

Design document

project title: RM Scheduling Analysis

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Team 3

- Project Description

Schedule the following task set using rate-monotonic :

T1 [P:5, E:2.5, D:5]

T2 [P:15, E:4.5, D:15]

T3 [P:20, E:3.5, D:20]

Requirements

- Calculate the URM
- Calculate the time-demand analysis
- Model the task set using Simso

- Calculate the URM

Task ID	Periodicity P	Execution Time E	Deadline	U=E/p
T1	5	2.5	5	0.5
T2	15	4.5	15	0.3
T3	20	3.5	20	0.175
Utilization				0.975
URM				0.78

$U = \text{sum } (E/P) \text{ for all tasks}$

$URM = N \times ((2^{\frac{1}{N}})-1)$

Where:

N: number of tasks = 3

We conclude from the result that $U > URM$

Therefore system need more Tests

- Calculate Time-demand Analysis

From the task parameters

Calculate Hyperperiod = $\text{LCM}(5, 15, 20) = 60$

RM scheduling: priorities are assigned according to periodicity
higher periodicity gives higher priority

Task ID	Periodicity	Priority		Time needed T_n	Time provided T_p
T1	5	1	Higher	2.5	5
T2	15	2		12	15
T3	20	3	Lower	22.5	20

Calculating time needed for T1 the highest priority assuming no tasks are scheduled

Knowing that task deadline = 5ms

$$W(5) = 2.5 + 0 = 2.5$$

Since $T_p > T_n$, T1 is schedulable

Calculating time needed for T2, assuming that there already scheduled tasks

Knowing that task deadline = 15ms

$$W(15) = 4.5 + (15/5) * 2.5 = 12$$

Since $T_p > T_n$, T2 is schedulable

Calculating time needed for T3, assuming that there already scheduled tasks

Knowing that task deadline = 20ms

$$W(20) = 3.5 + (20/15) * 4.5 + (20/15) * 2.5 = 22.5\text{ms}$$

Since $T_p < T_n$, T3 is not schedulable

Therefore the system is not schedulable

Simso Model

- Set scheduler to Fixed priority

Qt Model data

General

Scheduler

Processors

Tasks

Scheduler	simso.schedulers.FP
Scheduler Path	
Overhead schedule (cycles)	0
Overhead on activate (cycles)	0
Overhead on terminate (cycles)	0

- Set Hyperperiod to 60ms

Qt Model data

General

Scheduler

Processors

Tasks

Duration (cycles)	60000000
Duration (ms)	60
Cycles / ms	1000000
Execution Time Model	WCET

- Create task set

Qt Model data

General

Scheduler

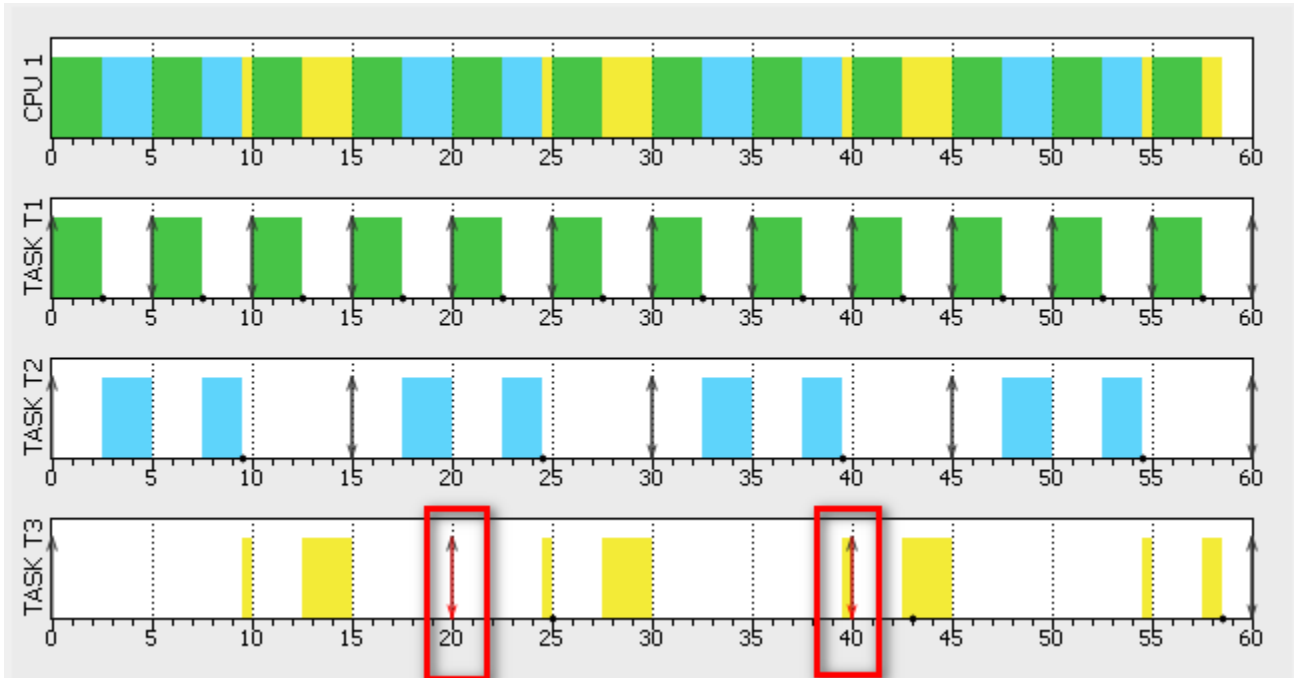
Processors

Tasks

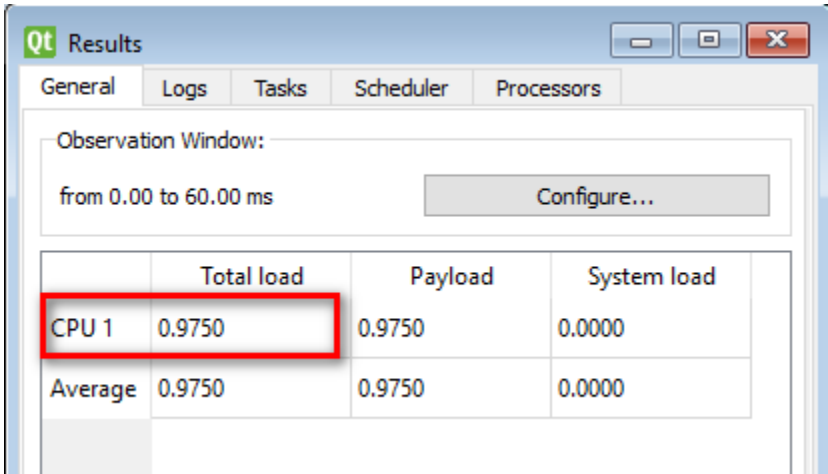
id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	priority
1	TASK T1	Periodic	<input type="checkbox"/> No	0	5.0	-	5.0	2.5		2
2	TASK T2	Periodic	<input type="checkbox"/> No	0	15.0	-	15.0	4.5		1
3	TASK T3	Periodic	<input type="checkbox"/> No	0	20.0	-	20.0	3.5		0

Simso Model Results

- Tasks Timeline



- CPU Load



**From Timeline T3 Missed Deadline so the task is not schedulable
And Therefore the system is not schedulable**