egFWD Embedded Systems Advanced Track

AUTOMOTIVE DOOR CONTROL SYSTEM DESIGN

Dynamic Design

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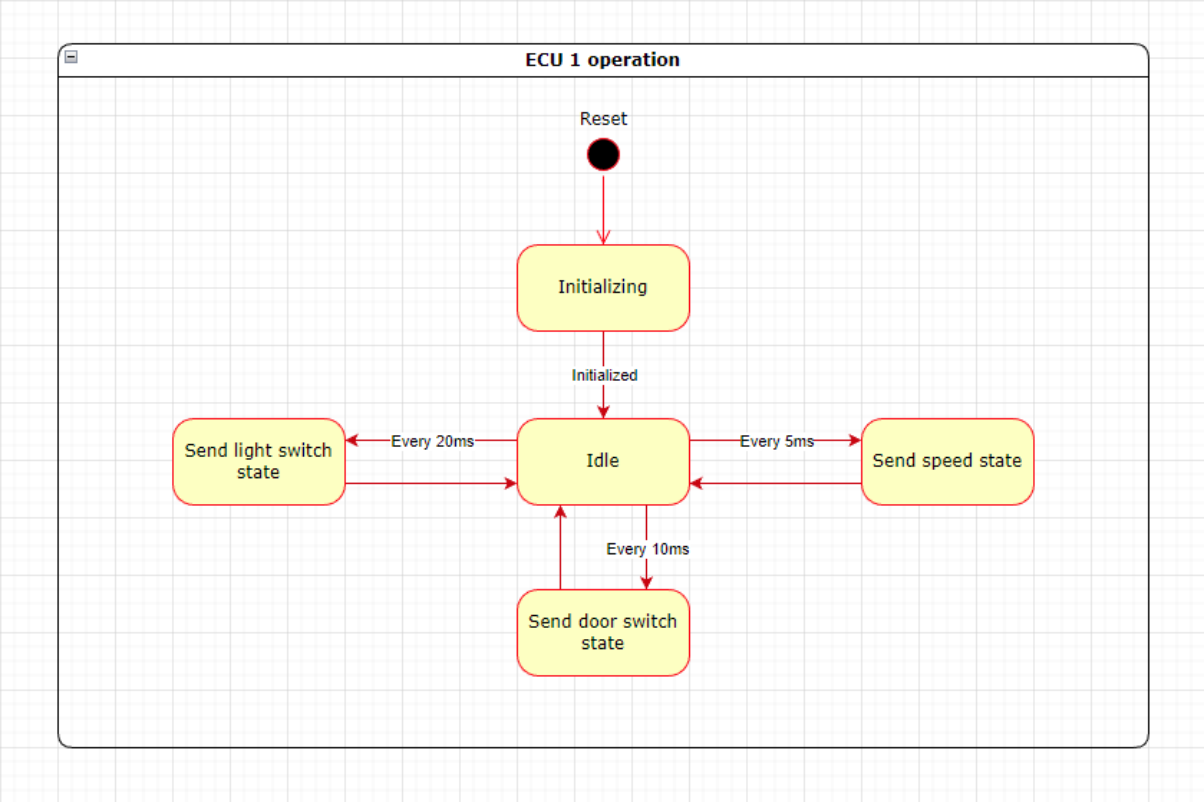
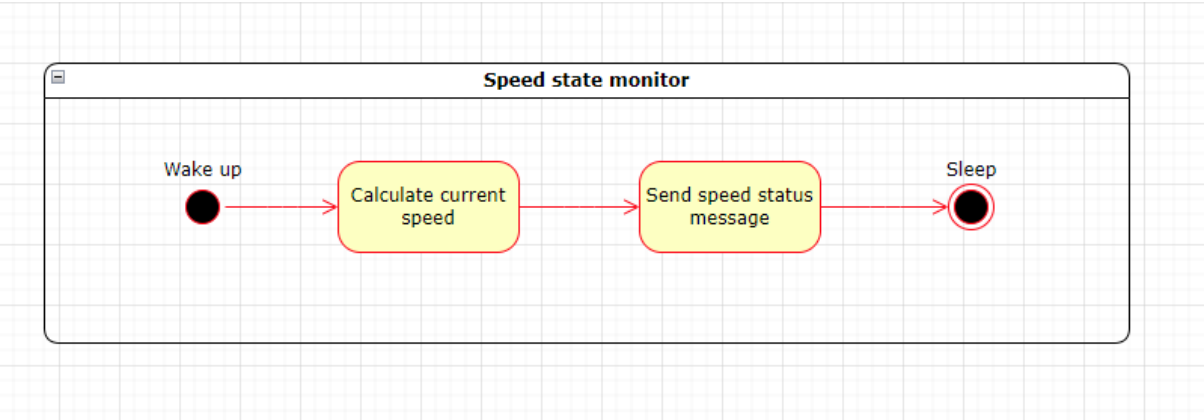
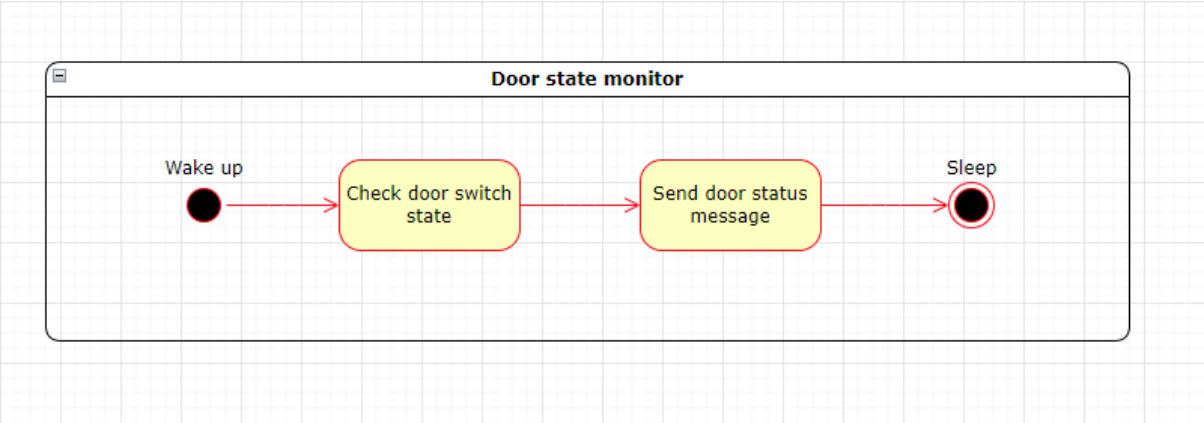
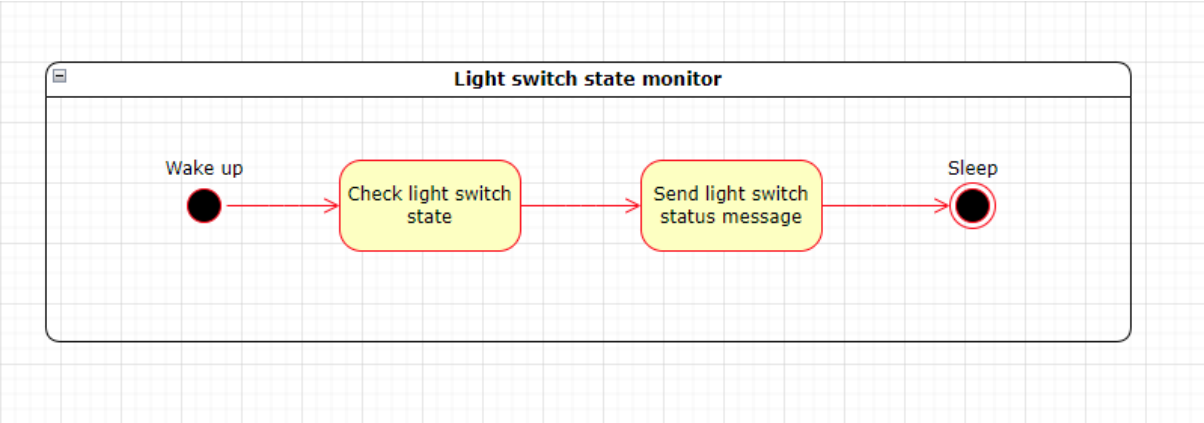
ECU 1 operation state machine



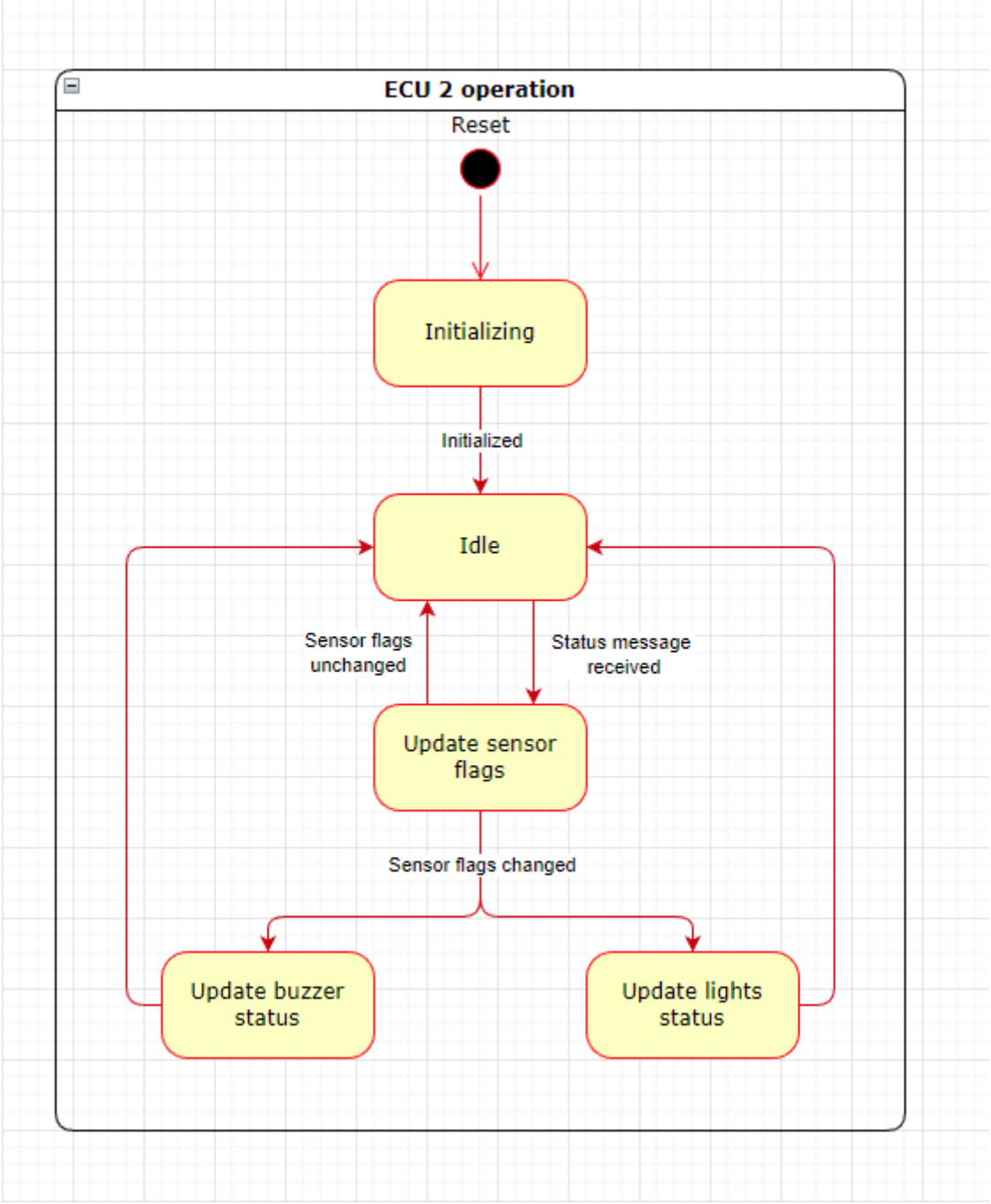
ECU 1 components state machines



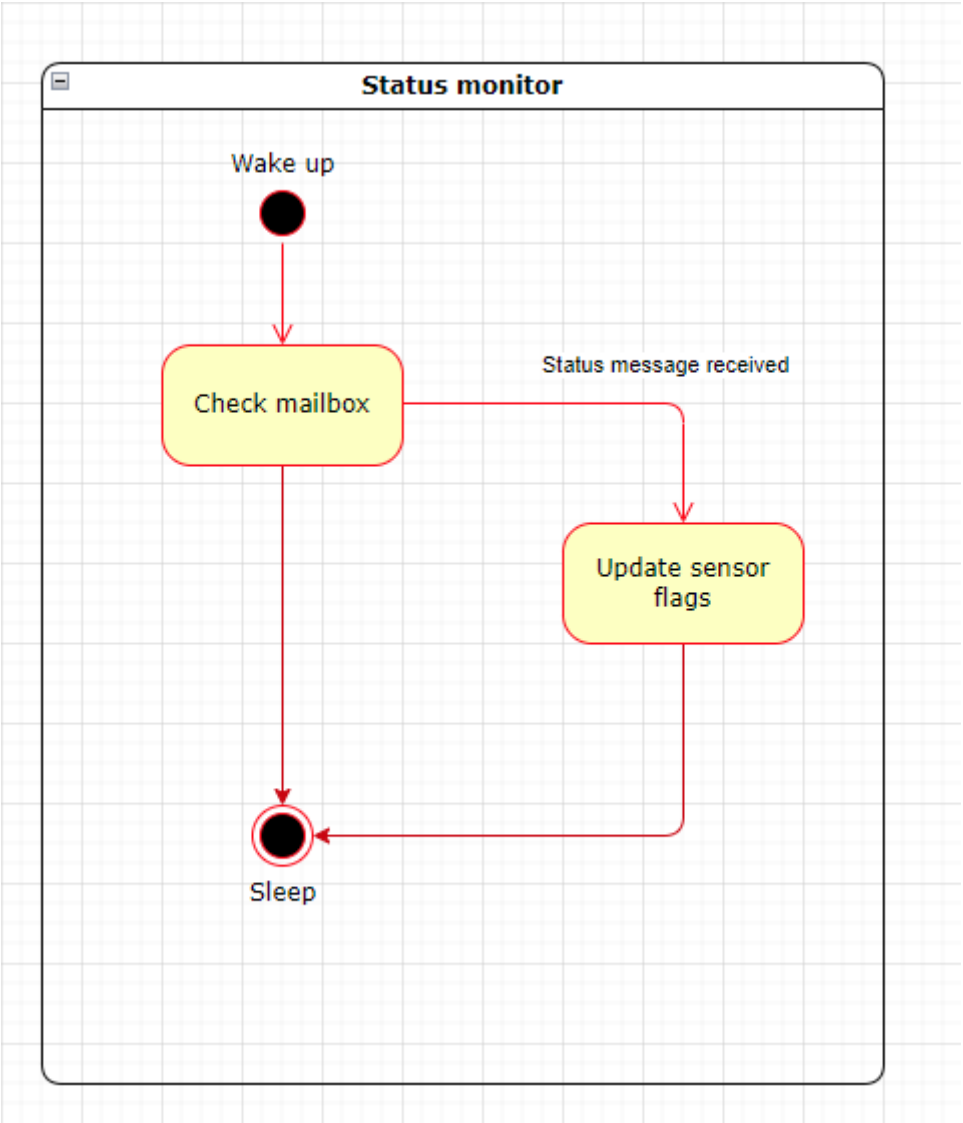


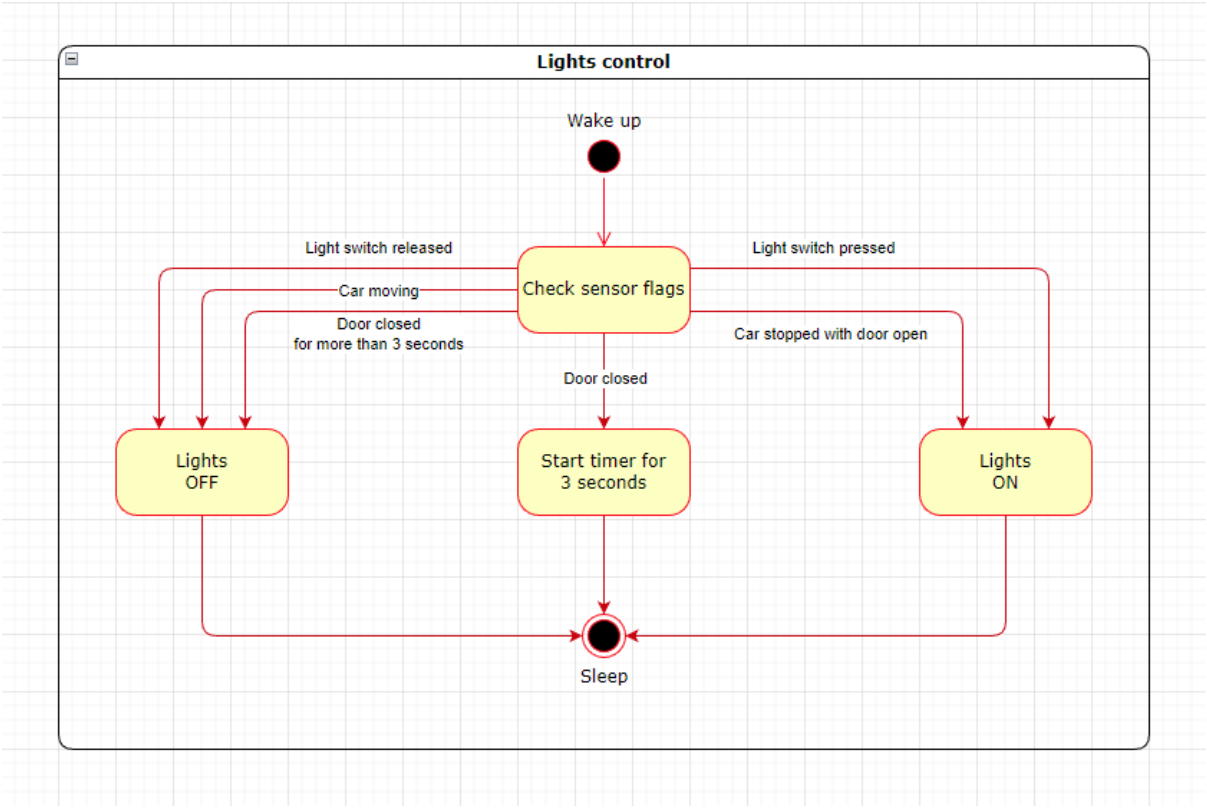


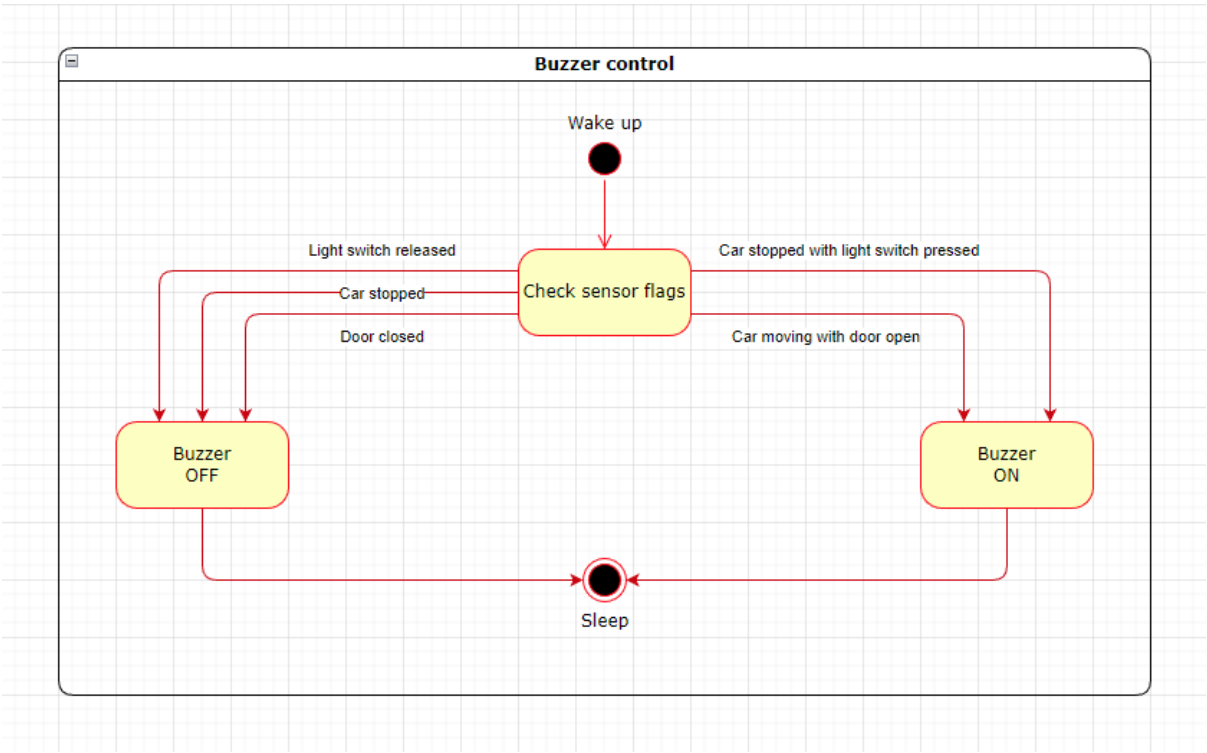
ECU 2 operation state machine



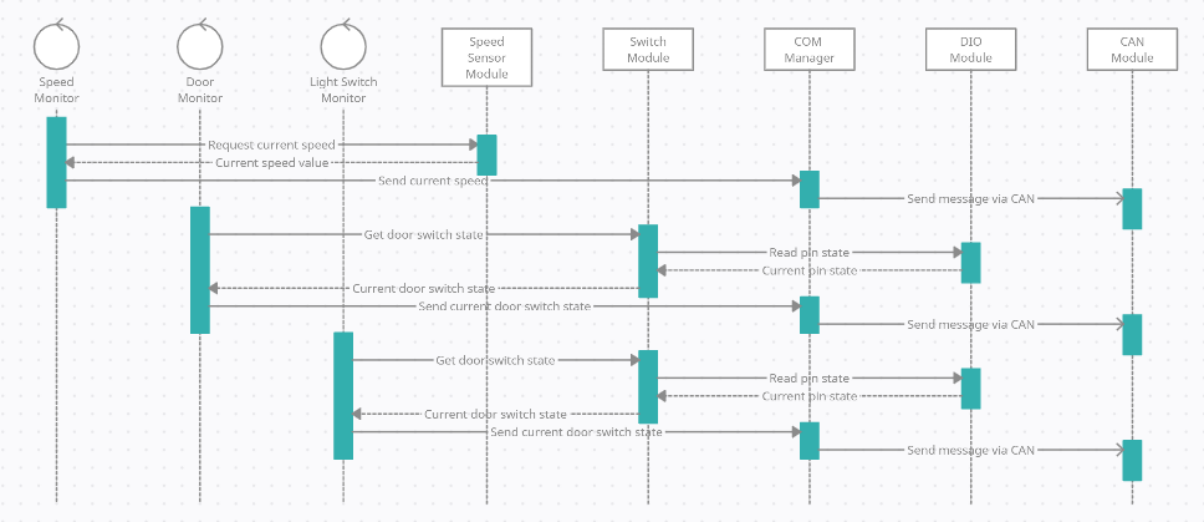
ECU 2 components state machines



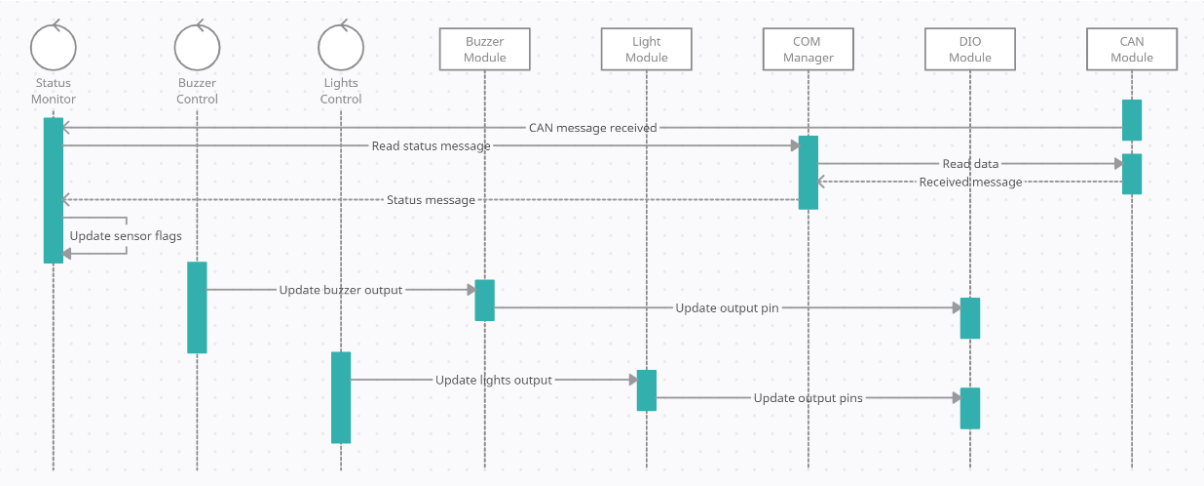

Lights control
Wake up
Light switch released
Light switch pressed
Check sensor flags
Car moving
Door closed
for more than 3 seconds
Car stopped with door open
Door closed
Lights
OFF
Start timer for
3 seconds
Lights
ON
Sleep


Buzzer control
Wake up
Light switch released
Car stopped with light switch pressed
Check sensor flags
Car stopped
Door closed
Car moving with door open
Buzzer
OFF
Buzzer
ON
Sleep

ECU 1 sequence diagram



ECU 2 sequence diagram



ECU 1 CPU load

**Assuming 1ms execution time for all tasks.

Hyperperiod = 20ms

$$CPU\ load = \frac{1 \times 3\ +\ 1 \times 2\ +\ 1}{20} \times 100 = 30\%$$

ECU 2 CPU load

**Assuming 1ms execution time for all tasks.

**Assuming periodicity of 5ms for status monitoring.

**Assuming periodicity of 10ms for light and buzzer control.

**Assuming Max CPU load scenario: Sensor status is always changing.

Hyperperiod = 10ms

$$CPU\ load = \frac{1 \times 2\ +\ 1\ +\ 1}{10} \times 100 = 40\%$$