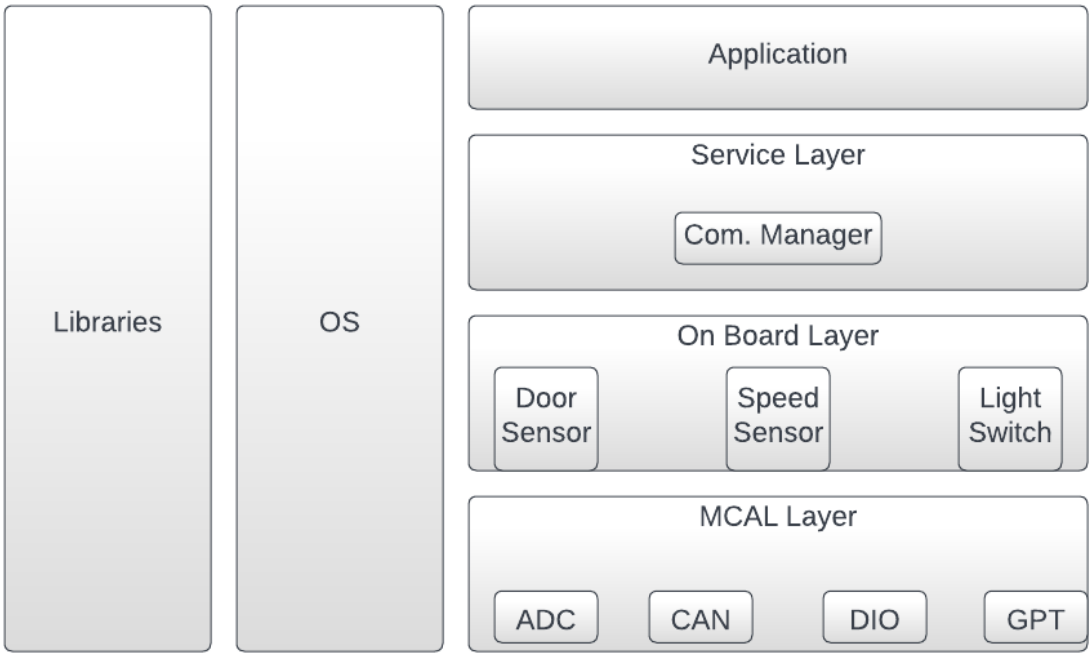
Abdelkhalek Magdy Eid

Automotive door control system design

Static Design

1- ECU 1:

- The layered architecture:



-Modules

GPIO

Name	GPIO_DirectionType	
Type	Enumeration	
Range	PIN_INPUT	0
	PIN_OUTPUT	1
Description		

Name	Gpio_LevelType	
Type	Enumeration	
Range	PIN_LOW	0
	PIN_HIGH	1
Description		

Name	Channel ID	
Type	Enumeration	
Range	PIN0	0
	…	…

	PINx	x
Description		

Name	Gpio_PortIDType	
Type	Enumeration	
Range	PORTA	0
	PORTB	1
	PORTC	2
	PORTD	3
	PORTE	4
	PORTF	5
Description		

Name	Gpio_ConfigType	
Type	Structure	
Range	Gpio_PortIDType	Select Port
	Channel ID	Select Channel
	GPIO_DirectionType	Select Direction
	Gpio_LevelType	Select Level
Description		

Function Name	GPIO_Init	
Arguments	INPUTS	
	* ConfigPtr	Gpio_ConfigType
	Description	Pointer to post -build configuration data
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Initialize GPIO	

Function Name	GPIO_PinWrite	
Arguments	INPUTS	
	PortID	PortIDType
	Description	Select Port
	PinID	Channel ID
	Description	Select Pin
	PIN_Level	Gpio_LevelType
	Description	Select Pin Level
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Set Level Of Pin	

Function Name	GPIO_PinRead	

Arguments	INPUTS	
	PortID	PortIDType
	Description	Select Port
	PinID	Channel ID
	Description	Select Pin
	OUTPUTS	
	Pin_Level	Gpio_LevelType
Return	E_OK	0
	E_NOK	1
Description	Read Pin	

CAN

Name	CAN_ChannelType	
Type	Enumeration	
Range	CAN_CH1	0
	CAN_CH2	1
Description		

Function Name	CAN_Init	
Arguments	INPUTS	
	CH_ID	CAN_ChannelType
	Description	Select channel
	BaudRate	uint16
	Description	Set Baud Rate
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Initializes the CAN module	

Function Name	CAN_Write	
Arguments	INPUTS	
	Data	uint32
	Description	Data Select to send
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Send Data	

Function Name	CAN_Read	
Arguments	INPUTS	NON
	OUTPUTS	
	Data	uint32
	Description	Data Receive
Return	E_OK	0

	E_NOK	1
Description	Receive Data from Can	

ADC

Name	ADC_ConfigType	
Type	Structure	
Range	ADC_Prescalar	Uint8
	ADC_RefVolatge	Uint8
Description		

Function Name	ADC_Init	
Arguments	INPUTS	
	* ConfigPtr	ADC_ConfigType
	Description	Select Config of ADC
	Output	None
Return	E_OK	0
	E_NOK	1
Description	Initialize ADC	

Function Name	ADC_readChannel	
Arguments	INPUTS	
	CH_ID	uint8
	Description	Select Channel ID
	Output	uint32
Return		uint32
Description	Read CH_ID Convert	

GPT

Name	Timer_ValueType
Type	uint8
Range	The range of this type is µC dependent (width of the timer register) and has to be described by the supplier.
Description	Type for reading and setting the timer values (in number of ticks).

Name	Timer_ConfigType
Type	Structure
Range	
Description	This is the type of the data structure including the configuration set required for initializing the timer unit.

Function Name	Timer_Init	
Arguments	INPUTS	

	* ConfigPtr	Timer_ConfigType
	Output	NON
Return		void
Description	Initializes the Timer module.	

Function Name	Timer_Start	
Arguments	INPUTS	
	Value	GPT_ValueType
	Output	NON
Return		void
Description	Start the timer module	

Function Name	Timer_Stop	
Arguments	INPUTS	NON
	Output	NON
Return		void
Description	Stop the timer module.	

Door Sensor

Function Name	Door_Init	
Arguments		None
Return	E_OK	0
	E_NOK	1
Description	Initializes the door sensor	

Function Name	Door_ReadValue	
Arguments	INPUTS	
	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	Uint8
Description	Get Door status	

Light Switch

Function Name	Light_Init	
Arguments		None
Return	E_OK	0
	E_NOK	1
Description	Initializes the Light Switch	

Function Name	Light _ReadValue	
Arguments	INPUTS	
	CH_ID	Uint8
	Description	Choose Channel

	Output	Uint8
Return		Uint8
Description	Get Light Switch status	

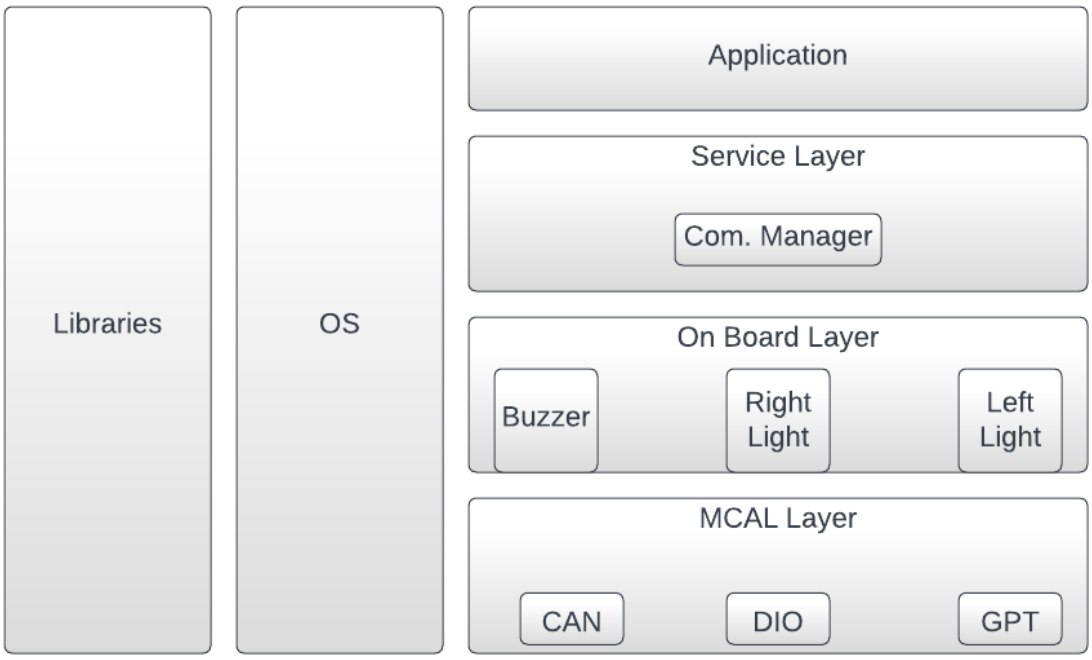
Speed Sensor

Function Name	Speed_Init	
Arguments		None
Return	E_OK	0
	E_NOK	1
Description	Initializes the Speed sensor	

Function Name	Speed_ReadValue	
Arguments	INPUTS	
	ADC_ID	Uint8
	Description	Select ADC Channel
	Output	Uint8
Return		Uint8
Description	Get Speed sensor status	

2- ECU 2:

- The layered architecture:



-Modules

GPIO

Name	GPIO_DirectionType	
Type	Enumeration	
Range	PIN_INPUT	0
	PIN_OUTPUT	1
Description		

Name	Gpio_LevelType	
Type	Enumeration	
Range	PIN_LOW	0
	PIN_HIGH	1
Description		

Name	Channel ID	

Type	Enumeration	
Range	PIN0	0
	…	…
	PINx	x
Description		

Name	Gpio_PortIDType	
Type	Enumeration	
Range	PORTA	0
	PORTB	1
	PORTC	2
	PORTD	3
	PORTE	4
	PORTF	5
Description		

Name	Gpio_ConfigType	
Type	Structure	
Range	Gpio_PortIDType	Select Port
	Channel ID	Select Channel
	GPIO_DirectionType	Select Direction
	Gpio_LevelType	Select Level
Description		

Function Name	GPIO_Init	
Arguments	INPUTS	
	* ConfigPtr	Gpio_ConfigType
	Description	Pointer to post -build configuration data
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Initialize GPIO	

Function Name	GPIO_PinWrite	
Arguments	INPUTS	
	PortID	PortIDType
	Description	Select Port
	PinID	Channel ID
	Description	Select Pin
	PIN_Level	Gpio_LevelType
	Description	Select Pin Level
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Set Level Of Pin	

Function Name	GPIO_PinRead	
Arguments	INPUTS	
	PortID	PortIDType
	Description	Select Port
	PinID	Channel ID
	Description	Select Pin
	OUTPUTS	
	Pin_Level	Gpio_LevelType
Return	E_OK	0
	E_NOK	1
Description	Read Pin	

CAN

Name	CAN_ChannelType	
Type	Enumeration	
Range	CAN_CH1	0
	CAN_CH2	1
Description		

Function Name	CAN_Init	
Arguments	INPUTS	
	CH_ID	CAN_ChannelType
	Description	Select channel
	BaudRate	uint16
	Description	Set Baud Rate
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Initializes the CAN module	

Function Name	CAN_Write	
Arguments	INPUTS	
	Data	uint32
	Description	Data Select to send
	OUTPUTS	NON
Return	E_OK	0
	E_NOK	1
Description	Send Data	

Function Name	CAN_Read	
Arguments	INPUTS	NON
	OUTPUTS	
	Data	uint32

	Description	Data Receive
Return	E_OK	0
	E_NOK	1
Description	Receive Data from Can	

GPT

Name	Timer_ValueType
Type	uint8
Range	The range of this type is µC dependent (width of the timer register) and has to be described by the supplier.
Description	Type for reading and setting the timer values (in number of ticks).

Name	Timer_ConfigType
Type	Structure
Range	
Description	This is the type of the data structure including the configuration set required for initializing the timer unit.

Function Name	Timer_Init	
Arguments	INPUTS	
	* ConfigPtr	Timer_ConfigType
	Output	NON
Return		void
Description	Initializes the Timer module.	

Function Name	Timer_Start	
Arguments	INPUTS	
	Value	GPT_ValueType
	Output	NON
Return		void
Description	Start the timer module	

Function Name	Timer_Stop	
Arguments	INPUTS	NON
	Output	NON
Return		void
Description	Stop the timer module.	

Buzzer

Function Name	Buzzer_ON	
Arguments	INPUTS	
	CH_ID	Channel ID

	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn on the buzzer	

Function Name	Buzzer_OFF	
Arguments	INPUTS	
	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn off the buzzer	

Right light

Function Name	RL_ON	
Arguments	INPUTS	
	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn on Right ligh	

Function Name	RL_ON	
Arguments	INPUTS	
	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn off Right ligh	

left light

Function Name	LL_ON	
Arguments	INPUTS	
	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn on Right ligh	

Function Name	LL_ON	
Arguments	INPUTS	

	CH_ID	Channel ID
	Description	Choose Channel
	Output	NON
Return	E_OK	0
	E_NOK	1
Description	Turn off Right ligh	