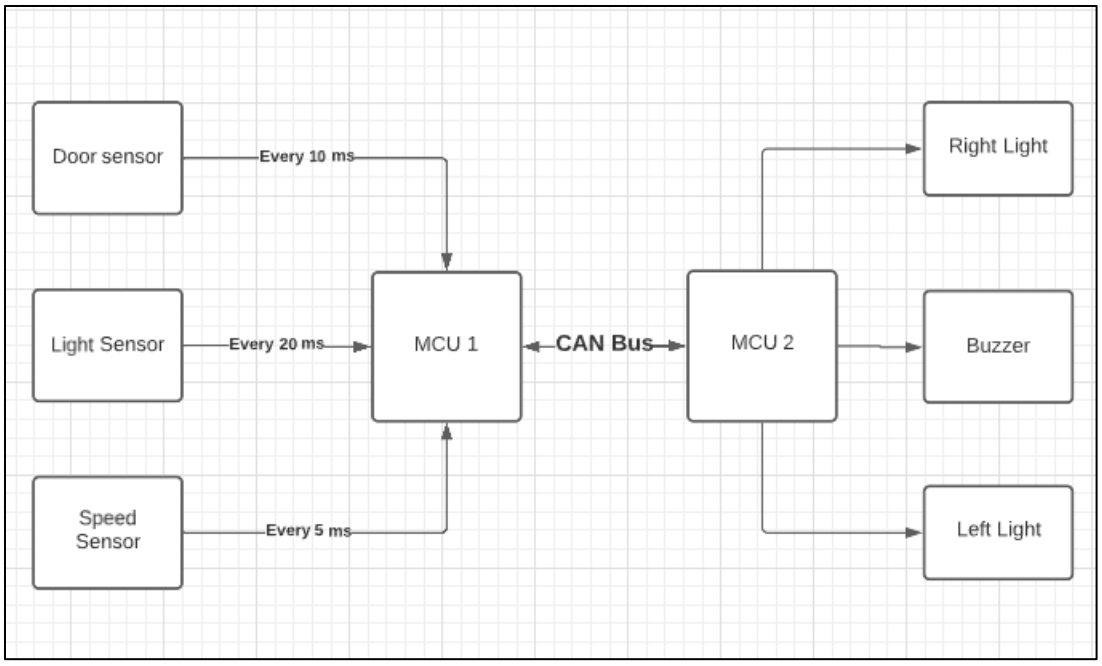
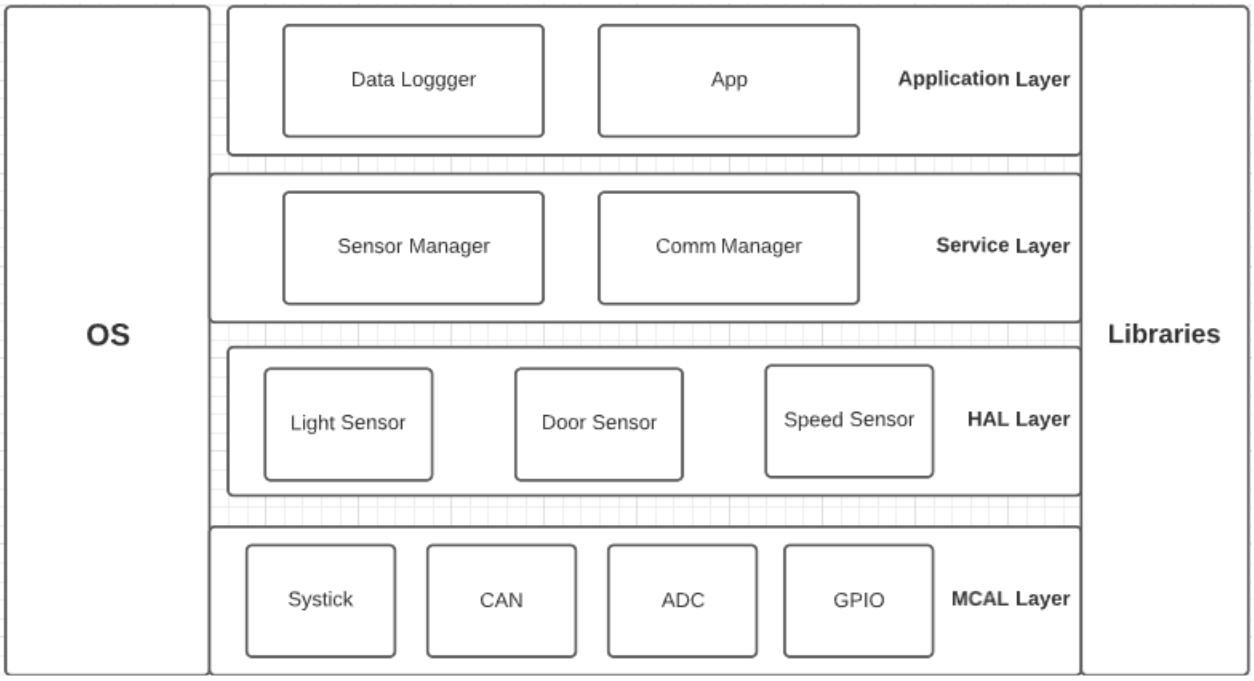
Static Design

Block Diagram



ECU 1

Layered Architecture



Modules

1- MCAL Layer

- GPIO

Name	**void** GPIO_Init (**struct*** ConfigPtr)
Description	Initializes GPIO based on the given struct.
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** GPIO_Read(**uint** Port_no , **uint** Pin_no)
Description	Reads the value of the given Pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**void** GPIO_Write (**uint** Port_no , **uint** Pin_no, **uint** Value)
Description	Writes the given value to the required pin
Return Value	void
Synch	Synchronous
Reentrancy	Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	Pin / Mode / Pin Value / Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no	Value
Type	**Uint8**	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8	0-1
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu	Value of specified pin, high or low

- ADC

Name	**Void** ADC_Init (**struct*** ConfigPtr)
Description	Initializes ADC based on the given struct.
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**uint** ADC_read (**uint8** Channel)
Description	Takes input from specified channel
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

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Used Typedefs

Name	PinConfig
Type	Structure
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Channel
Type	**Uint8**
Range	0 – 2^8
Description	Ranges from zero to number of available channels

- CAN

Name	**void** CAN_Init (**struct*** ConfigPtr)
Description	Initializes CAN bus based on the given struct.
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**void** CAN_Send(**uint** pin **, uint** data)
Description	Sends the given data using the specified pin
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Pin	Data
Type	**Uint8**	**Uint32**
Range	0-2^8	0-2^32
Description	Ranges from zero to number of pins in mcu	Data we want to send on the CAN bus

2- HAL Layer

- Door Sensor

Name	**void** Sensor_Init (**struct*** ConfigPtr)
Description	Initializes Door Sensor pin using GPIO
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** Door_Read(**uint** Port_no , **uint** Pin_no)
Description	Reads the value of the given Pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	Pin / Mode / Pin Value / Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no
Type	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu

- Light Sensor

Name	**void** Sensor_Init (**struct*** ConfigPtr)
Description	Initializes Light Switch pin using GPIO
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** Light_Read(**uint** Port_no , **uint** Pin_no)
Description	Reads the value of the given Pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	**Uint** Pin / **uint** Mode / **bool** Pin Value / **bool** Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no
Type	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu

- Speed Sensor

Name	**void** Sensor_Init (**struct*** ConfigPtr)
Description	Initializes Light Switch pin using ADC
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** Speed_Read(**uint** Port_no , **uint** Pin_no)
Description	Reads the value of the given Pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	Pin / Mode / Pin Value / Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no
Type	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu

3- Service Layer

- Comm. Manager

Name	**void** Communication_Handler (**struct*** ConfigPtr)
Description	Sends the specified message through the bus specified in the struct
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	Comm_Config
Type	Structure
Contents	**Uint** message / **uint** bus
Description	Struct to hold info for Communication handler

4- Application Layer

- App

Name	**Uint** Light_State(**void**)
Description	Sends value of light switch
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**uint** Speed_State(void)
Description	Sends value of speed sensor
Return Value	Uint
Synch	Synchronous
Reentrancy	Reentrant
Recursion	No

Name	**Uint** Door_State(**void**)
Description	Sends value of door sensor
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

- Data logger

Name	**void** Receive_Data (**uint32** data) Args -> data: **Range**(0-2^32), **desc :** data being received
Description	Saves the data sent to it
Return Value	Void
Synch	Synchronous
Reentrancy	None-Reentrant

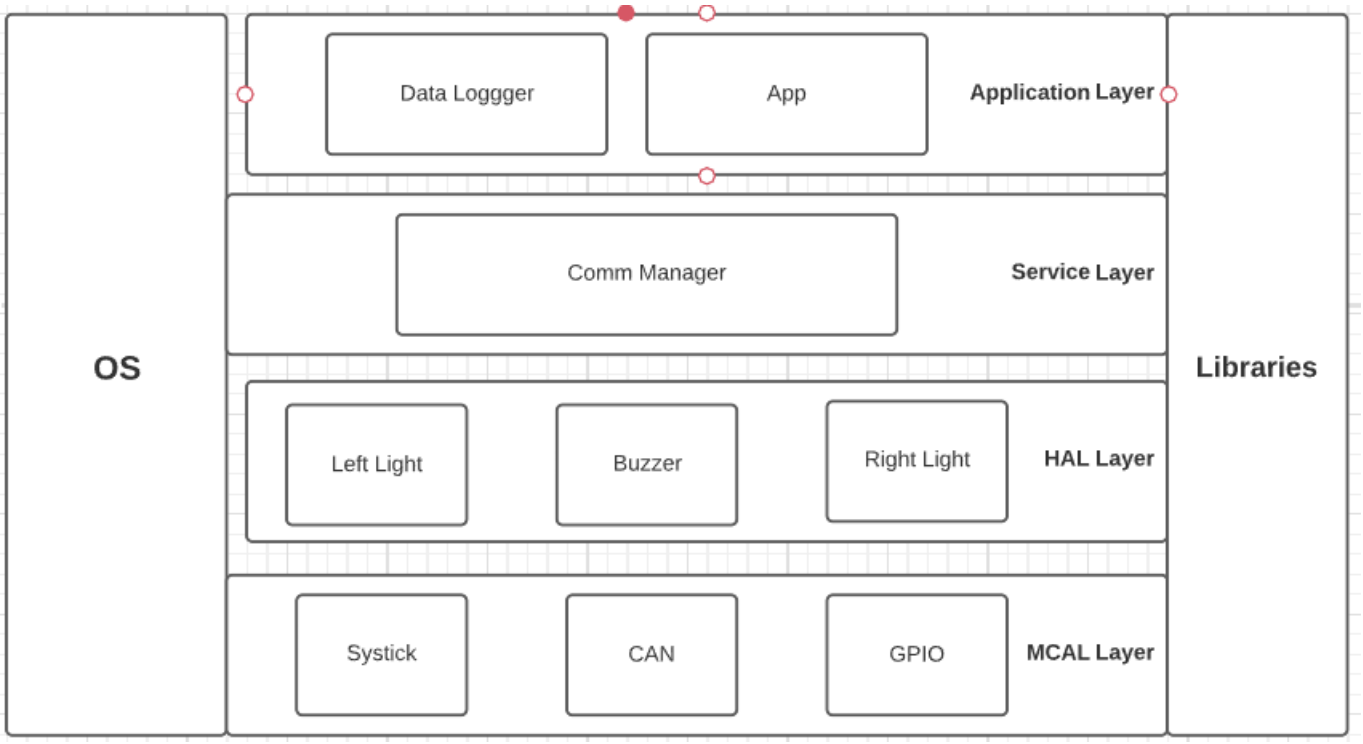
Folder Structure

MCAL	HAL	Service	Application
GPIO.c	Door_Sensor.c	Comm_manager.c	Data_logger.c
ADC.c	Light_switch.c	Sensor_manager.c	App.c
CAN.c	Speed_Sensor.c		
Systick.c			

MCAL (inc)	HAL(inc)	Service(inc)	Application(inc)	Config
GPIO.h	Door_Sensor.h	Comm_manager.h	Data_logger.h	GPIO_cfg.h
ADC.h	Light_switch.h	Sensor_manager.h	App.h	ADC_cfg.h
CAN.h	Speed_Sensor.h			CAN_cfg.h
Systick.h				Systick_cfg.h
				Door_cfg.h
				Light_cfg.h
				Speed_cfg.h

ECU 2

Layered Architecture



Modules

1- MCAL Layer

- GPIO

Name	**void** GPIO_Init (**struct*** ConfigPtr)
Description	Initializes GPIO based on the given struct.
Return Value	Void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** GPIO_Read(**uint** Port_no , **uint** Pin_no)
Description	Reads the value of the given Pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant

Name	**void** GPIO_Write (**uint** Port_no , **uint** Pin_no, **uint** Value)
Description	Writes the given value to the required pin
Return Value	Void
Synch	Synchronous
Reentrancy	Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	Pin / Mode / Pin Value / Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no	Value
Type	**Uint8**	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8	0-1
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu	Value of specified pin, high or low

- CAN

Name	**void** CAN_Init (**struct*** ConfigPtr)
Description	Initializes CAN bus based on the given struct.
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**Uint** CAN_Receive(**uint** pin **, uint** data)
Description	Receives the given data using the specified pin
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no	Value
Type	**Uint8**	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8	0-1
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu	Value of specified pin, high or low

2- HAL Layer

- Light

Name	**void** Light_Init (**struct*** ConfigPtr)
Description	Initializes both light pins using GPIO
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**void** Light_Write(**uint** Port_no , **uint** Pin_no, **uint** value)
Description	Writes the value to the given Pin
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	Pin / Mode / Pin Value / Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no	Value
Type	**Uint8**	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8	0-1
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu	Value of specified pin, high or low

- Buzzer

Name	**void** Buzzer_Init (**struct*** ConfigPtr)
Description	Initializes Buzzer pin using GPIO
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Name	**void** Buzzer_Write(**uint** Port_no , **uint** Pin_no, **uint** value)
Description	Writes the value to the given Pin
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	PinConfig
Type	Structure
Contents	**Uint** Pin / **uint** Mode / **bool** Pin Value / **bool** Direction
Description	Struct used for the initialization of the module using given configurations

Used Args

Name	Port_no	Pin_no	Value
Type	**Uint8**	**Uint8**	**Uint8**
Range	0 – 2^8	0-2^8	0-1
Description	Ranges from zero to number of ports in mcu	Ranges from zero to number of pins in mcu	Value of specified pin, high or low

3- Service Layer

- Comm. Manager

Name	**void** Communication_Handler (**struct*** ConfigPtr)
Description	Receives the specified message through the bus specified in the struct
Return Value	void
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

Used Typedefs

Name	Comm_Config
Type	Structure
Contents	**Uint** message / **uint** bus
Description	Struct to hold info for Communication handler

- Sensor Manager

Name	**uint** Sensor_Handler (**uint8** pin) Args-> pin: **Range:** (0-2^8), **Desc:** ranges from zero to number of pins
Description	Choose which sensor will operate
Return Value	Uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

4- Application Layer

Name	**Uint** Receive(**void**)
Description	Receives values from ECU1
Return Value	uint
Synch	Synchronous
Reentrancy	None-Reentrant
Recursion	No

- Data logger

Name	**void** Receive_Data (**uint32** data) Args-> data: **Range:** (0-2^32), **Desc:** data received by the data logger
Description	Saves the data sent to it
Return Value	Void
Synch	Synchronous
Reentrancy	None-Reentrant

Folder Structure

MCAL	HAL	Service	Application
GPIO.c	Light.c	Comm_manager.c	Data_logger.c
CAN.c	Buzzer.c		App.c
Systick.c			

MCAL (inc)	HAL(inc)	Service(inc)	Application(inc)	Config
GPIO.h	Light.h	Comm_manager.h	Data_logger.h	GPIO_cfg.h
CAN.h	Buzzer.h			CAN_cfg.h
Systick.h				Systick_cfg.h
				Buzzer_cfg.h
				Light_cfg.h