

# Assignment 3

## Part1(Theoretical)

T1(15, 1, 14) T2(20, 2, 26) T3(22, 3)

T1(4, 1) T2(5, 2, 7) T3(20, 5)

T1(5, 0.1) T2(7, 1) T3(12, 6) T4(45, 9)

## Part two (Simulation)

Q1

Q2

# Part1(Theoretical)

The following part of the assignment is a purely theoretical task that requires no additional tools. The task is to find the largest possible frame size for the cyclic structured scheduler by following requirements 1,2 and 3 for finding the largest frame size. The following three task sets should be used:

1. T1(15, 1, 14) T2(20, 2, 26) T3(22, 3)
2. T1(4, 1) T2(5, 2, 7) T3(20, 5)
3. T1(5, 0.1) T2(7, 1) T3(12, 6) T4(45, 9)

-Provide a written report which should contain:

- Calculations for each step for finding the frame size for each task set
- Resulting frame size for each task set

Find the largest possible frame size for the cyclic structured scheduler by following requirements 1,2 and 3 for finding the largest frame size. The following three task sets should be used:

1.  $T_1(15, 1, 14)$   $T_2(20, 2, 26)$   $T_3(22, 3)$

Q11)

$T_1(15, 1, 14)$   $T_2(20, 2, 26)$   $T_3(22, 3)$

$f \in \{22, 20, 10, 11, 5, 4, 3, 2, 1\}$

F	P	e	D	P	e	D	P	e	D
	15	1	14	20	2	26	22	3	
22	4	4	3	7	14				
20	4	0	5	7	14				
16	3	0	16	7	14				
11	22	1	7	14					
10	10	5	5	14	10	5	7	6	10
									7
5	10	5	5	14	10	5	7	6	10
									7
4	8	1	5	14	8	4	7	6	8
									7
2	9	1	5	14	4	2	7	6	4
									7

$f=2$   $f > D_3$   $\therefore T_3$  will be splitted

$F=2$

$T_3$  will be splitted

2.  $T_1(4, 1) T_2(5, 2, 7) T_3(20, 5)$

Q2)  $T_1(4, 1) T_2(5, 2, 7) T_3(20, 5)$

$\delta \in \{20, 10, 5, 4, 2, 1\}$

$2\delta - gch \leq 1$

$\delta$	$(4, 1)$	$(5, 2, 7)$	$(20, 5)$
20	$40 - 4 \leq 1$ X	X	X
10	$20 - 2 \leq 1$ X	X	X
5	$8 - 4 \leq 1$ X	X	X
2	$4 - 2 \leq 1$ X	X	X
1	$2 - 2 \leq 1$ ✓	$2 - 1 \leq 7$ ✓	$2 - 2 \leq 5$ ✓

$\boxed{\delta = 1}$  ✓  $T_2 / T_3$  will be splitted

F=1

$T_2 T_3$  will be splitted

3.  $T_1(5, 0.1)$   $T_2(7, 1)$   $T_3(12, 6)$   $T_4(45, 9)$

$f$	$5   0   1$	$7   1$	$12   6$	$45   6$
45	$45 - 45 = 0$	x	x	✓
12	$12 - 45 = -33$	x	x	x
9	$18 - 45 = -27$	x	x	x
7	$14 - 45 = -31$	x	x	x
5	$10 - 45 = -35$	x	x	x
6	$12 - 45 = -33$	x	x	✓
3	x	x	x	x
2				
1	$2 - 45 = -43$	$2 - 45 = -43$	$2 - 45 = -43$	$2 - 45 = -43$

$f = 1$   $T_3, T_4$  will be splitted

$F=1$

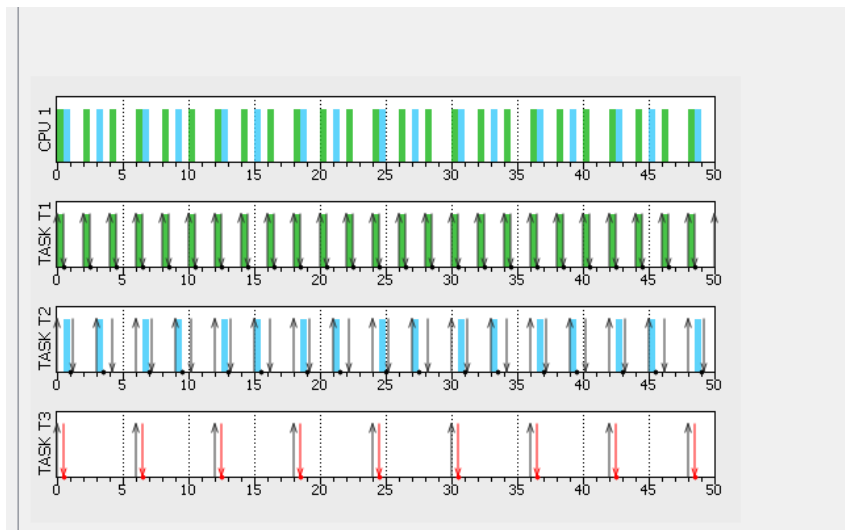
$T_3, T_4$  will be splitted

# Part two (Simulation)

## Q1

Input the tasks T1(2, 0.5), T2(3, 1.2), T3(6, 0.5) and the RM scheduler into the SimSo simulator

-Use SimSo to schedule the task set



Provide a report answering the following questions:

- **What is the utilization factor of the system and what is the value for  $U_{rm}(3)$** 
  - $U=0.5866$  (simulated)
  - $U=0.75$  (theoretical =  $(0.5/2 + 1.2/3 + 0.5/6)$ )
  - $U_{RM}=0.7779$
- What is the minimum/maximum/average response time of all tasks?

Qt Results

General Logs Tasks Scheduler Processors

General TASK T1 TASK T2 TASK T3

Computation time:

Task	min	avg	max	std dev	occupancy
TASK T1	0.500	0.500	0.500	0.000	0.250

Preemptions:

Migrations:

Task migrations:

Response time:

- 
- Is any task missing the deadline? Which task? Where?
  - T3 at 0.5 ms , T2 at 1.2 ms
- If a deadline is missed, could it be avoided by changing the scheduler?
- Cant find suitable one tiil now but making WCT of T1 smaller makes things smoother

Qt Results

General Logs Tasks Scheduler Processors

General TASK T1 TASK T2 TASK T3

Computation time:

Task	min	avg	max	std dev	occupancy
TASK T1	0.500	0.500	0.500	0.000	0.250
TASK T2	0.500	0.500	0.500	0.000	0.170

Preemptions:

Migrations:

Task migrations:

Response time:

Q2

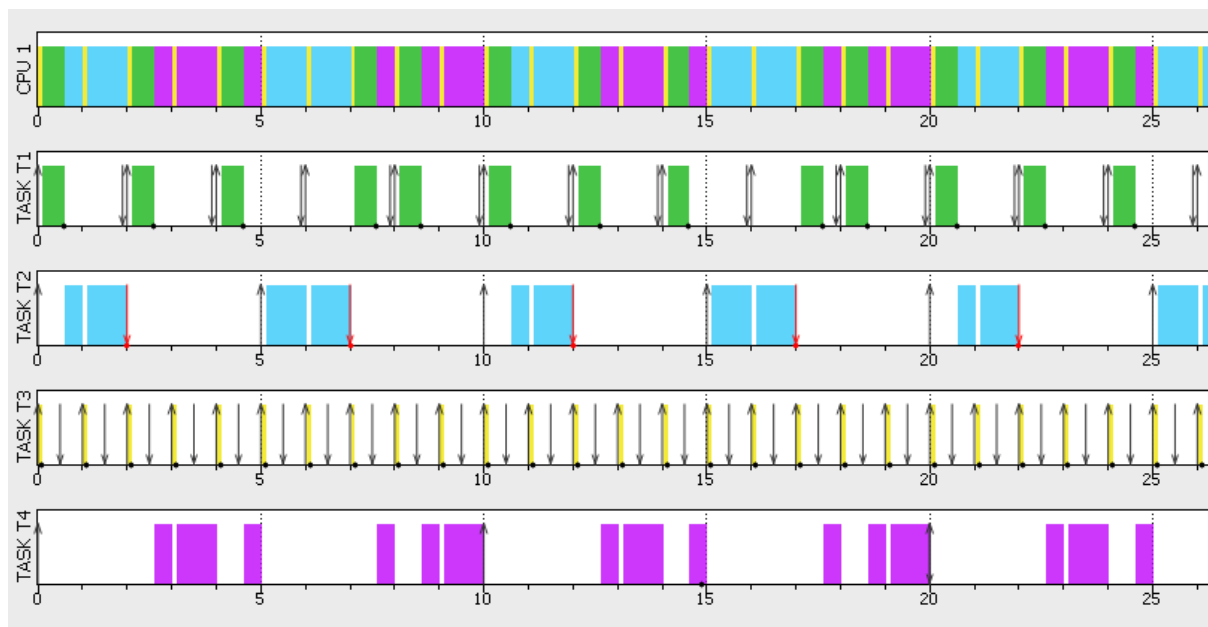
Input the tasks T1(2, 0.5, 1.9) T2(5, 2) T3(1, 0.1, 0.5) T4(10, 5, 20) and the EDF scheduler into the SimSo simulator

-Use SimSo to schedule the task set

The screenshot shows the 'Model data' window in the SimSo simulator. The 'Tasks' tab is active, displaying a table with the following data:

Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	owec
TASK T1	Periodic	<input checked="" type="checkbox"/> Yes	0	2	-	1.9	.5	
TASK T2	Periodic	<input checked="" type="checkbox"/> Yes	0	5	-	2	2	
TASK T3	Periodic	<input checked="" type="checkbox"/> Yes	0	1	-	.5	.1	
TASK T4	Periodic	<input checked="" type="checkbox"/> Yes	0	10	-	20	5	

Below the table, there are buttons for 'Remove selected task(s)', 'Add task', and 'Generate Task Set'. The 'Generate Task Set' button is highlighted.



Provide a report answering the following questions:



- What is the utilization factor of the system and what is the value for  $U_{rm}(4)$ 
  - $U=1$  from simulation
  - $U_{rm}(4)=0.756$ (but **URM** used in RM scheduler only!!!)
- What is the minimum/maximum/average response time of all tasks?

Qt Results

General Logs Tasks Scheduler Processors

General TASK T1 TASK T2 TASK T3 TASK T4

Computation time:

Task	min	avg	max	std dev	occupancy
TASK T1	0.494	0.499	0.500	0.003	0.249
TASK T2	1.775	1.775	1.775	0.000	0.307
TASK T3	0.100	0.100	0.100	0.000	0.100
TASK T4	4.042	4.064	4.120	0.033	0.343

Preemptions:

Migrations:

Task migrations:

Response time:

- Is any task missing the deadline? Which task? Where?
  - Job TASK T2\_1 aborted! Ret:0.375 at 2000000 cycle and  $t=2.0$  ms,  $t=12$  ms, 22ms
- If a deadline is missed, could it be avoided by changing the scheduler?
  - Maybe by changing the scheduler or by specifying more accurate WCT time for T2 as it passes at  $WCT=0.5$

