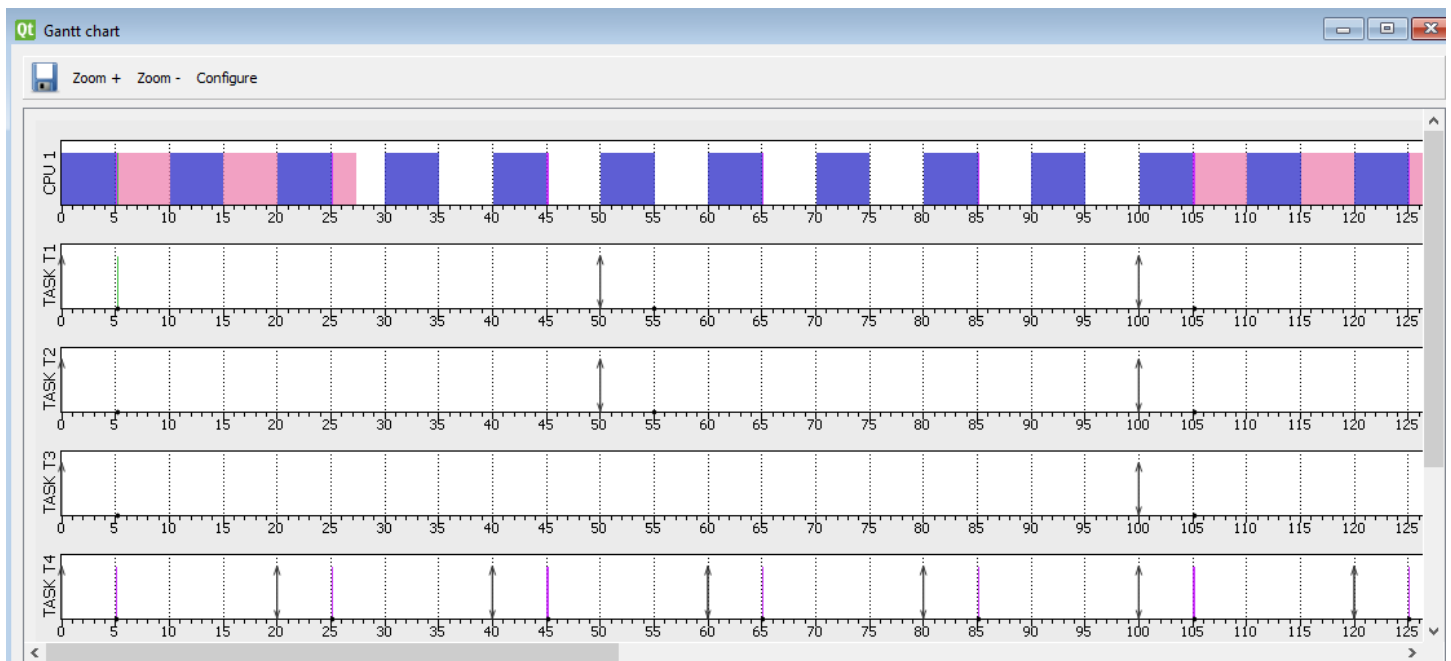
2.2 Results

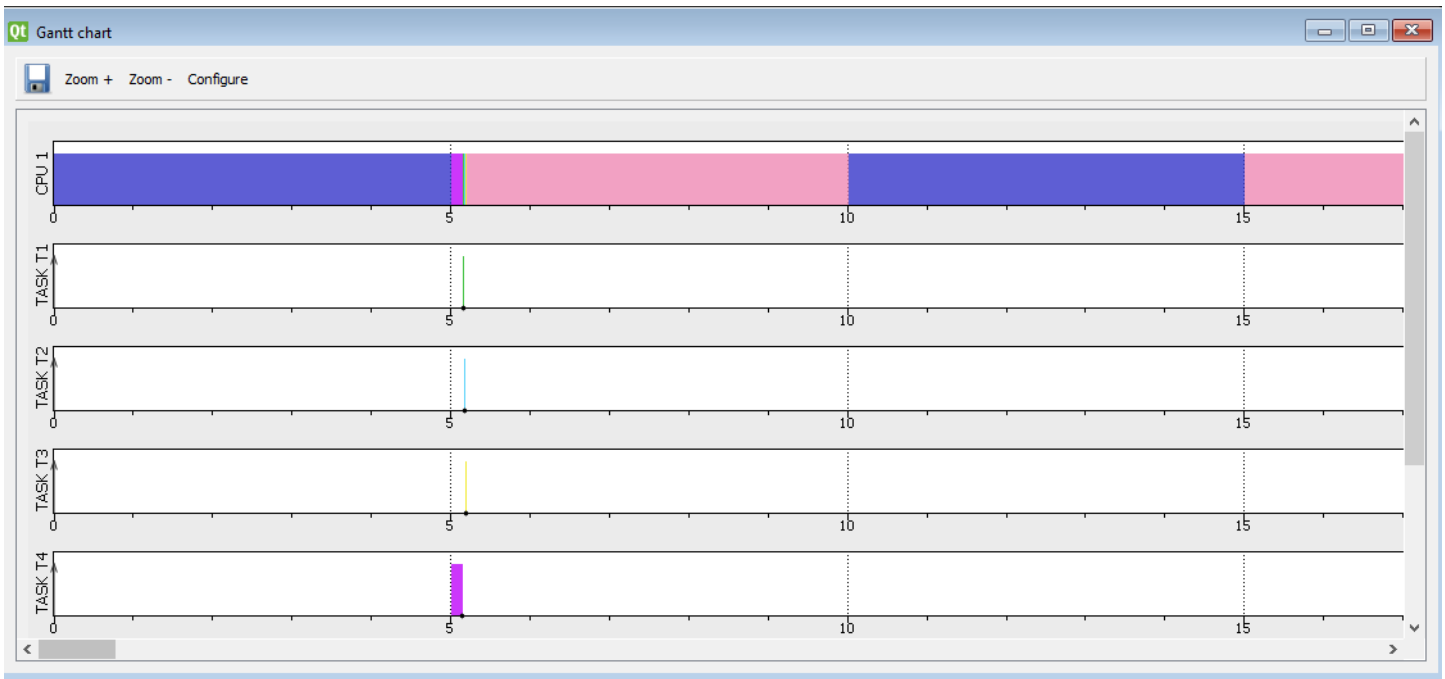*Figure 2 Simso Load result*

Figure 3 Simso execution in 300ms period

Figure 4 execution of small tasks in simso

3 Using Keil Simulator in run time

3.1 Tasks execution times
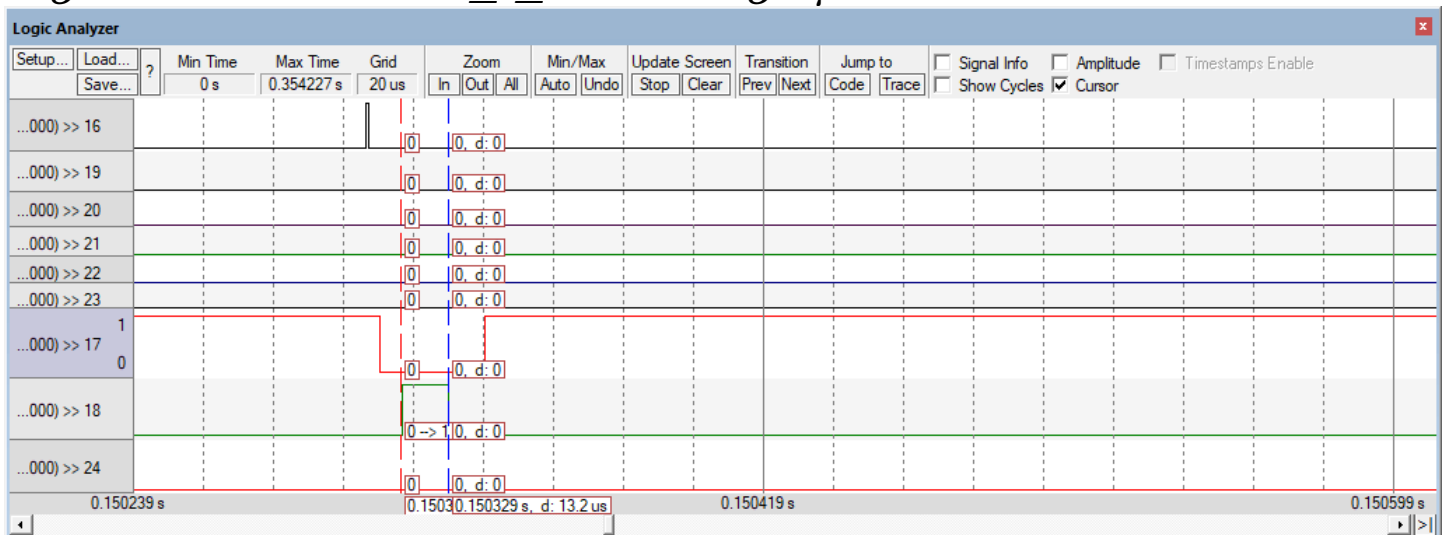
3.1.1 Task 1: Button_1_Monitor: 13.2 μs

Figure 5 Button_1_Monitor execution time

3.1.2   Task 2: Button_2_Monitor: 13.3 μs

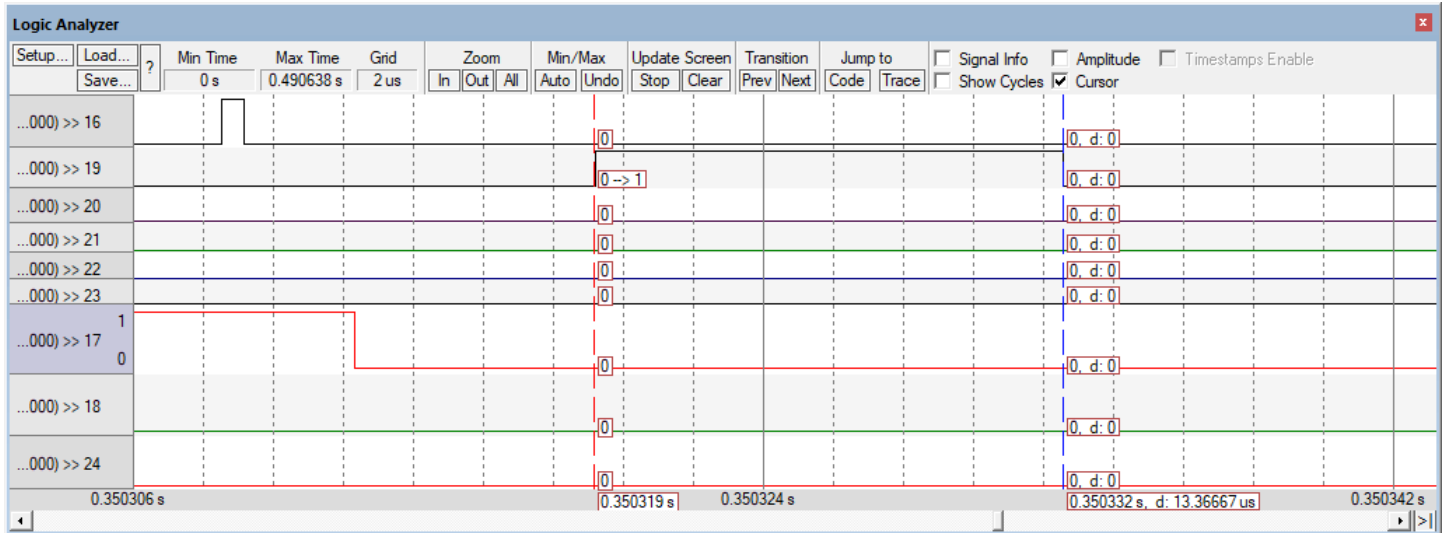Figure 6 Button_2_Monitor execution time
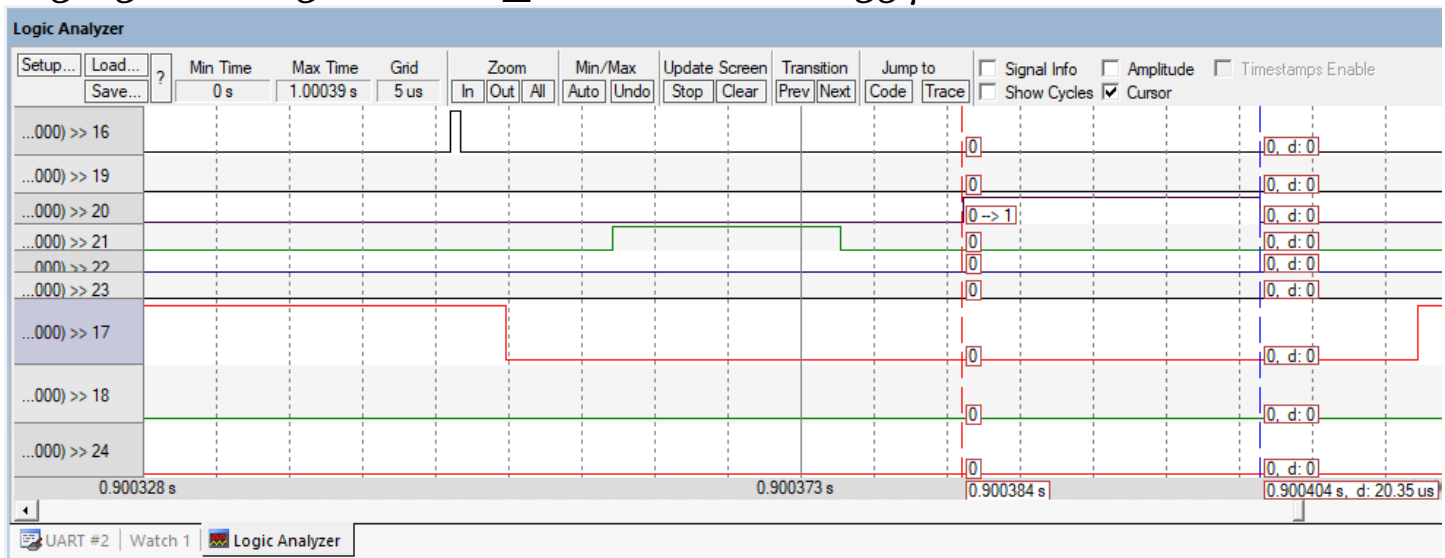
3.1.3   Task 3: Periodic_Transmitter: 20.35 μs

Figure 7 Periodic_Transmitter

3.1.4 Task 4: Uart_Receiver: 15.5µs or 26µs
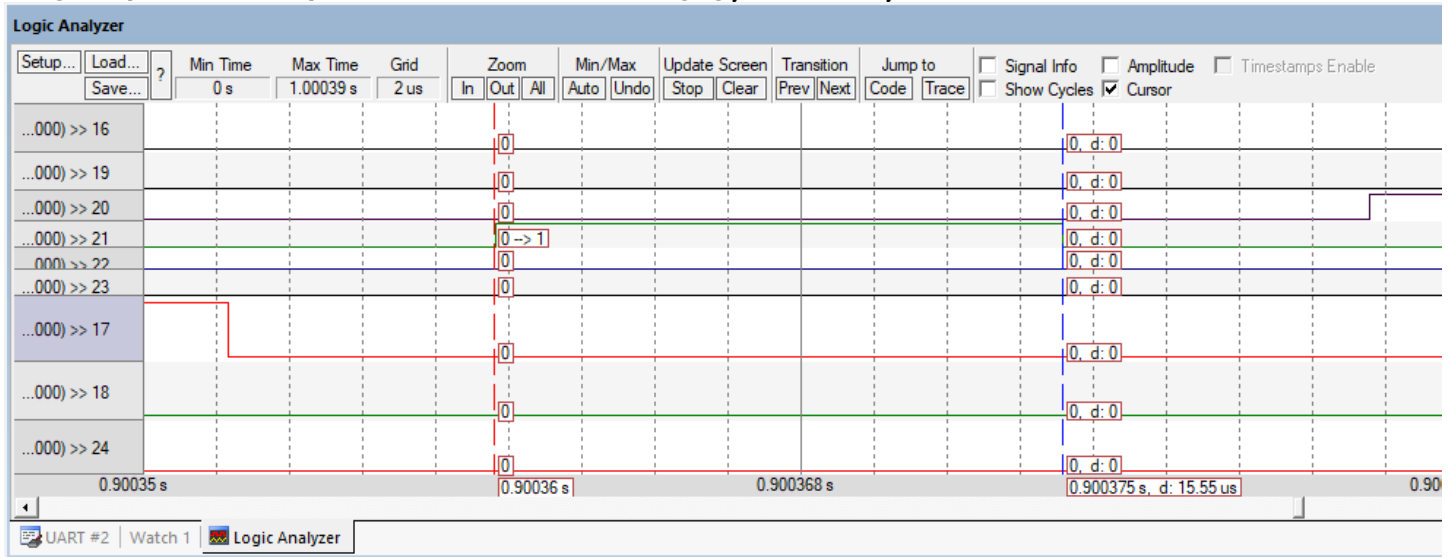
Figure 8 Uart_Receiver execution time when Queue is empty
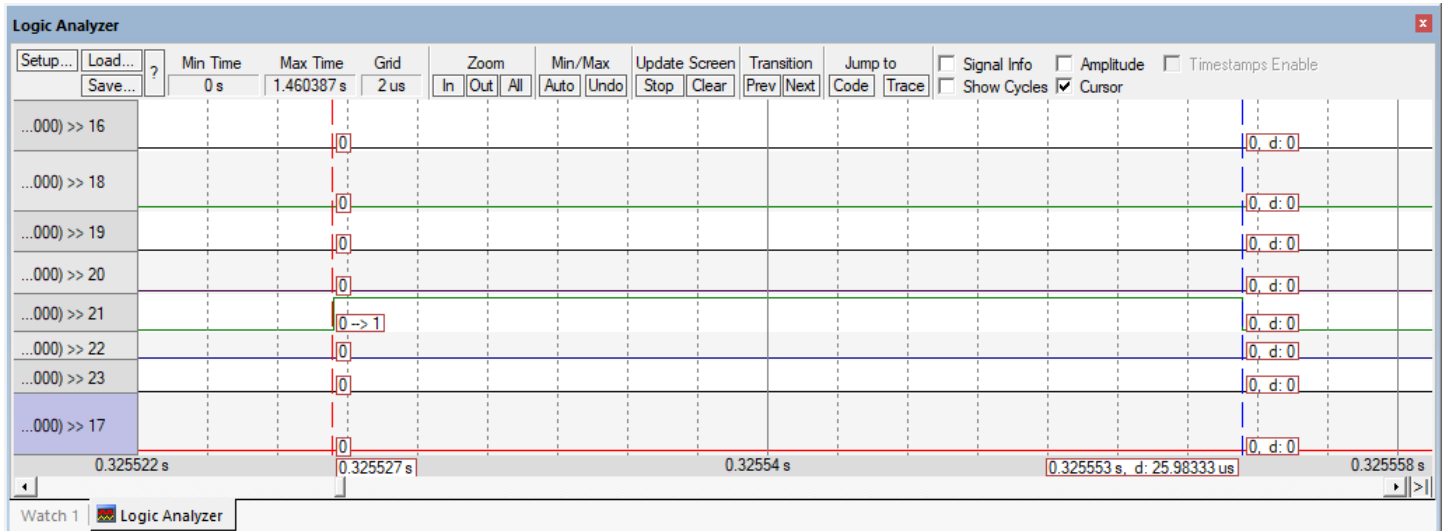
When there is data to send

Figure 9 Uart_Receiver execution time when Queue is full
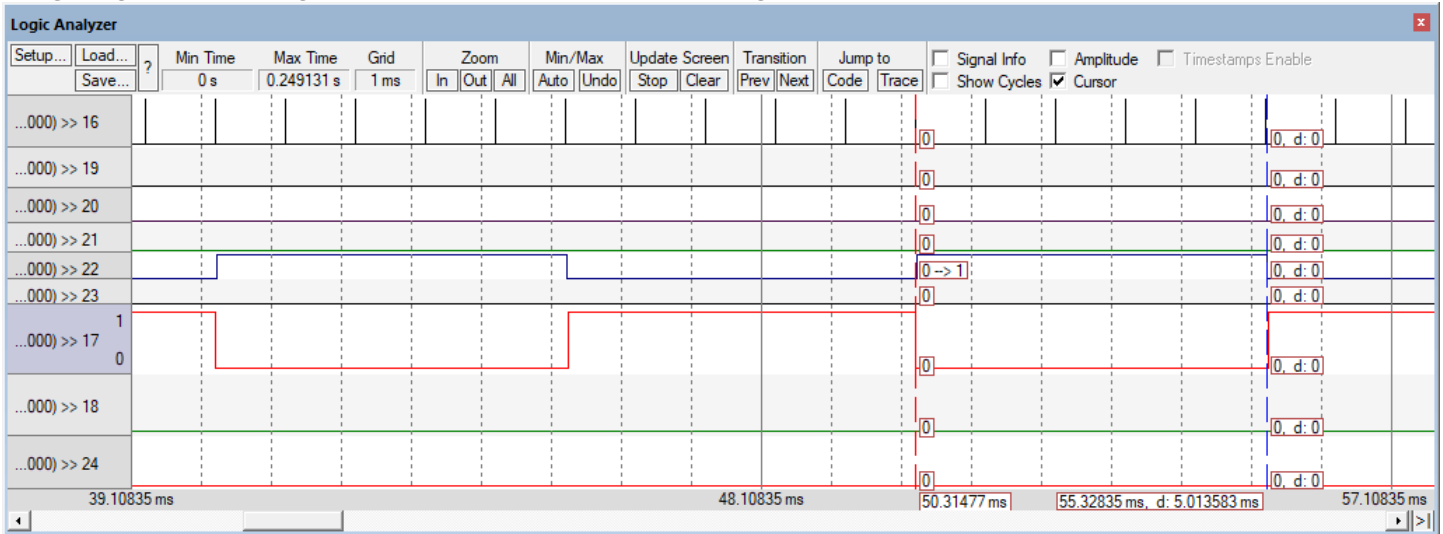
3.1.5   Task 5: Load_1_Simulation: 5.01ms

Figure 10 Load_1_Simulation execution time

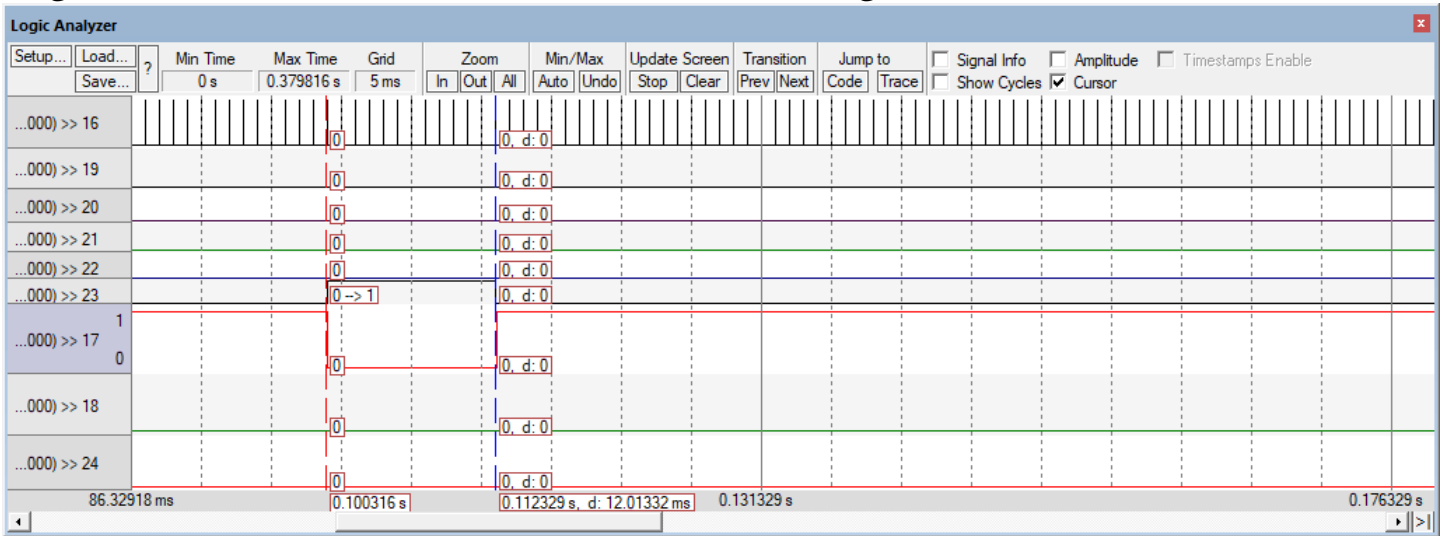### 3.1.6   Task 6: Load_2_Simulation: 12.013ms

Figure 11 Load_2_Simulation execution time
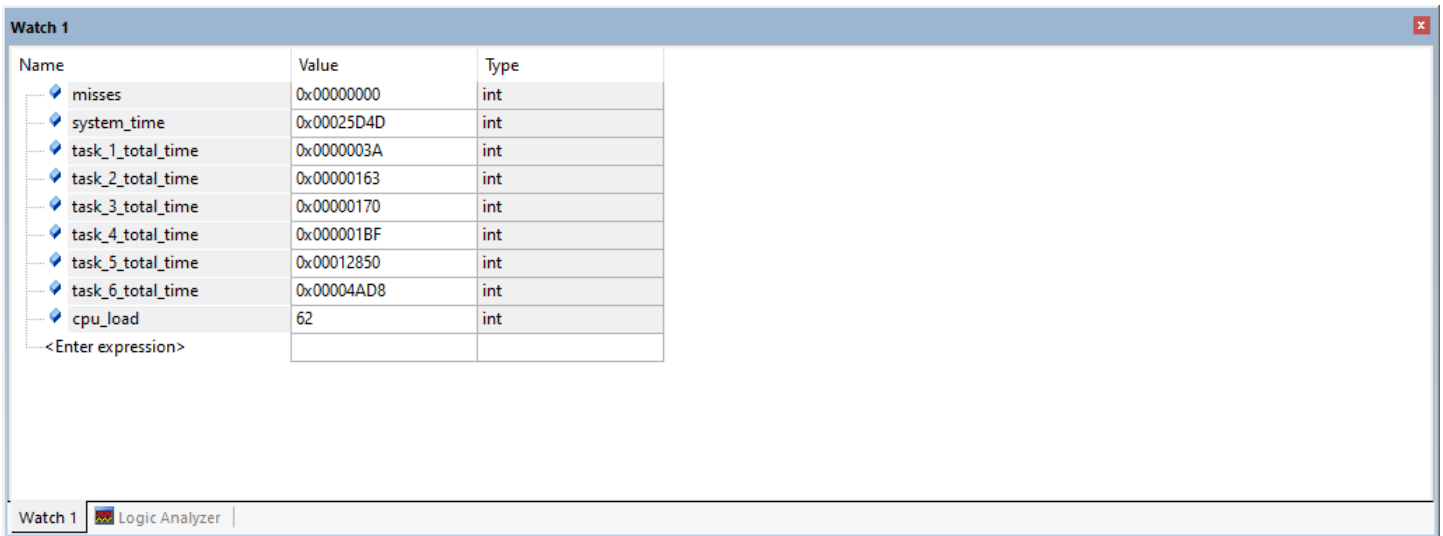
3.2 CPU usage
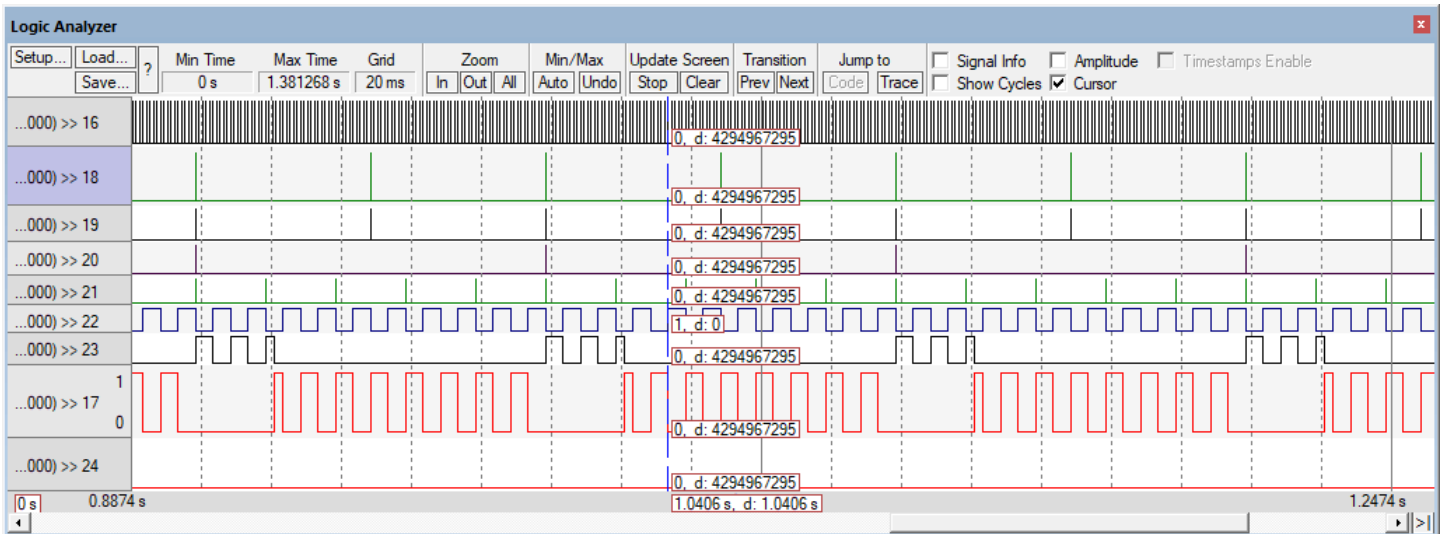

Figure 12 Tasks execution time and CPU load in run time

Figure 13 Live screen from the running program