egypt**fwd**
initiative

Project Dynamic Design

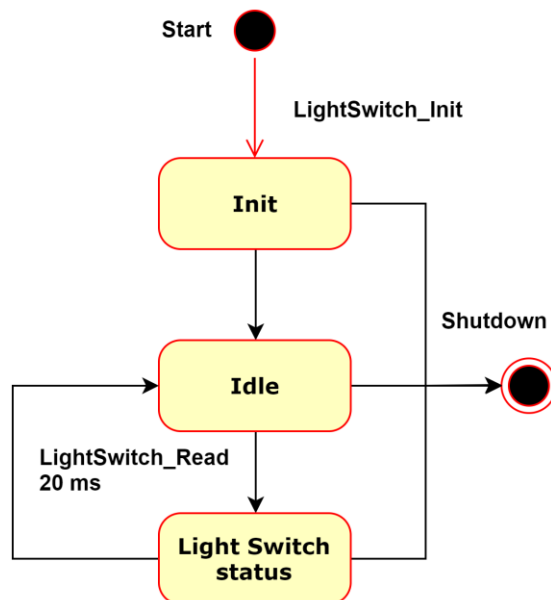| Name	Mohab Osamah Sharafeldin
Email	mohabosamah2011@yahoo.com
Documentation target	Delivering a fully dynamic design for Automotive door control system project

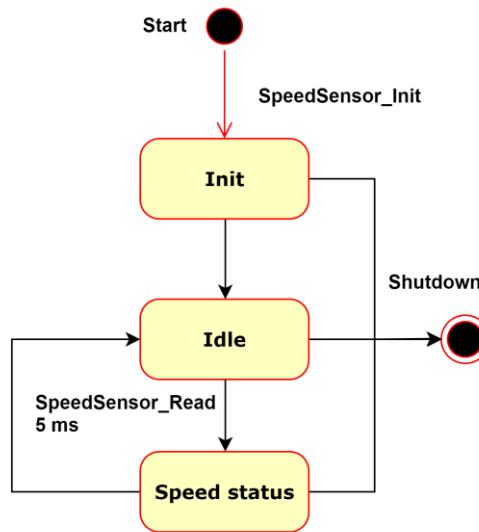# ECU1 Dynamic design:

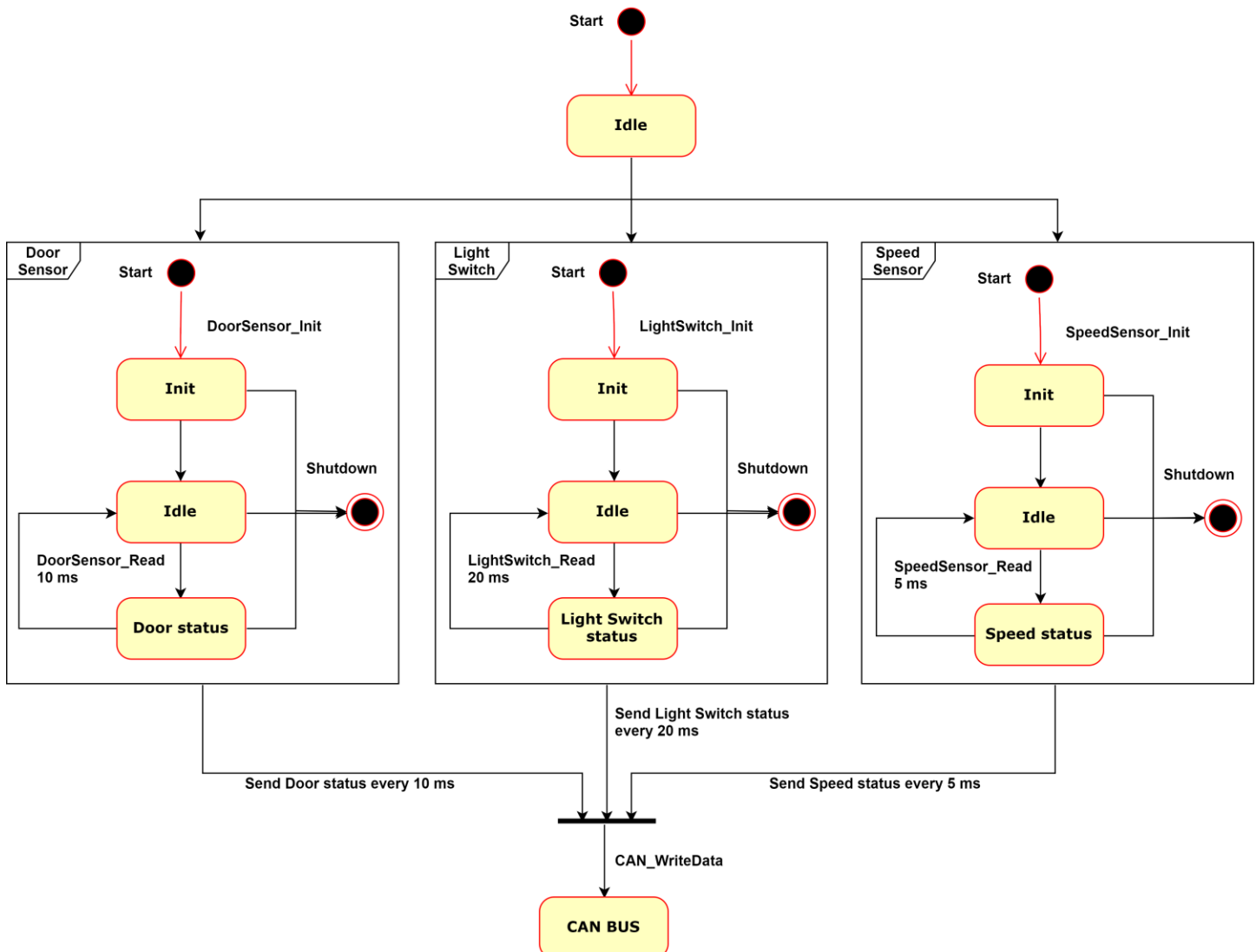- **State machine diagram for Door Sensor component:**
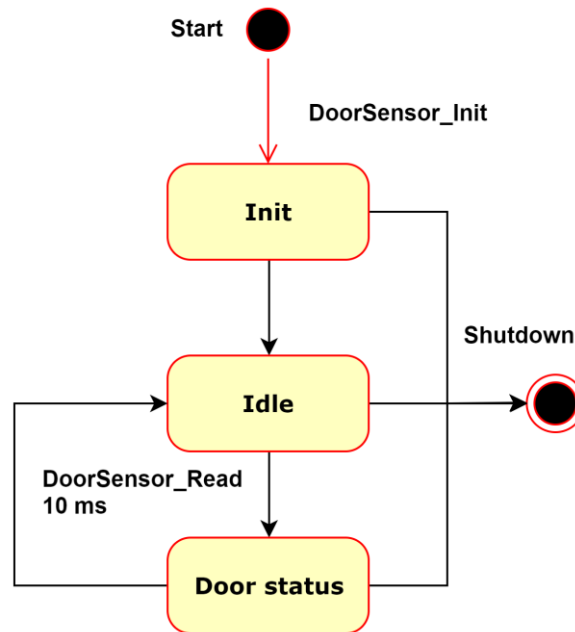
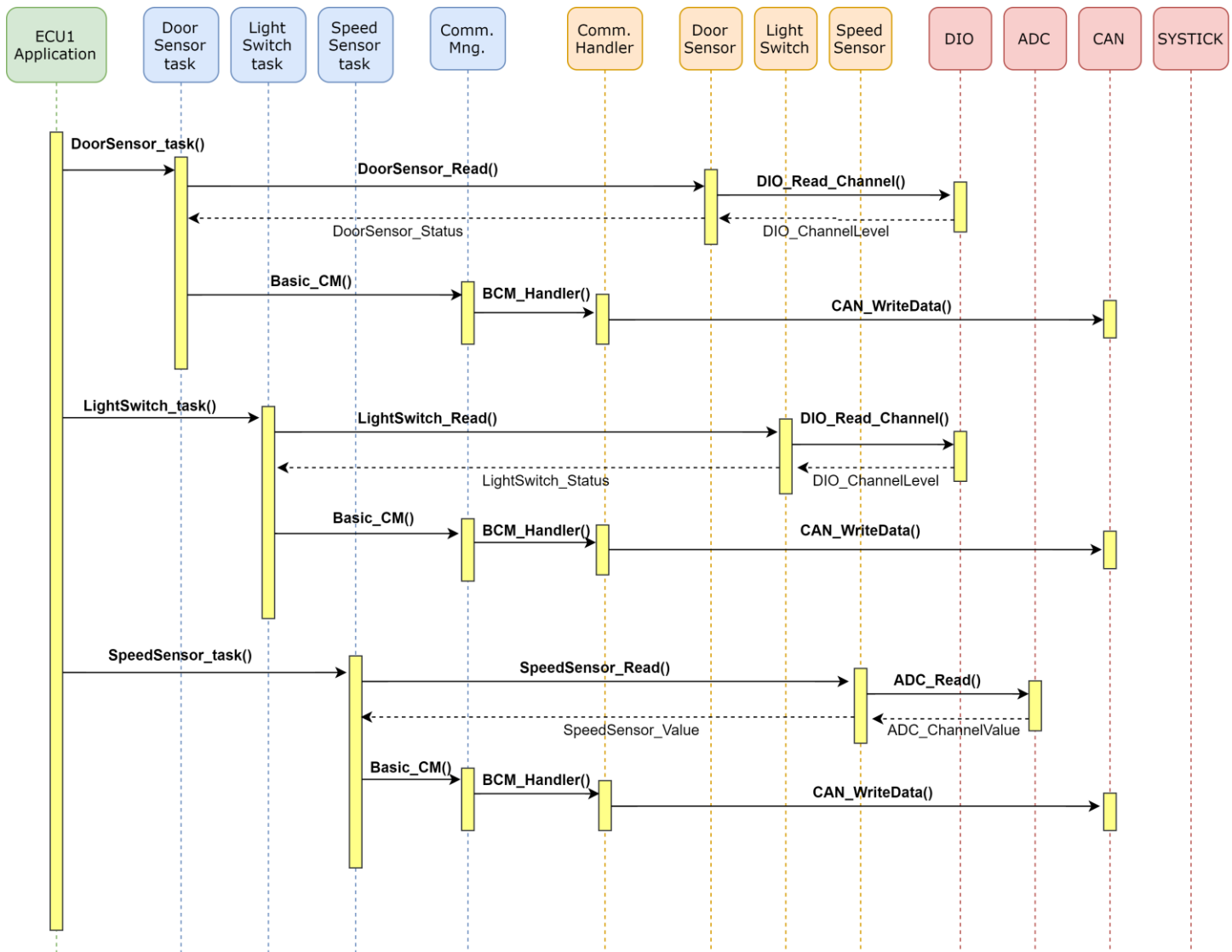- **State machine diagram for Light Switch component:**

- **State machine diagram for Speed Sensor component:**

- **State machine diagram for the ECU1 operation:**

- **sequence diagram for the ECU1:**

- **CPU load for the ECU1:**

Hyperperiod equals the least common multiplier (LCM) of all the tasks periodicities = **20 ms**

Task name	Periodicity (ms)	Execution time (ms) (Hypothetically)	Occurrence during hyperperiod
DoorSensor_task	10	1	2
LightSwitch_task	20	1.5	1
SpeedSensor_task	5	0.5	4

CPU Load = (E1 + E2 + E3) / H

((1*2 + 1.5*1 + 0.5*4) / 20) *100% = **27.5%**

ECU2 Dynamic design:

- ## State machine diagram for Buzzer component:

- ## State machine diagram for Left Light component:

- **State machine diagram for Right Light component:**

State machine diagram for the ECU2 operation:

- **sequence diagram for the ECU2:**

- CPU load for the ECU2:

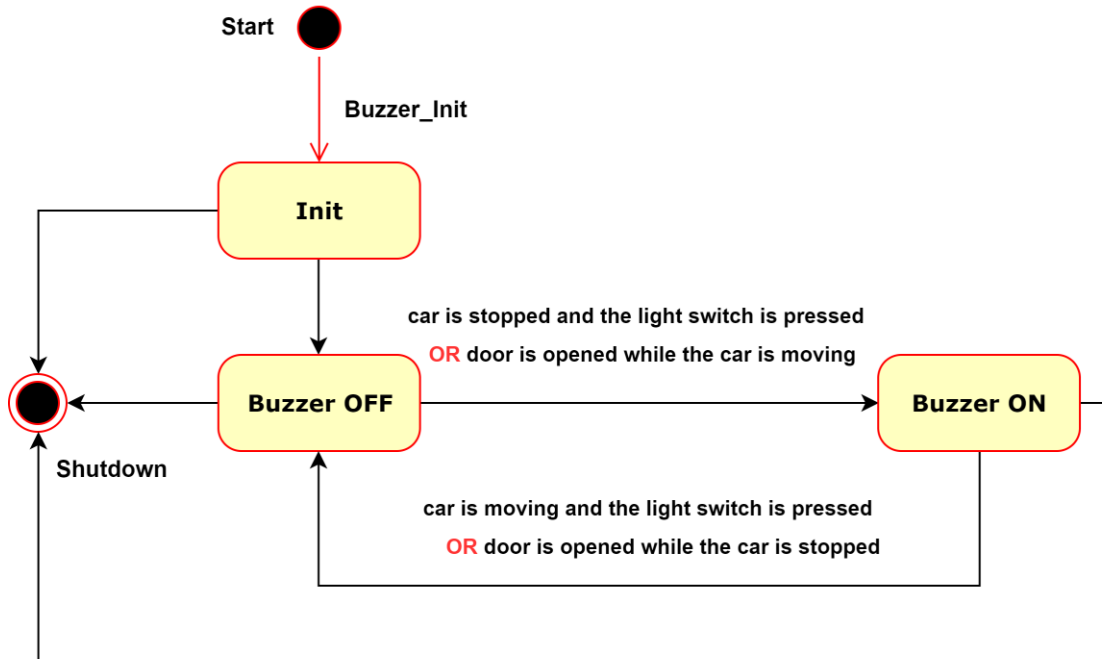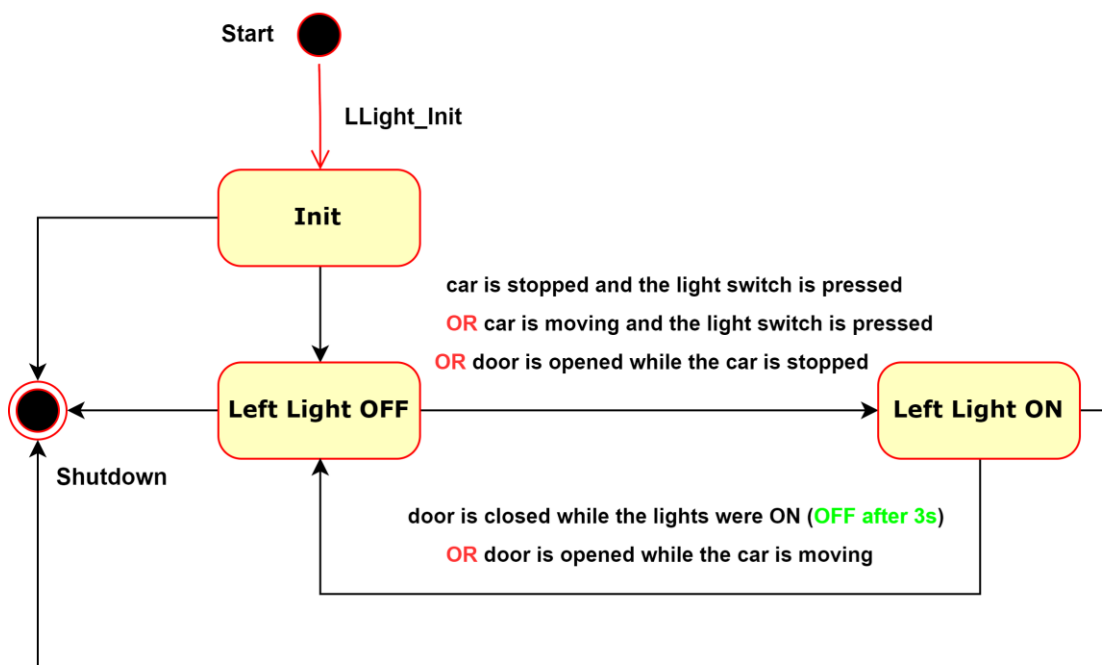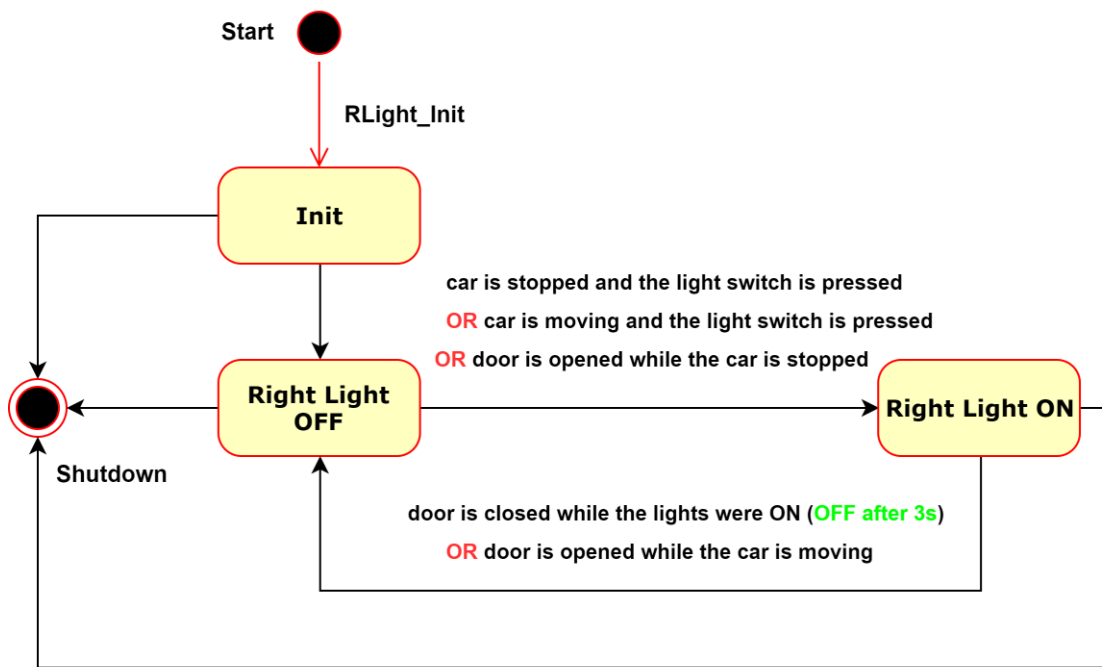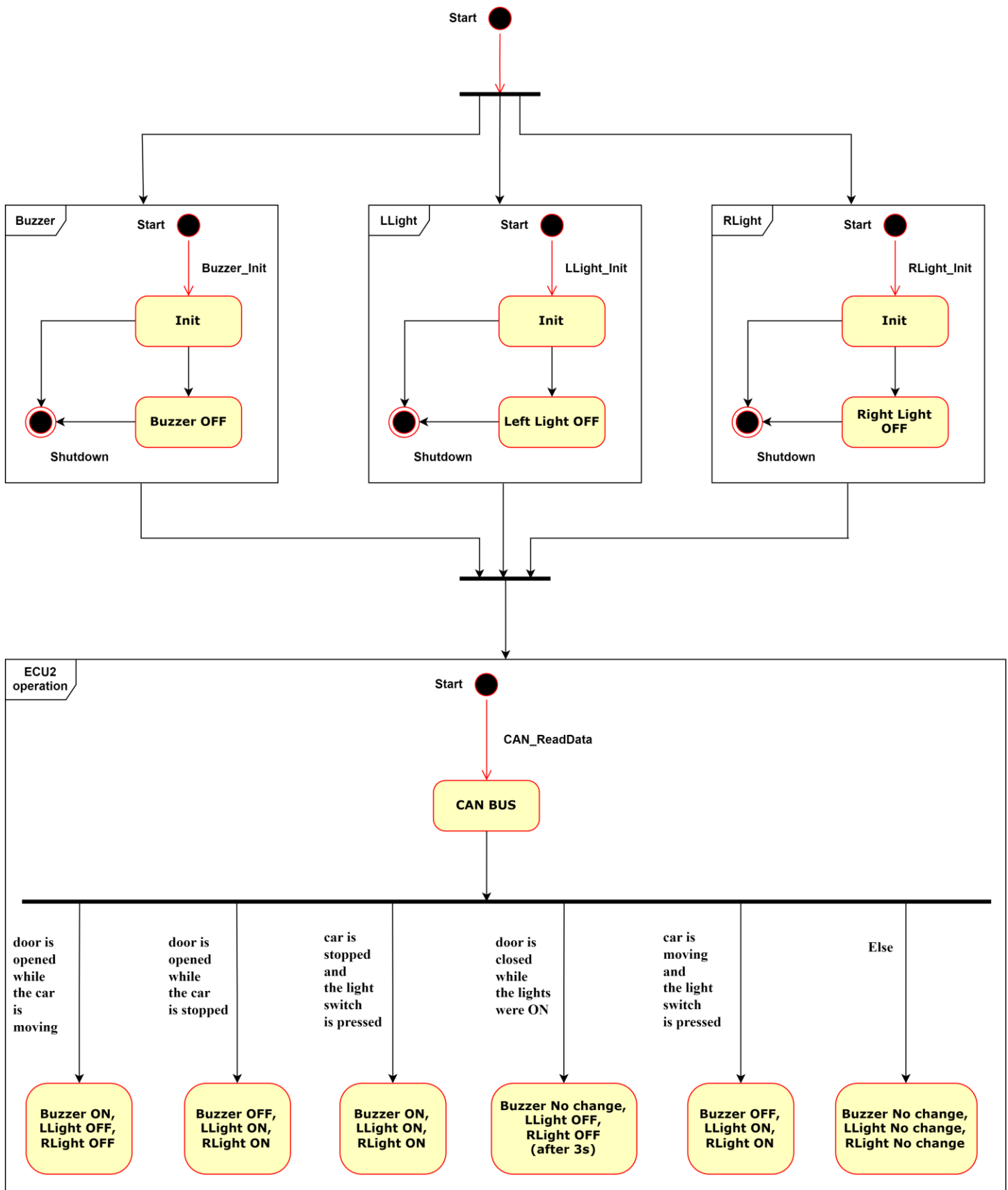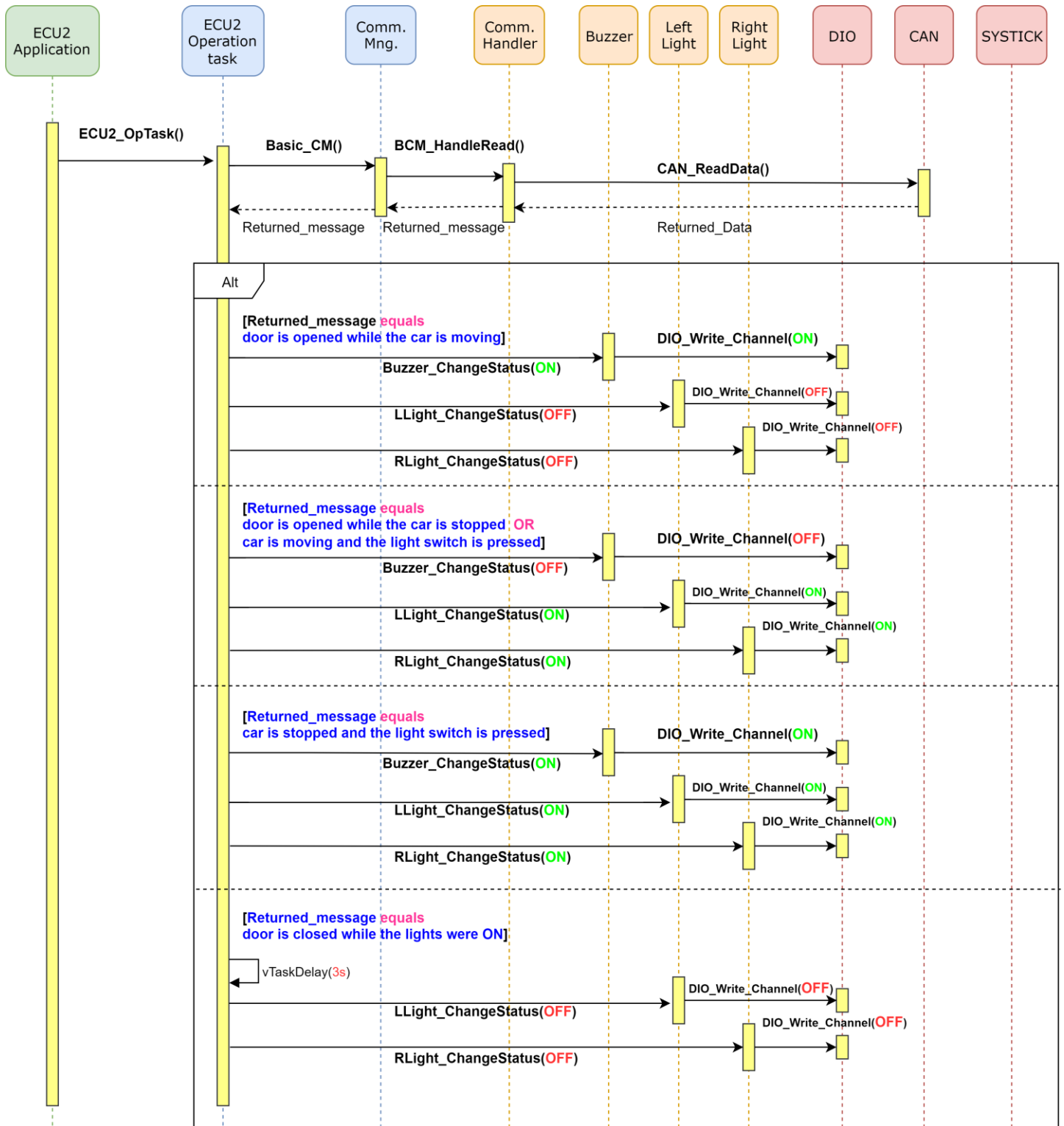**Hyperperiod** equals the least common multiplier (LCM) of all the tasks periodicities = **5 ms**

Task name	Periodicity (ms)	Execution time (ms) (Hypothetically)	Occurrence during hyperperiod
ECU2_OpTask	5	2	1

CPU Load = (E1) / H

((2*1) / 5) *100% = **40%**

- Bus load in the system:

Assuming that the bit time is **1 us**

A frame with no data bytes is about 50 bits, then a frame with 8 bytes data will be about **115 bits**

Therefore, the frame will takes a time of 115*1 = **115 us**

Through 20ms we have 7 frames to be sent.

Between frames we must have about 11 bit times of idle and there are 3 times of overlapping between the frames along the hyperperiod. Hence,

Time of frames on bus through 20ms = 7*115 + 3*11 = 838 us

Total time of frames on bus through 1s = 838*50 = **41900 us**

Bus load percentage per 1s = (41900 / 1000000) *100% = **4.19%**