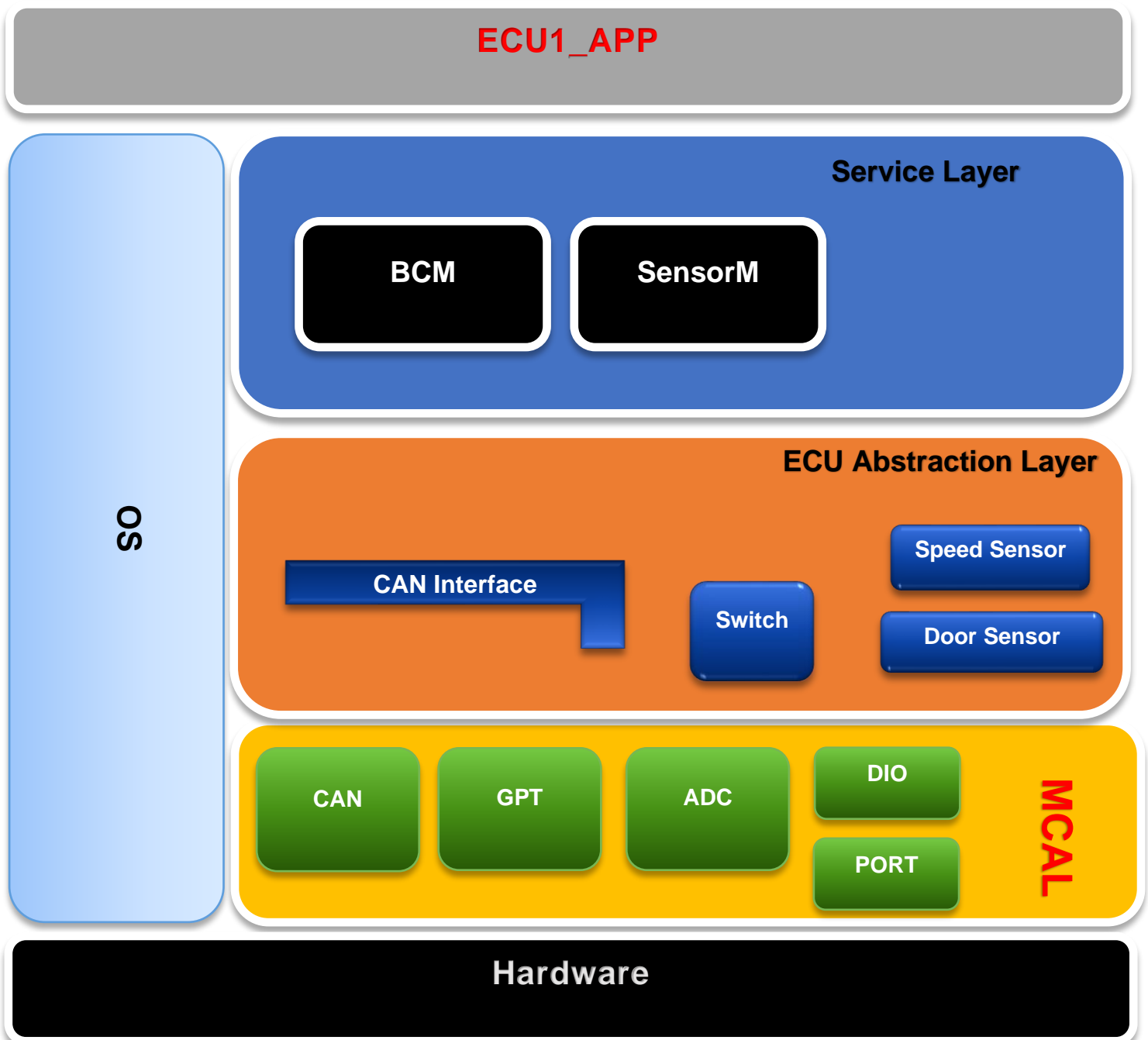
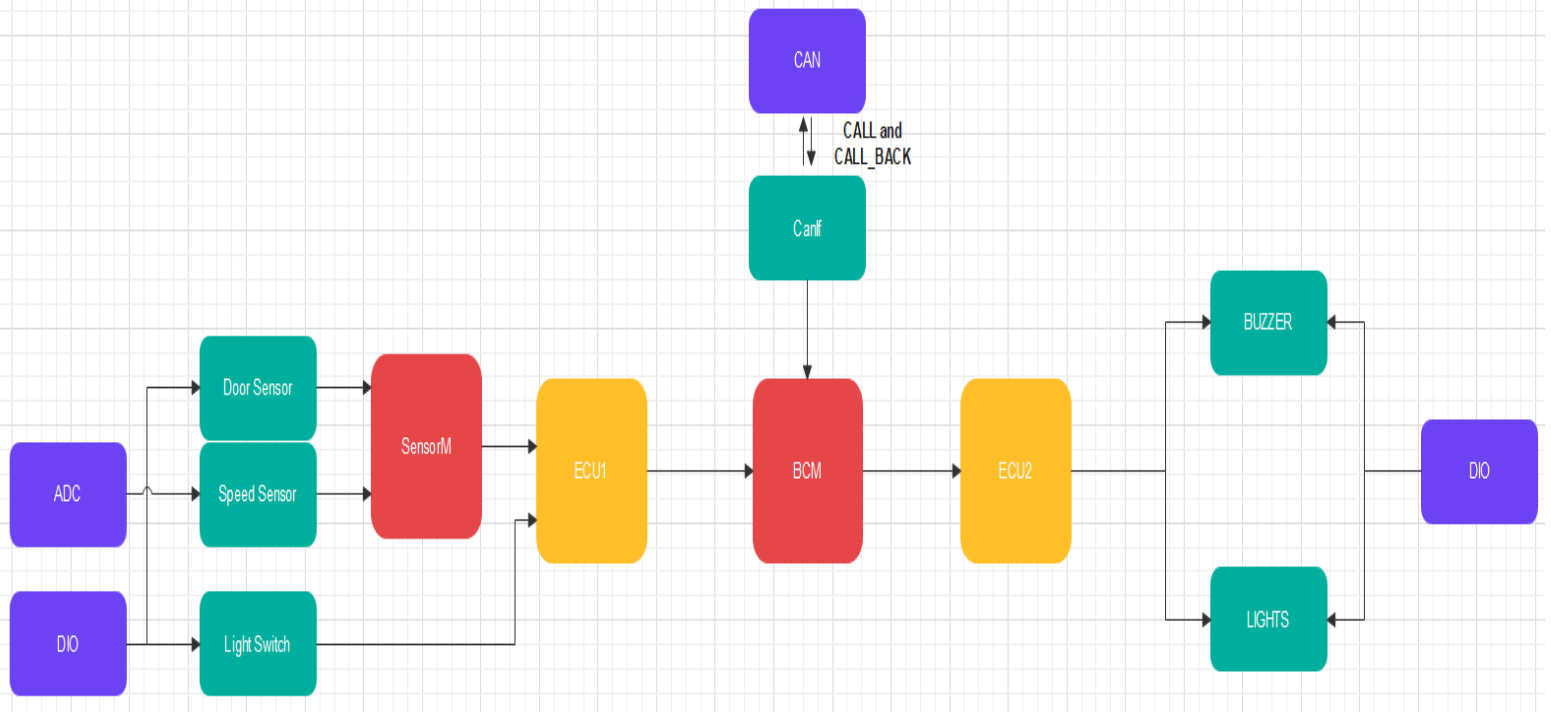


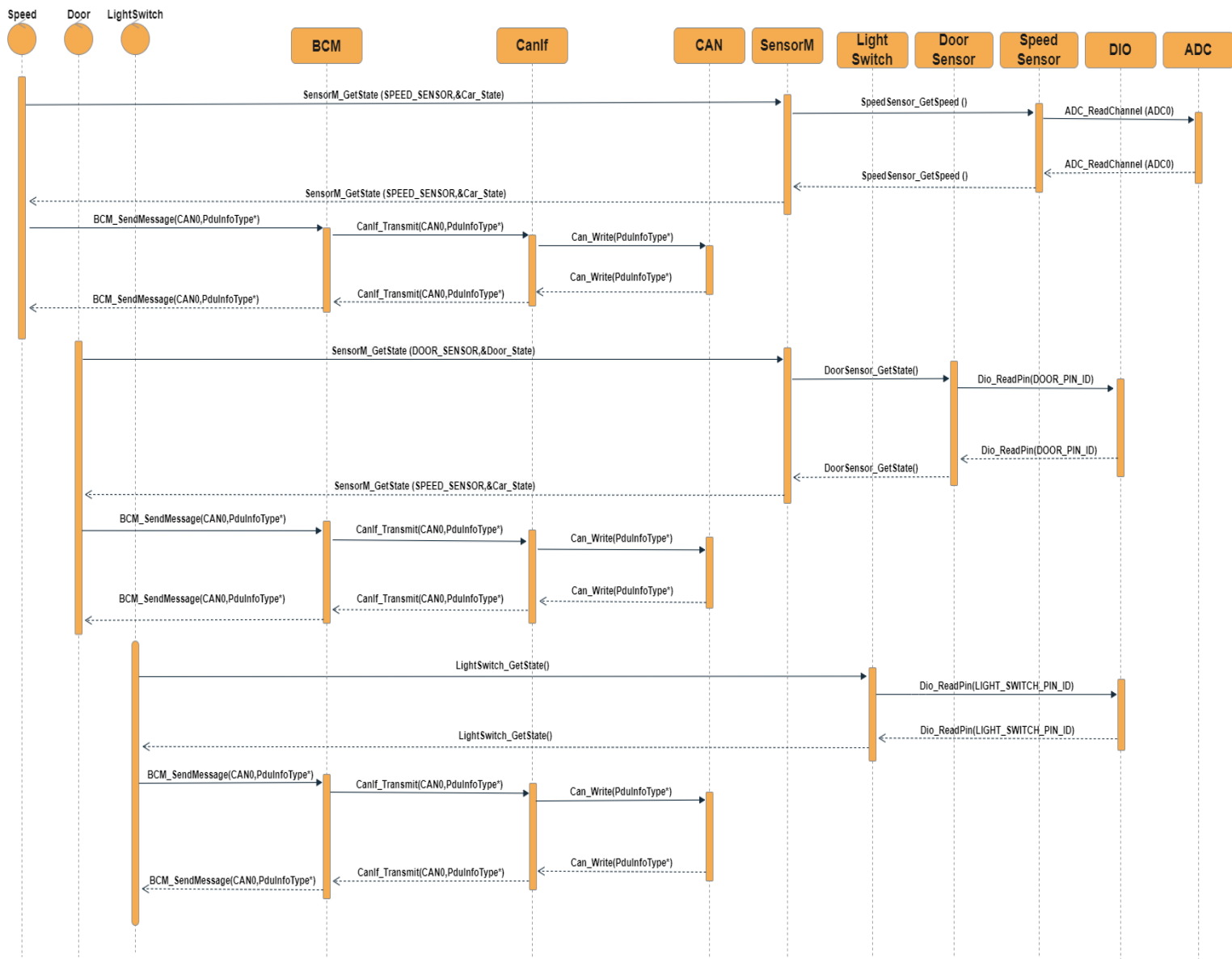
ECU_1 LAYERED ARCHITECTURE



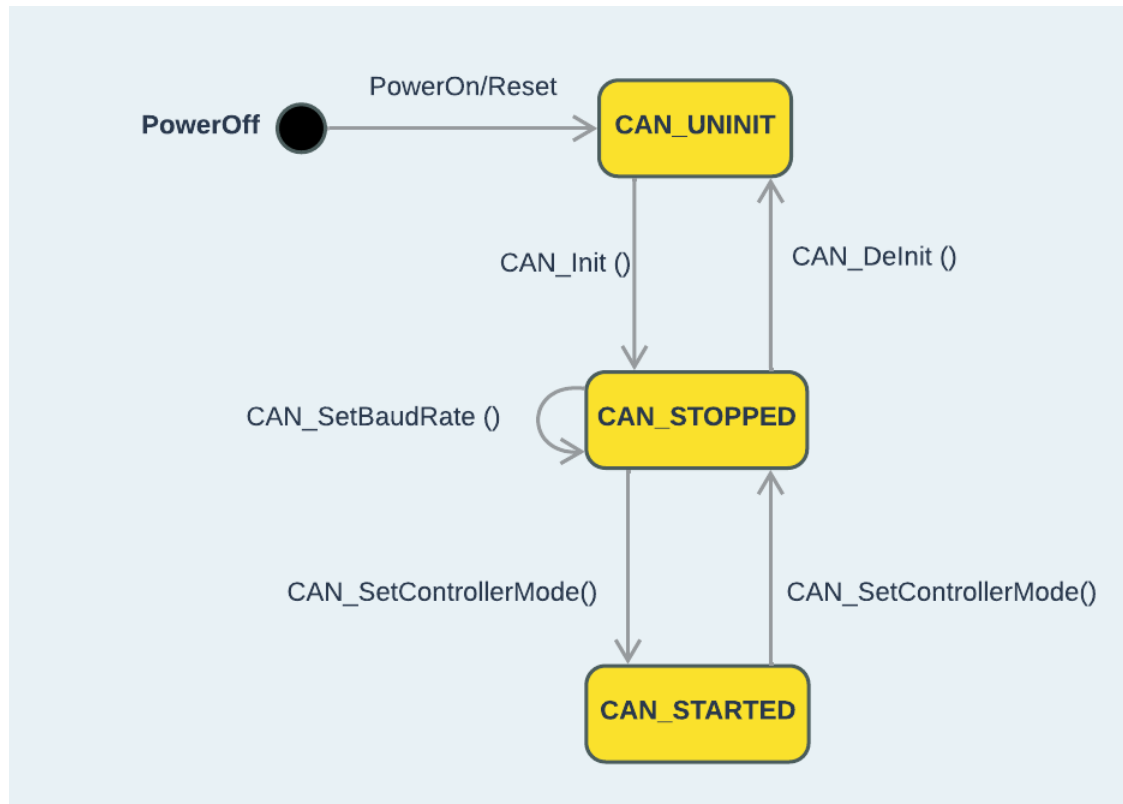
SYSTEM BLOCK DIAGRAM



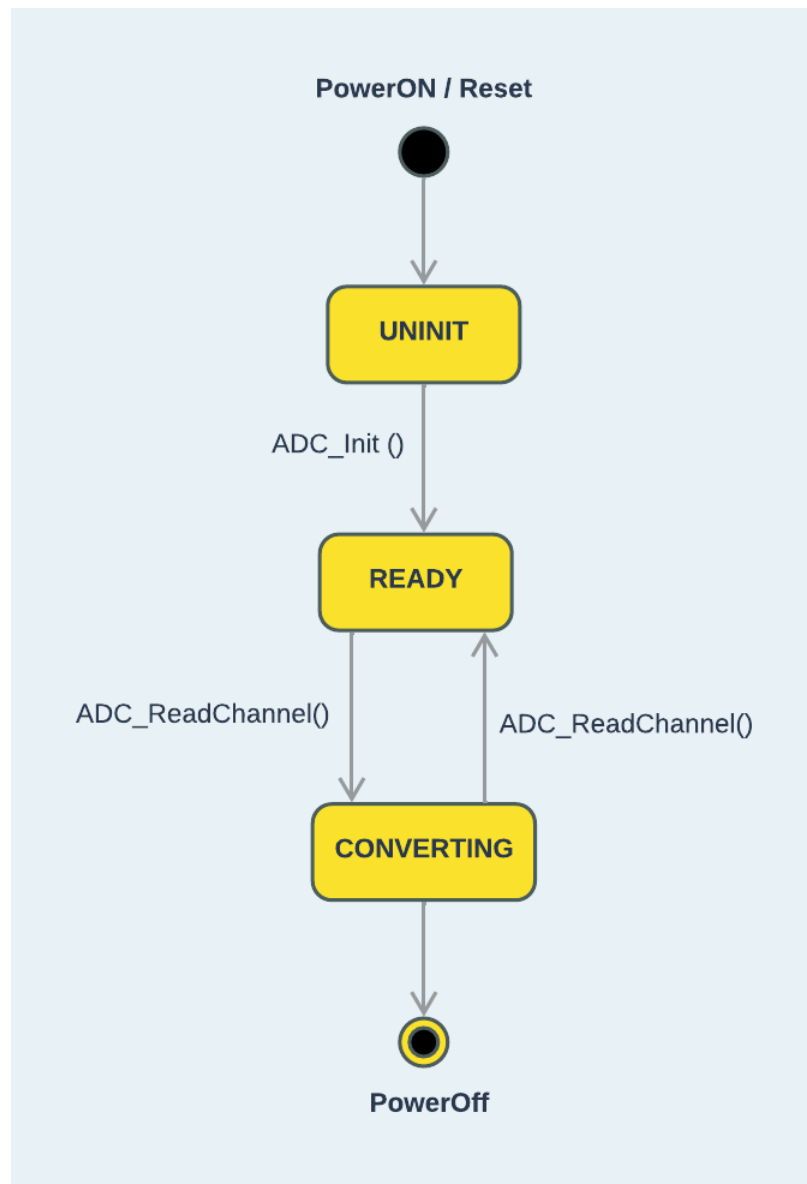
ECU1 SEQUENCE DIAGRAM



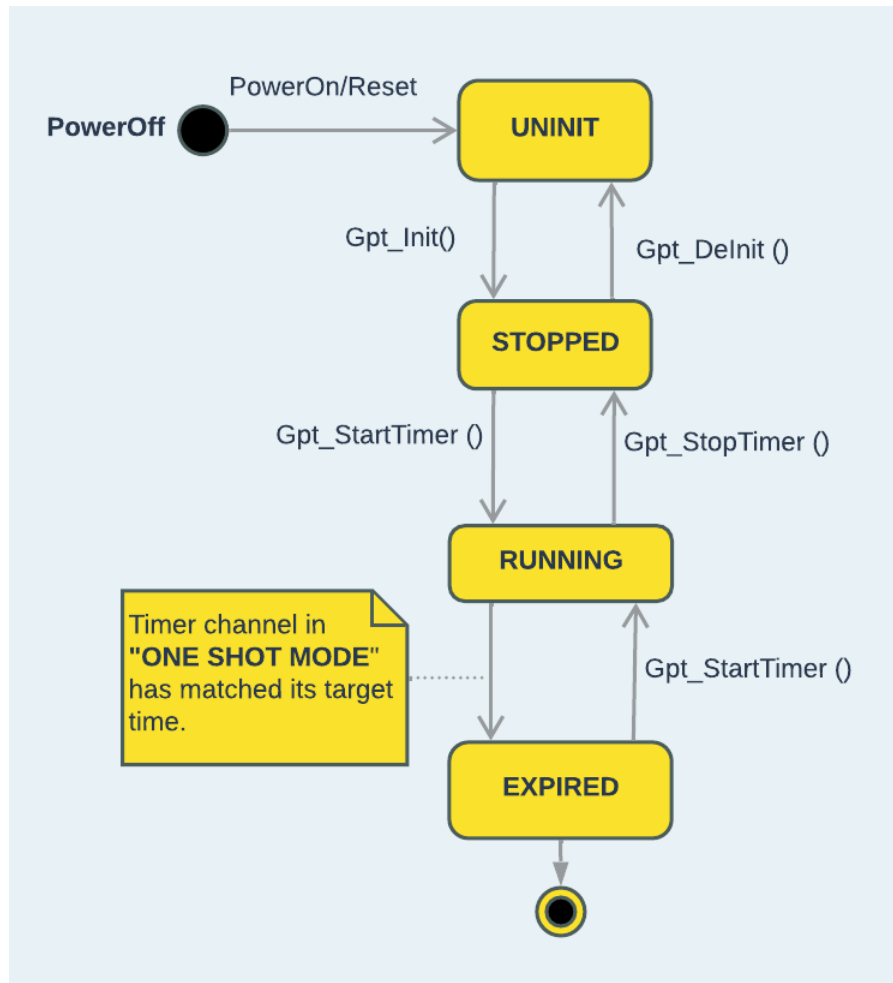
CAN STATE MACHINE



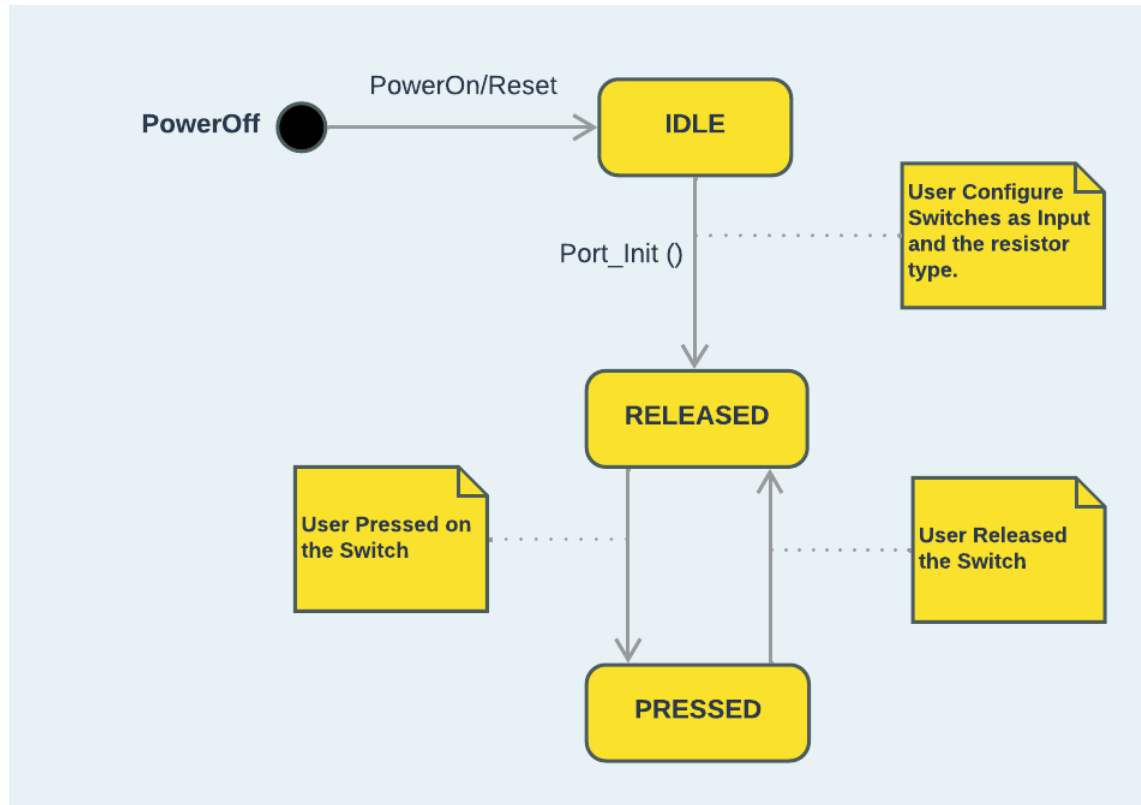
ADC STATE MACHINE



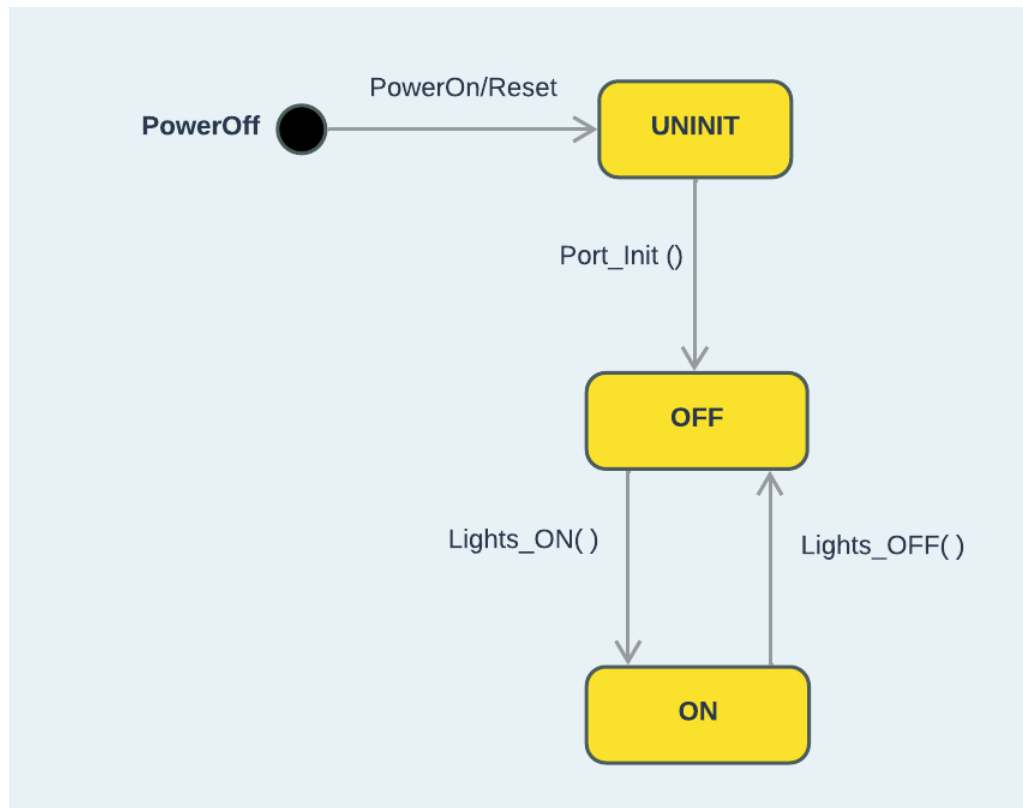
GPT STATE MACHINE



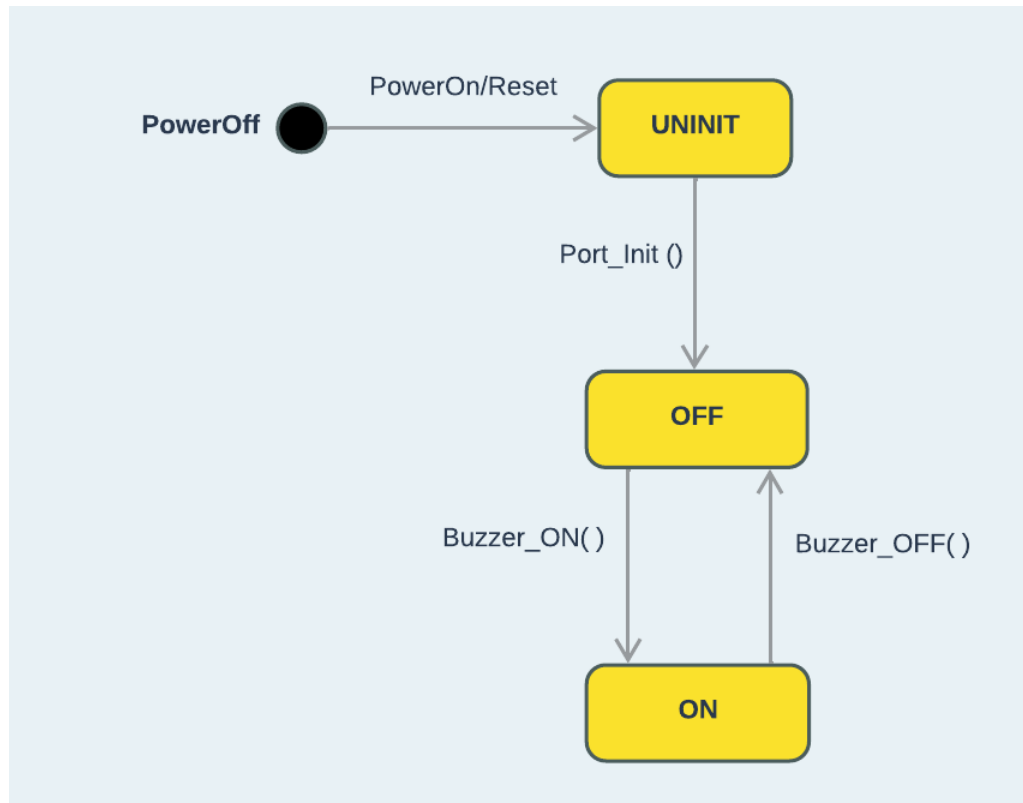
LIGHT SWITCH STATE MACHINE



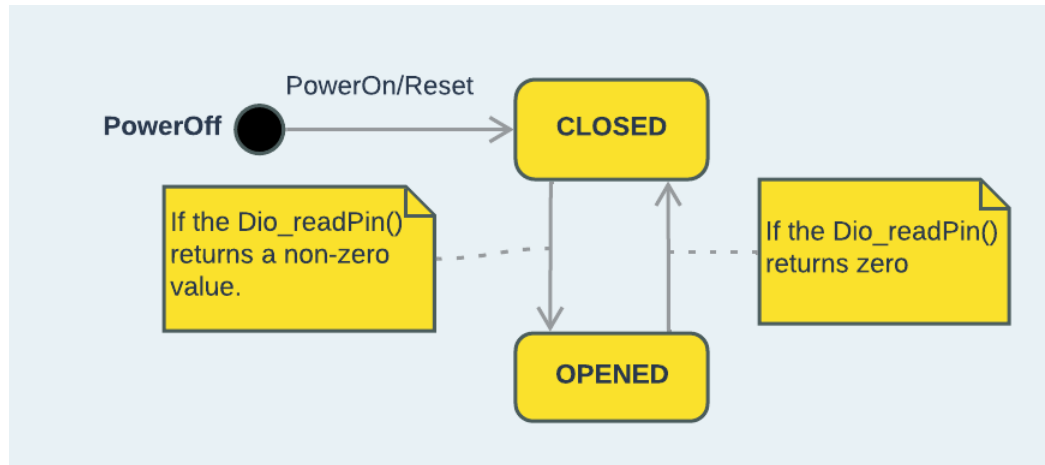
LIGHTS COMPONENT STATE MACHINE



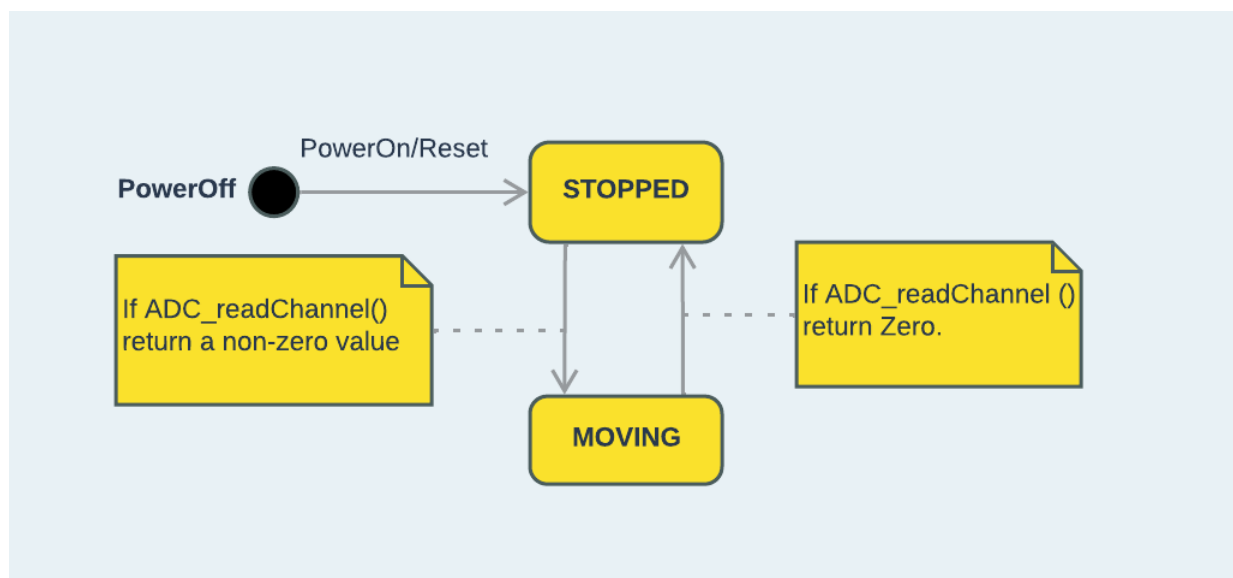
BUZZER STATE MACHINE



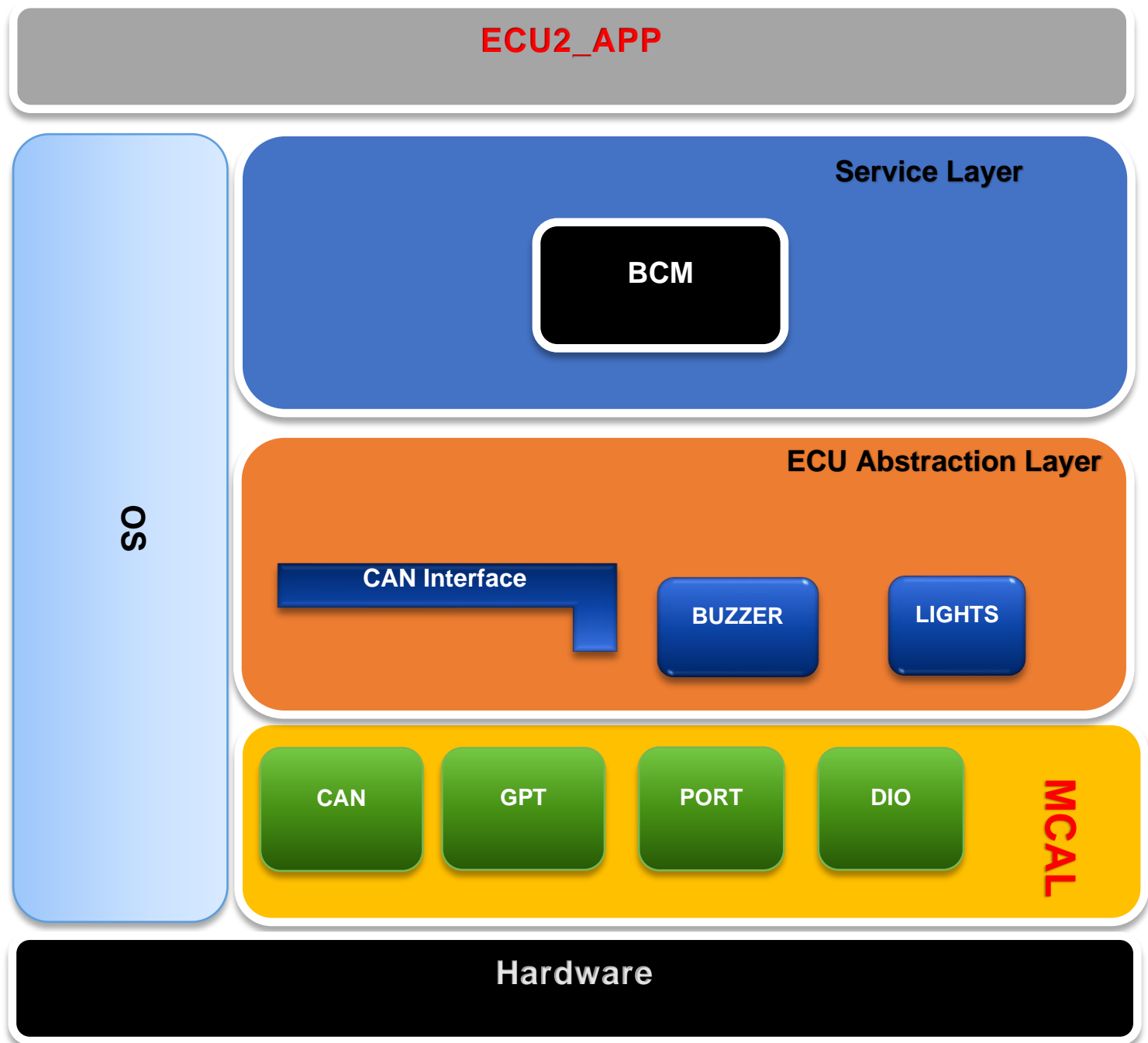
DOOR SENSOR STATE MACHINE



SPEED SENSOR STATE MACHINE



ECU_2 LAYERED ARCHITECTURE



CALCULATION OF BUS LOAD

- **Bus Load** = $\frac{\text{Total number of bits transferred per second}}{\text{Baudrate}} * 100\%$ (1)
- CAN Frame Size = 56 Bits
- Baud-rate = 1Mbits/sec
- Total number of transferred bits = Number of frames transferred in second * CAN Frame Size , (2)
- For Task1 (Speed):
 - Period = 5Ms.
 - Number of Transferred frame = 1000 msec / 5 msec = 200 frames.
- For Task2 (Door):
 - Period = 10Ms.
 - Number of Transferred frame = 1000 msec / 10 msec = 100 frames.
- For Task3 (Light Switch):
 - Period = 20 Ms.
 - Number of Transferred frame = 1000 msec / 20 msec = 50 frames.
- Total number of frames per second = 200+100+50 = 350 frames
- Substitute in equ(2):
 - Total number of transferred bits = 350 * 56 = 19600 Bits/Sec , (3)
- Substitute in equ(1):
 - **Bus load** = $\frac{19600}{1000000} * 100\% \approx 2\%$

CALCULATING CPU LOAD

- For Task1 (Speed):
 - Period = 5Ms.
 - Execution time = X
 - Priority = 3
- For Task 2 (Door):
 - Period = 10Ms.
 - Execution time = Y
 - Priority = 2
- For Task3 (Light Switch):
 - Period = 20Ms.
 - Execution time = Z
 - Priority = 1
- Hyper Period = 20Ms
- CPU load = (Total Execution Time of all Tasks) / (Hyper Period)

$$\text{CPU load} = (4 \cdot X + 2 \cdot Y + Z) / \text{Hyper-Period}$$