

EDF Scheduler Report

We have 2 task sets for verifying our EDF scheduler implementation:

- Set one: Task1 {P: 40, E: 15.1, D: 40}, Task2 {P: 100, E: 15.28, D: 100}.
- Set two: Task1 {P: 20, E: 15.1, D: 20}, Task2 {P: 40, E: 15.28, D: 40}.

With each task set we'll:

- Calculate the CPU load using analytical methods, SimSo and on Run-time.
- Check the schedulability by analytical methods, SimSo and on Run-time.
- Draw the timeline using SimSo and on Run-time.

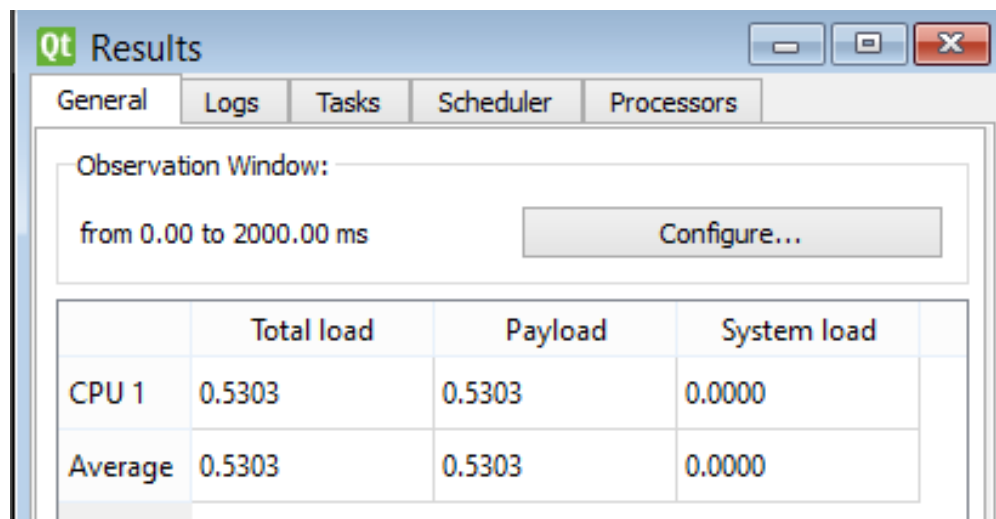
Task set one:

{P: 40, E: 15.1, D: 40}, Task2 {P: 100, E: 15.28, D: 100}

- The CPU load:
 - Analytical methods:

$$U = (15.1/40) + (15.28/100) = 0.5303 \approx 53\%$$

- SimSo:



Qt Results			
General Logs Tasks Scheduler Processors			
Observation Window:			
from 0.00 to 2000.00 ms			Configure...
	Total load	Payload	System load
CPU 1	0.5303	0.5303	0.0000
Average	0.5303	0.5303	0.0000

CPU ≈ 53%

- On Run-time:
 - Using vTaskGetRunTimeStats() function:

UART #2		
Task1	39866	38%
IDLE	50551	46%
Task2	16578	15%
Task1	41677	37%
IDLE	53804	46%
Task2	17798	15%
Task1	44396	38%
IDLE	56167	46%
Task2	18420	15%
Task1	46207	37%

$$\text{Total system time} = 56167 + 18420 + 46207 = 120794$$

$$\text{CPU Load} = (18420/120794) + (46207/120794) \approx 0.53 = 53\%$$

- Using traceTASK_SWITCHED_IN() & traceTASK_SWITCHED_OUT():

Task1TimeTotal	46182	uint
Task2TimeTotal	19331	uint
TotalSystemTime	121714	uint
CPUload	0.538253605	float

$$\text{CPU load} \approx 0.53 = 53\%$$

- Schedulability:

- Analytical methods:

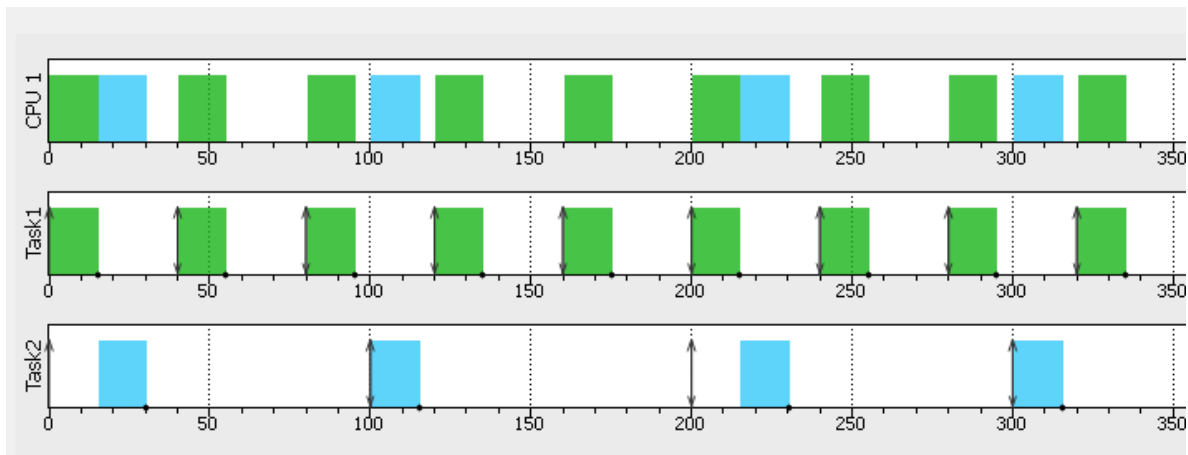
“A task set of periodic tasks is schedulable by EDF if and only if $U \leq 1$ ”

$$U = (15.1/40) + (15.28/100) = 0.5303$$

$$\therefore U < 1$$

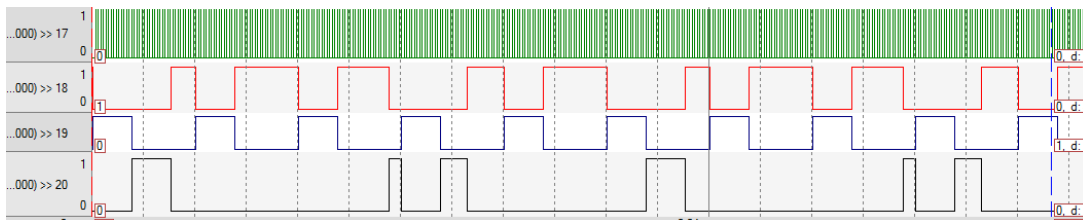
\therefore System guaranteed schedulable

- SimSo:



*From Gantt chart each of two tasks finishes before its deadline
 \therefore **System guaranteed schedulable***

- On Run-time:



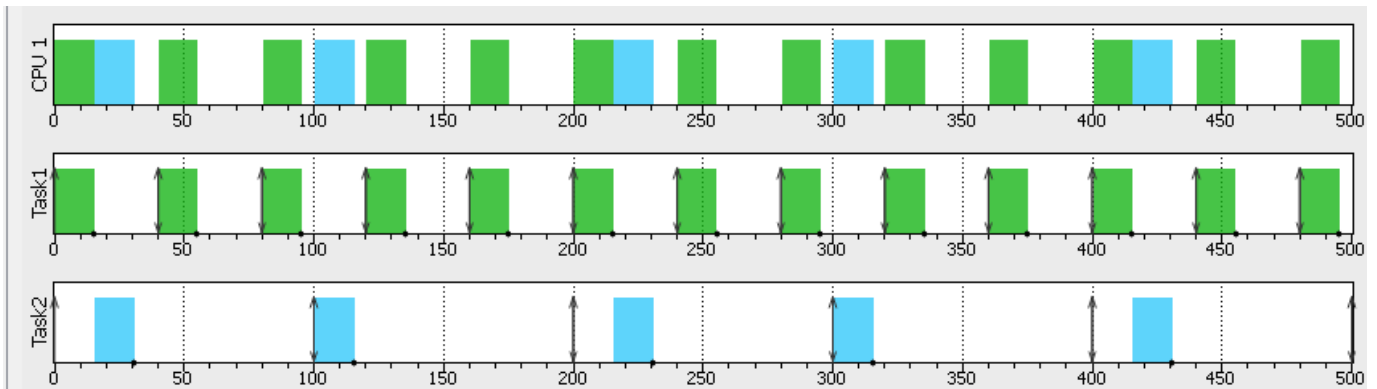
*Task1 ->Blue wave
 Task2 ->Black wave*

Task1DeadlineMissesCount	0	uint
Task2DeadlineMissesCount	0	uint

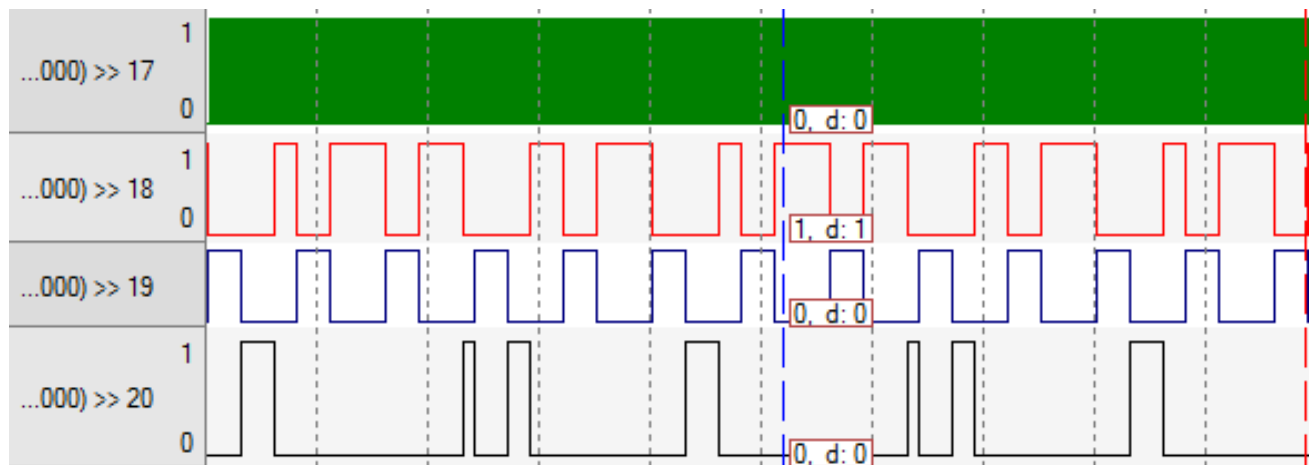
*Task1DeadlineMissesCount = 0
 Task2DeadlineMissesCount = 0
 \therefore **System guaranteed schedulable***

- System timeline:

- SimSo:



- On Run-time:



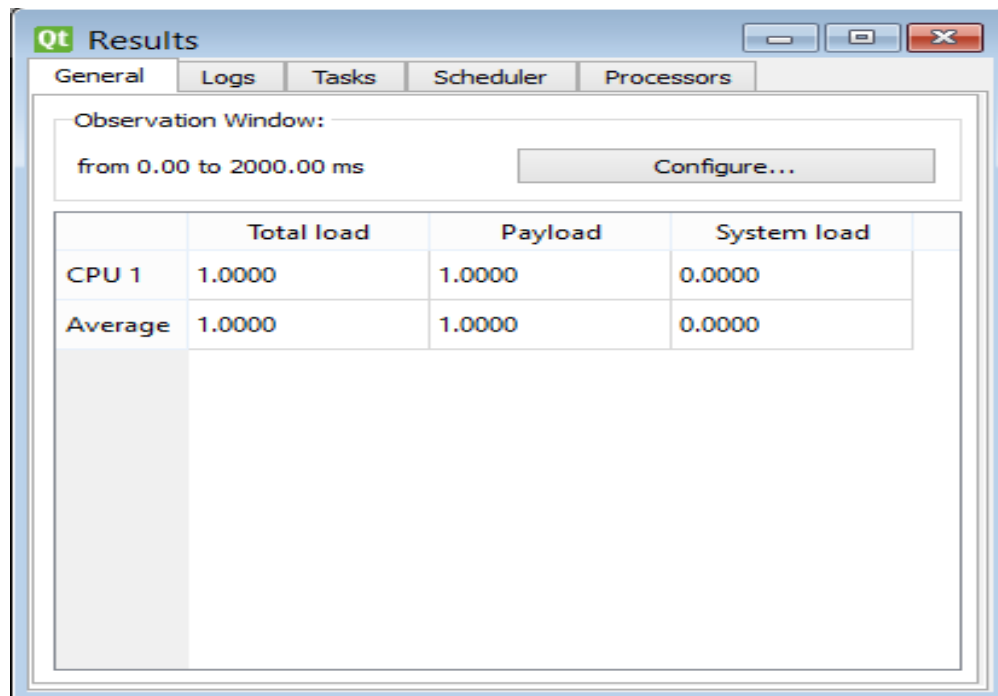
Task set two:

{P: 20, E: 15.1, D: 20}, Task2 {P: 40, E: 15.28, D: 40}

- The CPU load:
 - Analytical methods:

$$U = (15.1/20) + (15.28/40) = 1.137 \approx 100\%$$

- SimSo:



The image shows a screenshot of a software window titled "Qt Results". It has several tabs: "General", "Logs", "Tasks", "Scheduler", and "Processors". The "General" tab is selected. Inside the window, there is an "Observation Window" section with a text field showing "from 0.00 to 2000.00 ms" and a "Configure..." button. Below this is a table with the following data:

	Total load	Payload	System load
CPU 1	1.0000	1.0000	0.0000
Average	1.0000	1.0000	0.0000

CPU = 100%

- On Run-time:
 - Using vTaskGetRunTimeStats() function:

UART #2		
Task2	35889	32%
Task1	75275	66%
IDLE	0	<1%
Task2	36810	32%
Task1	77111	66%
IDLE	0	<1%
Task2	37731	32%
Task1	78948	66%
IDLE	0	<1%
Task2	38651	32%

IDLE Task execution time = 0 which means CPU load = 100%

- Using traceTASK_SWITCHED_IN() & traceTASK_SWITCHED_OUT():

Task1TimeTotal	80751	uint
Task2TimeTotal	39554	uint
TotalSystemTime	120355	uint
CPUload	0.999584556	float

CPU load $\approx 0.9995 \approx 100\%$

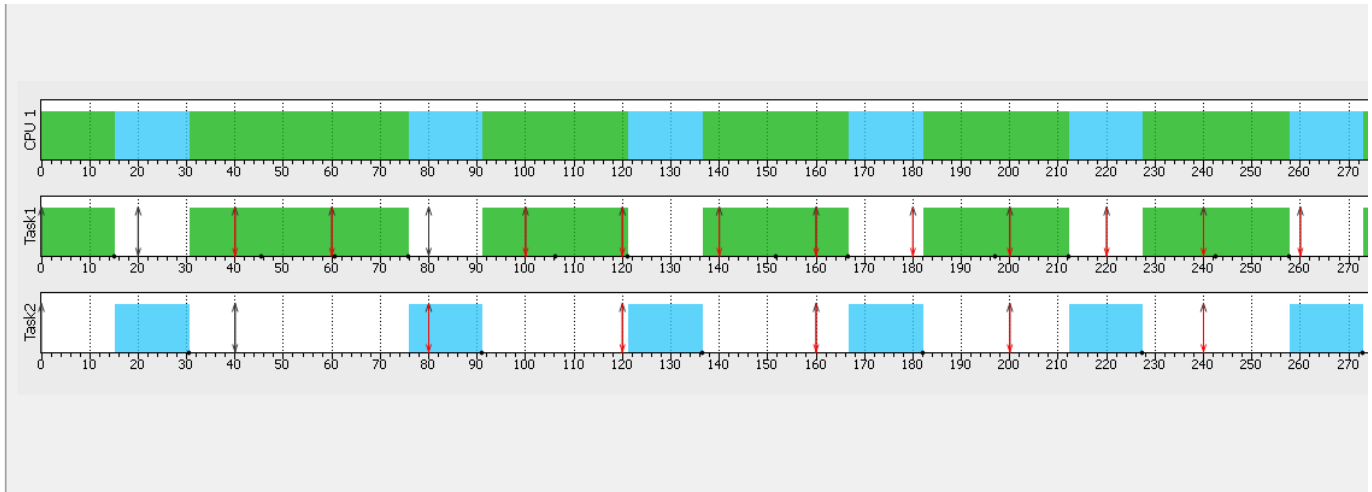
- Schedulability:
 - Analytical methods:
 - “A task set of periodic tasks is schedulable by EDF if and only if $U \leq 1$ ”

$$U = (15.1/20) + (15.28/40) = 1.137$$

$$\therefore U > 1$$

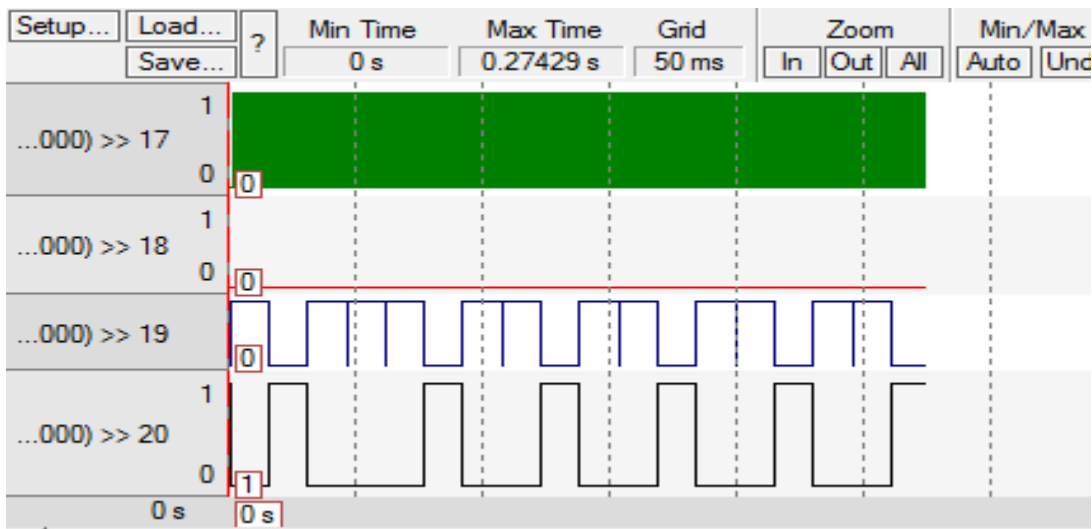
\therefore System guaranteed not schedulable

- SimSo:



*From Gantt chart each of two tasks misses its deadline
 \therefore System guaranteed not schedulable*

- On Run-time:



Task1 ->Blue wave

Task2 ->Black wave

Task1DeadlineMissesCount	10	uint
Task2DeadlineMissesCount	3	uint

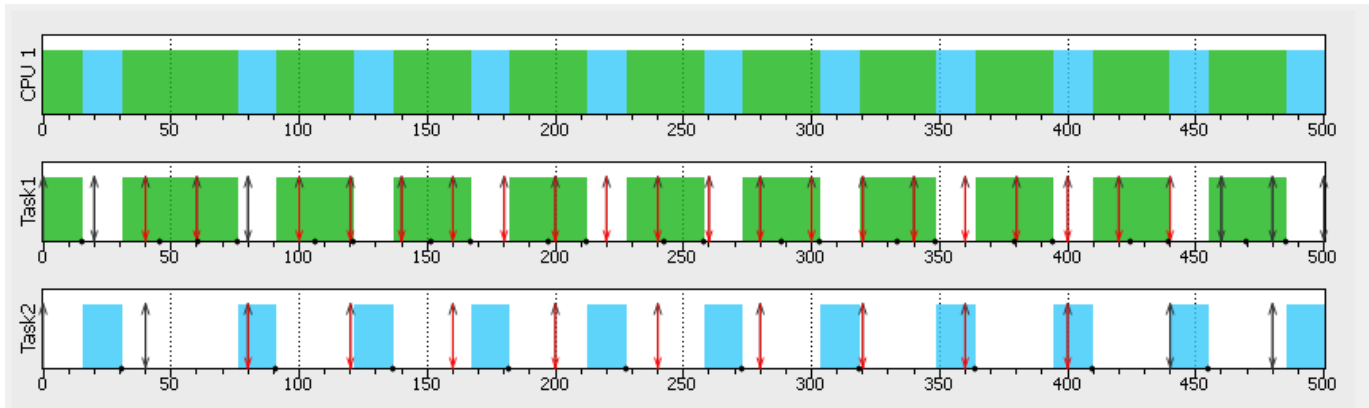
Task1DeadlineMissesCount=10

Task2DeadlineMissesCount=3

\therefore System guaranteed not schedulable

- System timeline:

- SimSo:



- On Run-time:

