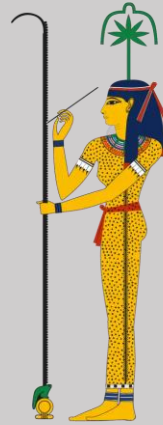


# Ministry of Communications and Information Technology



مستقبلنا رقمي



## ***Embedded Systems Advanced Nanodegree Program***

### **Automotive Door Control System Design (RTOS-EDF REPORT)**

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Tasks	Periodicity	Deadline	Execution time	Occurrence in hyperperiod
BUT1	50ms	50ms	12us	2
BUT2	50ms	50ms	13us	2
Periodic Transmitter	100ms	100ms	140us	1
Uart	20ms	20ms	150us	5
Load1	10ms	10ms	5ms	10
Load2	100ms	100ms	12ms	1

- Hyper period is 100ms
- CPU Load :

Utilization = total execution time/hyper-period

Utilization =  $(2 \times (12\mu s) + 2 \times (13\mu s) + 1 \times (140\mu s) + 5 \times (150\mu s) + 10 \times (5\text{ms}) + 1 \times (12\text{ms})) / (100\text{ms}) = 62.9\%$

Utilization = 62.9%

- System Schedulable
  - Rate Monotonic

Utilization "U" = 63.16%

number of tasks "N" = 6

If  $(U < N(2^{(1/N)} - 1))$  then system is schedulable

$0.629 < 0.734$  thus system is schedulable

### ○ Time Demand

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k$$

Worst cases  $\gg 100\text{ms}$

hyperperiod	Tasks	test	periodicity	Schedulable?
10	Load1	$W1(10) = 5\text{ms} + 0 = 5\text{ms}$	10ms	Yes
5	Uart	$W2(20) = 150\text{us} + (20/10) * 5\text{ms} = 10.15\text{ms}$	20ms	Yes
2	BUT1	$W3(50) = 12\text{us} + (50/20) * 150\text{us} + (50/10) * 5 = 25.38$	50ms	yes
2	BUT2	25.4	50ms	Yes
1	Periodic Transmitter	51	100ms	Yes
1	Load2	63.6	100ms	yes

## Simso

Qt Model data								
General		Scheduler	Processors	Tasks				
id	Name	Task type	Abort on miss	Deadline (ms)	Period (ms)	Current deadline	Deadline	WCET (ms)
1	TASK T1	Periodic	<input type="checkbox"/> No	0	50	-	50	0.012
2	TASK T2	Periodic	<input type="checkbox"/> No	0	50	-	50	.013
3	TASK T3	Periodic	<input type="checkbox"/> No	0	100	-	100	.14
4	TASK T4	Periodic	<input type="checkbox"/> No	0	20	-	20	.15
5	TASK T5	Periodic	<input type="checkbox"/> No	0	10	-	10	5
6	TASK T6	Periodic	<input type="checkbox"/> No	0	100	-	100	12

	Total load	Payload	System load
CPU 1	0.6294	0.6294	0.0000
Average	0.6294	0.6294	0.0000



## Kiel implementation

