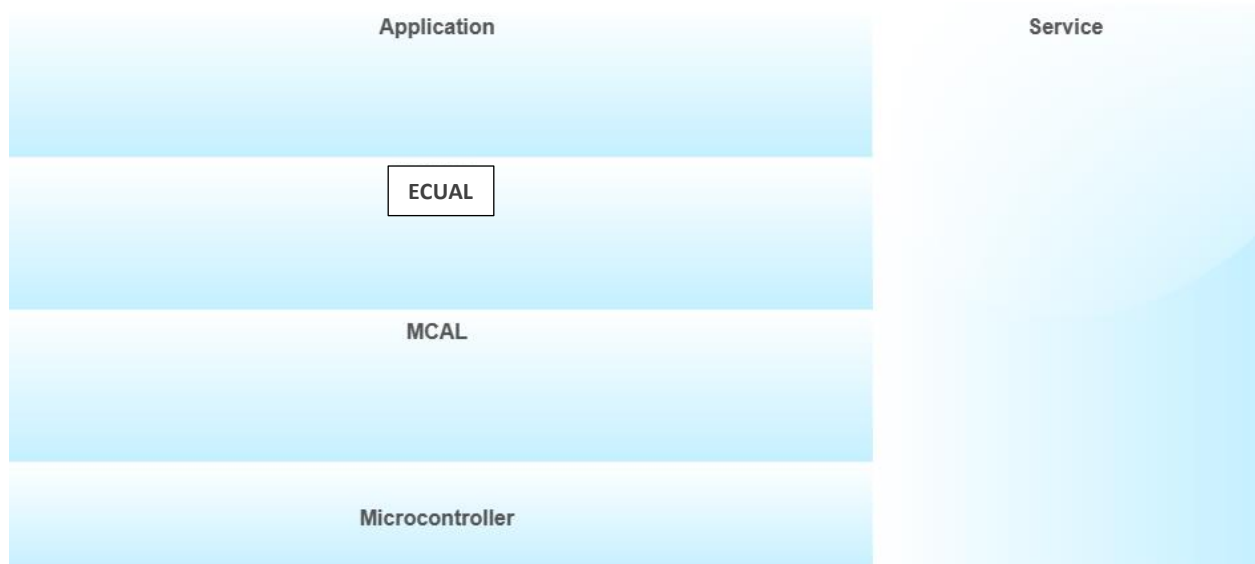# MOVING CAR DESIGN

1. LAYERED ARCHITECTURE

As figured in the picture, we have 5 layers; 4 vertical layers, and 1 horizontal layer. Each layer can call the layer just beneath it but the lower layers can't call functions or APIs from the upper layers except by using call-back functions. In parallel, the service layer is used to communicate with all layers and has APIs that have to be used anywhere as supporting APIs.

2. SYSTEM MODULES
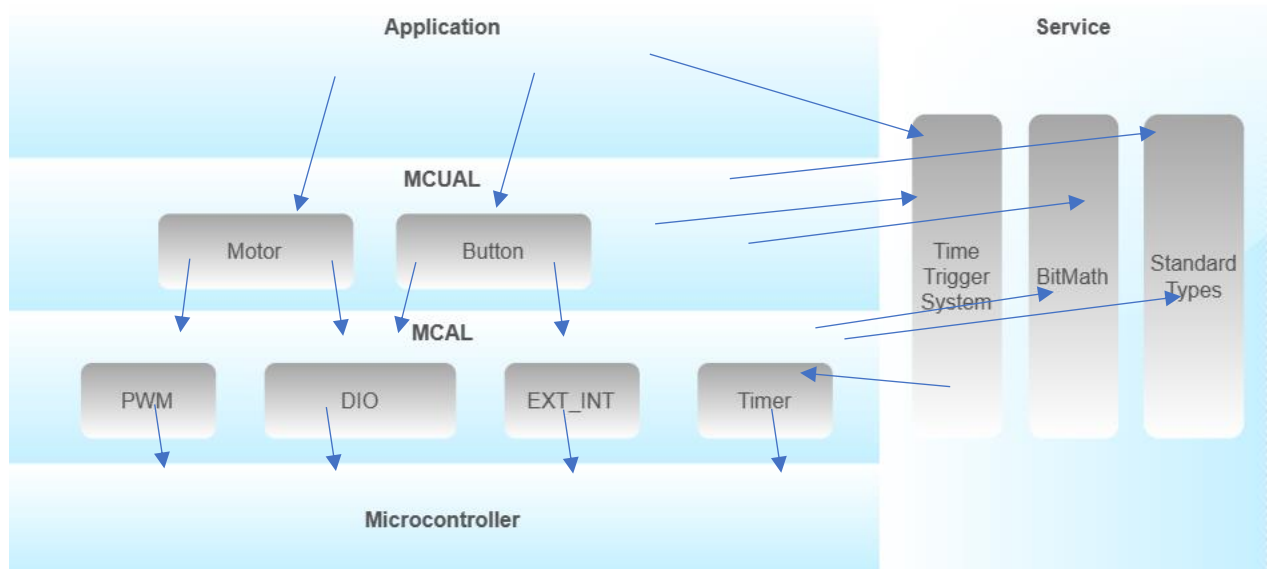
So here as shown I added the modules/drivers used. Application will access Time Triggered System, Button, and Motor to develop the application. The motor will access PWM and DIO to work, Buttons will access DIO and EXT_INT too to be developed and working, Time-Triggered System will access the Timer to initialize it. Time-Triggered System, BitMath, and Standard Types will be accessible to all drivers to support them.

3. MODULE NAME APIS

3.1. DIO_init(uint8_t portNumber, uint8_t pinNumber, uint8_t direction)

Function Name	DIO_init
Description	Initializes DIO pins' direction, output current, and internal attach
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t portNumber, uint8_t pinNumber, uint8_t direction
Parameters (out)	None
Return Value	WRONG_PORT_NUMBER, WRONG_PIN_NUMBER, WRONG_DIRECTION, E_OK

3.2. DIO_write(uint8_t portNumber, uint8_t pinNumber, uint8_t value)

Function Name	DIO_write
Description	Write on DIO pins' a specific output High or Low
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t portNumber, uint8_t pinNumber, uint8_t value
Parameters (out)	None
Return Value	WRONG_PORT_NUMBER, WRONG_PIN_NUMBER, WRONG_VALUE, E_OK

3.3. DIO_toggle(uint8_t portNumber, uint8_t pinNumber)

Function Name	DIO_toggle
Description	Toggle the output of a specific pin
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t portNumber, uint8_t pinNumber
Parameters (out)	None
Return Value	WRONG_PORT_NUMBER, WRONG_PIN_NUMBER, E_OK

3.4. DIO_read(uint8_t portNumber, uint8_t pinNumber, uint8_t *value)

Function Name	DIO_read
Description	Read input from a pin and send it back in a pointer to uint8_t
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t portNumber, uint8_t pinNumber
Parameters (out)	uint8_t *value
Return Value	WRONG_PORT_NUMBER, WRONG_PIN_NUMBER, E_OK

3.5. EXT_INT_init(uint8_t intNumber)

Function Name	EXT_INT_init
Description	Initializes External Interrupts pins' mode.
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t int Number
Parameters (out)	None
Return Value	E_OK, WRONG_INTERRUPT_NUMBER

3.6. EXT_INT_setCallBackIntx()

Function Name	EXT_INT_setCallBackIntx
Description	Sends pointer to function to be called when the interrupt fires
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	Void (*funPtr) (void)
Parameters (out)	None
Return Value	None

3.7.　TIMER_init(uint8_t timerUsed)

Function Name	**TIMER_init**
Description	Initializes a specific timer to work as a CTC or overflow timer
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t timerUsed
Parameters (out)	None
Return Value	EN_timerError_t

3.8.　TIMER_setTime(uint8_t timerUsed, uint32_t desiredTime)

Function Name	**TIMER_setTime**
Description	Used to set time at which the timer interrupt will fires and execute a desired function
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t timerUsed, uint32_t desiredTime
Parameters (out)	None
Return Value	EN_timerError_t

3.9.　Timer_start(uint8_t timerUsed)

Function Name	**TIMER_start**
Description	Start specific timer to count
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t timerUsed
Parameters (out)	None
Return Value	EN_timerError_t

3.10. TIMER_stop(uint8_t timerUsed)

Function Name	TIMER_stop
Description	Stop specific timer from counting
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t timerUsed
Parameters (out)	None
Return Value	EN_timerError_t

3.11. TIMER_setCallBack()

Function Name	TIMER_setCallBack
Description	Initializes Sends pointer to function to be called when the timer's interrupt fires
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t portNumber, uint8_t pinNumber, uint8_t direction
Parameters (out)	None
Return Value	None

3.12. PWM_init(uint8_t pwmPort, uint8_t pwmPin)

Function Name	PWM_init
Description	Initializes a specific pwm
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t pwmPort, uint8_t pwmPin
Parameters (out)	None
Return Value	EN_pwmError_t

3.13. PWM_setDutyCycle(uint8_t pwmPort, uint8_t pwmPin, uint8_t desiredDutyCycle)

Function Name	PWM_setDutyCycle
Description	Set a desired duty cycle for a specific pwm module
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t pwmPort, uint8_t pwmPin, uint8_t desiredDutyCycle
Parameters (out)	None
Return Value	EN_pwmError_t

3.14. PWM_start(uint8_t pwmPort, uint8_t pwmPin)

Function Name	PWM_start
Description	Starts a specific pwm
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t pwmPort, uint8_t pwmPin
Parameters (out)	None
Return Value	EN_pwmError_t

3.15. PWM_stop(uint8_t pwmPort, uint8_t pwmPin)

Function Name	DIO_init
Description	Stops a specific pwm
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t pwmPort, uint8_t pwmPin
Parameters (out)	None
Return Value	EN_pwmError_t

3.16. MOTOR_init ()

Function Name	DIO_init
Description	Initializes motor
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	None
Parameters (out)	None
Return Value	EN_motorError_t

3.17. MOTOR_setDirection(uint8_t direction)

Function Name	MOTOR_setDirection
Description	Sets motor's direction
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t direction
Parameters (out)	None
Return Value	EN_motorError_t

3.18. MOTOR_speed(uint8_t setSpeed)

Function Name	MOTOR_speed
Description	Determines motor speed
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t setSpeed
Parameters (out)	None
Return Value	EN_motorError_t

3.19. MOTOR_start()

Function Name	MOTOR_start
Description	Starts the motor
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	None
Parameters (out)	None
Return Value	EN_mottorError_t

3.20. MOTOR_stop()

Function Name	MOTOR_stop
Description	Stops the motor
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	None
Parameters (out)	None
Return Value	EN_mottorError_t

3.21. BUTTON_init(uint8_t buttonPort, uint8_t buttonPin)

Function Name	DIO_init
Description	Initializes a specific button as input
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t buttonPort, uint8_t buttonPin
Parameters (out)	None
Return Value	EN_buttonError_t

3.22. BUTTON_read(uint8_t buttonPort, uint8_t buttonPin, uint8_t *buttonState)

Function Name	BUTTON_read
Description	Gets a specific button value
Sync\Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	uint8_t buttonPort, uint8_t buttonPin
Parameters (out)	Uint8_t *buttonState
Return Value	EN_buttonError_t