EGFWD: ADVANCED EMBEDDED SYSTEMS

SW Design Project Report

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MARCH 25, 2023

SPRINTS EGFWD

Advanced Embedded Systems Track

1-System Block Diagram

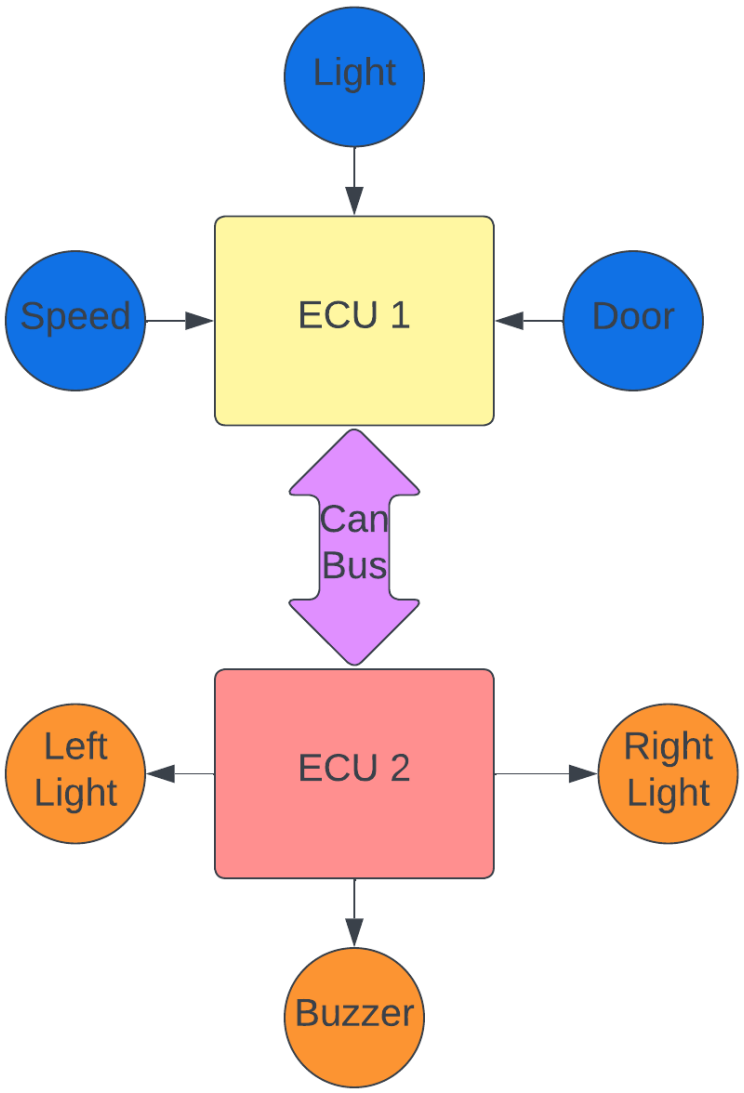
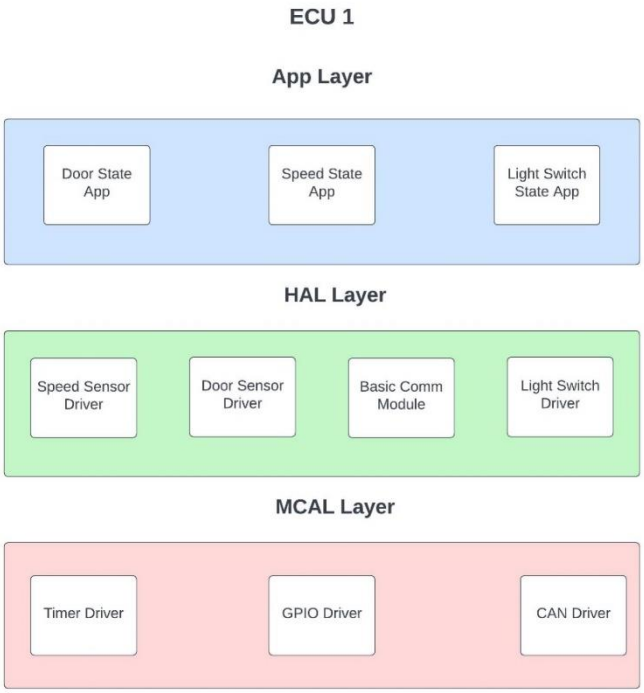


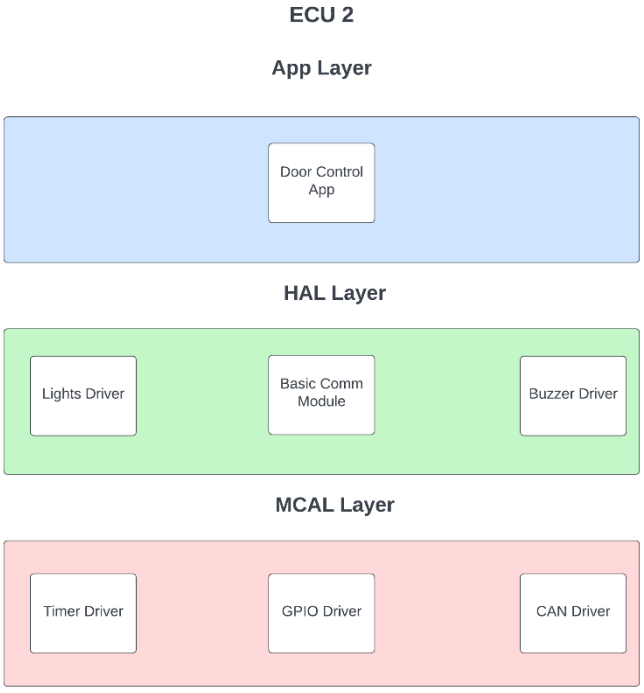
Figure 1 *System Block Diagram according to rubric understanding.*

1-Static Architecture

1.1 ECU 1 Layered Architecture



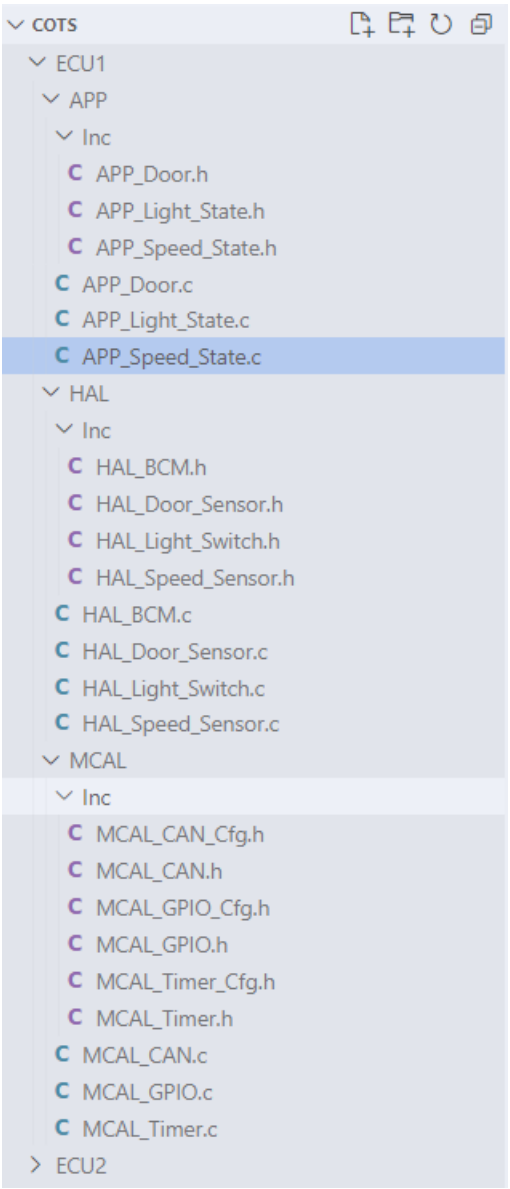
1.2 ECU 2 Layered Architecture

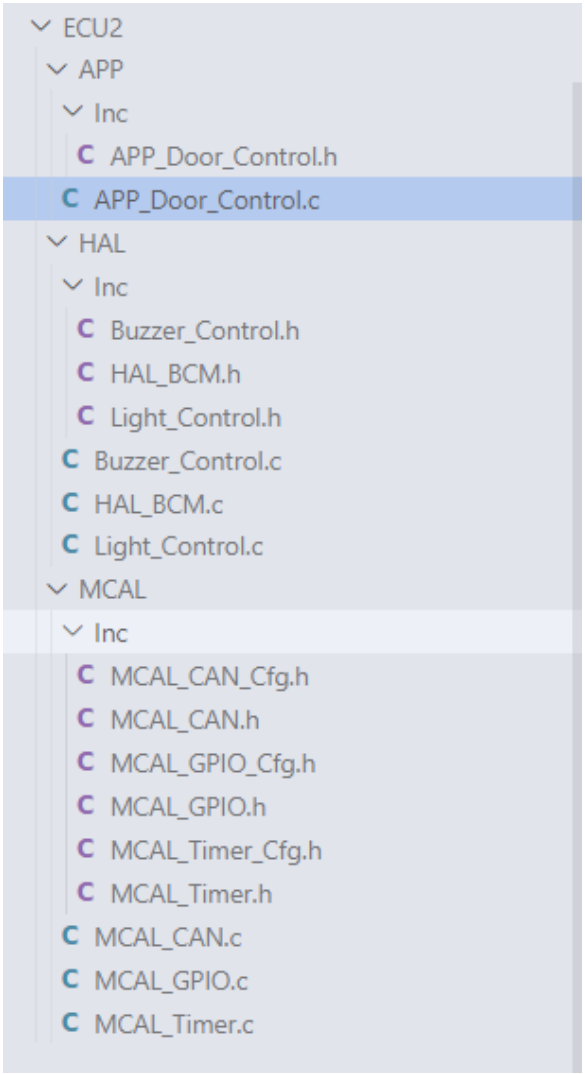


1.3 APIS and Data Type

Please Refer to this Google Sheet for all APIs and Data Types. Note that ECU 1 Contains some APIs that are common to both ECU 1 and ECU 2.
https://docs.google.com/spreadsheets/d/1A9iLuI26zkGEF17e5Cy-MG8v9nT4K6RR-r6xuhaIftA/edit?usp=sharing

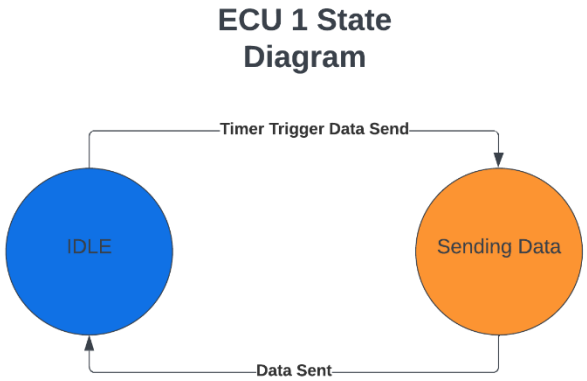
1.4 Folder Structure

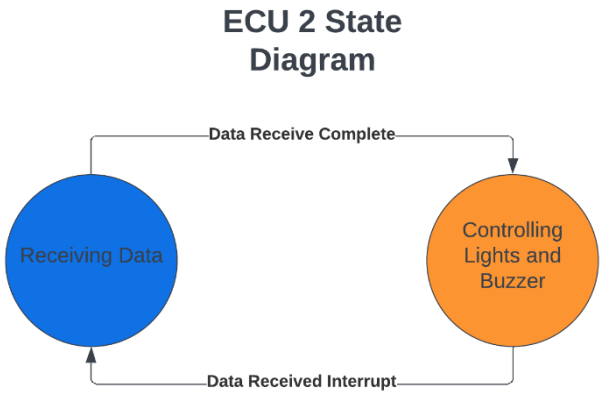




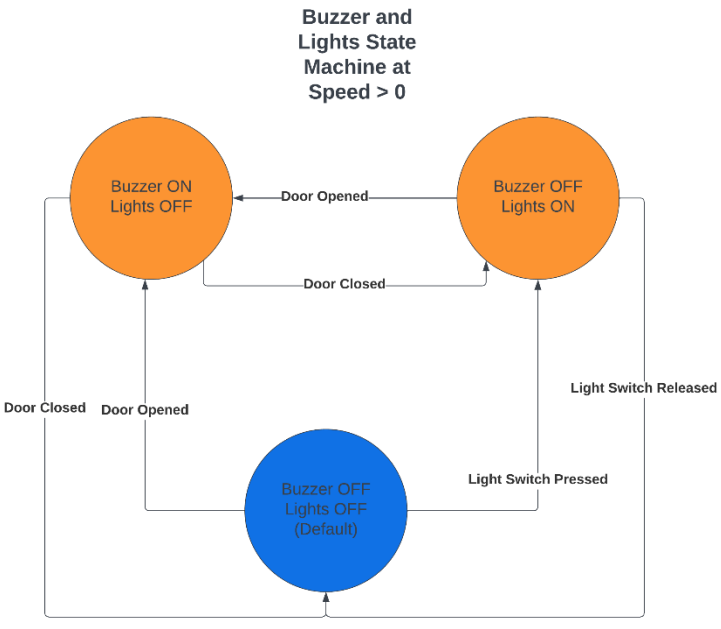
2-Dynamic Architecture

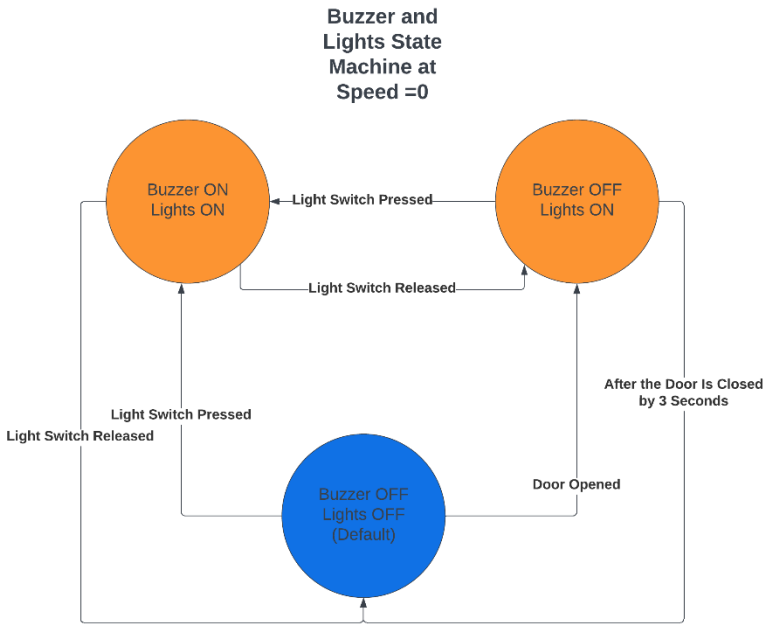
2.1 ECU State Machines



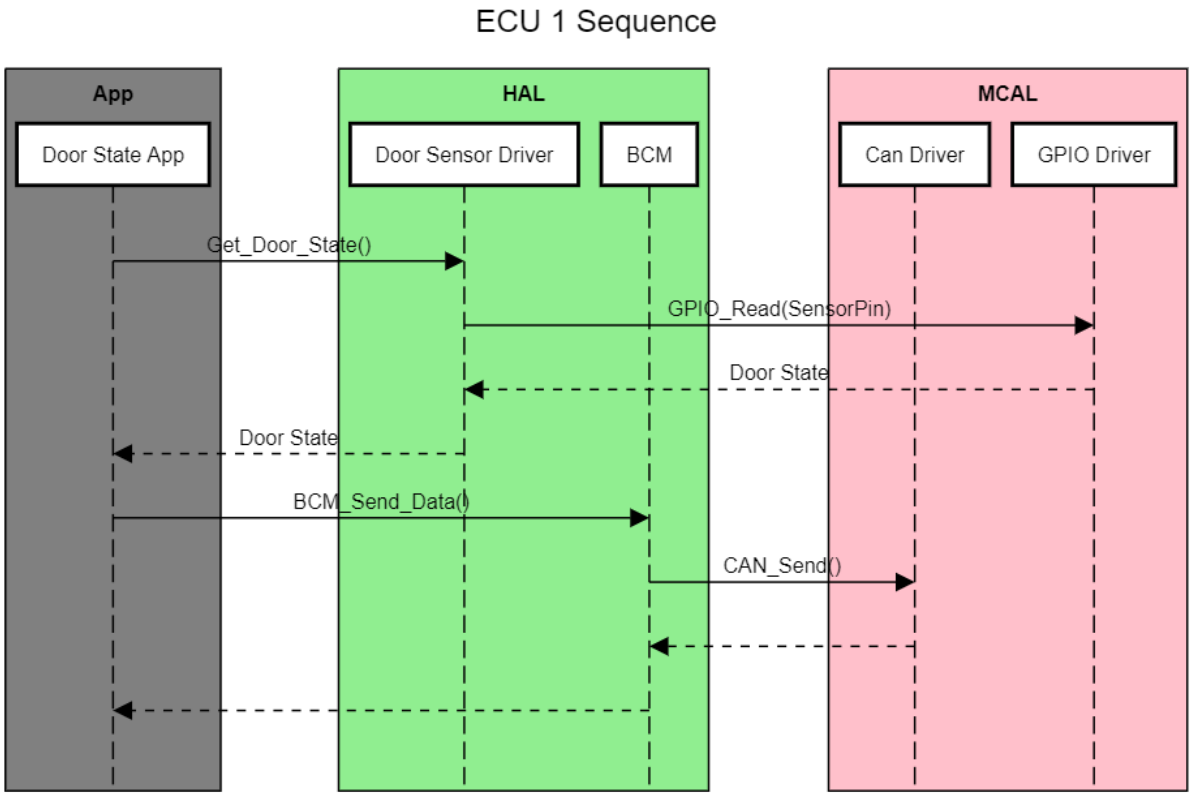


2.2 Application/Modules State Machines

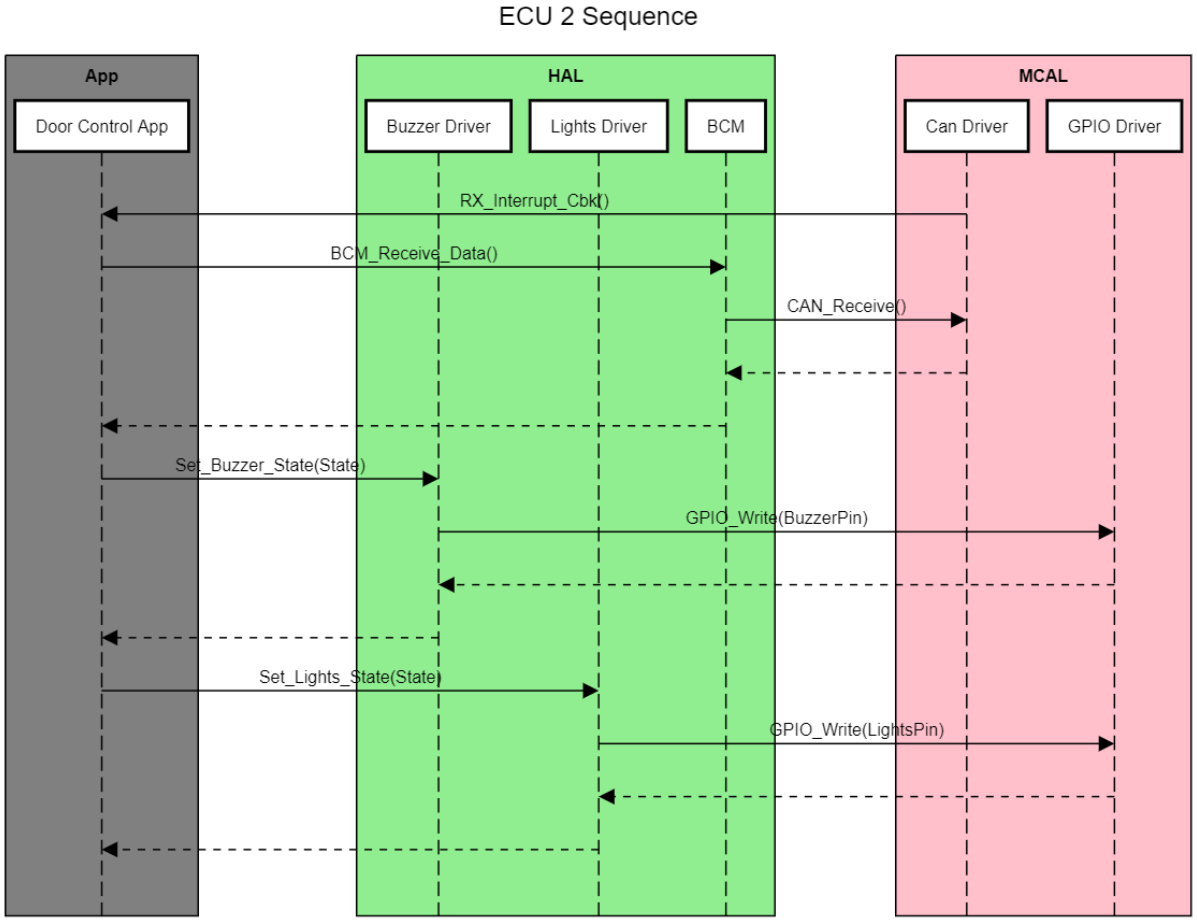




2.3 ECU 1 Demo Sequence Diagram



2.4 ECU 2 Demo Sequence Diagram



2.5 Approximate CPU Load

$$CPU\ Load = \frac{TaskTimes}{HyperPeriod}$$

For ECU 1, we assume an execution time of 1ms for data sending tasks:

$$ECU1 = \frac{(1 \times 10) + (1 \times 20) + (1 \times 5)}{100} = 0.35(35\%)$$

For ECU 2, we assume execution time for the door control task to be 5 ms every 10ms and data rx execution 1ms every 5ms:

$$ECU2 = \frac{(5 \times 2) + (1 \times 4)}{20} = 0.7(70\%)$$

2.6 Bus Load

Data is sent over the bus every 5 , 10, and 20 ms. So in 1000ms, a total of

$$(200) + (100) + (50) = 350\ transfers$$

Assuming every transfer takes 1ms as we assumed above while calculating the CPU load, then the total bus load is

$$\frac{350}{1000} = 0.35\ (35\%)$$