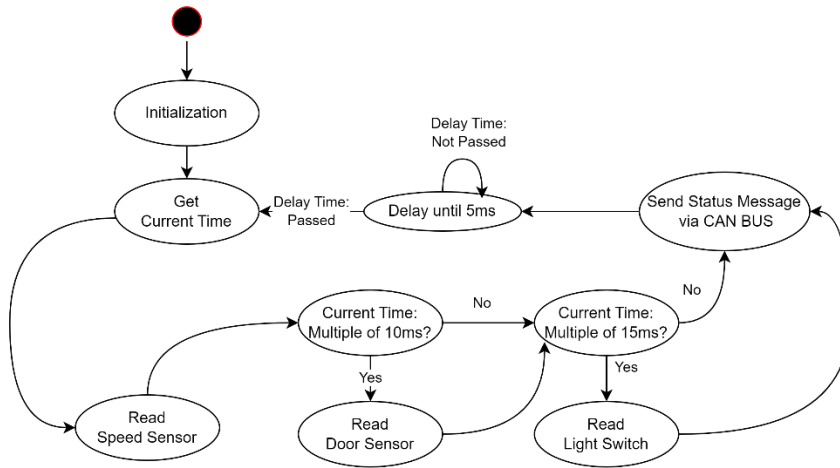
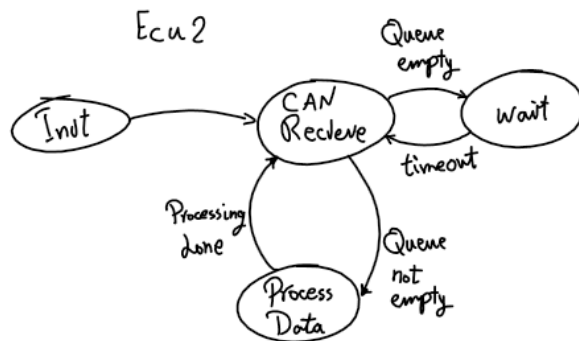


# 1. State machine Diagram of ECU

## 1. ECU 1

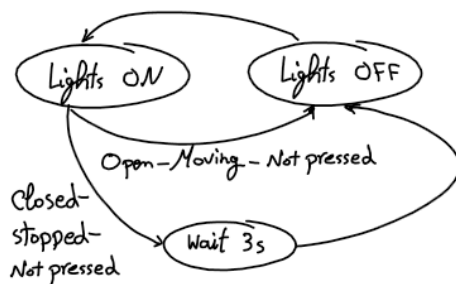


## 2. ECU 2

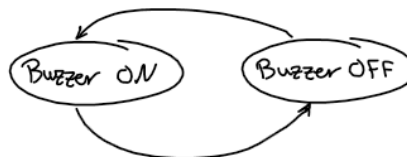


### • Process Data (State Machine Diagram for Actuators)

Open - stopped - Not pressed ,  
 Closed-Moving - Pressed ,  
 Closed-stopped - Pressed ,



Open -Moving - Not pressed ,  
 Closed-stopped - Pressed

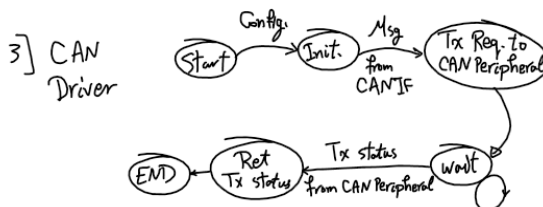
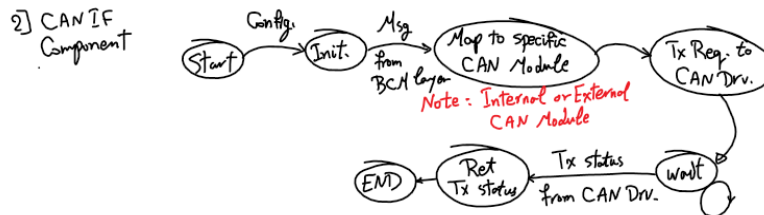
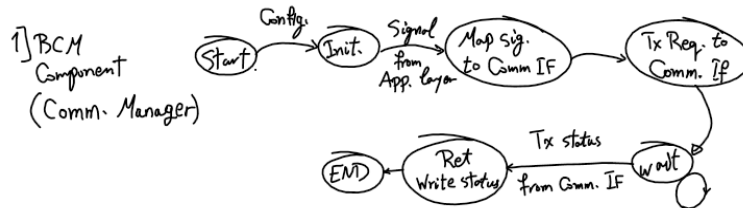
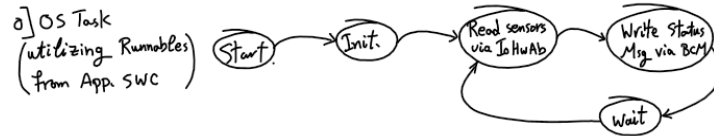


Open - stopped - Not pressed ,  
 Closed- stopped - Not pressed ,  
 Closed-Moving - Pressed

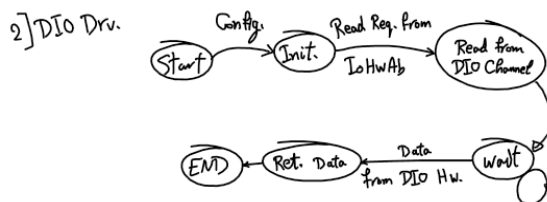
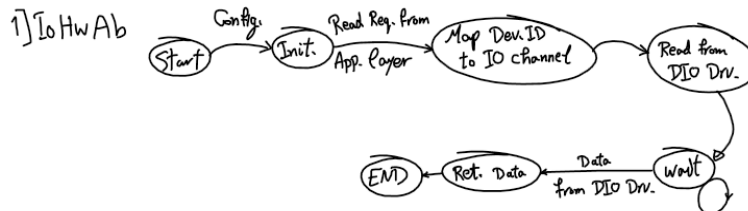
## 2. State Machine Diagram of ECU Components

### 1. ECU 1

- ECU1 CAN Tx Path :

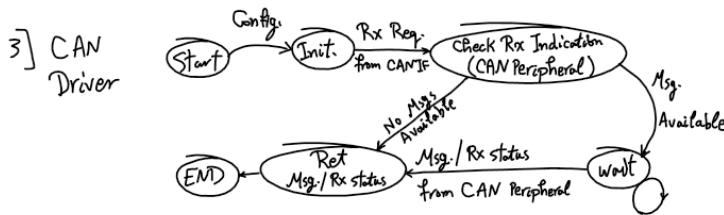
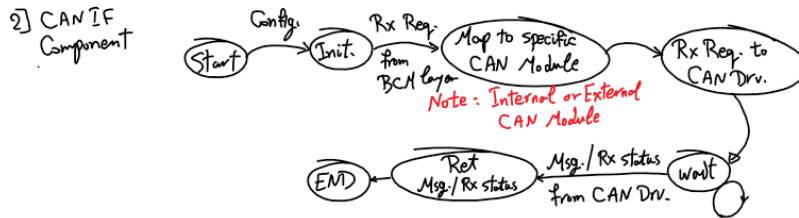
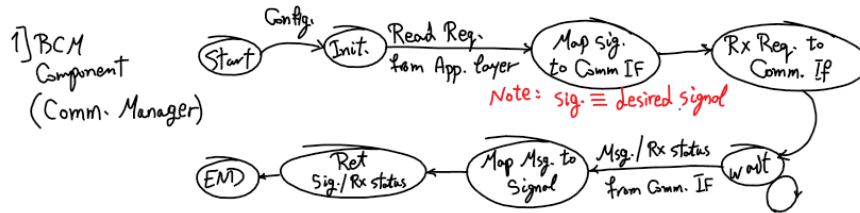


- ECU1 IoHwAb Path :

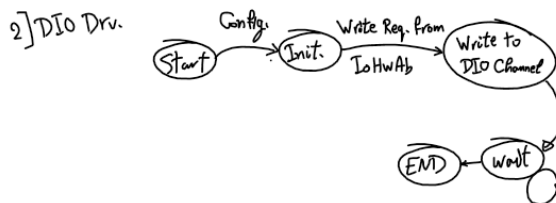
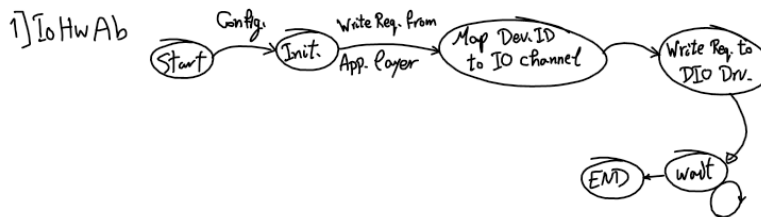


## 2. ECU 2

- ECU2 CAN Rx Path :

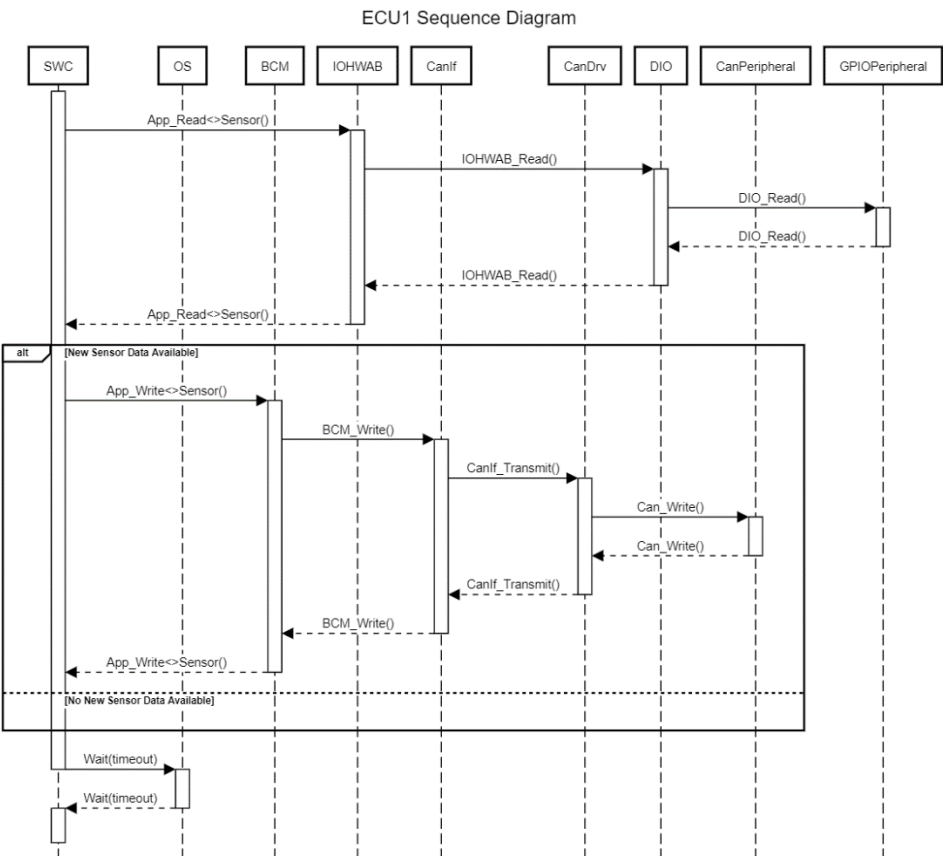


- ECU2 IoHwAb Path :



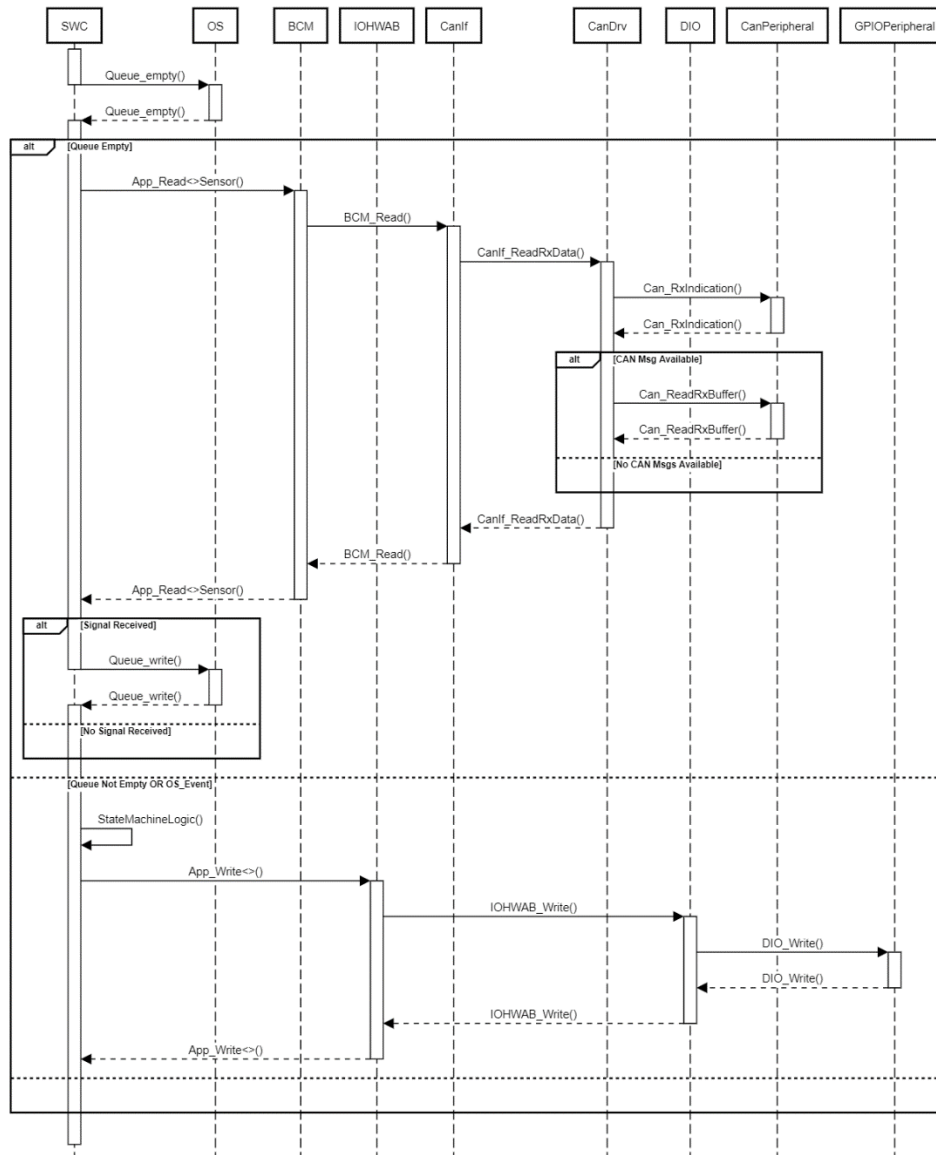
# 1. Sequence Diagram for ECU

## 1. ECU 1



## 2. ECU 2

ECU2 Sequence Diagram



#### 4. CPU Load for the ECU

##### 1. ECU1

Single OS Task with period of 5ms

Assume the worst case execution time of this task  $T_1 \leq 5\text{ms}$

$$\text{CPU Load of ECU1 \%} = \frac{T_1}{5\text{ms}} \times 100 \%$$

##### 2. ECU2

Single OS Task with period of 1ms

Assume the worst case execution time of this task  $T_2 \leq 1\text{ms}$

$$\text{CPU Load of ECU2 \%} = \frac{T_2}{1\text{ms}} \times 100 \%$$

#### 5. BUS Load in the system

Periodic Messages					# Frames / 20ms
	5ms	10ms	15ms	20ms	
Speed State: 5ms	x	x	x	x	4 Frames
Door State: 10ms		x		x	2 Frames
Light Sw. State: 20ms				x	1 Frame
Total					7 Frames

# Data Bytes per Msg: 1Byte = 8bits

# bits per CAN Frame without data: 47bits

# total bits per CAN Frame: 47+8 = 55bits

# bits transmitted over CAN in 20ms = 55bits \* 7 Frames = 385 bits

# bits transmitted over CAN in 1s = 385bits/20ms = 19,250 bits/s

# max bits that can be transmitted over CAN in 1s = 125,000 bits/s

$$\text{BUS Load} = \frac{\text{BUS Utilization}}{\text{BUS Max Capacity}} = \frac{19,250}{125,000} = 15.4\%$$