



Ministry of Communications
and Information Technology



Automotive Door Control System

Dynamic Design

Submitted by:

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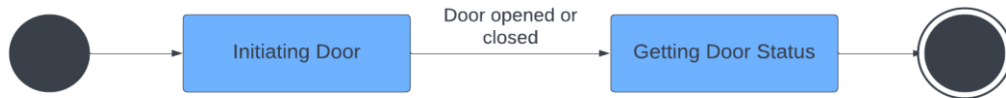
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Contents

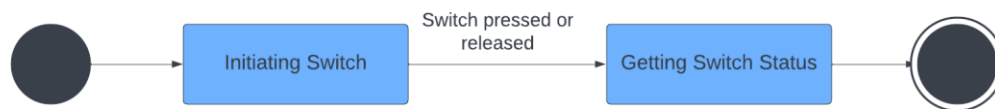
ECU Components State Machine Diagram	3
Door Sensor:	3
Light Switch:	3
Speed Sensor:	3
Right/Left Light:.....	3
Buzzer:	3
ECU Operation State Machine Diagram	4
ECU 1:.....	4
ECU 2:.....	5
ECU Sequence Diagram	6
ECU 1:.....	6
ECU 2:.....	7
ECU CPU Load	8
ECU 1:.....	8
ECU 2:.....	8
System Bus Load.....	9

ECU Components State Machine Diagram

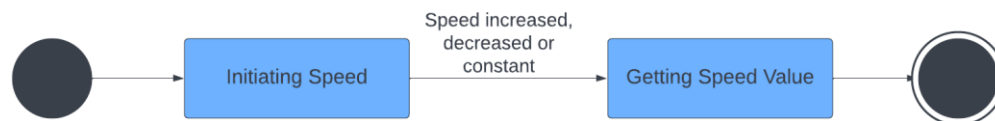
Door Sensor:



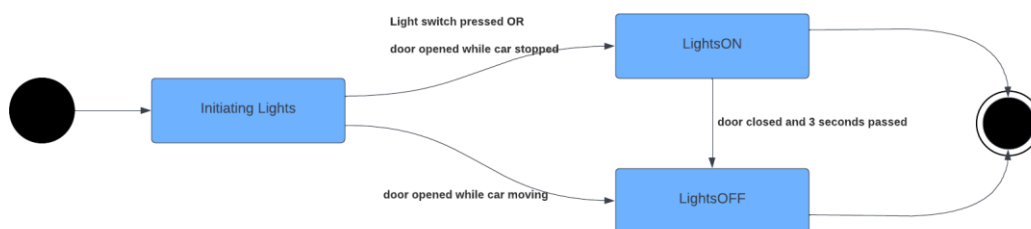
Light Switch:



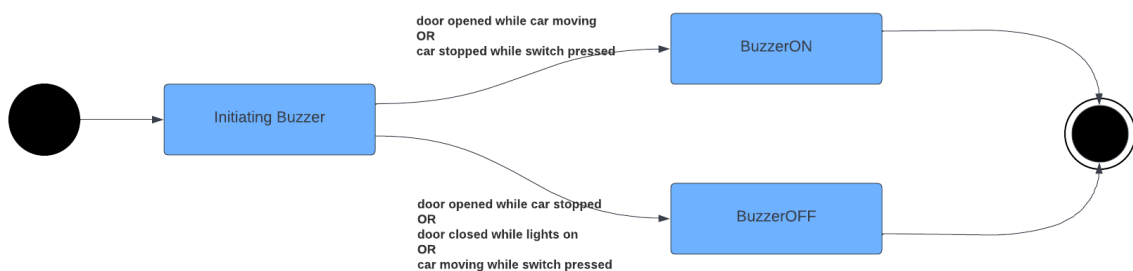
Speed Sensor:



Right/Left Light:

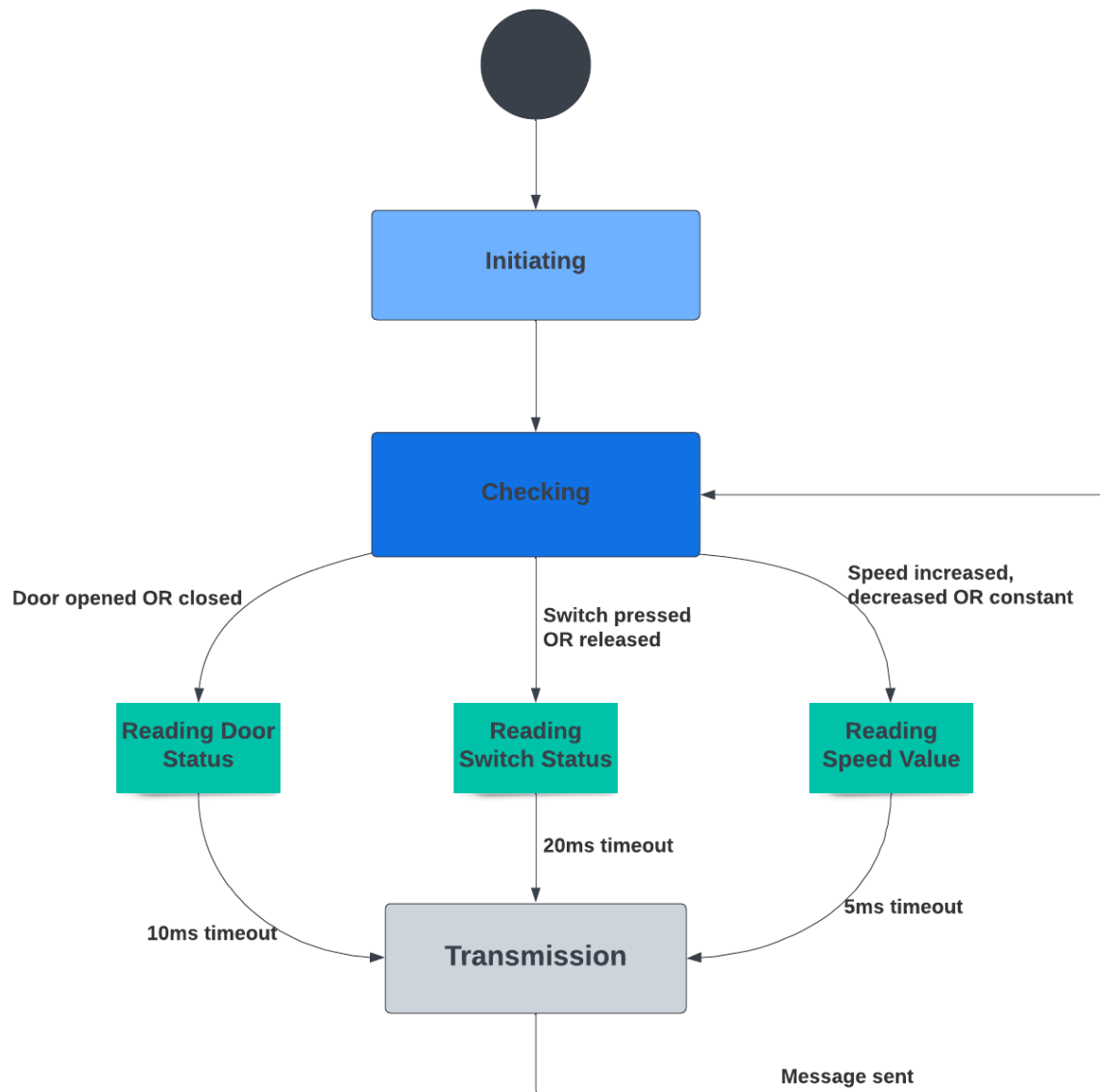


Buzzer:

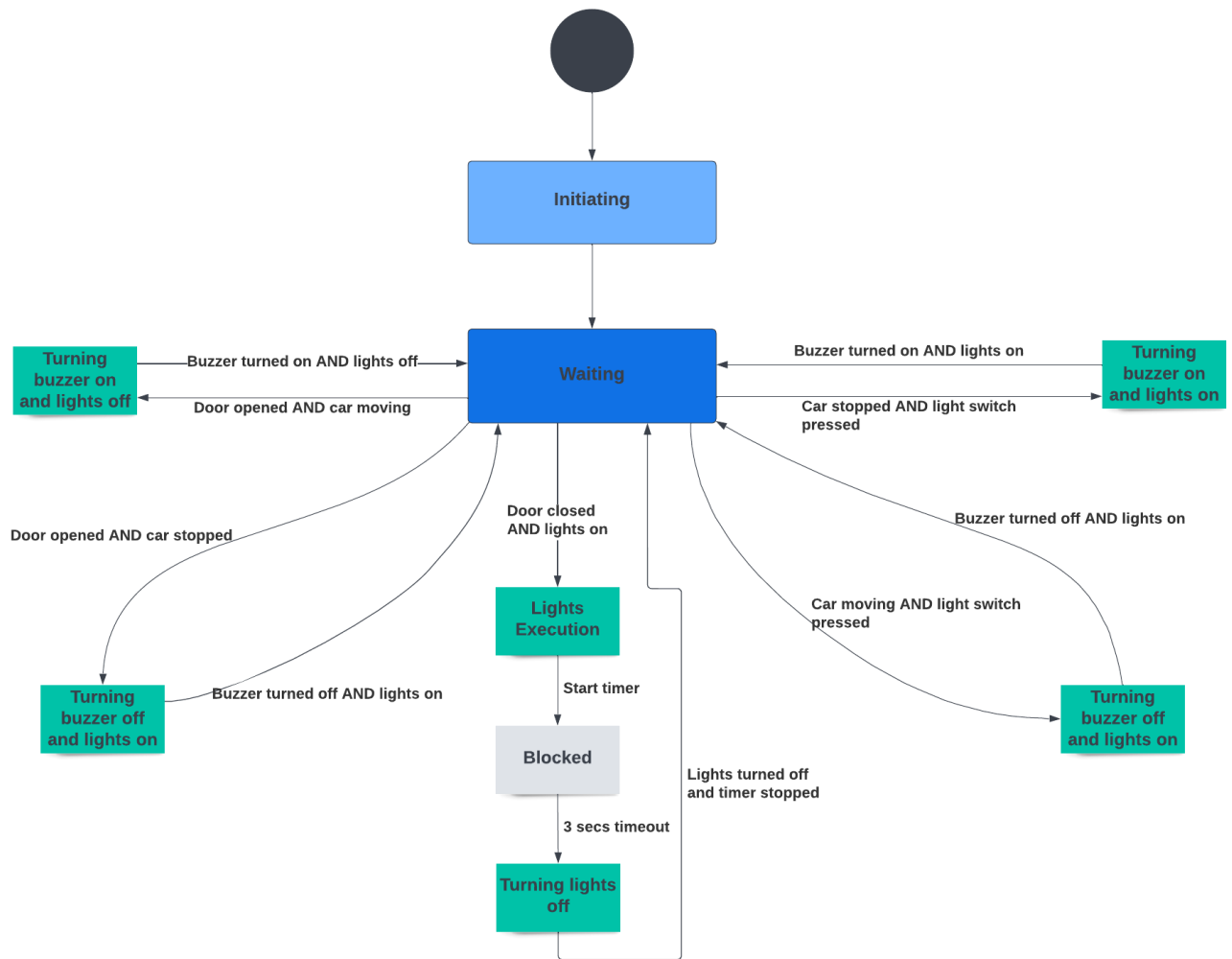


ECU Operation State Machine Diagram

ECU 1:

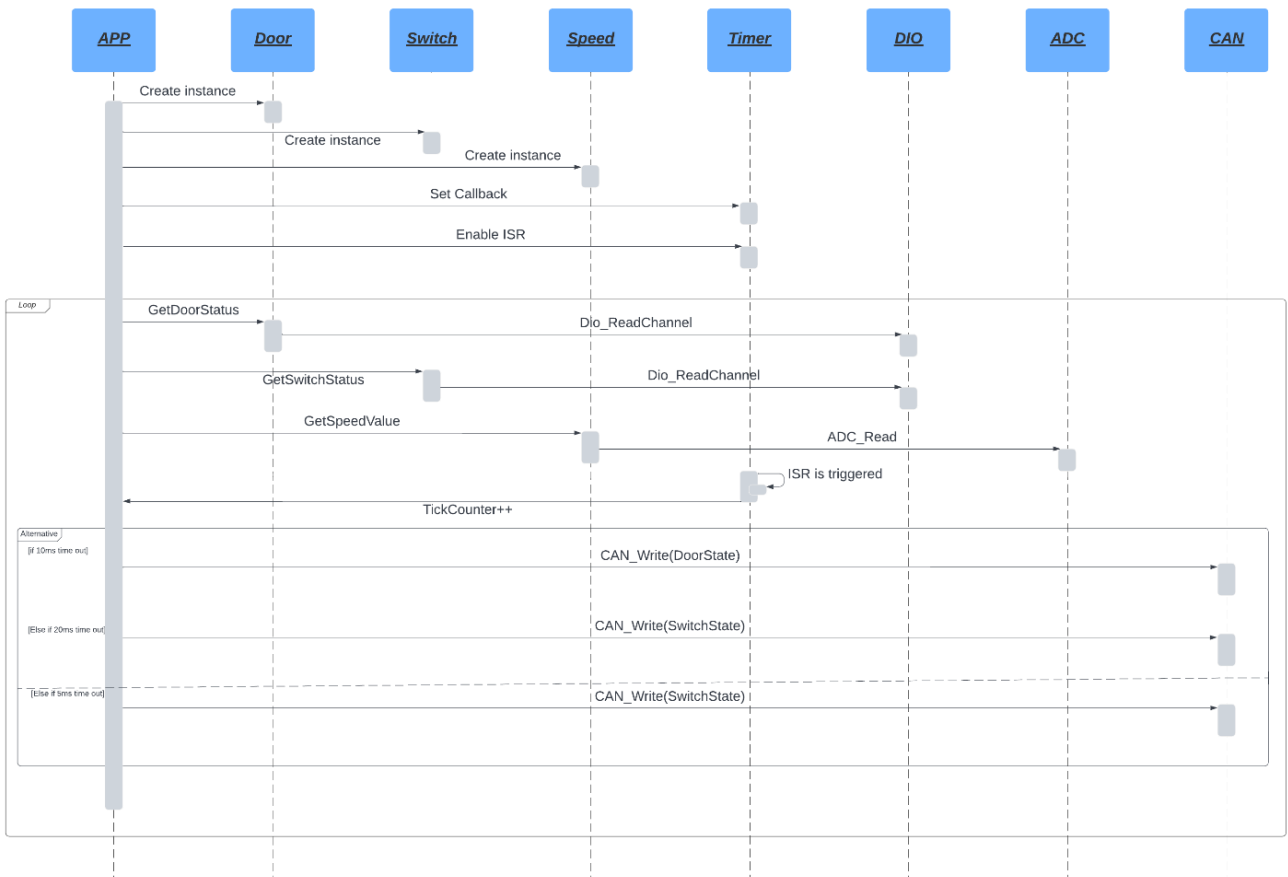


ECU 2:

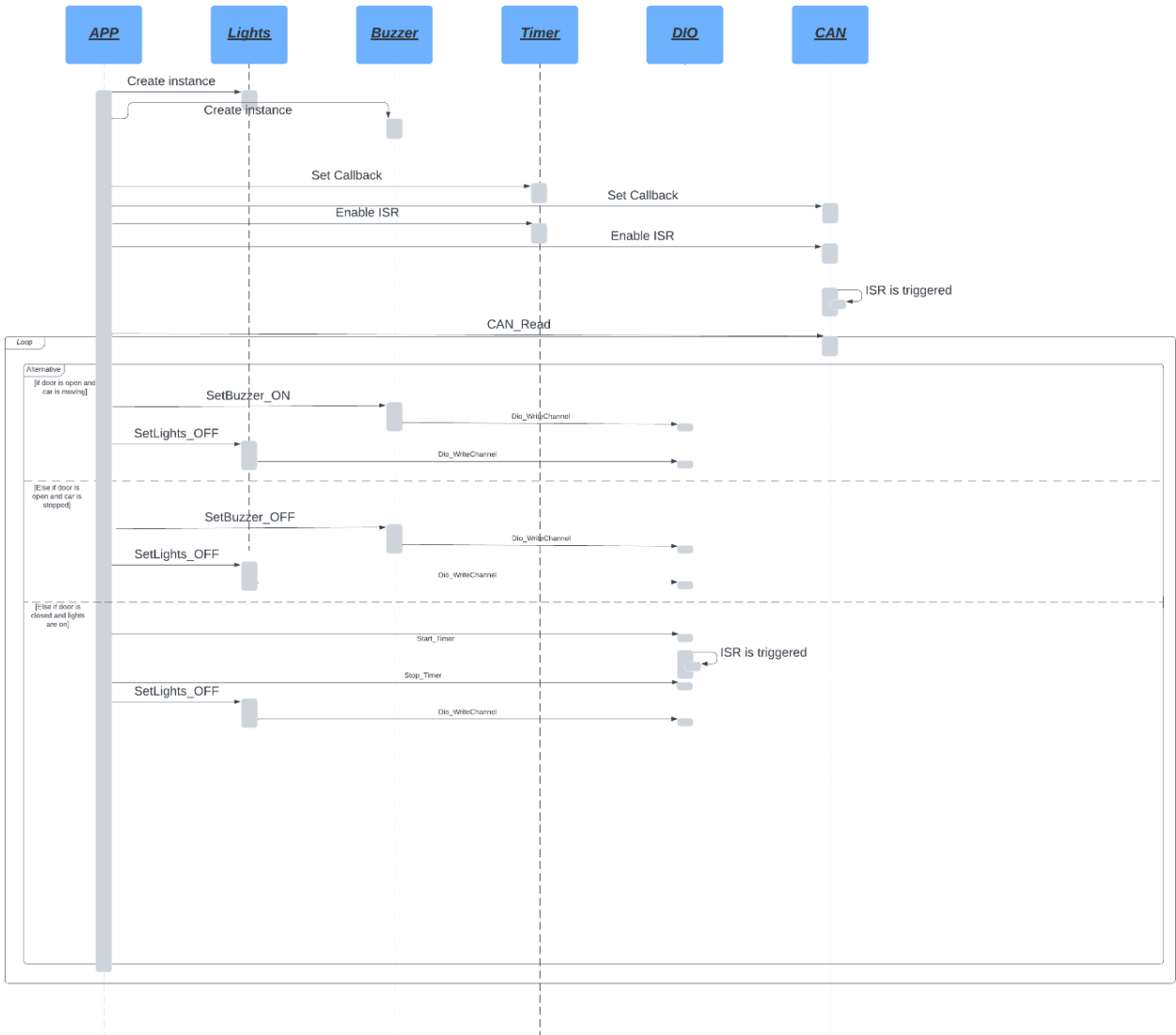


ECU Sequence Diagram

ECU 1:



ECU 2:



ECU CPU Load

ECU 1:

Assuming idle time is 65%.

$$\begin{aligned}\text{CPU Utilization} &= 100\% - \text{Idle Time} \\ &= 100\% - 65\% = 35\%\end{aligned}$$

ECU 2:

Assuming idle time is 45%.

$$\begin{aligned}\text{CPU Utilization} &= 100\% - \text{Idle Time} \\ &= 100\% - 45\% = 55\%\end{aligned}$$

System Bus Load

Assuming approximate time to transfer 1 CAN frame is 250 μ s.

Given that:

- Door state message will be sent every 10ms
- Light switch state message will be sent every 20ms
- Speed state message will be sent every 5ms

As we have multiple sending intervals on the bus as:

1 frame every 10 ms \rightarrow 100 frames every 1000 ms

1 frame every 20 ms \rightarrow 50 frames every 1000 ms

1 frame every 5 ms \rightarrow 200 frame every 1000 ms

This is in total: 350 frames every 1000 ms

Total time on bus is: 350 * 250 μ s

Bus load = $((350 * 250) / (1000 * 1000)) * 100 \% = 8.75 \%$

Reference:

https://support.vector.com/kb?id=kb_article_view&sysparm_article=KB0012332&sys_kb_id=99354e281b2614148e9a535c2e4bcb6d&spa=1