

# Scheduling analysis

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This document provides analysis for simple RTOS system where we use URM analysis and time demand analysis and test our manual calculations using Simso.

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Table of Content:

Tasks description .....	2
URM analysis.....	2
Time demand analysis.....	3
Simso figures .....	4

### Tasks description:

Task 1: [P: 5, E: 2.5, D: 5]

Task 2: [P: 15, E: 4.5, D: 15]

Task 3: [P: 20, E: 3.5, D: 20]

### URM analysis:

$$U = (E_1/P_1) + (E_2/P_2) + (E_3/P_3) = (2.5/5) + (4.5/15) + (3.5/20) = 0.975$$

$$URM = n * (2^{1/n} - 1) = 3 * (2^{1/3} - 1) = 0.779$$

**Result:** As  $U > URM$ , Then the system isn't schedulable.

**Comment:** As all tasks are periodic tasks and deadlines are equal to periodicities, URM analysis technique can be applied.

### Time demand analysis:

Task 1: [P: 5, E: 2.5, D: 5]

Task 2: [P: 15, E: 4.5, D: 15]

Task 3: [P: 20, E: 3.5, D: 20]

1- Calculating critical instant

(LCM) hyper period = 60.

2- For task1 → provided time = 5 ms.

Needed time =  $2.5 + 0 = 2.5$  ms

Needed < provided → task1 is schedulable.

3- For task2 → provided time = 15 ms.

Needed time =  $4.5 + (2.5 * 3) = 12$  ms

Needed < provided → task2 is schedulable.

4- For task3 → provided time = 20 ms.

Needed time =  $3.5 + (2.5 * 4) + (4.5 * 2) = 22.5$  ms

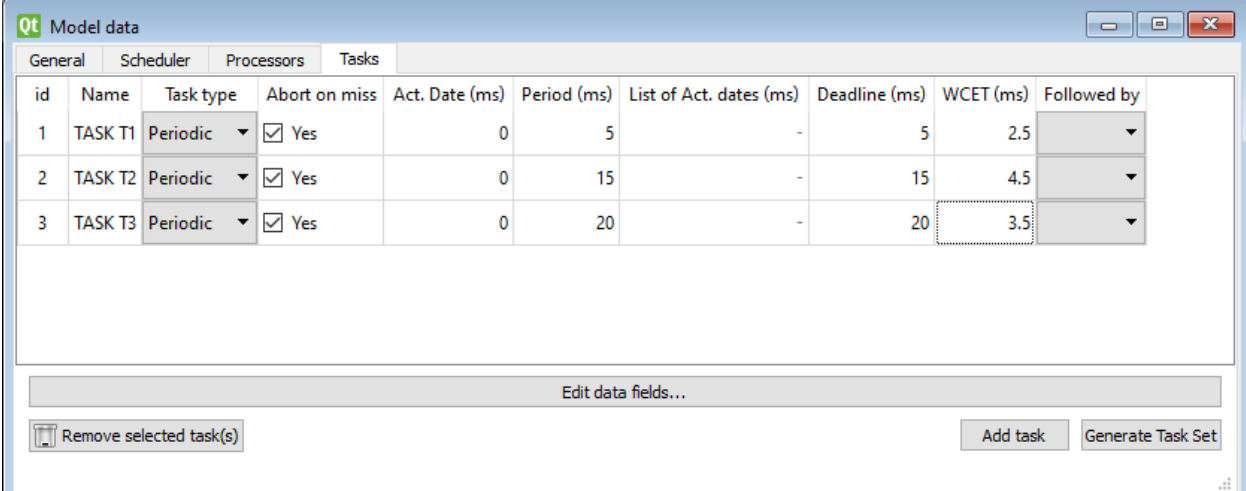
Needed > provided → task3 isn't schedulable.

**Result:** The system isn't schedulable.

**Comment:** It's predicted that this system isn't schedulable because URM which is the optimum analysis shows that this isn't a schedulable .

## SimSO Figures:

### 1- Adding tasks



The Qt Model data window displays a table for configuring tasks. The table has columns for id, Name, Task type, Abort on miss, Act. Date (ms), Period (ms), List of Act. dates (ms), Deadline (ms), WCET (ms), and Followed by. Three tasks are listed: TASK T1, TASK T2, and TASK T3, all with a Periodic task type and an Abort on miss checkbox checked. The WCET values are 2.5, 4.5, and 3.5 respectively. Below the table is an 'Edit data fields...' button and a 'Remove selected task(s)' button. At the bottom right are 'Add task' and 'Generate Task Set' buttons.

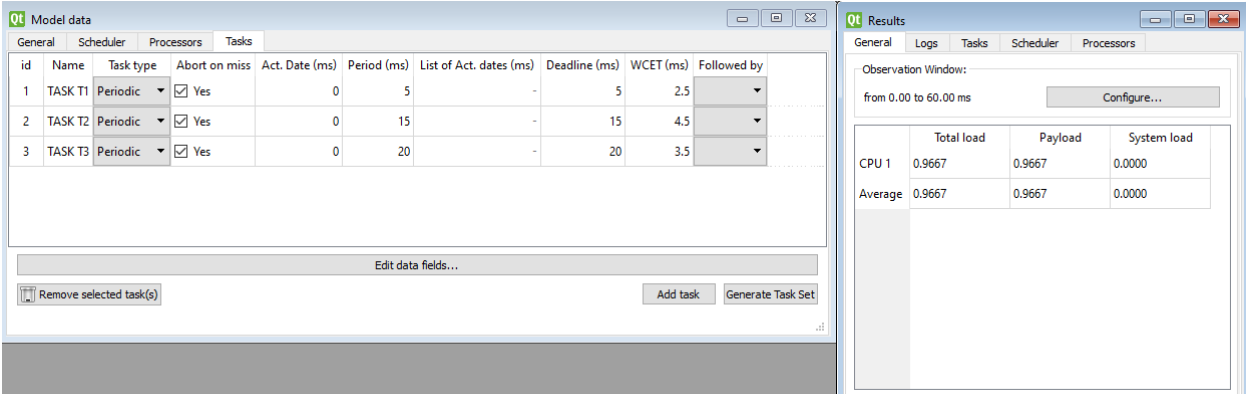
id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by
1	TASK T1	Periodic	<input checked="" type="checkbox"/> Yes	0	5	-	5	2.5	
2	TASK T2	Periodic	<input checked="" type="checkbox"/> Yes	0	15	-	15	4.5	
3	TASK T3	Periodic	<input checked="" type="checkbox"/> Yes	0	20	-	20	3.5	

Edit data fields...

Remove selected task(s)

Add task Generate Task Set

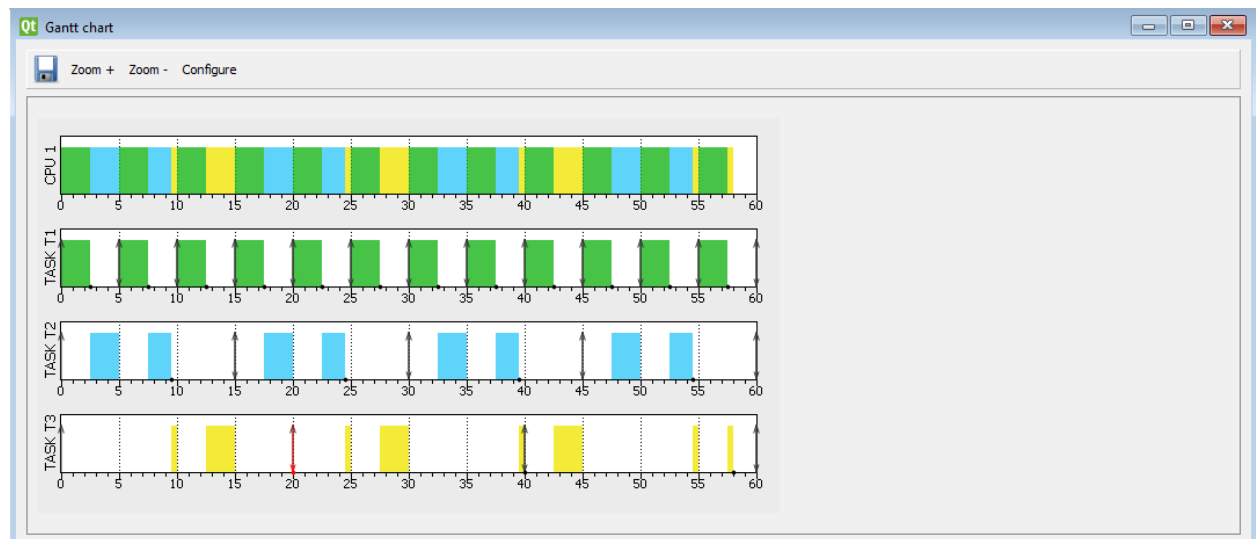
### 2- CPU load



The Qt Model data window is shown alongside the Qt Results window. The Qt Results window displays the 'General' tab with an 'Observation Window' from 0.00 to 60.00 ms. Below this is a table showing CPU load metrics for CPU 1 and the Average.

	Total load	Payload	System load
CPU 1	0.9667	0.9667	0.0000
Average	0.9667	0.9667	0.0000

### 3- Time line



**Comment:** Simso shows that **system is not schedulable** (Task3 missed deadline) and also the CPU\_load is very high.