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.

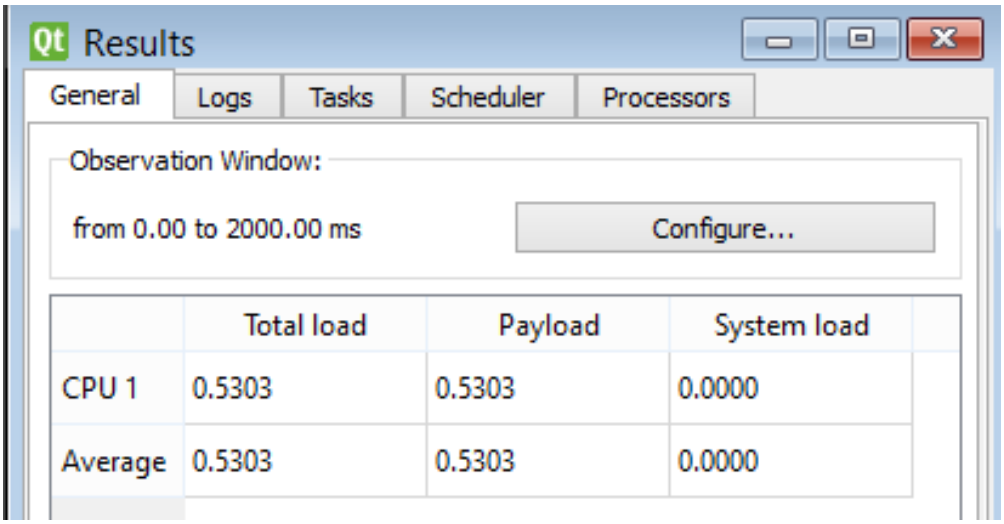
Task set one:

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

- The CPU load:
  - Analytical methods:

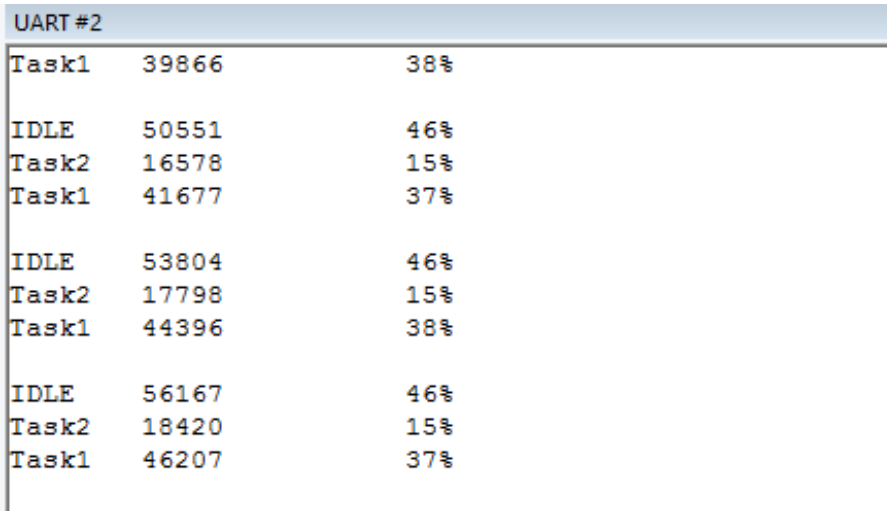
$$U = (15.1/40) + (15.28/100) = 0.5303 \approx 53\%$$

  - SimSo:



CPU ≈ 53%

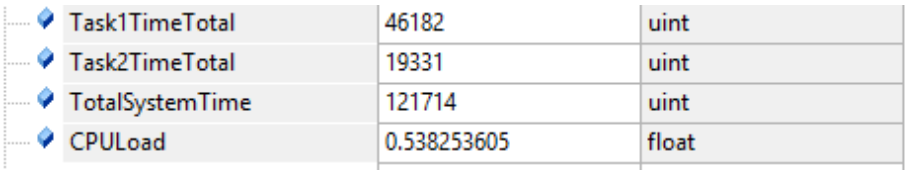
- On Run-time:
  - Using vTaskGetRunTimeStats() function:



```
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%
```

$$Total\ system\ time = 56167 + 18420\ + 46207 = 120794$$
$$CPU\ Load = (18420/120794) + (46207/120794) \approx\ 0.53 =\ 53\%$$

  - Using traceTASK_SWITCHED_IN() & traceTASK_SWITCHED_OUT():



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

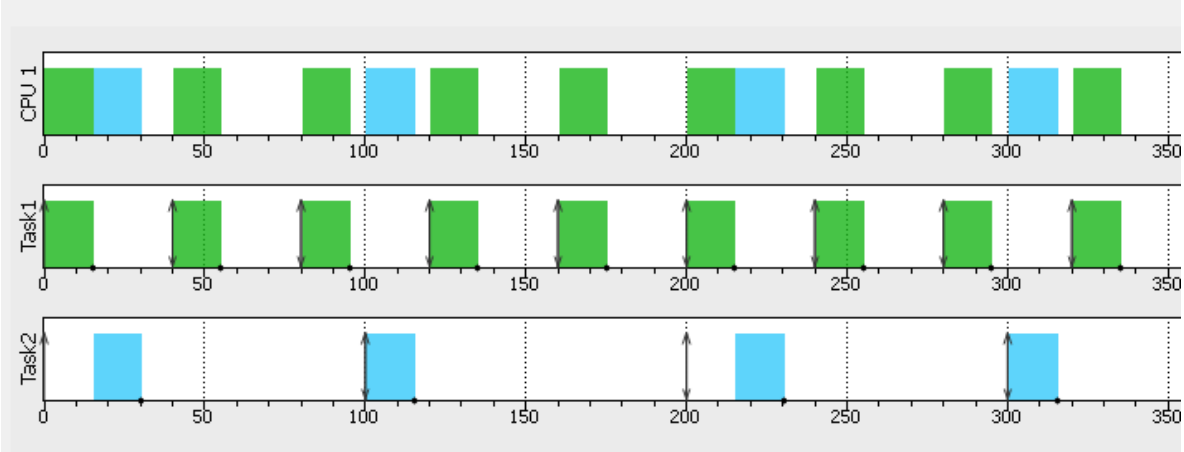
CPU load ≈ 0.53 = 53%

- Schedulability:
  - Analytical methods:

    "A task set of periodic tasks is schedulable by EDF if and only if U≤1"

$$U = (15.1/40) + (15.28/100) = 0.5303$$
$$\therefore U < 1$$
$$\therefore \boldsymbol{System\ guaranteed\ schedulable}$$

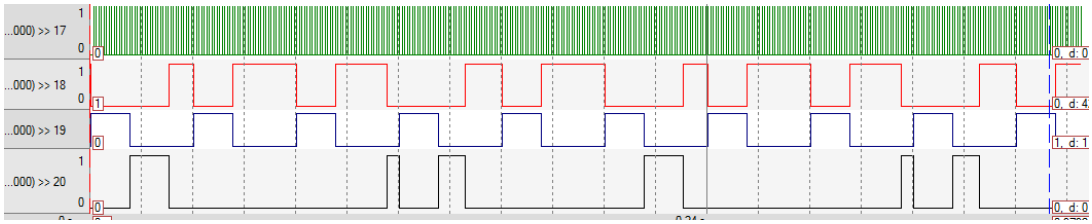
- SimSo:



From Gantt chart each of two tasks finishes before its deadline

∴ System guaranteed schedulable

- On Run-time:



Task1 ->Blue wave

Task2 ->Black wave

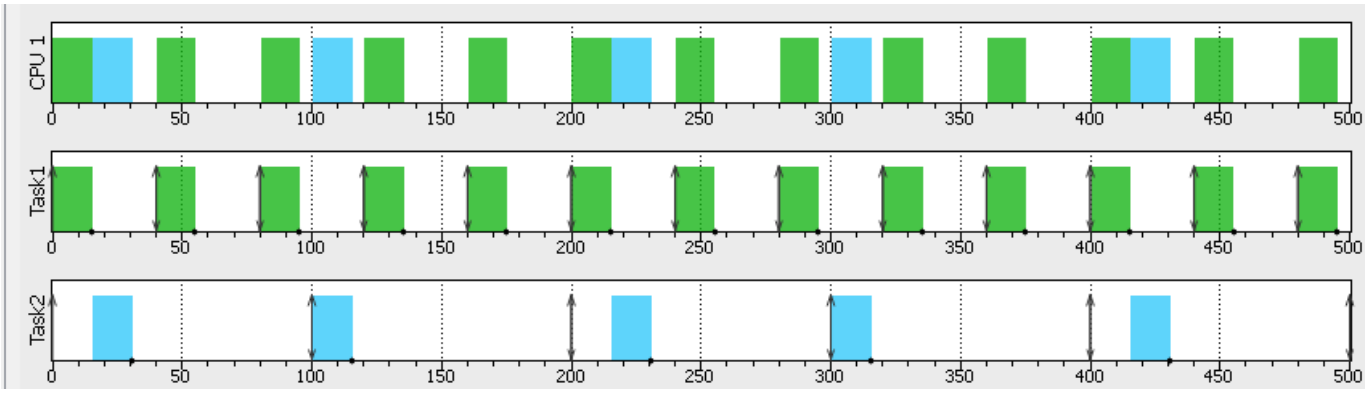
Task1DeadlineMissesCount	0	uint
Task2DeadlineMissesCount	0	uint

Task1DeadlineMissesCount = 0

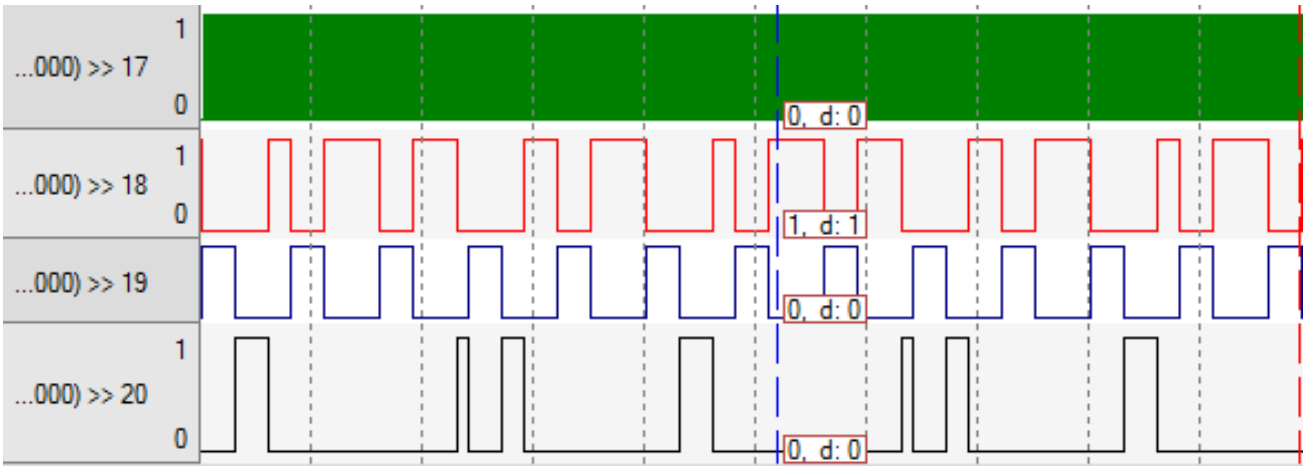
Task2DeadlineMissesCount = 0

∴ System guaranteed schedulable

- System timeline:
  - SimSo:



  - On Run-time:



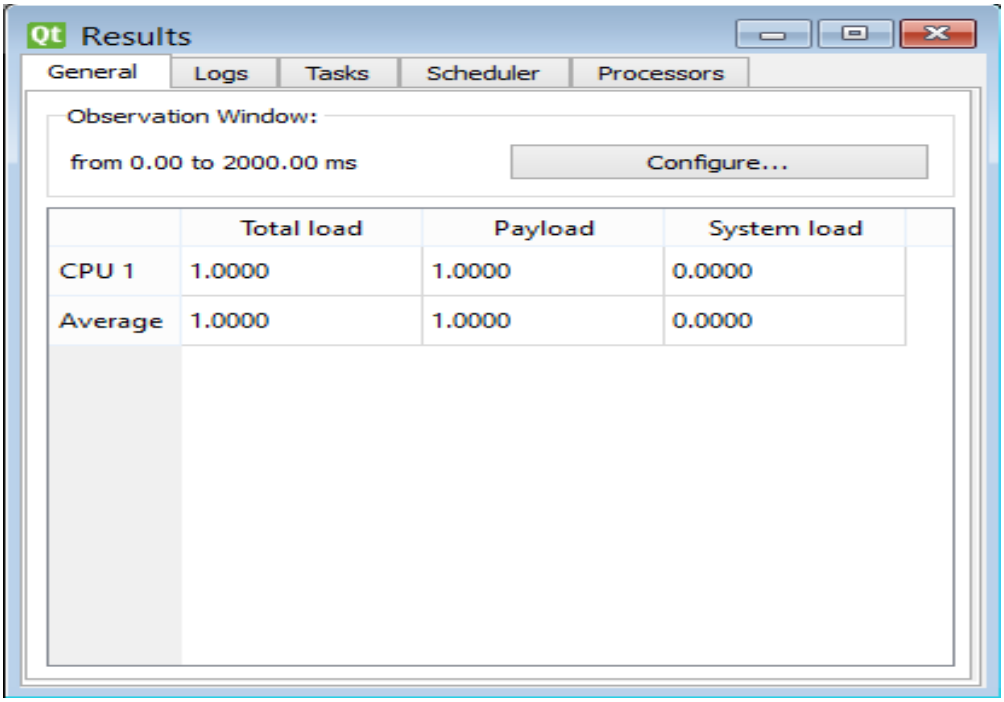
Task set two:

{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:



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

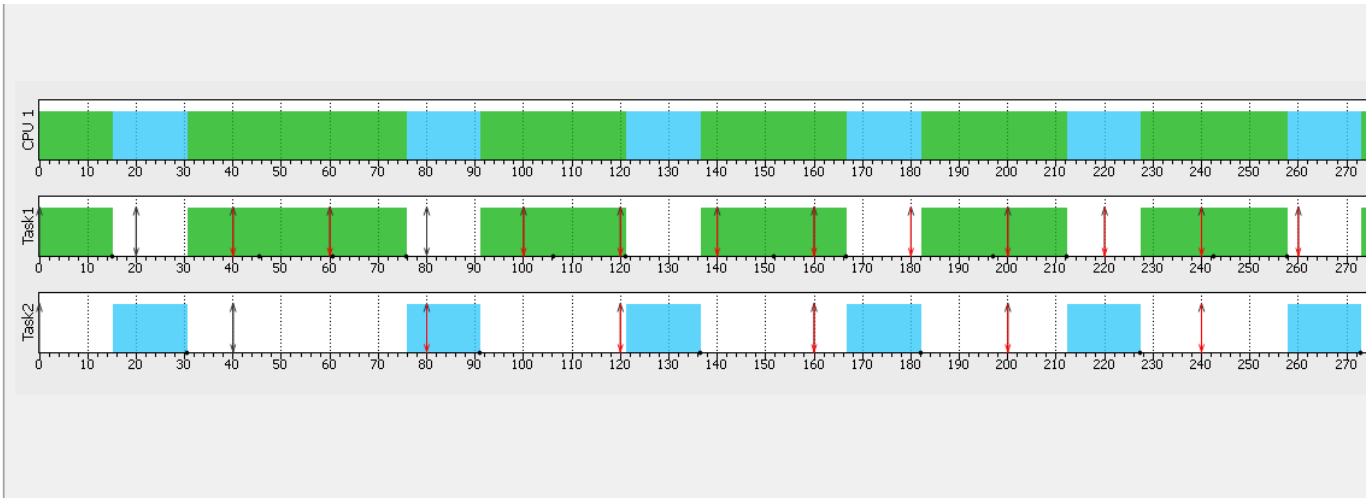
CPU load ≈ 0.9995 ≈ 100%

- Schedulability:
  - Analytical methods:

"A task set of periodic tasks is schedulable by EDF if and only if U≤1"

$$U = (15.1/20) + (15.28/40) = 1.137$$
$$\therefore U > 1$$
$$\therefore \boldsymbol{System\ guaranteed\ not\ schedulable}$$

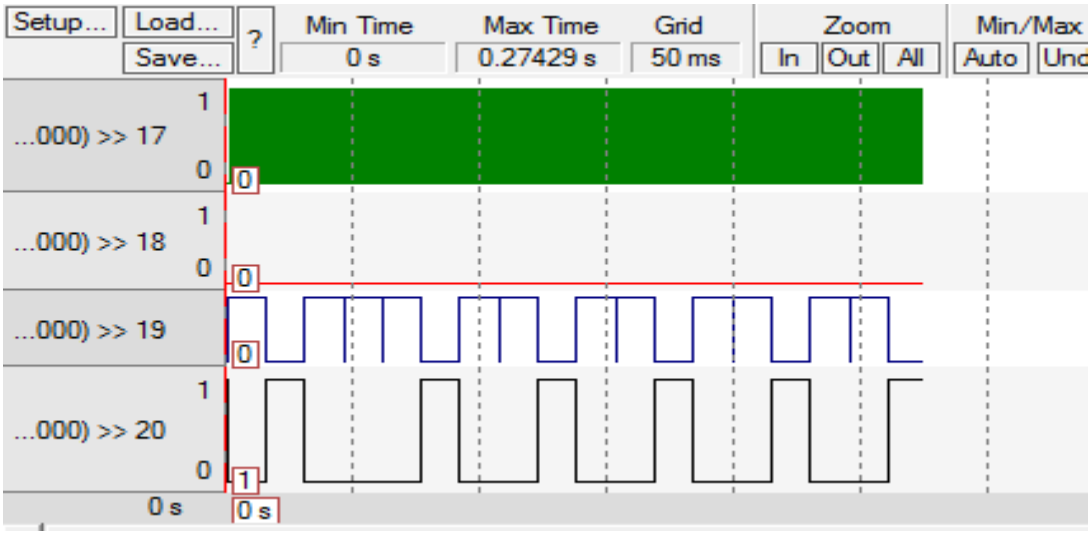
- SimSo:



From Gantt chart each of two tasks misses its deadline

∴ System guaranteed not schedulable

- On Run-time:



Task1 ->Blue wave

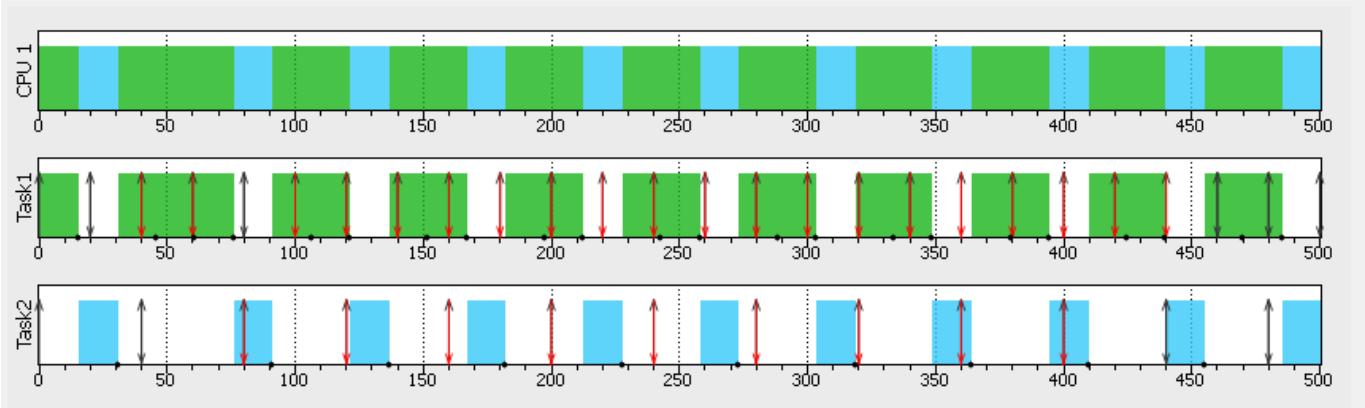
Task2 ->Black wave

Task1DeadlineMissesCount=10

Task2DeadlineMissesCount=3

∴ System guaranteed not schedulable

- System timeline:
  - SimSo:



  - On Run-time: