

## Assignment 3

### Theory assignment

The following part of 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

1.  $H = \text{LCM}(15, 20, 22) = 660$

$f \geq e_i, \quad f \geq 3$

$f | H \quad f = 2, 3, 4, 5, 6, 10, 11 \dots$

$2f - \text{gcd}(p_i, f) \leq D_i$

	Task 1	Task 2	Task 3
period	15	20	22
execution	1	2	3
deadline	14	20	22
f	Compare to deadline		
11	21	21	11
10	15	10	18
6	9	10	10
5	5	5	9
4	7	4	6
3	3	5	5
2	3	2	2

**Frame Size = 6**

2.  $H = \text{LCM}(4, 5, 20) = 20$

$f \geq e_i \quad f \geq 5$

$f | H \quad f = 2, 4, 5, 10, 20$

	Task 1	Task 2	Task 3
period	4	5	20
execution	1	2	5
deadline	4	5	20
f	Compare to deadline		
20	36	35	20
10	18	15	10
5	9	5	5
4	4	7	4
2	2	3	2

No frame works, could choose Frame Size = 2, but it is not larger than the execution task3, with  $f \geq 5$ . Task3 should be divided into 3 parts of execution time 2ms. Notice that deadline on task2 is 5 and not 7 because of the period.

3.  $H = \text{LCM}(5, 7, 12, 45) = 1260$

$f \geq e_i$        $f \geq 9$

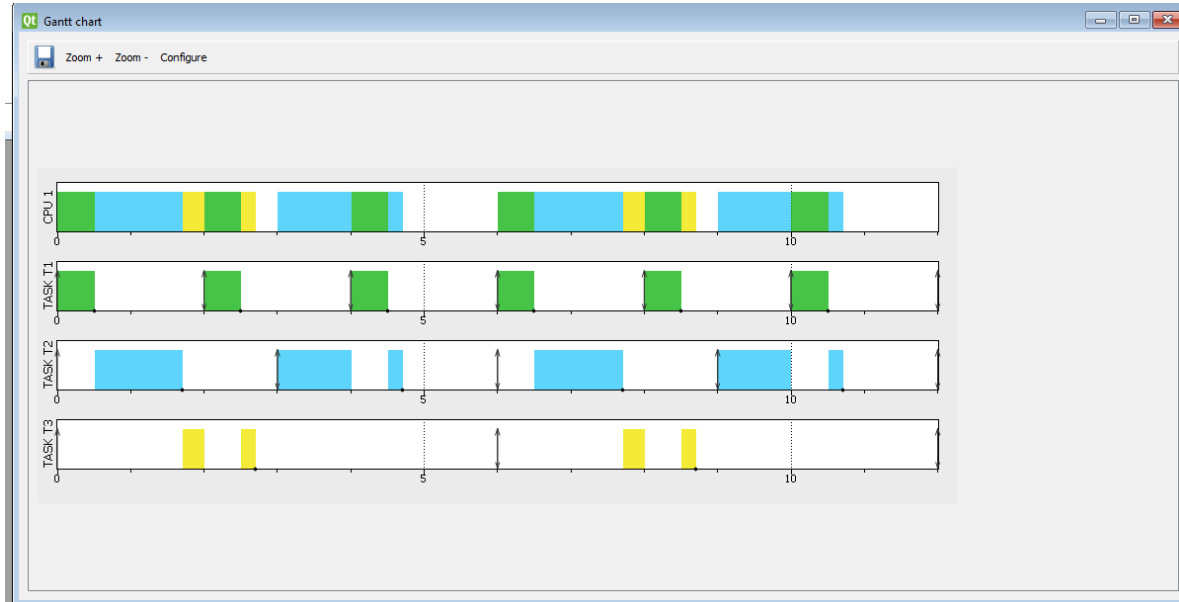
$f | H$        $f = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 18, 20, 21, 28, 30, 36, 35, 42, 45,$

	Task 1	Task 2	Task 3	Task 4
period	5	7	12	45
execution	0.1	1	6	9
deadline	5	7	12	45
f	Compare to deadline			
28	55	49	52	55
21	41	35	39	39
20	35	39	36	35
18	35	35	30	27
15	25	29	27	15
14	27	21	26	27
12	23	23	12	21
10	15	19	18	15
9	17	17	15	9
7	13	7	13	13
6	11	11	6	9
5	5	9	9	5
4	7	7	4	7
3	5	5	3	3
2	3	3	2	3
1	1	1	1	1

No frame works, could choose 3 but it is no larger of equal to 8. Task3 and Task4 should be divided into equal 3ms parts for it to work.

## Simulation assignment

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

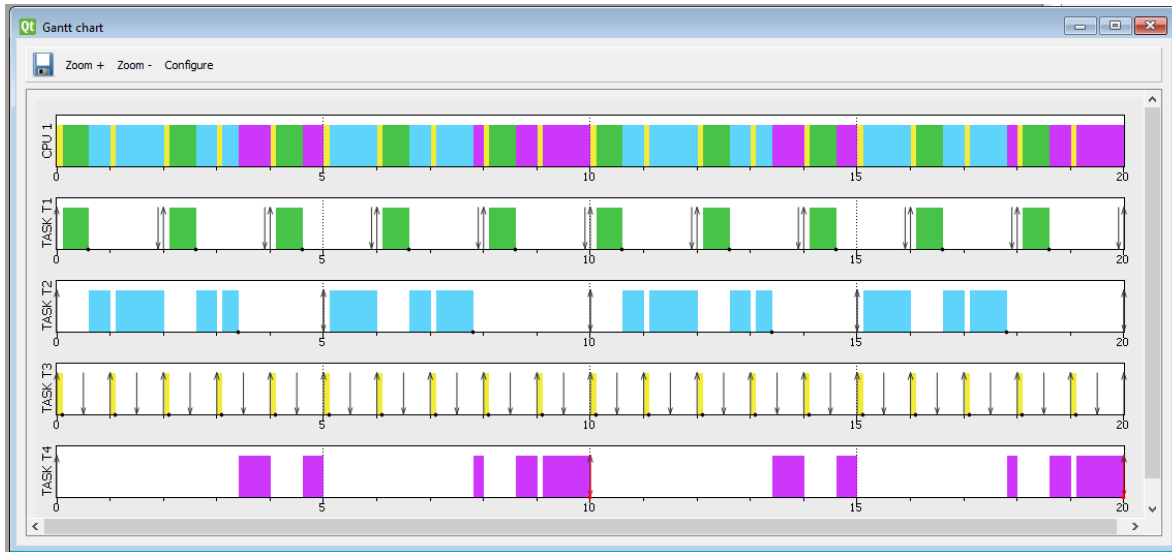


- What is the utilization factor of the system and what is the value for  $U_{RM}(3)$   
 $Utilization = 0.5/2 + 1.2/3 + 0.5/6 = 0.733$   
 $U_{RM}(3) = 0.7798$   
Since  $Utilization < U_{RM}$ , it is considered feasible
- What is the minimum/maximum/average response time of all tasks?

Response time:				
Task	min	avg	max	std dev
TASK T1	0.500	0.500	0.500	0.000
TASK T2	1.700	1.700	1.700	0.000
TASK T3	2.700	2.700	2.700	0.000

- Is any task missing the deadline? Which task? Where?  
No task is missing the deadline
- If a deadline is missed, could it be avoided by changing the scheduler?  
It is not missing, it's not necessary

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



- What is the utilization factor of the system and what is the value for  $U_{RM}(4)$
- Utilization = 1.25  
 $U_{RM}(4) = 0.7568$   
 It is not feasible, Utilization is greater than 1
- What is the minimum/maximum/average response time of all tasks?

Task	min	avg	max	std dev
TASK T1	0.600	0.600	0.600	0.000
TASK T2	2.800	3.100	3.400	0.300
TASK T3	0.100	0.100	0.100	0.000
TASK T4	20.000	20.000	20.000	0.000

- Is any task missing the deadline? Which task? Where?

General	TASK T1	TASK T2	TASK T3	TASK T4	
Activation	Start	End	Deadline	Comp. time	Resp. time
0.0000	0.0000	10.0000	10.0000	2.5000	10.0000
10.0000	10.0000	20.0000	20.0000	2.5000	10.0000
20.0000	20.0000	30.0000	30.0000	2.5000	10.0000
30.0000	30.0000	40.0000	40.0000	2.5000	10.0000
40.0000	40.0000	50.0000	50.0000	2.5000	10.0000

Task 4 is missing the deadlines every period of 10ms, deadline should be 20, but the period causes the deadline to be 10ms, and not being able to follow this rate.

- If a deadline is missed, could it be avoided by changing the scheduler?  
 No, utilization is too high

José Eduardo Morales Espinoza