Embedded Systems Advanced Nano-Degree
Embedded Software Design

Automotive Door Control System Design

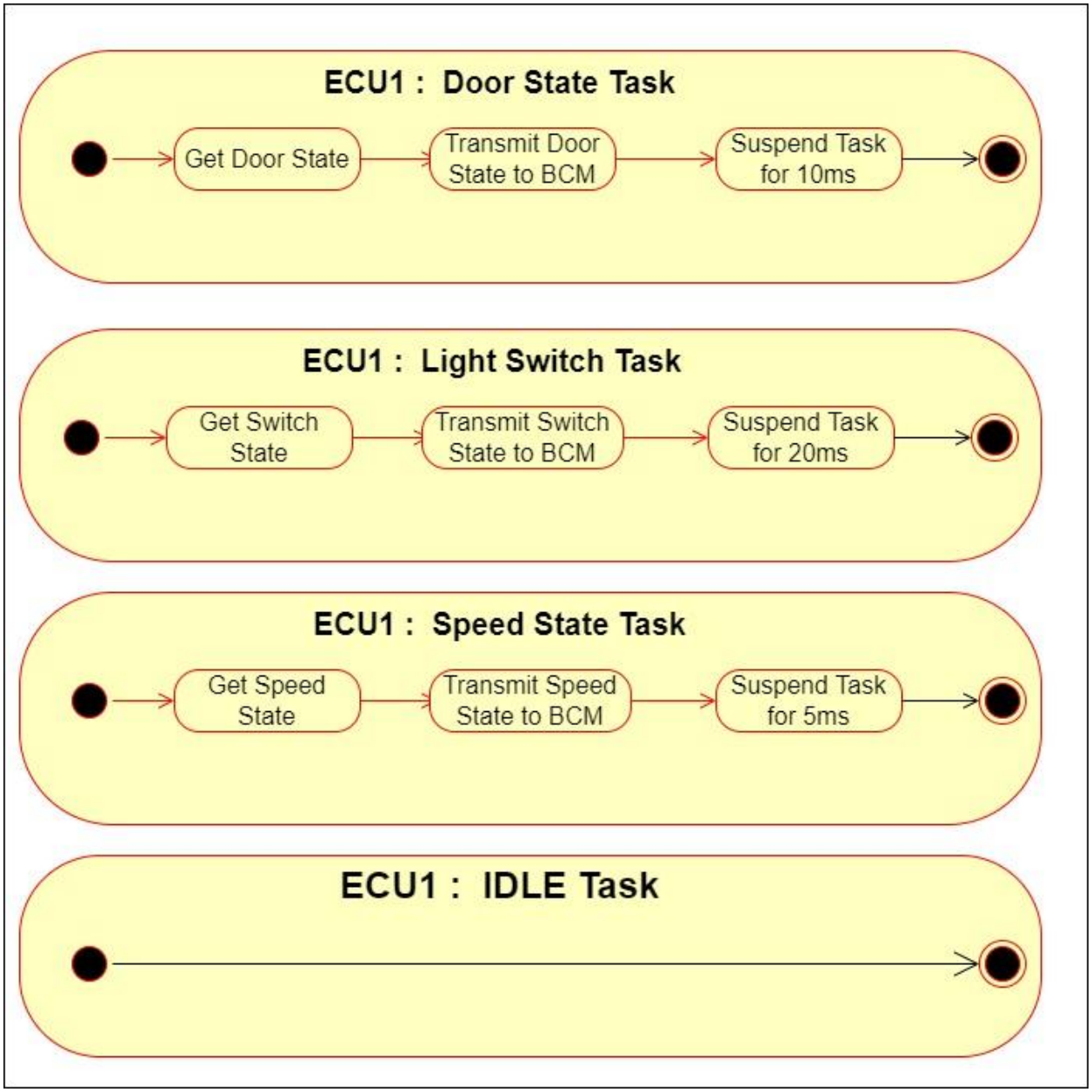
Dynamic Design

Ahmad Aladdin Tohamy

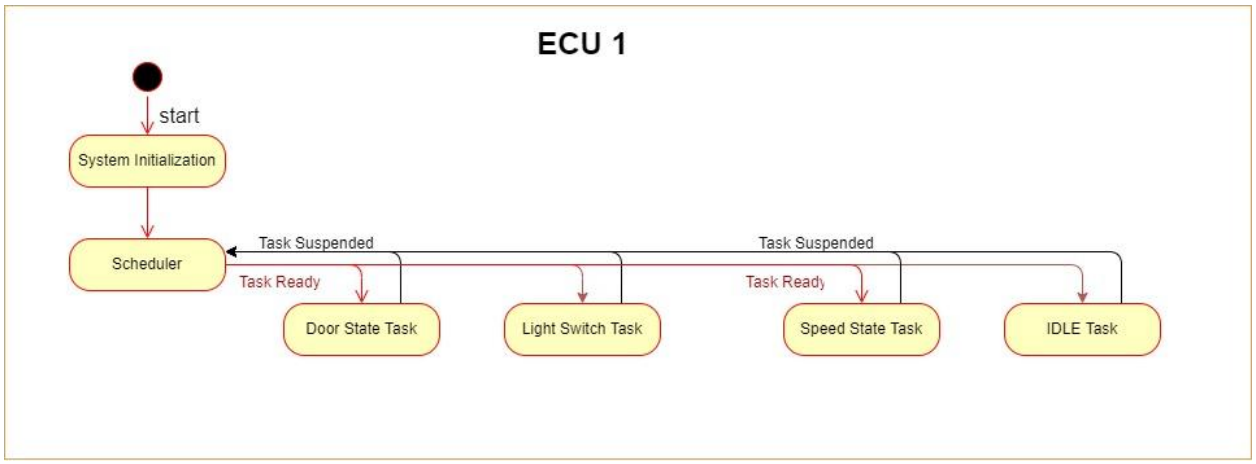
tuhami.10.8@gmail.com
July Cohort 2022

ECU 1

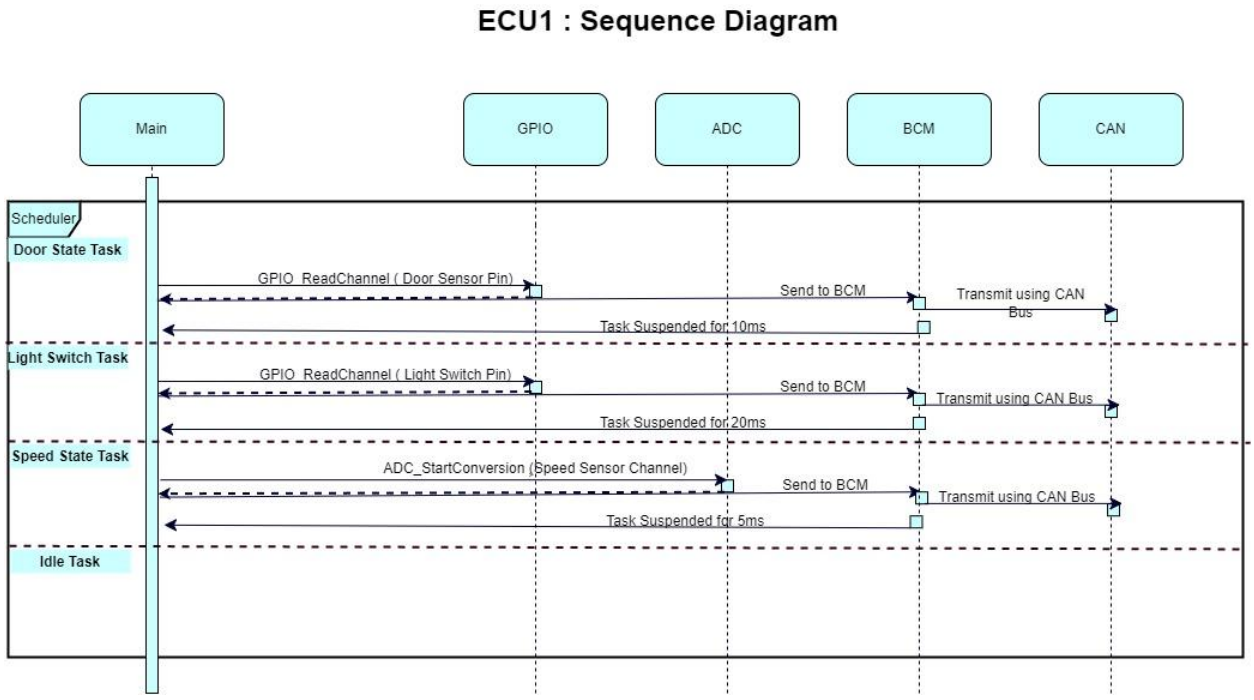
State Machine for each component



State Machine for ECU operation



ECU1 Sequence Diagram



CPU Load

Assuming that each task shall not consume more than 1ms of processor time
Knowing that

Task	Deadline	Occurrence During Hyperperiod
Door State	10 ms	2
Light Switch	20 ms	1
Speed State	5 ms	4

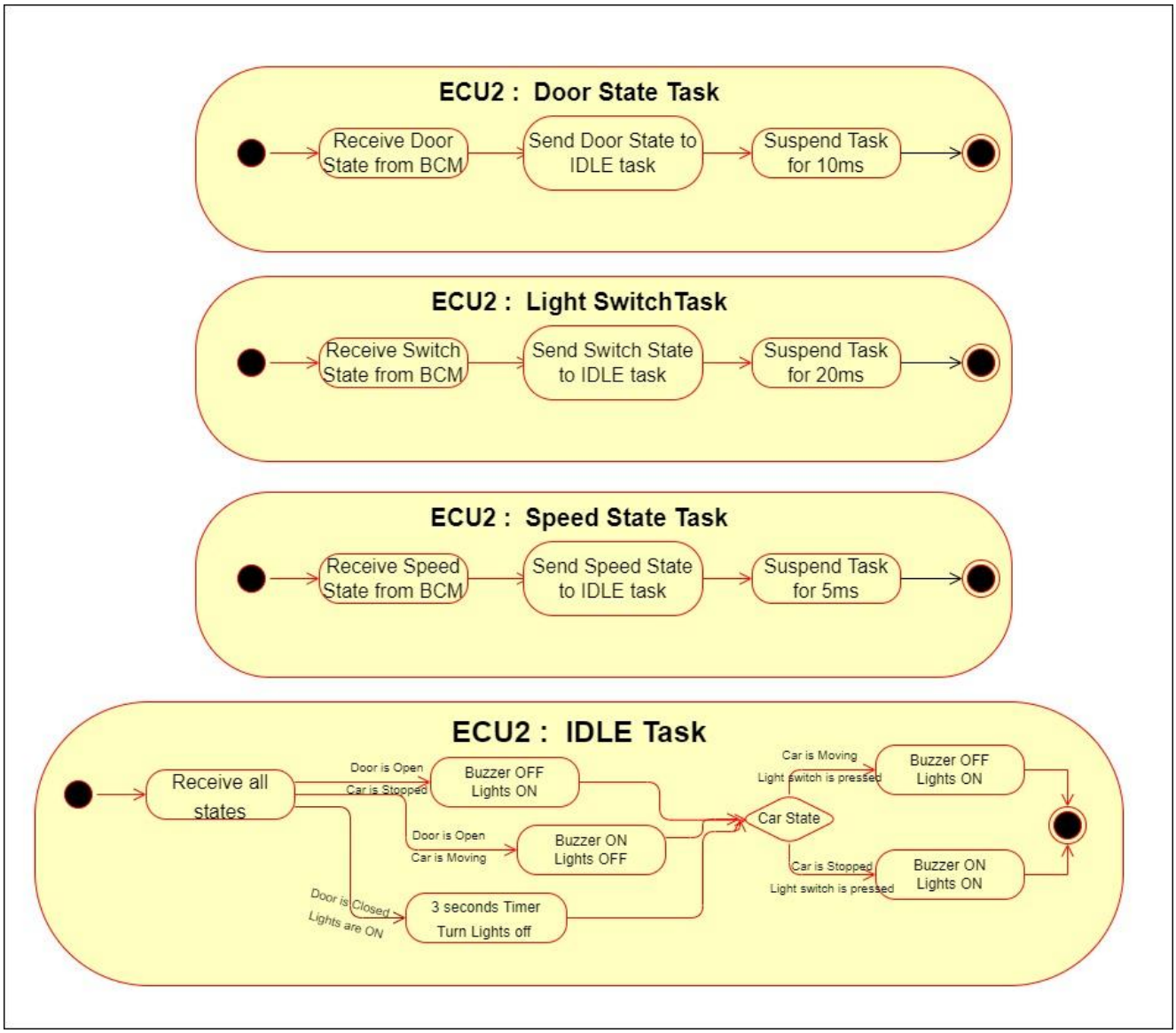
Utilization = Total Execution Time During Hyperperiod / Hyperperiod

$$U = \frac{(1m*2)+(1m*1)+(1m*4)}{20m} \times 100\% = 35\%$$

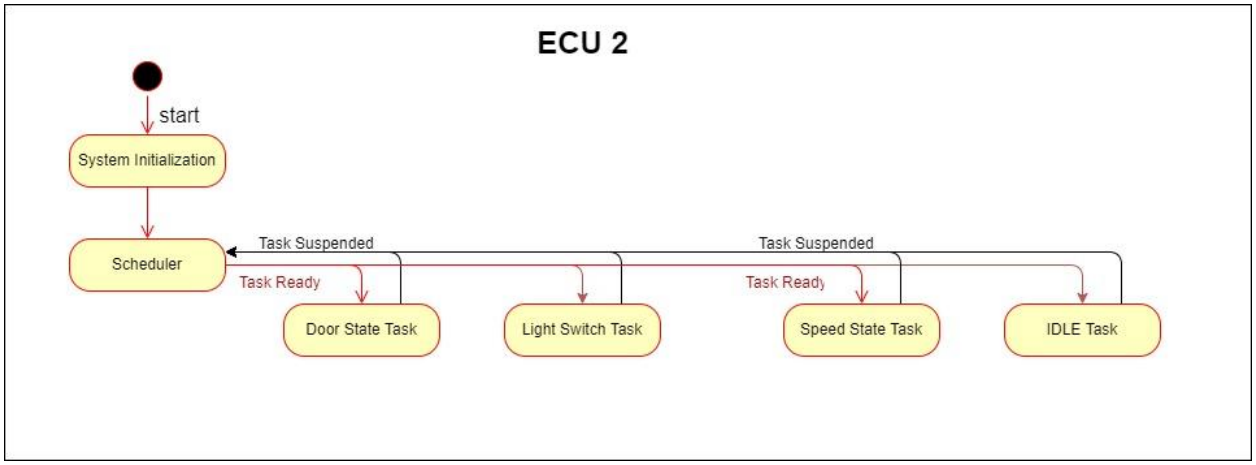
There for CPU load shall never exceed 35%

ECU 2

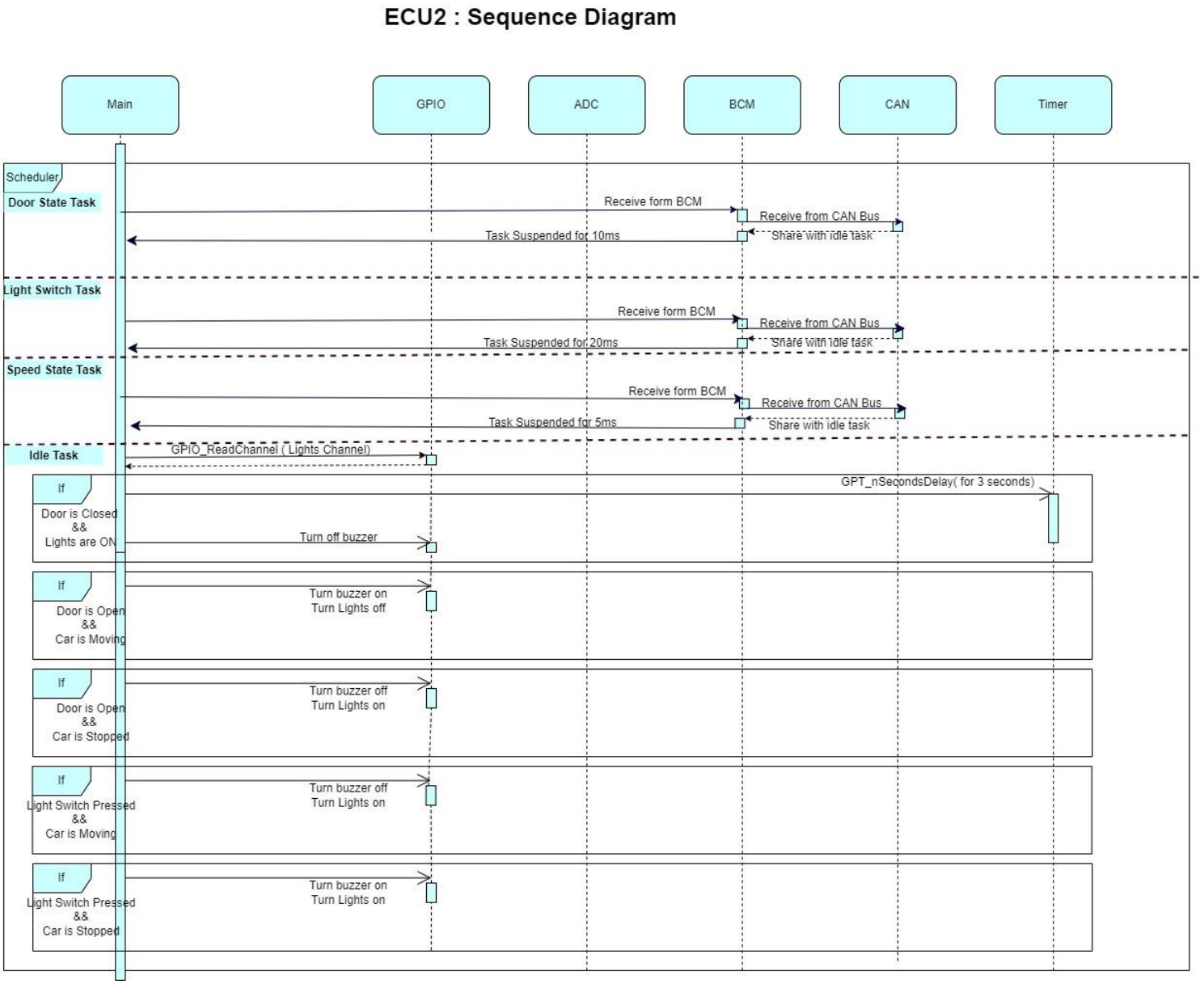
State Machine for each component



State Machine for ECU operation



ECU2 Sequence Diagram



CPU Load

Assuming that each task shall not consume more than 1ms of processor time
Knowing that

Task	Deadline	Occurrence During Hyperperiod
Door State	10 ms	2
Light Switch	20 ms	1
Speed State	5 ms	4

Utilization = Total Execution Time During Hyperperiod / Hyperperiod

$$U = \frac{(1m*2)+(1m*1)+(1m*4)}{20m} \times 100\% = 35\%$$

There for CPU load shall never exceed 35%