Bassant Ahmed Mohamed
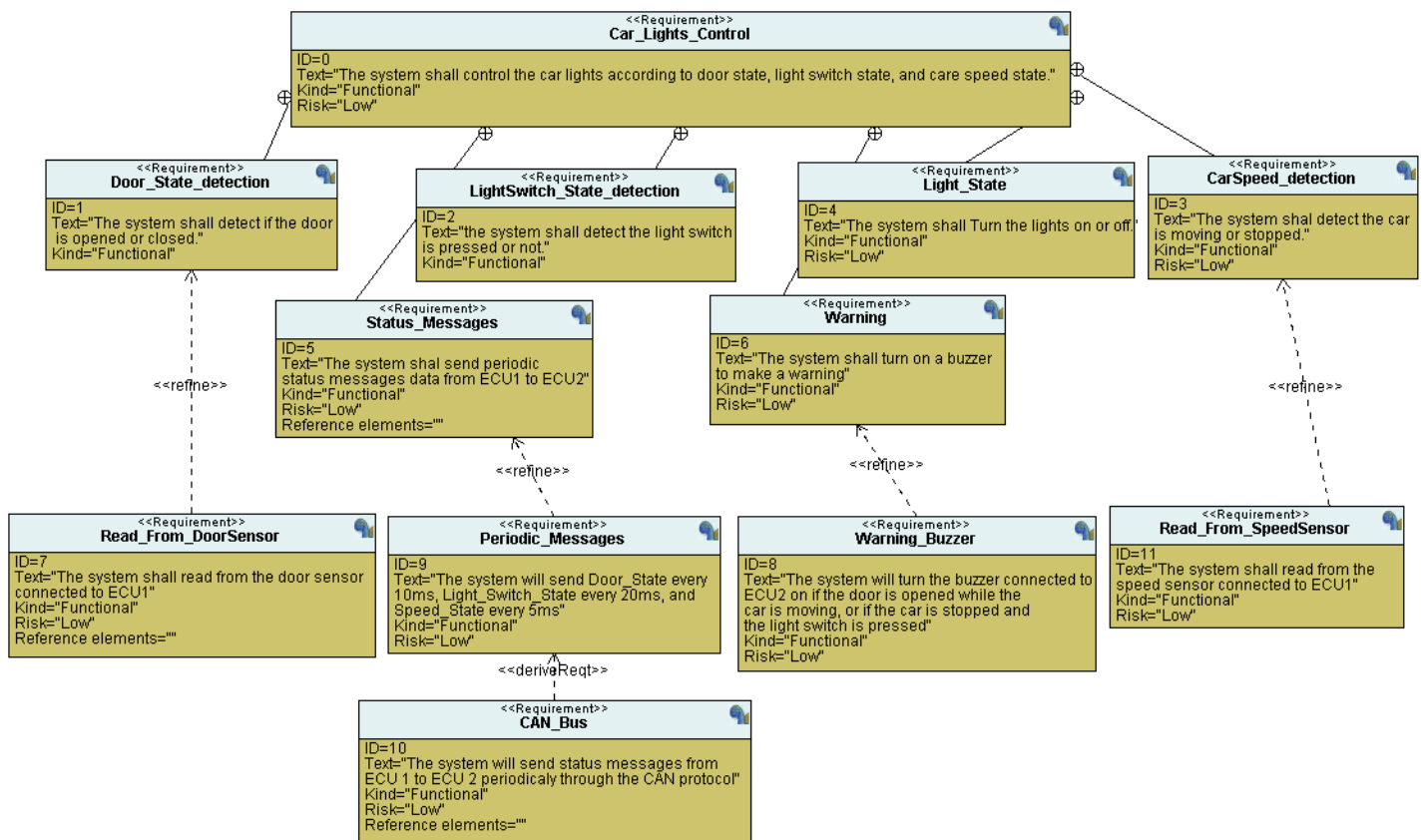# Automotive Door Control System Design

Submitted to:
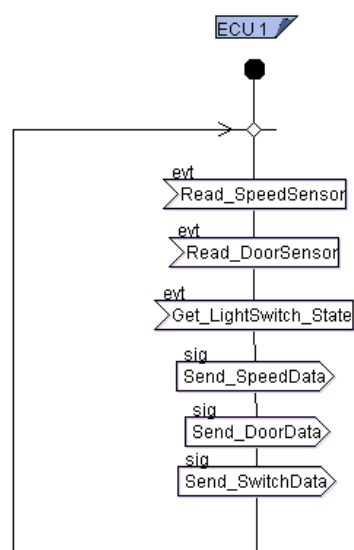
EgFwd Advanced Embedded System Track
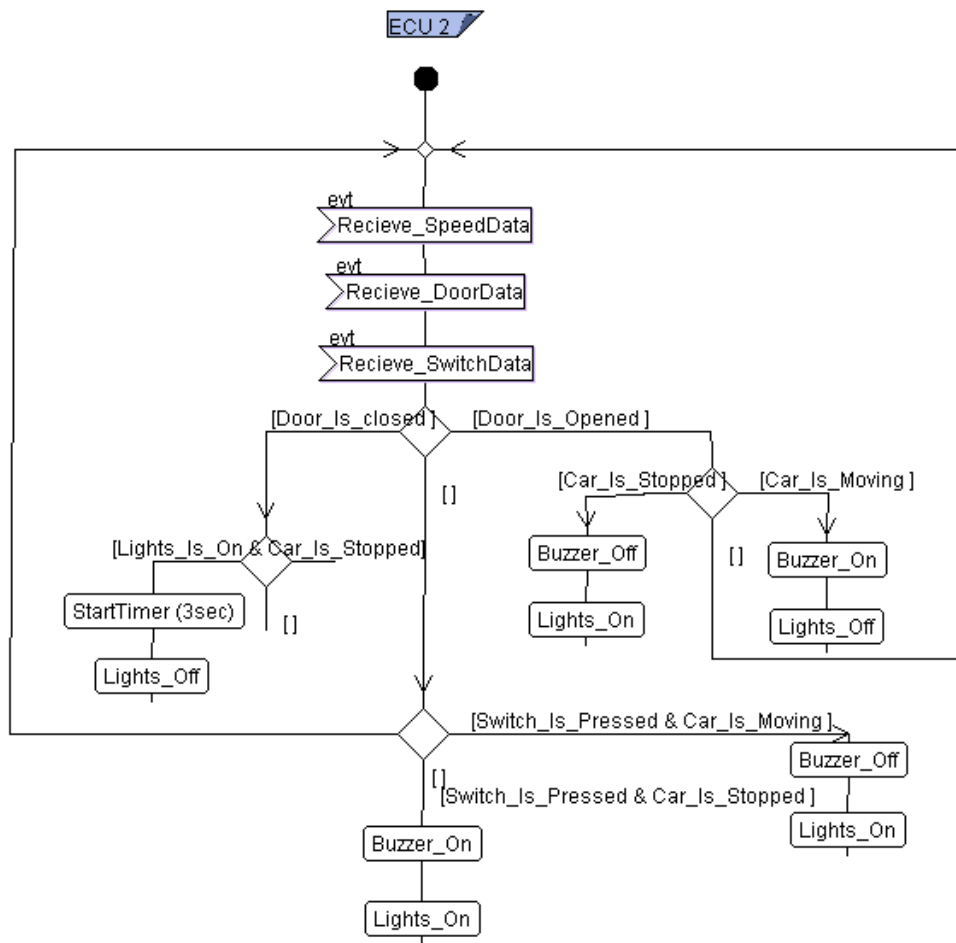
1. Reading Project Requirements
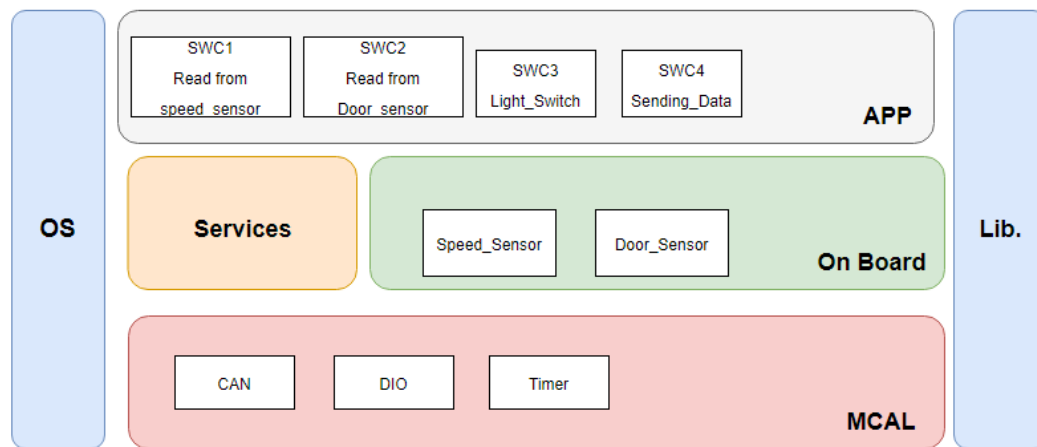
1.1 Requirements

<<Requirement>> Car_Lights_Control
ID=0
Text="The system shall control the car lights according to door state, light switch state, and care speed state."
Kind="Functional"
Risk="Low"

<<Requirement>> Door_State_detection
ID=1
Text="The system shall detect if the door is opened or closed."
Kind="Functional"

<<Requirement>> LightSwitch_State_detection
ID=2
Text="the system shall detect the light switch is pressed or not."
Kind="Functional"

<<Requirement>> Light_State
ID=4
Text="The system shall Turn the lights on or off."
Kind="Functional"
Risk="Low"

<<Requirement>> CarSpeed_detection
ID=3
Text="The system shal detect the car is moving or stopped."
Kind="Functional"
Risk="Low"

<<Requirement>> Status_Messages
ID=5
Text="The system shal send periodic status messages data from ECU1 to ECU2"
Kind="Functional"
Risk="Low"
Reference elements=""

<<Requirement>> Warning
ID=6
Text="The system shall turn on a buzzer to make a warning"
Kind="Functional"
Risk="Low"

<<Requirement>> Read_From_DoorSensor
ID=7
Text="The system shall read from the door sensor connected to ECU1"
Kind="Functional"
Risk="Low"
Reference elements=""

<<Requirement>> Periodic_Messages
ID=9
Text="The system will send Door_State every 10ms, Light_Switch_State every 20ms, and Speed_State every 5ms"
Kind="Functional"
Risk="Low"

<<Requirement>> Warning_Buzzer
ID=8
Text="The system will turn the buzzer connected to ECU2 on if the door is opened while the car is moving, or if the car is stopped and the light switch is pressed"
Kind="Functional"
Risk="Low"

<<Requirement>> Read_From_SpeedSensor
ID=11
Text="The system shall read from the speed sensor connected to ECU1"
Kind="Functional"
Risk="Low"

<<Requirement>> CAN_Bus
ID=10
Text="The system will send status messages from ECU 1 to ECU 2 periodicaly through the CAN protocol"
Kind="Functional"
Risk="Low"
Reference elements=""

1.2 Block Diagram

ECU 1

evt
Read_SpeedSensor

evt
Read_DoorSensor

evt
Get_LightSwitch_State

sig
Send_SpeedData

sig
Send_DoorData

sig
Send_SwitchData

ECU 2

Recieve_SpeedData

evt
Recieve_DoorData

evt
Recieve_SwitchData

[Door_Is_closed]   [Door_Is_Opened]

[]

[Car_Is_Stopped]   [Car_Is_Moving]

[Lights_Is_On & Car_Is_Stopped]   Buzzer_Off   []   Buzzer_On

StartTimer (3sec)   []   Lights_On   Lights_Off

Lights_Off

[Switch_Is_Pressed & Car_Is_Moving]

Buzzer_Off

[]
[Switch_Is_Pressed & Car_Is_Stopped]   Lights_On

Buzzer_On

Lights_On

2. Static Design Analysis

2.1 ECU1 Layered Architecture, Components, and Modules

2.2 ECU 1 APIs and Typedefs

2.3 ECU 2 Layered Architecture, Components, and Modules

2.4 ECU 2 APIs and Typedefs