

Schedulability Calculation

1) Define Tasks.

- Task (1): {Periodicity: 50 , Deadline: 50 , Execution time: 0.018ms }
- Task (2): {Periodicity: 50 , Deadline: 50 , Execution time: 0.018ms }
- Task (3): {Periodicity: 100 , Deadline: 100 , Execution time: 0.084ms }
- Task (4): {Periodicity: 20 , Deadline: 20 , Execution time: 0.025ms }
- Task (5): {Periodicity: 10 , Deadline: 10 , Execution time: 5ms }
- Task (6): {Periodicity: 20 , Deadline: 20 , Execution time: 12ms }

2) Analytic Method (Rate - Monotonic).

$$U = \sum_{i=1}^n \frac{C_i}{P_i} \leq n(2^{\frac{1}{n}} - 1)$$

U = Total Utilization
C = Execution time
P = Periodicity
N = Number of tasks

a. With 6 Tasks

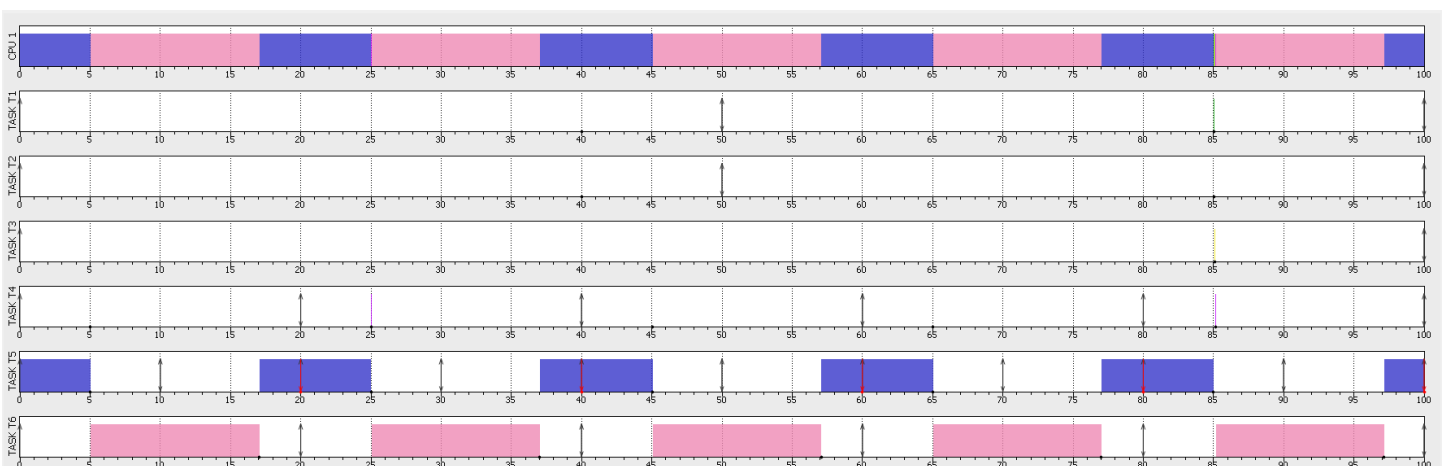
- Hyper Period =100ms
- CPU(LOAD)=2(0.018/50)+(0.084/100)+(0.025/20)+(15/10)+(12/20)=1.10281
- URM=6*(2^{1/6})-1=0.7347
- System Is Not Schedulable.

b. With 5 Tasks

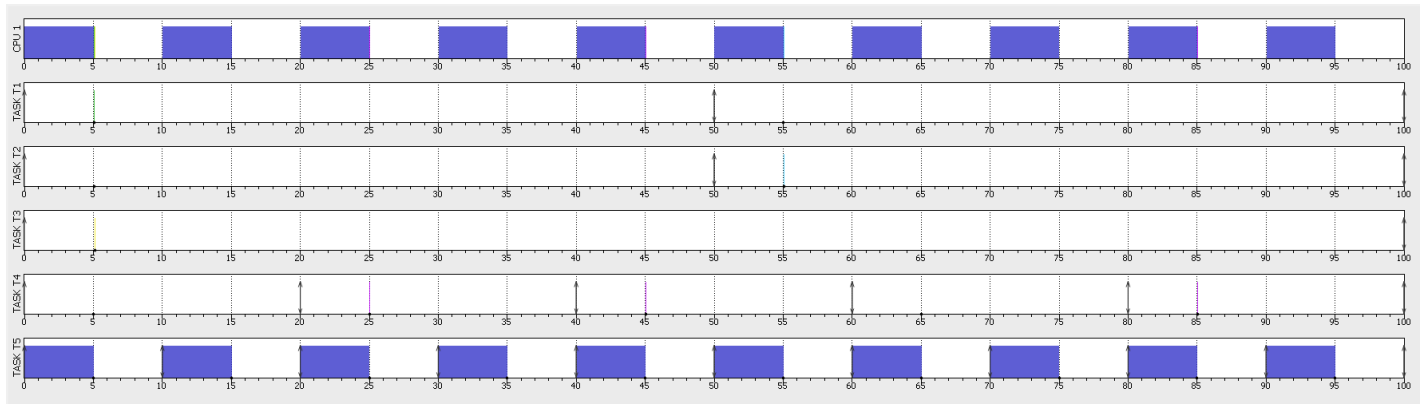
- Hyper Period =100ms
- CPU(LOAD)=2(0.018/50)+(0.084/100)+(0.025/20)+(5/10)=0.50281
- URM=5*(2^{1/5})-1=0.743.
- System Is Schedulable.

3) SimSo Simulation

a. With 6 Tasks

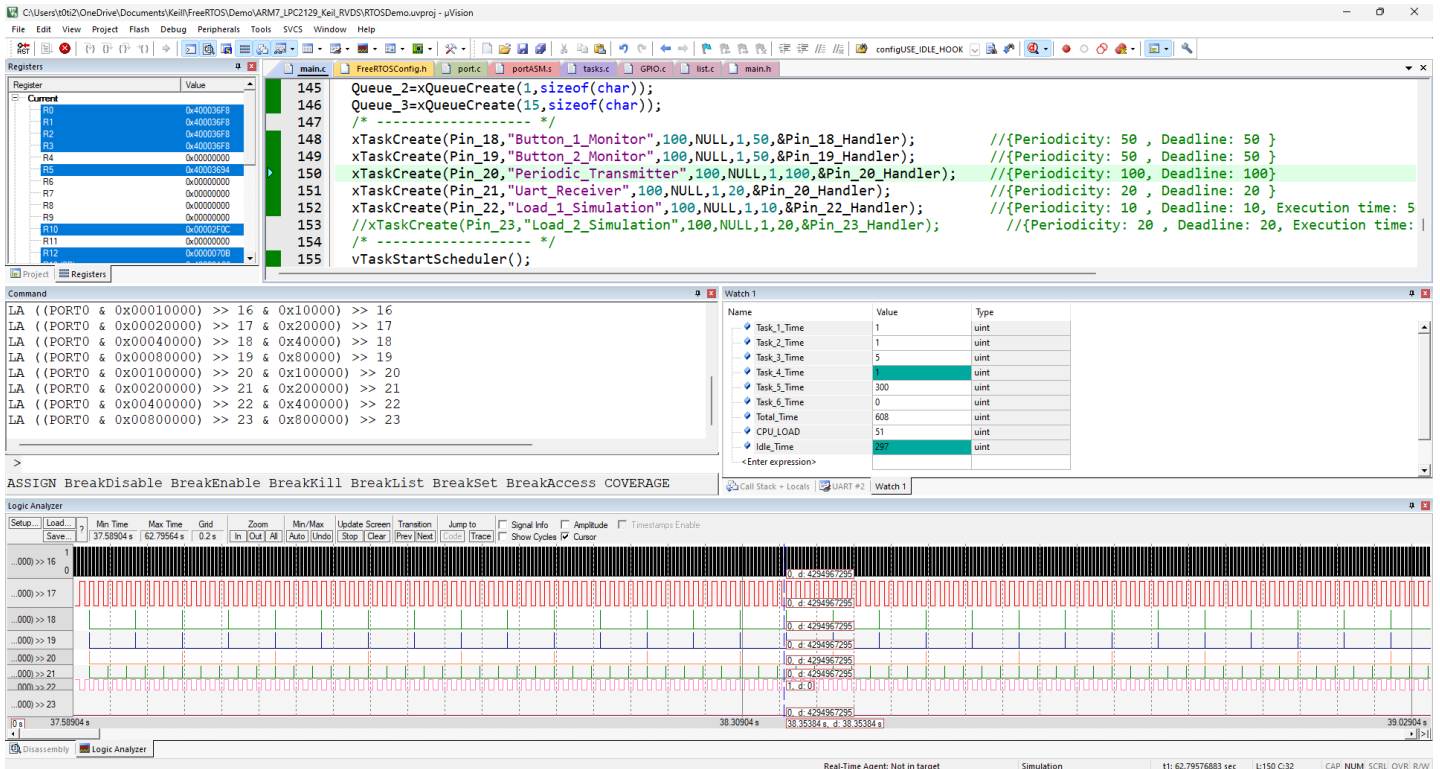


b. With 5 Tasks



4) Keil Simulation

c. With 5 Tasks



Name	Value	Type
Task_1_Time	1	uint
Task_2_Time	1	uint
Task_3_Time	5	uint
Task_4_Time	1	uint
Task_5_Time	300	uint
Task_6_Time	0	uint
Total_Time	608	uint
CPU_LOAD	51	uint
Idle_Time	299	uint
<Enter expression>		

d. With 4 Tasks

FreeRTOS Demo Project - uVision

Registers

Register	Value
Current	0x40000000
R0	0x40000000
R1	0x40000000
R2	0x40000000
R3	0x40000000
R4	0x00000000
R5	0x40000000
R6	0x00000000
R7	0x00000000
R8	0x00000000
R9	0x00000000
R10	0x00000000
R11	0x00000000
R12	0x00000000

main.c

```
145 Queue_2=xQueueCreate(1,sizeof(char));
146 Queue_3=xQueueCreate(1,sizeof(char));
147 /* ----- */
148 xTaskCreate(Pin_18,"Button_1_Monitor",100,NULL,1,50,&Pin_18_Handler);    //{Periodicity: 50 , Deadline: 50 }
149 xTaskCreate(Pin_19,"Button_2_Monitor",100,NULL,1,50,&Pin_19_Handler);    //{Periodicity: 50 , Deadline: 50 }
150 xTaskCreate(Pin_20,"Periodic_Transmitter",100,NULL,1,100,&Pin_20_Handler); //{Periodicity: 100, Deadline: 100 }
151 xTaskCreate(Pin_21,"Uart_Receiver",100,NULL,1,20,&Pin_20_Handler);        //{Periodicity: 20 , Deadline: 20 }
152 //xTaskCreate(Pin_22,"Load_1_Simulation",100,NULL,1,10,&Pin_22_Handler);  //{Periodicity: 10 , Deadline: 10, Execution time:
153 //xTaskCreate(Pin_23,"Load_2_Simulation",100,NULL,1,20,&Pin_23_Handler);  //{Periodicity: 20 , Deadline: 20, Execution time:
154 /* ----- */
155 vTaskStartScheduler();
```

Command

```
LA ((PORT0 & 0x00010000) >> 16 & 0x10000) >> 16
LA ((PORT0 & 0x00020000) >> 17 & 0x20000) >> 17
LA ((PORT0 & 0x00040000) >> 18 & 0x40000) >> 18
LA ((PORT0 & 0x00080000) >> 19 & 0x80000) >> 19
LA ((PORT0 & 0x00100000) >> 20 & 0x100000) >> 20
LA ((PORT0 & 0x00200000) >> 21 & 0x200000) >> 21
LA ((PORT0 & 0x00400000) >> 22 & 0x400000) >> 22
LA ((PORT0 & 0x00800000) >> 23 & 0x800000) >> 23
```

Watch 1

Name	Value	Type
Task_1_Time	1	uint
Task_2_Time	1	uint
Task_3_Time	5	uint
Task_4_Time	1	uint
Task_5_Time	0	uint
Task_6_Time	0	uint
Total_Time	1206	uint
CPU_LOAD	1	uint
Idle_Time	596	uint

ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE

Logic Analyzer

Setup: Load Save Min Time Max Time Grid Zoom Min/Max Update Screen Transition Jump to Signal Info Amplitude Timestamps Enable

0s 0s 6.978707s 1s In Out All Auto Undo Stop Clear Prev/Next Code Trace Show Cycles Cursor

0.000 >> 16 1 0 0.4294967295

0.000 >> 17 1 0 0.4294967295

0.000 >> 18 1 0 0.4294967295

0.000 >> 19 1 0 0.4294967295

0.000 >> 20 1 0 0.4294967295

0.000 >> 21 1 0 0.4294967295

0.000 >> 22 1 0 0.4294967295

0.000 >> 23 1 0 0.4294967295

0s 0s 3.6s 7.2s

Real-Time Agent: Not in target Simulation t1: 6.95605213 sec L142 C1 CAP NUM SCRL OVR: R/W

Watch 1

Name	Value	Type
Task_1_Time	1	uint
Task_2_Time	1	uint
Task_3_Time	5	uint
Task_4_Time	1	uint
Task_5_Time	0	uint
Task_6_Time	0	uint
Total_Time	1206	uint
CPU_LOAD	1	uint
Idle_Time	1198	uint

Call Stack + Locals UART #2 Watch 1