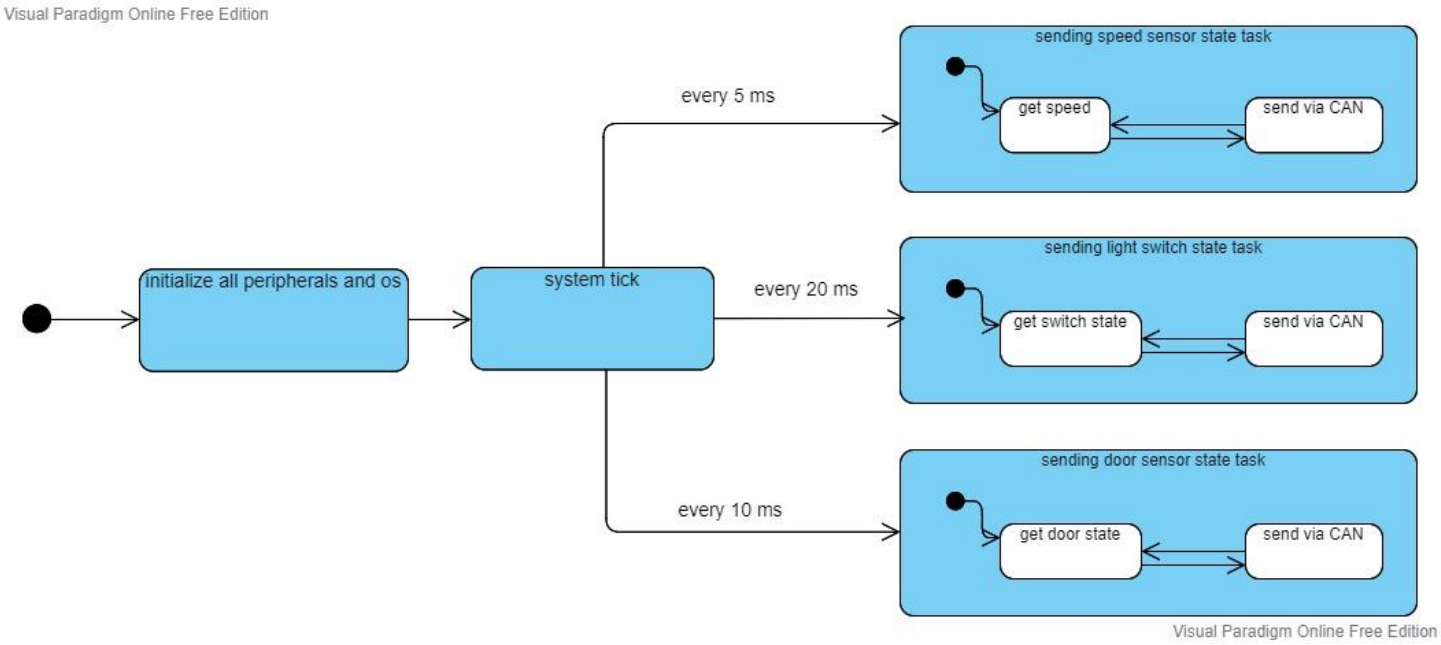
Dynamic design analysis:

ECU 1:

1- state machine diagram



2- CPU load

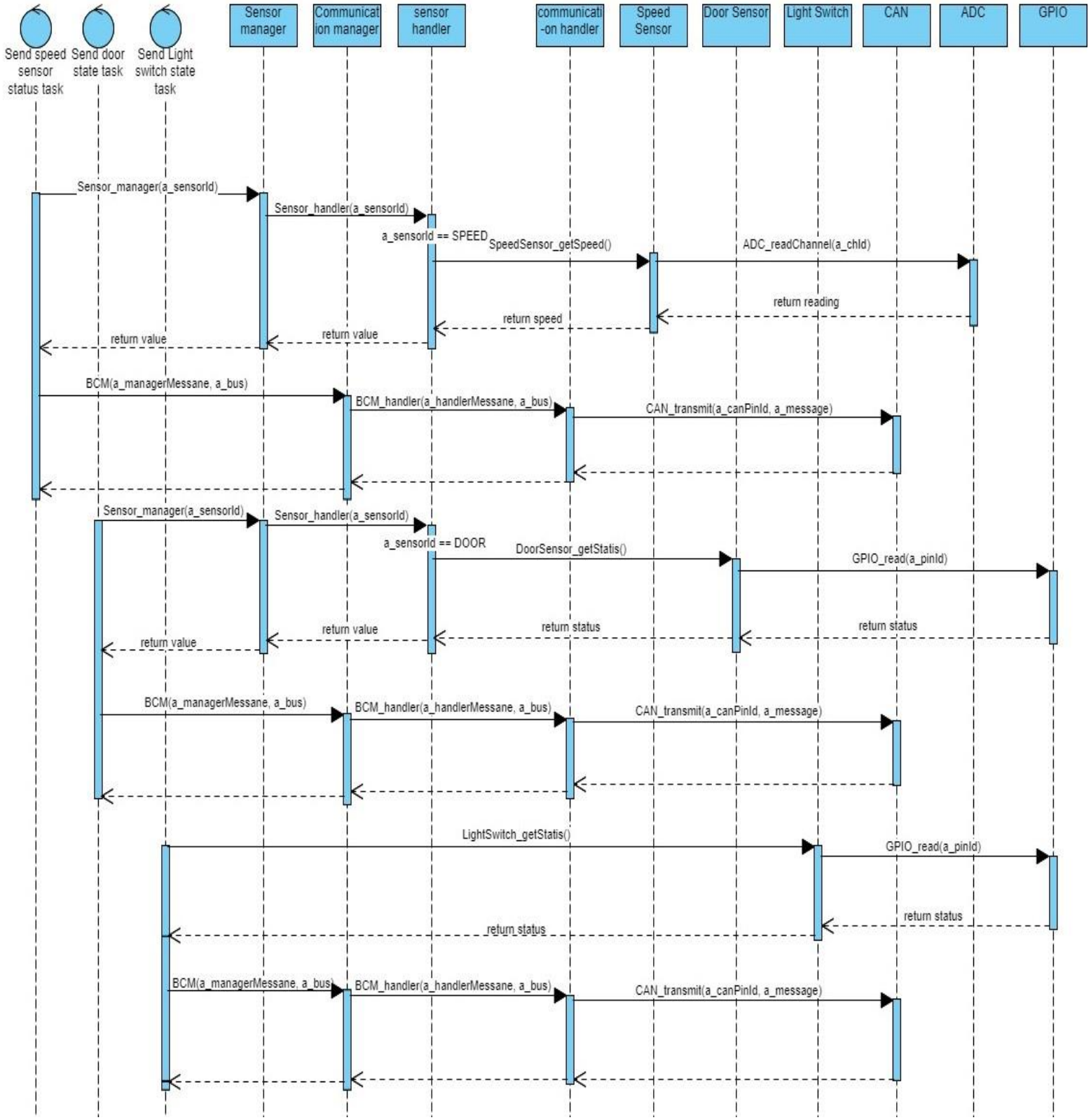
The system mainly divided to three tasks and we assumed all tasks execution time is 1 ms which is a very large time for a task, but this considered to be the worst case scenario.

T1 {P:20, E:1} T1 {P:10, E:1} T1 {P:5, E:1}

Hyper period = 20

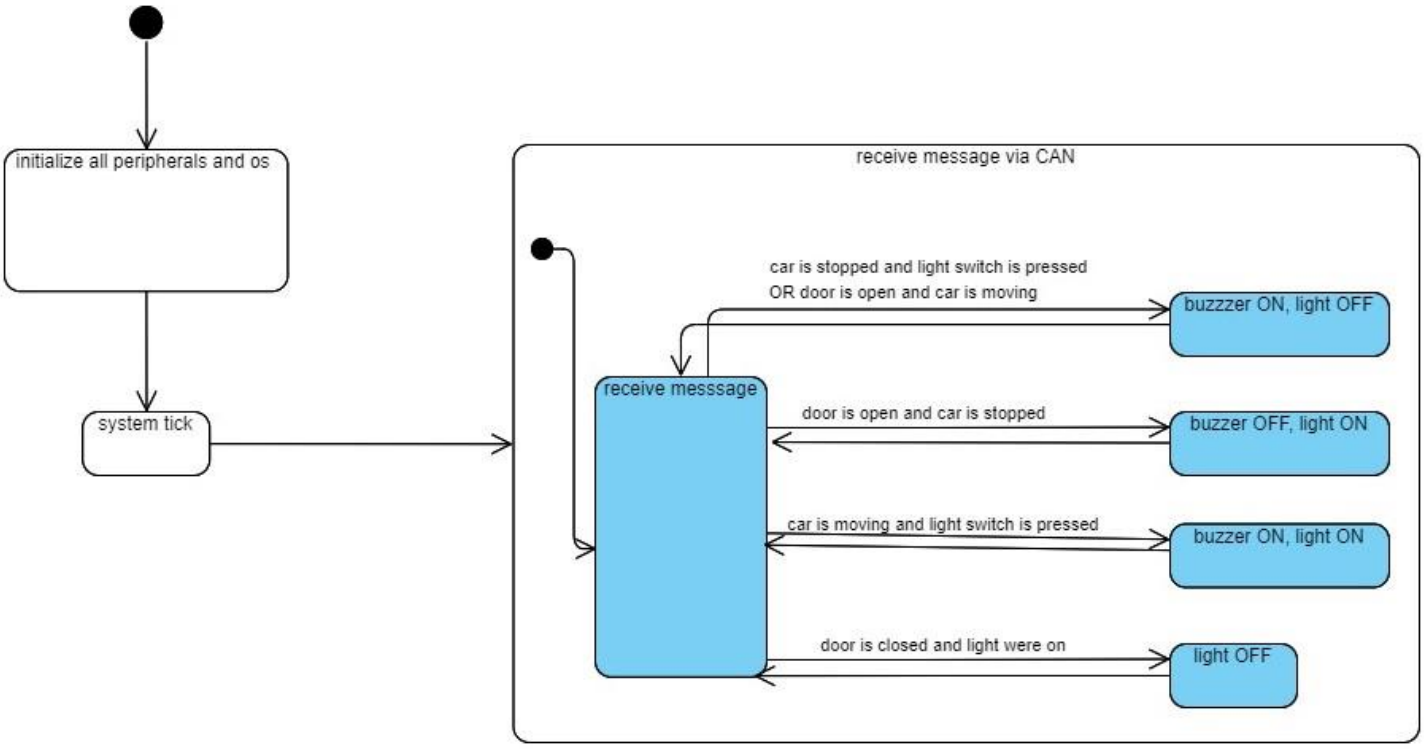
U = (E1 + E2 + E3) / H = ((1*1) + (1*2) + (1*4) / 20) * 100 % = 35%

3- sequence diagram



ECU 2:

1- State machine diagram:



2- CPU load:

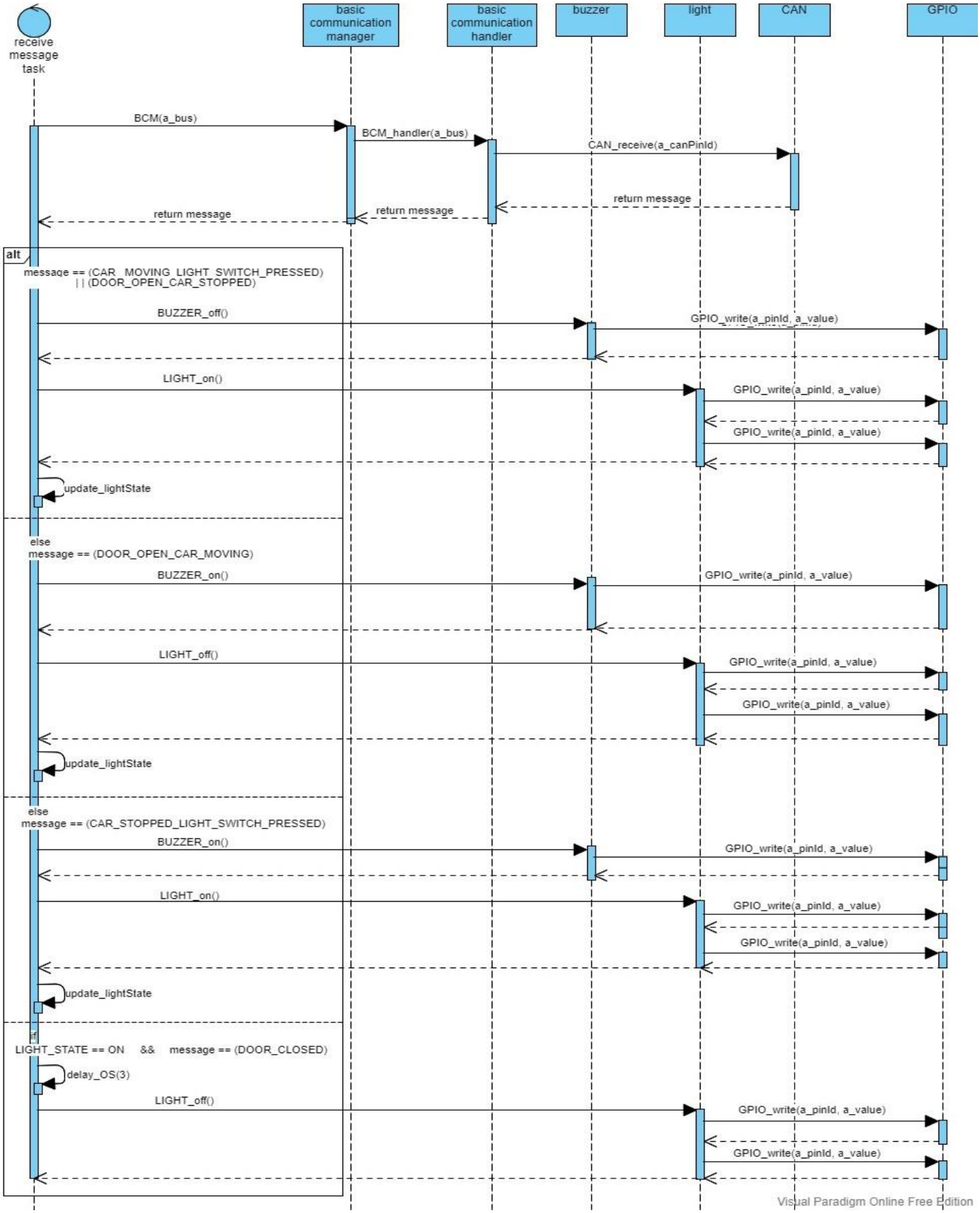
The system mainly consists of only one task and we assumed the task exection time to be 2.5 ms which is a very large time for a task, but this considered to be the worst case scenario. And the periodicity is assumed to be 5 ms as we know that every 5 ms atleast a message is sent.

T1 {P:5, E:2.5}

Hyper period = 5

U = E1 / H = ((1*2.5) / 5) * 100 % = 50%

3- sequence diagram



4- Bus load:

Assumed a standard identifier so CAN frame consists of 125 bit and assume using 500 kBit/s

Bit time = 1 / bit rate = 1 / (500 * 100) s = 2 us

Frame time = number of bits * bit time = 125 bit * 2 us = 250 us

the bus load for 3 messages every 5, 10 and 20 ms can be calculated by

- 1 frame every 5 ms = 200 frame every 1000 ms

- 1 frame every 10 ms = 100 frame every 1000 ms

- 1 frame every 20 ms = 50 frame every 1000 ms

Total frames in 1 s = 350

Total time on bus = 350 * 250 us = 87500 us

Bus load in 1 s = (87500 us / (1000 ms * 1000)) * 100 % = 8.75 %