

Assignment 4

Task number	periodicity	Execution time	deadline
t1	5	2.5	5
t2	15	4.5	15
t3	20	3.5	20

First method: Rate-monotonic utilization bound

$$U = \sum ci/pi$$

$$U = 2.5/5 + 4.5/15 + 3.5/20 = 0.975$$

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

$$URM = 3(2^{(1/3)} - 1) = 0.77976$$

$$U > URM$$

THEN SYSTEM GUARANTEED NOT SCHEDULABLE

Second method: time-demand analysis

$$Wi(t) = Ei + \sum (t/Pk) * Ek$$

1- time demand for Task 1

$$w1(1) = 2.5 + 0 = 2.5$$

$$w1(2) = 2.5 + 0 = 2.5$$

$$w1(3) = 2.5 + 0 = 2.5$$

$$w1(4) = 2.5 + 0 = 2.5$$

$$w1(5) = 2.5 + 0 = 2.5 < 5$$

Then task 1 is schedulable

2- time demand for task 2

$$W2(1) = 4.5 + 1/5 * 2.5 = 7$$

$$W2(2) = 4.5 + 2/5 * 2.5 = 7$$

$$W2(3) = 4.5 + 3/5 * 2.5 = 7$$

$$W2(4) = 4.5 + 4/5 * 2.5 = 7$$

$$W2(5) = 4.5 + 5/5 * 2.5 = 7$$

$$W2(6) = 4.5 + 6/5 * 2.5 = 9.5$$

$$W2(7) = 4.5 + 7/5 * 2.5 = 9.5$$

$$W2(8) = 4.5 + 8/5 * 2.5 = 9.5$$

$$W2(9) = 4.5 + 9/5 * 2.5 = 9.5$$

$$W2(10) = 4.5 + 10/5 * 2.5 = 9.5$$

$$W2(11) = 4.5 + 11/5 * 2.5 = 12$$

$$W2(12) = 4.5 + 12/5 * 2.5 = 12$$

$$W2(13) = 4.5 + 13/5 * 2.5 = 12$$

$$W2(14) = 4.5 + 14/5 * 2.5 = 12$$

$$W2(15) = 4.5 + 15/5 * 2.5 = 12 < 15$$

Task 2 is schedulable

3- time demand for task 3

$$W3(1) = 3.5 + 1/5 * 2.5 + 1/15 * 4.5 = 10.5$$

$$W3(2) = 3.5 + 2/5 * 2.5 + 2/15 * 4.5 = 10.5$$

$$W3(3) = 3.5 + 3/5 * 2.5 + 3/15 * 4.5 = 10.5$$

$$W3(4) = 3.5 + 4/5 * 2.5 + 4/15 * 4.5 = 10.5$$

$$W3(5) = 3.5 + 5/5 * 2.5 + 5/15 * 4.5 = 10.5$$

$$W3(6) = 3.5 + 6/5 * 2.5 + 6/15 * 4.5 = 13$$

$$W3(7) = 3.5 + 7/5 * 2.5 + 7/15 * 4.5 = 13$$

$$W3(8) = 3.5 + 8/5 * 2.5 + 8/15 * 4.5 = 13$$

$$W3(9) = 3.5 + 9/5 * 2.5 + 9/15 * 4.5 = 13$$

$$W3(10) = 3.5 + 10/5 * 2.5 + 10/15 * 4.5 = 13$$

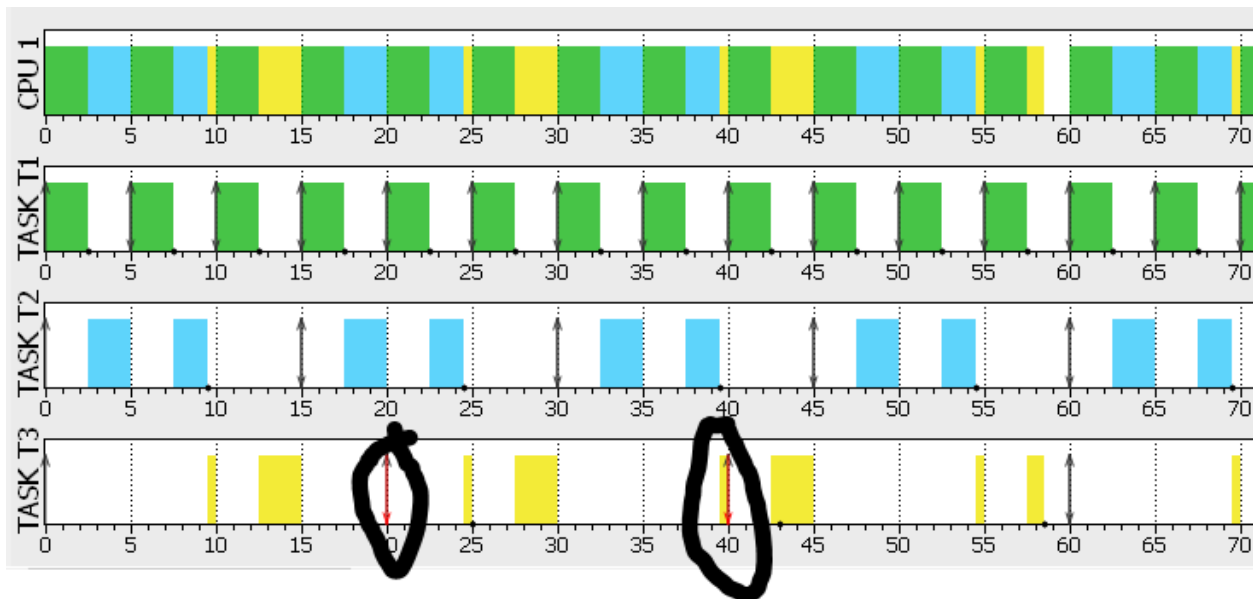
$$W3(11) = 3.5 + 11/5 * 2.5 + 11/15 * 4.5 = 15.5$$

$$W3(12) = 3.5 + 12/5 * 2.5 + 12/15 * 4.5 = 15.5$$

$$W3(13) = 3.5 + 13/5 * 2.5 + 13/15 * 4.5 = 15.5$$

$W3(14) = 3.5 + 14/5 * 2.5 + 14/15 * 4.5 = 15.5$
 $W3(15) = 3.5 + 15/5 * 2.5 + 15/15 * 4.5 = 15.5$
 $W3(16) = 3.5 + 16/5 * 2.5 + 16/15 * 4.5 = 22.5$
 $W3(17) = 3.5 + 17/5 * 2.5 + 17/15 * 4.5 = 22.5$
 $W3(18) = 3.5 + 18/5 * 2.5 + 18/15 * 4.5 = 22.5$
 $W3(19) = 3.5 + 19/5 * 2.5 + 19/15 * 4.5 = 22.5$
 $W3(20) = 3.5 + 20/5 * 2.5 + 20/15 * 4.5 = 22.5 > 20$
 Then task 3 is not schedulable

Simso simulation



	Total load	Payload	System load
CPU 1	0.9750	0.9750	0.0000
Average	0.9750	0.9750	0.0000

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 type="checkbox"/> No	0	5	-	5	2.5	▾
2	TASK T2	Periodic ▾	<input type="checkbox"/> No	0	15	-	15	4.5	▾
3	TASK T3	Periodic ▾	<input type="checkbox"/> No	0	20		20	3.5	▾

General	Scheduler	Processors	Tasks
Duration (cycles)		300000000	
Duration (ms)		300	
Cycles / ms		1000000	
Execution Time Model		WCET	

General	Scheduler	Processors	Tasks
Scheduler		simso.schedulers.RM	
Scheduler Path		<input type="text"/> <input type="button" value="Open"/>	
Overhead schedule (cycles)		0	
Overhead on activate (cycles)		0	
Overhead on terminate (cycles)		0	

Comments:
From time demand calculations and simso simulation the system is not schedulable because task 3 is not schedulable