Program: MCTA

Automotive Embedded Networking

MCT 411

Final - Documentation

Submitted by

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Introduction

The project attempts to create a communication system between three Tiva's through CAN protocol while complying to the AUTOSAR standardized software architecture and level of abstraction.

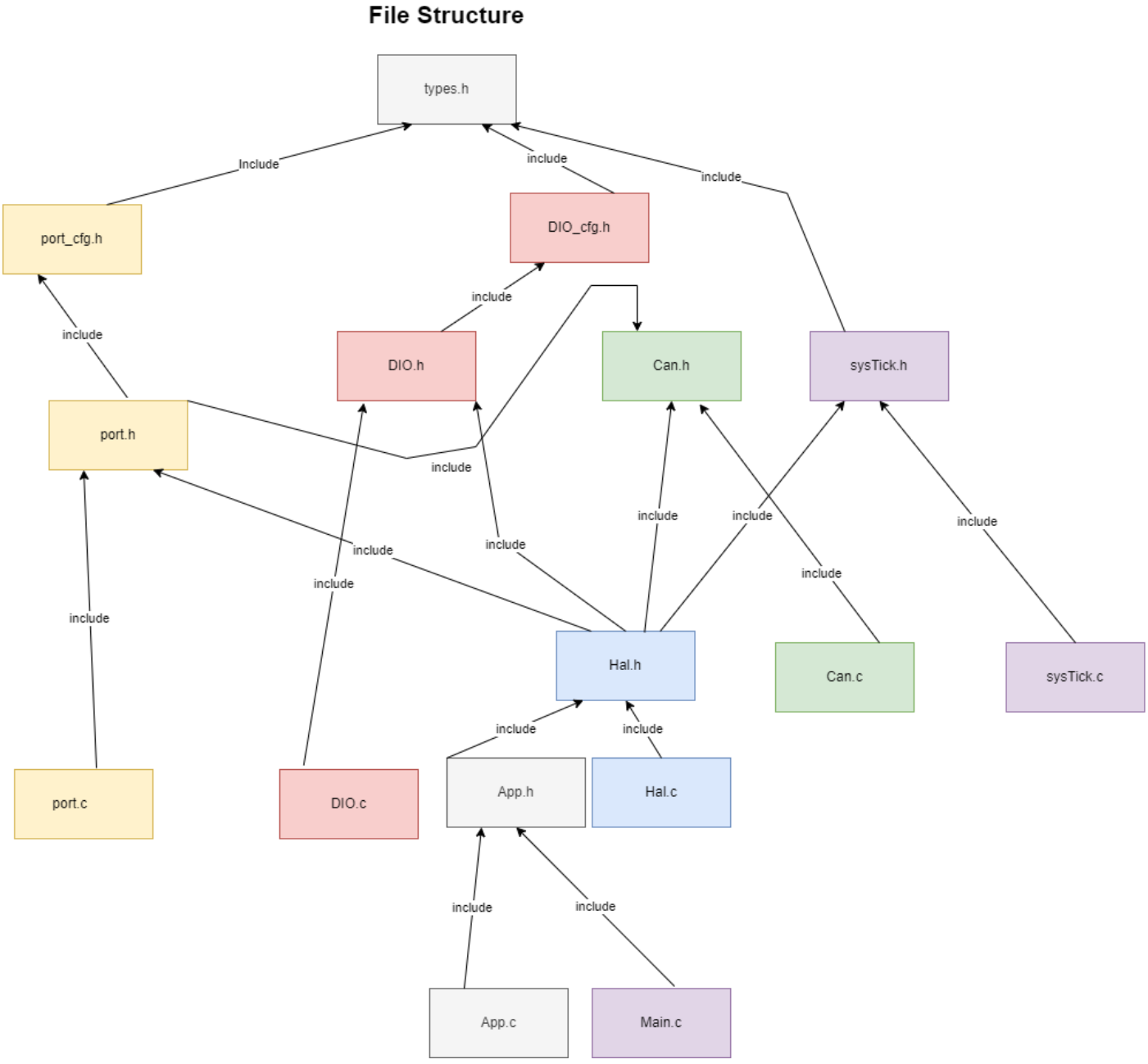


Figure 1 Header File Structure

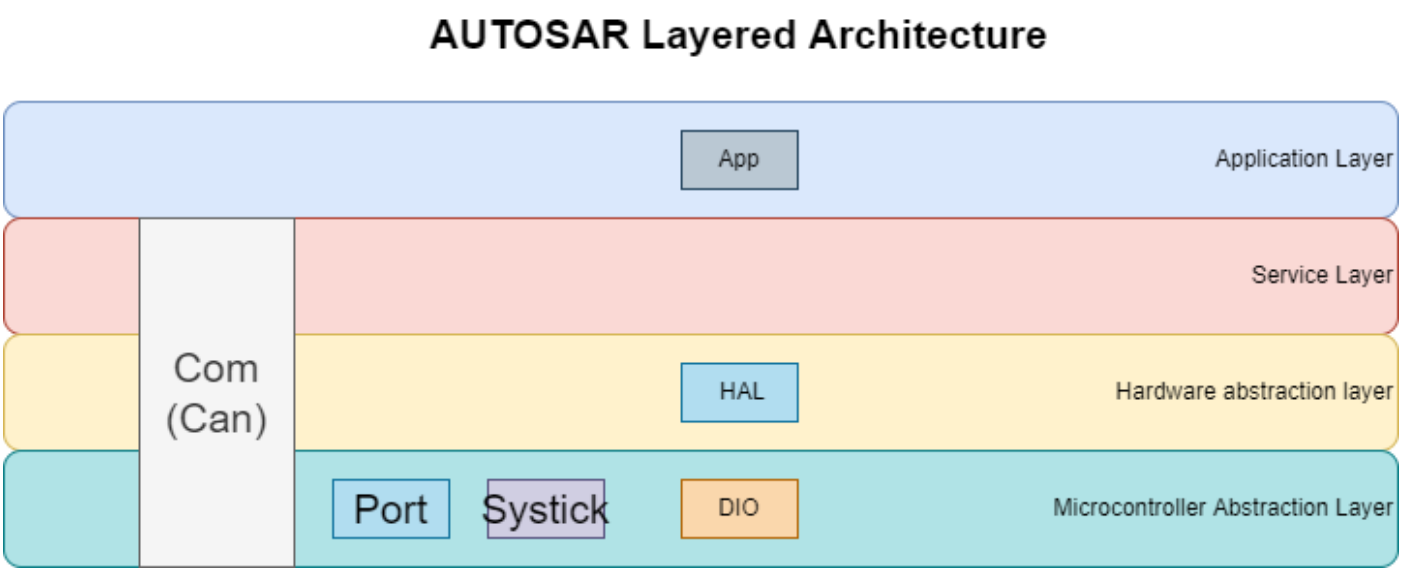


Figure 2 AUTOSAR architecture layer

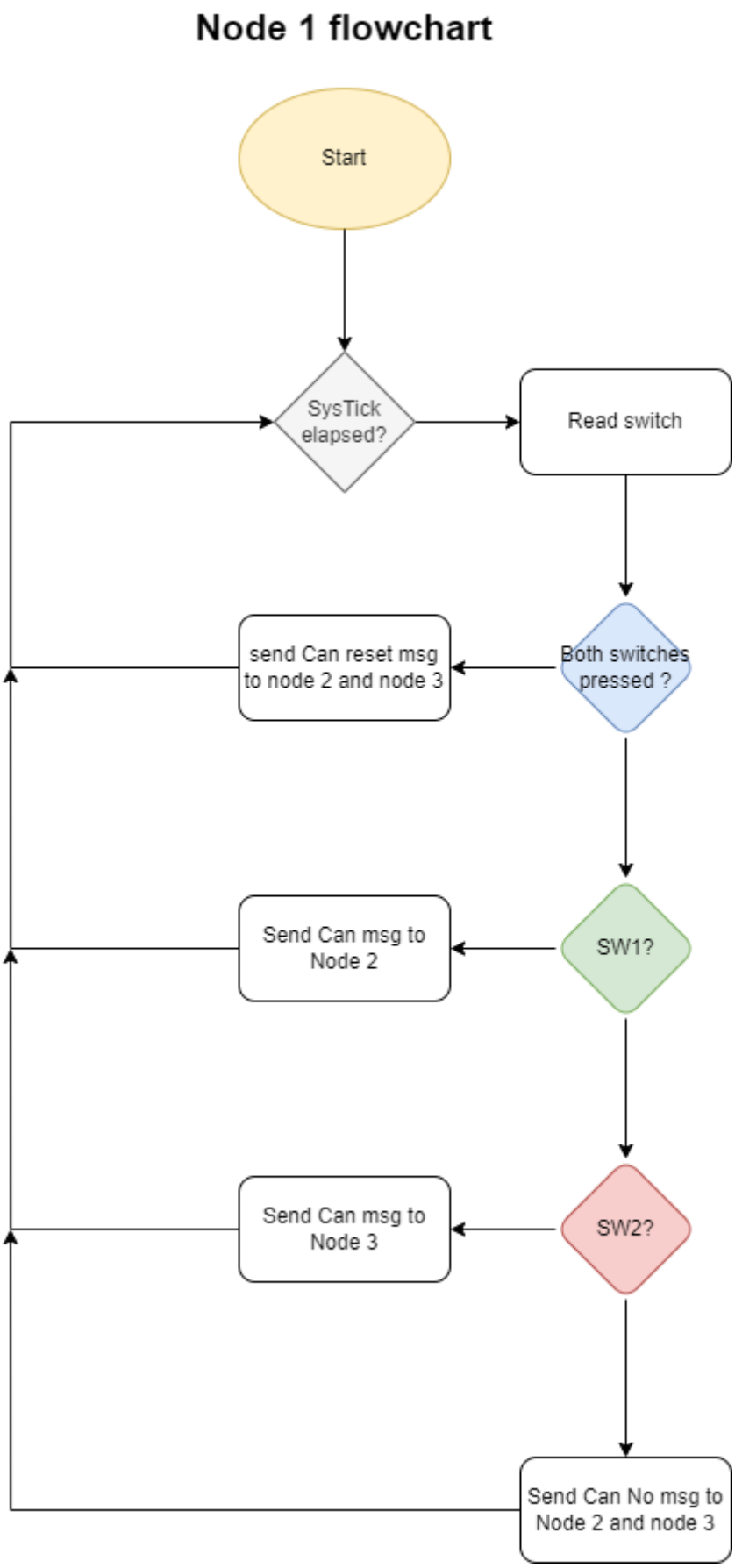


Figure 3 Node 1 flowchart

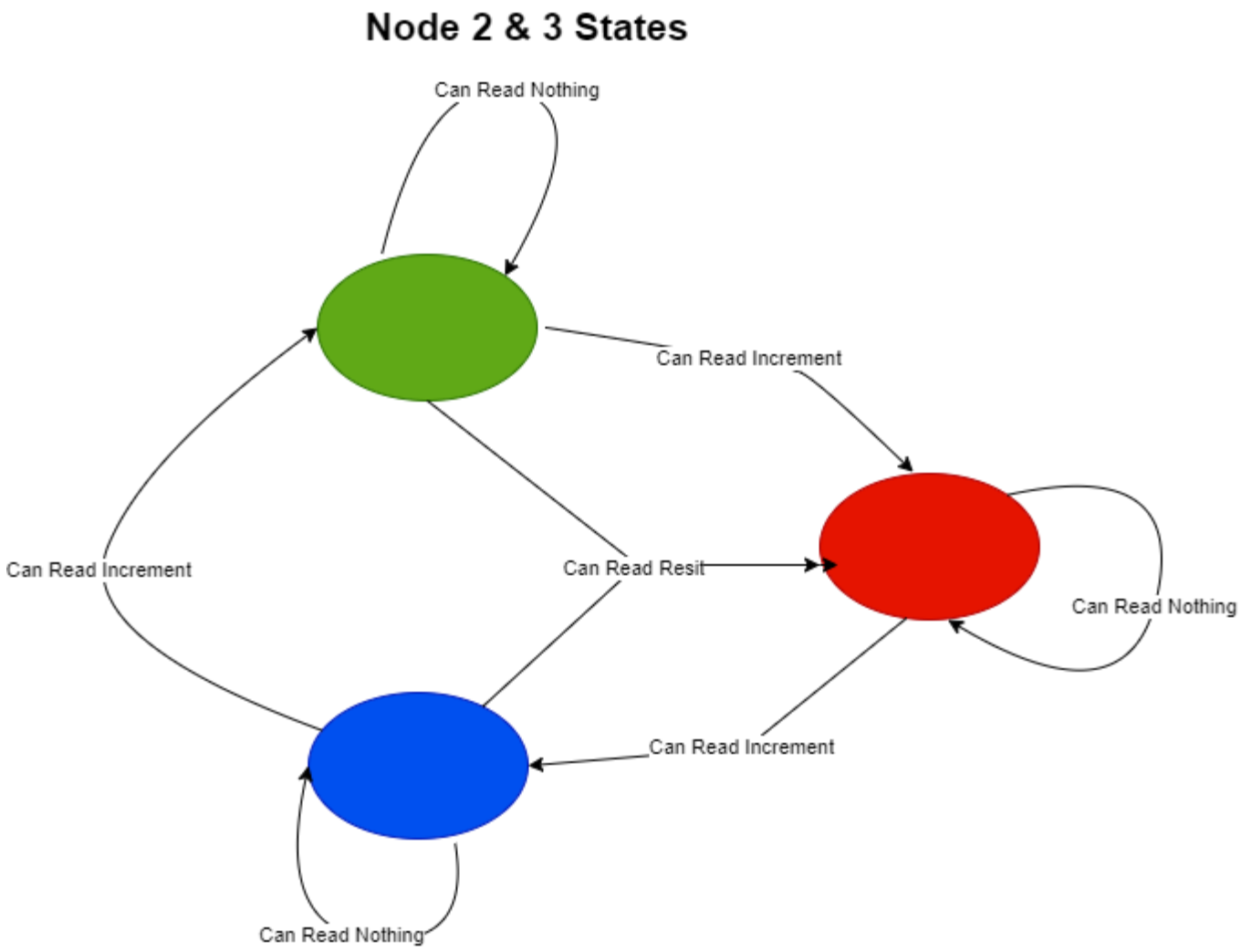


Figure 4 Node 2/3 States

AUTOSAR Data Types description

Name	Port_ConfigType
Type	struct
Content	Port_PinModeType PinMode; Port_PinDirectionType PinDirection; Port_PinType Pin; uint32_t PinType; uint32_t PinStrength;
Description	Contains all initialization for the Port Driver

Compliance with AUTOSAR	SWS_Port_00228{
	[SWS_Port_00073] [The type Port_ConfigType is a type for the external data structure containing the initialization data for the PORT Driver.]
	[SWS_Port_00072] [A list of possible port configurations for the structure]
	}

Name	Port_PinModeType
Type	enum
Content	Port_PinMode_CAN; Port_PinMode_DIO;
Description	Covers all port pin modes

Compliance with AUTOSAR	[SWS_Port_00231] {
	[SWS_Port_00124] [A port pin shall be configurable with a number of port pin]
	[SWS_Port_00212] [The type Port_PinModeType shall be used with the function call Port_SetPinMode
	}

Name	Port_PinDirectionType
Type	enum
Content	PORT_PIN_IN; PORT_PIN_OUT;
Description	Defines port pin direction In/Out

Compliance with AUTOSAR	SWS_Port_00230{
	[SWS_Port_00046] [The type Port_PinDirectionType is a type for defining the direction of a Port Pin.]
	[SWS_Port_00220] [The type Port_PinDirectionType shall be of enumeration type having range as PORT_PIN_IN and PORT_PIN_OUT.
	}

Name	Port_PinType
Type	uint
Content	-
Description	Covers all port pins

Compliance with AUTOSAR	SWS_Port_00229{
	[SWS_Port_00013] [The type Port_PinType shall be used for the symbolic name of a Port Pin.]
	[SWS_Port_00219] [The type Port_PinType shall be uint8, uint16 or uint32 based on the specific MCU platform.
	}

Name	Dio_ChannelGroupType
Type	struct
Content	Dio_PortType port; uint8_t offset; uint32_t mask;
Description	Identifies port, channel position and mask

Compliance with AUTOSAR	SWS_Dio_00184{
	[SWS_Dio_00021] [Dio_ChannelGroupType is the type for the definition of a channel group, which consists of several adjoining channels within a port
	[SWS_Dio_00022] [For parameter values of type Dio_ChannelGroupType, the user shall use the symbolic names provided by the configuration description.
	}

Name	Dio_PortType()
Type	uint
Content	-
Description	Numeric ID of a DIO port

Compliance with AUTOSAR	SWS_Dio_00183{
	[SWS_Dio_00018] ⌈Parameters of type Dio_PortType contain the numeric ID of a DIO port. ⌋
	[SWS_Dio_00020] ⌈For parameter values of type Dio_PortType, the user shall use the symbolic names provided by the configuration description.
	}

Name	Dio_ChannelType
Type	Uint
Content	-
Description	Covers all available DIO channels

Compliance with AUTOSAR	SWS_Dio_00182{
	[SWS_Dio_00015] ⌈Parameters of type Dio_ChannelType contain the numeric ID of a DIO channel. ⌋
	[SWS_Dio_00180] ⌈The mapping of the ID is implementation specific but not configurable. ⌋
	}

Name	Dio_LevelType
Type	Enum
Content	STD_LOW; STD_HIGH;
Description	Physical state low (0 v) or high (5/3.3 v)

Compliance with AUTOSAR	SWS_Dio_00185{
	[SWS_Dio_00023] ⌈Dio_LevelType is the type for the possible levels that a DIO channel can have (input or output). ⌋
	}

Name	Dio_PortLevelType
Type	Uint
Content	-
Description	Inherit size of largest port if the mcu have different port sizes

Compliance with AUTOSAR	SWS_Dio_00186 {
	[SWS_Dio_00024] ⌈Dio_PortLevelType is the type for the value of a DIO port.
	}

AUTOSAR API's description

Port Driver

Function Name	Port_Init()
Input Parameters	ConfigPtr - Pointer to configuration set.
Output Parameters	Void
Input/Output Parameters	None
Function Description	Initialize the port driver

Compliance with AUTOSAR	SWS_Port_00140{
	[SWS_Port_00041] [The function Port_Init shall initialize ALL ports and port pins with the configuration set pointed to by the parameter.]
	[SWS_Port_00078] [The Port Driver module's environment shall call the function Port_Init first in order to initialize the port for use.]
	}

Function Name	Port_SetPinMode()
Input Parameters	Pin - Port pin ID number Mode - Pin mode to be set
Output Parameters	Void
Input/Output Parameters	None
Function Description	Set Port Pin Mode

Compliance with AUTOSAR	SWS_Port_00145 {
	[SWS_Port_00125] [The function Port_SetPinMode shall set the port pin mode of the referenced pin during runtime.]
	[SWS_Port_00128] [The function Port_SetPinMode shall be re-entrant if accessing different pins, independent of a port.]
	}

Function Name	Port_SetPinDirection()
Input Parameters	Pin - Port pin ID number Direction - Pin direction to be set
Output Parameters	Void
Input/Output Parameters	None
Function Description	Set Port Pin Direction

Compliance with AUTOSAR	SWS_Port_00141{
	[SWS_Port_00063] [The function Port_SetPinDirection shall set the port pin direction during runtime.]
	[SWS_Port_00054] [The function Port_SetPinDirection shall be re-entrant if accessing different pins independent of a port.]
	}

Function Name	Dio_ReadChannel()
Input Parameters	ChannelId - ID of the DIO channel
Output Parameters	Void
Input/Output Parameters	None
Return	Dio_LevelType -
Function Description	Returns the value of the specified DIO channel.

Compliance with AUTOSAR	SWS_Dio_00133{
	[SWS_Dio_00027] ⌈The Dio_ReadChannel function shall return the value of the specified DIO channel.⌋
	}

Function Name	Dio_WriteChannel()
Input Parameters	ChannelId - ID of the DIO channel Level - Specify level value to be written
Output Parameters	Void
Input/Output Parameters	None
Function Description	Service to set a level of a channel.

Compliance with AUTOSAR	[SWS_Dio_00134]{
	[SWS_Dio_00028] ⌈If the specified channel is configured as an output channel, the Dio_WriteChannel function shall set the specified Level for the specified channel. ⌋
	
	}

Function Name	Dio_ReadPort()
Input Parameters	PortId - ID of the DIO port
Output Parameters	Void
Input/Output Parameters	None
Return	Dio_PortLevelType
Function Description	Returns the level of all channels of that port.

Compliance with AUTOSAR	[SWS_Dio_00135]{
	[SWS_Dio_00031] ⌈The Dio_ReadPort function shall return the level of all channels of that port. ⌋
	}

Function Name	Dio_WritePort()
Input Parameters	PortId - ID of the DIO port Level - Value to be written
Output Parameters	Void
Input/Output Parameters	None
Function Description	Service to set a value of the port.

Compliance with AUTOSAR	[SWS_Dio_00136]{
	[SWS_Dio_00034] ⌈The Dio_WritePort function shall set the specified value for the specified port. ⌋
	[SWS_Dio_00035] ⌈When the Dio_WritePort function is called, DIO Channels that are configured as input shall remain unchanged.⌋
	}

Function Name	Dio_ReadChannelGroup()
Input Parameters	ChannelGroupIdPtr - Pointer to channelGroup
Output Parameters	Void
Input/Output Parameters	None
Return	Dio_PortLevelType
Function Description	This Service reads a subset of the adjoining bits of a port.

Compliance with AUTOSAR	[SWS_Dio_00137]{
	[SWS_Dio_00037] ⌈The Dio_ReadChannelGroup function shall read a subset of the adjoining bits of a port (channel group). ⌋
	[SWS_Dio_00092] ⌈The Dio_ReadChannelGroup function shall do the masking of the channel group. ⌋
	}

Function Name	Dio_WriteChannelGroup()
Input Parameters	ChannelGroupIdPtr - Pointer to channelGroup Level - Value to be written
Output Parameters	Void
Input/Output Parameters	None
Function Description	Service to set a subset of the adjoining bits of a port to a specified level.

Compliance with AUTOSAR	[SWS_Dio_00138]{
	[SWS_Dio_00039] ⌈The Dio_WriteChannelGroup function shall set a subset of the adjoining bits of a port (channel group) to a specified level. ⌋
	}

Function Name	Dio_WriteChannelGroup()
Input Parameters	ChannelGroupIdPtr - Pointer to channelGroup Level - Value to be written
Output Parameters	Void
Input/Output Parameters	None
Function Description	Service to set a subset of the adjoining bits of a port to a specified level.

Compliance with AUTOSAR	[SWS_Dio_00138]{
	[SWS_Dio_00039] ⌈The Dio_WriteChannelGroup function shall set a subset of the adjoining bits of a port (channel group) to a specified level. ⌋
	}

Function Name	Dio_WriteChannelGroup()
Input Parameters	ChannelGroupIdPtr - Pointer to channelGroup Level - Value to be written
Output Parameters	Void
Input/Output Parameters	None
Function Description	Service to set a subset of the adjoining bits of a port to a specified level.

Compliance with AUTOSAR	[SWS_Dio_00138]{
	[SWS_Dio_00039] ⌈The Dio_WriteChannelGroup function shall set a subset of the adjoining bits of a port (channel group) to a specified level. ⌋
	}

Node 1 App API's

Function Name	State_Machine()
Input Parameters	Read Switch
Output Parameters	Button state
Input/Output Parameters	None
Function Description	Set button state depending on the switch read

Function Name	Send_Command()
Input Parameters	Button state
Output Parameters	Can message
Input/Output Parameters	None
Function Description	Send Can message to both nodes depending on the button state

Function Name	CAN_Init()
Input Parameters	Void
Output Parameters	Void
Input/Output Parameters	None
Function Description	Initialise Can module and declare a message object for each node

Function Name	CAN_Send_2()
Input Parameters	String
Output Parameters	Void
Input/Output Parameters	None
Function Description	Set message object and send message to node 2

Function Name	CAN_Send_3()
Input Parameters	String
Output Parameters	Void
Input/Output Parameters	None
Function Description	Set message object and send message to node 3

Function Name	CAN_recieve()
Input Parameters	Rx flag
Output Parameters	Rx message object
Input/Output Parameters	None
Function Description	Set Rx message object

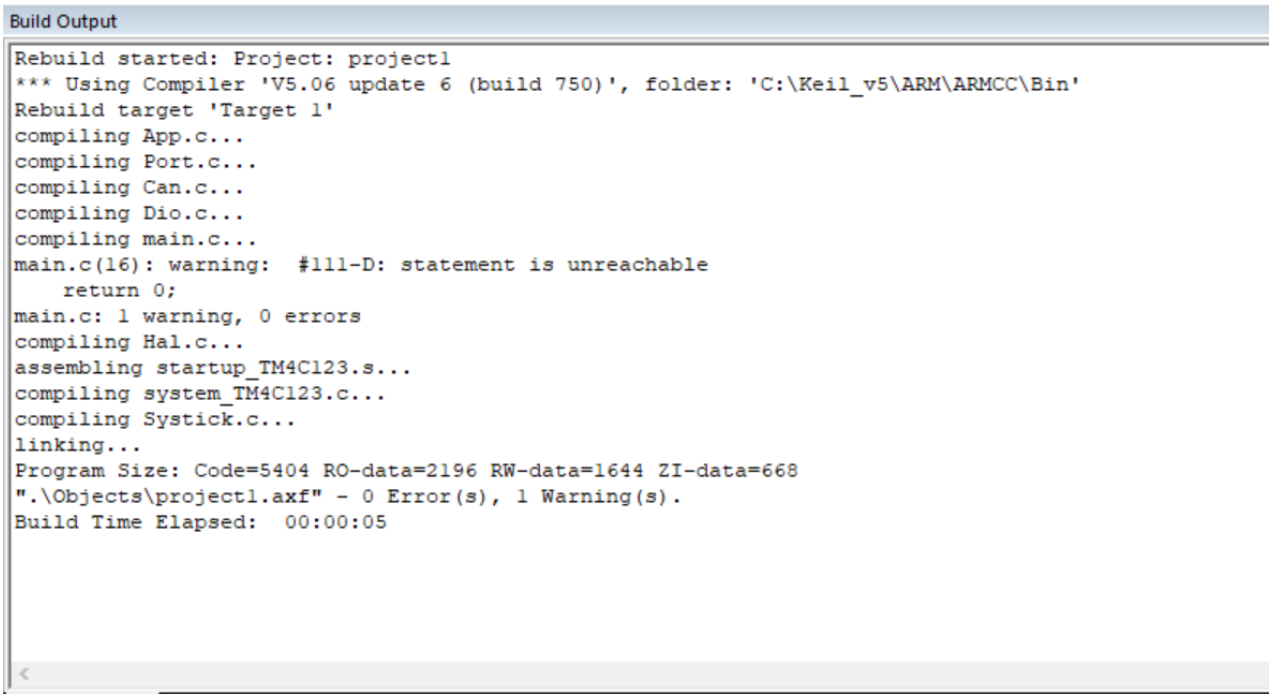
Node 2 and 3 App API's

Function Name	State_Machine()
Input Parameters	Void
Output Parameters	Void
Input/Output Parameters	None
Function Description	The state machine for the application checking the sent message every 10 ms and setting the state variable accordingly

Function Name	State_Change()
Input Parameters	State variable
Output Parameters	Void
Input/Output Parameters	None
Function Description	Write low to all the leds and high to the specified leds

Function Name	CAN_recieve()
Input Parameters	Rx flag
Output Parameters	Rx message object
Input/Output Parameters	None
Function Description	Set Rx message object

Compilation Warning Report



1 warning

Main.c(16): warning: #111-D: statement is unreachable return 0;

Links

- Videos link
- Github repository