# Healthcare System RTOS design

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Task

- **Task:** Design a healthcare system using RTOS with the following requirements:
  - A touch LCD as input that can control the system and give commands. Every LCD command is represented in 4 bytes. LCD is connected to the micro-controller through UART with speed 9600 bps [Bit per second]. (Reading 4 bytes and processing the command takes 2 ms)
  - Blood pressure sensor with new data every 25ms. (Reading the sensor and processing its data takes 3 ms)
  - Heart beat detector with new data every 100ms. (Reading the sensor and processing its data takes 1.5 ms)
  - Temperature sensor with new data every 10ms. (Reading the sensor and processing its data takes 2.5 ms)
  - Alert siren. (Activate or Deactivate the siren takes 1 ms)
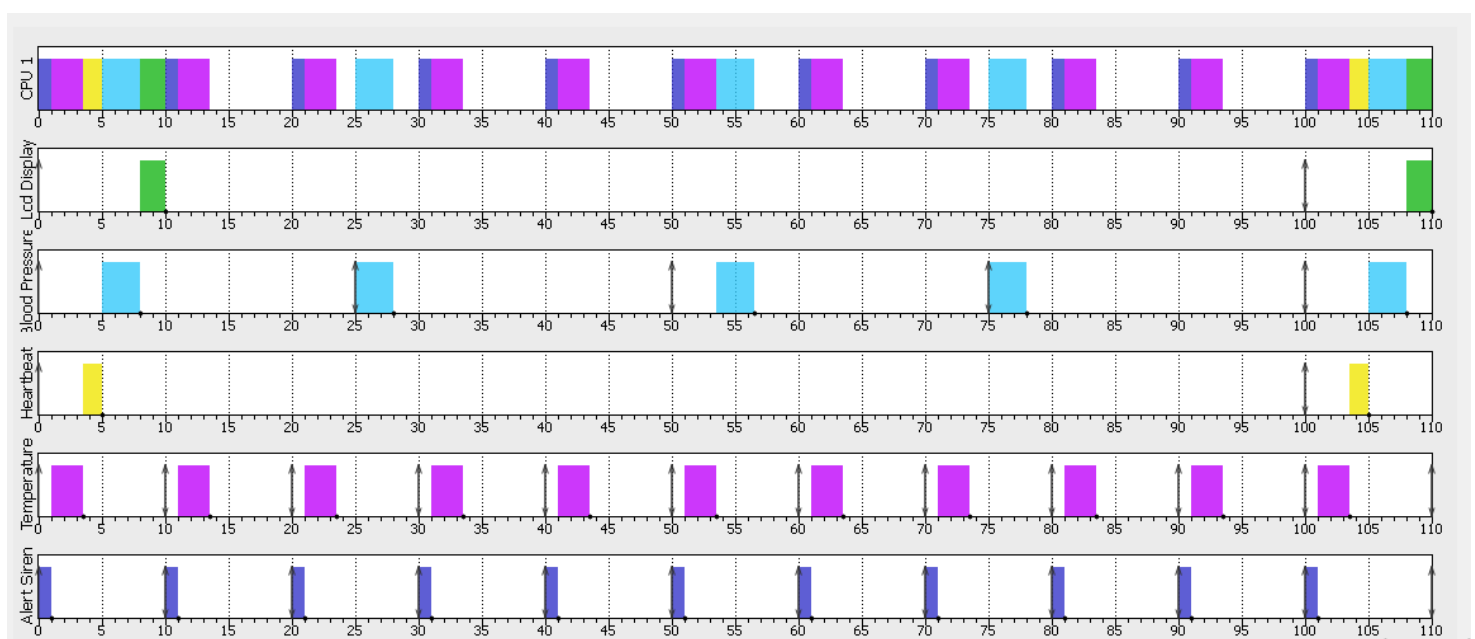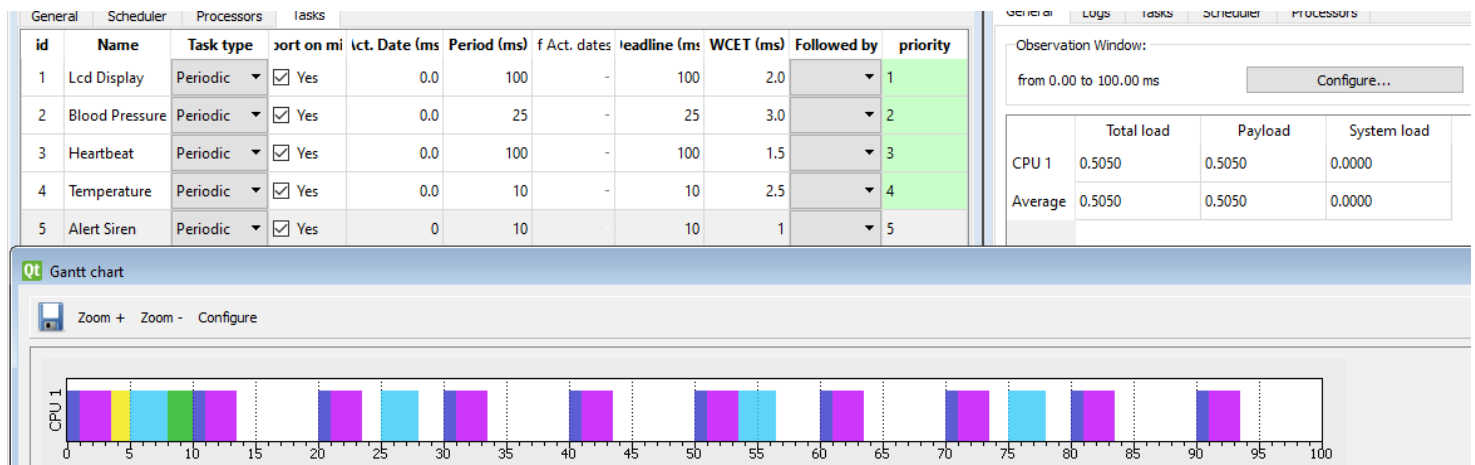
Task
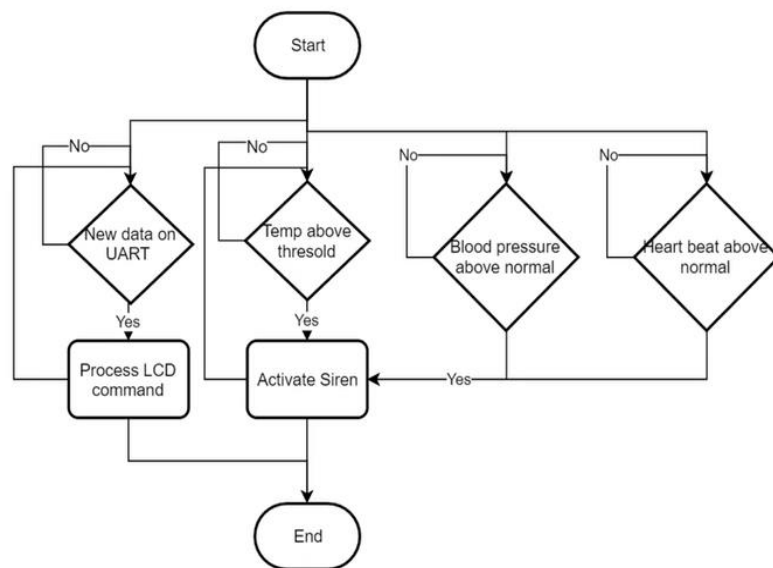
First Design

task	Priority	periodicity	Execution time	Deadline
1-Lcd Display	1	100 ms	2 ms	200 ms
2-Blood Pressure	2	25 ms	3 ms	25 ms
3-Heartbeat	3	100 ms	1.5 ms	100 ms
4-Temperature	4	10 ms	2.5 ms	10 ms
5-Alert Siren	5	10 ms	1 ms	10 ms

- SysTick Value > Total E.T Of All Tasks (2+3+1.5+2.5+1)
- SysTick Value = 10 ms
- System Hyperperiod = 100
- CPU Load = ((10*1)+(10*2.5)+(1*1.5)+(4*3)+(1*2))/100 = 50.5/100 (50.5%)
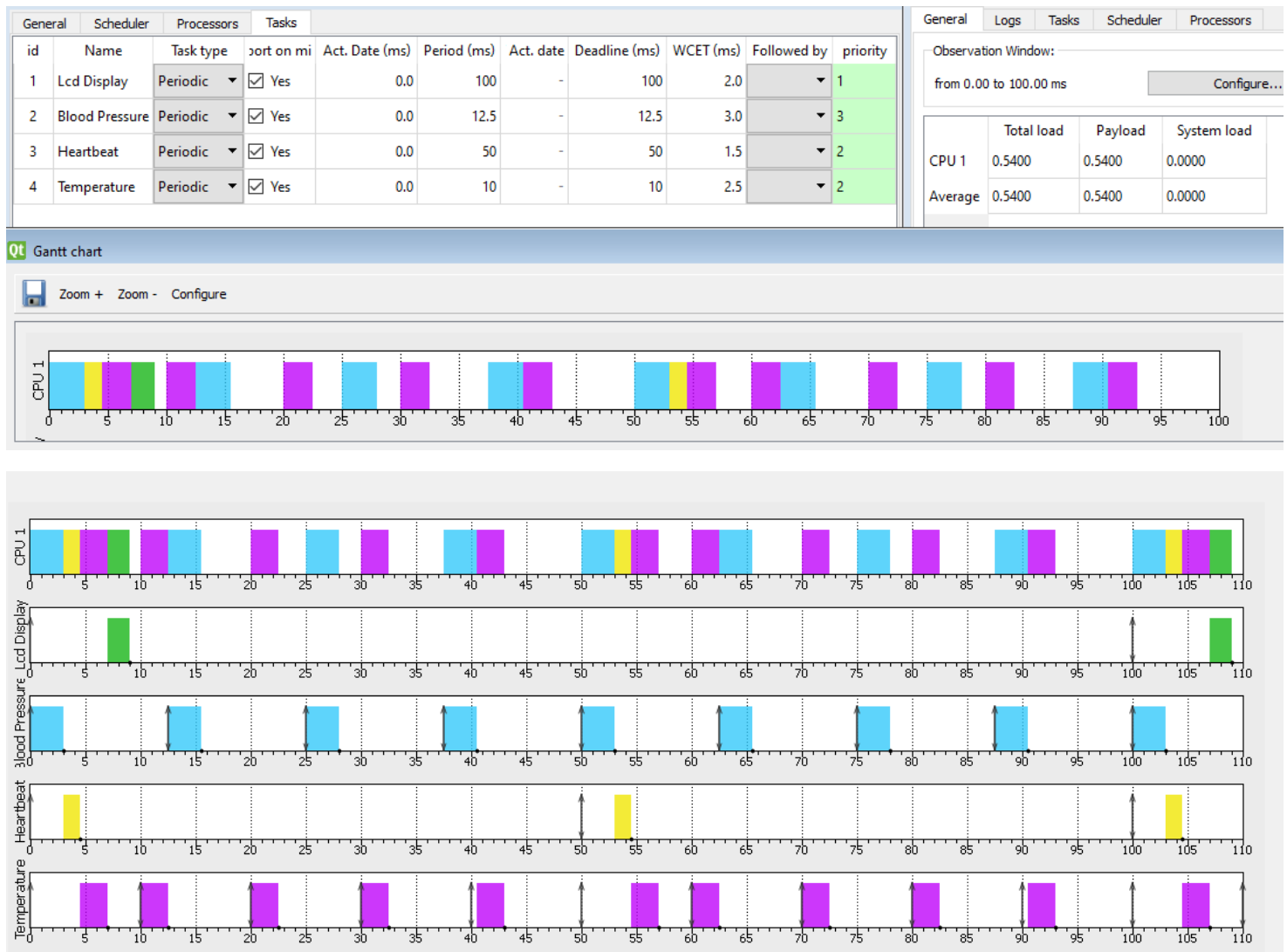
Desing on SimSo

In this design I didn't use (Nyquist theorem) so I notice that CPU load is very good and we can add more tasks and all tasks are in deadline and all tasks execute without any preemption.

Second Design

task	Priority	periodicity	Execution time	Deadline
1-Lcd Display	1	100 ms	2 ms	100 ms
2-Blood Pressure	3	12.5 ms	3 ms	12.5 ms
3-Heartbeat	2	50 ms	1.5 ms	50 ms
4-Temperature	2	10 ms	2.5 ms	10 ms
5-Alert Siren	On Event		1 ms	

- SysTick Value > Total E.T Of All Tasks   (2+3+1.5+2.5)
- SysTick Value   = 10 ms
- System Hyperperiod = 100
- CPU Load = (10*2.5)+(2*1.5)+(8*3)+(1*2))/100 = 54/100 =   (54%)

Desing on SimSo

In this design I used (Nyquist theorem) and Alert siren task executes on Event so

I notice that CPU load is good and we can add more tasks and all tasks execute without any preemption.

First Design hand written