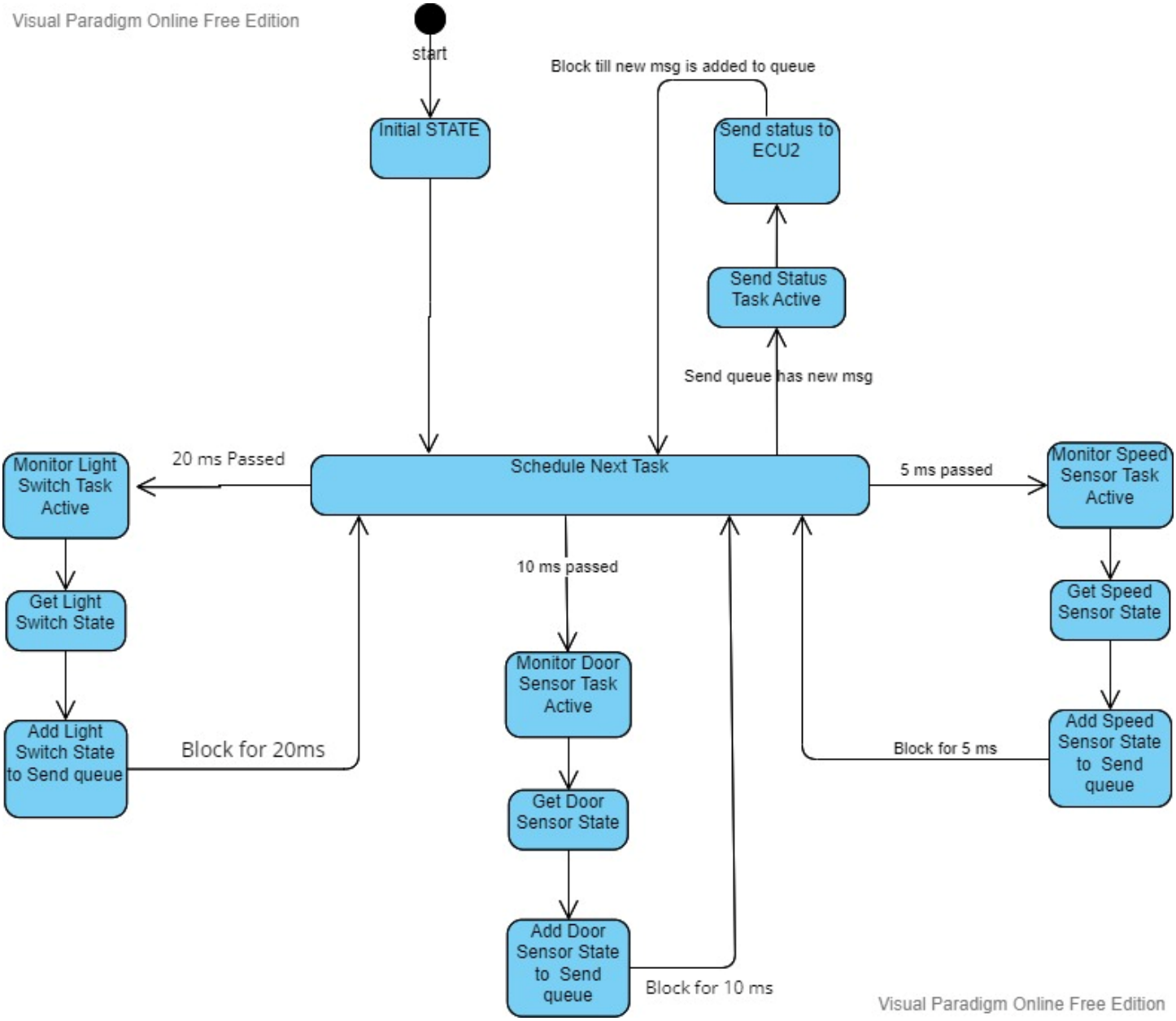
Automotive Door Control System Design

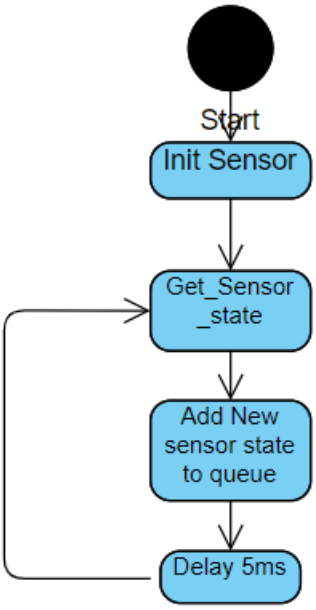
DYNAMIC DESIGN

Nora Elhennawy | EGYFWD | 4-10-22

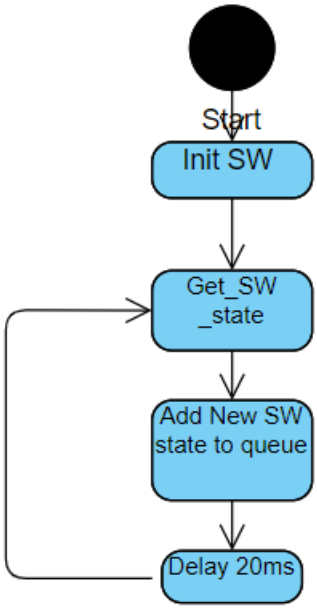
ECU1

STATE MACHINE DIAGRAM

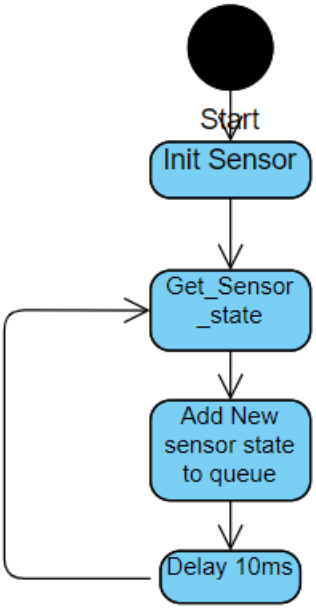




Speed Sensor Monitor

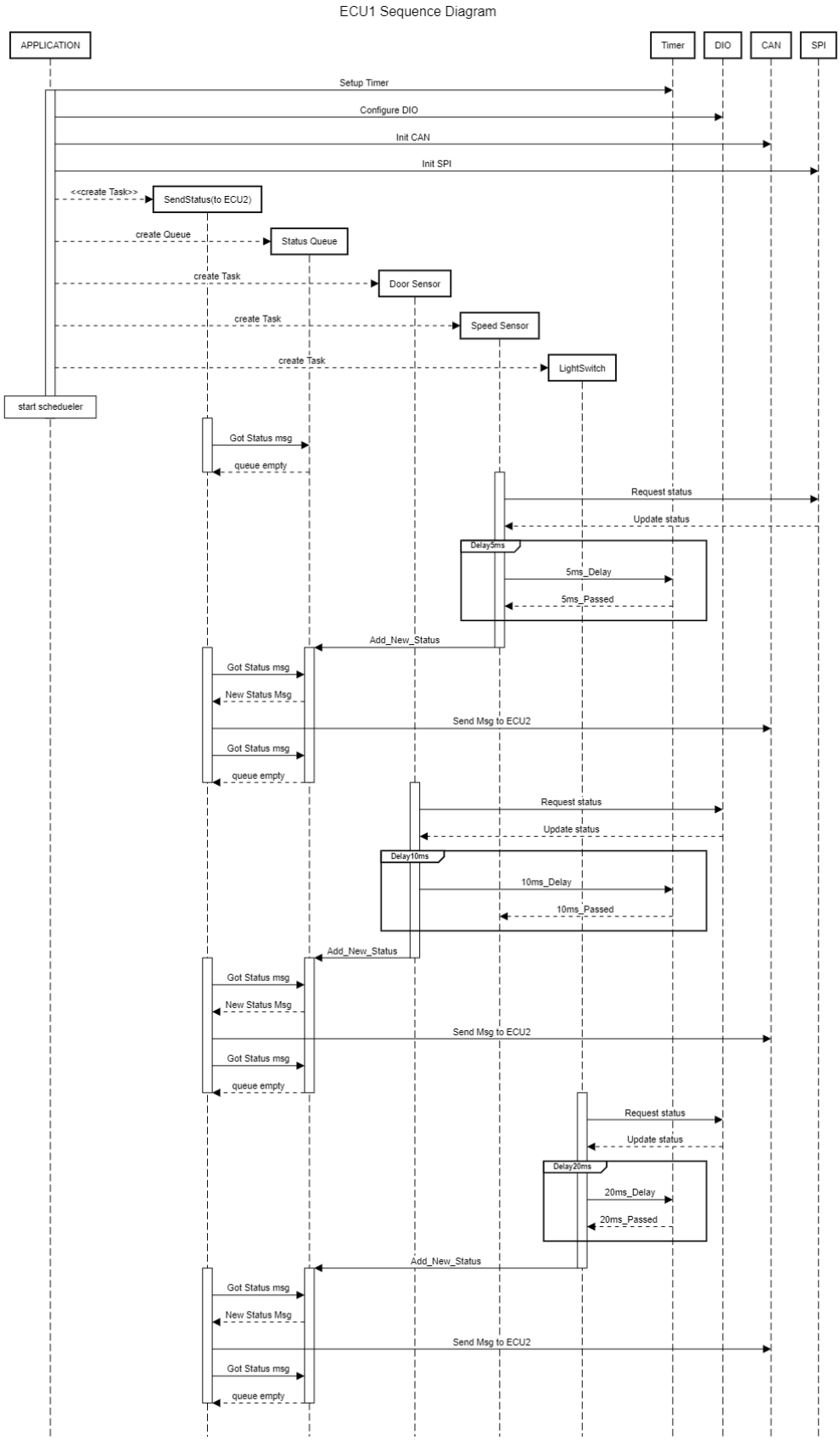


Light SW Monitor



Door Sensor Monitor

ECU1 SEQUENCE DIAGRAM



ECU1 CPU LOAD

The system has 4 tasks:

Door_Sensor_Monitor : exec time 15 us , period=10 ms

Speed_Sensor_Monitor : exec time 15us , period=5ms

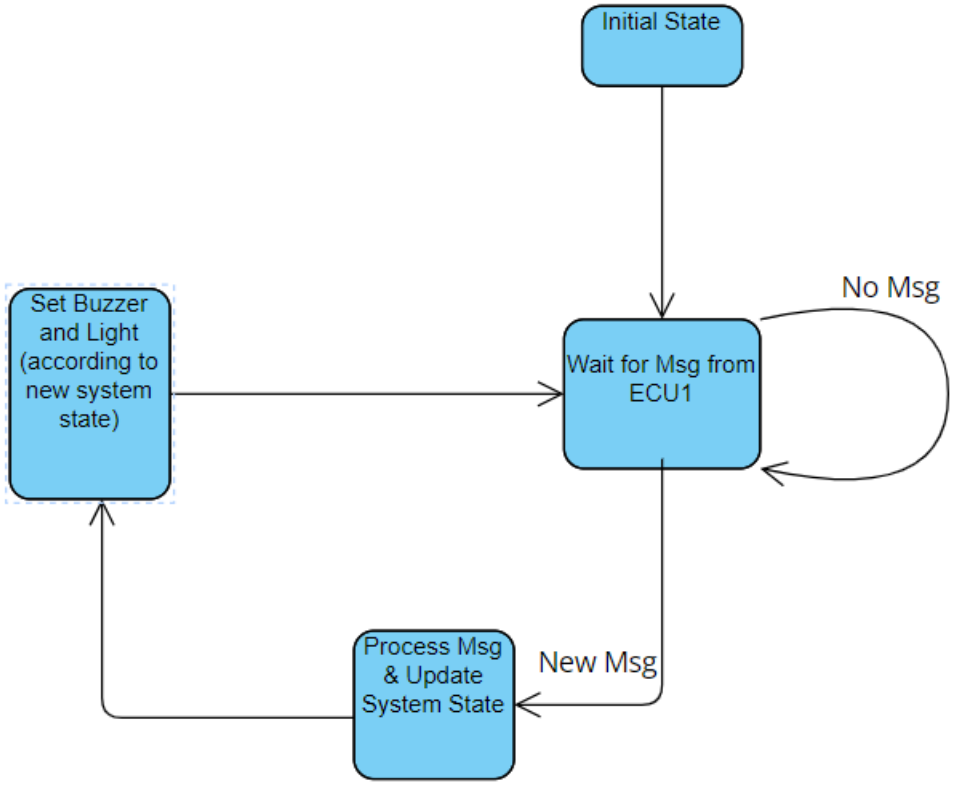
Light_SW_Monitor : exec time 15 us, period=20 ms

Send_Status_Task : exec time 18 us, period=5ms

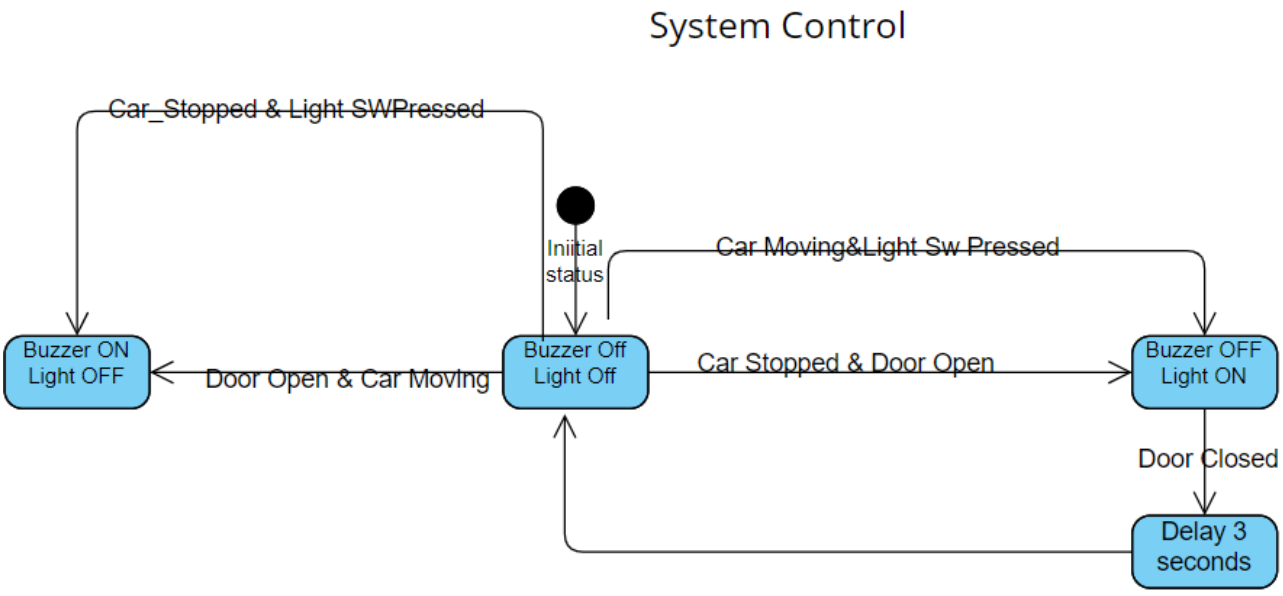
HyperPeriod =20 ms.

CPU Load = ((0.015*2+0.015*4+0.015+0.018*4)/20) x 100 = 0.885 %

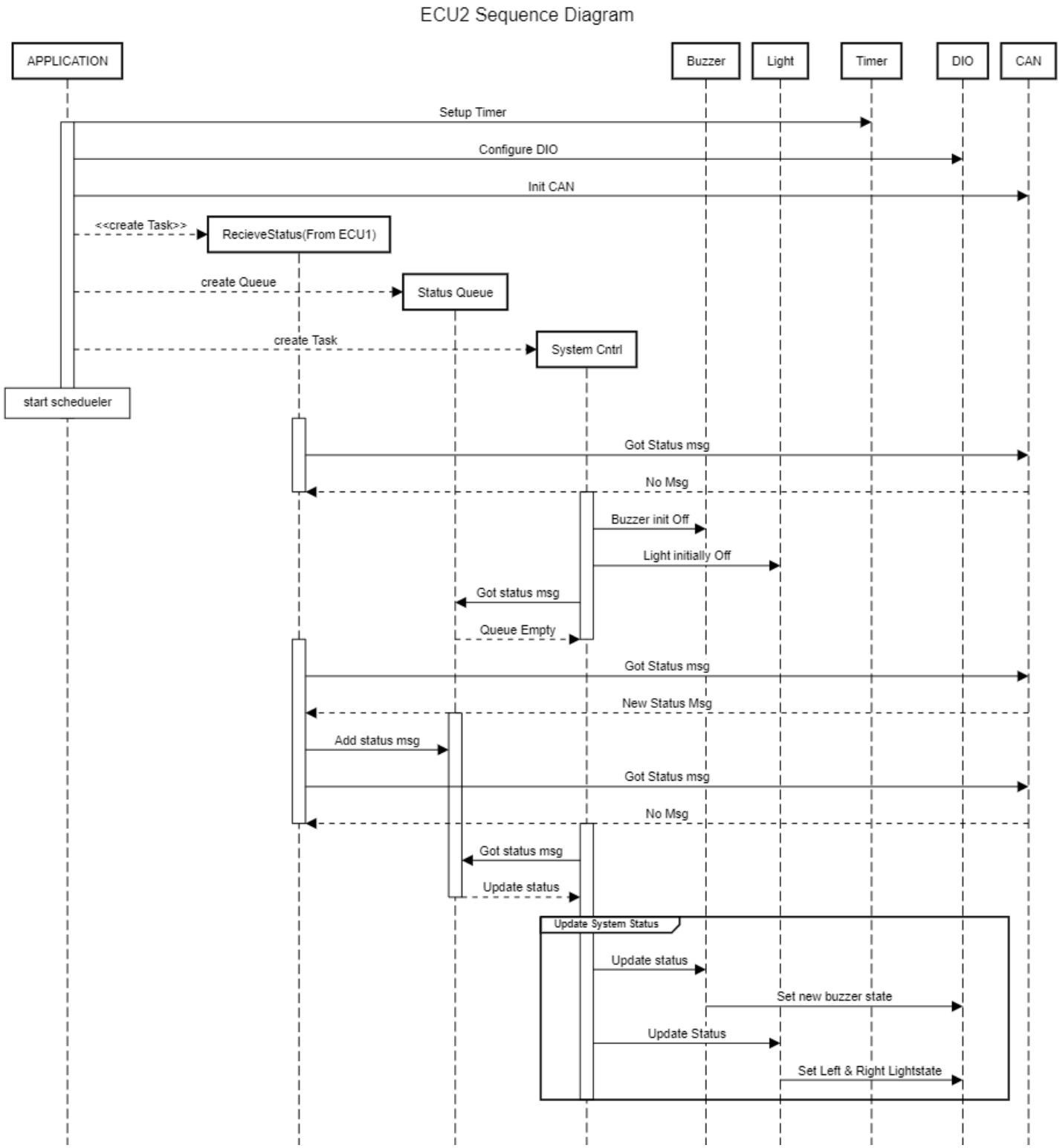
ECU2 STATE DIAGRAM



ECU2 COMPONENTS STATE DIAGRAM



ECU2 SEQUENCE DIAGRAM



ECU2 CPU LOAD

The system has two tasks :

RecvStatus_task : Exe time= 18 us , period =5ms

SystemCntrl: exe time =15 us, period =5ms

Hyper period =5ms

CPU Load = ((0.015+0.018)/5)x100 =0.66 %

NOTE: task exe time was assumed according to real exec time for similar tasks from the RTOS project.

SYSTEM BUS LOAD

Speed Sensor Status (5ms)=200 messages/second

Door Sensor Status(10ms)=100 message/second

Light Sw Status(20ms) = 50 message /second

Total messages on bus = 350 message/second.

Assuming simple can protocol with a 125-bit frame length at a speed of 500kbit/s:

Bus Load= ((350*250)/(1000*1000))*100=8.75%