

**Moving Car Project**

**Team Members:**

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| Bassel Yasser |
| Sharpel Malek |
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[Figure 1: Project Layered Architecture 2](file:///D:\02_workspace\MovingCarProject\Moving_Car.docx#_Toc132213547)

# INTRODUCTION

In our project we have a four-driving wheel robot and moves in a rectangular shape, on this document we will illustrate the module design and how they integrate with each other, we’ll also discuss the used APIs in more detail and providing the flowchart for each function in each module, and making layered architecture.

In this project we used PWM for controlling motor speed, TIMER on normal mode for controlling the duration of motor, DIO for GPIO Pins and External Interrupt Module for Start / Stop Motor

# High Level Design

## **Layered Architecture**

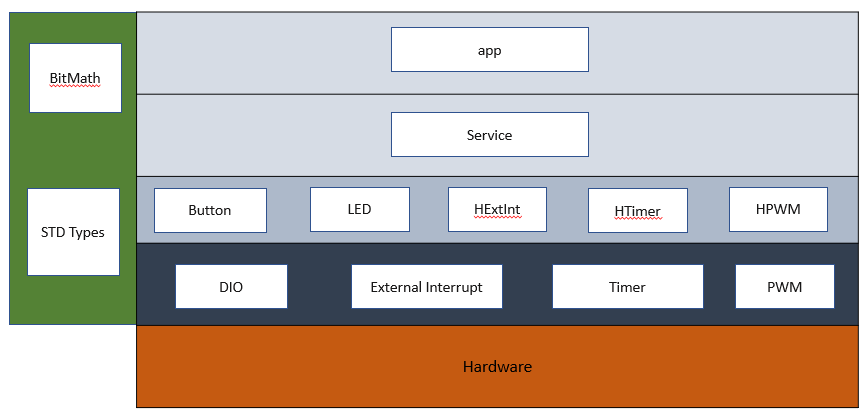


Figure 1: Project Layered Architecture

## **Modules Description**

**MCAL Layer:**

* **DIO:**
* **External Interrupt:**
* **Timer:**
* **PWM:** a modulation technique that generates variable-width pulses to represent the amplitude of an analog input signal, and directly communicate to hardware

**HAL Layer:**

* **Button:**
* **LED**
* **HPWM:** Is in Middle layer which Application can communicate to MCAL layer**.**
* **HTimer:**
* **HExtInt:**

**Service Layer:**

**Application Layer:**

## **Drivers’ Documentation**

**MCAL Layer:**

* **DIO:**
* **External Interrupt:**
* **Timer:**
* **PWM:** 
  + **enu\_timer1Status\_t Timer1\_enuInit (enu\_timer1Mode\_t)**

**Author :** Bassel Yasser Mahmoud

**Function Name:** Timer1\_enuInit

**Function Description**: Initialize Timer1 to Fast PWM Mode

**Arguments:** copy\_enTmerMode {TIMER1\_OVF\_MODE, TIMER1\_FAST\_PWM\_MODE,}

**Return:** enu\_timer1Status\_t {TIMER1\_OK or TIMER1\_NOK}

* + **enu\_timer1Status\_t Timer1\_enuSetPrescallar(enu\_timer1Prescalar\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Nam**e : Timer1\_enuSetPrescallar

**Function Description** : Set Prescaller

**Arguments:** Timer1\_enuSetPrescallar {TIMER1\_PRE\_1, TIMER1\_PRE\_64, TIMER1\_PRE\_256}

**Return** : enu\_timer1Status\_t {TIMER1\_OK or TIMER1\_NOK}

* + **enu\_timer1Status\_t Timer1\_enuFastPWMInit(enu\_pwm1Mode\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Name** : Timer1\_enuFastPWMInit

**Function Description :** Set PWM Mode

**Arguments: c**opy\_enPWMMode {TIMER1\_PWM\_NORMAL, TIMER1\_PWM\_CLR\_ON\_CMP, TIMER1\_PWM\_SET\_ON\_CMP}

**Return**  : enu\_timer1Status\_t {TIMER1\_OK or TIMER1\_NOK}

* + **enu\_timer1Status\_t Timer1\_enuPWMGenerate (Uchar8\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Name** : Timer1\_enuPWMGenerate

**Function Description** : Generate PWM

**Arguments** : copy\_u8DutyCycle {1 ~ 100}

**Return**  : enu\_timer1Status\_t {TIMER1\_OK or TIMER1\_NOK}

* + **enu\_timer2Status\_t Timer2\_enuInit (enu\_timer2Mode\_t)**

**Author :** Bassel Yasser Mahmoud

**Function Name:** Timer1\_enuInit

**Function Description**: Initialize Timer2 to Fast PWM Mode

**Arguments:** copy\_enTmerMode {TIMER2\_OVF\_MODE, TIMER2\_FAST\_PWM\_MODE,}

**Return:** enu\_timer1Status\_t {TIMER2\_OK or TIMER2\_NOK}

* + **enu\_timer2Status\_t Timer2\_enuSetPrescallar(enu\_timer2Prescalar\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Nam**e : Timer2\_enuSetPrescallar

**Function Description** : Set Prescaller

**Arguments:** Timer2\_enuSetPrescallar {TIMER2\_PRE\_1, TIMER2\_PRE\_64, TIMER2\_PRE\_256}

**Return** : enu\_timer2Status\_t {TIMER2\_OK or TIMER2\_NOK}

* + **enu\_timer2Status\_t Timer2\_enuFastPWMInit(enu\_pwm2Mode\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Name** : Timer2\_enuFastPWMInit

**Function Description :** Set PWM Mode

**Arguments: c**opy\_enPWMMode {TIMER2\_PWM\_NORMAL, TIMER2\_PWM\_CLR\_ON\_CMP, TIMER2\_PWM\_SET\_ON\_CMP}

**Return**  : enu\_timer2Status\_t {TIMER2\_OK or TIMER2\_NOK}

* + **enu\_timer2Status\_t Timer2\_enuPWMGenerate (Uchar8\_t)**

**Author**  : Bassel Yasser Mahmoud

**Function Name** : Timer2\_enuPWMGenerate

**Function Description** : Generate PWM

**Arguments** : copy\_u8DutyCycle {1 ~ 100}

**Return**  : enu\_timer2Status\_t {TIMER2\_OK or TIMER2\_NOK}

**HAL Layer:**

* **Button:**
* **LED:**
* **HPWM:** 
  + **enu\_pwmStatus\_t pwm\_enInit(void)**

**Author** : Bassel Yasser Mahmoud

**Function Name** : pwm\_enInit

**Function Description :** Initialize PWM to be fast PWM, set prescaller, Set PWM Mode

**Arguments** : void

**Return**  : enu\_pwmStatus\_t {PWM\_OK or PWM\_NOK}

* + **enu\_pwmStatus\_t pwm\_enGenerate(Uchar8\_t)**

**Author** : Bassel Yasser Mahmoud

**Function Name** : pwm\_enGenerate

**Function Description :** Generate PWM signal

**Arguments** : Uchar8\_t

**Return**  : enu\_pwmStatus\_t {PWM\_OK or PWM\_NOK}

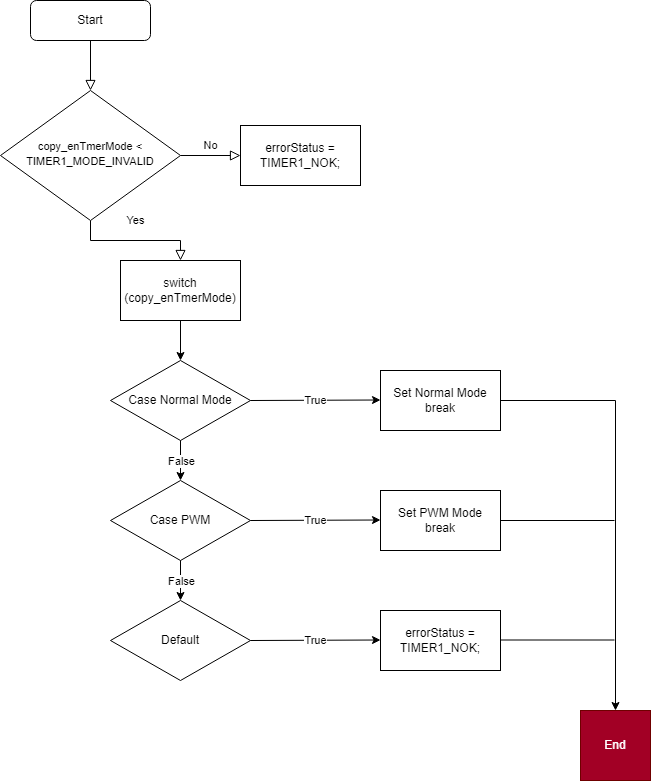
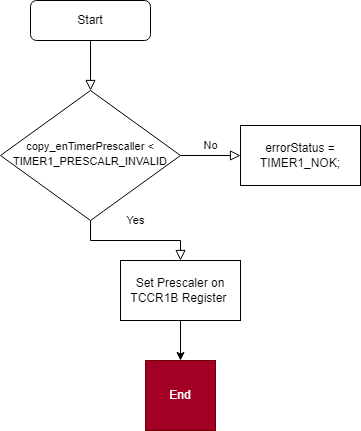
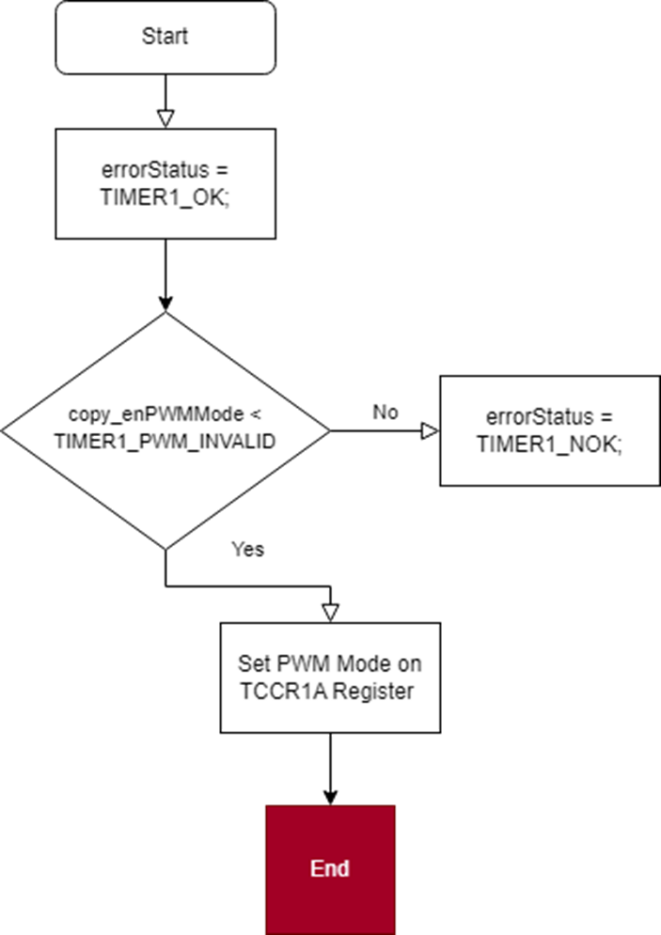
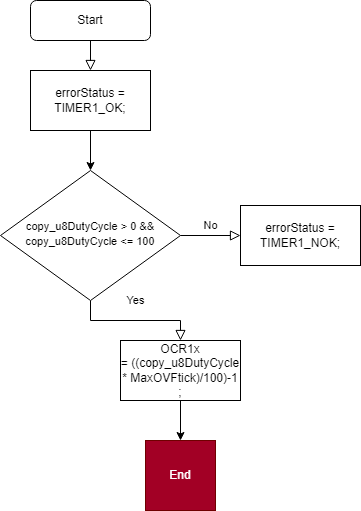
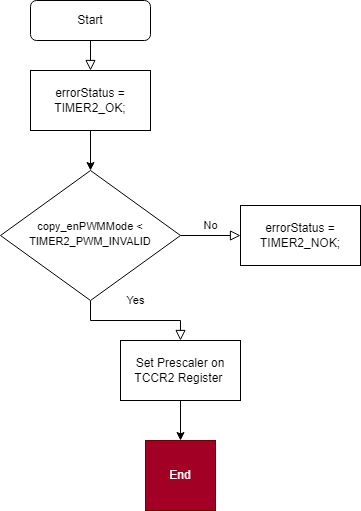
* **HTimer:**
* **HExtInt:**

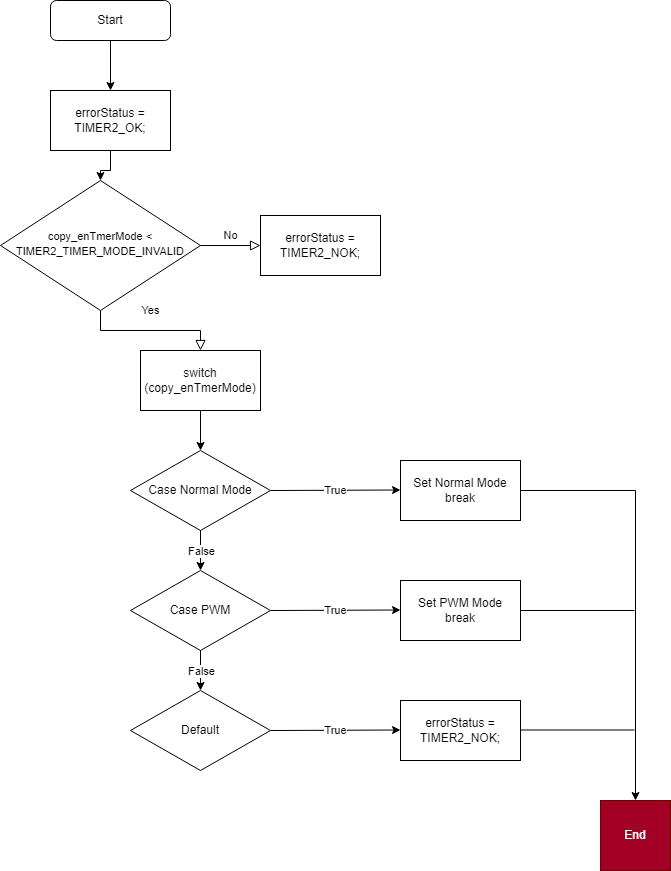
**Service Layer:**

**Application Layer:**

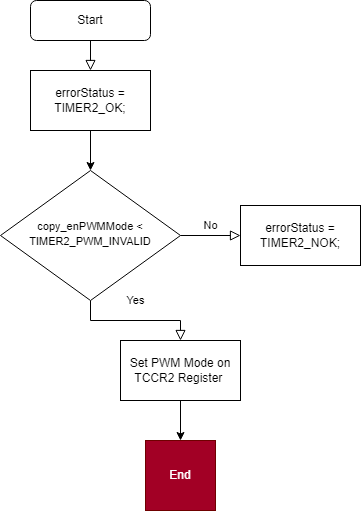
# Low Level Design

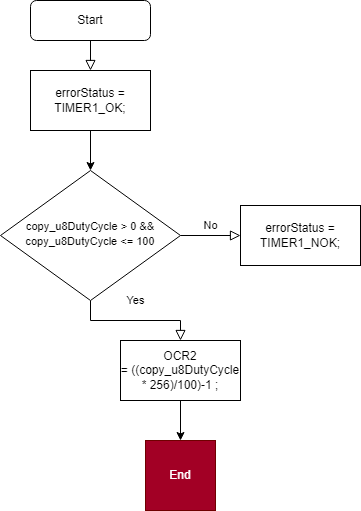
**MCAL Layer:**

* **DIO:**
* **External Interrupt:**
* **Timer:**
* **PWM:** 
  + **enu\_timer1Status\_t Timer1\_enuInit (enu\_timer1Mode\_t)**
  + **enu\_timer1Status\_t Timer1\_enuSetPrescallar(enu\_timer1Prescalar\_t)**
  + **enu\_timer1Status\_t Timer1\_enuFastPWMInit(enu\_pwm1Mode\_t)**
  + **enu\_timer1Status\_t Timer1\_enuPWMGenerate (Uchar8\_t)**
  + **enu\_timer2Status\_t Timer2\_enuSetPrescallar(enu\_timer2Prescalar\_t)**
  + **enu\_timer2Status\_t Timer2\_enuInit (enu\_timer2Mode\_t)**

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* + **enu\_timer2Status\_t Timer2\_enuFastPWMInit(enu\_pwm2Mode\_t)**

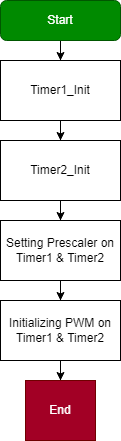
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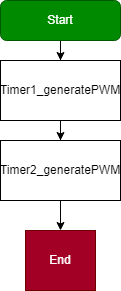
* + **enu\_timer2Status\_t Timer2\_enuPWMGenerate (Uchar8\_t)**

**HAL Layer:**

* **Button:**
* **LED:**
* **HPWM:** 
  + **enu\_pwmStatus\_t pwm\_enInit(void)**



* + **enu\_pwmStatus\_t pwm\_enGenerate(Uchar8\_t)**

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* **HTimer:**
* **HExtInt:**

**Service Layer:**

**Application Layer:**