

Basic Communication Manager Design

Bassel Yasser Mahmoud

Contents

Project Introduction	1
High Level Design	2
Layered Architecture.....	2
Module Description.....	3
Drivers' documentation.....	4
APP	4
SERVICE.....	6
HAL	9
MCAL	16
UML	26
Low Level Design	32
Flowchart.....	32
APP	32
SERVICE.....	35
HAL	40
MCAL	51
Pre-compiling configuration	70
SERVICE.....	70
MCAL	71
Linking Configuration.....	73
SERVICE.....	73
MCAL	75

Project Introduction

The Basic Communication Manager module has a capability to work with different serial communication protocol using ISR with the highest possible throughput.

In this design Docs we'll discuss layered architecture, module description, drivers' documentation and UML on High Level Design.

We'll discuss also flowchart of each module, Pre-compiling configuration and Linking configuration on Low Level Design

High Level Design

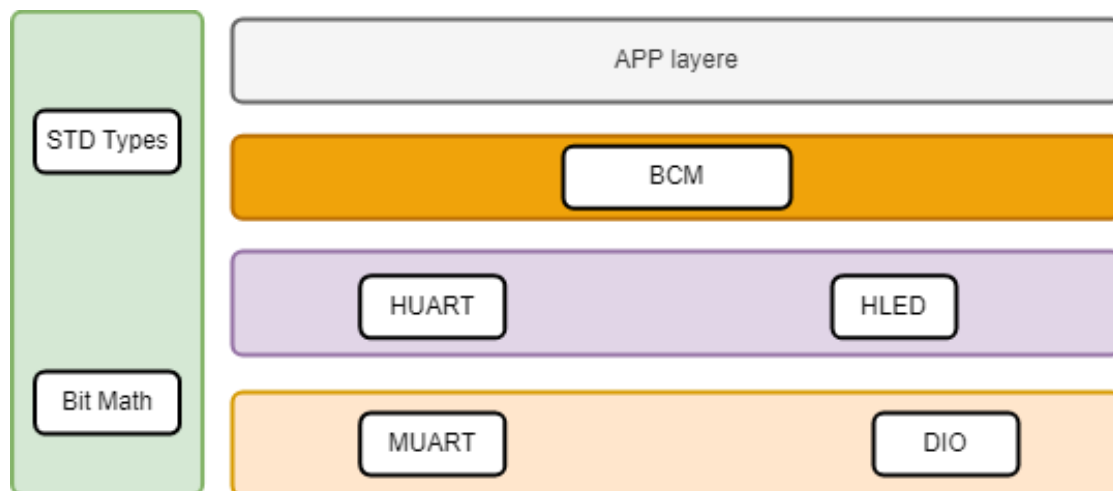
Layered Architecture

APP Layer: written in high level languages like java, C++, C# with rich GUI support. Application layer calls the middleware api in response to action by the user or an event.

HAL Layer: are a way to provide an interface between hardware and software so applications can be device independent.

MCAL Layer: is a software module that directly accesses on-chip MCU peripheral modules and external devices that are mapped to memory, and makes the upper software layer independent of the MCU. Details of the MCAL software module are shown below.

Common Layer: is the layer which consists of BIT_MATH and STD types



Module Description

- **APP Layer**
 - **App:** written in high level languages like java, C++, C# with rich GUI support. Application layer calls the middleware api in response to action by the user or an event.
- **SERVICE Layer**
 - **Sbcm:** In this module configure communication protocol selection
- **HAL Layer**
 - **Huart:** this module communicates with Muart on MCAL layer
 - **Led:** this led module configure selected pin as output and generate volt
- **MCAL Layer**
 - **Muart:** this module having configuration and Initialization for UART which communicate to hardware register directly
- **COMMON Layer**
 - **std_types:** having basic standard types like (UInt32_t, UInt8_t,
 - **bit_math** : Consist of bit manipulation like (SetBit, ClrBit, GetBit, ..)

Drivers' documentation

APP

APP_vidInit

Service name	APP_vidInit
Description	This Function Make Modules Initialization
Syntax	void APP_vidInit (void)
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	app.h

APP_vidStart

Service name	APP_vidStart
Description	This Function Start the Application.
Syntax	void APP_vidStart (void)
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	app.h

SERVICE

BCM module

bcm_init

Service name	bcm_init
Description	This Function Initialize Specific communication protocol
Syntax	<code>enu_system_status_t bcm_init (str_bcm_instance_t* ptr_str_instance_t);</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	ptr_str_instance_t : address of BCM instance
Parameters (out)	None
Return	<code>enu_system_status_t</code>
Available via	bcm.h

bcm_deinit

Service name	bcm_deinit
Description	This Function De-Initialize Specific communication protocol
Syntax	<code>enu_system_status_t bcm_deinit (str_bcm_instance_t* ptr_str_instance_t)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	ptr_str_instance_t : address of BCM instance
Parameters (out)	None
Return	<code>enu_system_status_t</code>
Available via	bcm.h

bcm_send

Service name	bcm_send
Description	This Function Send One byte of data
Syntax	<code>enu_system_status_t bcm_send (str_bcm_instance_t* ptr_str_instance_t, Uint8_t u8_one_byte_data)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	ptr_str_instance_t: address of BCM instance u8_one_byte_data: Copy of data
Parameters (out)	None
Return	<code>enu_system_status_t</code>
Available via	bcm.h

bcm_send_n

Service name	bcm_send_n
Description	This Function send N byte of data
Syntax	<code>enu_system_status_t bcm_send_n (str_bcm_instance_t* ptr_str_instance_t, Uint8_t* ptr_u8_n_byte_data, Uint16_t u16_byte_length)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	ptr_str_instance_t: address of BCM instance ptr_u8_n_byte_data: Copy of array u8_byte_length: Length of array
Parameters (out)	None
Return	<code>enu_system_status_t</code>
Available via	bcm.h

bcm_dispatcher

Service name	bcm_dispatcher
Description	Is periodic function and notifies the user with need event
Syntax	<code>enu_system_status_t bcm_dispatcher (str_bcm_instance_t* ptr_str_instance_t)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>ptr_str_instance_t</code> : address of BCM instance
Parameters (out)	None
Return	<code>enu_system_status_t</code>
Available via	bcm.h

HAL

HUART module

HUART_enInit

Service name	HUART_enInit
Description	This Function call MUART_enInit on MCAL layer
Syntax	<code>en_huartErrStat_t HUART_enInit (Uint32_t copy_u32BaudRateH)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	copy_u32BaudRateH: Copy of Baudrate
Parameters (out)	None
Return	<code>en_huartErrStat_t</code> : <code>HUART_OK</code> , <code>HUART_NOK</code>
Available via	huart_Interface.h

HUART_enDeInit

Service name	HUART_enDeInit
Description	This Function de Initialize UART
Syntax	<code>en_huartErrStat_t HUART_enDeInit(void)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	void
Parameters (out)	None
Return	<code>en_huartErrStat_t</code> : <code>HUART_OK</code> , <code>HUART_NOK</code>
Available via	huart_Interface.h

HUART_enSyncSendData

Service name	HUART_enSyncSendData
Description	This Function call MUART_enSyncSendData on MCAL layer
Syntax	<code>en_huartErrStat_t HUART_enSyncSendData(Uint8_t Copy_u8DataH)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	Copy_u8DataH: Copy of One Byte Data
Parameters (out)	None
Return	<code>en_huartErrStat_t: HUART_OK, HUART_NOK</code>
Available via	huart_Interface.h

HUART_enAsyncSendData

Service name	HUART_enAsyncSendData
Description	This Function call MUART_enAsyncSendData on MCAL layer
Syntax	<code>en_huartErrStat_t HUART_enAsyncSendData (Uint8_t Copy_u8DataH)</code>
Sync/Async	Asynchronous
Reentrancy	Non-Reentrant
Parameters (in)	Copy_u8DataH: Copy of One Byte Data
Parameters (out)	None
Return	<code>en_huartErrStat_t: HUART_OK, HUART_NOK</code>
Available via	huart_Interface.h

HUART_enRecieveData

Service name	HUART_enReieveData
Description	This Function call MUART_enRecieveData on MCAL layer
Syntax	<code>en_huartErrStat_t HUART_enRecieveData (Uin8_t* Ref_u8DataH)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	None
Parameters (out)	Ref_u8DataH: Address of variable which data to be stored
Return	<code>en_huartErrStat_t</code> : <code>HUART_OK</code> , <code>HUART_NOK</code>
Available via	huart_Interface.h

HUART_sendSyncString

Service name	HUART_sendSyncString
Description	This Function call MUART_sendSyncStringon MCAL layer
Syntax	<code>void HUART_sendSyncString (Uin8_t * Hstr, Uin8_t u8_arr_size)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>p_u8_string</code> : Copy of array of char or String <code>u8_arr_size</code> : Copy of array size
Parameters (out)	None
Return	<code>void</code>
Available via	huart_Interface.h

HUART_sendAsyncString

Service name	HUART_sendAsyncString
Description	This Function call MUART_sendAsyncString MCAL layer
Syntax	void HUART_sendAsyncString (Uin8_t * Hstr, Uin16_t u16_arr_size)
Sync/Async	Asynchronous
Reentrancy	Non-Reentrant
Parameters (in)	p_u8_string: Copy of array of char or String u8_arr_size: Copy of array size
Parameters (out)	None
Return	void
Available via	huart_Interface.h

HUART_receiveSTRING

Service name	HUART_receiveSTRING
Description	This Function call MUART_receiveSTRING on MCAL layer
Syntax	void HUART_receiveSTRING (Uin8_t * p_u8_arr, Uin8_t p_u8_arr_size)
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	p_u8_arr: Empty Array which data to be stored p_u8_arr_size: Array size
Parameters (out)	None
Return	void
Available via	huart_Interface.h

HUART_receiveAsyncString

Service name	HUART_receiveAsyncString
Description	This Function call MUART_receiveAsyncString on MCAL layer
Syntax	void HUART_receiveAsyncString (Uuint16_t u16_arr_size)
Sync/Async	S\Asynchronous
Reentrancy	Reentrant
Parameters (in)	u16_arr_size : buffer size that data to be stored
Parameters (out)	None
Return	void
Available via	huart_Interface.h

HUART_enEnableInterrupt

Service name	HUART_enEnableInterrupt
Description	This Function call MUART_enEnableInterrupt on MCAL layer
Syntax	en_huartErrStat_t HUART_enEnableInterrupt (en_huart_tx_rx_sel_t en_huart_tx_rx_sel)
Sync/Async	Asynchronous
Reentrancy	Reentrant
Parameters (in)	en_huart_tx_rx_sel : Take kind of operation (TX or RX)
Parameters (out)	None
Return	en_huartErrStat_t
Available via	huart_Interface.h

HLED module

HLed_Init

Service name	HLed_Init
Description	This Function Init LED dio pin as output
Syntax	<code>enu_ledError_t HLed_Init (enu_pin en_pinNum)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_pinNum: dio pin selection
Parameters (out)	None
Return	<code>enu_ledError_t</code>
Available via	hled.h

HLed_on

Service name	HLed_on
Description	This Function give LED pin logic 1
Syntax	<code>enu_ledError_t HLed_on (enu_pin en_pinx);</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_pinNum: dio pin selection
Parameters (out)	None
Return	<code>enu_ledError_t</code>
Available via	hled.h

HLed_off

Service name	HLed_off
Description	This Function give LED pin logic 0
Syntax	<code>enu_ledError_t HLed_off (enu_pin en_pinx)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_pinNum: dio pin selection
Parameters (out)	None
Return	<code>en_ledError_t</code>
Available via	hled.h

HLed_toggle

Service name	HLed_toggle
Description	This Function Change previous state of LED pin
Syntax	<code>enu_ledError_t HLed_toggle (enu_pin en_pinx)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_pinNum: dio pin selection
Parameters (out)	None
Return	<code>en_ledError_t</code>
Available via	hled.h

MCAL

MUART module

MUART_enInit

Service name	MUART_enInit
Description	This Function Initialize UART configuration
Syntax	<code>en_uartErrStat_t MUART_enInit (Uint32_t copy_u32BaudRateH)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	copy_u32BaudRateH: Copy of Baudrate
Parameters (out)	None
Return	<code>en_uartErrStat_t</code> : <code>MUART_OK</code> , <code>MUART_NOK</code>
Available via	muart_Interface.h

MUART_en_TX_Enable

Service name	MUART_en_TX_Enable
Description	This Function Transmitter Enable
Syntax	<code>void MUART_en_TX_Enable(void)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	<code>void</code>
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_en_RX_Enable

Service name	MUART_en_TX_Enable
Description	This Function Receiver Enable
Syntax	void MUART_en_RX_Enable(void)
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	muart_Interface.h

MUART_en_TX_Disable

Service name	MUART_en_TX_Disable
Description	This Function Disable Transmitter
Syntax	void MUART_en_TX_Disable(void)
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	muart_Interface.h

MUART_en_RX_Disable

Service name	MUART_en_RX_Disable
Description	This Function Disable Receiver
Syntax	void MUART_en_RX_Disable(void)
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	muart_Interface.h

MUART_en_TX_RX_Enable

Service name	MUART_en_TX_RX_Enable
Description	This Function Enable Transmitter & Receiver
Syntax	void MUART_en_TX_RX_Enable(void)
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	void
Parameters (out)	None
Return	void
Available via	muart_Interface.h

MUART_en_TX_RX_Disable

Service name	MUART_en_TX_RX_Disable
Description	This Function Disable Transmitter & Receiver
Syntax	<code>void MUART_en_TX_RX_Disable(void)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	<code>void</code>
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_enSyncSendData

Service name	MUART_enSyncSendData
Description	This Function Send data via UDR register
Syntax	<code>en_uartErrStat_t MUART_enSyncSendData (Uint8_t Copy_u8Data)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>Copy_u8Data</code> : Copy of One Byte Data
Parameters (out)	None
Return	<code>en_uartErrStat_t</code> : <code>MUART_OK</code> , <code>MUART_NOK</code>
Available via	muart_Interface.h

MUART_enAsyncSendData

Service name	MUART_enAsyncSendData
Description	This Function send data and this function is non blocking
Syntax	<code>en_huartErrStat_t MUART_enAsyncSendData (Uin8_t Copy_u8DataH)</code>
Sync/Async	Asynchronous
Reentrancy	Non-Reentrant
Parameters (in)	Copy_u8DataH: Copy of One Byte Data
Parameters (out)	None
Return	<code>en_uartErrStat_t: MUART_OK, MUART_NOK</code>
Available via	huart_Interface.h

MUART_enRecieveData

Service name	MUART_enReieveData
Description	This Function Receive data via UDR register
Syntax	<code>en_uartErrStat_t MUART_enRecieveData (Uin8_t* Ref_u8DataH)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	None
Parameters (out)	Ref_u8DataH: Address of variable which data to be stored
Return	<code>en_uartErrStat_t: MUART_OK, MUART_NOK</code>
Available via	muart_Interface.h

MUART_sendSyncString

Service name	MUART_sendSyncString
Description	This Function Send group of char
Syntax	<code>void MUART_sendSyncString(Uint8_t * str, Uint8_t u8_arr_size)</code>
Sync/Async	Synchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>p_u8_string</code> : Copy of array of char or String <code>u8_arr_size</code> : array or string length to be sent
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_sendAsyncString

Service name	MUART_sendAsyncString
Description	This Function Send group of char
Syntax	<code>void MUART_sendAsyncString (Uint8_t * str, Uint16_t u16_arr_size)</code>
Sync/Async	Asynchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>p_u8_string</code> : Copy of array of char or String <code>u8_arr_size</code> : array or string length to be sent
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_receiveAsyncString

Service name	MUART_receiveAsyncString
Description	This Function Send group of char
Syntax	<code>void MUART_receiveAsyncString(Uint16_t u16_arr_size)</code>
Sync/Async	Asynchronous
Reentrancy	Non-Reentrant
Parameters (in)	<code>u16_arr_size</code> : array or string length to be received
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_receiveSTRING

Service name	MUART_receiveSTRING
Description	This Function Receive group of char
Syntax	<code>void MUART_receiveSTRING (Uint8_t * p_u8_arr, Uint8_t p_u8_arr_size)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	<code>p_u8_arr</code> : Empty Array which data to be stored <code>p_u8_arr_size</code> : Array size
Parameters (out)	None
Return	<code>void</code>
Available via	muart_Interface.h

MUART_enEnableInterrupt

Service name	MUART_enEnableInterrupt
Description	This Function Enable UART Interrupt
Syntax	<code>en_uartErrStat_t MUART_enEnableInterrupt (en_muart_interrupt_t en_muart_interrupt)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_muart_interrupt: choosing which INT fires (TX or RX)
Parameters (out)	None
Return	<code>en_uartErrStat_t</code>
Available via	muart_Interface.h

MUART_enDisableInterrupt

Service name	MUART_enDisableInterrupt
Description	This Function Disable UART Interrupt
Syntax	<code>en_uartErrStat_t MUART_enDisableInterrupt (en_muart_interrupt_t en_muart_interrupt)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	en_muart_interrupt: choosing which INT Disabled (TX or RX)
Parameters (out)	None
Return	<code>en_uartErrStat_t</code>
Available via	muart_Interface.h

DIO module

DIO_s8SETPinDir

Service name	DIO_s8SETPinDir
Description	This Function Initialize Pin Direction Input or Output
Syntax	<code>Sint8_t DIO_s8SETPinDir (enu_pin enPinCopy, enu_dir enPortDir)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	enPinCopy: Select pin and port [DIO_PINA_0,.....] enPortDir: Select Pin direction [INPUT, OUTPUT]
Parameters (out)	None
Return	<code>Sint8_t: DIO_OK, DIO_NOK</code>
Available via	dio_Interface.h

DIO_s8SETPinVal

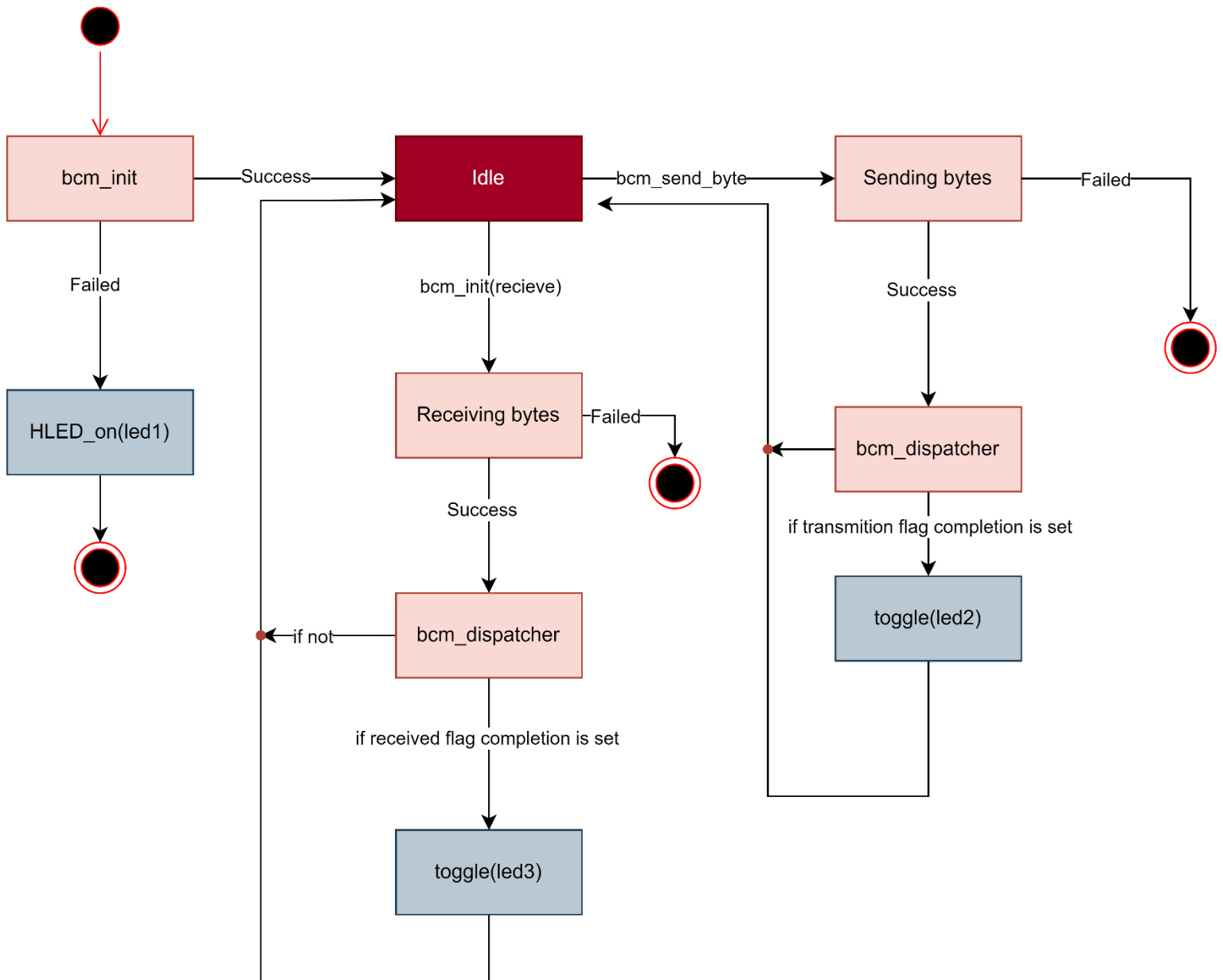
Service name	DIO_s8SETPinVal
Description	This Function Initialize Pin Value High or Low
Syntax	<code>Sint8_t DIO_s8SETPinVal (enu_pin enPinCopy, enu_dir enPortVal)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	enPinCopy: Select pin and port [DIO_PINA_0,.....] enPortDir: Select Pin Value [HIGH, LOW]
Parameters (out)	None
Return	<code>Sint8_t: DIO_OK, DIO_NOK</code>
Available via	dio_Interface.h

DIO_s8GETPinVal

Service name	DIO_s8GETPinVal
Description	This Function Get value from selected pin
Syntax	<code>Sint8_t DIO_s8GETPinVal (enu_pin enPinCopy, Uint8_t* pu8Val)</code>
Sync/Async	Synchronous
Reentrancy	Reentrant
Parameters (in)	enPinCopy: Select pin and port [DIO_PINA_0,.....]
Parameters (out)	pu8Val: Address of variable which pin status to be stored
Return	<code>Sint8_t: DIO_OK, DIO_NOK</code>
Available via	dio_Interface.h

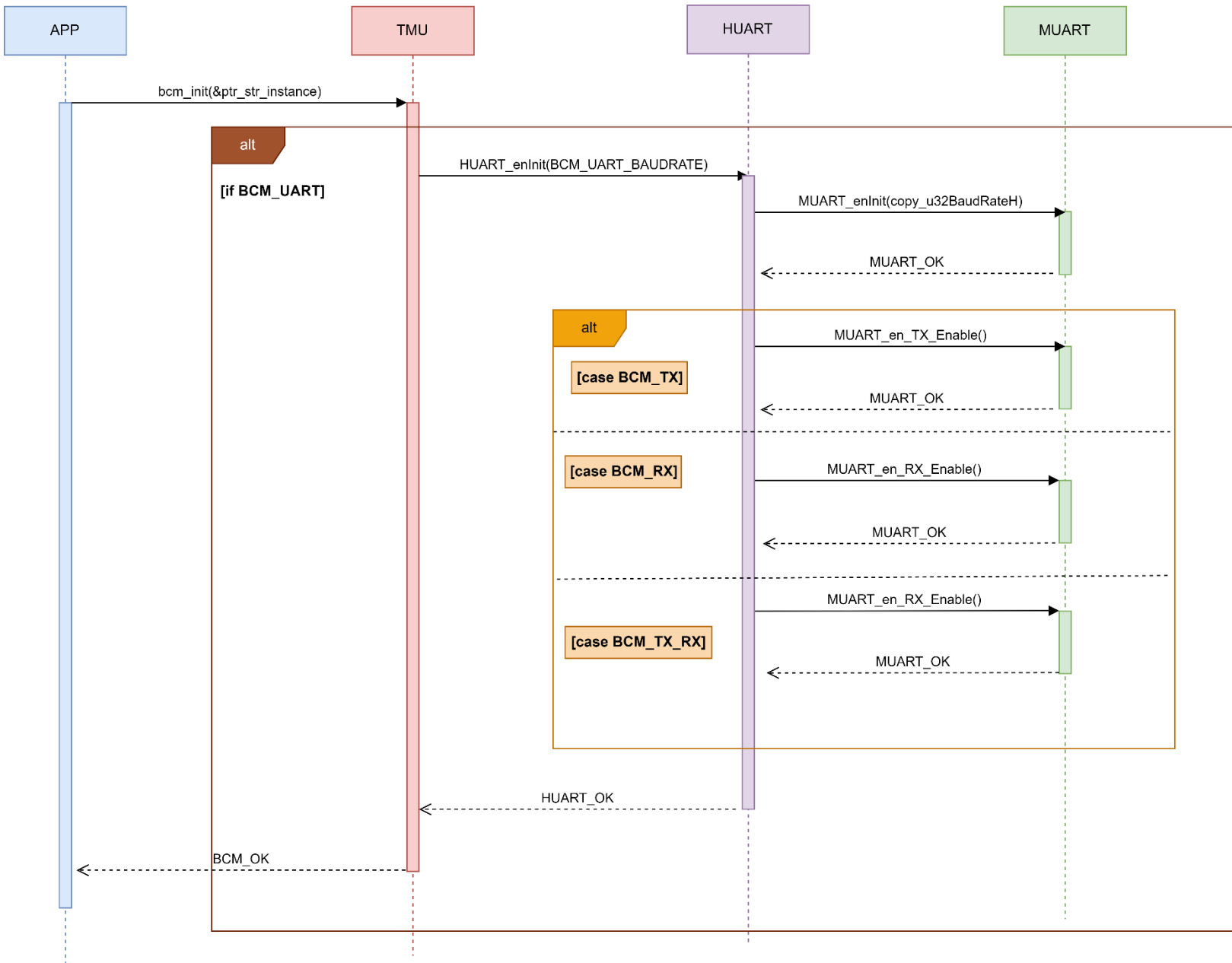
UML

State Machine

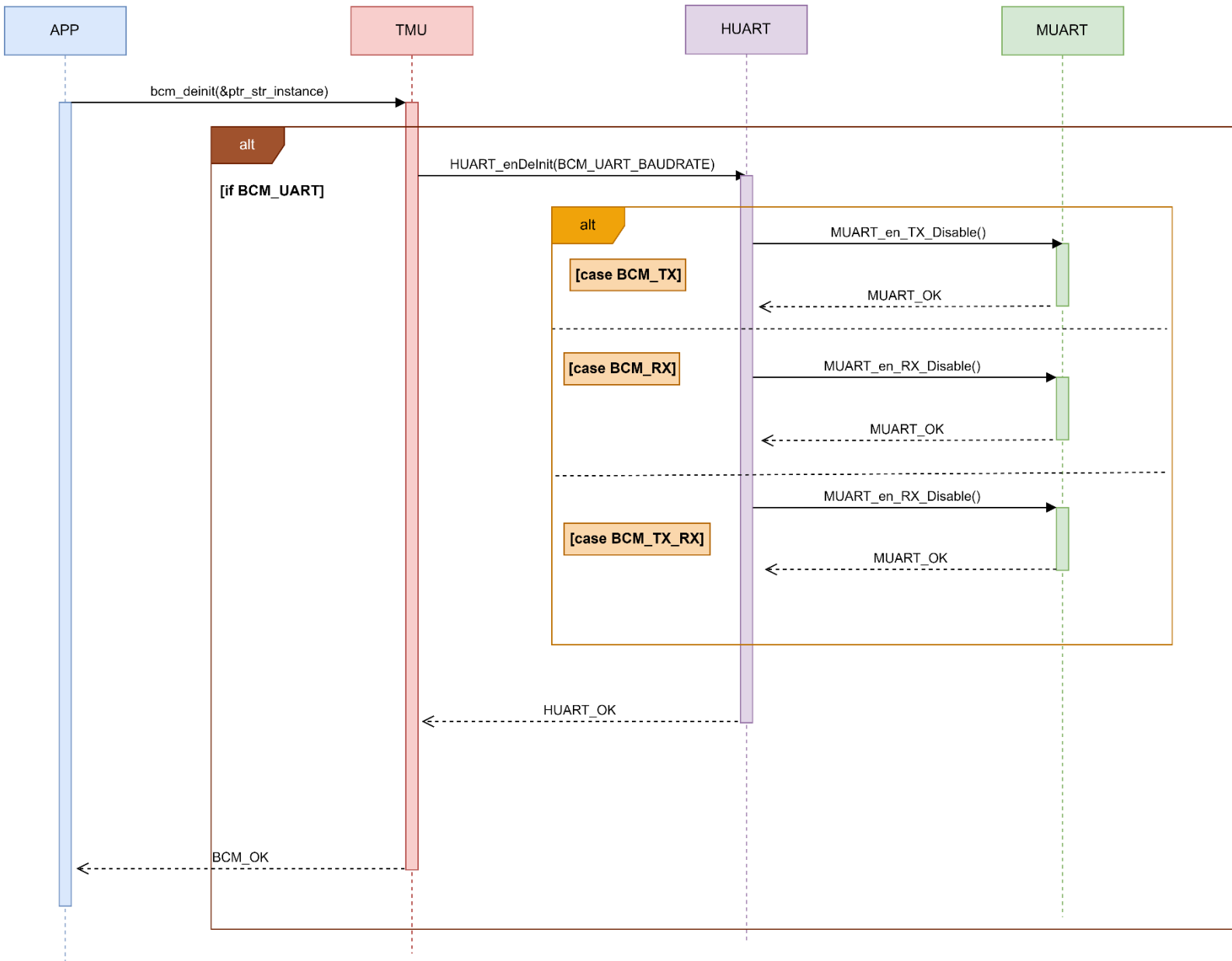


Sequence Diagram

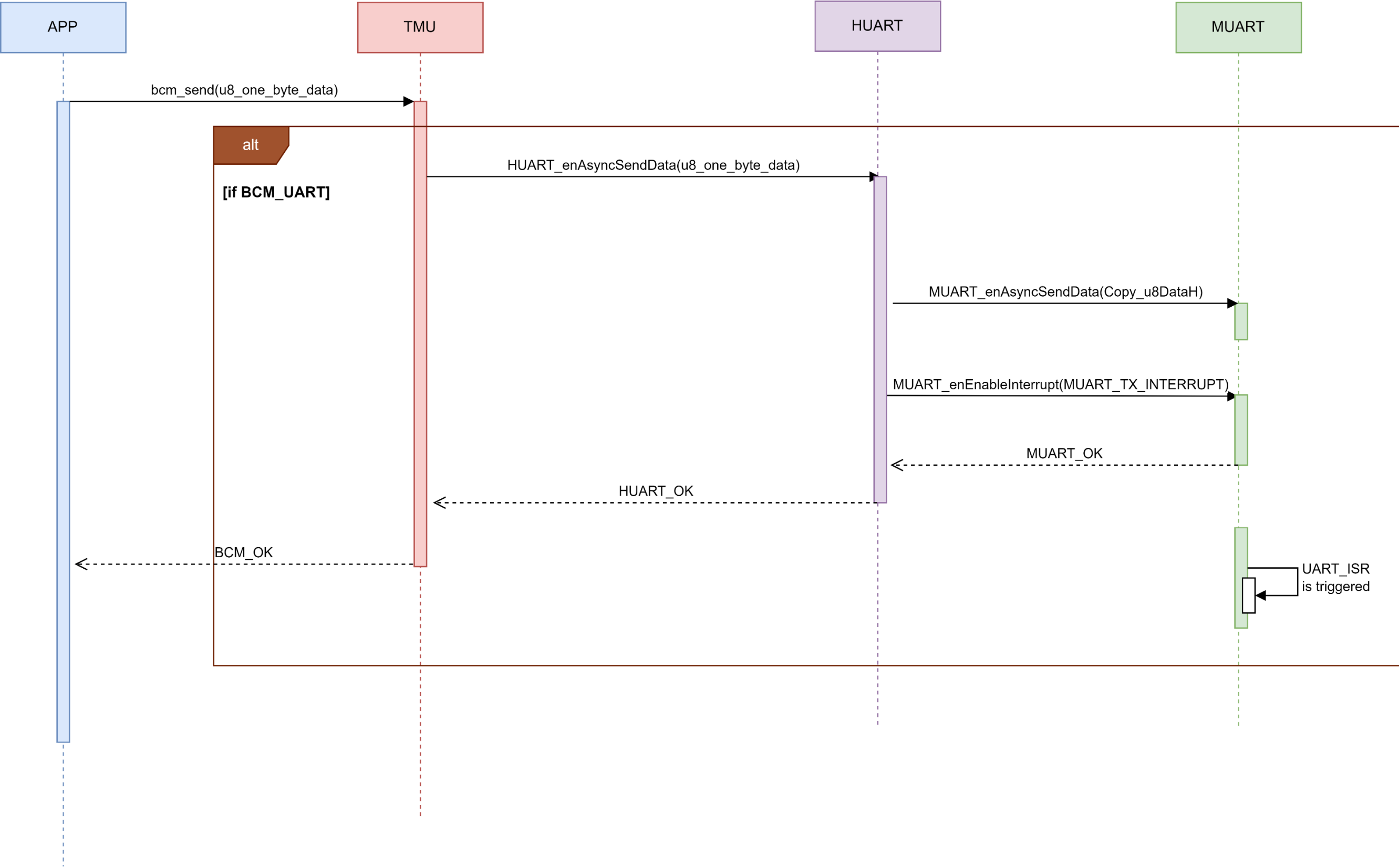
Communication Initialization



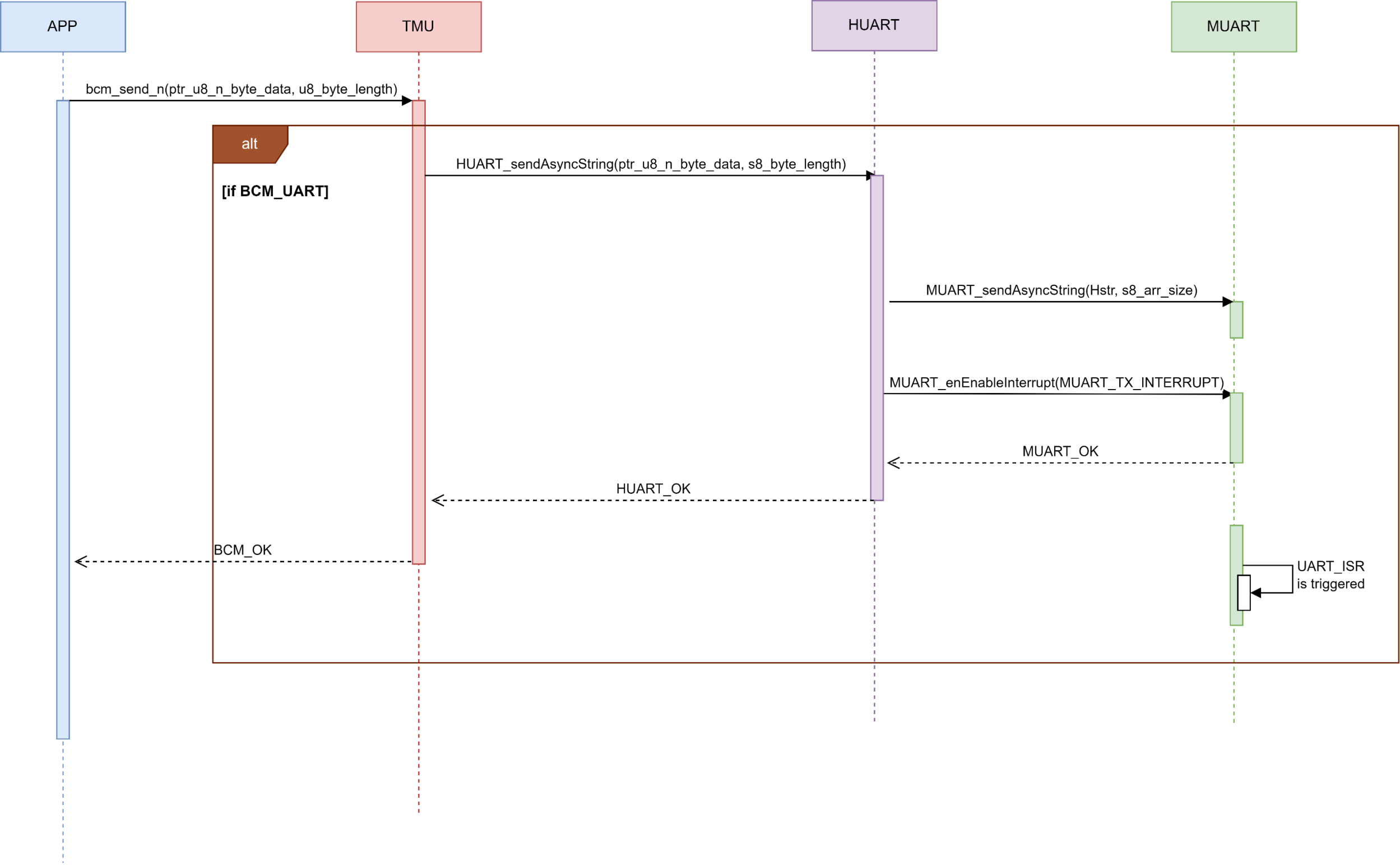
Communication De-Initialization



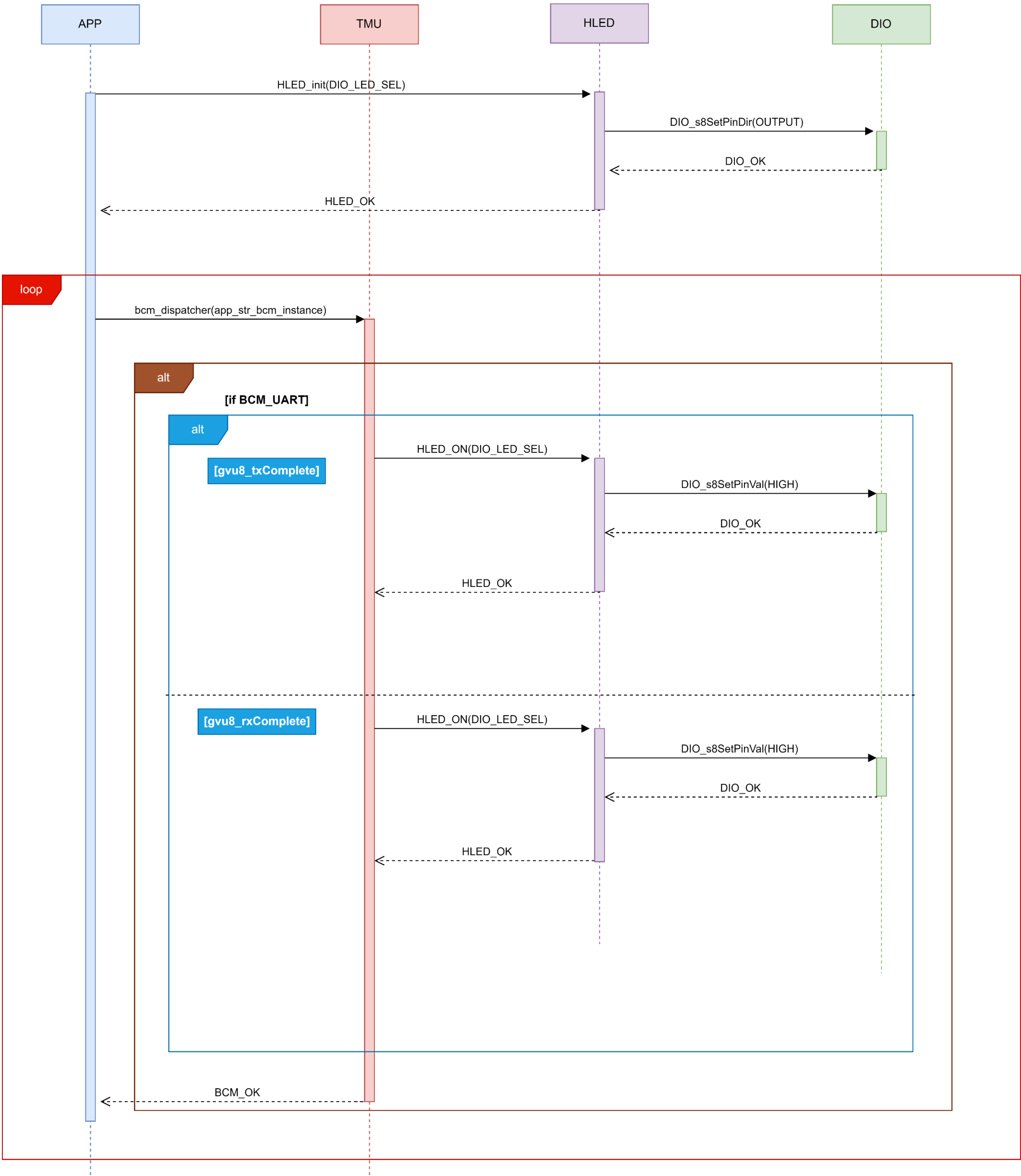
Sending Data (one byte)



Sending Data (N bytes)



Dispatcher function

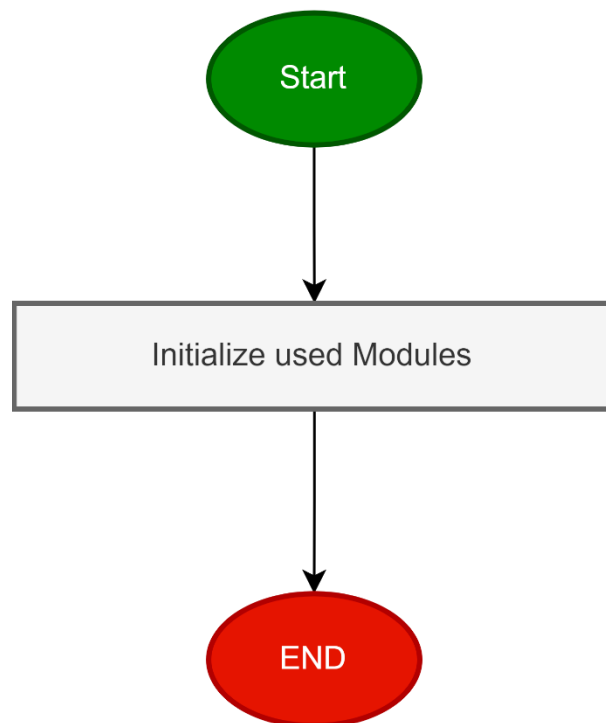


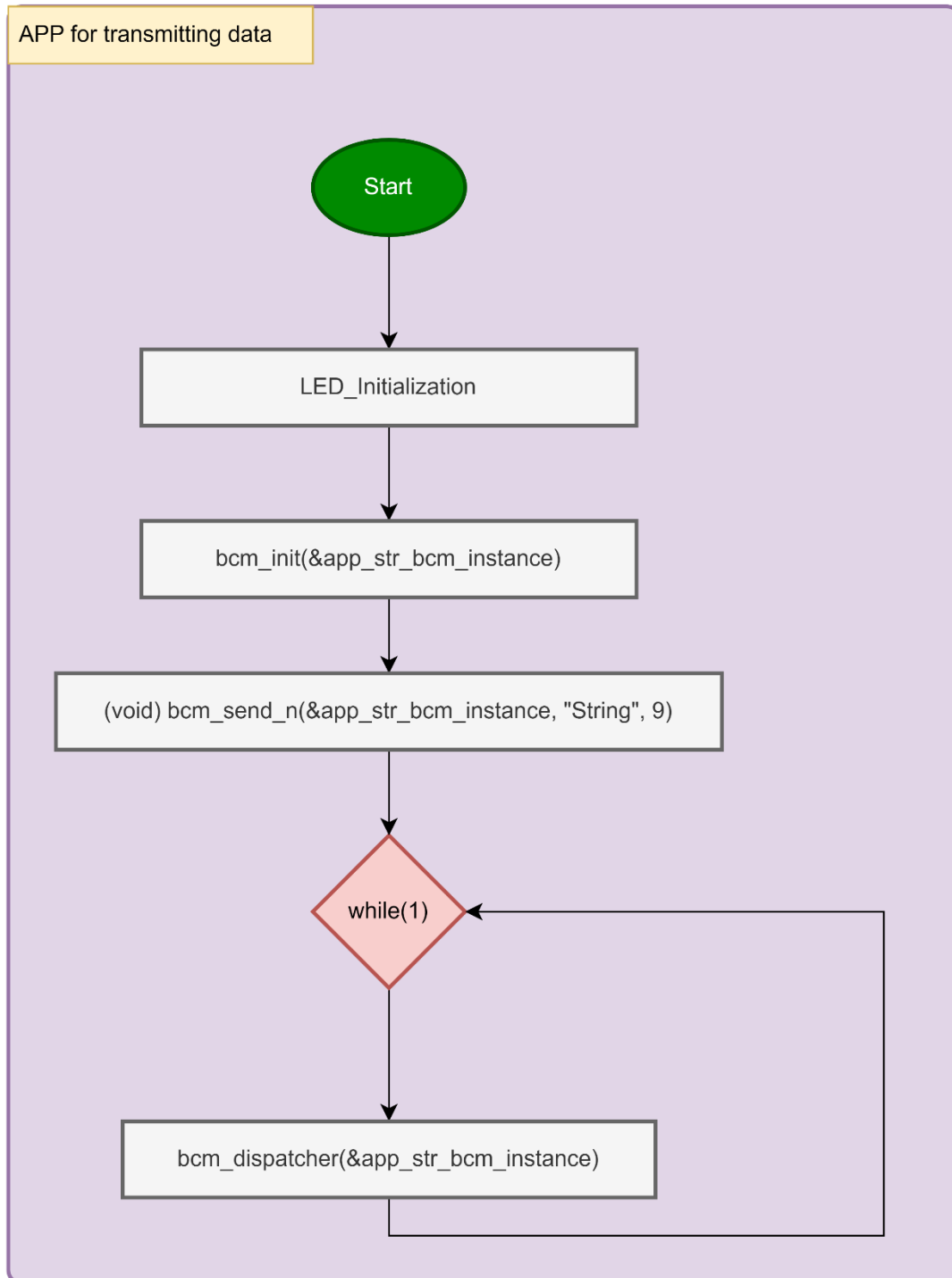
Low Level Design

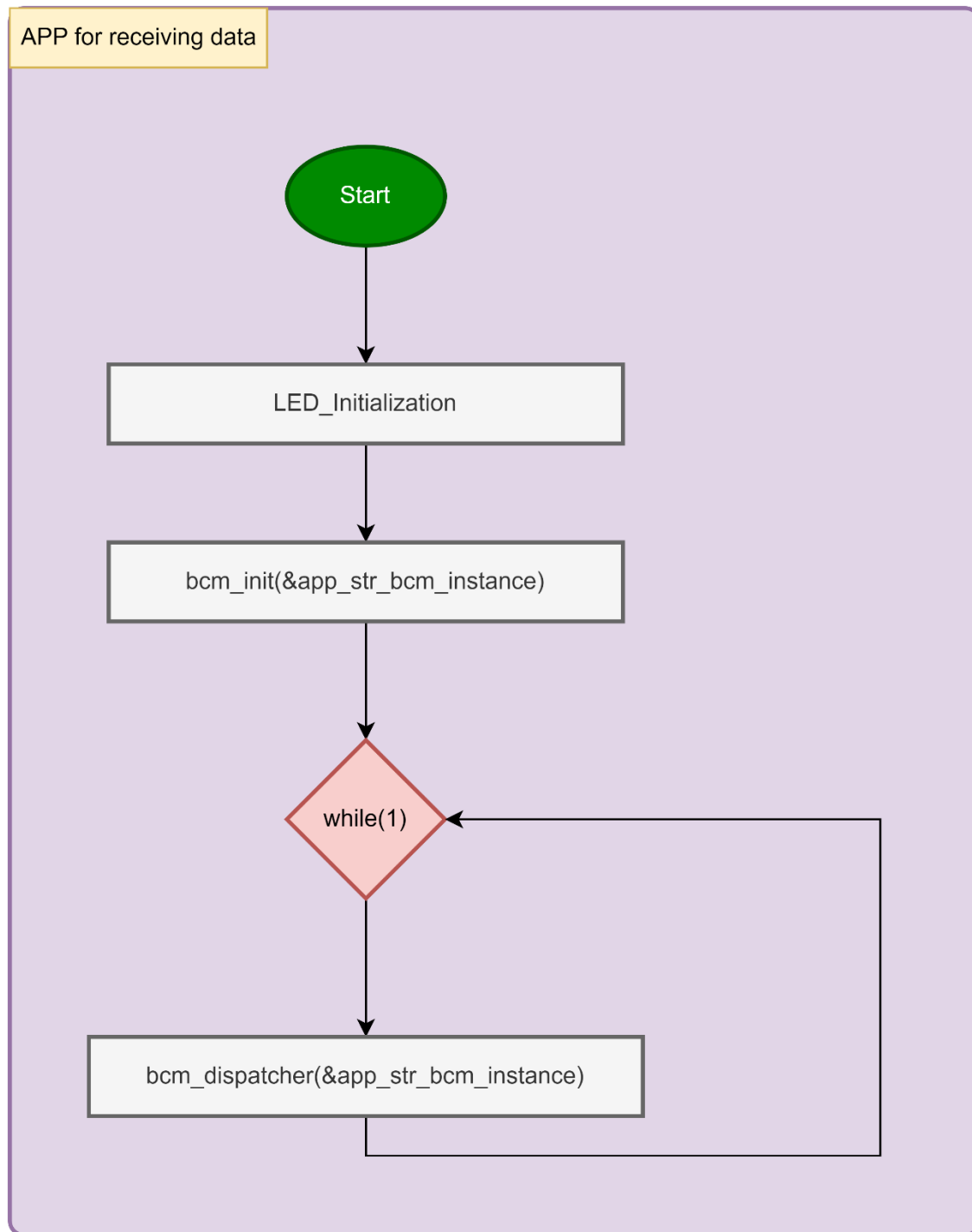
Flowchart

APP

APP_vidInit



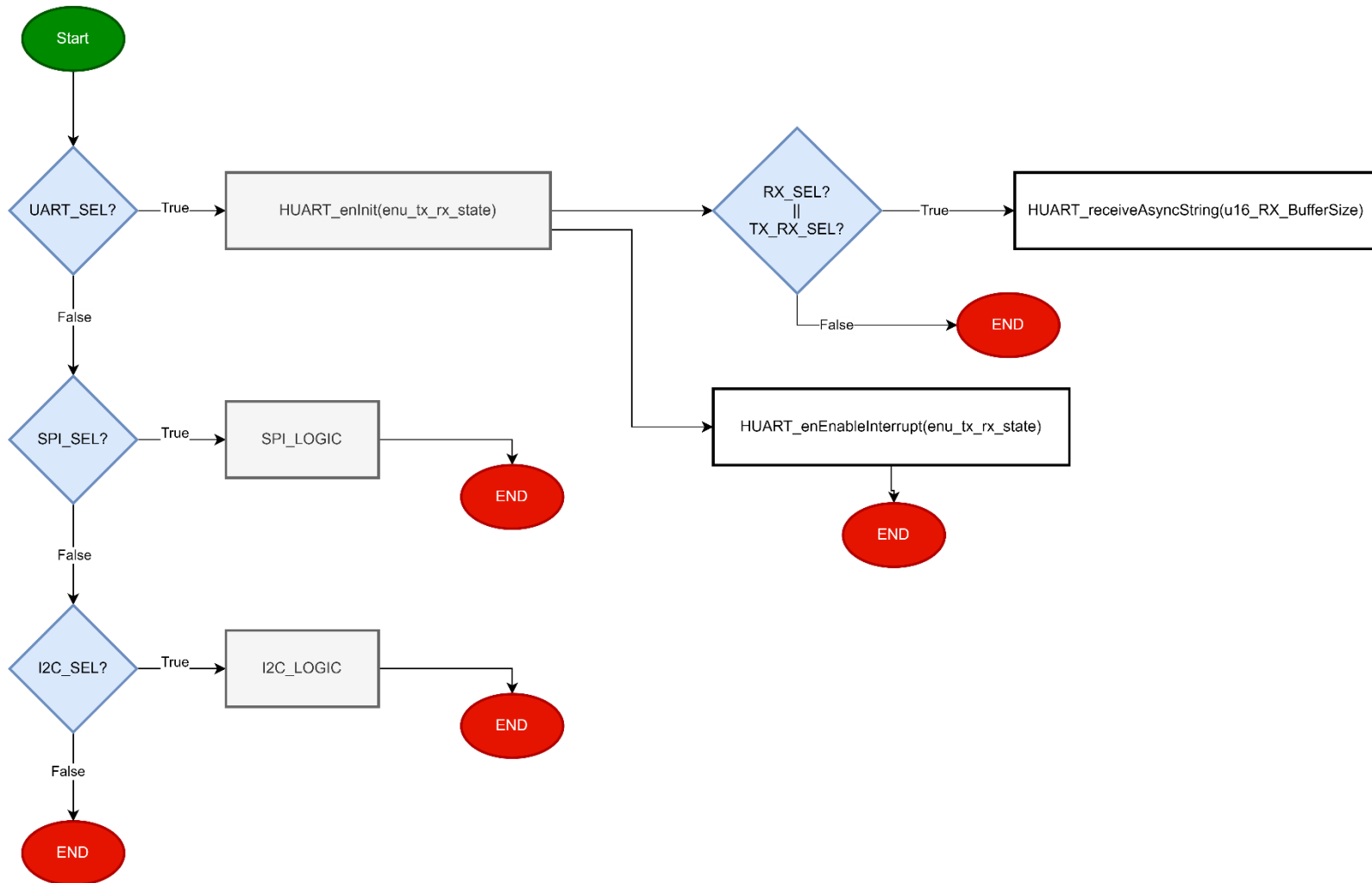
APP_vidStart

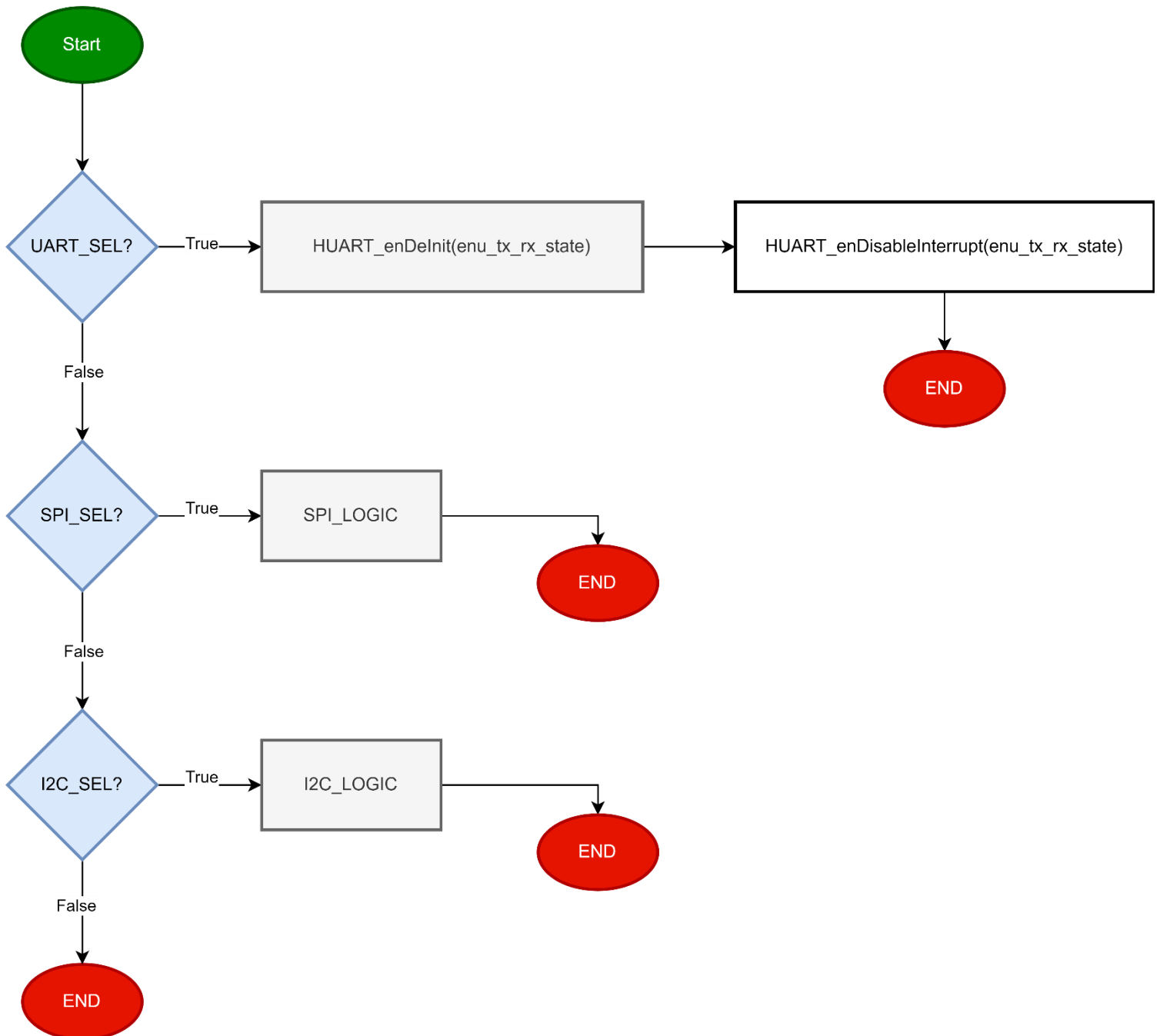


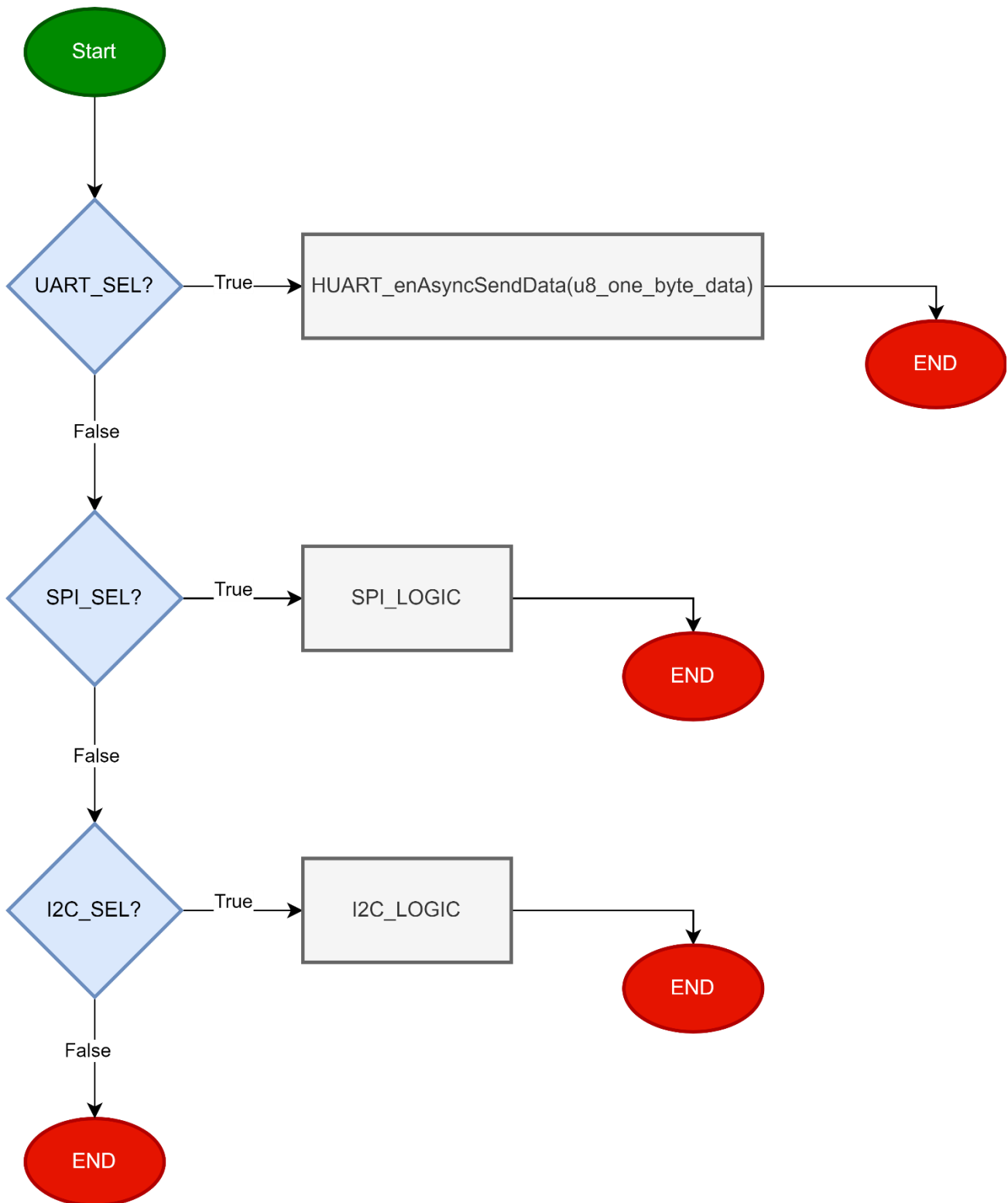
SERVICE

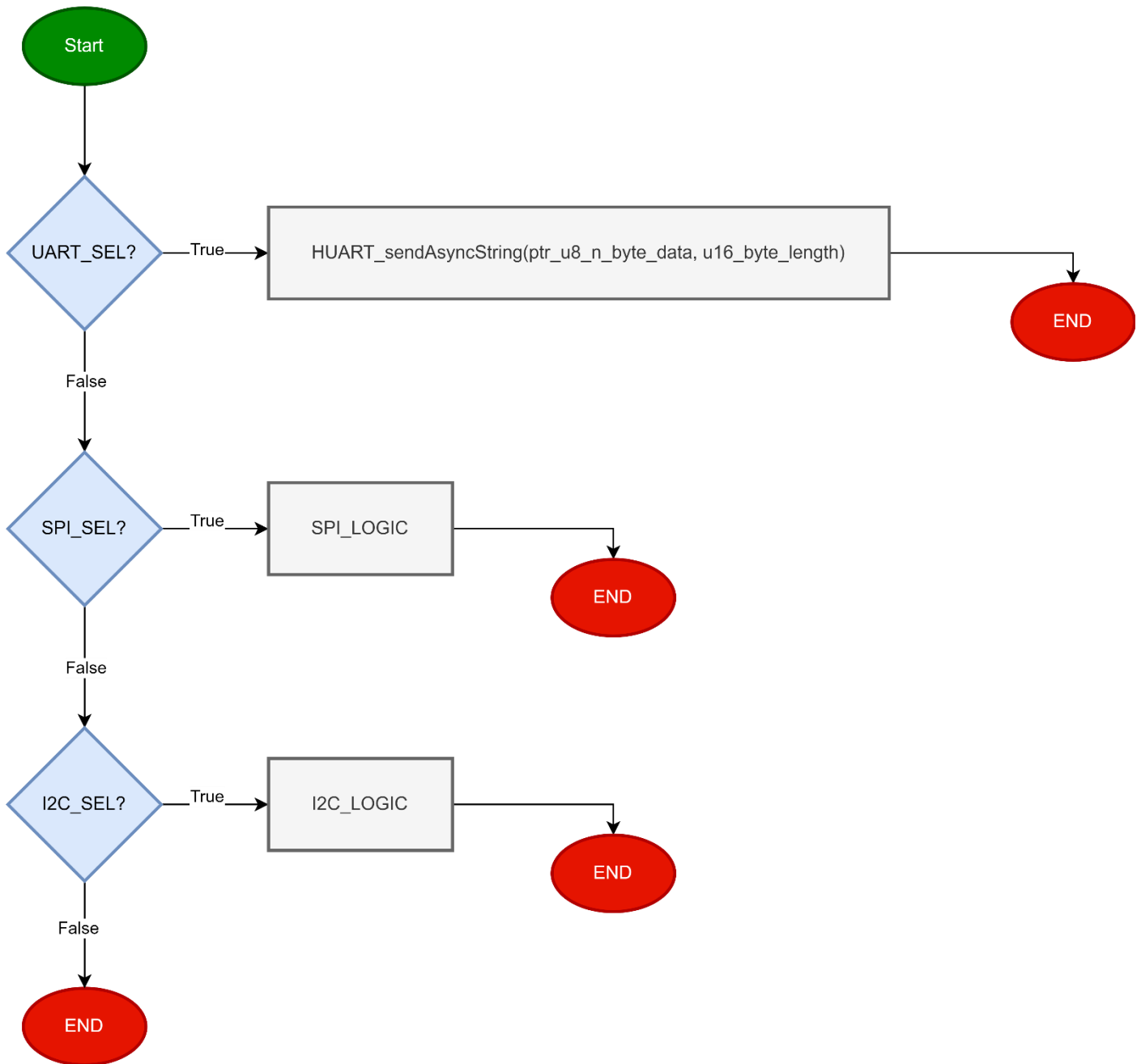
BCM module

bcm_init

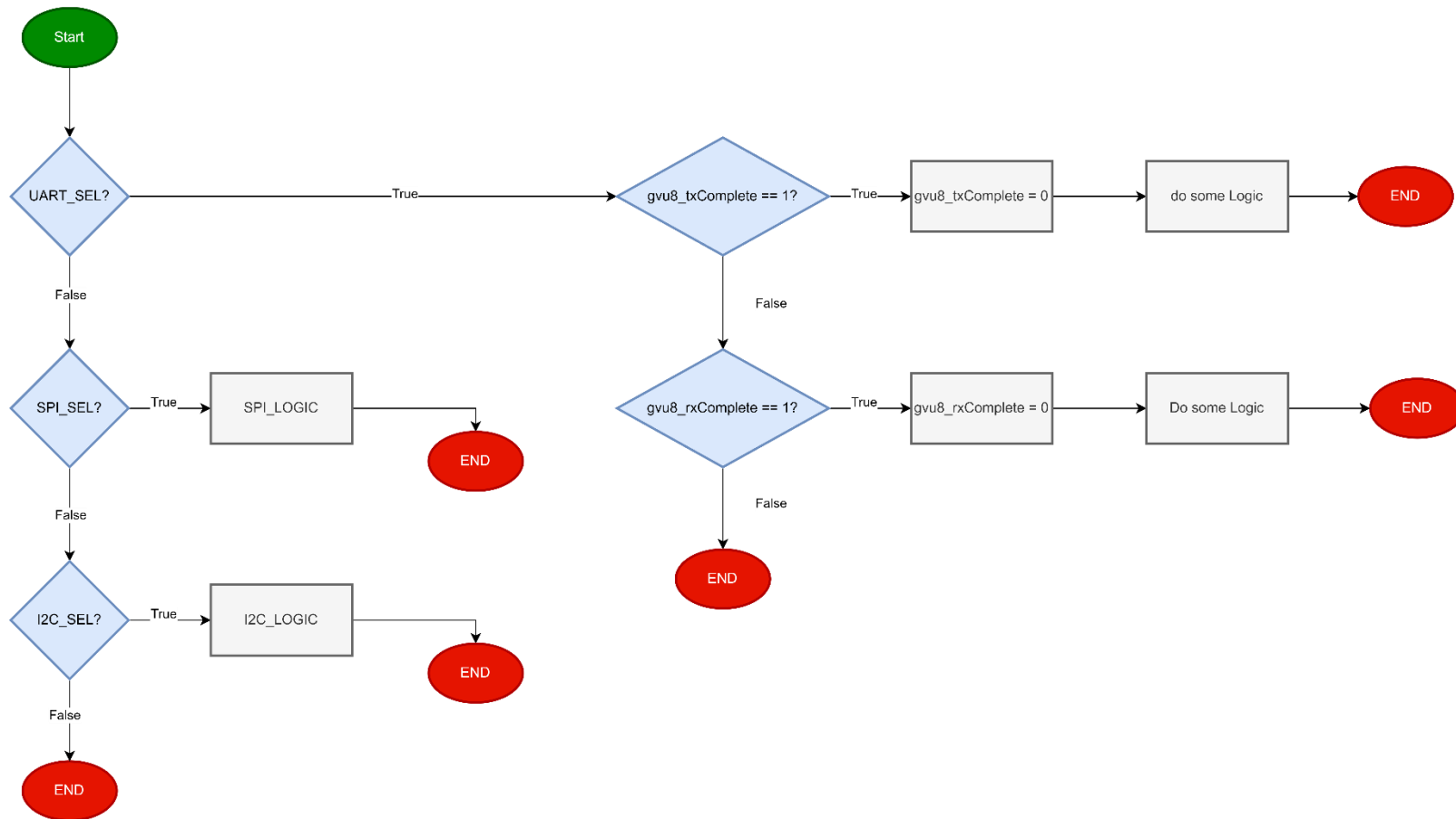


bcm_deinit

bcm_send

bcm_send_n

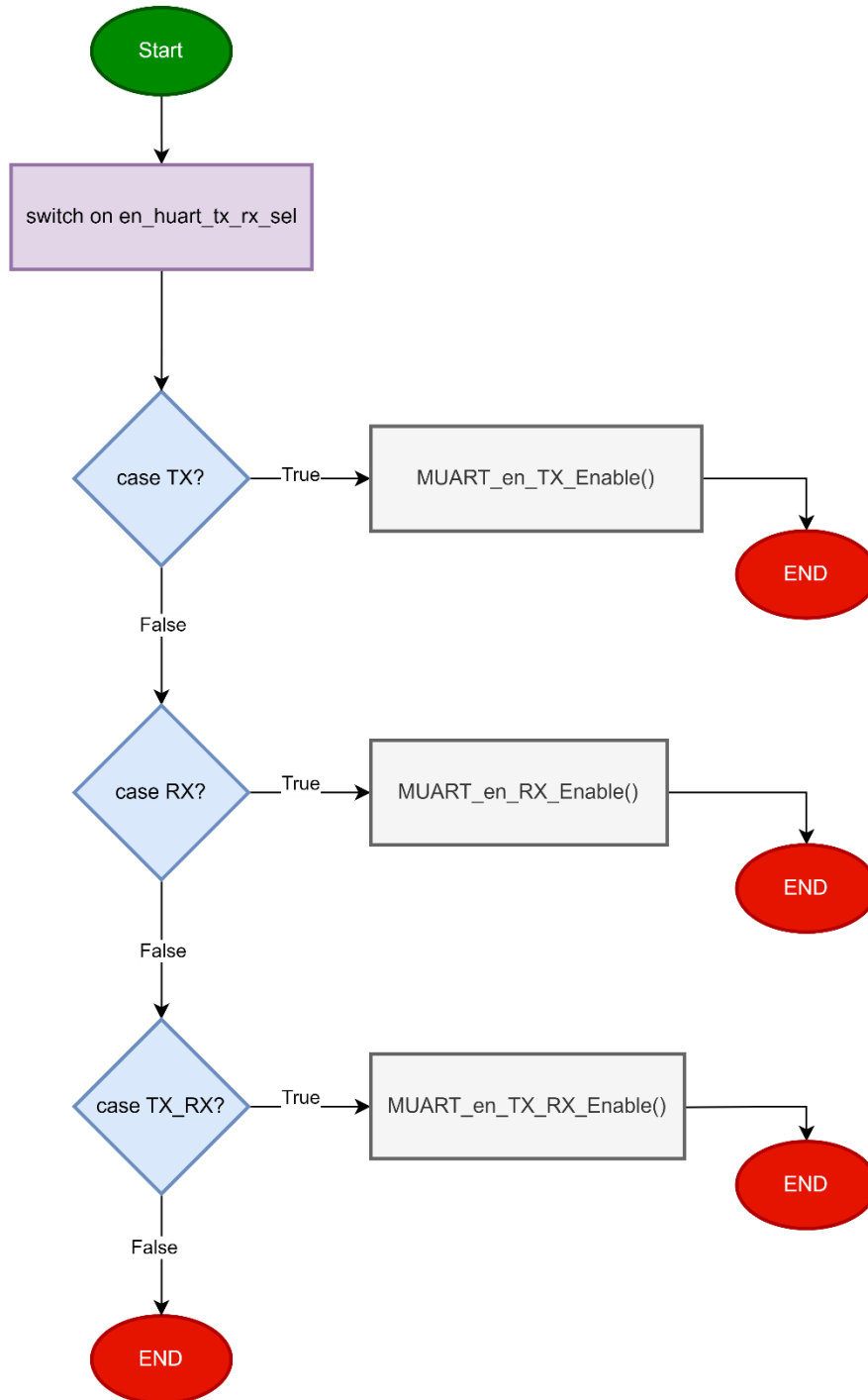
bcm_dispatcher

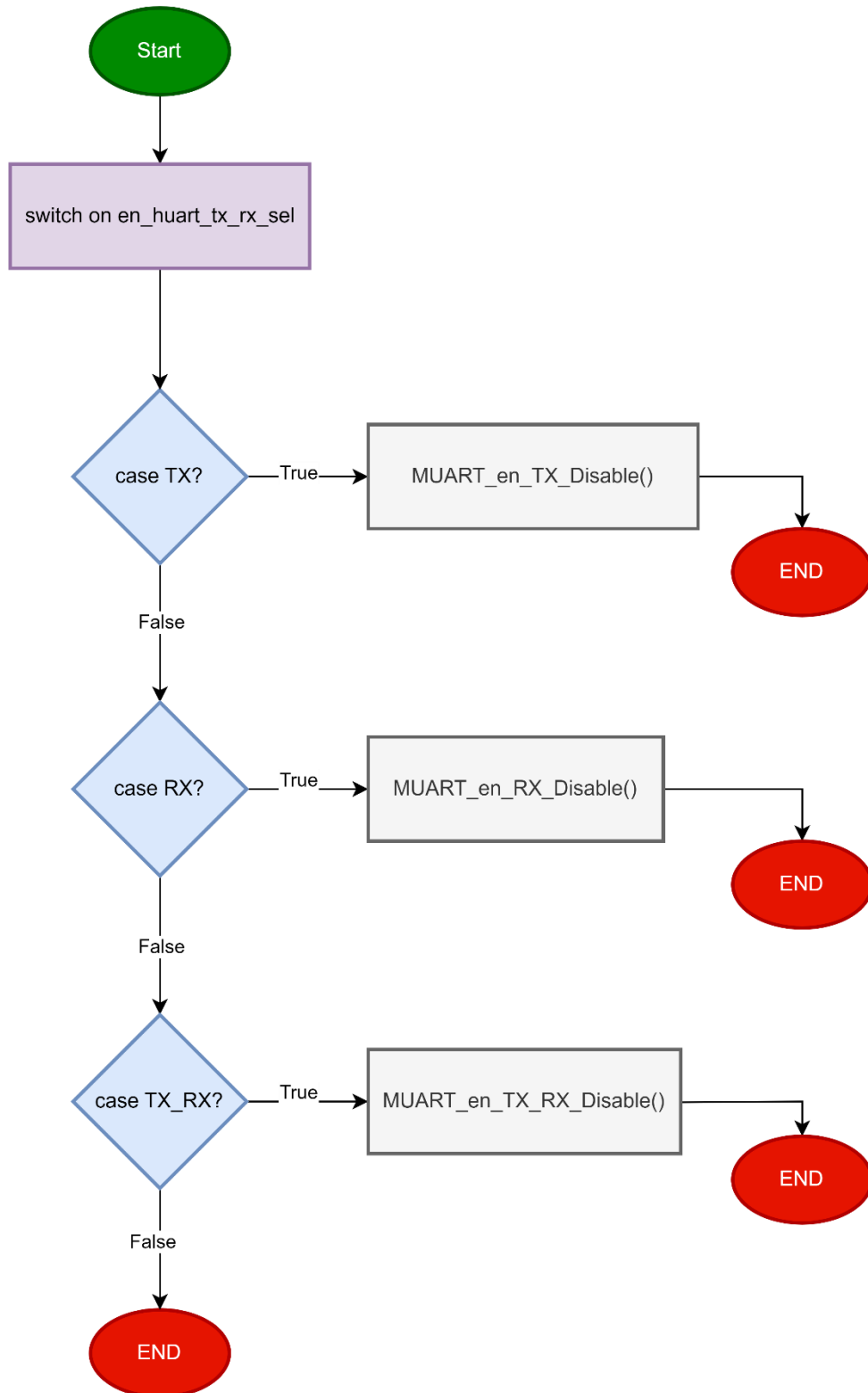


HAL

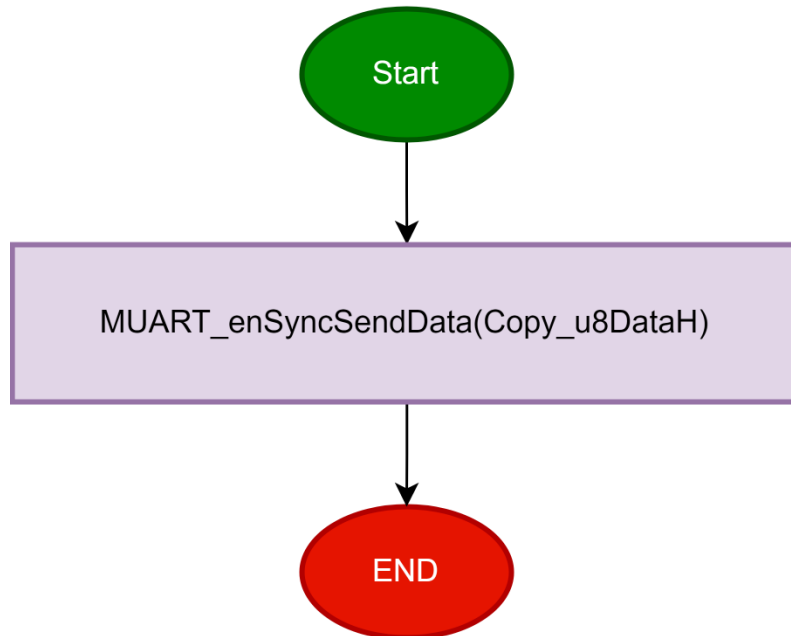
HUART module

HUART_enInit

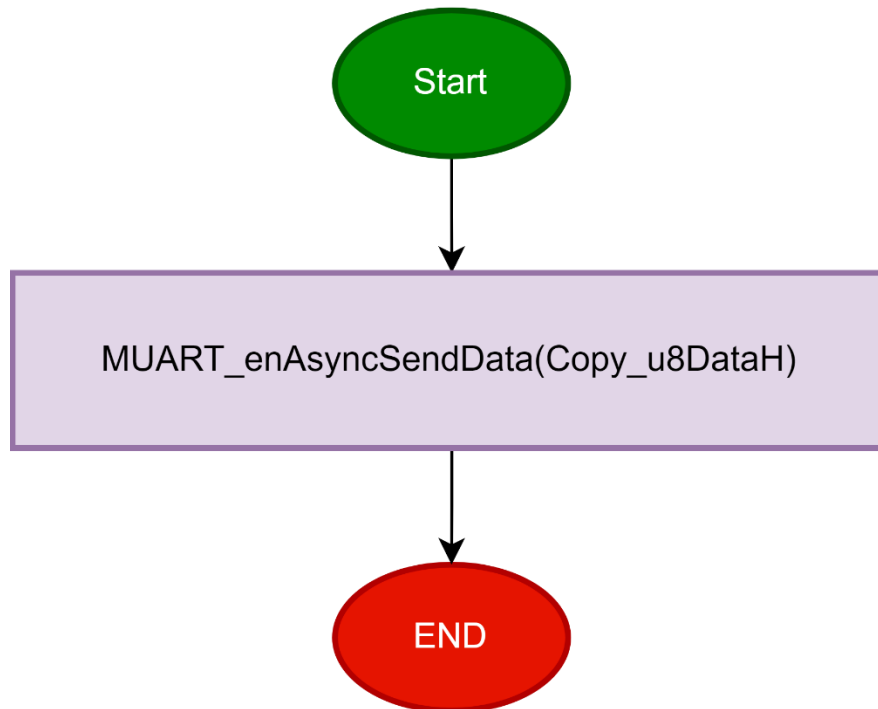


HUART_enDeInit

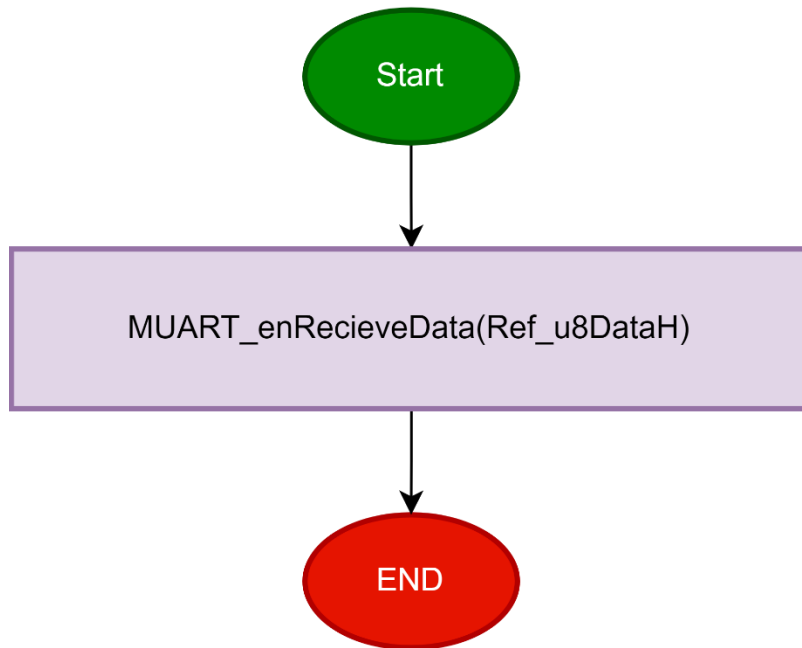
HUART_enSyncSendData



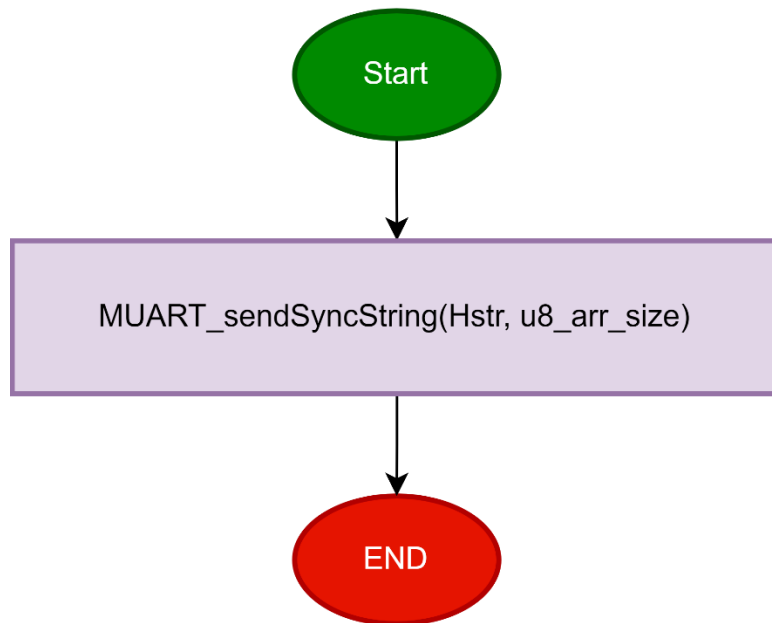
HUART_enAsyncSendData

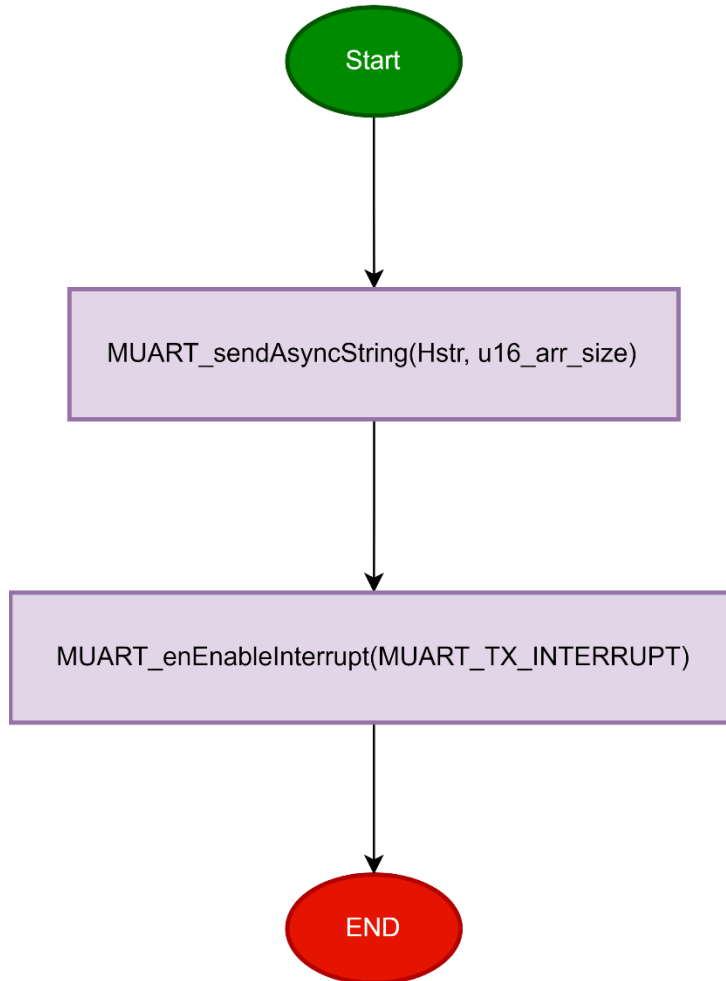


HUART_enRecieveData

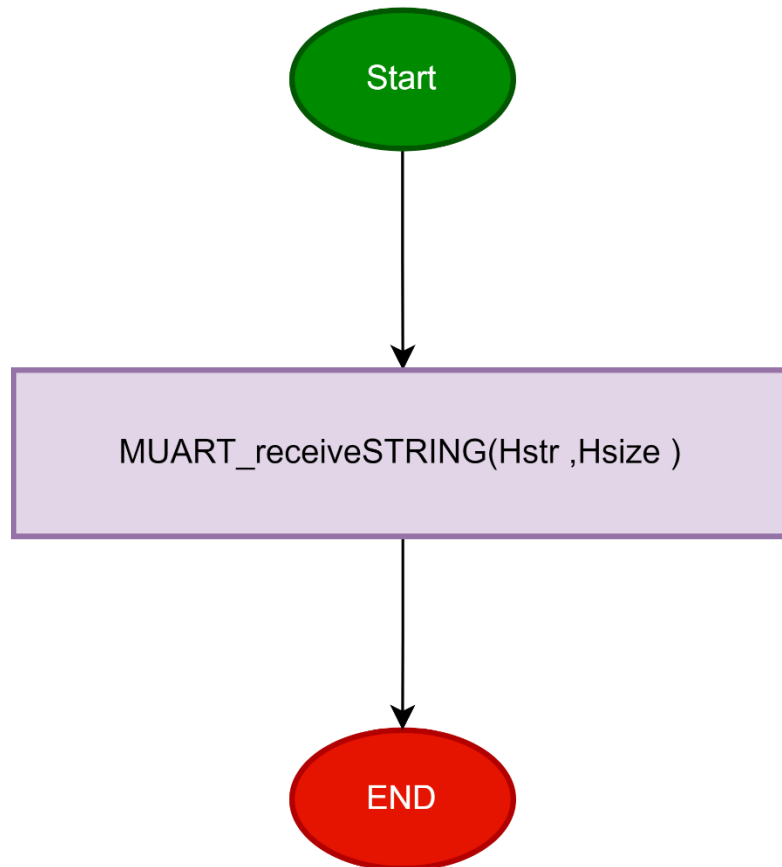


HUART_sendSyncString

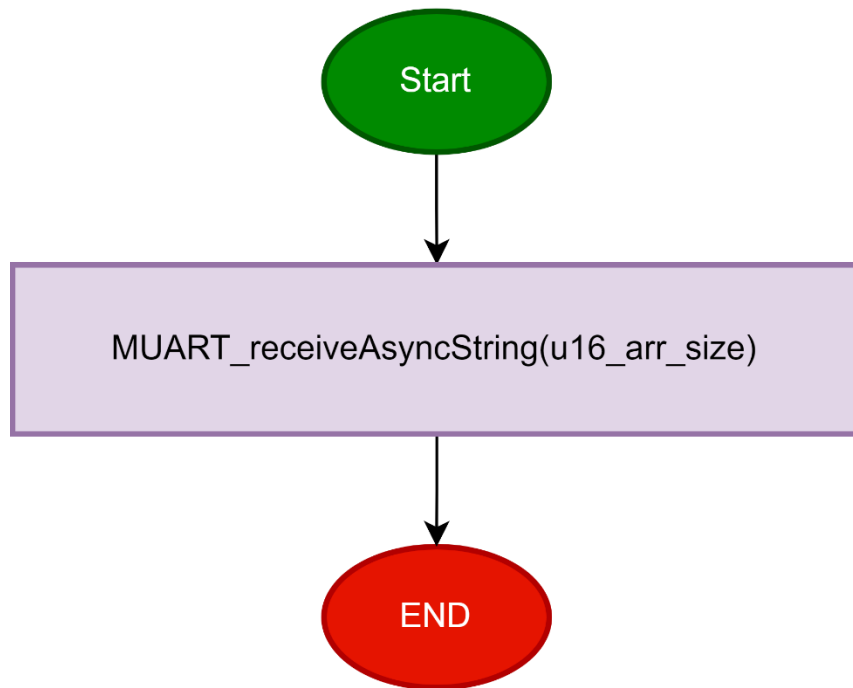


HUART_sendAsyncString

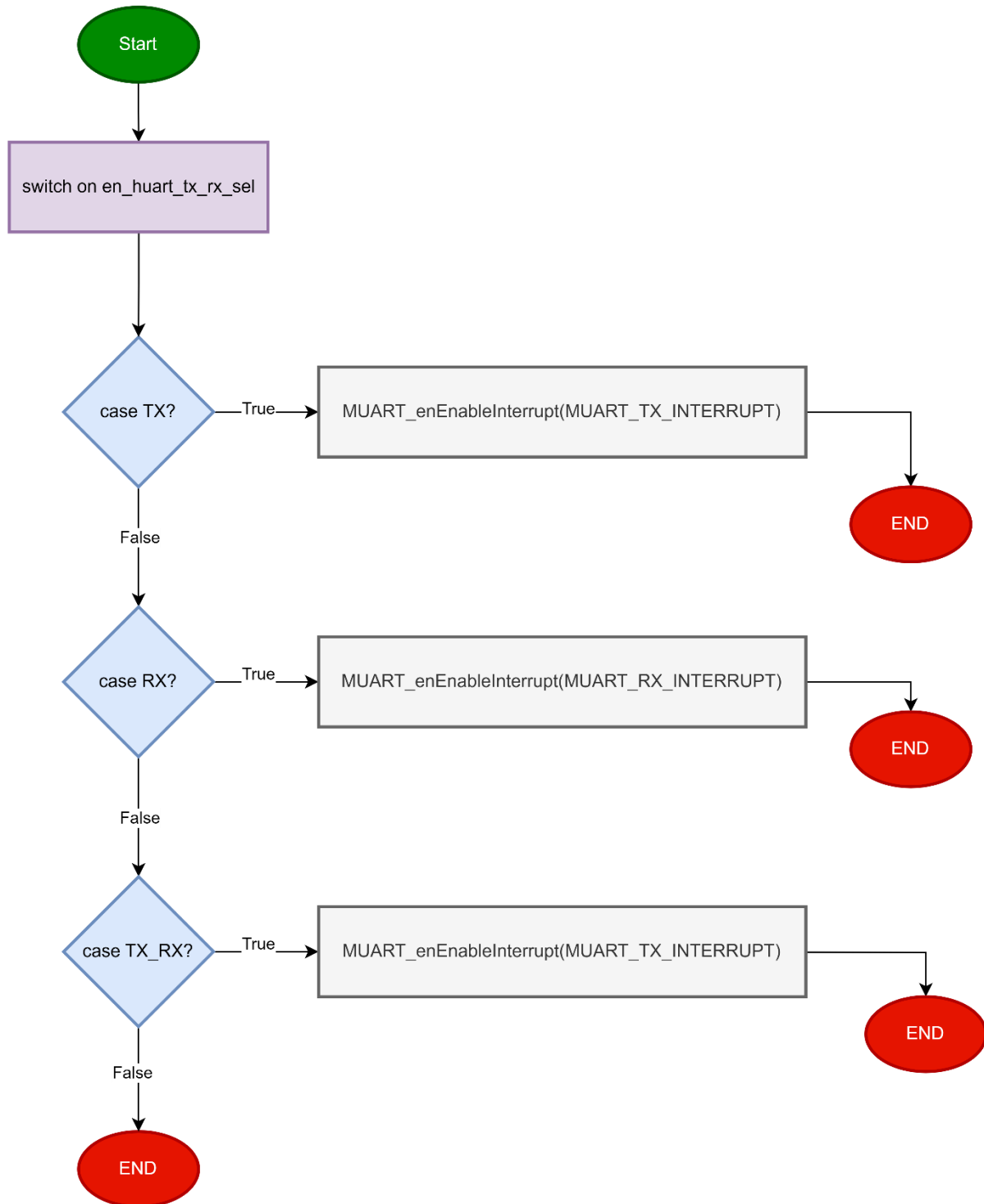
HUART_receiveSTRING



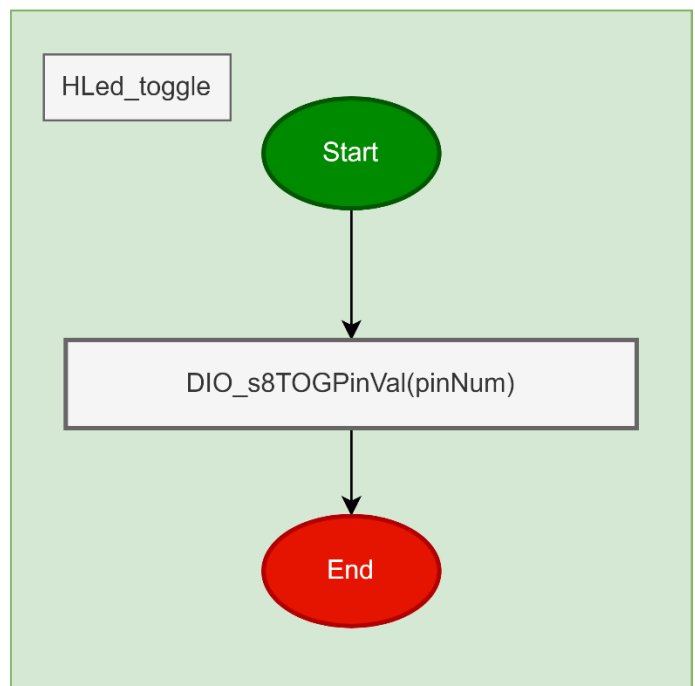
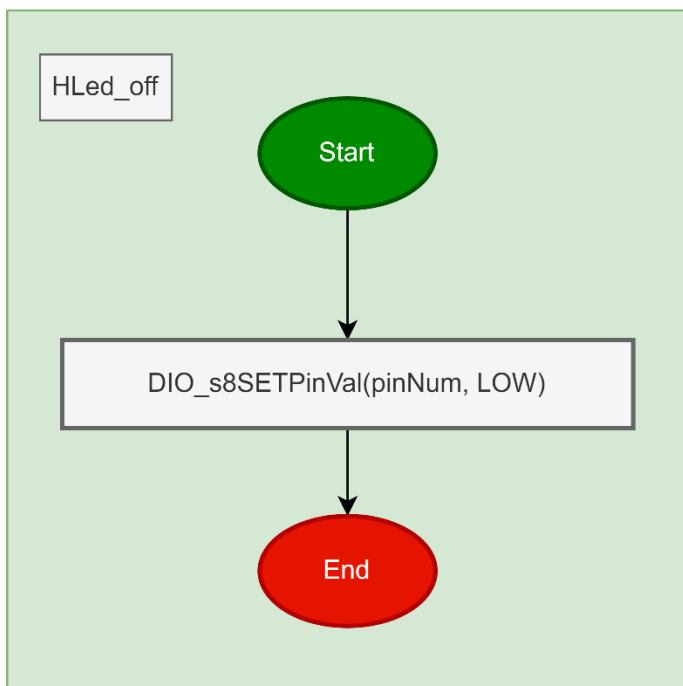
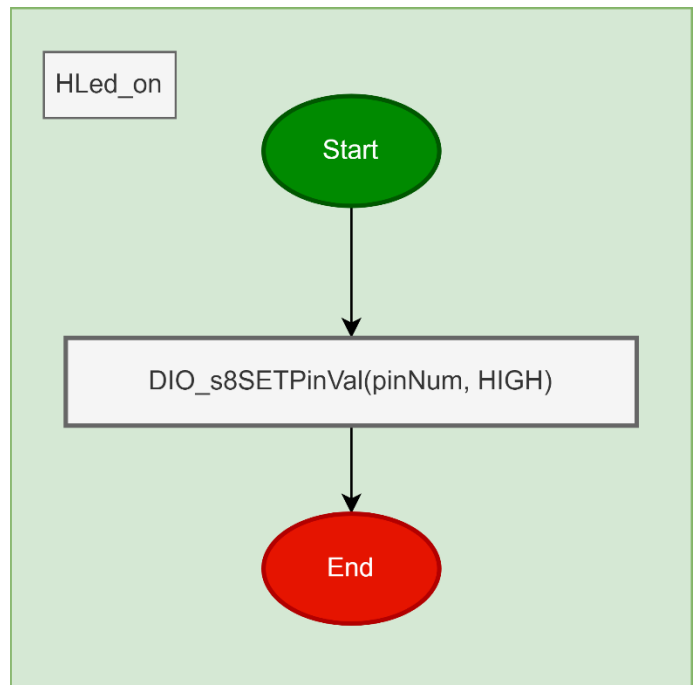
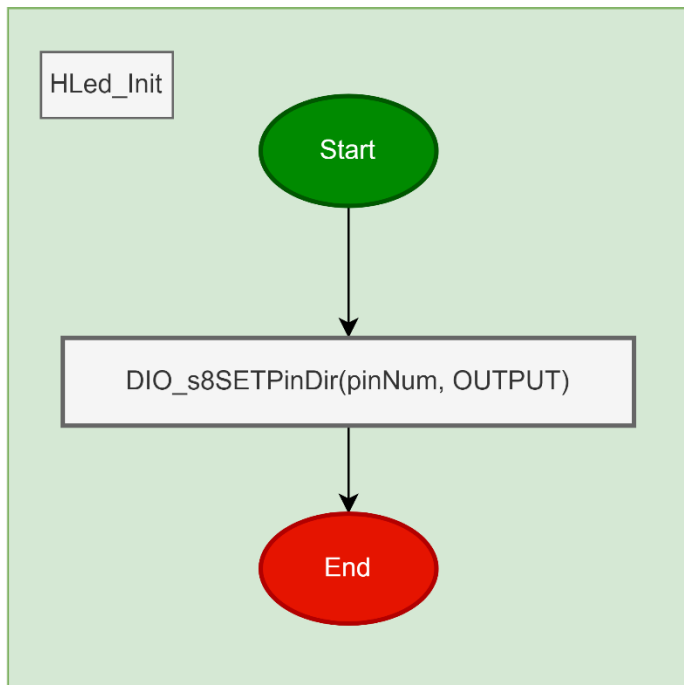
HUART_receiveAsyncString



HUART_enEnableInterrupt



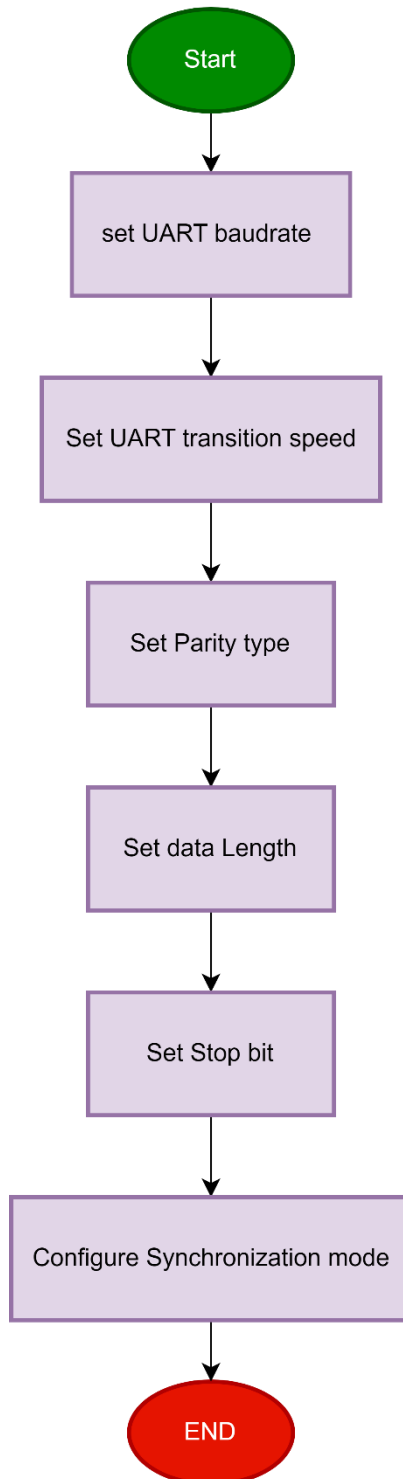
HLED module



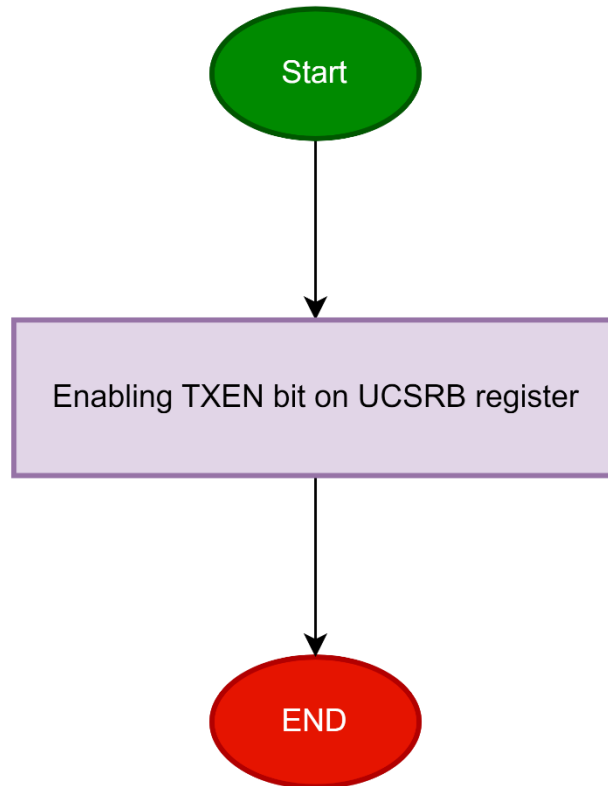
MCAL

MUART module

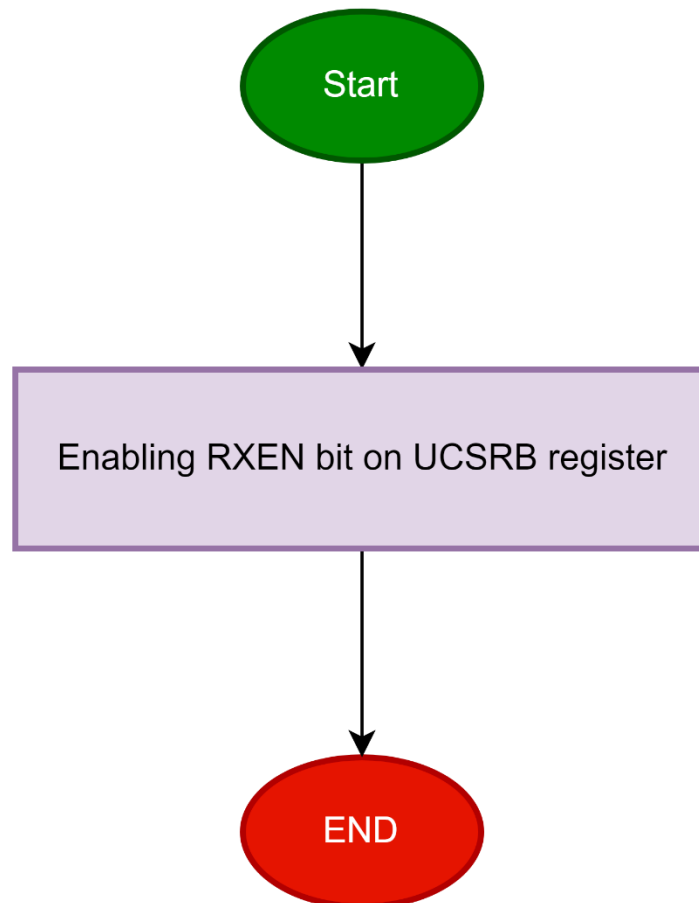
MUART_enInit



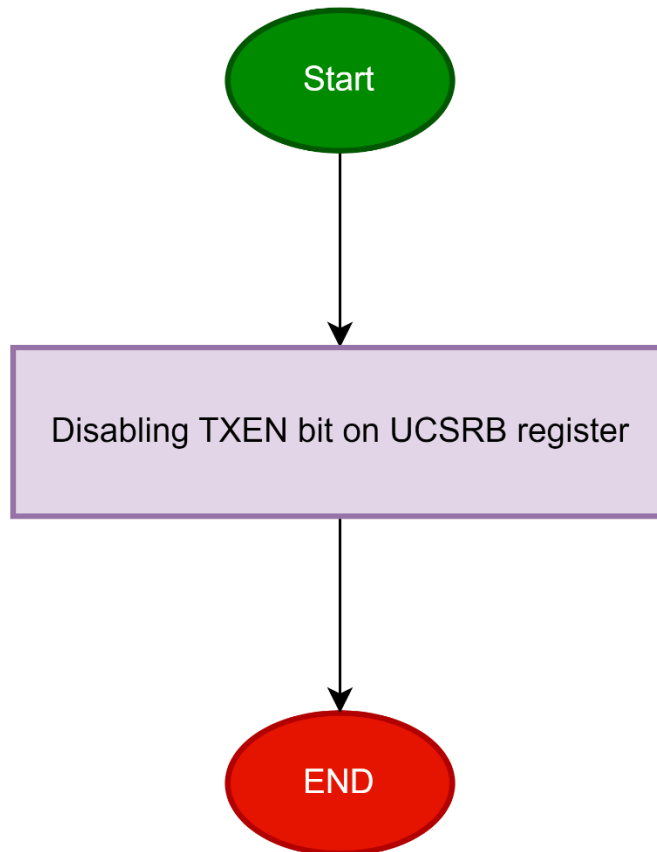
MUART_en_TX_Enable



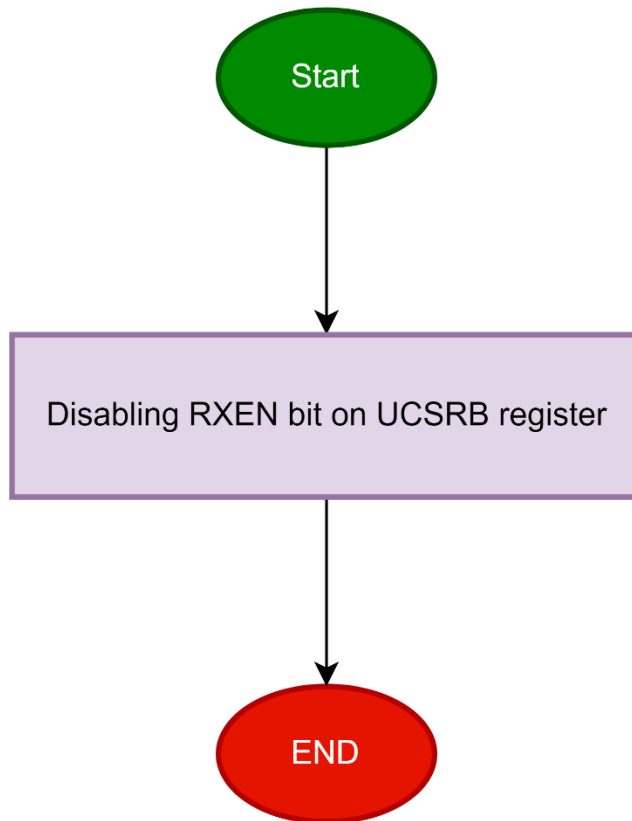
MUART_en_RX_Enable



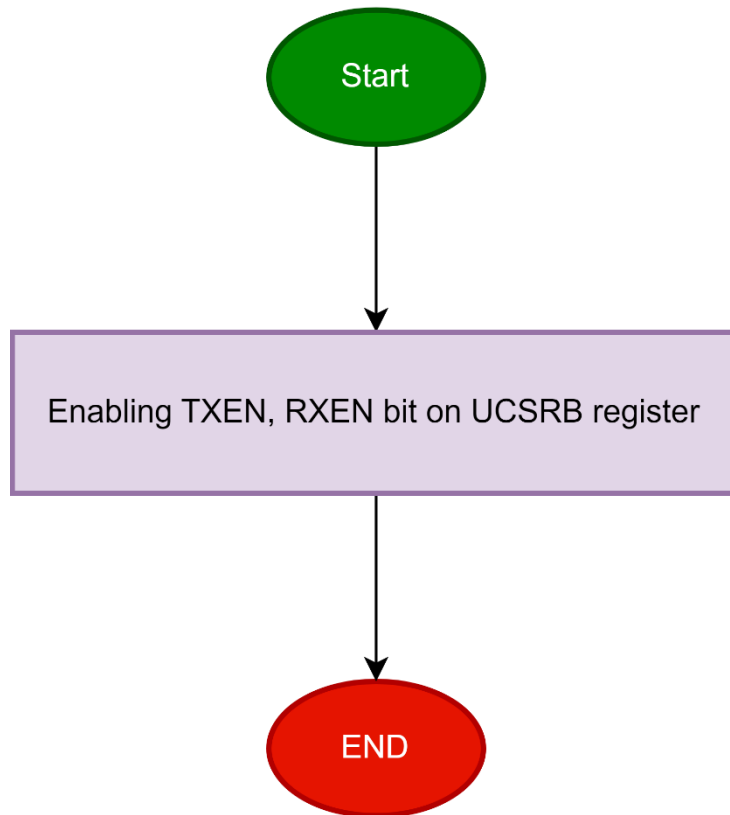
MUART_en_TX_Disable



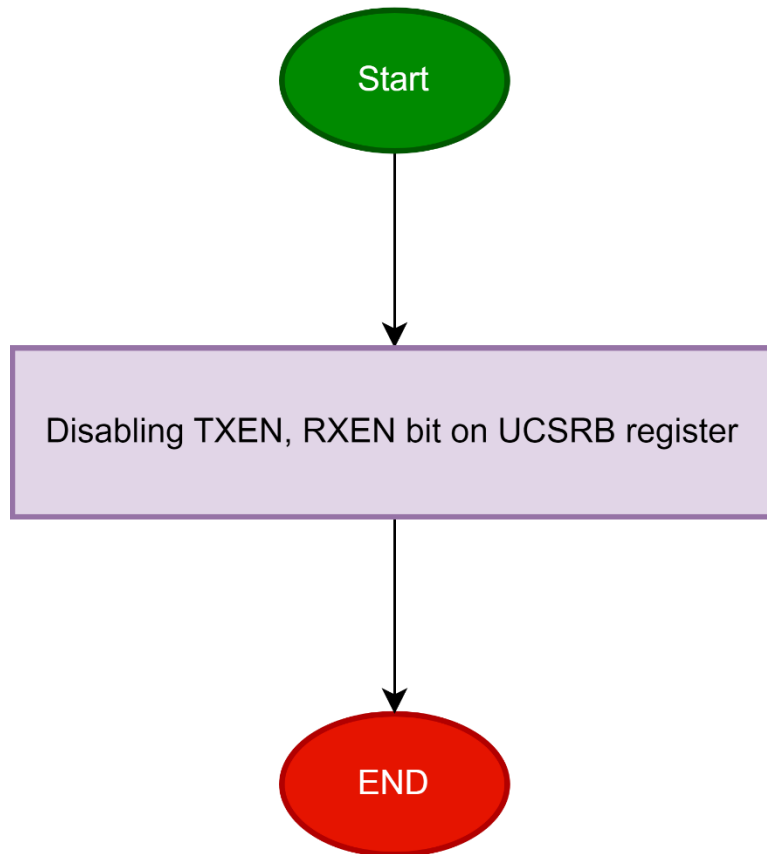
MUART_en_RX_Disable

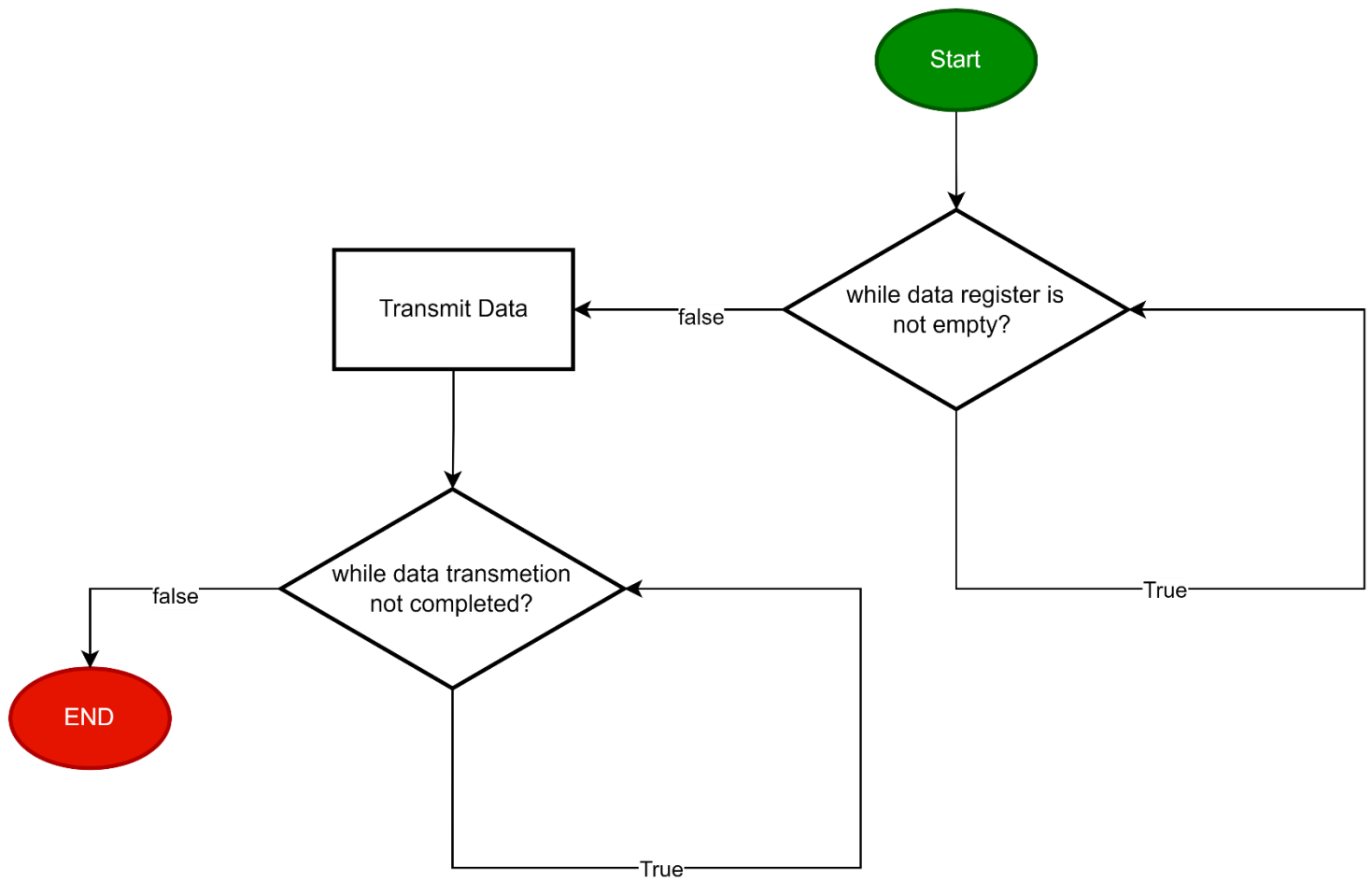


MUART_en_TX_RX_Enable

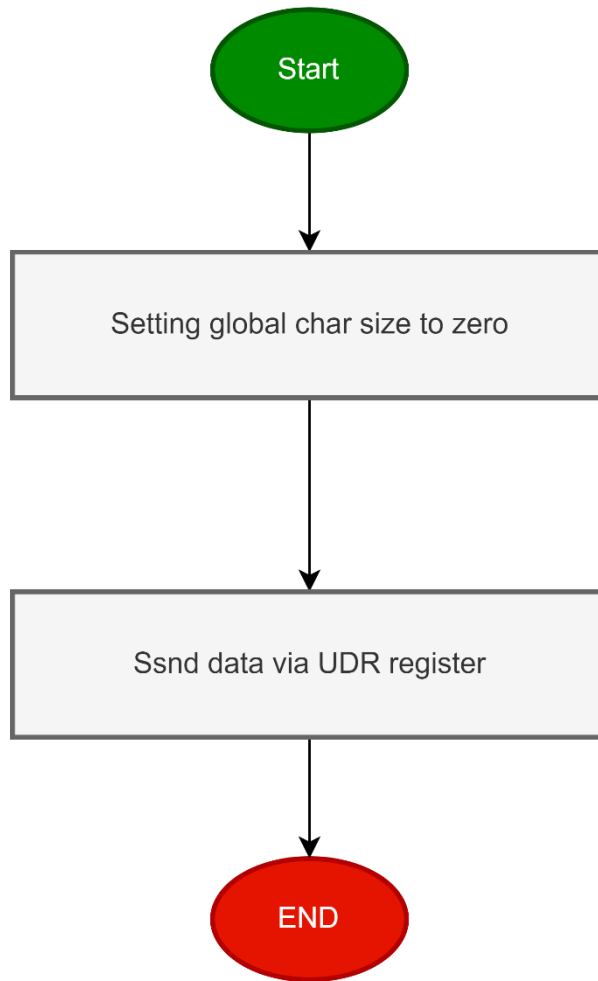


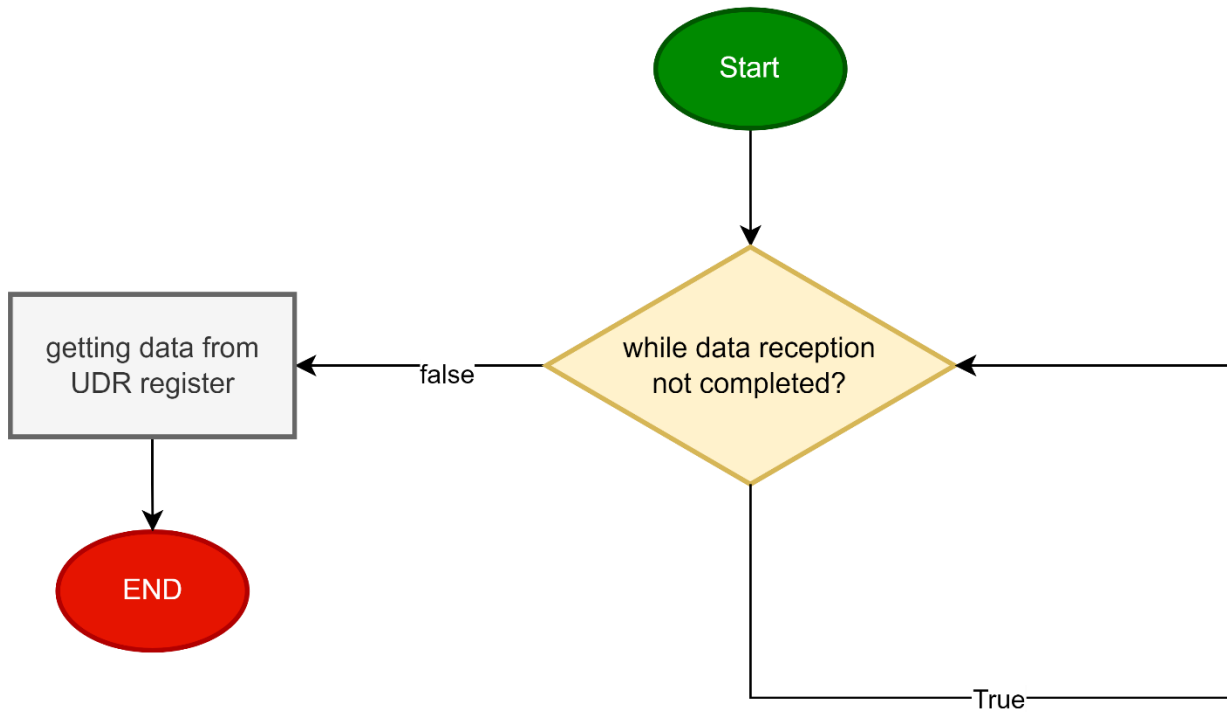
MUART_en_TX_RX_Disable

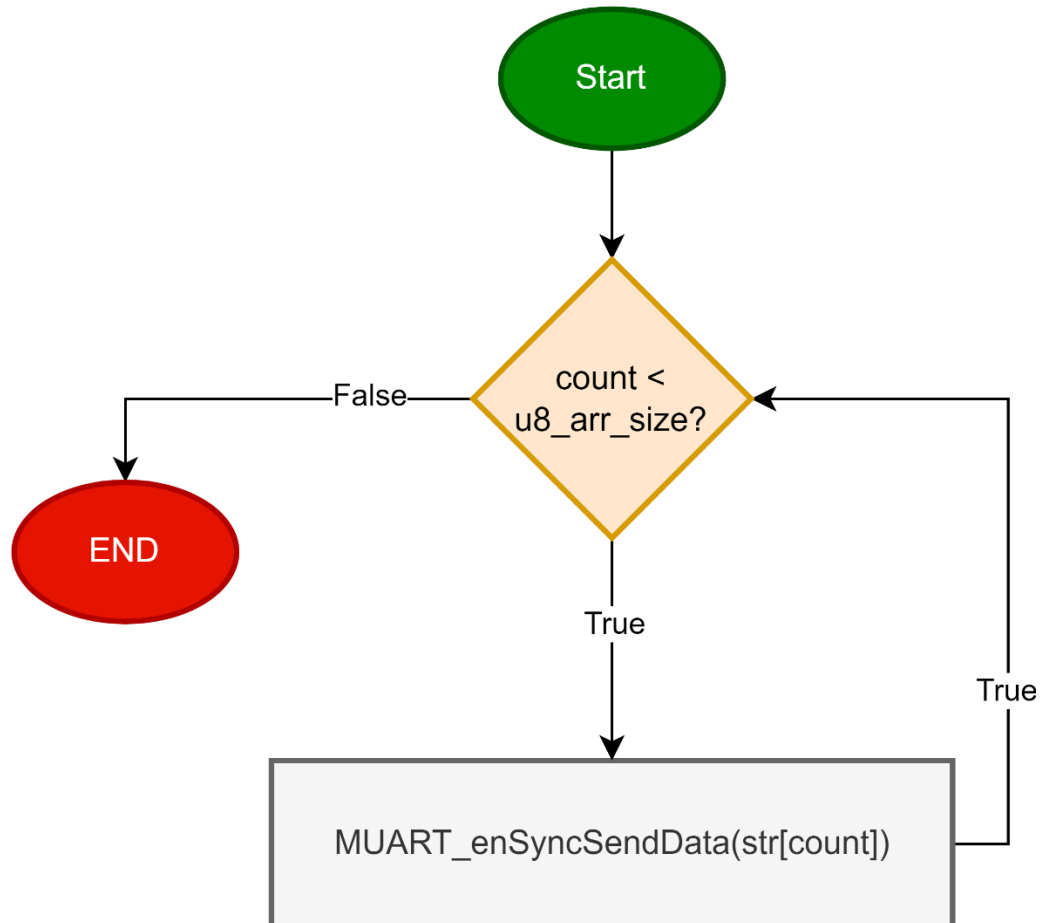


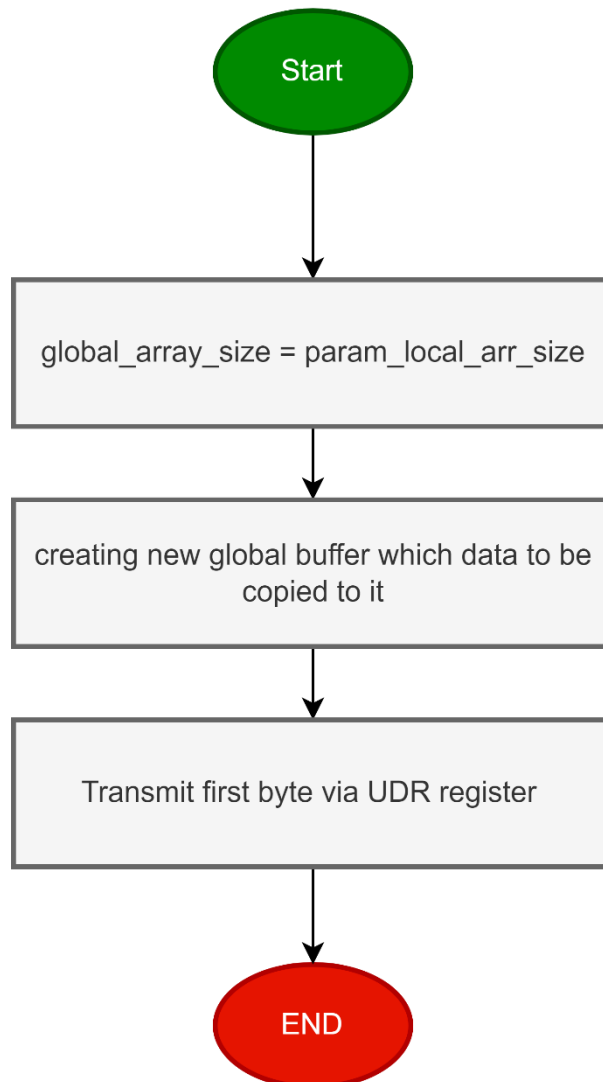
MUART_enSyncSendData

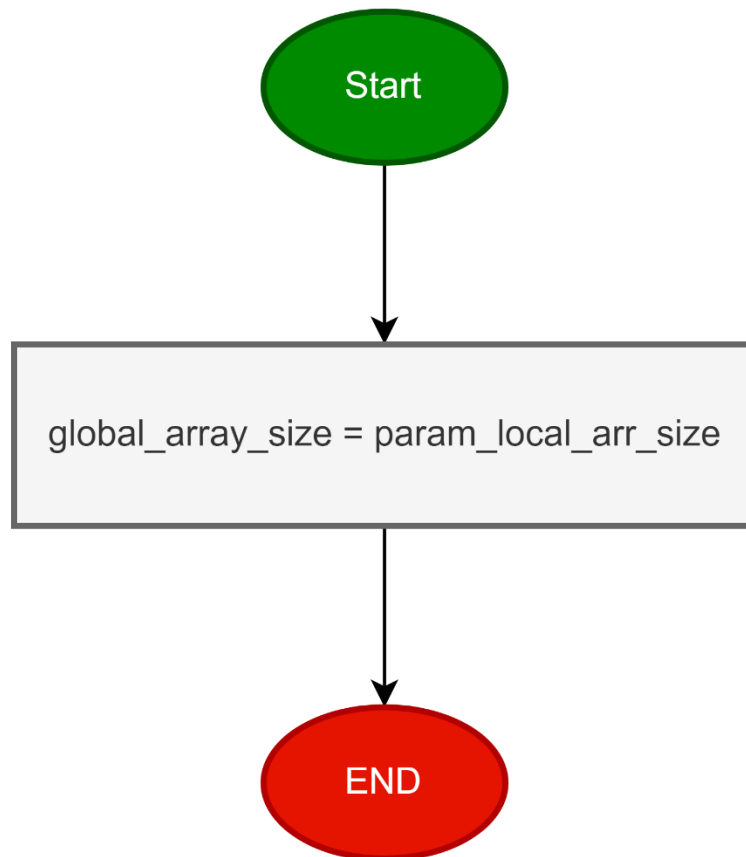
MUART_enAsyncSendData

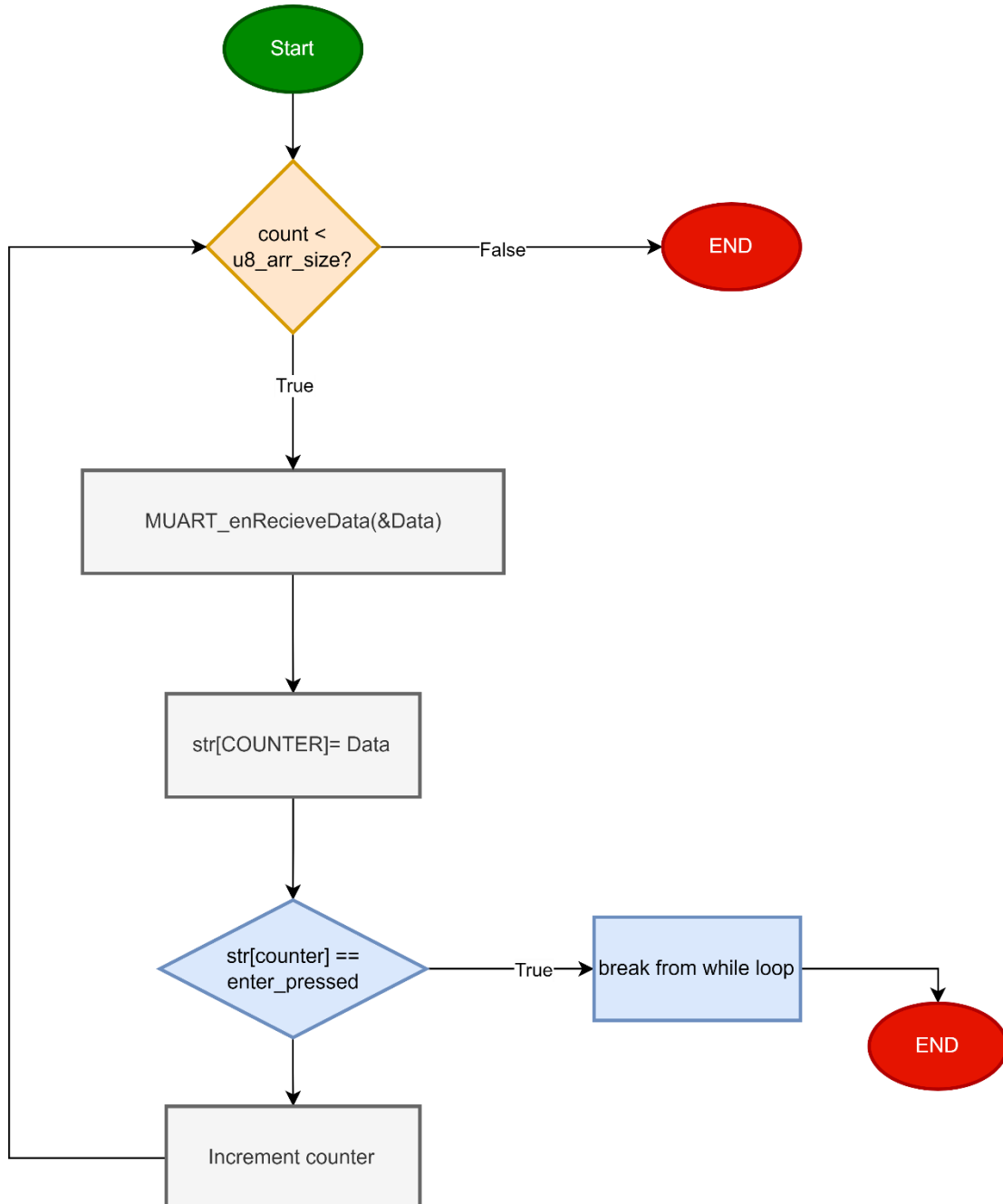


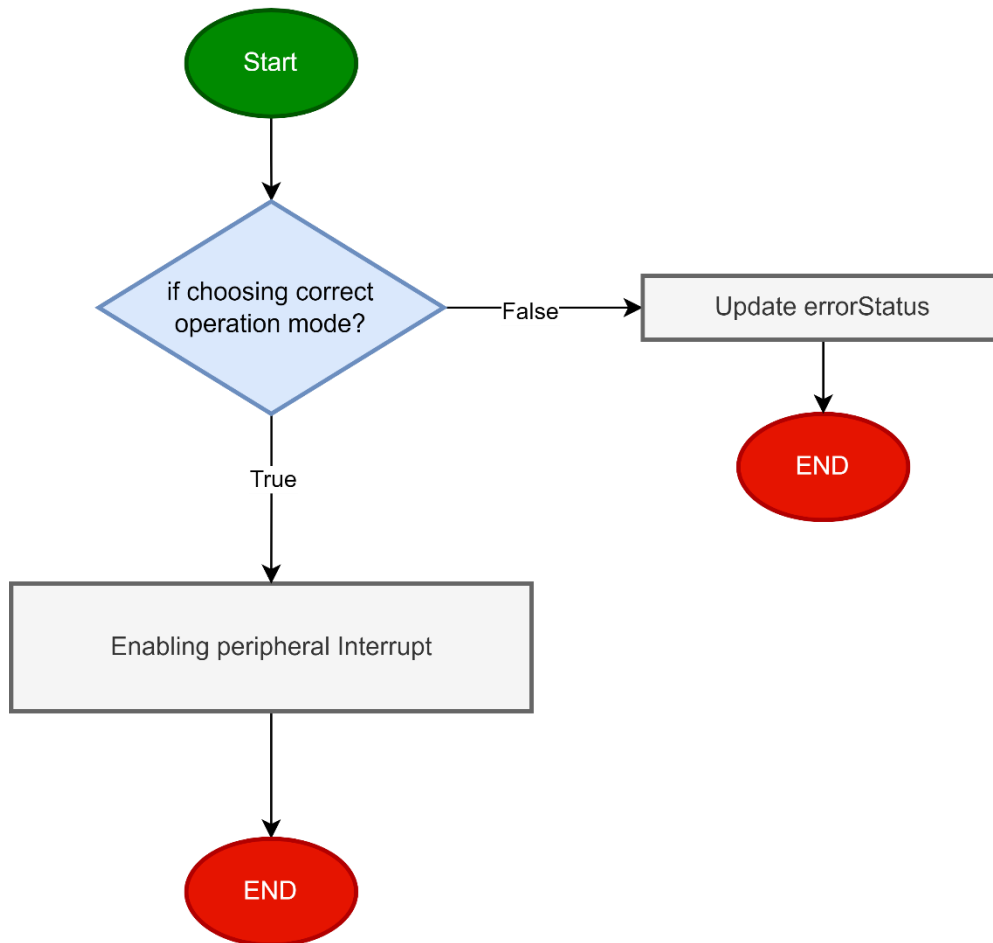
MUART_enRecieveData

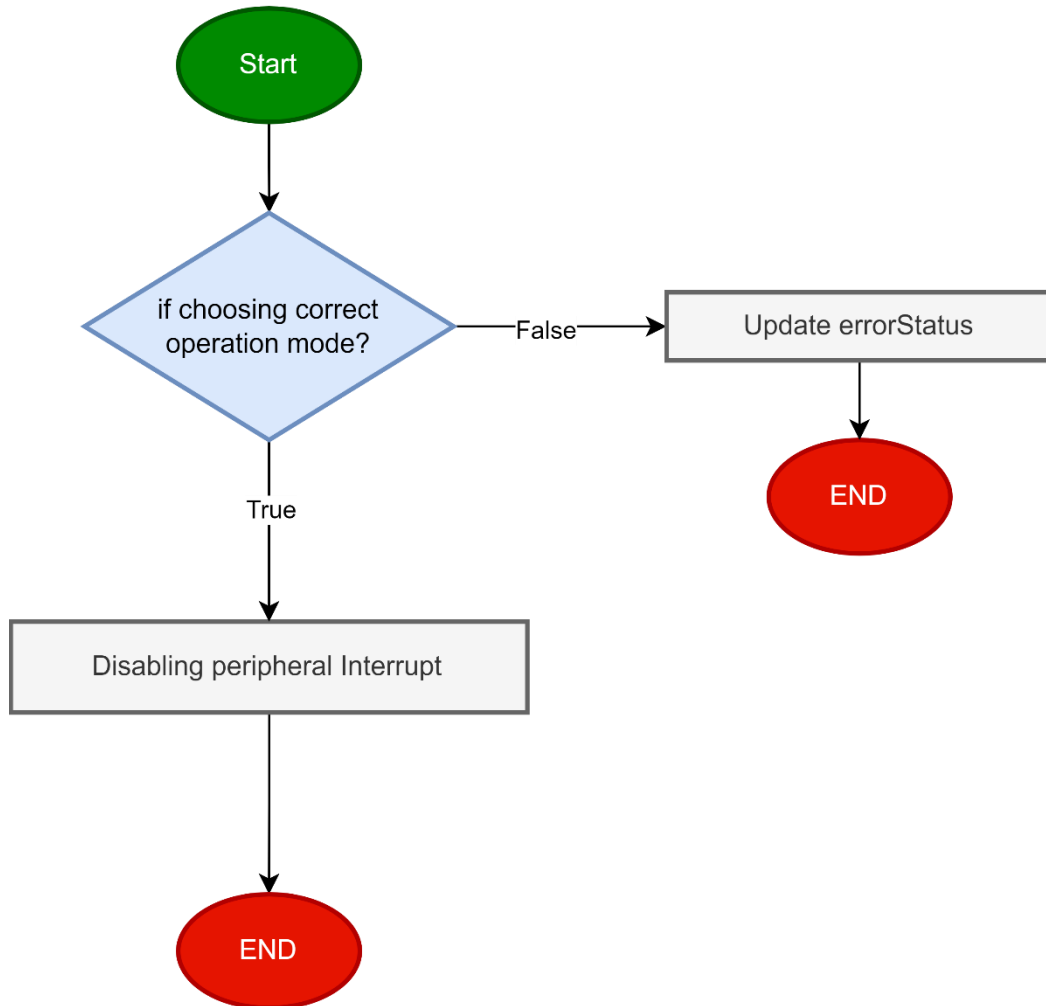
MUART_sendSyncString

MUART_sendAsyncString

MUART_receiveAsyncString

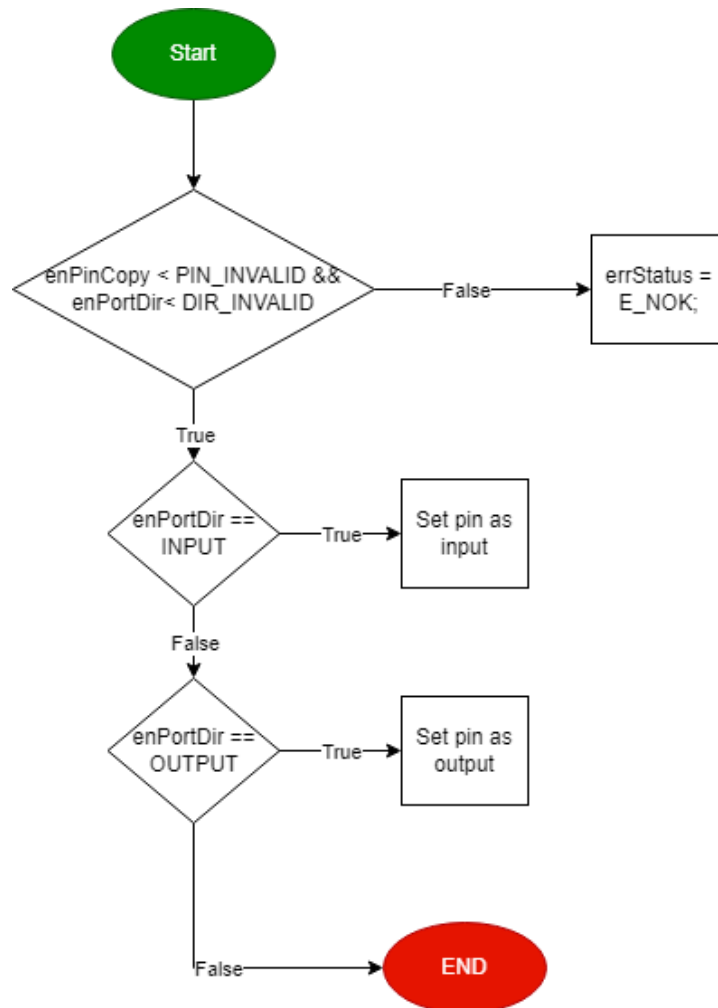
MUART_receiveSTRING

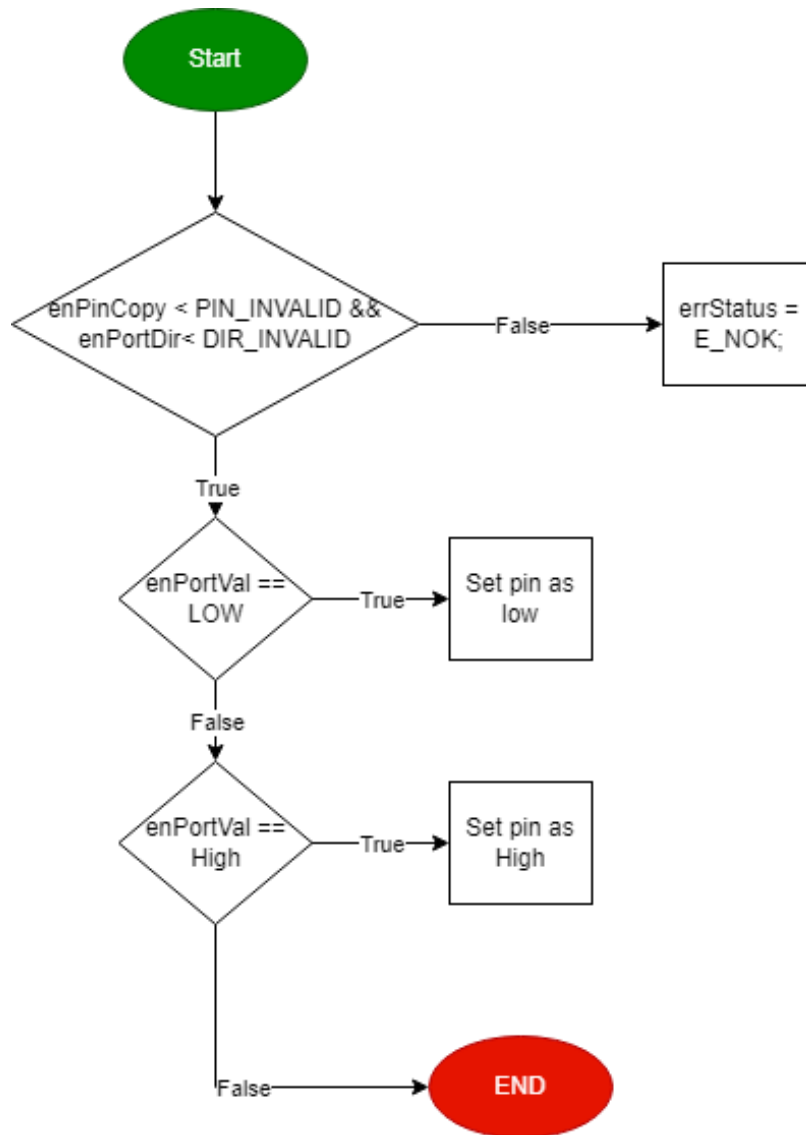
MUART_enEnableInterrupt

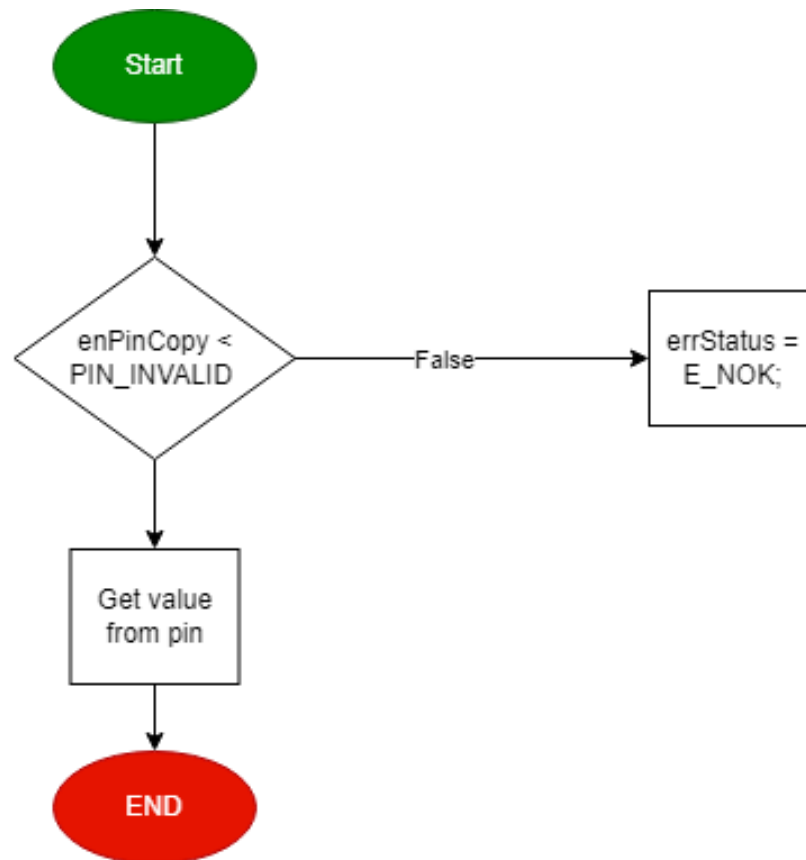
MUART_enDisableInterrupt

DIO module

DIO_s8SETPinDir



DIO_s8SETPinVal

DIO_s8GETPinVal

Pre-compiling configuration

SERVICE

BCM module

BCM_UART_BAUDRATE

Name	BCM_UART_BAUDRATE
Type	MACRO
Range	Baudrate configuration for UART
Found in	Bcm_config.h

MCAL

MUART module

MUART_SPEED_TYPE

Name	MUART_SPEED_TYPE
Type	MACRO
Description	Configure UART Speed
Configuration	MUART_SINGLE_SPEED
	MUART_DOUBLE_SPEED
Found in	muart_config.h

MUART_TX_RX

Name	MUART_TX_RX
Type	MACRO
Description	Configure UART operation
Configuration	MUART_TX_ENABLE
	MUART_RX_ENABLE
	MUART_TX_RX_ENABLE
Found in	muart_config.h

MUART_STOP_BIT

Name	MUART_STOP_BIT
Type	MACRO
Description	Configure UART stop bit
Configuration	MUART_1_STOP_BIT
	MUART_2_STOP_BIT
Found in	muart_config.h

Linking Configuration

SERVICE

BCM module

str_bcm_instance_t

Name	str_bcm_instance_t
Type	Struct
Description	Configure BCM struct Instance
Configuration	enu_communication_sel_t
	enu_tx_rx_state_t
Found in	bcm_Interface.h

enu_communication_sel_t

Name	enu_communication_sel_t
Type	enum
Description	Choosing communication protocol
Configuration	<i>BCM_UART</i>
	<i>BCM_SPI</i>
	<i>BCM_I2C</i>
Found in	bcm_Interface.h

enu_tx_rx_state_t

Name	enu_tx_rx_state_t
Type	enum
Description	Choosing communication operation
Configuration	<i>BCM_TX</i>
	<i>BCM_RX</i>
	<i>BCM_TX_RX</i>
Found in	bcm_Interface.h

MCAL

MUART module

en_muartParity_t

Name	en_muartParity_t
Type	enum
Description	Choosing MUART parity type
Configuration	<i>MUART_NO_PARITY</i>
	<i>MUART_PR_RESERVED</i>
	<i>MUART_EVEN_PARITY</i>
	<i>MUART_ODD_PARITY</i>
Found in	muart_Config.h

en_muartDataLength_t

Name	en_muartDataLength_t
Type	enum
Description	Choosing data length in byte
Configuration	<i>MUART_FIVE_BIT_DATA</i>
	<i>MUART_SIX_BIT_DATA</i>
	<i>MUART_SEVEN_BIT_DATA</i>
	<i>MUART_EIGHT_BIT_DATA</i>
	<i>MUART_NINE_BIT_DATA</i>
Found in	muart_Config.h

st_muart_t

Name	st_muart_t
Type	struct
Description	Configure MUART struct Instance
Configuration	<i>en_muartParity_t</i>
	<i>en_muartDataLength_t</i>
Found in	muart_Config.h