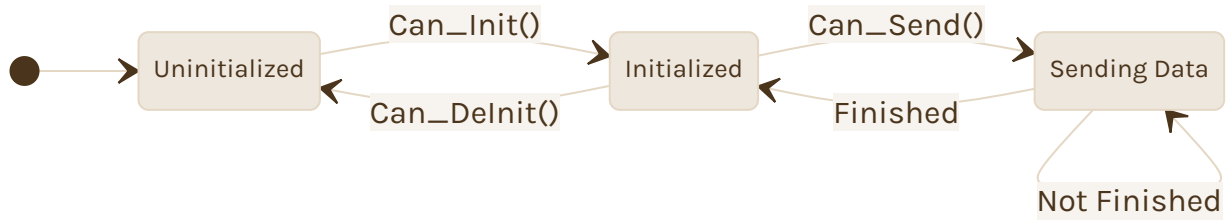
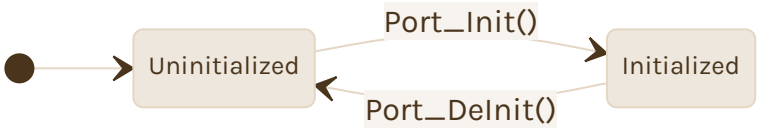
ECU1

1. FSM For Each Component

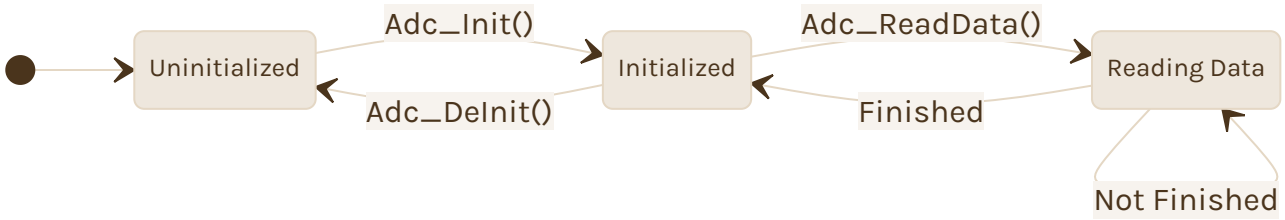
CAN



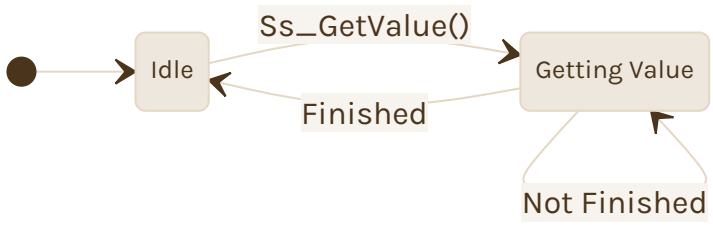
Port



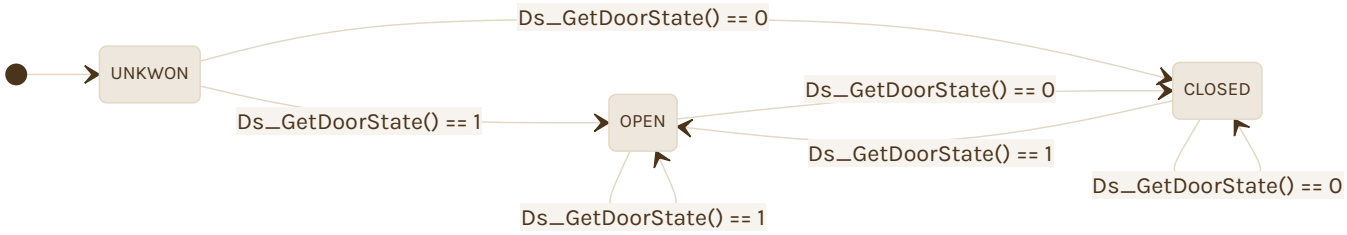
ADC



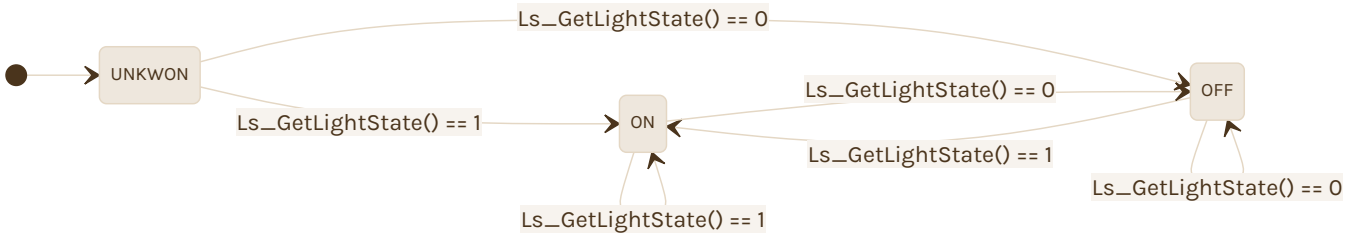
Speed Sensor



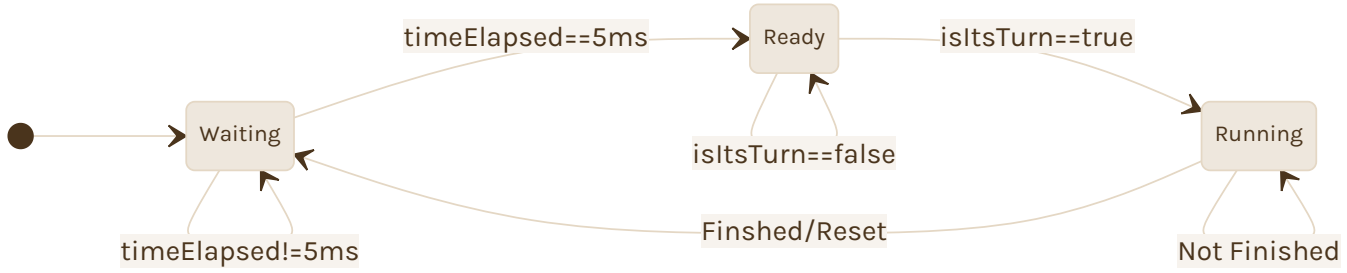
Door Sensor



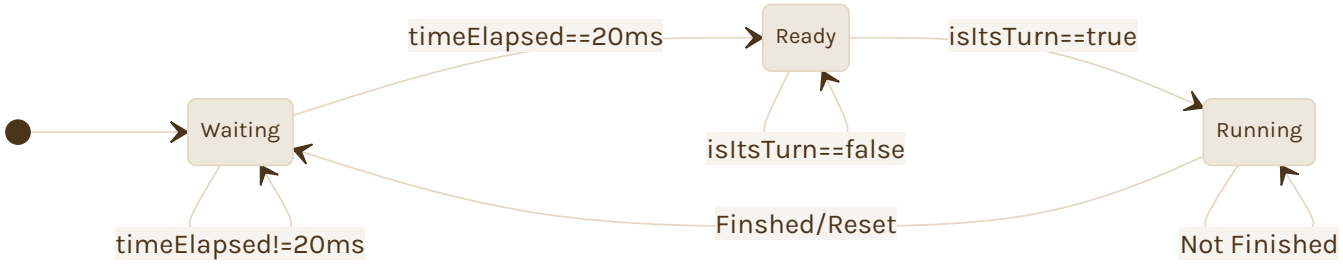
Light Sensor



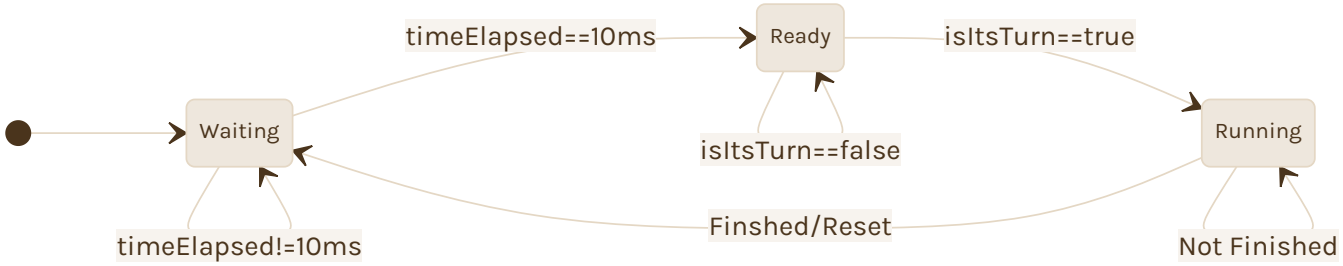
Speed Task



Light Task

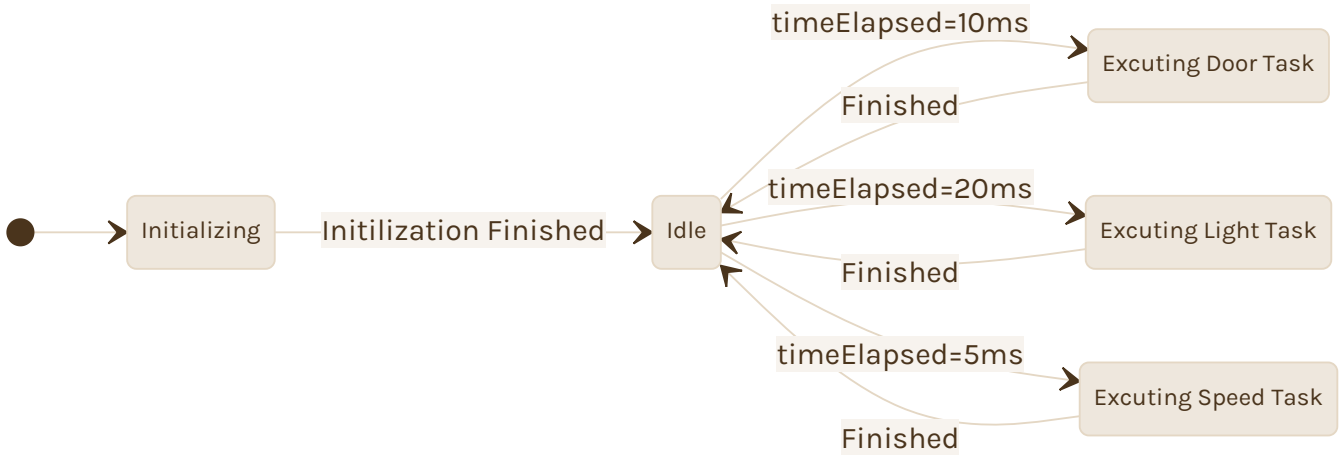


Door Task

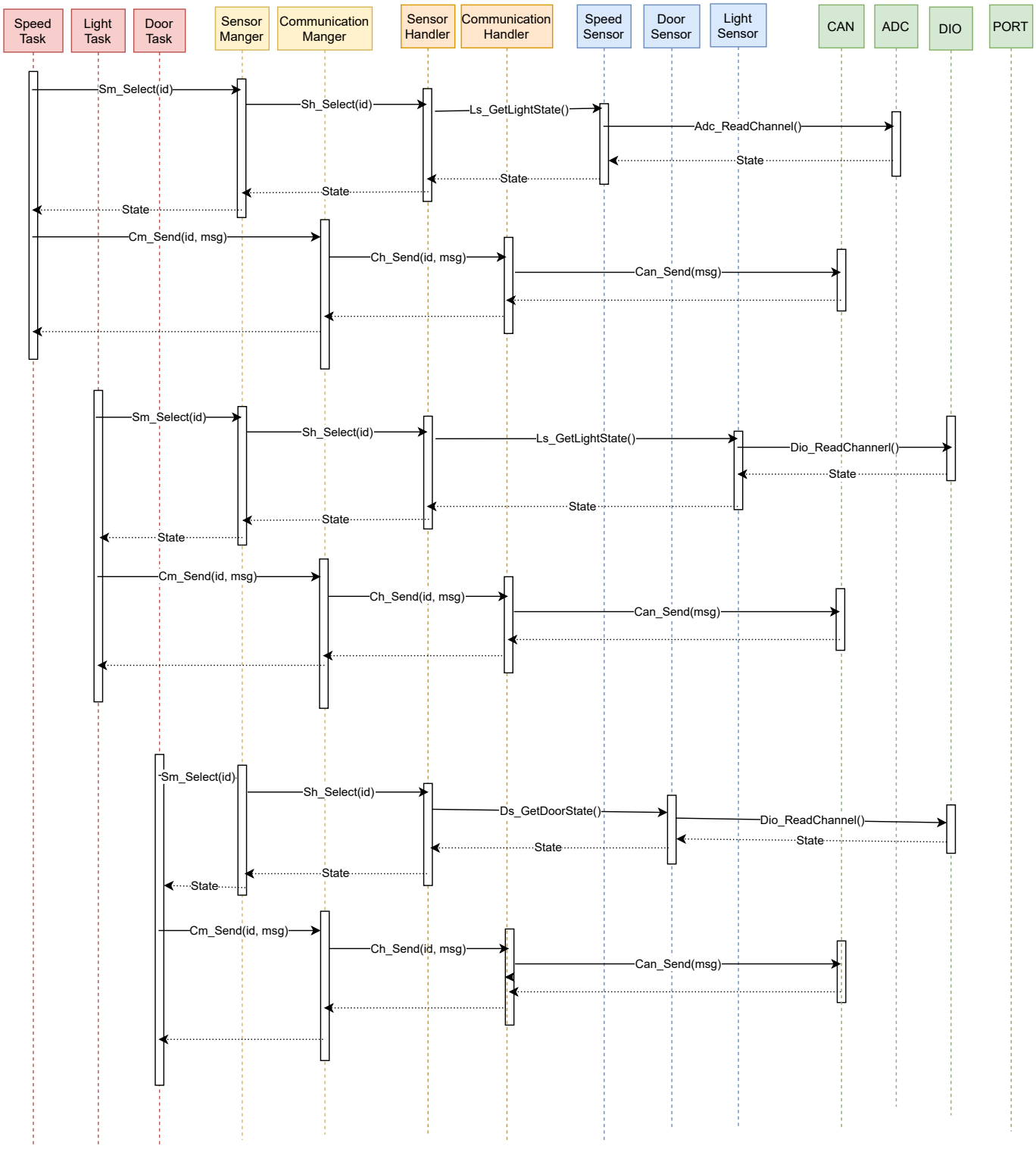


- IMPORTANT NOTE: Communication Manager, Handler and DIO modules are NOT finite state machines as they don't hold any internal data that affects their behavior. they only have functions (like in DIO: read and write to or from memory) That are purely dependent on the inputs only. they don't need to know any thing about the past so they don't really have any memory or state inside of them. It's analogous to Combinational logic and Sequential logic circuits. In this case These modules are "Combinational Logic".

2. FSM For ECU1



3. Sequence Diagram



4. CPU Load

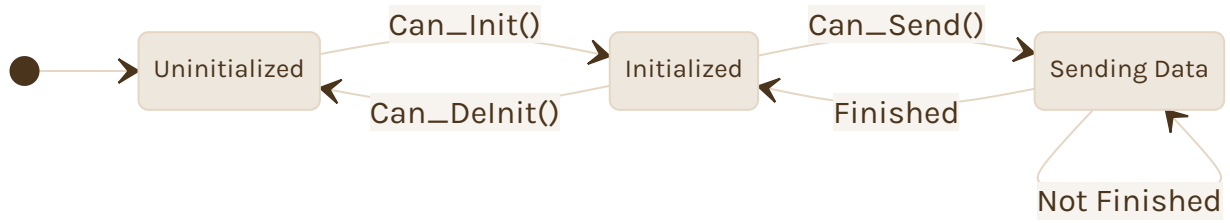
- assume all tasks execution time = 1ms

  $U = (E_1 + E_2 + E_3)/H = (1 * 1 + 1 * 2 + 1 * 4)/20) * 100 = 35\%$

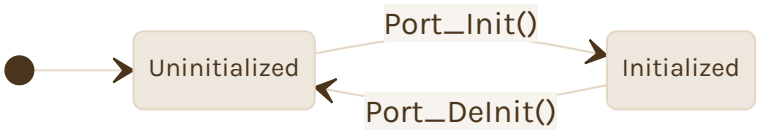
ECU2

1. FSM For Each Component

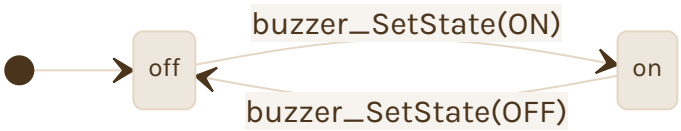
CAN



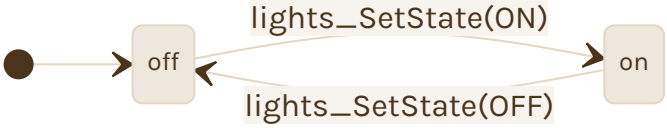
Port



Buzzer



Lights



- IMPORTANT NOTE: Communication Manager, Handler and DIO modules are NOT finite state machines as they don't hold any internal data that affects their behavior. they only have functions (like in DIO: read and write to or from memory) That are purely dependent on the inputs only. they don't need to know any thing about the past so they don't really have any memory or state inside of them. It's analogous to Combinational logic and Sequential logic circuits. In this case These modules are "Combinational Logic".

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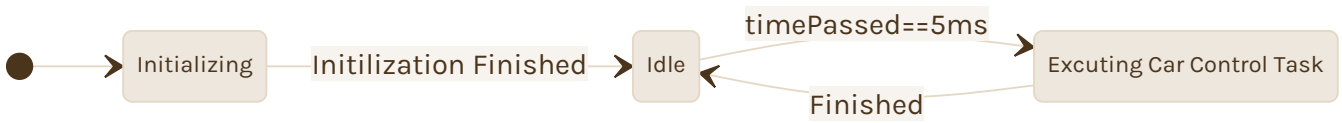
2. FSM For ECU2



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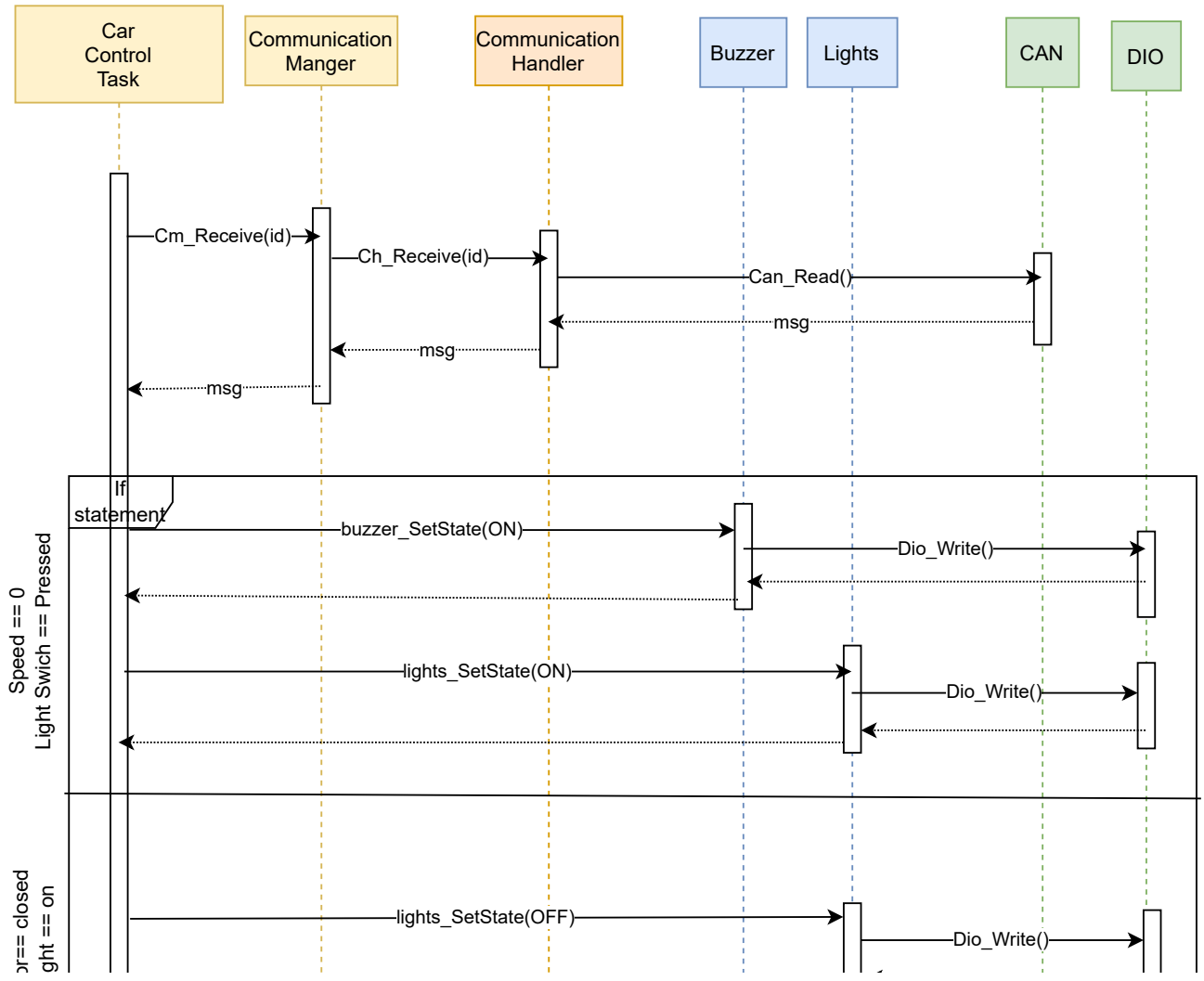
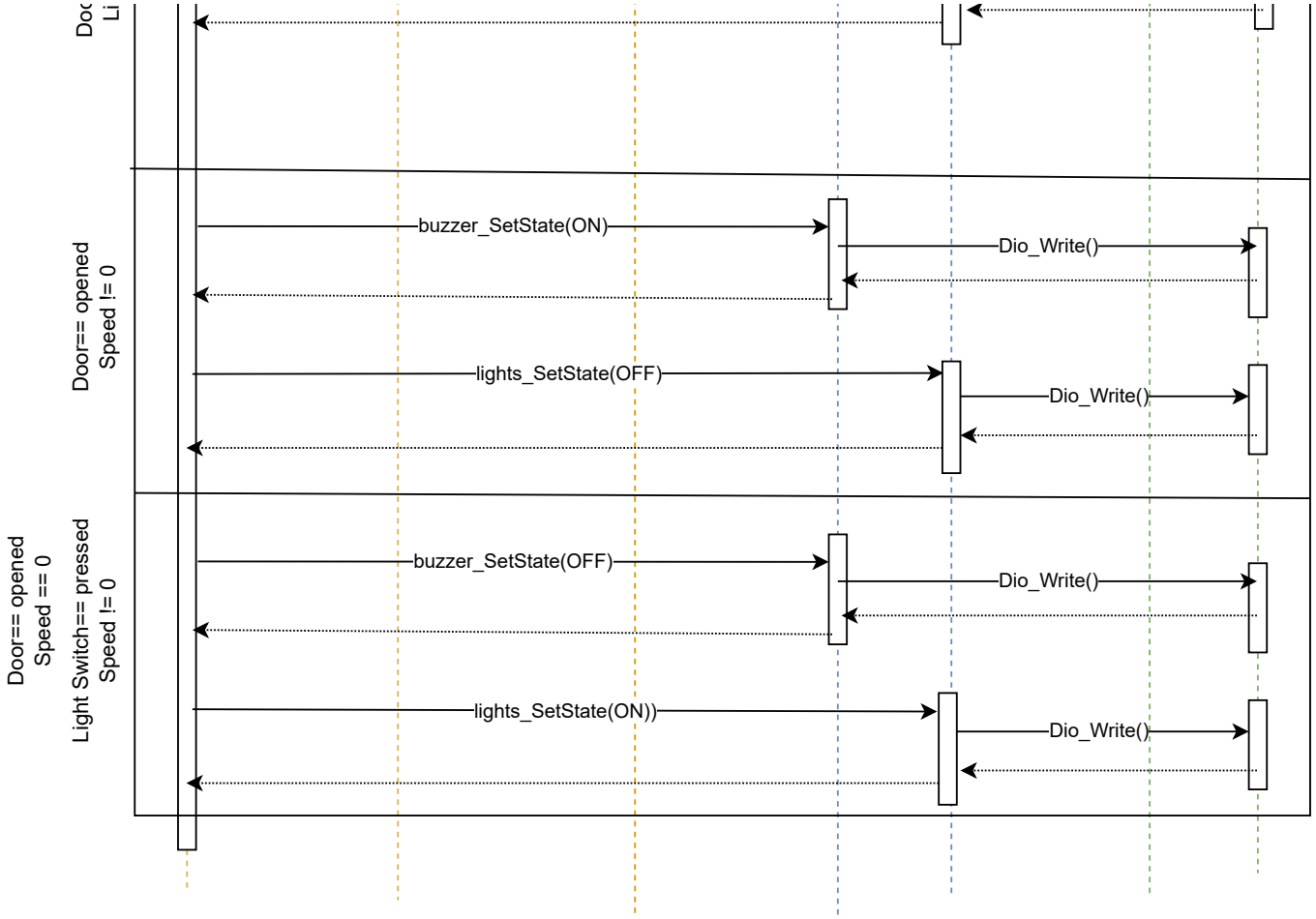
3. Sequence Diagram





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4. CPU Load

- assume all tasks execution time = 1ms

  $U = (E_1)/H = (1 * 1)/5 * 100 = 20\%$

Bus Load

Assume:

- Frame = 32bit
- bitrate = 100kBit/s

1. $t_{frame} = 32bit * \frac{1}{100kBit/s} = 320us$
2. $\#frames/sec = \frac{1000}{5} + \frac{1000}{10} + \frac{1000}{20} = 350$
3. $t_{bus} = 350 * 320us = 112000us = 0.112s$

$$BusLoad = 0.112 * 100 = 11.2\%$$