Tutorial 01: CanIf_AppDemo (english text)

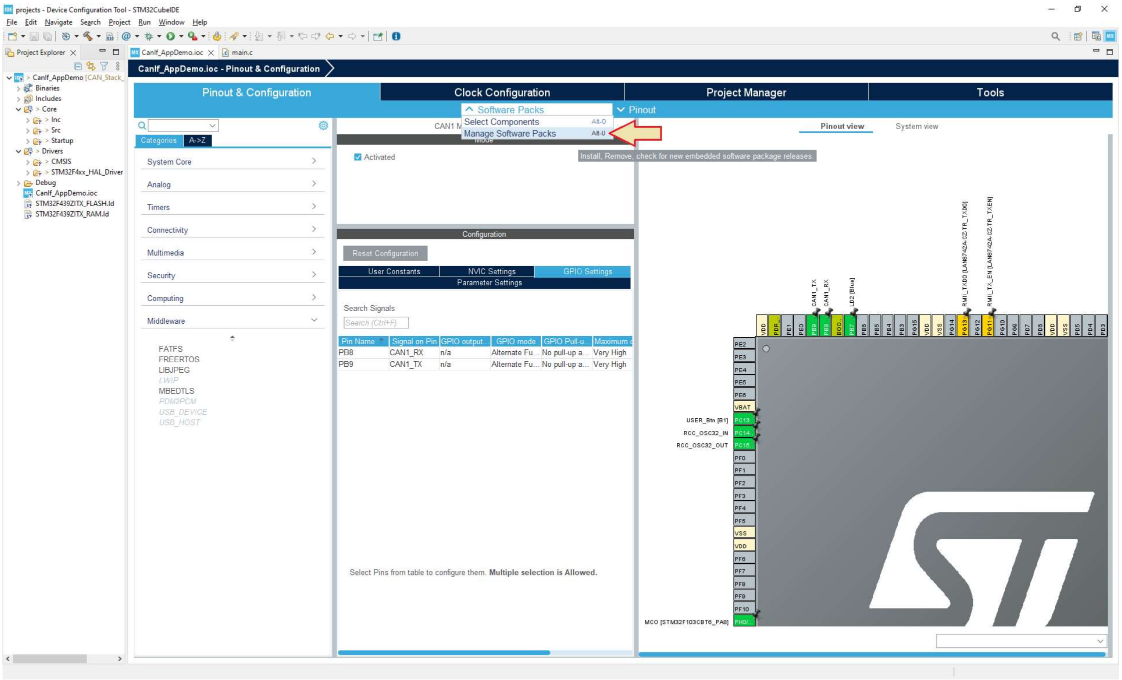
coming soon (who want to do this?) It should be the same es in **German**

At first wyou get the sections to integrate the pack.

Table of Contents

How to integrate the Expansion Package to STM32CubeIDE

Manage Software Packs

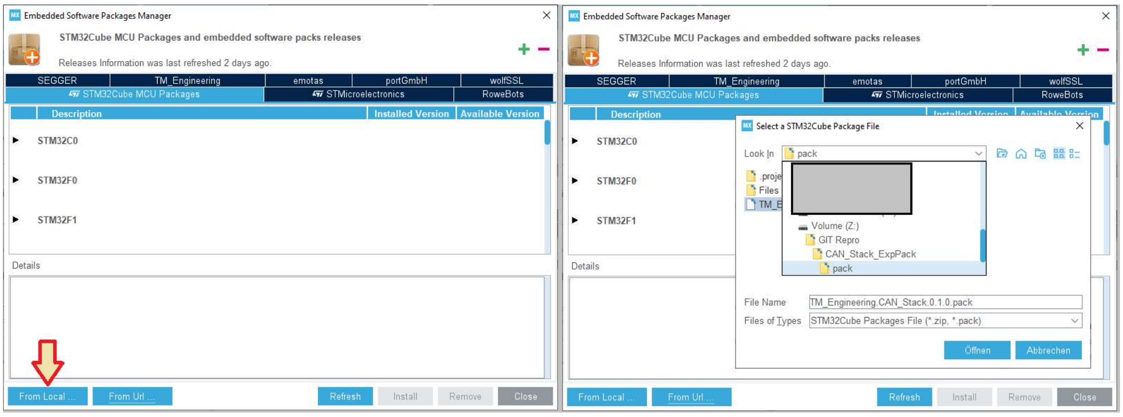


Pin Name	Signal on Pin	GPIO output...	GPIO mode	GPIO Pull-u...	Maximum o...
PB8	CAN1_RX	n/a	Alternate Fu...	No pull-up a...	Very High
PB9	CAN1_TX	n/a	Alternate Fu...	No pull-up a...	Very High

Select Pins from table to configure them. **Multiple selection is Allowed.**

Open manage software packs dialog

Inside the `CanIf_AppDemo.ioc` file view you can find at the top middle the menu "Select Packs/Manage Software Packs"

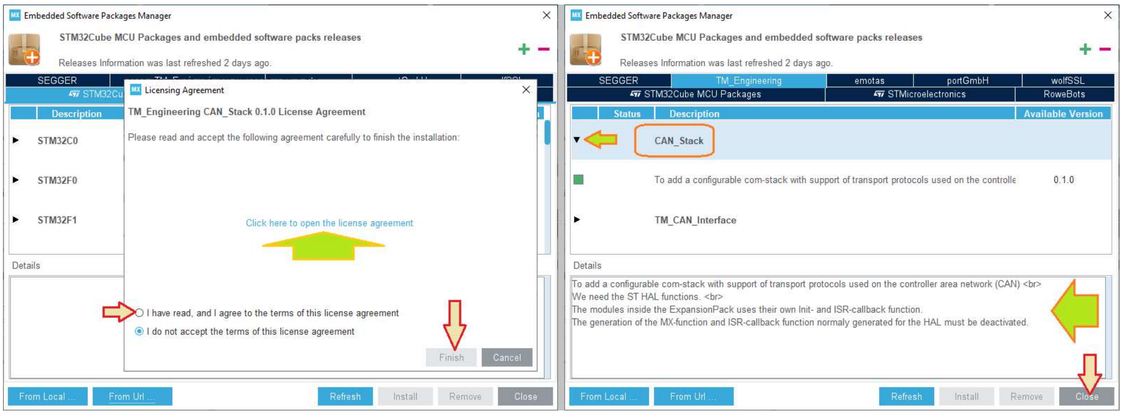


File Name: TM_Engineering.CAN_Stack.0.1.0.pack

Files of Types: STM32Cube Packages File (*.zip, *.pack)

load pack

You can choose to load the pack from the local disc space or via URL from a web space. In my case I have the pack saved on disc space coming with the repository.



Embedded Software Packages Manager

STM32Cube MCU Packages and embedded software packs releases

Releases Information was last refreshed 2 days ago.

Licensing Agreement

TM_Engineering CAN_Stack 0.1.0 License Agreement

Please read and accept the following agreement carefully to finish the installation:

Click here to open the license agreement

○ I have read, and I agree to the terms of this license agreement

● I do not accept the terms of this license agreement

Status	Description	Available Version
▼	CAN_Stack	
🟩	To add a configurable com-stack with support of transport protocols used on the controlle	0.1.0
▶	TM_CAN_Interface	

Details

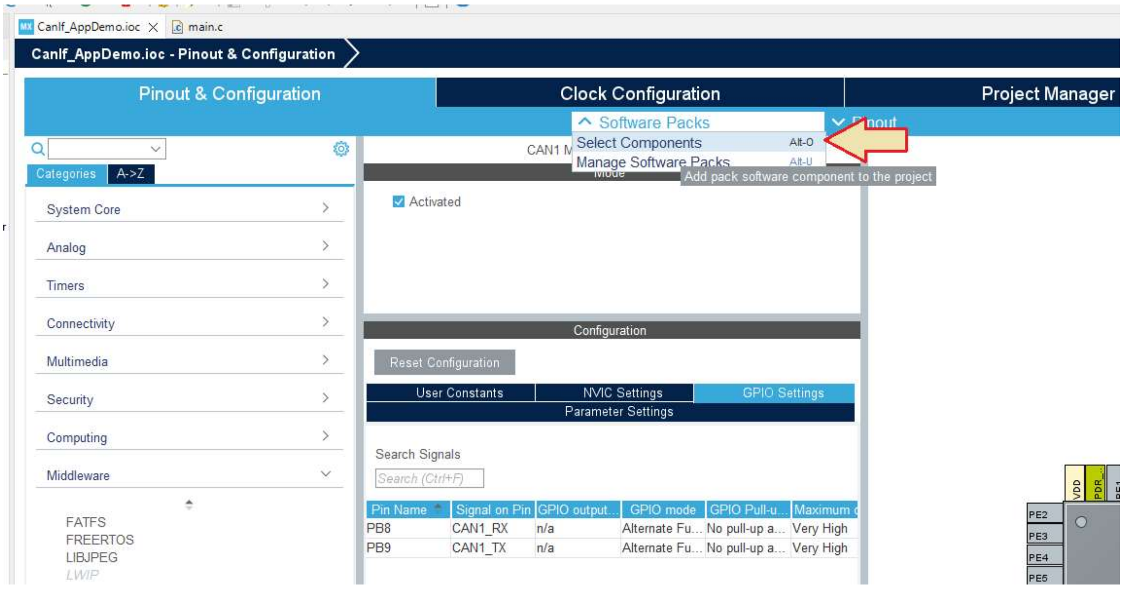
To add a configurable com-stack with support of transport protocols used on the controller area network (CAN)
We need the ST HAL functions.
The modules inside the ExpansionPack uses their own Init- and ISR-callback function.
The generation of the MX-function and ISR-callback function normaly generated for the HAL must be deactivated.

License agreement

If you have read the license info and agree to it, click on "finish".

You can find some useful details if you click on the ExpansionPack inside the new view. For example there is something with the MX-functions coming from HAL code generation.

Select the components coming with the pack



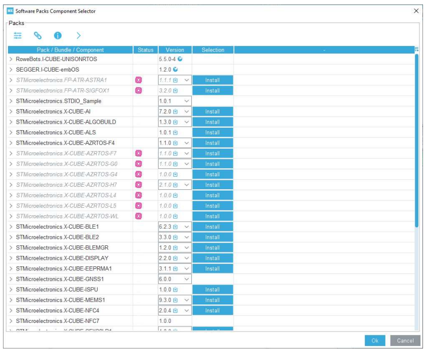
CanIf_AppDemo.ioc - Pinout & Configuration

☑ Activated

Pin Name	Signal on Pin	GPIO output...	GPIO mode	GPIO Pull-u...	Maximum o
PB8	CAN1_RX	n/a	Alternate Fu...	No pull-up a...	Very High
PB9	CAN1_TX	n/a	Alternate Fu...	No pull-up a...	Very High

load pack

Back on the `CanIf_Appdemo.ioc` view you can find the menu "Software Packs/Select Components". On this, you open the "Software Pack Component Selector". Here is a small picture on it. Don't worry about no readable, I will go to details on next.



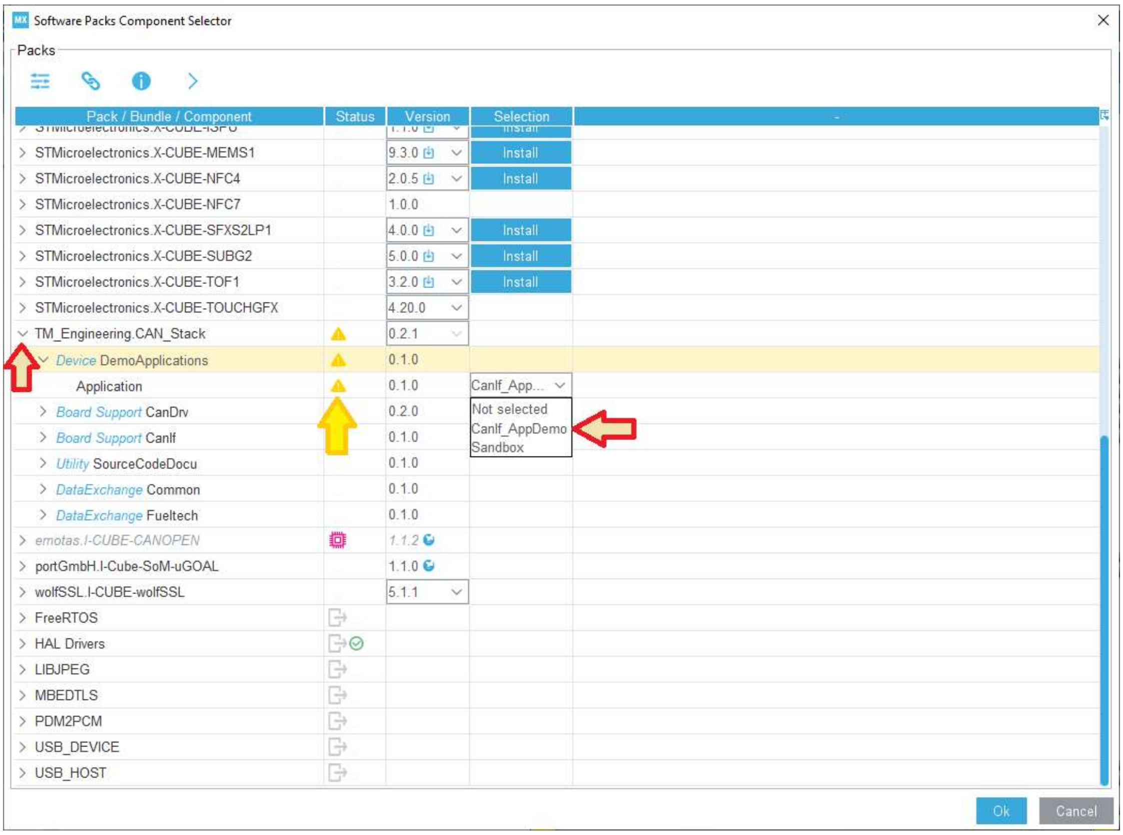
Software Packs Component Selector

Packs

Pack / Bundle / Component	Status	Version	Selection
RoweBots.I-CUBE-UNISONRTOS		5.5.0-4	
SEGGER.I-CUBE-embOS		1.2.0	
STMicroelectronics.FP-ATR-ASTRA1		1.1.1	Install
STMicroelectronics.FP-ATR-SIGFOX1		3.2.0	Install
STMicroelectronics.STDIO_Sample		1.0.1	
STMicroelectronics.X-CUBE-AI		7.2.0	Install
STMicroelectronics.X-CUBE-ALGOBUILD		1.3.0	Install
STMicroelectronics.X-CUBE-ALS		1.0.1	Install
STMicroelectronics.X-CUBE-AZRTOS-F4		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-F7		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-G0		1.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-G4		1.0.0	Install
STMicroelectronics.X-CUBE-AZRTOS-H7		2.1.0	Install
STMicroelectronics.X-CUBE-AZRTOS-L4		1.0.0	Install
STMicroelectronics.X-CUBE-AZRTOS-L5		1.0.0	Install
STMicroelectronics.X-CUBE-AZRTOS-WL		1.0.0	Install
STMicroelectronics.X-CUBE-BLE1		6.2.3	Install
STMicroelectronics.X-CUBE-BLE2		3.3.0	Install
STMicroelectronics.X-CUBE-BLEMGR		1.2.0	Install
STMicroelectronics.X-CUBE-DISPLAY		2.2.0	Install
STMicroelectronics.X-CUBE-EEPRMA1		3.1.1	Install
STMicroelectronics.X-CUBE-GNSS1		6.0.0	
STMicroelectronics.X-CUBE-ISPU		1.0.0	Install
STMicroelectronics.X-CUBE-MEMS1		9.3.0	Install
STMicroelectronics.X-CUBE-NFC4		2.0.4	Install
STMicroelectronics.X-CUBE-NFC7		1.0.0	

Software Pack Component Selector

You can find all ExpansionPacks delivered from the STMicroelectronics server. With a click on `Install` you can download and install the ExpansionPack. If you scroll down you can find our ExpansionPack `TM_Engineering.CAN_Stack`.



Software Packs Component Selector

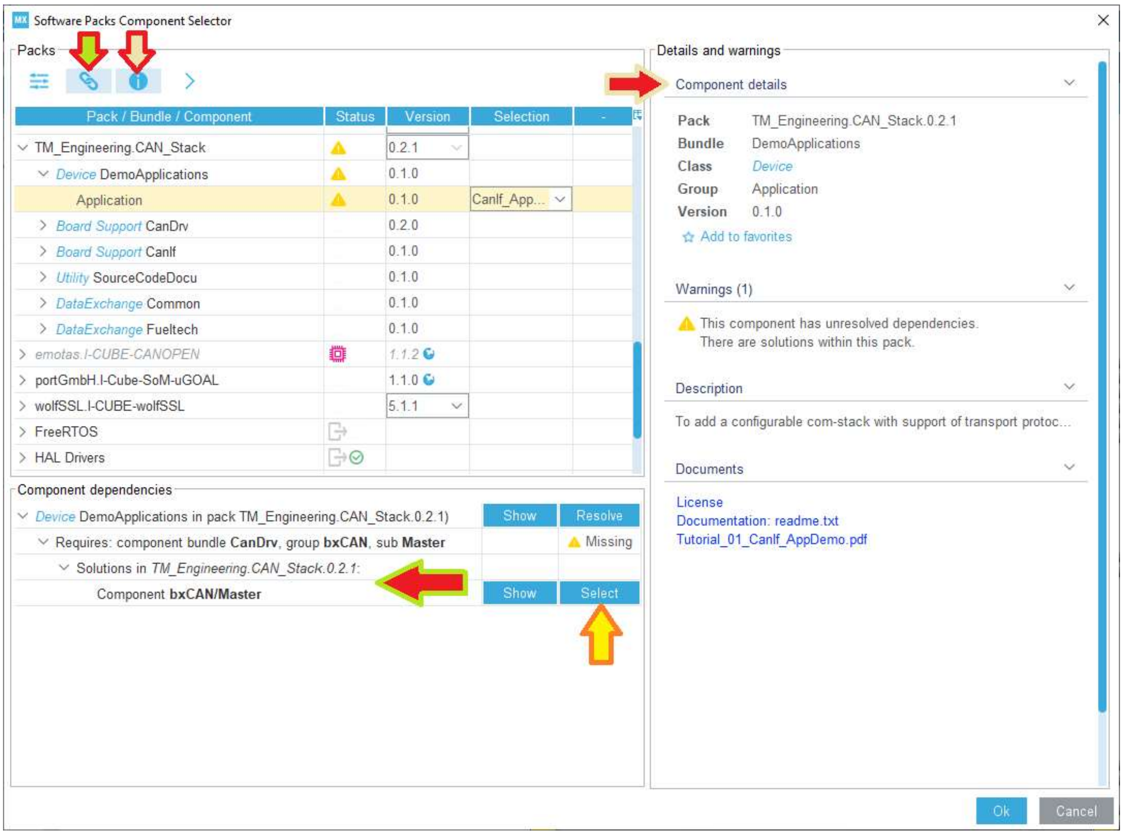
Packs

Pack / Bundle / Component	Status	Version	Selection
> STMicroelectronics.X-CUBE-ISPU		1.1.0	Install
> STMicroelectronics.X-CUBE-MEMS1		9.3.0	Install
> STMicroelectronics.X-CUBE-NFC4		2.0.5	Install
> STMicroelectronics.X-CUBE-NFC7		1.0.0	
> STMicroelectronics.X-CUBE-SFXS2LP1		4.0.0	Install
> STMicroelectronics.X-CUBE-SUBG2		5.0.0	Install
> STMicroelectronics.X-CUBE-TOF1		3.2.0	Install
> STMicroelectronics.X-CUBE-TOUCHGFX		4.20.0	
∨ TM_Engineering.CAN_Stack	⚠	0.2.1	
∨ *Device* DemoApplications	⚠	0.1.0	
Application	⚠	0.1.0	CanIf_App...
> *Board Support* CanDrv		0.2.0	Not selected CanIf_AppDemo Sandbox
> *Board Support* CanIf		0.1.0	
> *Utility* SourceCodeDocu		0.1.0	
> *DataExchange* Common		0.1.0	
> *DataExchange* Fueltech		0.1.0	
> *emotas.I-CUBE-CANOPEN*		*1.1.2*	
> portGmbH.I-Cube-SoM-uGOAL		1.1.0	
> wolfSSL.I-CUBE-wolfSSL		5.1.1	
> FreeRTOS			
> HAL Drivers	✓		
> LIBJPEG			
> MBEDTLS			
> PDM2PCM			
> USB_DEVICE			
> USB_HOST			

Select the Demo Application

With a click on the ">" it will show you the bundles and the components of the pack. For the first try we select the Demo Application `CanIf_AppDemo`.

There will be some warnings signaled with the yellow triangle.



Software Packs Component Selector

Packs

Pack / Bundle / Component	Status	Version	Selection
∨ TM_Engineering.CAN_Stack	⚠	0.2.1	
∨ *Device* DemoApplications	⚠	0.1.0	
Application	⚠	0.1.0	CanIf_App...
> *Board Support* CanDrv		0.2.0	
> *Board Support* CanIf		0.1.0	
> *Utility* SourceCodeDocu		0.1.0	
> *DataExchange* Common		0.1.0	
> *DataExchange* Fueltech		0.1.0	
> *emotas.I-CUBE-CANOPEN*		*1.1.2*	
> portGmbH.I-Cube-SoM-uGOAL		1.1.0	
> wolfSSL.I-CUBE-wolfSSL		5.1.1	
> FreeRTOS			
> HAL Drivers	✓		

Component dependencies

∨ *Device* DemoApplications in pack TM_Engineering.CAN_Stack.0.2.1)	Show	Resolve
∨ Requires: component bundle **CanDrv**, group **bxCAN**, sub **Master**		⚠ Missing
∨ Solutions in *TM_Engineering.CAN_Stack.0.2.1*:		
Component **bxCAN/Master**	Show	Select

Details and warnings

Component details

Pack	TM_Engineering.CAN_Stack.0.2.1
Bundle	DemoApplications
Class	*Device*
Group	Application
Version	0.1.0

☆ Add to favorites

Warnings (1)

⚠ This component has unresolved dependencies.
There are solutions within this pack.

Description

To add a configurable com-stack with support of transport protoc...

Documents

License
Documentation: readme.txt
Tutorial_01_CanIf_AppDemo.pdf

Bundle warnings and Info

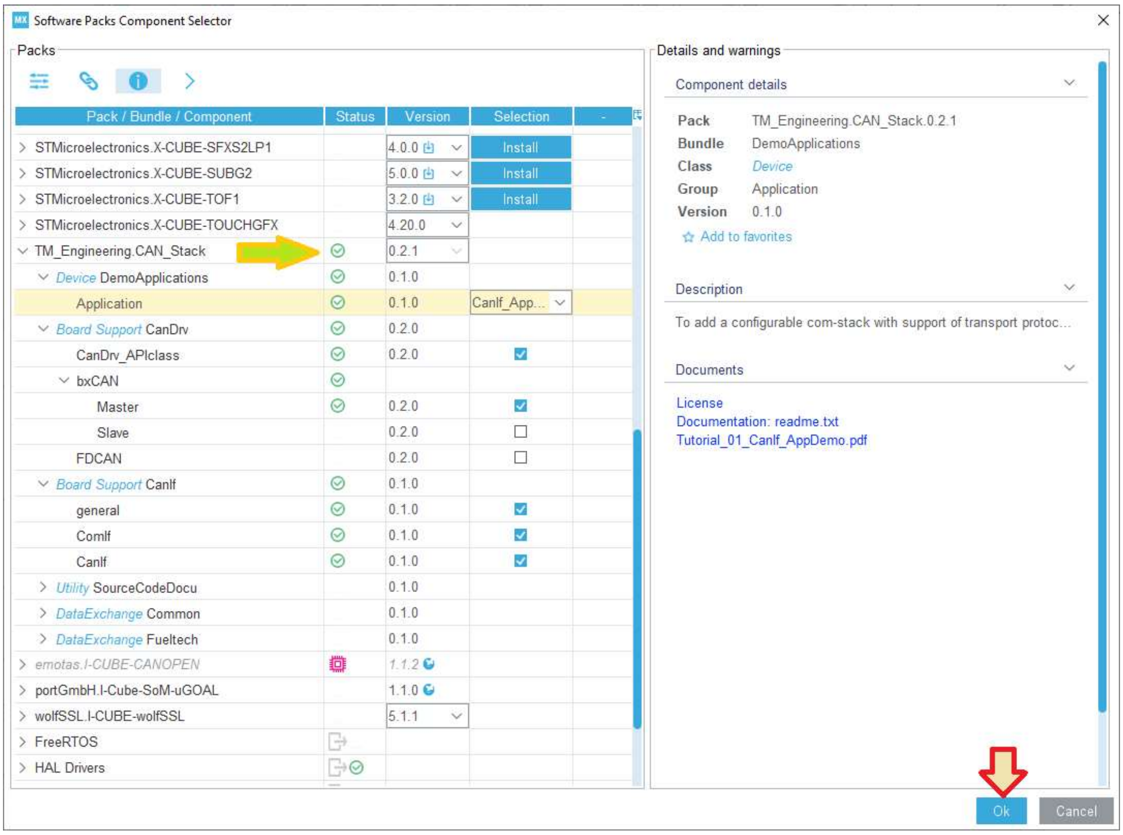
With a click in the ℹ button (like the biscuit/red arrow in the picture) you can find more details to the bundle or component. Here is some text to explain the waring(s): "This component has unresolved dependencies". So we know there must be some more components to use this one. The next line says: "There are solutions within this pack". There must be an other component inside our pack. We don't need an other pack.
The 🔗 button (like green/red arrow) will show you the needed dependencies. So, the `DemoApplication` needs a component named `bxCAN/Master`.

You can choose your way to select the other components. The "Component Dependencies" view gives you some shortcuts

- you can manual select every with a click on the square in the "Selection" column
- you can click on "Select" button to do the same like above
- you can click on "Show" button to find where to select like the first point
- you can click on "Resolve" button to do the same like the second point but includes all other dependencies

After all you should have selected the following components and get green checkmark for solved dependencies

Bundle	Module	Content
CanDrv	CanDrv_APIclass	This module contains a virtual class **Can** which describes the API for all compatible CanDrv
	bxCAN / Master	Here is the **CanDrv_bxCAN** for the STM bxCAN Controller. We need in the tutorial the Master controller only
CanIf	general	The component includes compiler dependencies and runtime version management
	ComIf	This component includes a virtual C++ class to abstract communication interfaces like the AUTOSAR idea.
	CanIf	This is the derived interface class for communication on the CAN



Pack / Bundle / Component	Status	Version	Selection	-
STMicroelectronics.X-CUBE-SFXS2LP1		4.0.0	Install	
STMicroelectronics.X-CUBE-SUBG2		5.0.0	Install	
STMicroelectronics.X-CUBE-TOF1		3.2.0	Install	
STMicroelectronics.X-CUBE-TOUCHGFX		4.20.0		
TM_Engineering.CAN_Stack	✓	0.2.1		
Device DemoApplications	✓	0.1.0		
Application	✓	0.1.0	CanIf_App...	
Board Support CanDrv	✓	0.2.0		
CanDrv_APIclass	✓	0.2.0	☑	
bxCAN	✓			
Master	✓	0.2.0	☑	
Slave		0.2.0	□	
FDCAN		0.2.0	□	
Board Support CanIf	✓	0.1.0		
general	✓	0.1.0	☑	
ComIf	✓	0.1.0	☑	
CanIf	✓	0.1.0	☑	
Utility SourceCodeDocu		0.1.0		
DataExchange Common		0.1.0		
DataExchange Fueltech		0.1.0		
emotas.I-CUBE-CANOPEN		*1.1.2*		
portGmbH.I-Cube-SoM-uGOAL		1.1.0		
wolfSSL.I-CUBE-wolfSSL		5.1.1		
FreeRTOS				
HAL Drivers	✓			

Component details

Pack	TM_Engineering.CAN_Stack.0.2.1
Bundle	DemoApplications
Class	Device
Group	Application
Version	0.1.0

☆ Add to favorites

Description

To add a configurable com-stack with support of transport protoc...

Documents

License
Documentation: readme.txt
Tutorial_01_CanIf_AppDemo.pdf

Select needed modules

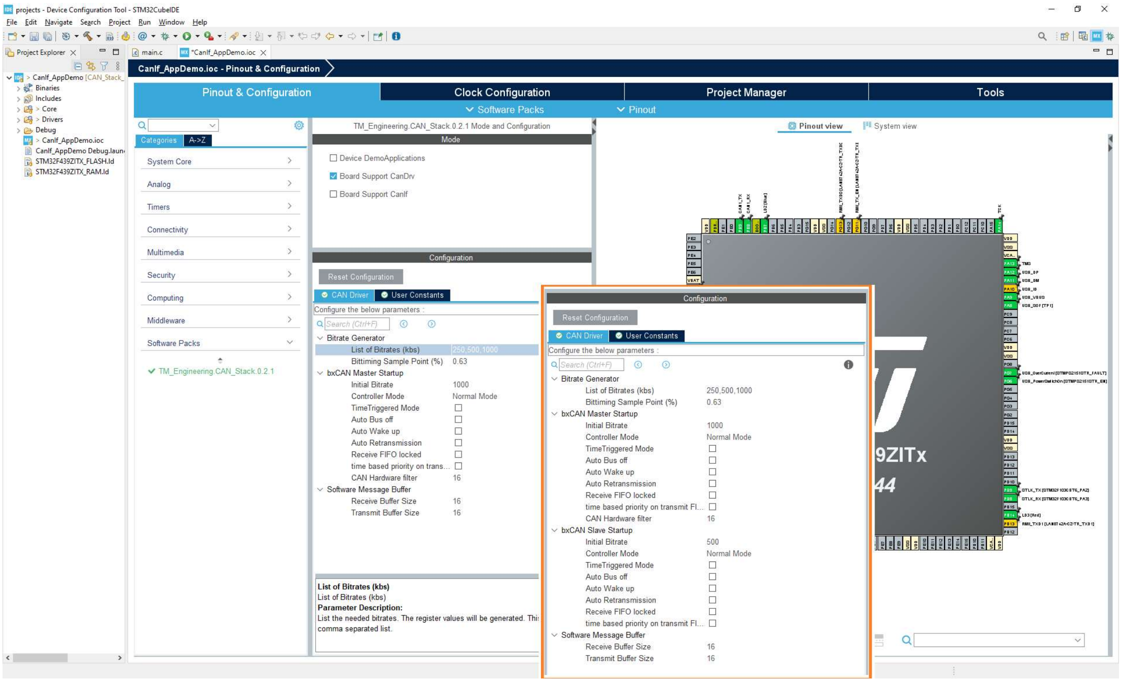
Now you can close the "Software Pack Component Selector".

Module Configuration

Back in the `CanIf_AppDemo.ioc` viewer you can find on the left column a new point named "Software Packs". Here will be listed all ExpansionPacks you have selected in the previous window. So you can see the `TM_Engineering.CAN_Stack` at this time. If you select it, there will be created a second column with to sections. On the top there is the c Mode Section. Here you can activate and deactivate the modules. On activation of a mode there will appear the configuration tab(s) on the lower section.

CAN Driver

The CAN Driver tab contains the configuration parameters for the access to the CAN bus.



TM_Engineering.CAN_Stack.0.2.1 Mode and Configuration

Mode

- ☐ Device DemoApplications
- ☑ Board Support CanDrv
- ☐ Board Support CanIf

```
Configuration
Reset Configuration
CAN Driver | User Constants
Configure the below parameters :
Bitrate Generator
    List of Bitrates (kbs)                 250,500,1000
    Bittiming Sample Point (%)             0.63
bxCAN Master Startup
    Initial Bitrate                        1000
    Controller Mode                        Normal Mode
    TimeTriggered Mode                     ☐
    Auto Bus off                           ☐
    Auto Wake up                           ☐
    Auto Retransmission                    ☐
    Receive FIFO locked                    ☐
    time based priority on transmit FI...  ☐
    CAN Hardware filter                    16
bxCAN Slave Startup
    Initial Bitrate                        500
    Controller Mode                        Normal Mode
    TimeTriggered Mode                     ☐
    Auto Bus off                           ☐
    Auto Wake up                           ☐
    Auto Retransmission                    ☐
    Receive FIFO locked                    ☐
    time based priority on transmit FI...  ☐
Software Message Buffer
    Receive Buffer Size                    16
    Transmit Buffer Size                   16
```

List of Bitrates (kbs)
List of Bitrates (kbs)
Parameter Description:
List the needed bitrates. The register values will be generated. Thi
comma separated list.

Config the Hardware Settings of the CanDrv module

If you need some more help you can select the (i) button at the upper right side in the tab. It will give you some more information about the selected parameter.

Bitrate Generator

The "Bitrate Generator" is inside the code generation ftl file. It will calculate the needed timing parameters like `SeqmentTime1`, `SeqmentTime2` or `SyncJumpWidth`. This calcualtion based on the `APB1` clock which drives the CAN controller.

Remarks

Today there is no support on switching the clock during run time!!!

Parameter	Beschreibung
List of Bitrates	Give comma seperated list with bitrate values This values are selectable inside the startup configuration and can be switched during runtime
Bittiming Sample Point	Sample Point can be given as a percent value (50%-100%) or as a float value (0.5 - 1.0)

bxCAN Master Setup / bxCAN Slave Setup

This are the startup parameter for th bxCAN Master controller or the bxCAN Slve controller, if activated.

Parameter	Value Type	Beschreibung
Initial Bitrate	[Number, Integer]	select a value you have defined in the "Bitrate Generator"
Controller Mode	Normal	Standard. The controller works as normal CAN device
	Loopback	This is an internal loopback of CAN-Tx und CAN-Rx lines. So it doesn't needs a second CAN device for testing.

	Silent	The controller don't do the arbitration.
	Silent & Loopback	combines the two above
Time Triggered Mode	true / false	Time triggered communication mode
Auto Bus off	true	The Bus-Off state is left automatically by hardware once 128 occurrences of 11 recessive bits have been monitored.
	false	The Bus-Off state is left on software request, once 128 occurrences of 11 recessive bits have been monitored and the software has first set and cleared the INRQ bit of the CAN_MCR register.
	-	For more information see the CAN-Error Management
Auto Wake up	true	The Sleep mode is left automatically by hardware on CAN message detection
	false	The Sleep mode is left on software request by clearing the SLEEP bit of the CAN_MCR register
Auto Retransmission	true	The CAN hardware will automatically retransmit the message until it has been successfully transmitted according to the CAN standard.
	false	A message will be transmitted only once, independently of the transmission result (successful, error or arbitration lost)
	Attention	This value is inverted to the Bit 4 NART: No automatic retransmission of the bxCAN controller. The inversion is done inside the HAL Init function.
Receive FIFO Locked	true	Receive FIFO locked against overrun. Once a receive FIFO is full the next incoming message will be discarde
	false	Receive FIFO not locked on overrun. Once a receive FIFO is full the next incoming message will overwrite the previous one.
time based priority on transmission	true	Priority driven by the request order (chronologically)
	false	Priority driven by the identifier of the message
CAN Hardware filter	[Number, Integer]	This gives the maximum count of used hardware filters for use on the bxCAN Master. The bxCAN has 28 filter banks. The remaining filters will be used by the bxCAN Slave

Software Message Buffer

The bxCAN controller has only a three message sized receive FIFO and three transmit mailboxes So we have configurable software buffers in the CanDrv. The size of this buffers will be given with this two values