# XC2287M HOT

## Solution CAN_2

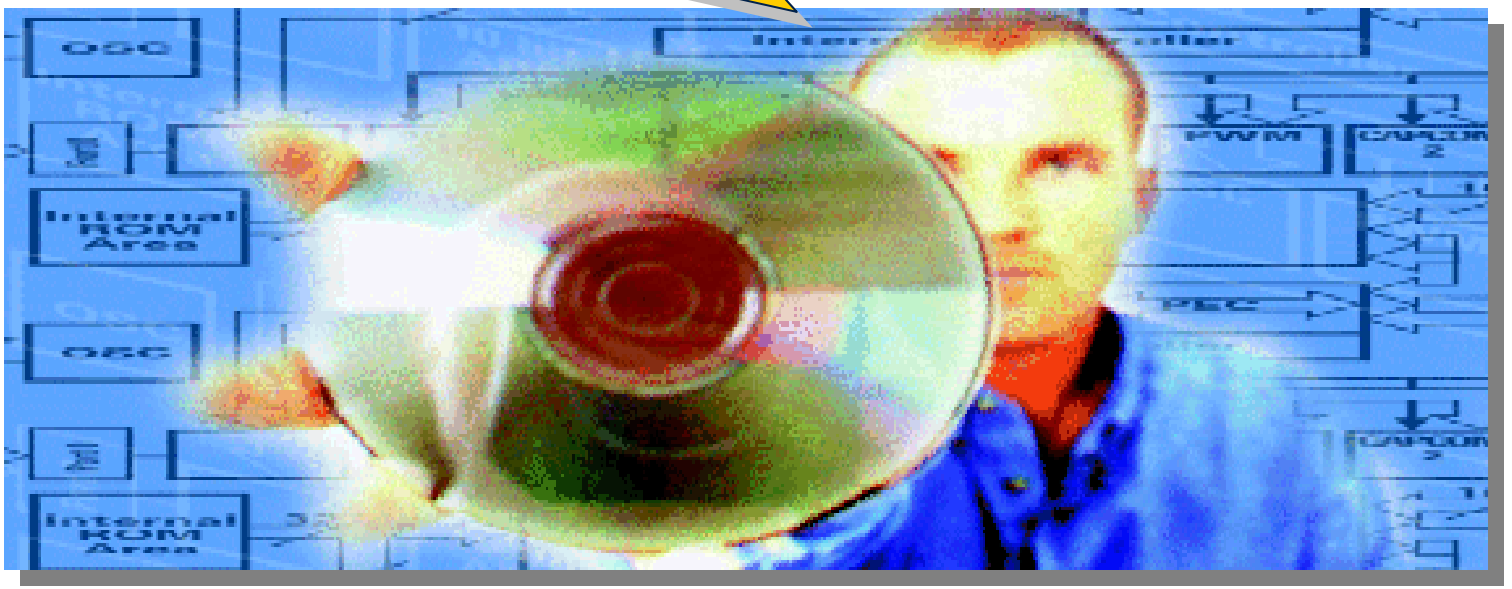
## Serial Communication using the CAN with external CAN BUS

Device: XC2287M-104F80
Compiler: Tasking Viper 2.4r1
Code Generator: DAvE 2.1

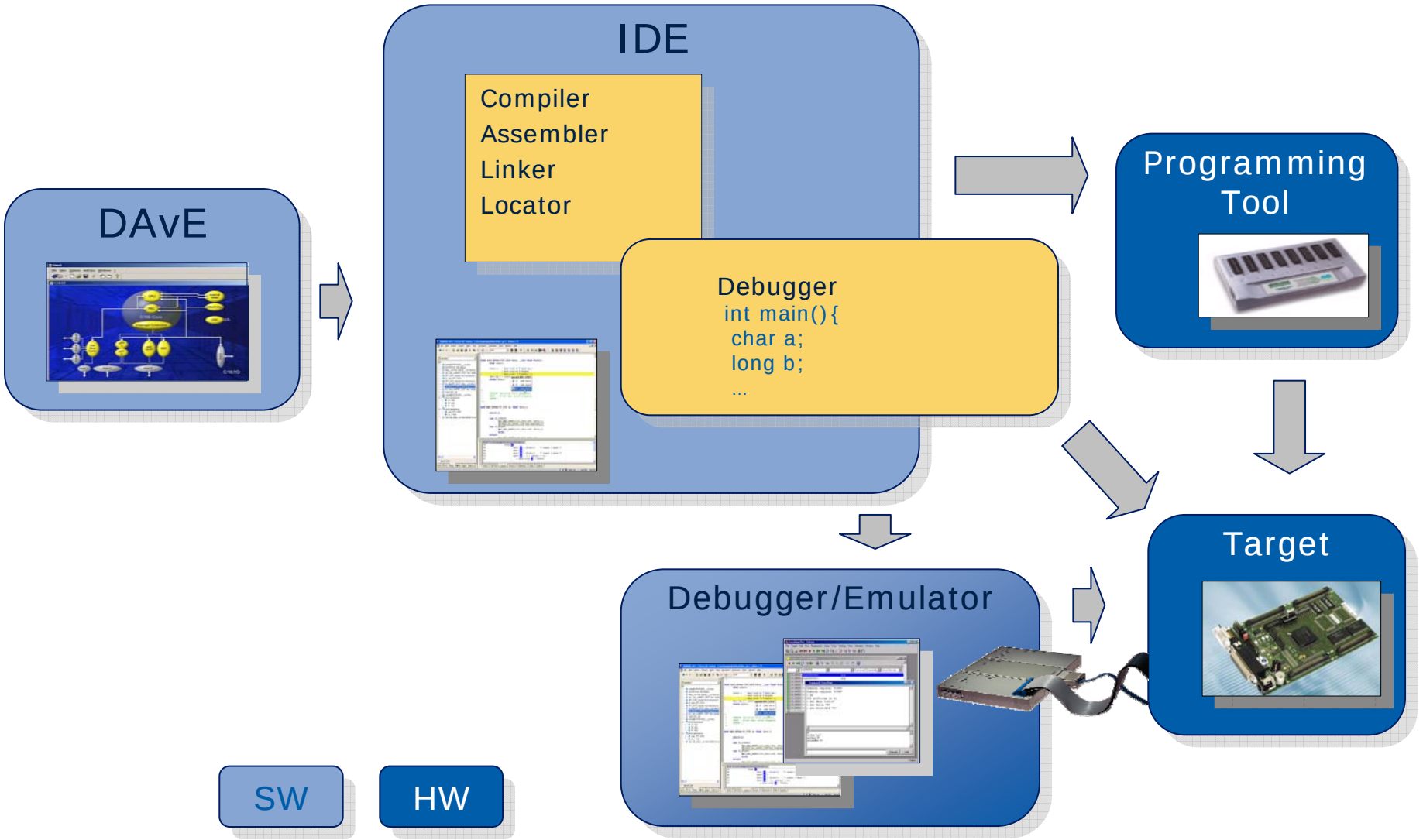
Never stop thinking

# Serial Communication using the CAN_2 with external CAN-BUS

Let’s get started now!

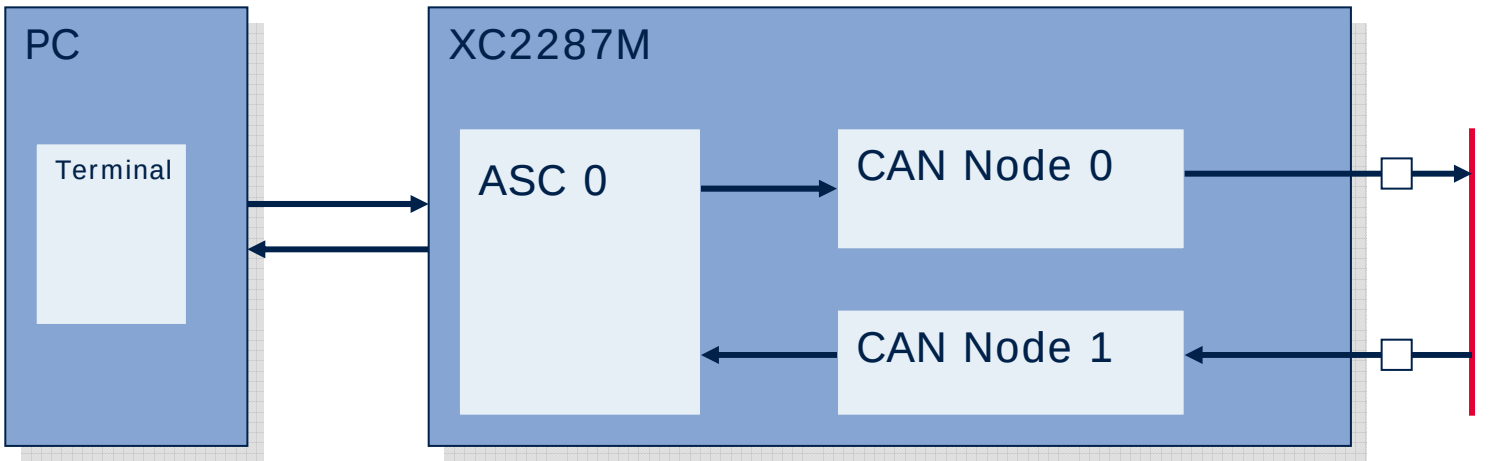


# XC2287M HOT Exercise CAN_2
# Interaction of Development Tools

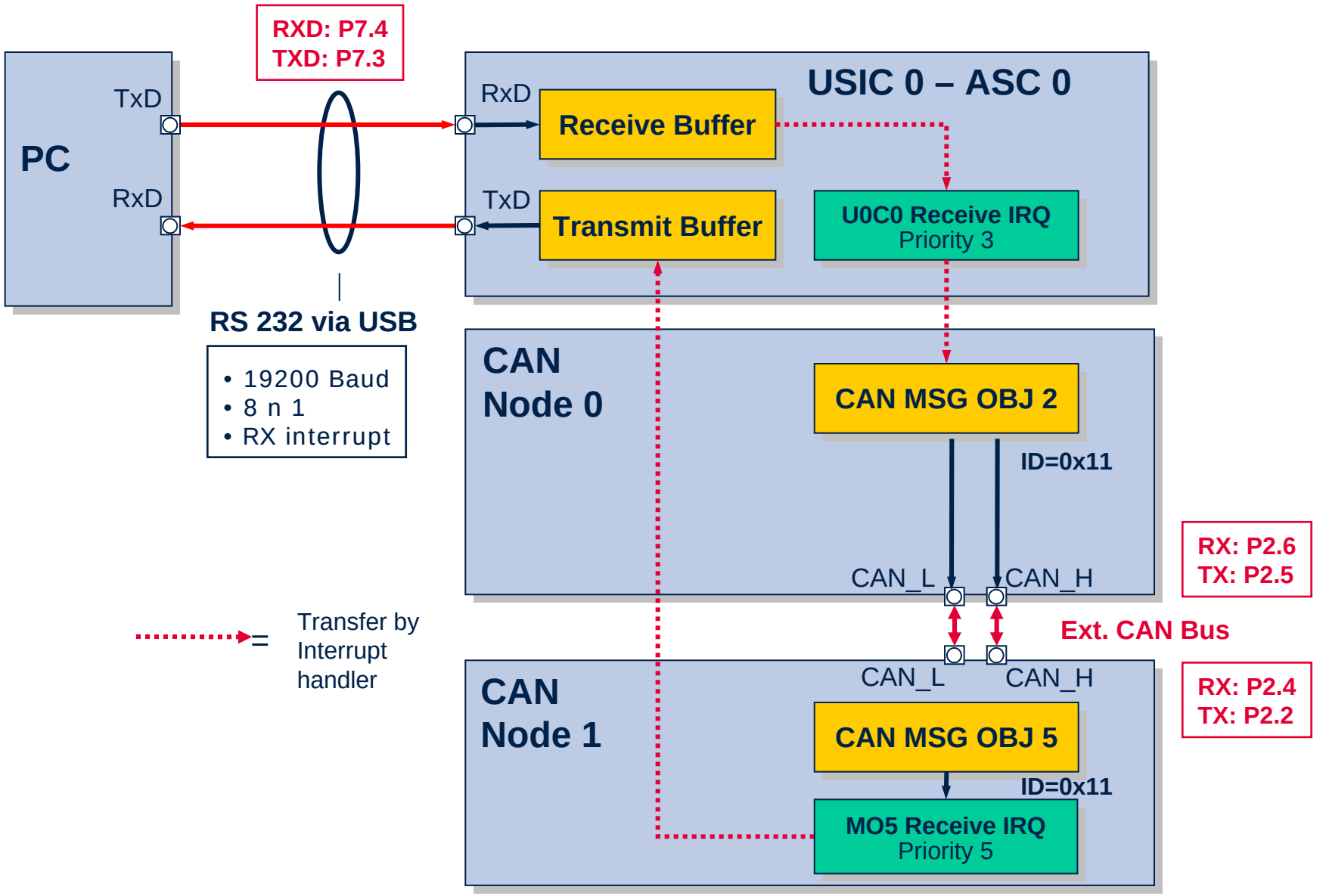


# HOT Exercise CAN_2
# Objective

- Use a terminal program to send ASCII characters via the serial port
- Receive these ASCII characters using ASC0
- Forward to CAN Node 0 and transmit to CAN Node 1 via external CAN-Bus
- Forward  from CAN Node 1 back to ASC0
- Transmit the received ASCII characters back to the PC

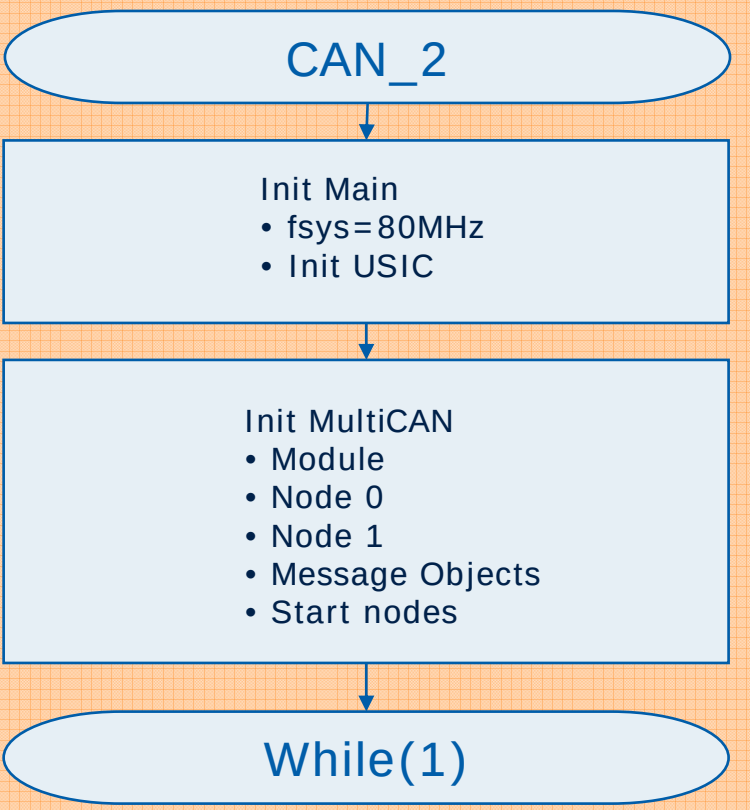


# HOT Exercise CAN_2
# Block Diagram



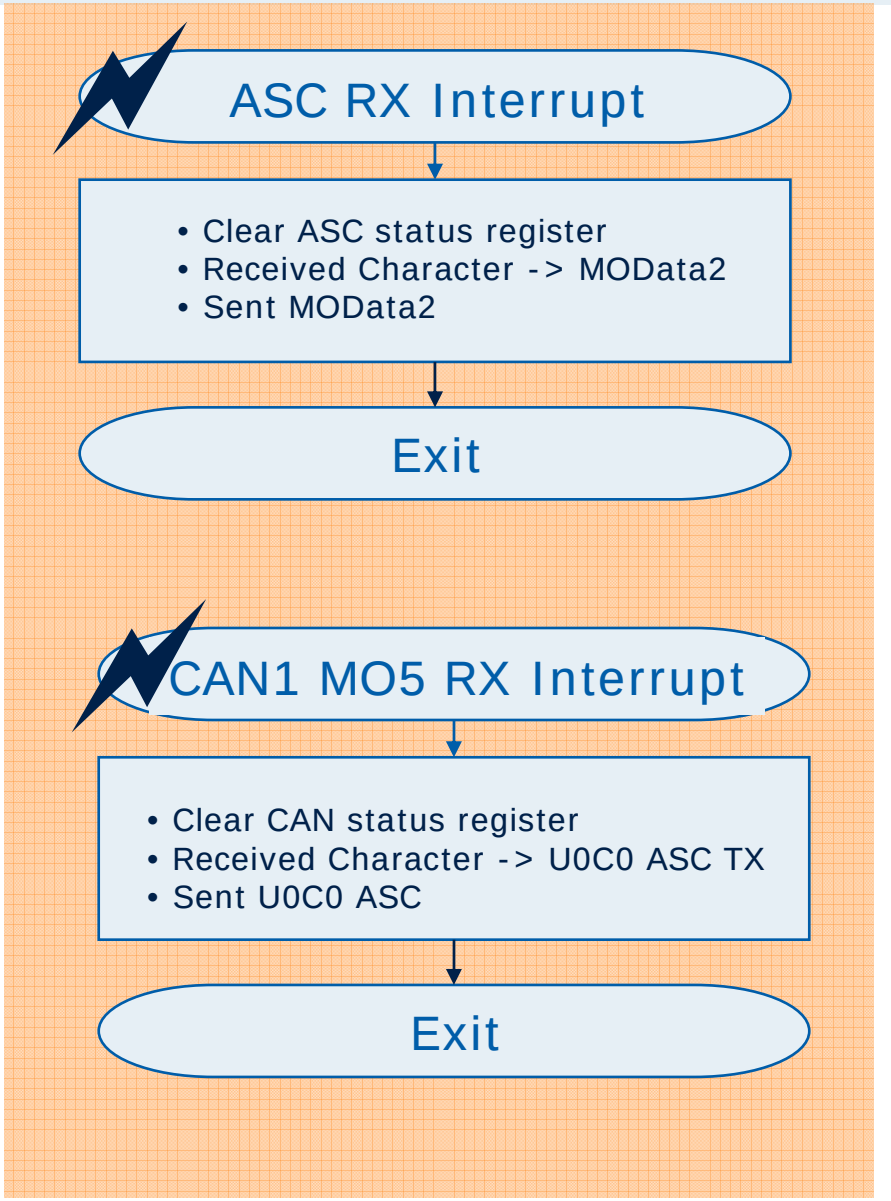
# HOT Exercise CAN_2
# Flow Chart 1/2

- Init CAN Module
  - Module enable
  - Module Clock
  - EINIT write protected register
- Init CAN Node
  - Enable node and interrupts
  - Configure pin connections
  - Set baud rate
  - Assign Message Objects to node
- Init Message Objects (MO)
  - RX/TX mode
  - data length
  - INT pointer and enable
  - Identifier
  - Data content
  - Enable MO
- Start Node on CAN Bus



# HOT Exercise CAN_2
# Flow Chart 2/2

- USIC 0 Channel 0 (ASC) Interrupt

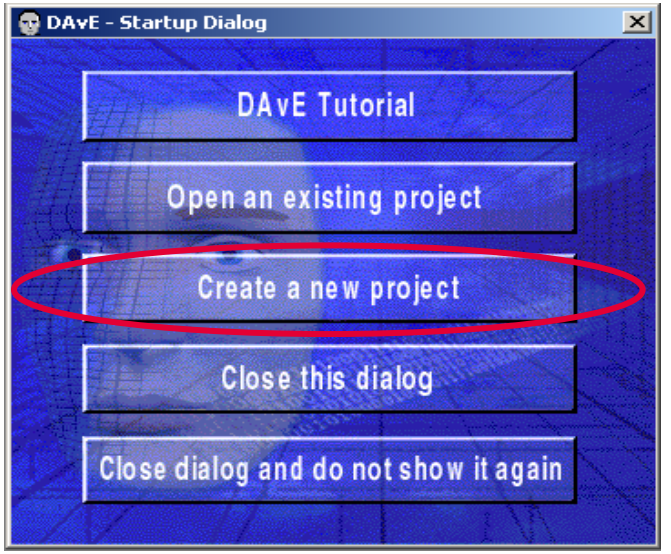



- CAN 1 Message Object 5 Interrupt

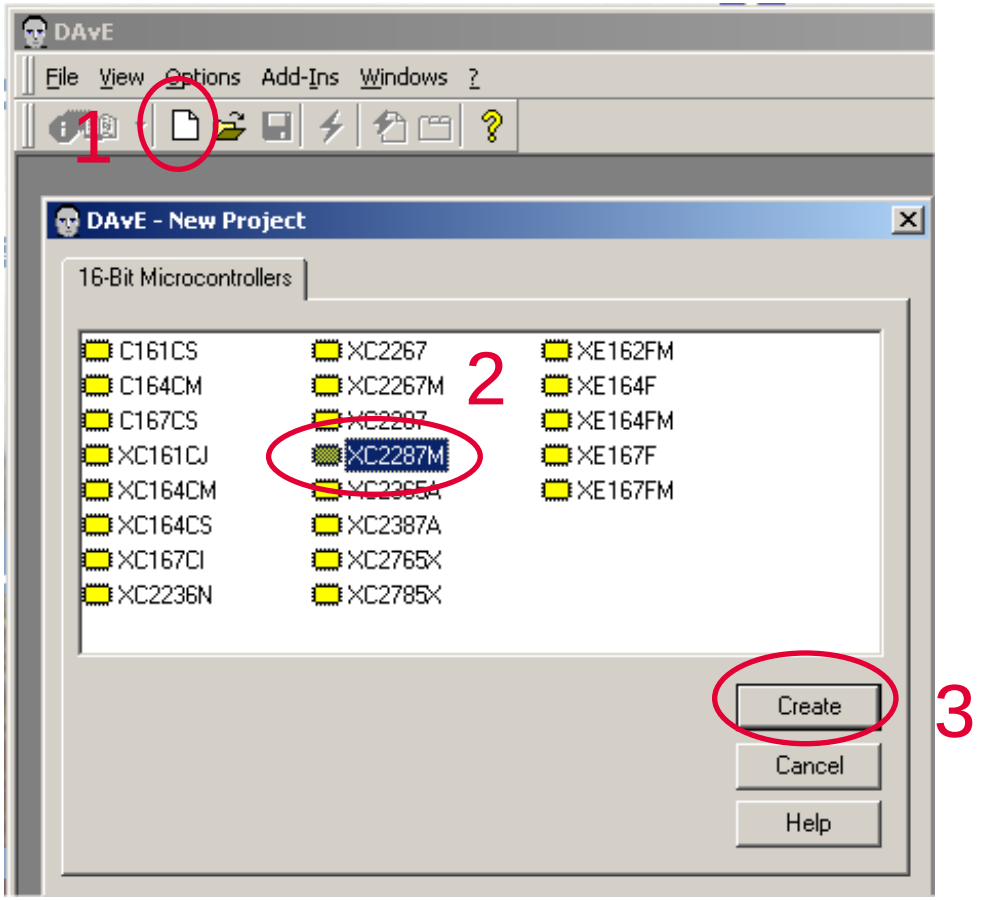
# HOT Exercise CAN_2 - DAvE Configurations
# Start DAvE

- **Start DAvE**
  - Click on the 


- **Create a new project** (Startup Dialog pop up automatically)
  - Click on ‘Create a new project’ or select File -> New
  - Select microcontroller: ‘XC2287M’

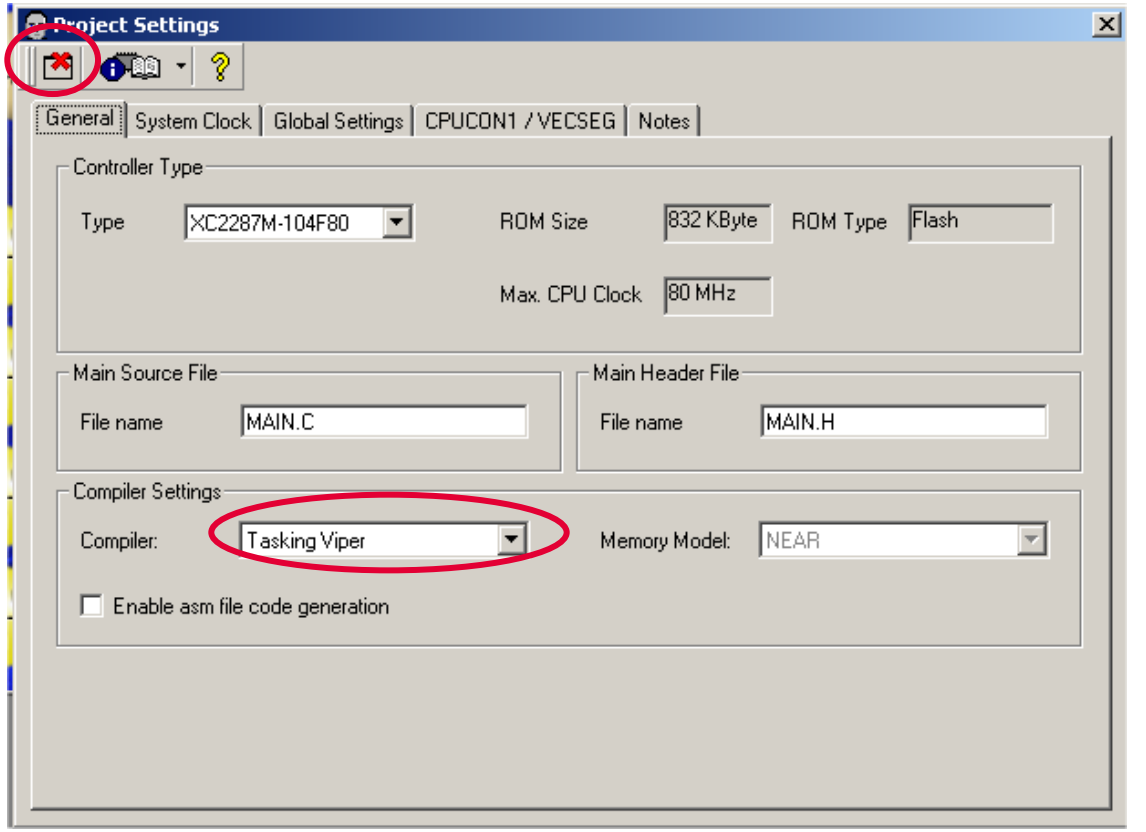


# HOT Exercise CAN _2
# Start DAvE (cont.)



# HOT Exercise CAN_2- DAvE Configurations Project Settings

- Project Settings
- Close the window

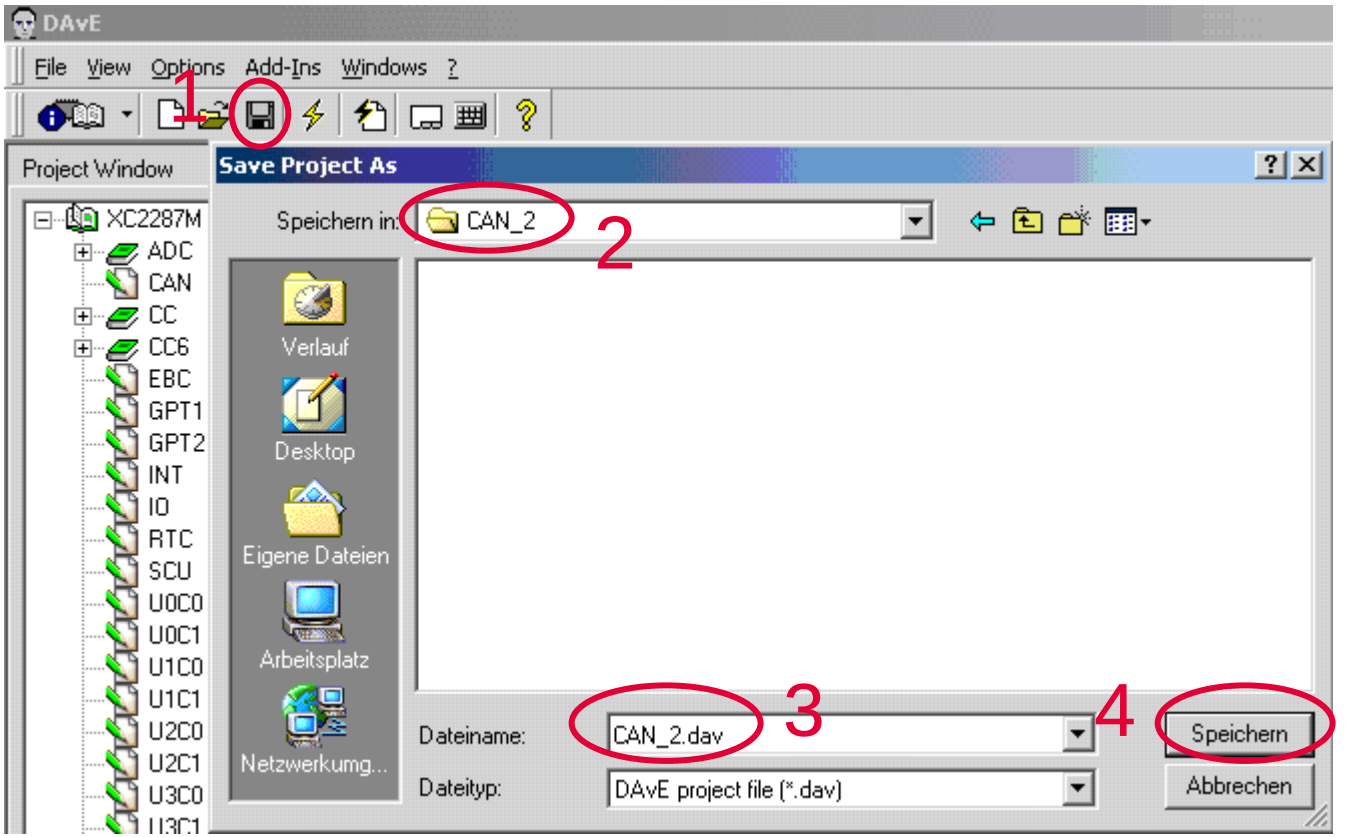


# HOT Exercise CAN_2 - DAvE Configurations
# Save DAvE Project

- Save your DAvE project 
  - Path:
    C:\IFX_HOT\XC2287M\Examples\CAN_2
  - Project name:
    CAN_2\CAN_2.dav

# HOT Exercise CAN_2 - DAvE Configurations
# Save DAvE Project

- Save your DAvE Project File

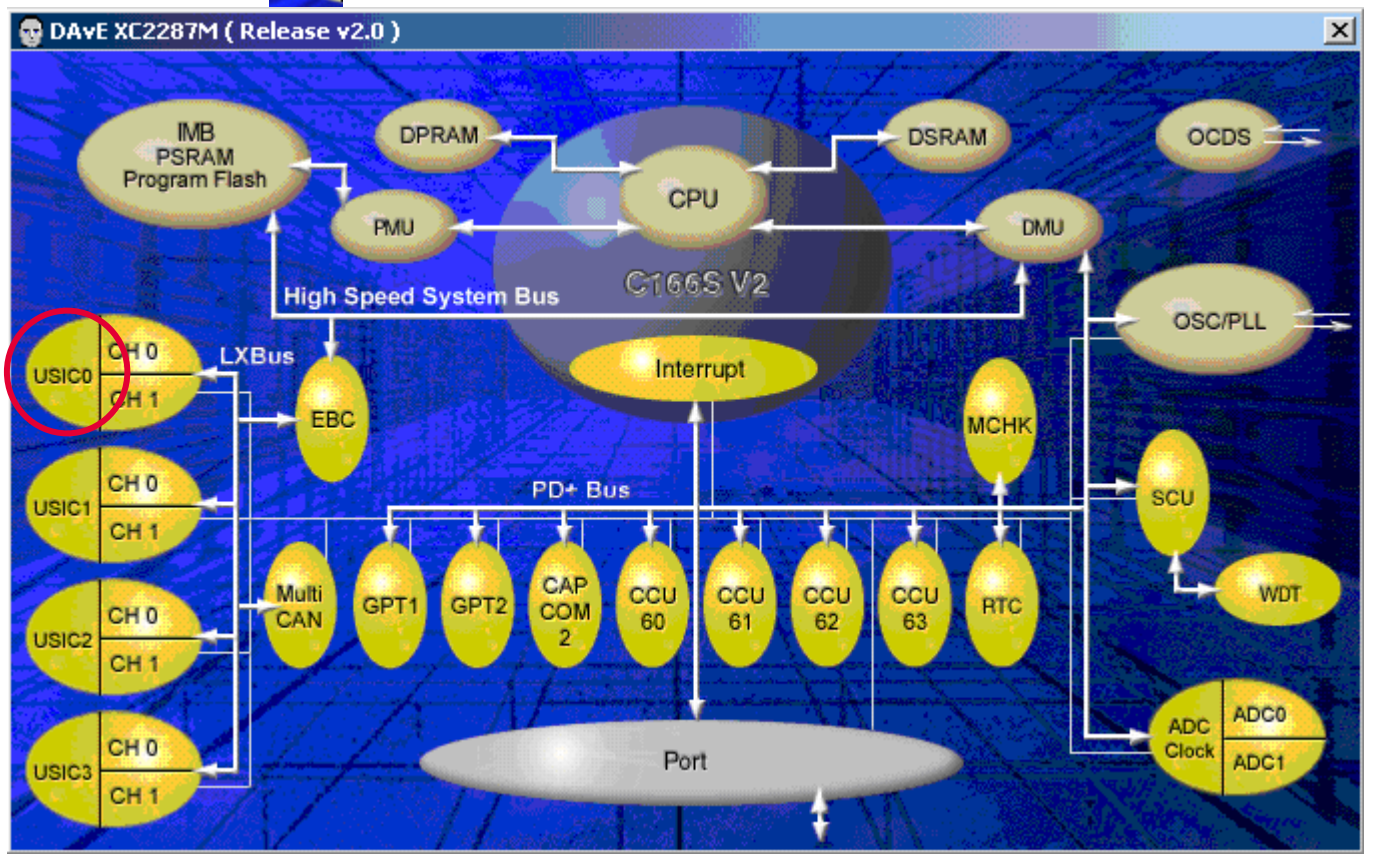


# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **RS232 Settings**
  - Baud Rate = 19200 Baud
  - 8 bit data, 1 stop bit, no parity
  - Receive interrupt
  - RXD:P7.4 TXD: P7.3

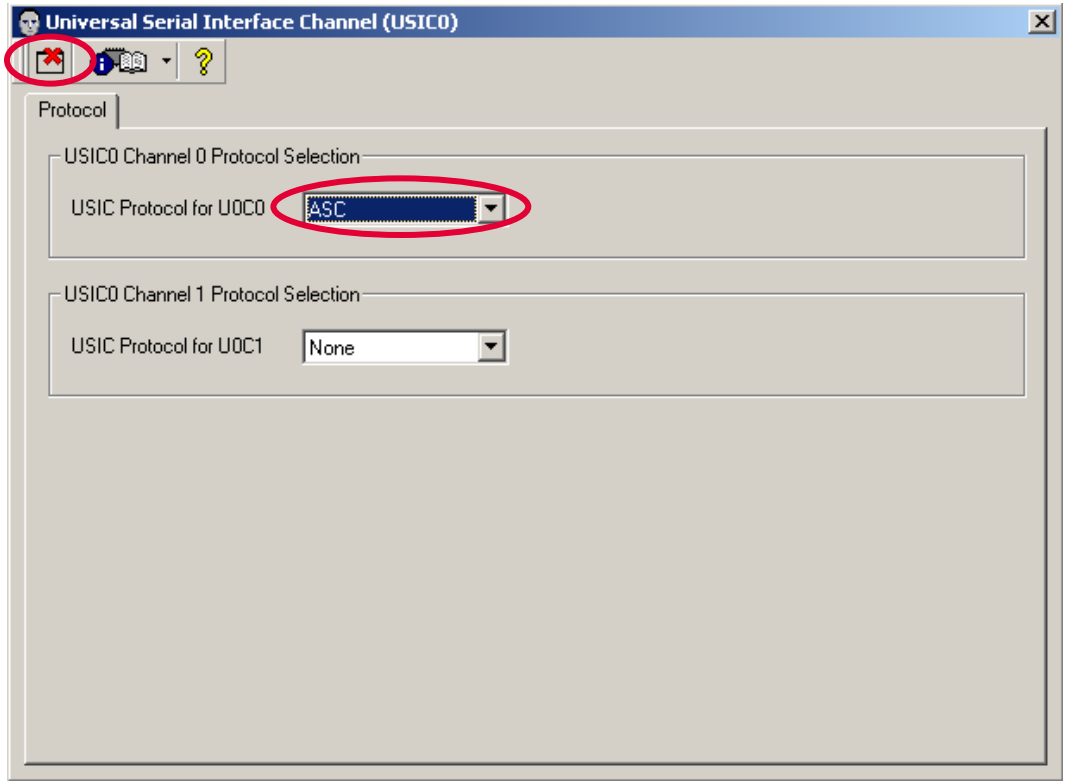
# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **XC2287M**
  - **USIC0 :**
    - Click on the 

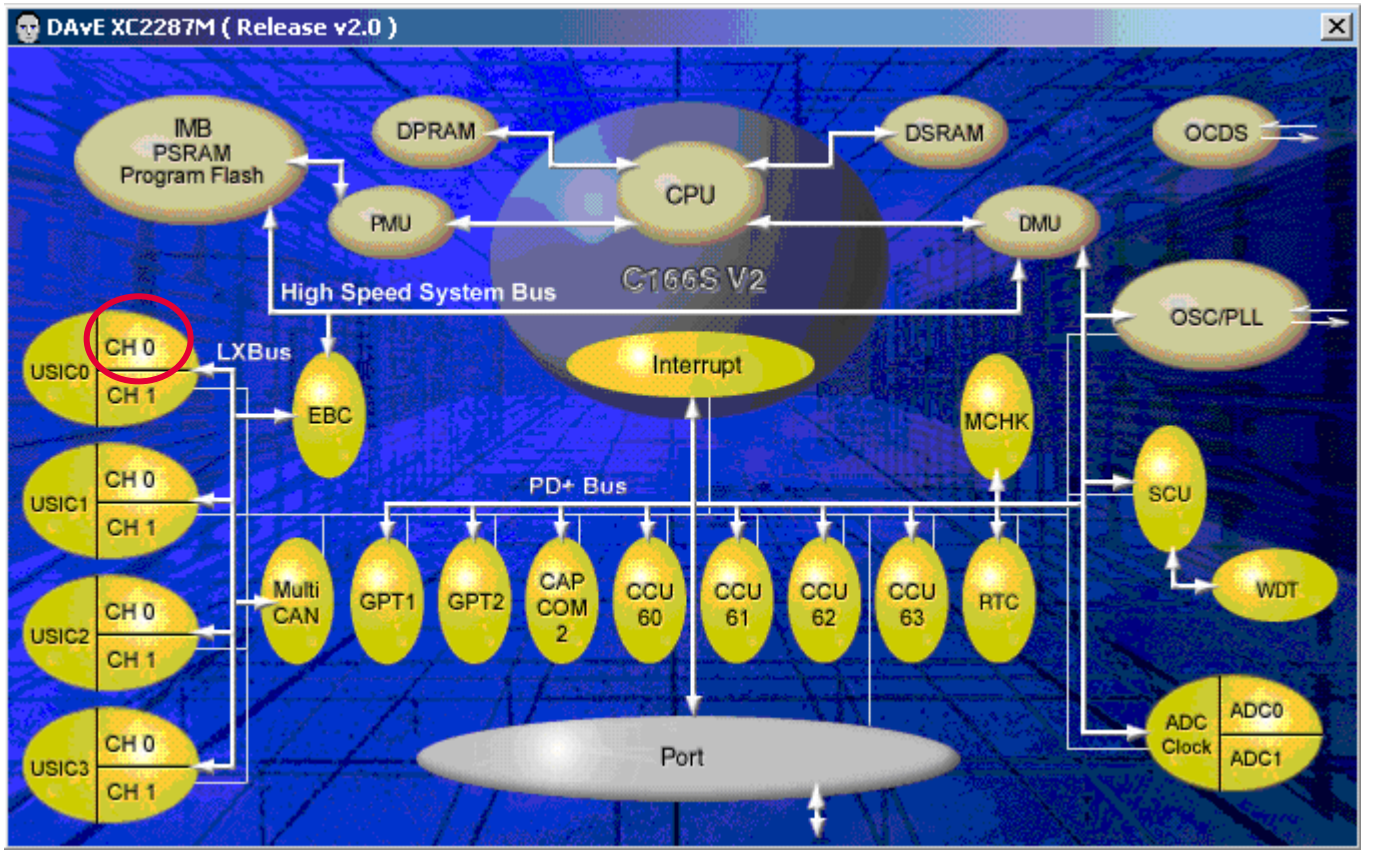
# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **XC2287M**
  - **USIC0 :**
    - Select ASC for U0C0 protocol
    - Click  to exit



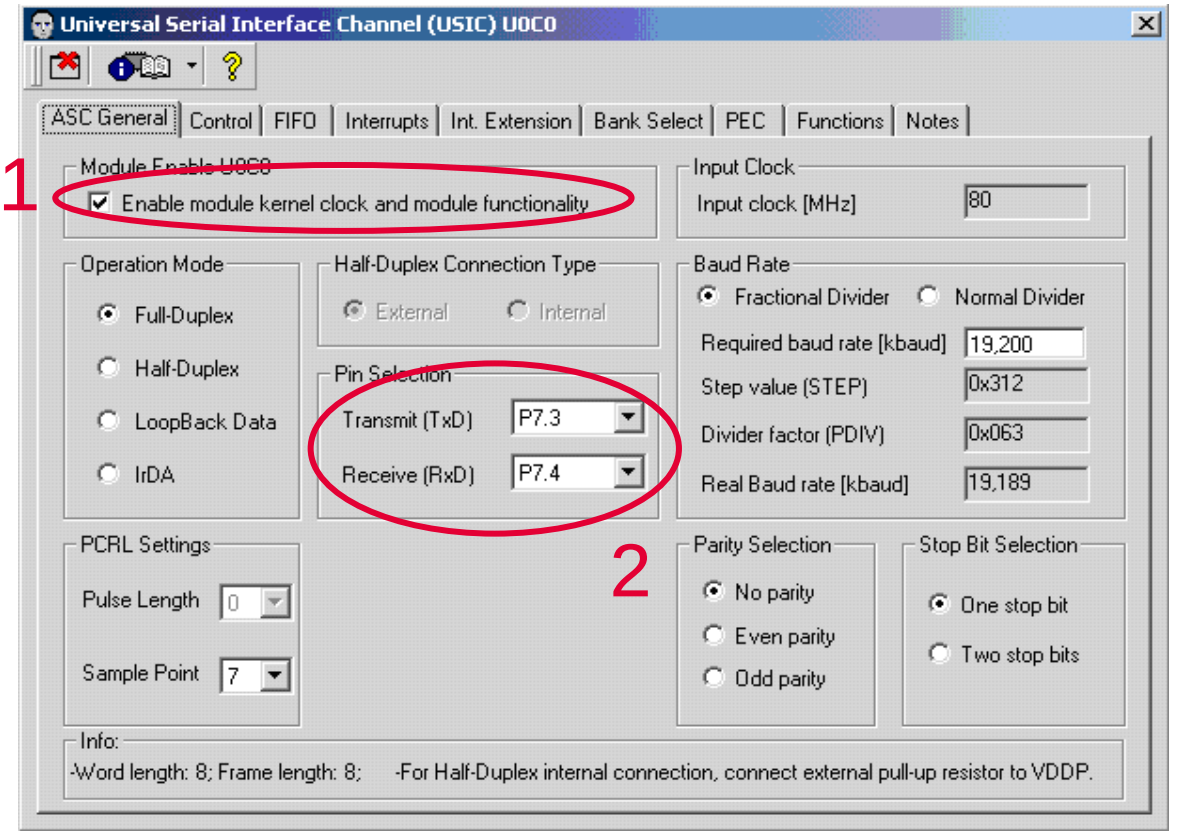
# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **XC2287M**
  - **USIC0, CH0 :**
    - ¬ Click on the 

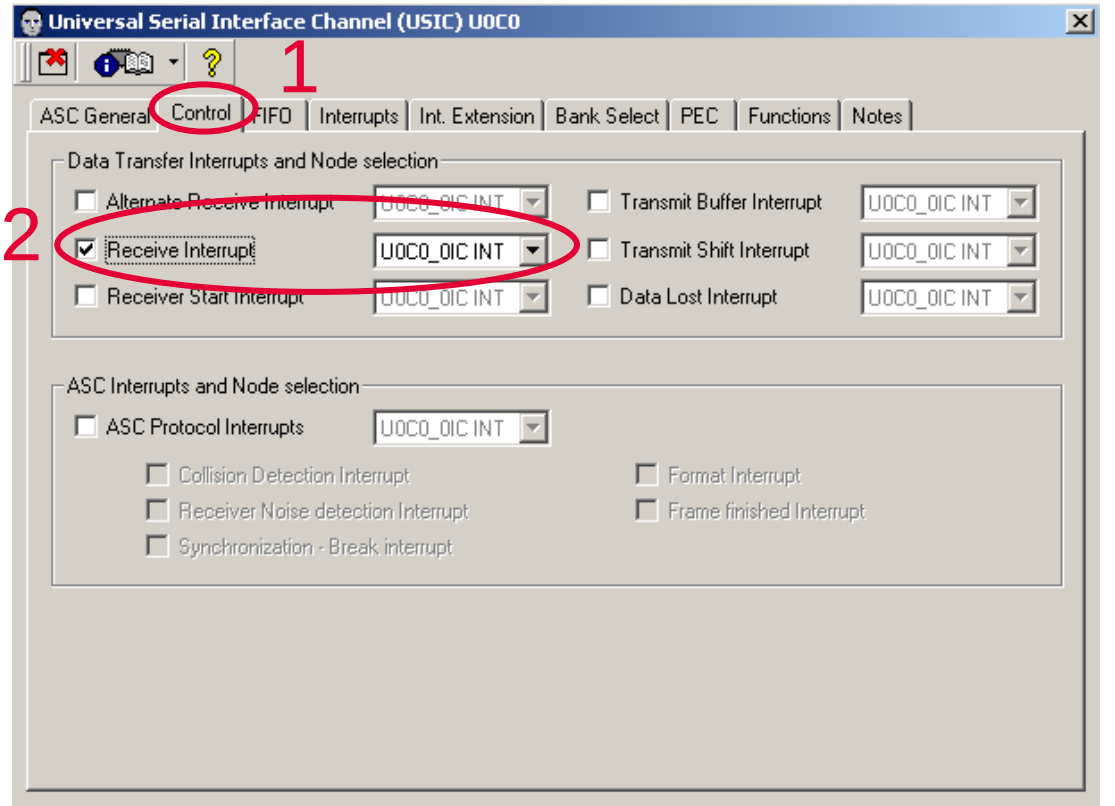
# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **Configure CH0 ASC**
  - **ASC General:**
    - Enable module clock
    - Select P7.3 for TxD and P7.4 for RxD



# HOT Exercise CAN_2 - DAvE Configurations ASC settings

- **Configure CH0 ASC**
  - **Control:**
    - Enable Receive Interrupt

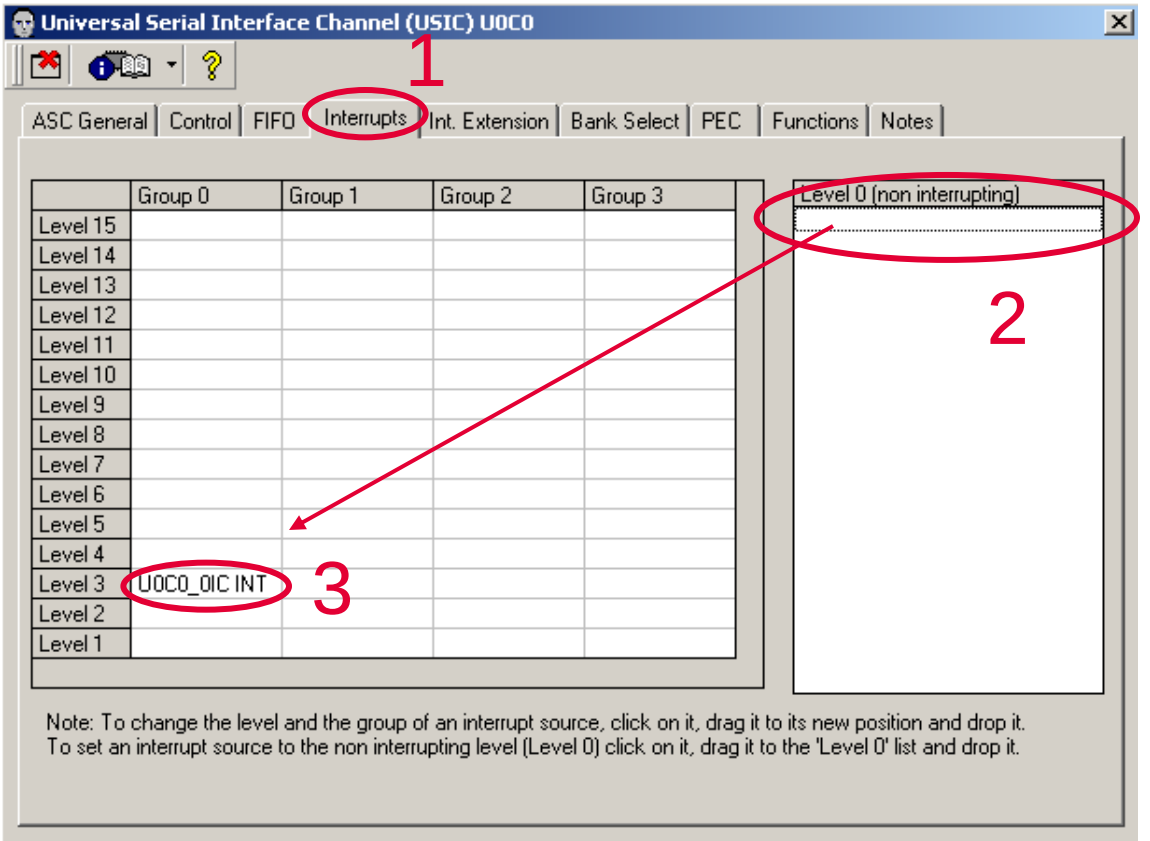


# HOT Exercise CAN_2 - DAvE Configurations ASC settings

## Configure CH0 ASC

### Interrupts:

- Drag ‘U0C0_0IC INT’ and drop it to Interrupt Level 3, Group 0

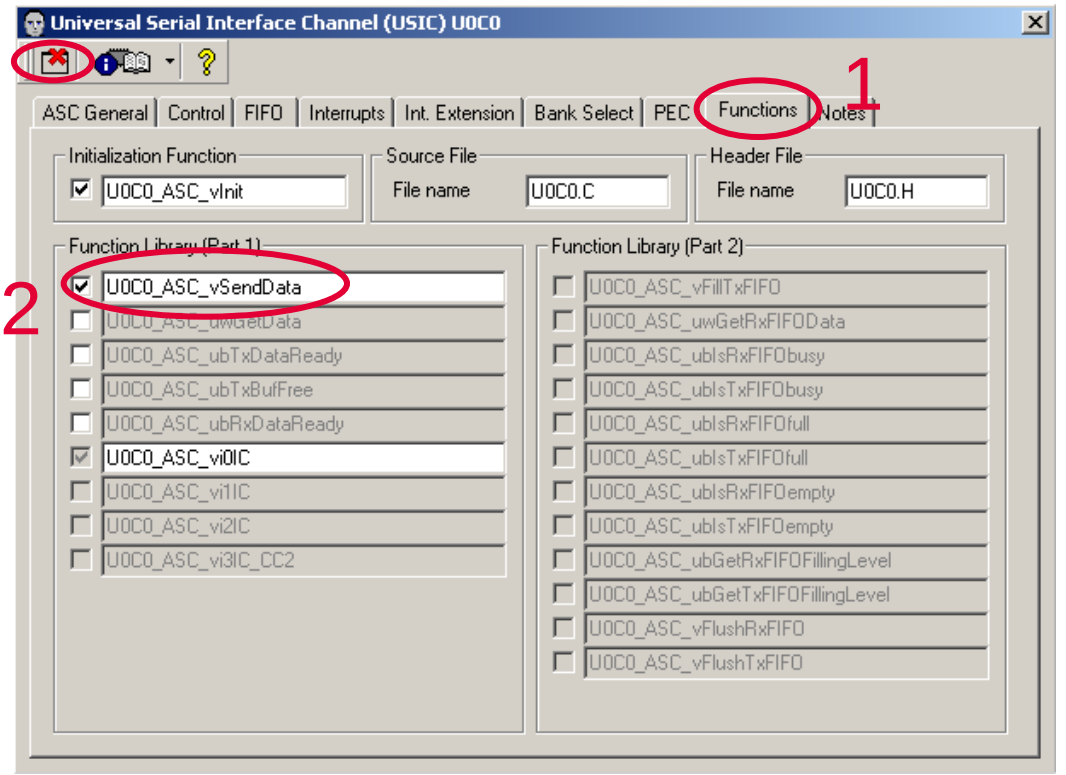


# HOT Exercise CAN_2 - DAvE Configurations ASC settings

## Configure CH0 ASC

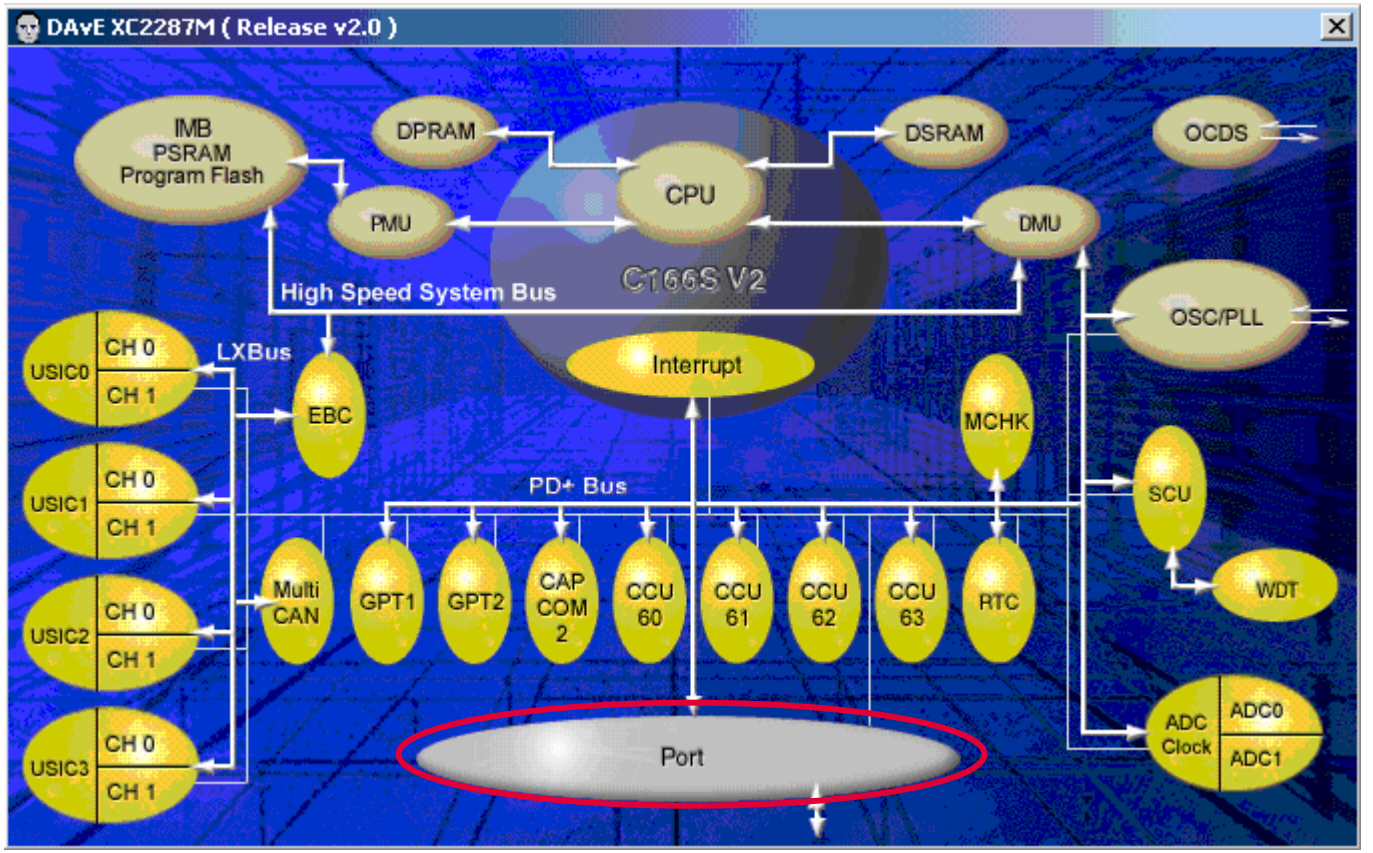
### Functions:

- Include ‘U0C0_ASC_vInit’
- Include ‘U0C0_ASC_vSendData’



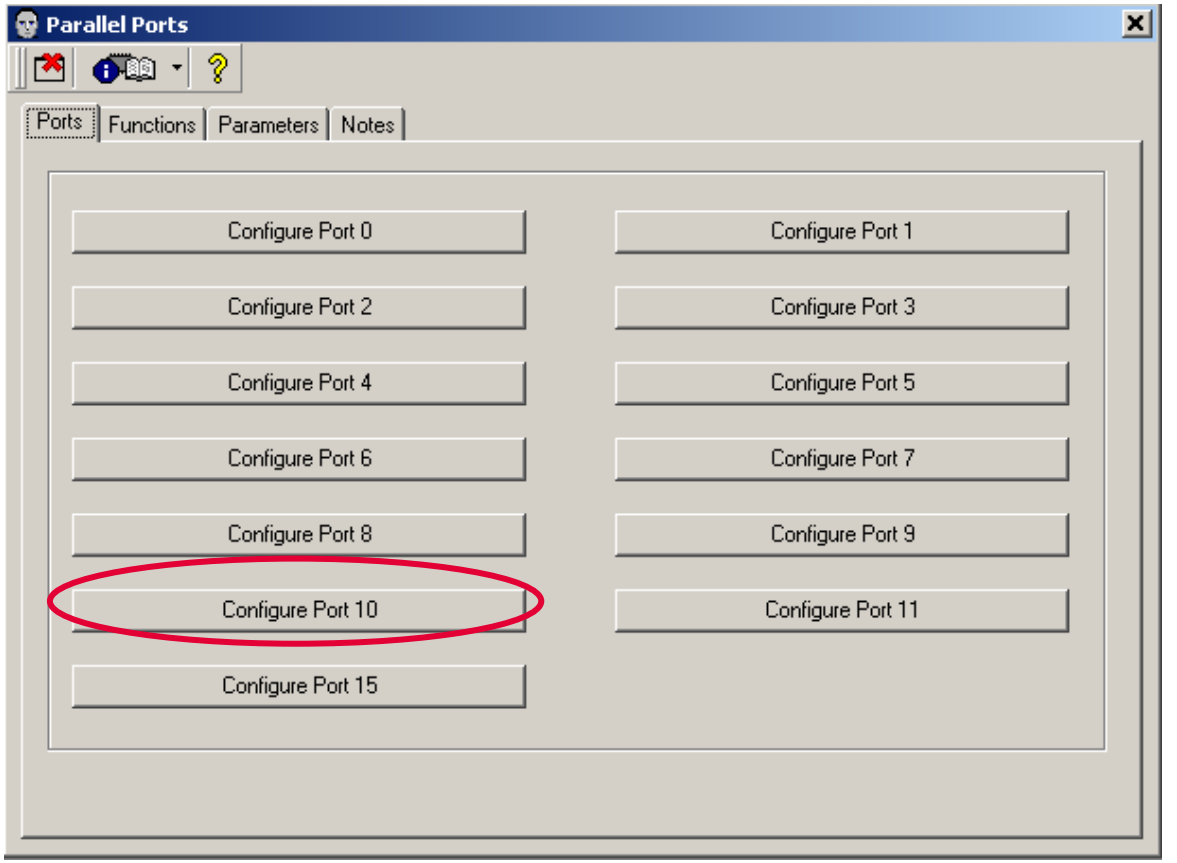
# HOT Exercise CAN_2 - DAvE Configurations Port settings

- **XC2287M**
  - **Port:**
    - Click on the 

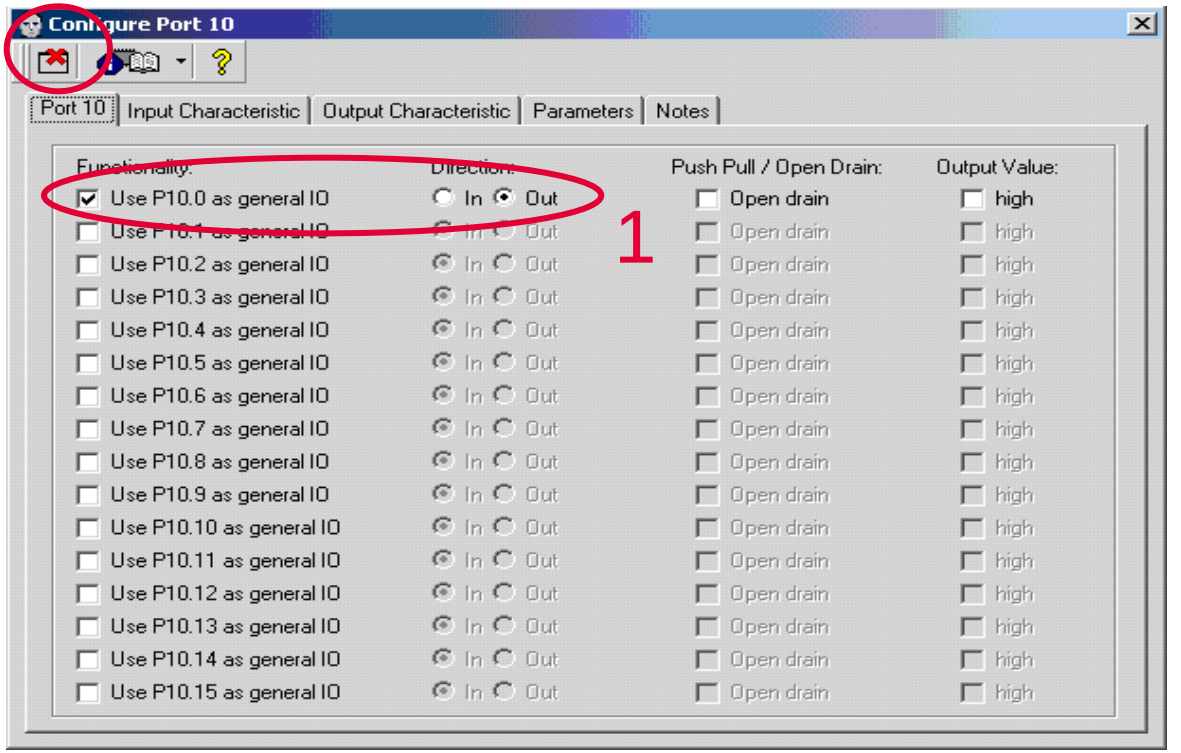
# HOT Exercise CAN_2 - DAvE Configurations Port settings

- **Parallel Ports**
  - **Ports:**
    - Configure Port 10



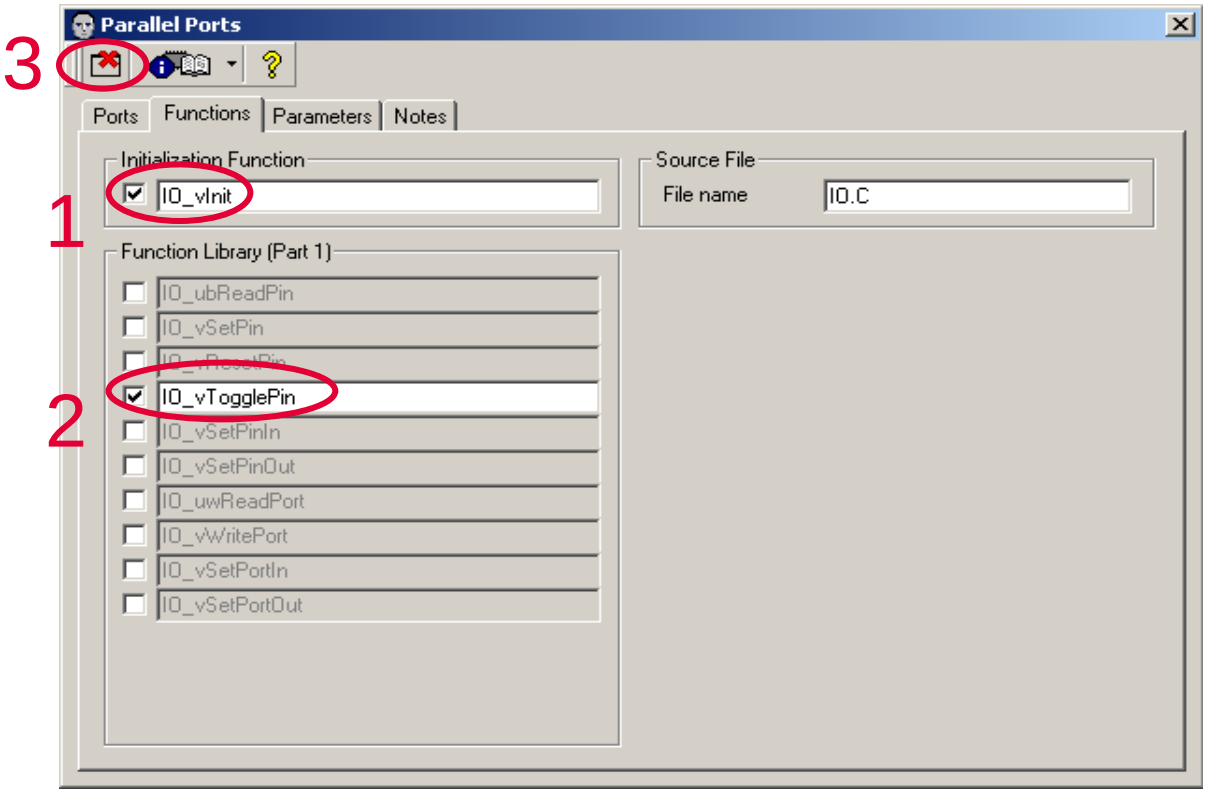
# HOT Exercise CAN_2 - DAvE Configurations Port settings

- **Configure Port 10**
  - **Port 10:**
    - Use P10.0 as general IO
    - Set Direction to Out
    - Close the window



# HOT Exercise CAN_2 - DAvE Configurations Port settings

- **Parallel Ports**
  - **Functions:**
    - Include ‘IO_vInit’
    - Include ‘IO_vTogglePin’

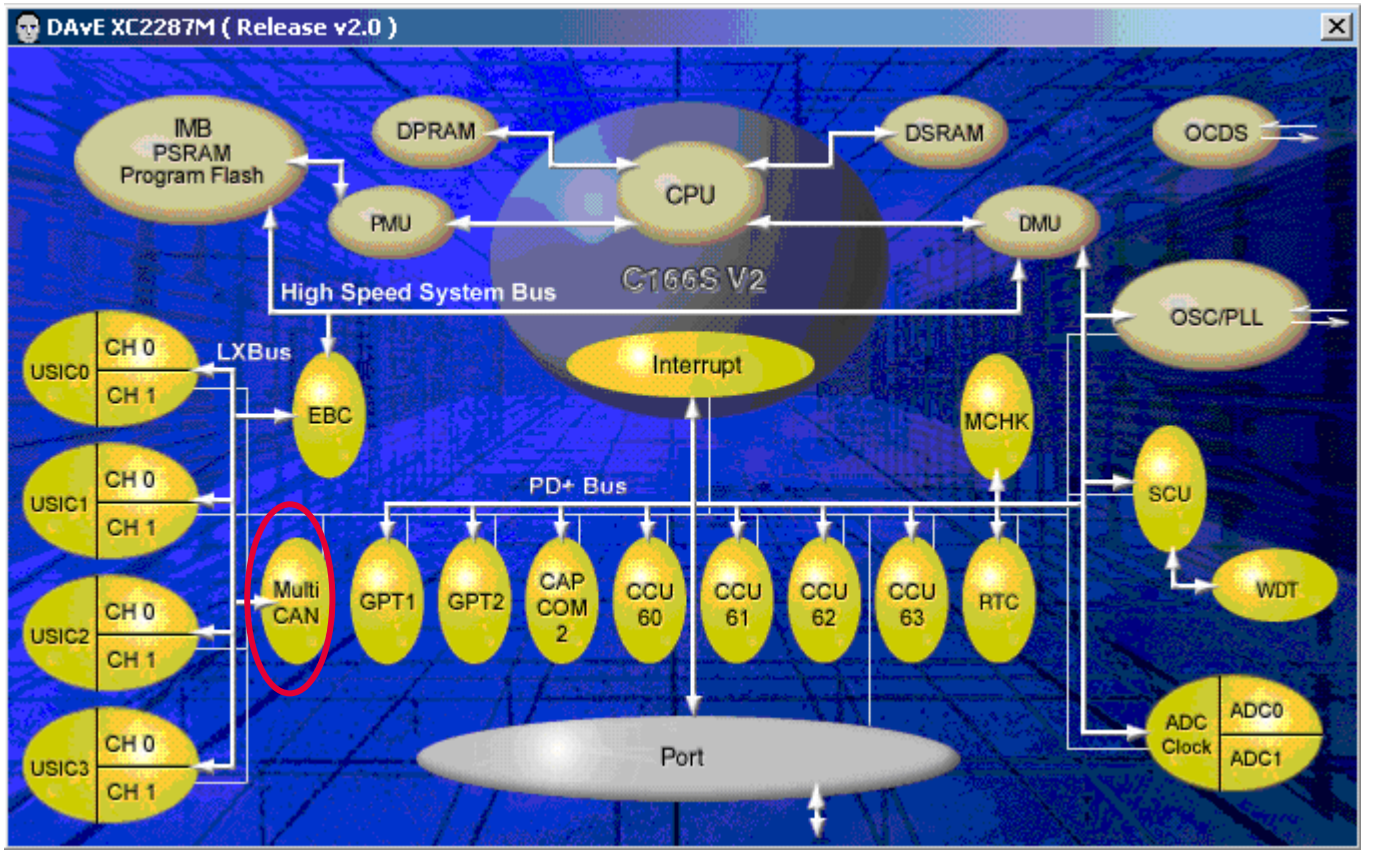


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **CAN Settings**
  - Baud Rate = 500 kBaud
  - Message Object 2 : CAN node 0, transmit, 1 byte, 11-bit ID = 0x11
  - Message Object 5 : CAN node 1, receive, 1 byte, 11-bit ID = 0x11
    RX-interrupt, level 5
  - CAN 0: RX: P2.6, TX P2.5
  - CAN 1; RX: P2.4, TX P2.2

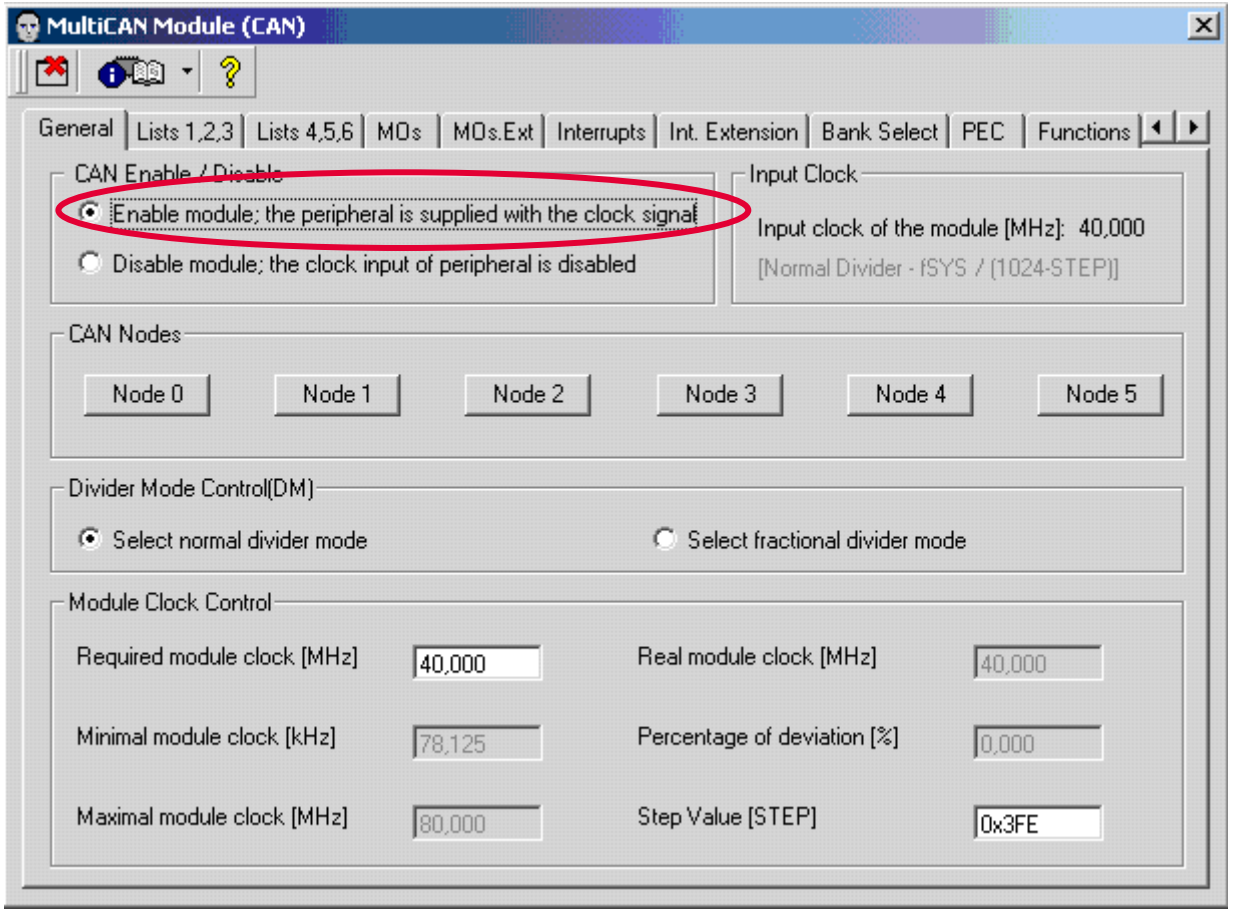
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **XC2287M**
  - **MultiCAN :**
    - Click on the 

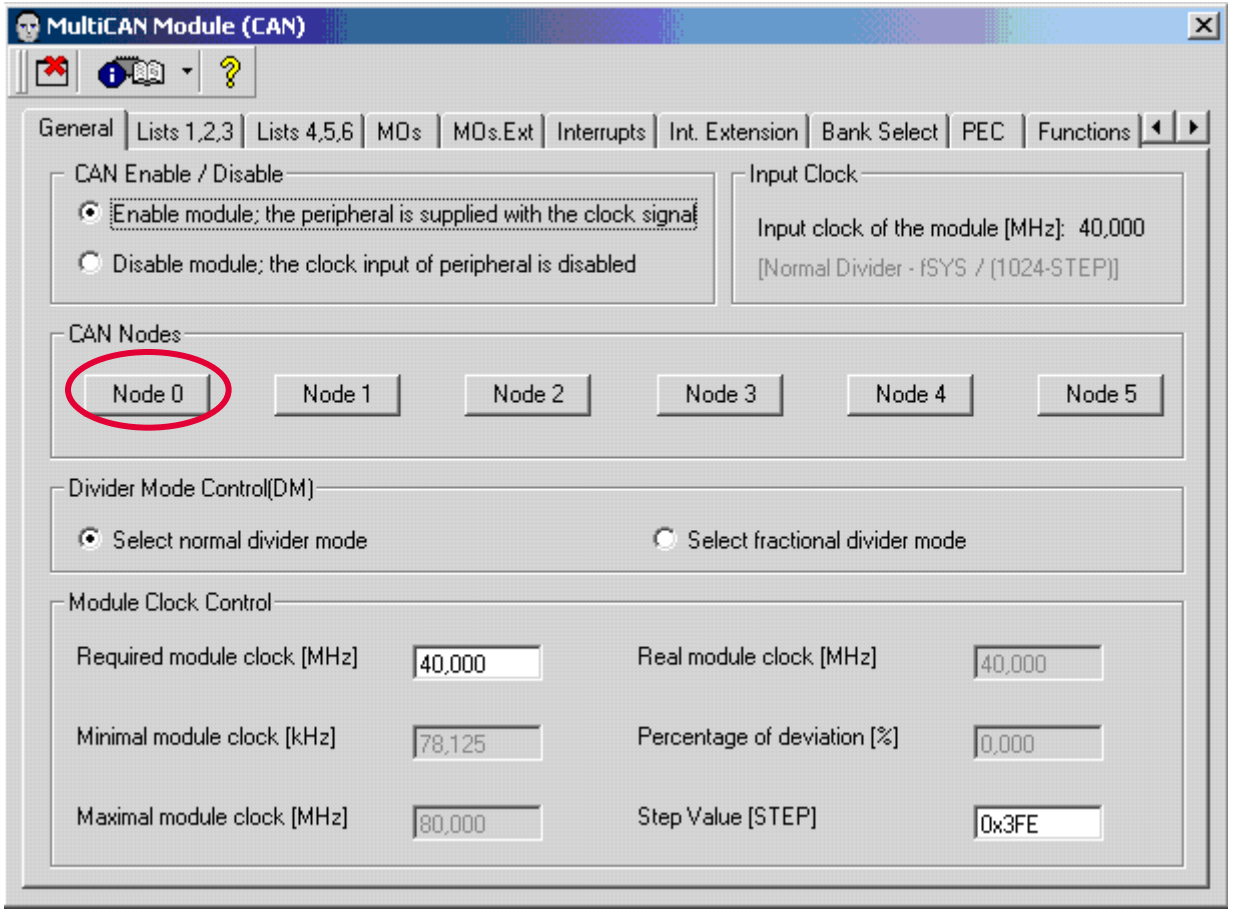
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure MultiCAN**
  - **General:**
    - Enable module



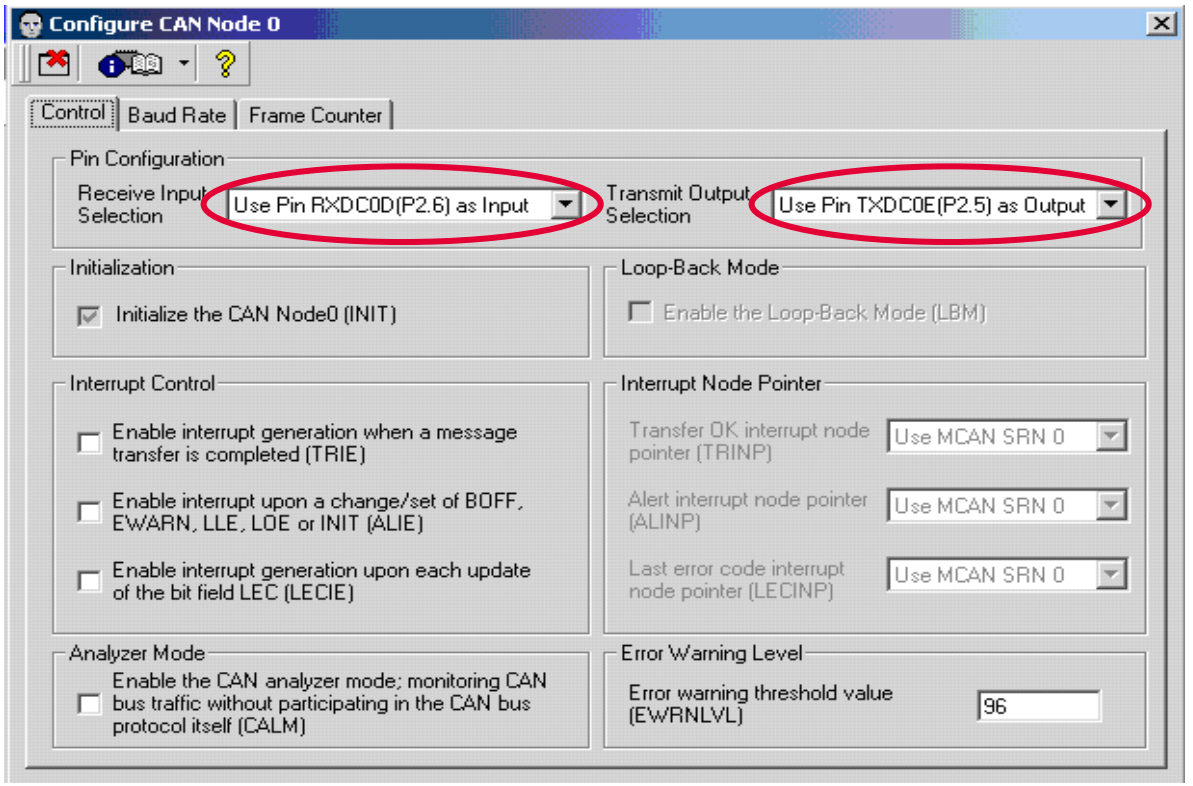
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure MultiCAN**
  - **General:**
    - Select Node 0



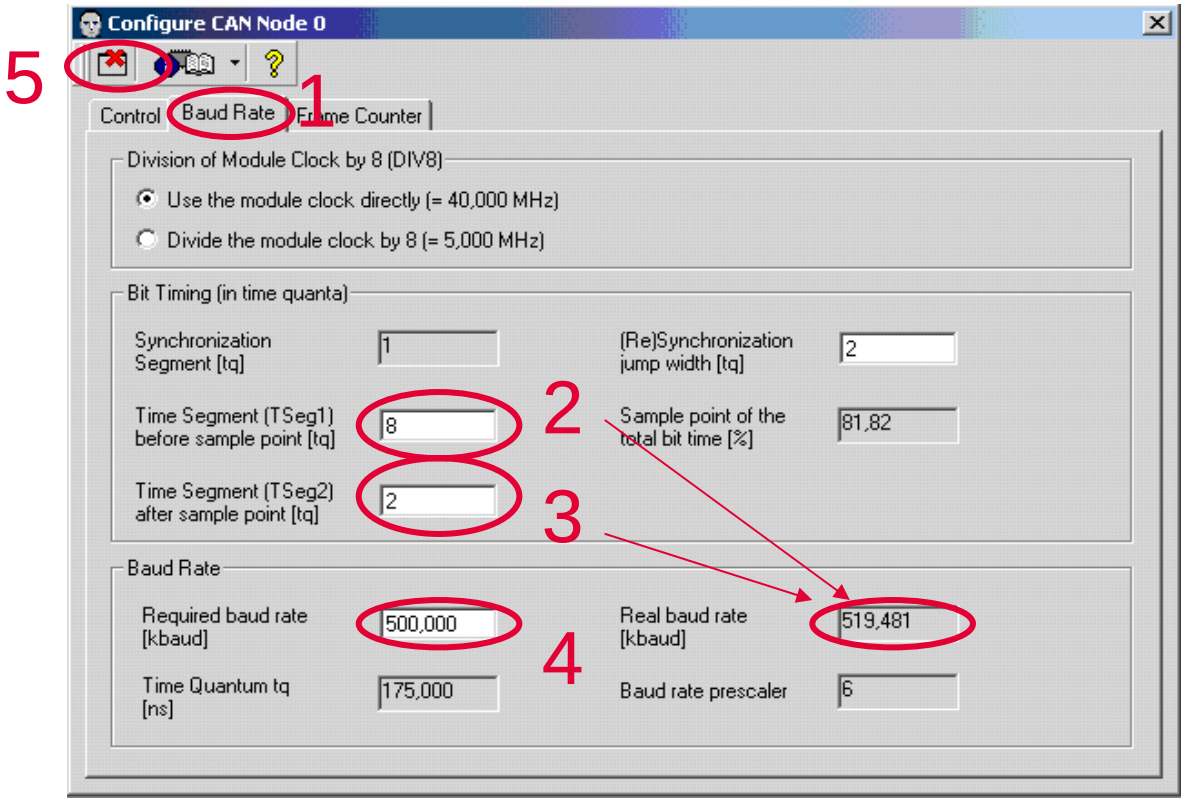
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure CAN Node 0**
  - **General:**
    - Select P2.6 for Receive Input and P2.5 for Transmit Output
    - Initialize the CAN node 0 automatically



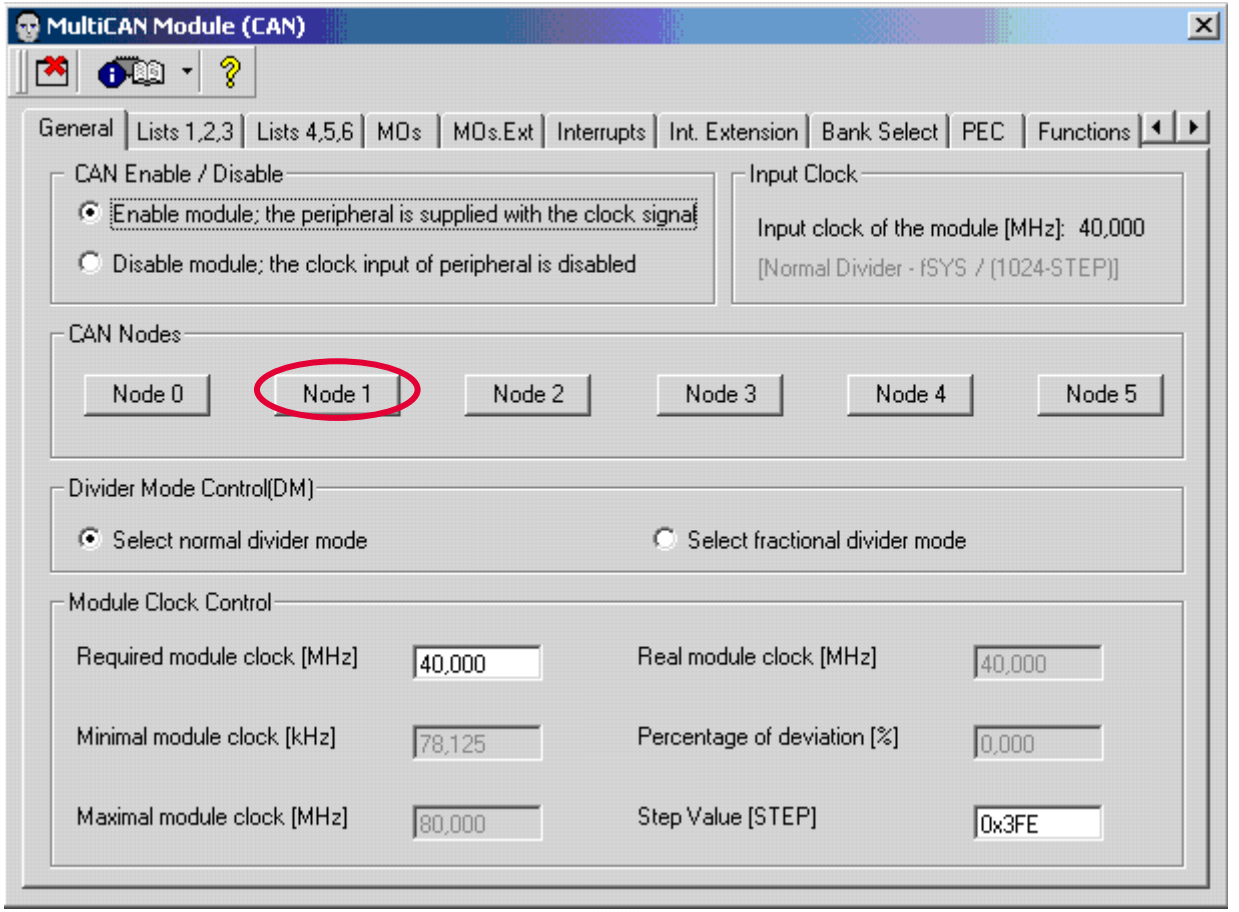
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure CAN Node 0**
  - **Baud Rate:**
    - Required baud rate : 500 Kbaud
    - Modify TSeg1/TSeg2 to get Real baud rate at 500 Kbaud



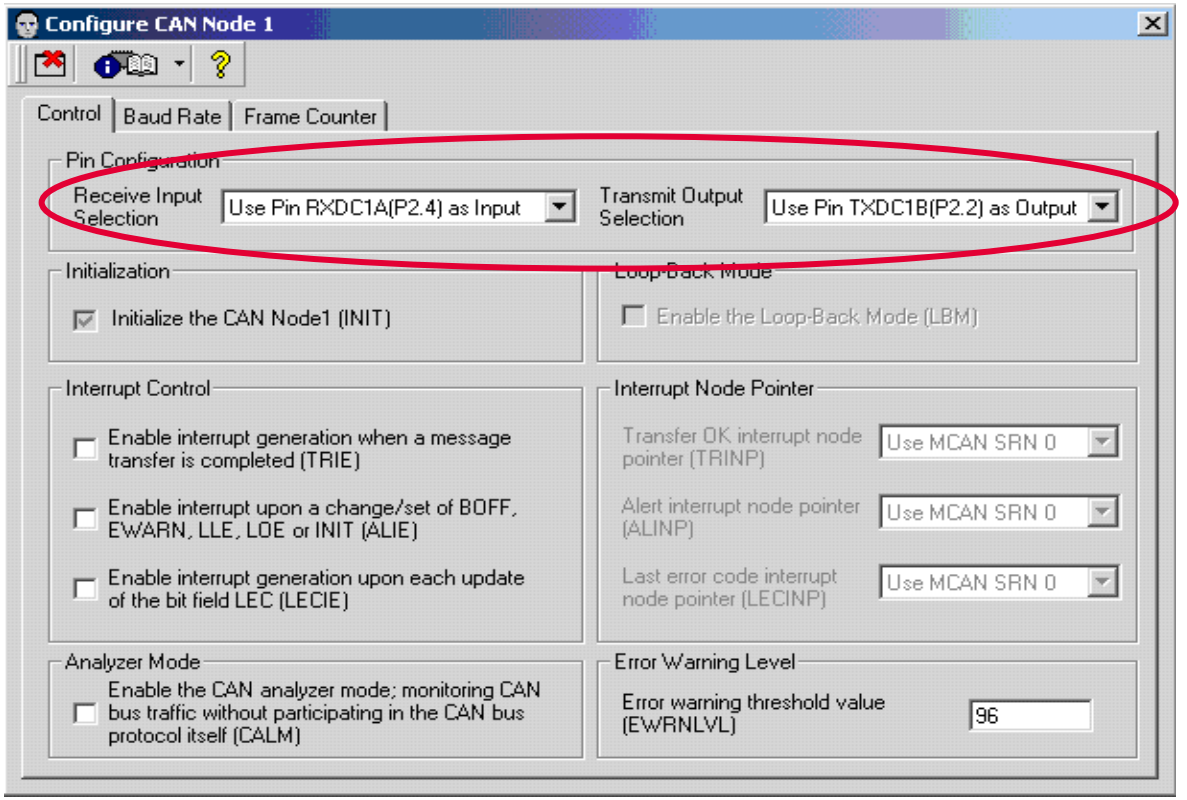
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure MultiCAN**
  - **General:**
    - Select Node 1



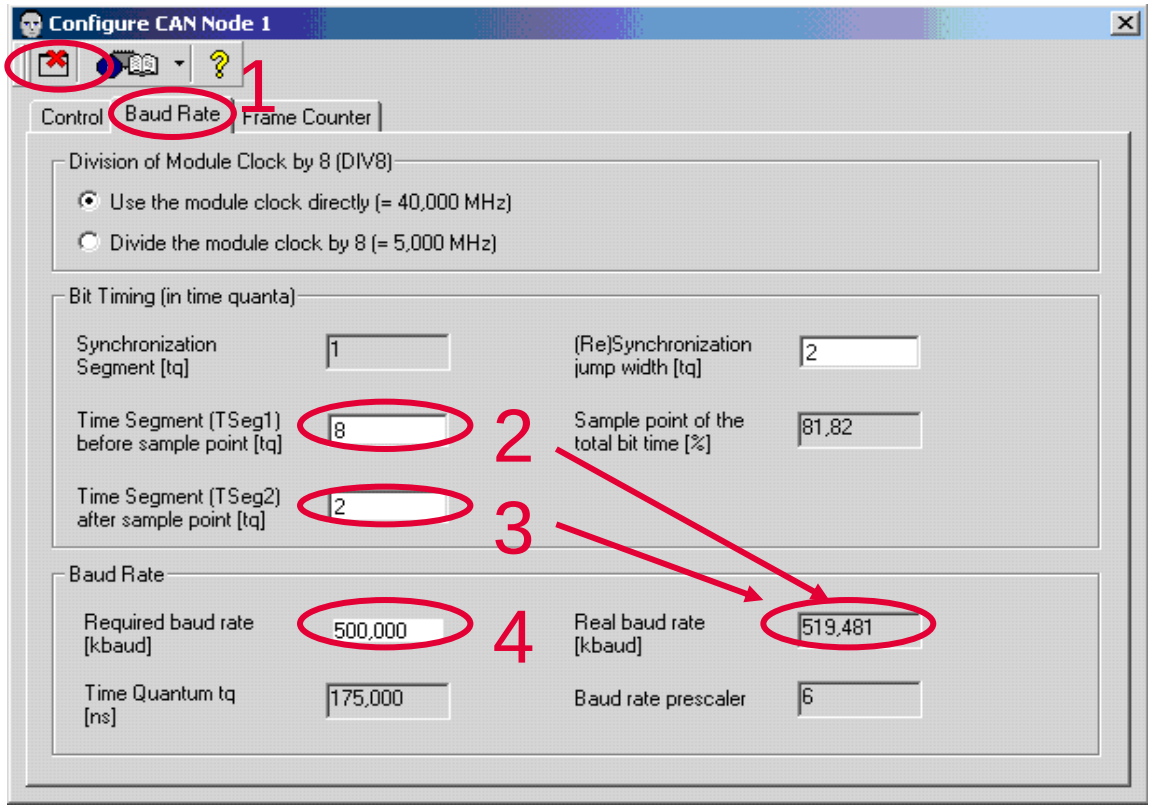
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure CAN Node 1**
  - **General:**
    - Select P2.4 for Receive Input and P2.2 for Transmit Output
    - Initialize the CAN node 1 automatically



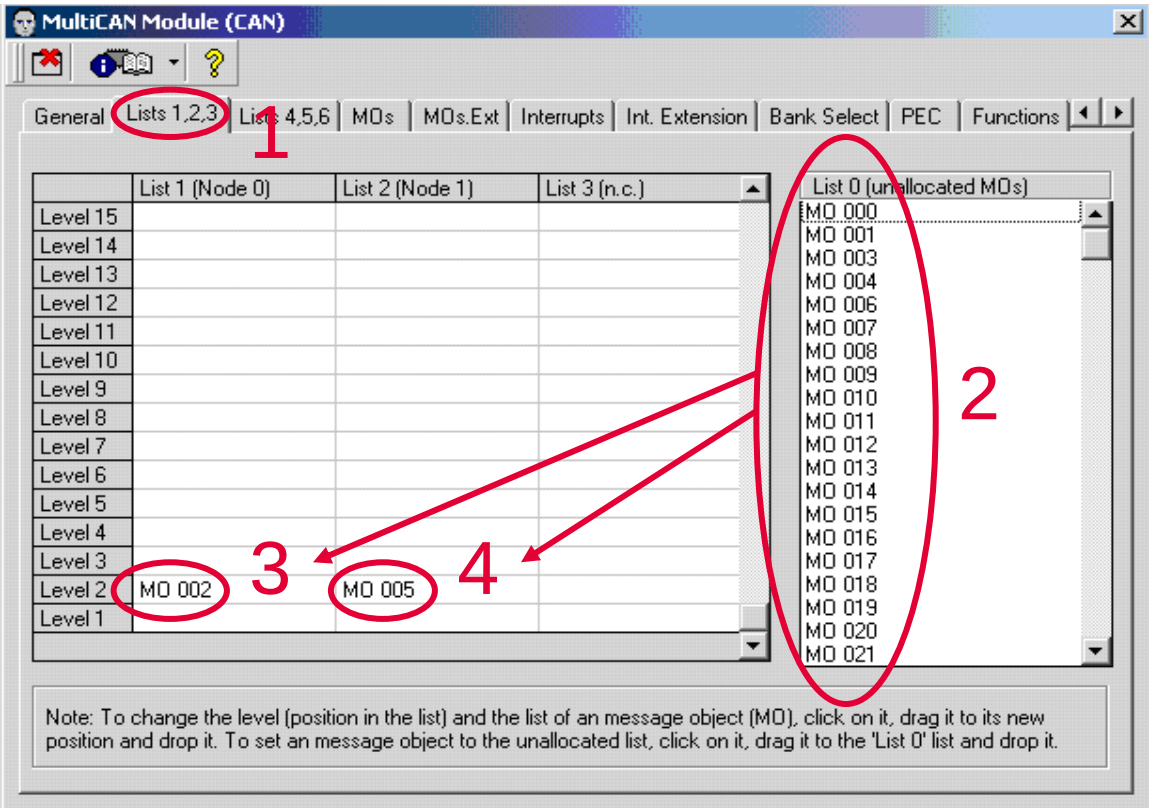
# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure CAN Node 1**
  - **Baud Rate:**
    - Required baud rate : 500 Kbaud
    - Modify TSeg1/TSeg2 to get Real baud rate at 500 Kbaud



# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure MultiCAN**
  - **List1, 2:**
    - Drag ‘M02’ and drop it to List 1 (Node 0)
    - Drag ‘M05’ and drop it to List 2 (Node 1)

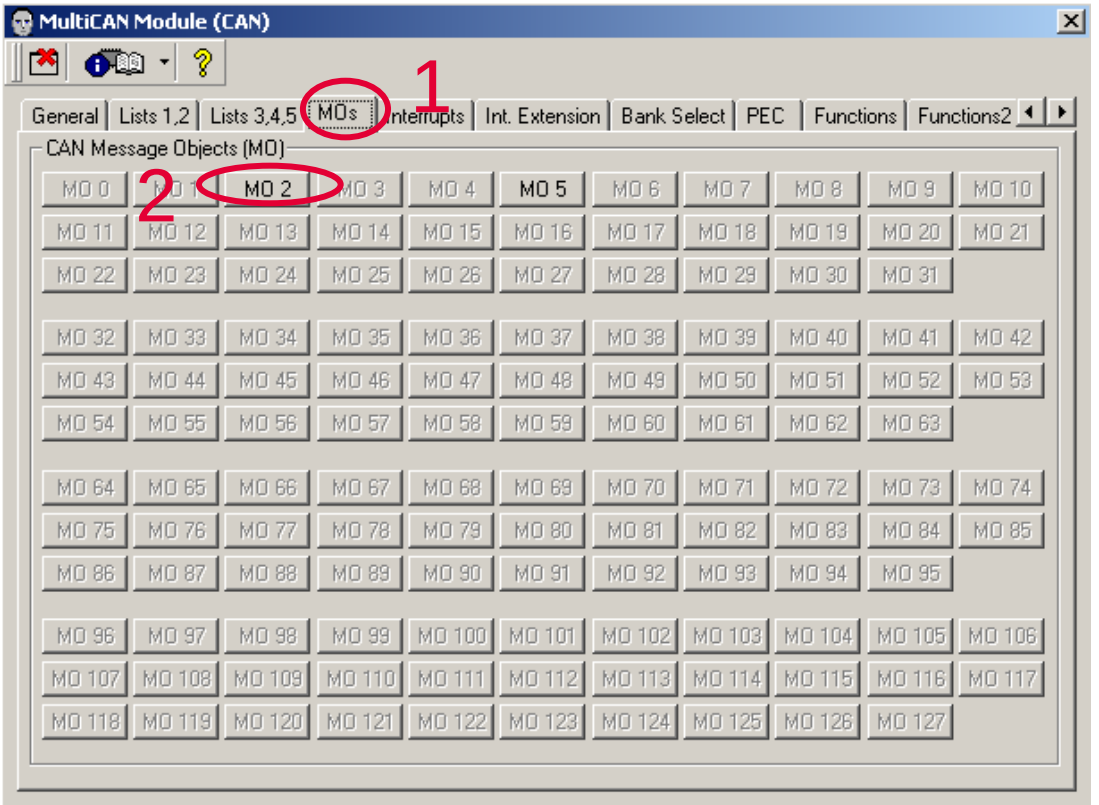


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure MultiCAN

### MOs:

- Select M02

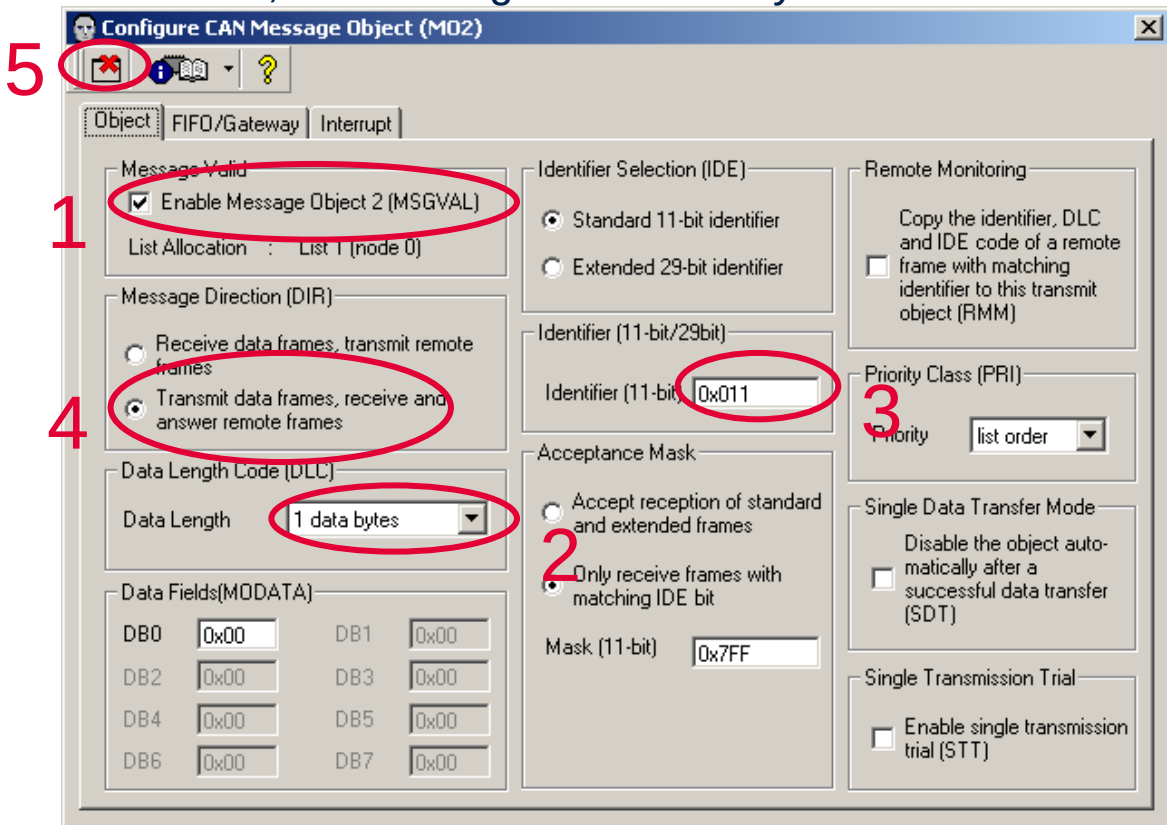


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure CAN Message Object (M02)

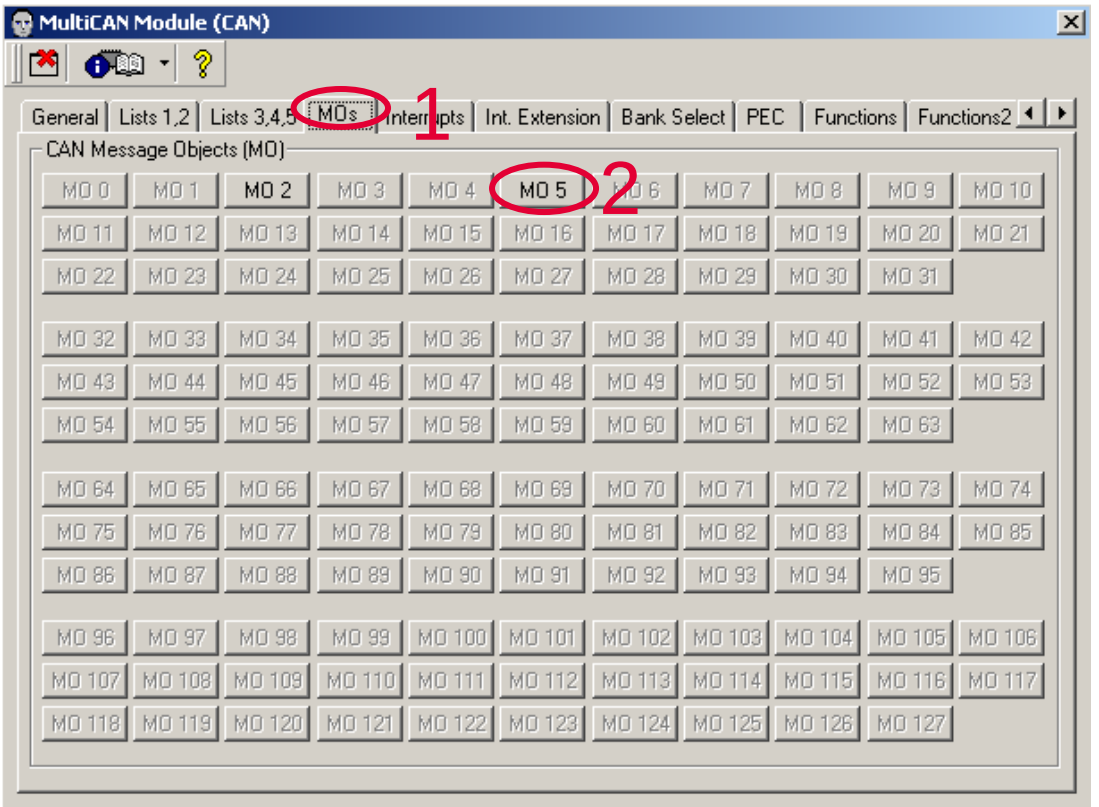
### Object:

- Enable MO2, Select Transmit data frames
- Identifier: 0x011, Data Length: 1 data bytes



# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

- **Configure MultiCAN**
  - **MOs:**
    - Select MO5

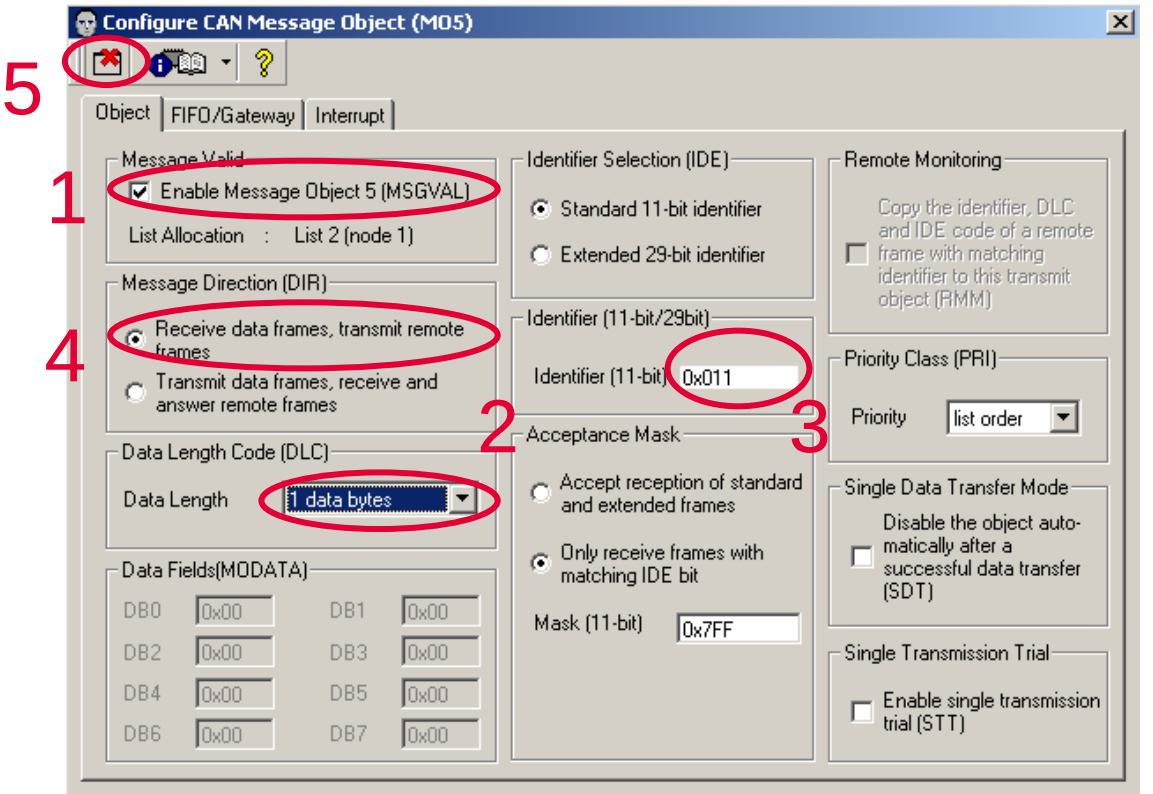


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure CAN Message Object (M05)

### Object:

- Enable MO5, Select Receive data frames
- Identifier: 0x011, Data Length: 1 data bytes

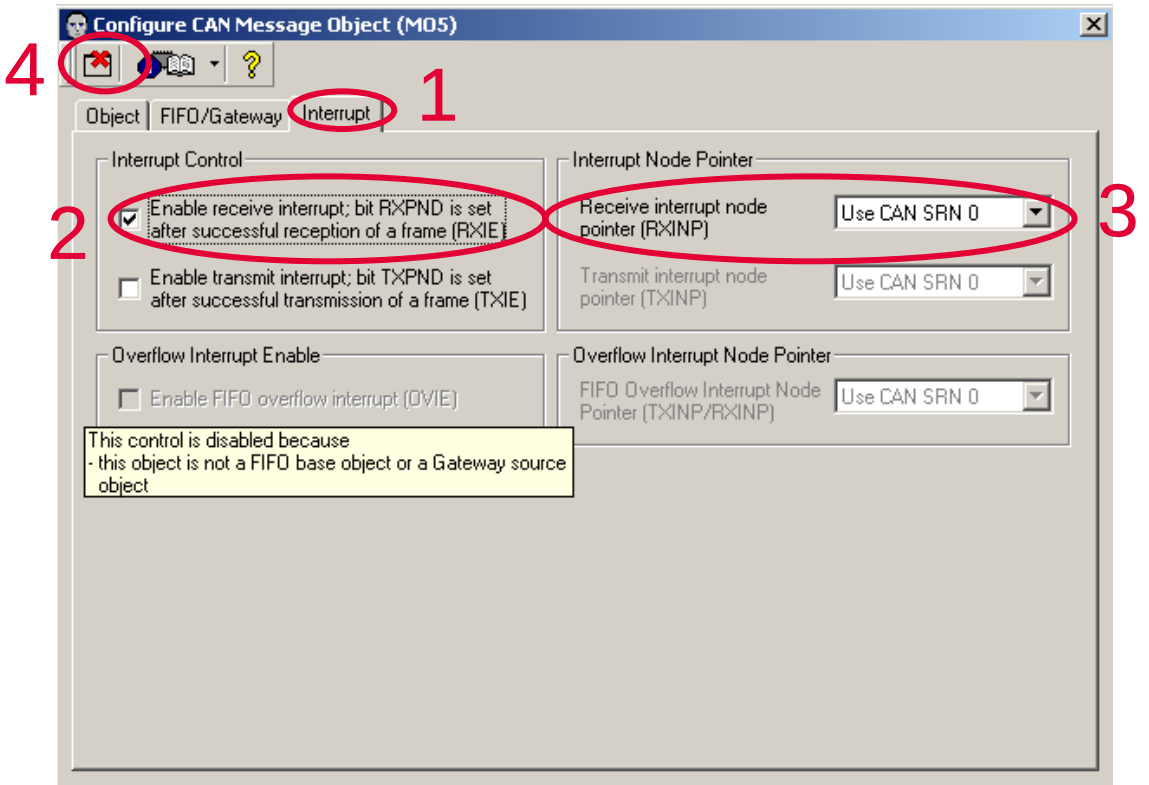


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure CAN Message Object (M05)

### Interrupt:

- Enable receive interrupt
- Use CAN SRN 0

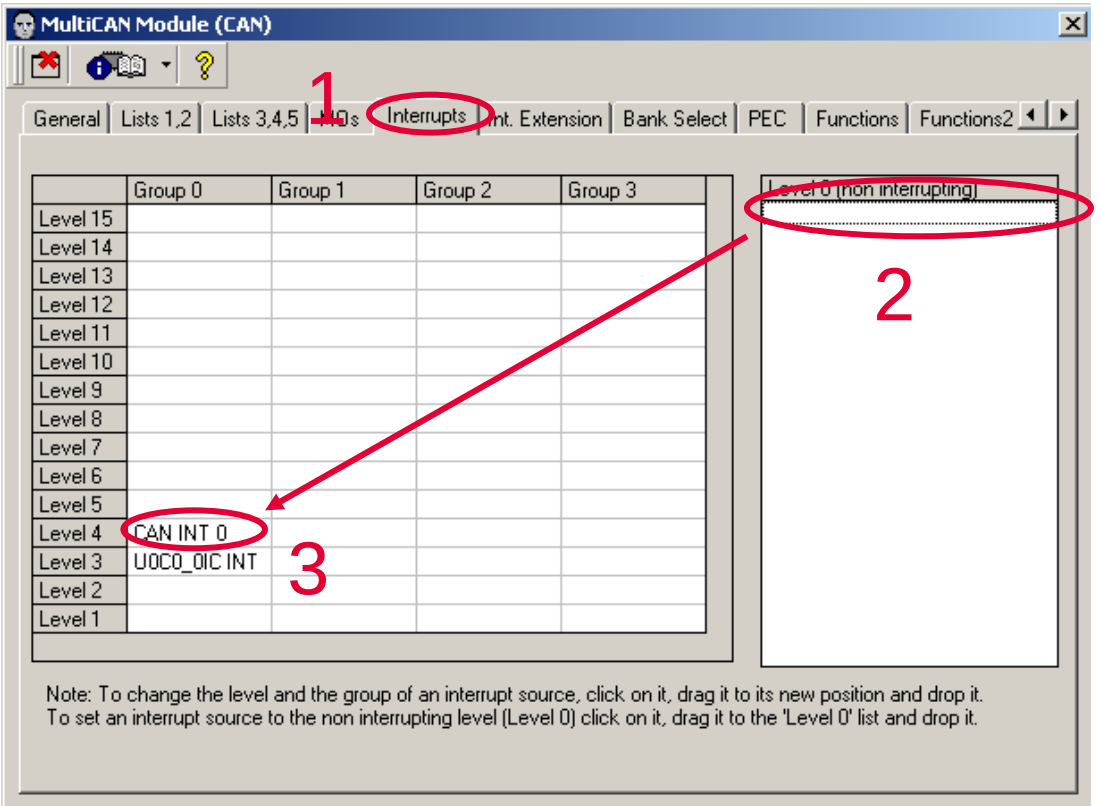


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure MultiCAN

### Interrupts :

- Drag ‘CAN INT 0’ and drop it to Interrupt Level 4, Group 0

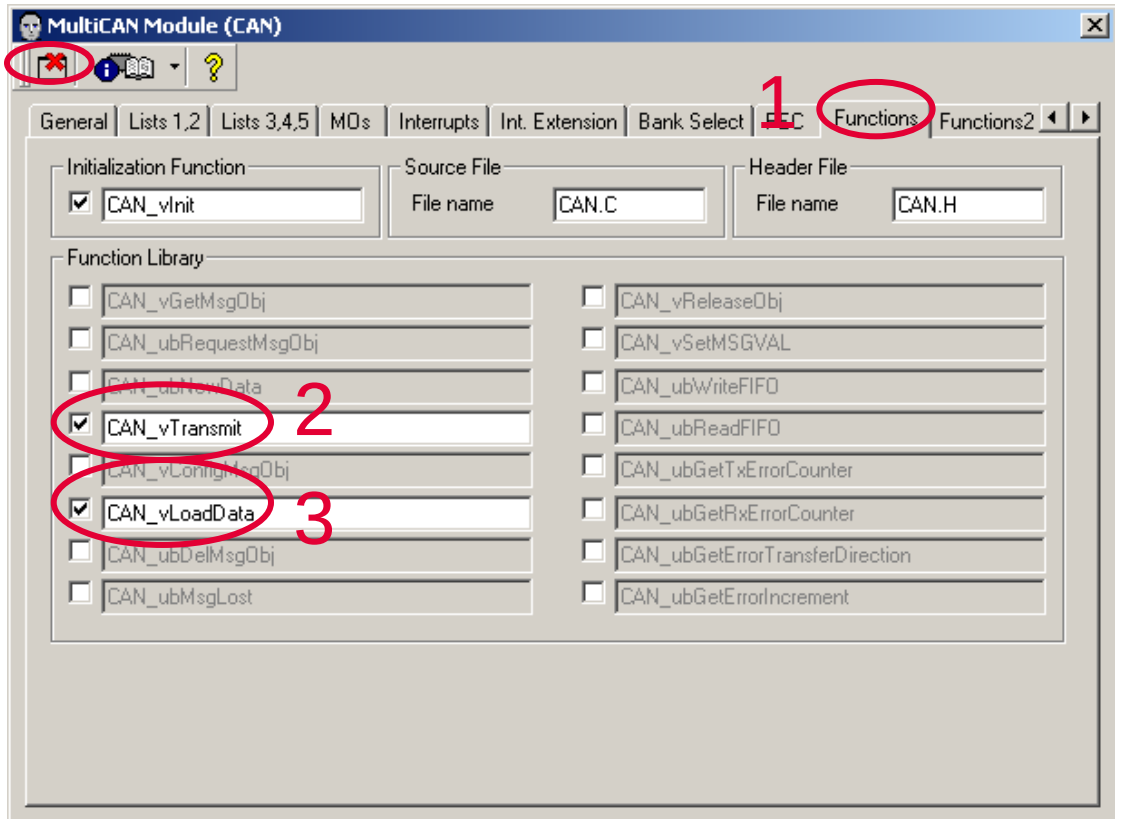


# HOT Exercise CAN_2 - DAvE Configurations MultiCAN settings

## Configure MultiCAN

### Functions:

- Include ‘CAN_vInit’
- Include ‘CAN_vTransmit’ and ‘CAN_vLoadData’

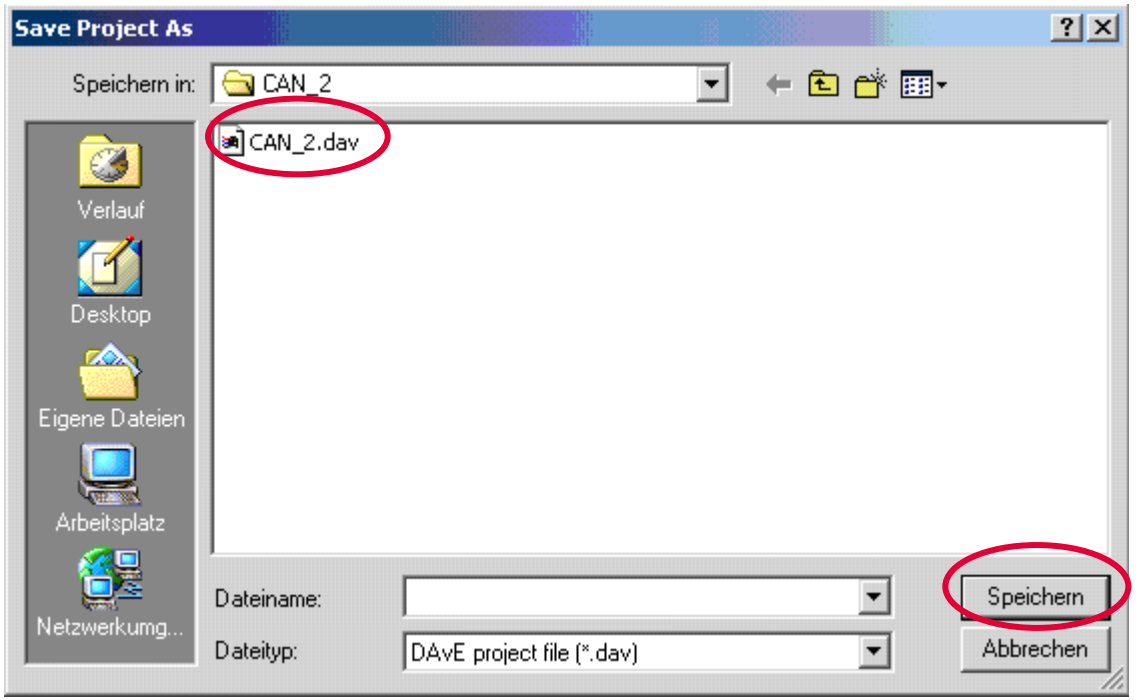


# HOT Exercise CAN_2 - DAvE Configurations
# Save DAvE Project

- Save your DAvE Project File
  - Go to **File → Save (or Save As)** or click on 
  - Filename entered previously:

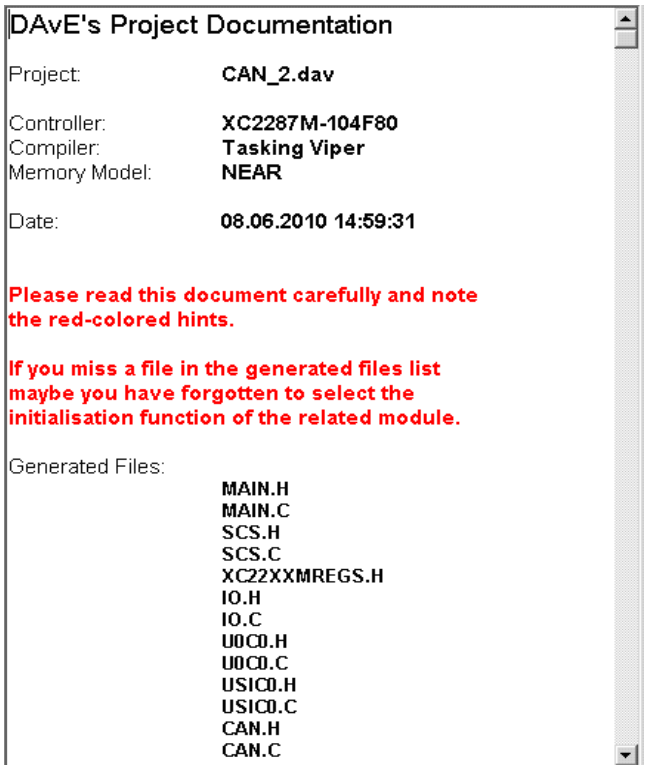
    1

    **“c:\IFX_HOT\XC2287M\Examples\CAN_2\CAN_2.dav”**



# HOT Exercise CAN_2 - DAvE Configurations Code Generation

- Let DAvE Generate Code for You
  - Go to **File → generate Code** or click on 
  - DAvE generated code files are
    1. ¬ ‘CAN.c’, ‘CAN.h’
    - ¬ ‘U0C0.c’, ‘U0C0.h’
    - ¬ ‘IO.c’, ‘IO.h’
    - ¬ ‘USIC0.c’, ‘USIC0.h’
    - ¬ ‘MAIN.c’, ‘MAIN.h’
    - ¬ ‘SCS.c’, ‘SCS.h’
    - ¬ ‘XC22xxREGS.h’

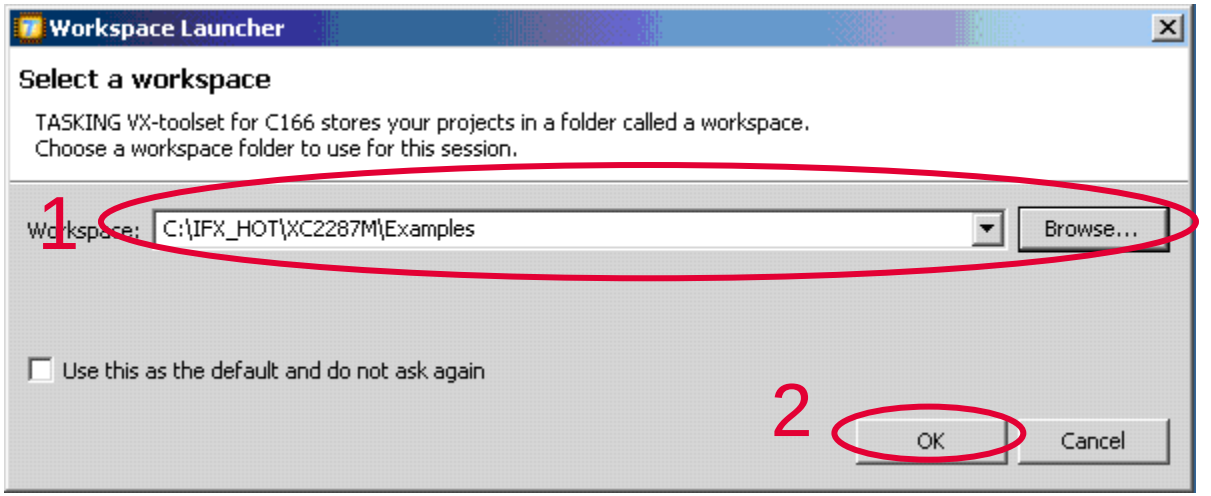



  - In general:
    - ¬ if the included function is a macro it is included in the ‘.h’ file
    - ¬ if the included function is a function it is included in the ‘.c’ file

# HOT Exercise CAN_2 – Tasking VX Toolset

- Open Project Work Space
  - Click on 

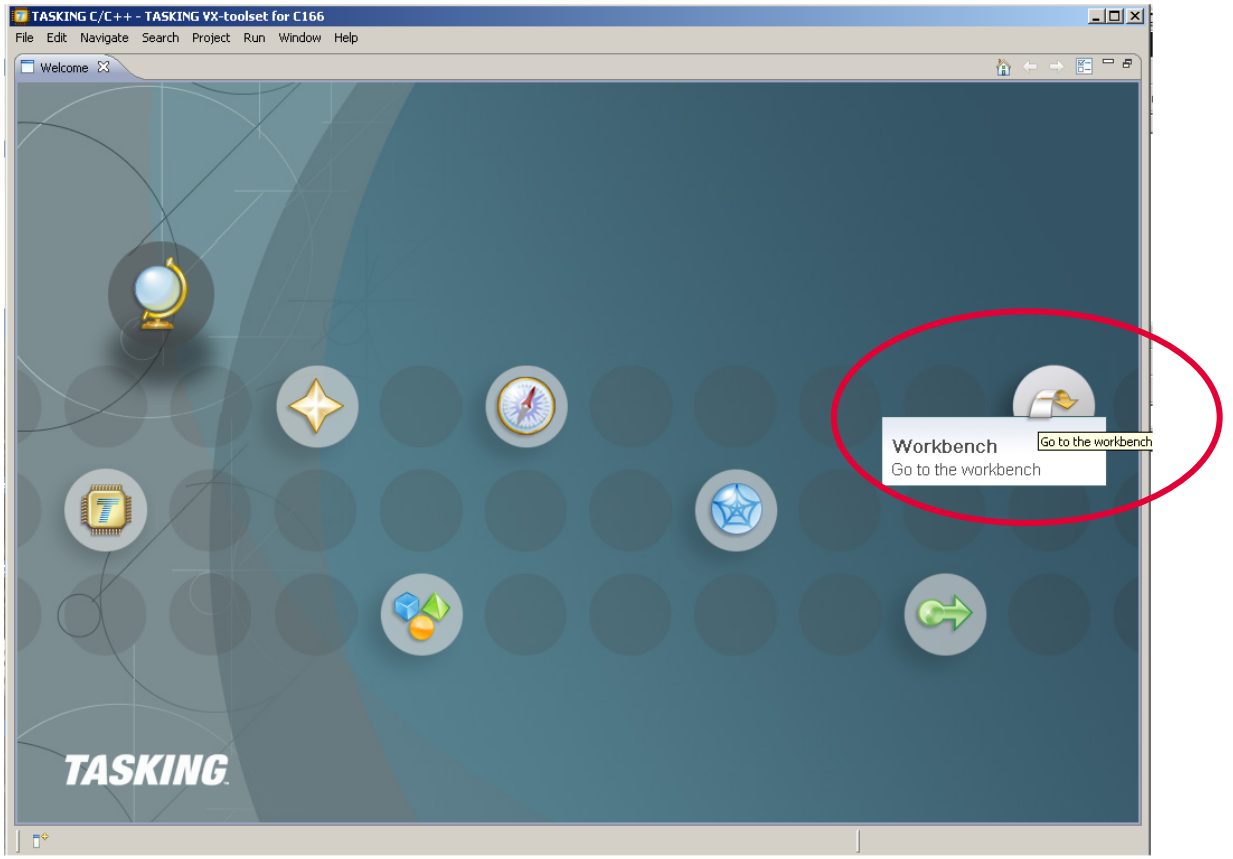
  - Filename: browse to **“c:\IFX_HOT\XC2287M\Examples”**
  - Click ‘OK’



# HOT Exercise CAN_2 – Tasking VX Toolset

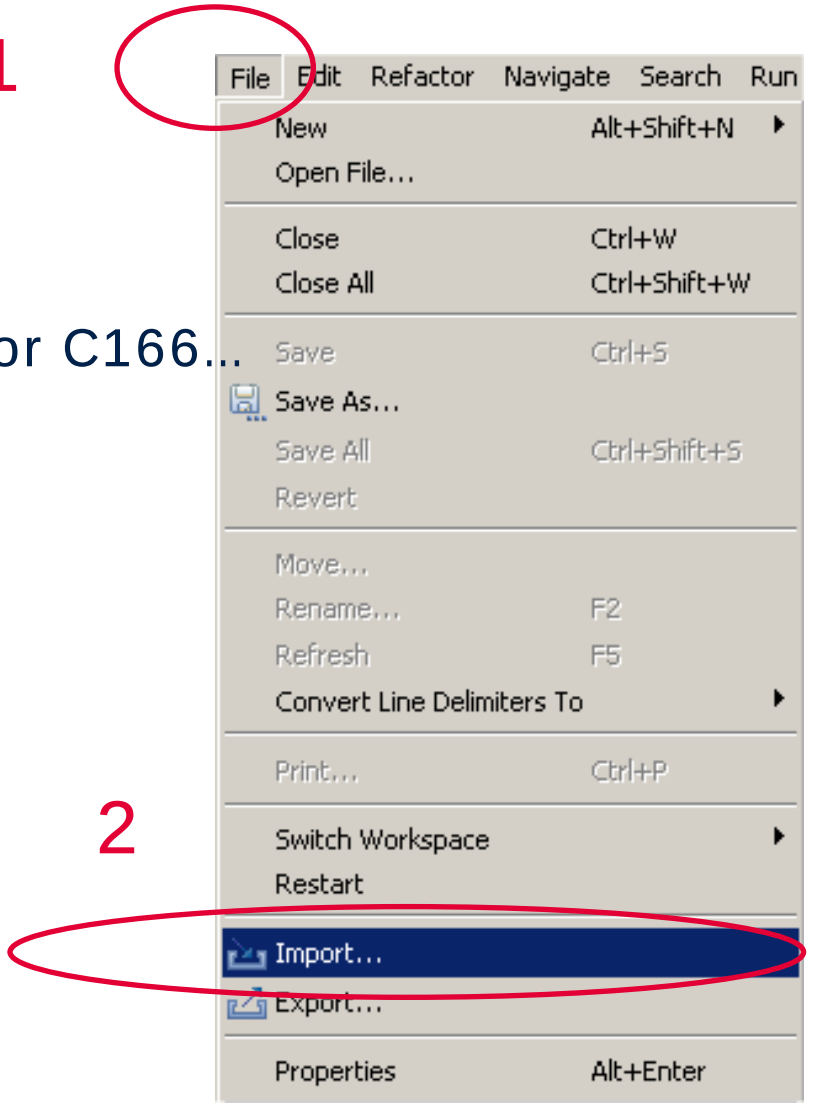
- Create New Project
  - Click on Workbench (if not already there…)

1



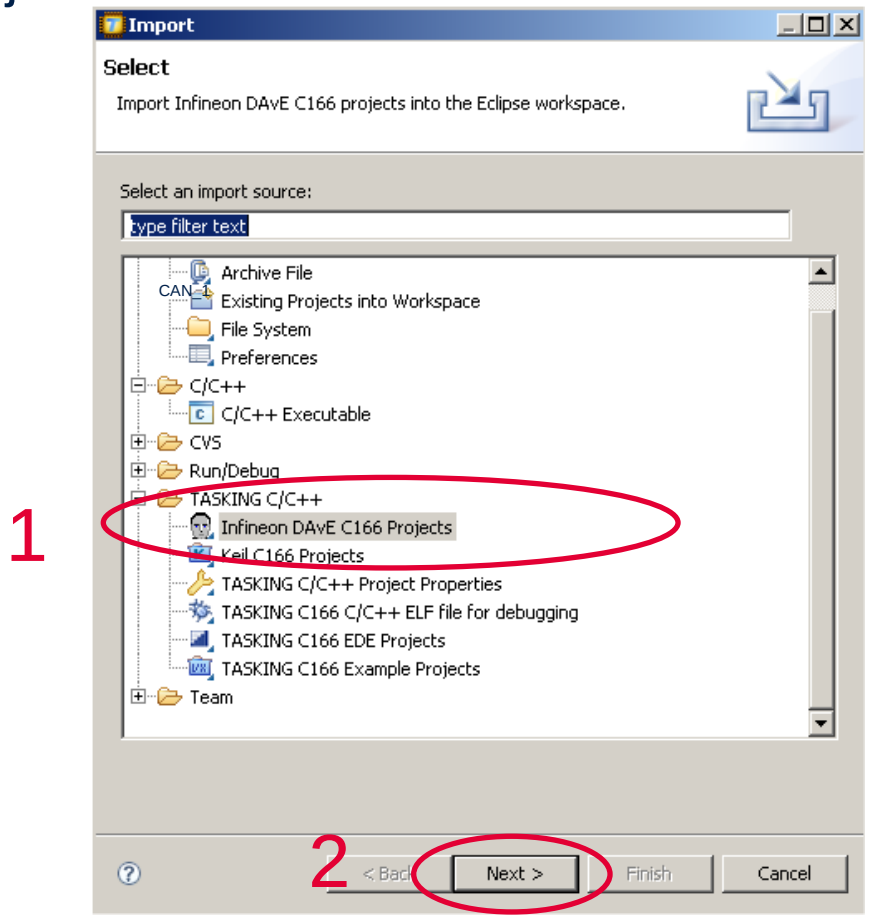
# HOT Exercise CAN_2 – Tasking VX Toolset

- Import DAVE Project
  - Click on File -> Import
  - Select Tasking VX-toolset for C166...
  - Click ‘OK’



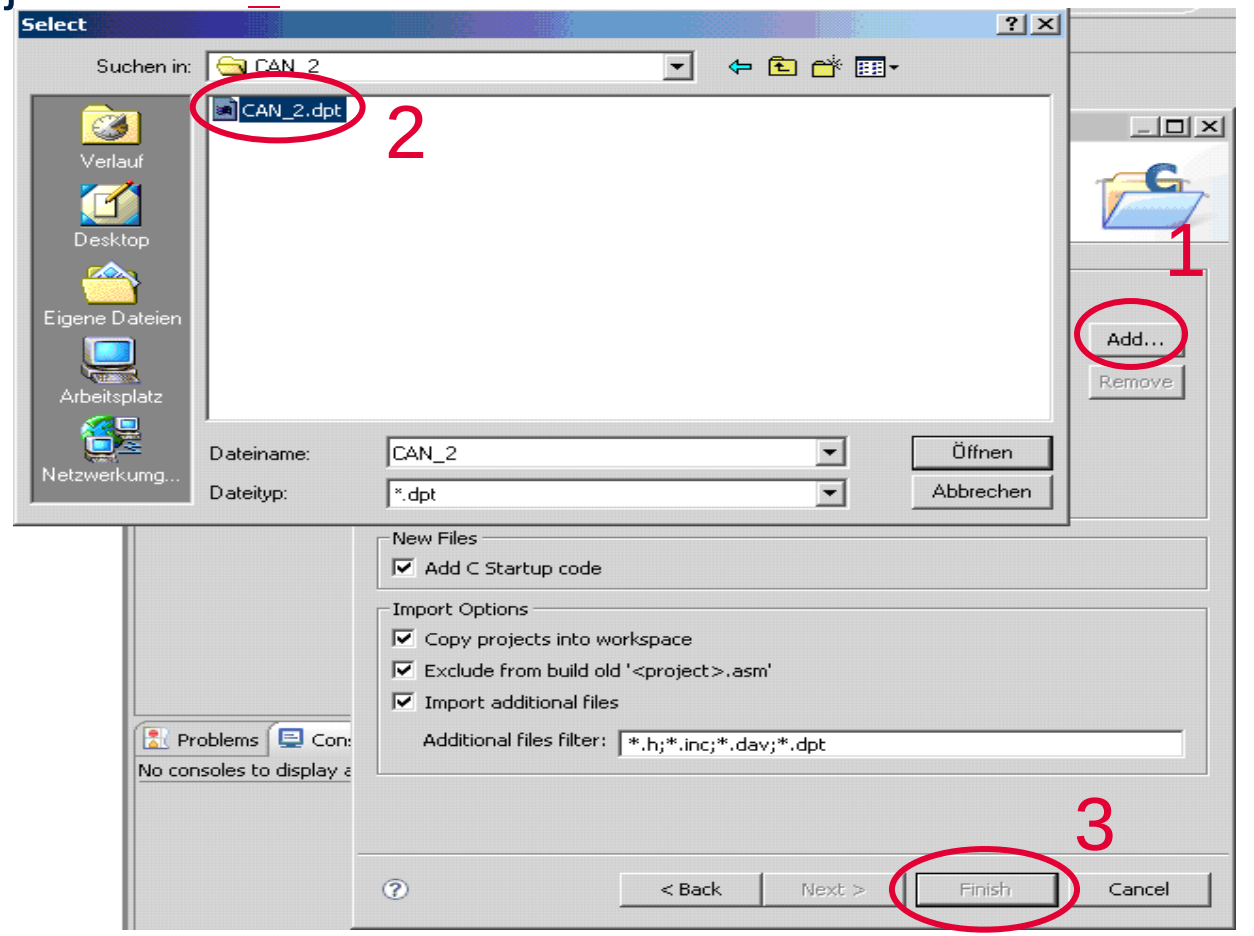
# HOT Exercise CAN_2 – Tasking VX Toolset

- Import DAVE Project
  - Click `Infineon DAvE C166 Project´
  - Click ‘Next’



# HOT Exercise CAN_2 – Tasking VX Toolset

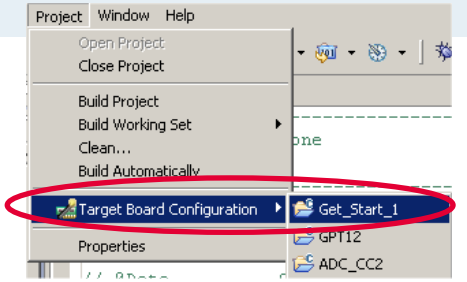
- Import DAvE Project
  - Add Dave Project ‘CAN_2´
  - Click `Finish´

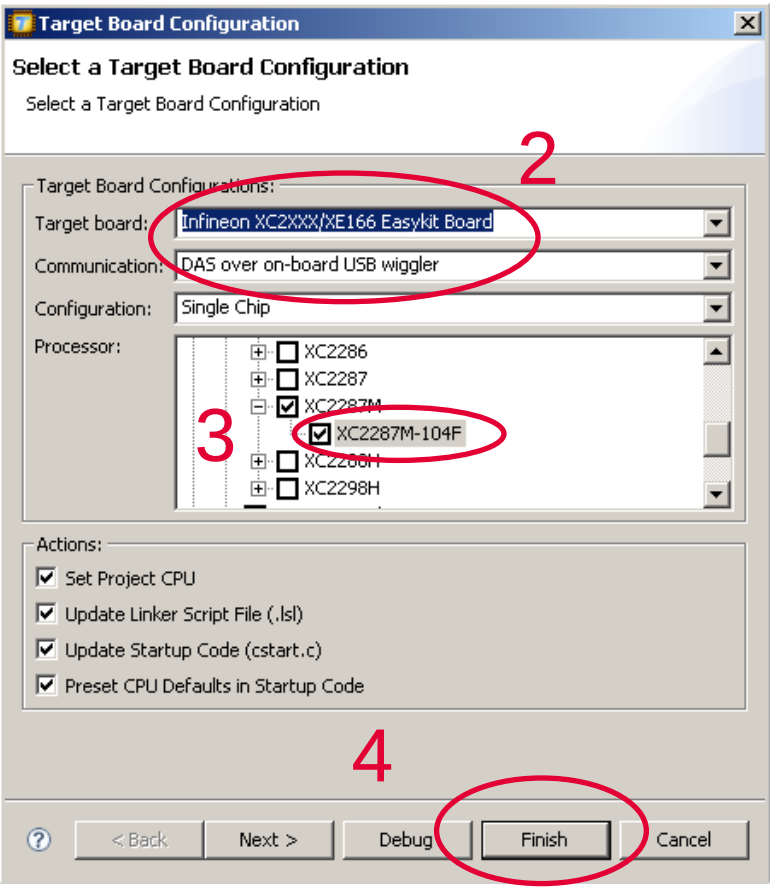


# HOT Exercise CAN_2 – Tasking VX Toolset

- Configure Target Board 

  - Select the project in the navigator
  - Select ‘Project/Target Board Configuration’
  - Select ‘Infineon XC2000/XE166 Easykit Board’
  - Choose `XC2287M-104F´
  - Click `Finish´



- Software Hint
  - DAvE doesn't change code that is inserted in the 'USER CODE' sections if you let DAvE regenerate the code.

    Therefore, whenever adding code to the generated code, write it into a 'USER CODE' section.

    The code you really have to add looks like this:

```
while(1)
{
// USER CODE BEGIN (Main,4)

BlinkLED();

// USER CODE END
}
```

# HOT Exercise CAN_2 - Complete code
# Edit File 'U0C0.C'

- In the ISR function 'U0C0_ASC_vi0IC(void)' (almost at the end)

```
_interrupt(U0C0_0INT)  void U0C0_ASC_vi0IC(void)
{
   // USER CODE BEGIN (ASC0IC,2)
   // USER CODE END

   if (U0C0_PSR & 0x4000)
   {
      // USER CODE BEGIN (ASC0IC,4)
      CAN_MODATA2LL =  U0C0_RBUF; //store received character in MO2
      CAN_vTransmit(2);
      // USER CODE END

      U0C0_PSCR   |= 0x4000;        // clear PSR_RIF
   }
   // USER CODE BEGIN (ASC0IC,15)
   // USER CODE END

} //  End of function U0C0_ASC_vi0IC
```

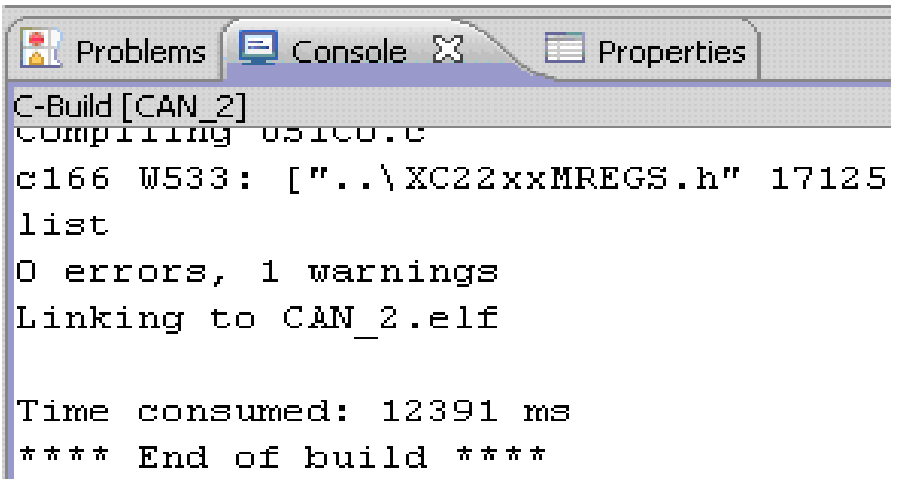
# HOT Exercise CAN_2 - Complete code
# Edit File 'CAN.C'

- In the ISR function 'CAN_viSRN0(void)' (almost at the end)

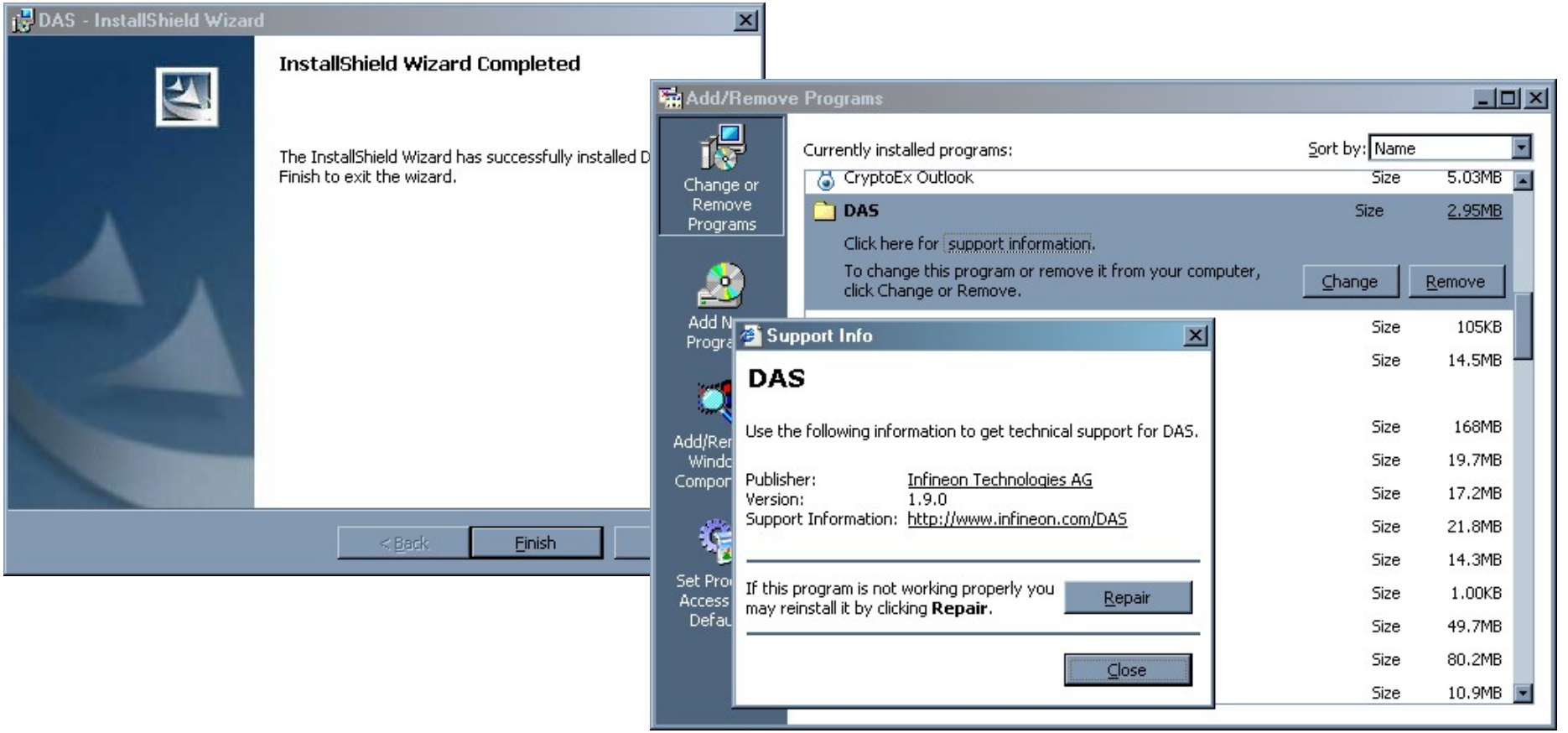
```
_interrupt(CAN_SRN0INT)  void CAN_viSRN0(void)
{       :
        :
  while (CAN_MSID0 != 0x0020)
  {    switch(CAN_MSID0){
       case 5: // message object 5 interrupt
           uwSRN0ObjHandler = CAN_HWOBJ[5].uwMOCTRL;
           if(uwSRN0ObjHandler & MOSTAT_RXPND) // if message object 5 receive interrupt
          {        // USER CODE BEGIN (SRN0_OBJ5,1)
                   IO_vTogglePin(IO_P10_0);
                   U0C0_ASC_vSendData (CAN_MODATA5LL);
                   // USER CODE END
                   :
                   :
          }
```

# HOT Exercise CAN_2 – Tasking VX Toolset Build Project


- Click on ‘Build Project CAN’

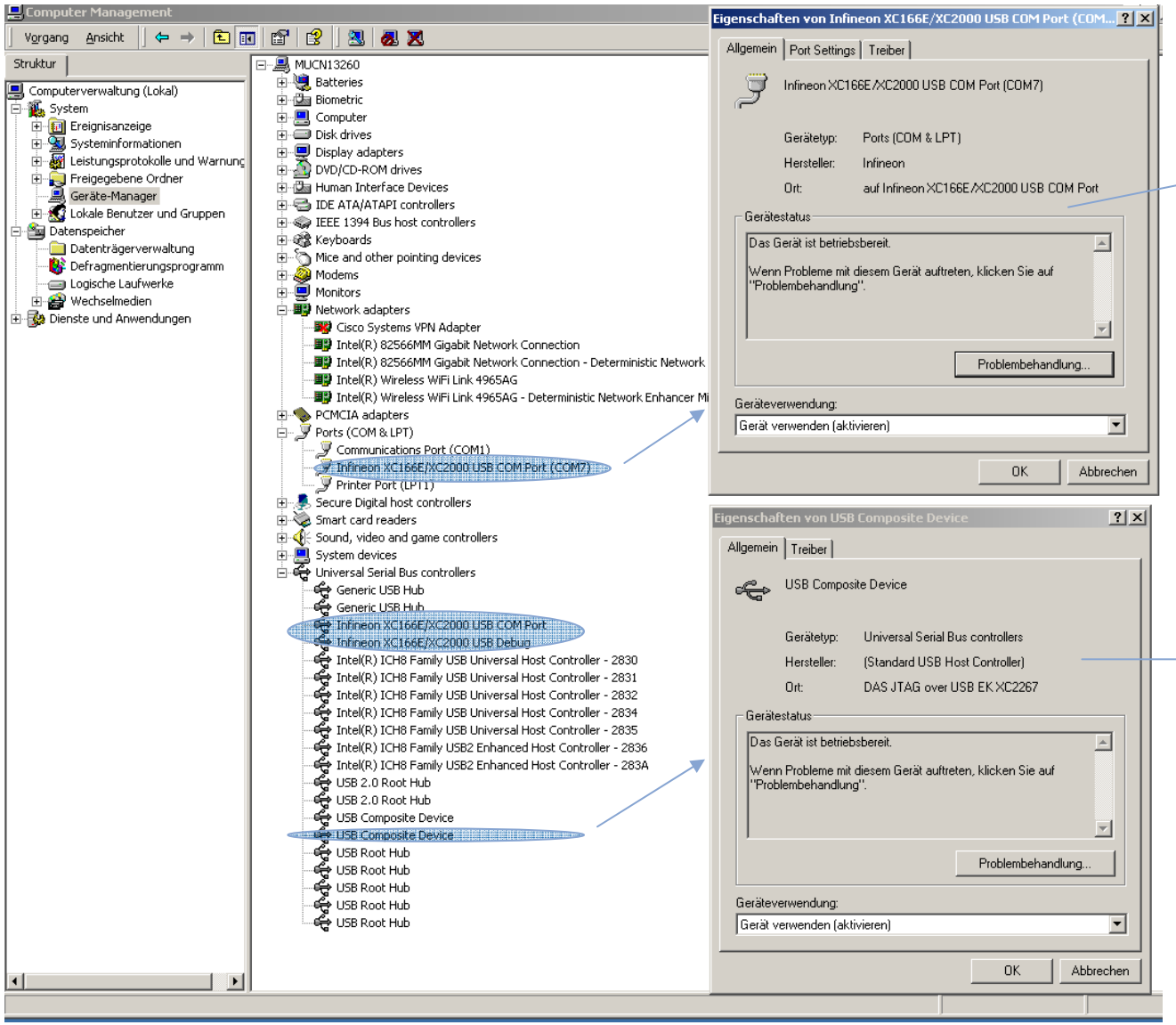


# HOT Exercise CAN_2 - Device Access Server
# Check for the latest DAS version




Note: It is recommended to use the latest DAS version.
Download the latest version at www.infineon.com\DAS

# HOT Exercise CAN_2 - Device Access Server
# 1.) Checking USB connections




This gets identified only when COM port is used

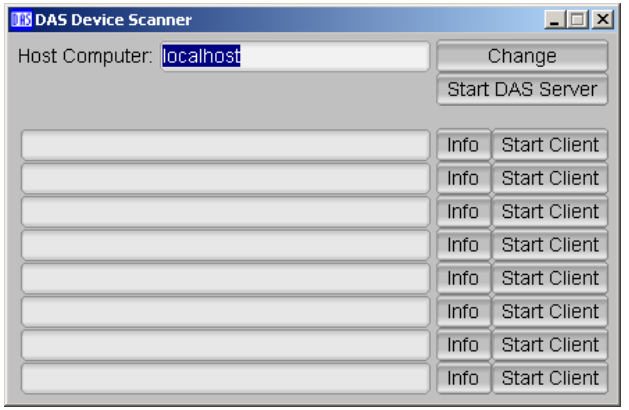
- Via the USB interface on the Easykit with FTDI chip

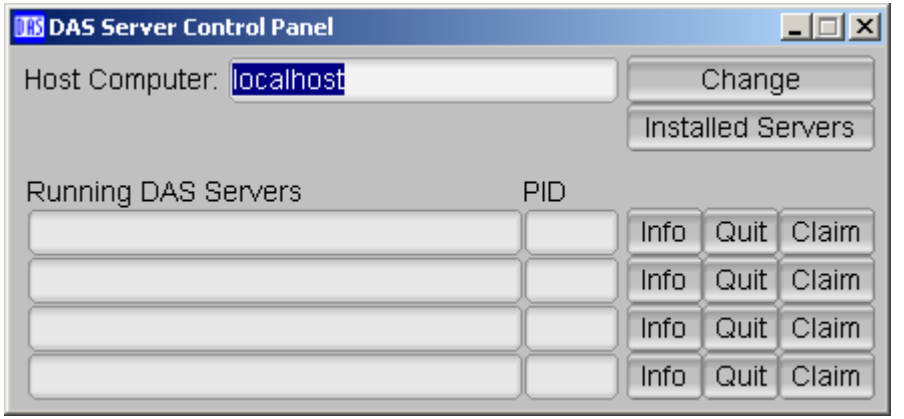
The DAS JTAG composite device gets identified

- When miniWiggler is connected
- When USB Wiggler Box is connected
- Via the USB interface on the Easykits with FTDI chip

# HOT Exercise CAN_2 - Device Access Server
# 2.) Check DAS status

1. Start DAS device scanner
2. Start DAS Server Control panel

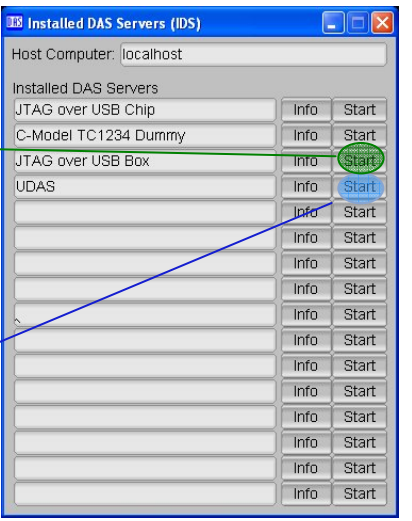



3. If DAS device scanner does not show any device, start the appropriate DAS server

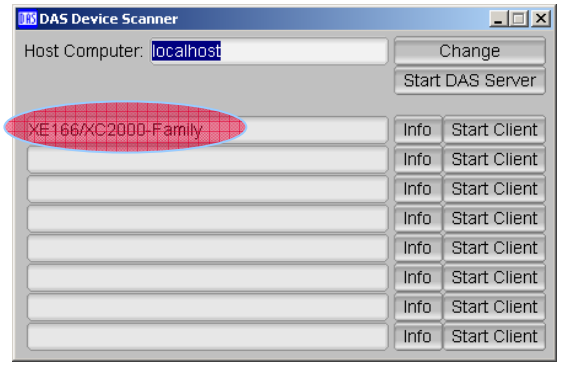
Incase you are connected via the USB Wiggler box, then start „JTAG over USB Box“

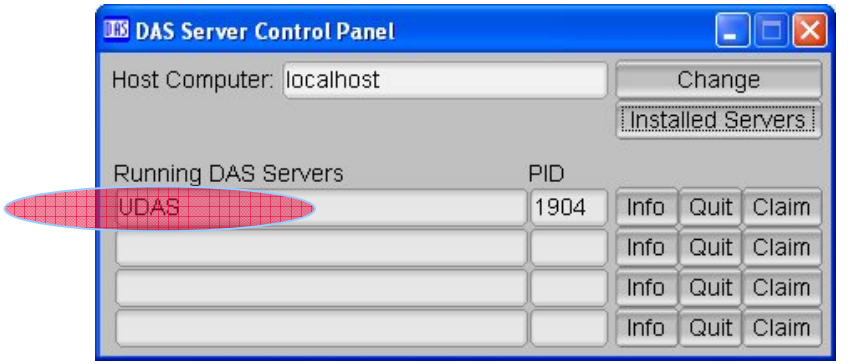
Incase you are connected via the FTDI chip or mini wiggler, then start „UDAS“



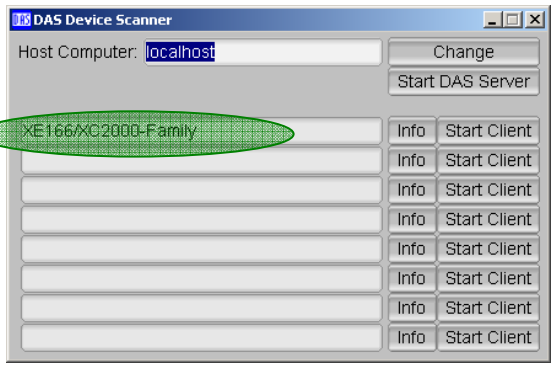
# HOT Exercise CAN_2 - Device Access Server
# 3.) Starting the servers manually

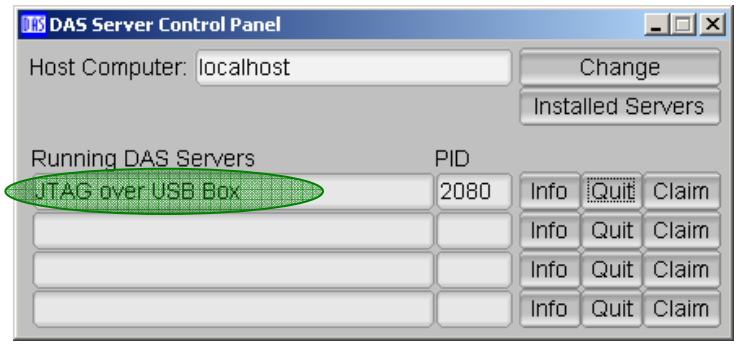
4. Incase „UDAS“ server is started and XC2000 easykit is connected via on-chip FTDI or via separate miniWiggler, following status changes could be noted



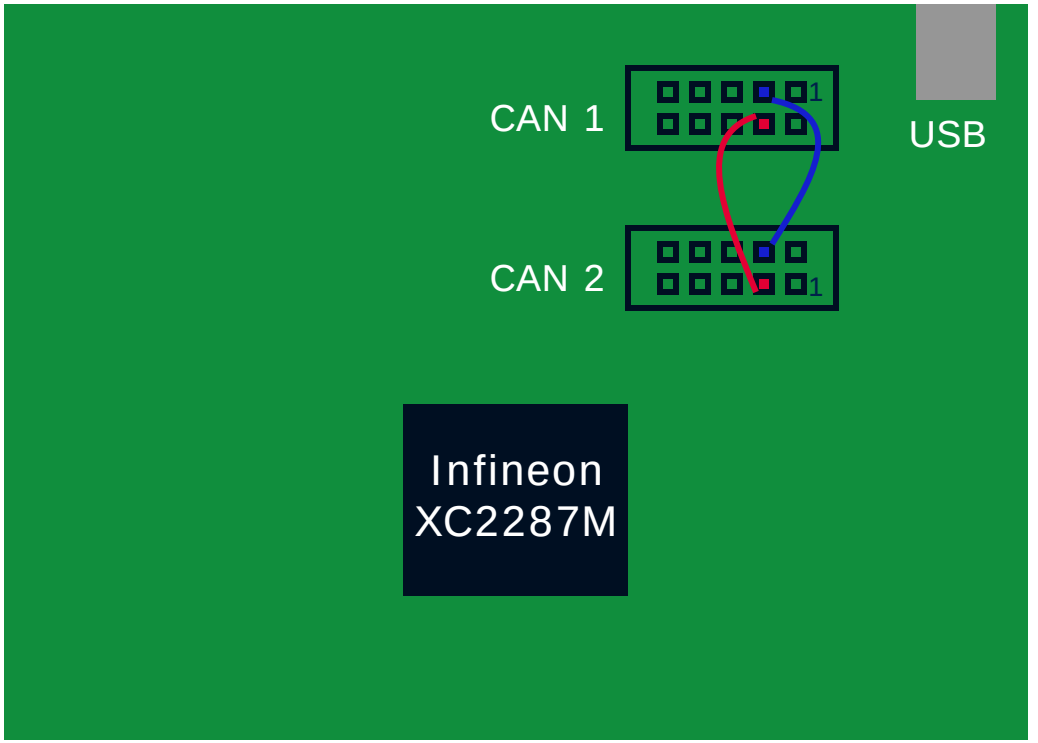

5. Incase „JTAG over USB Box“ server is started and XC2000 starter kit is connected via Wiggler box, following status changes could be noted



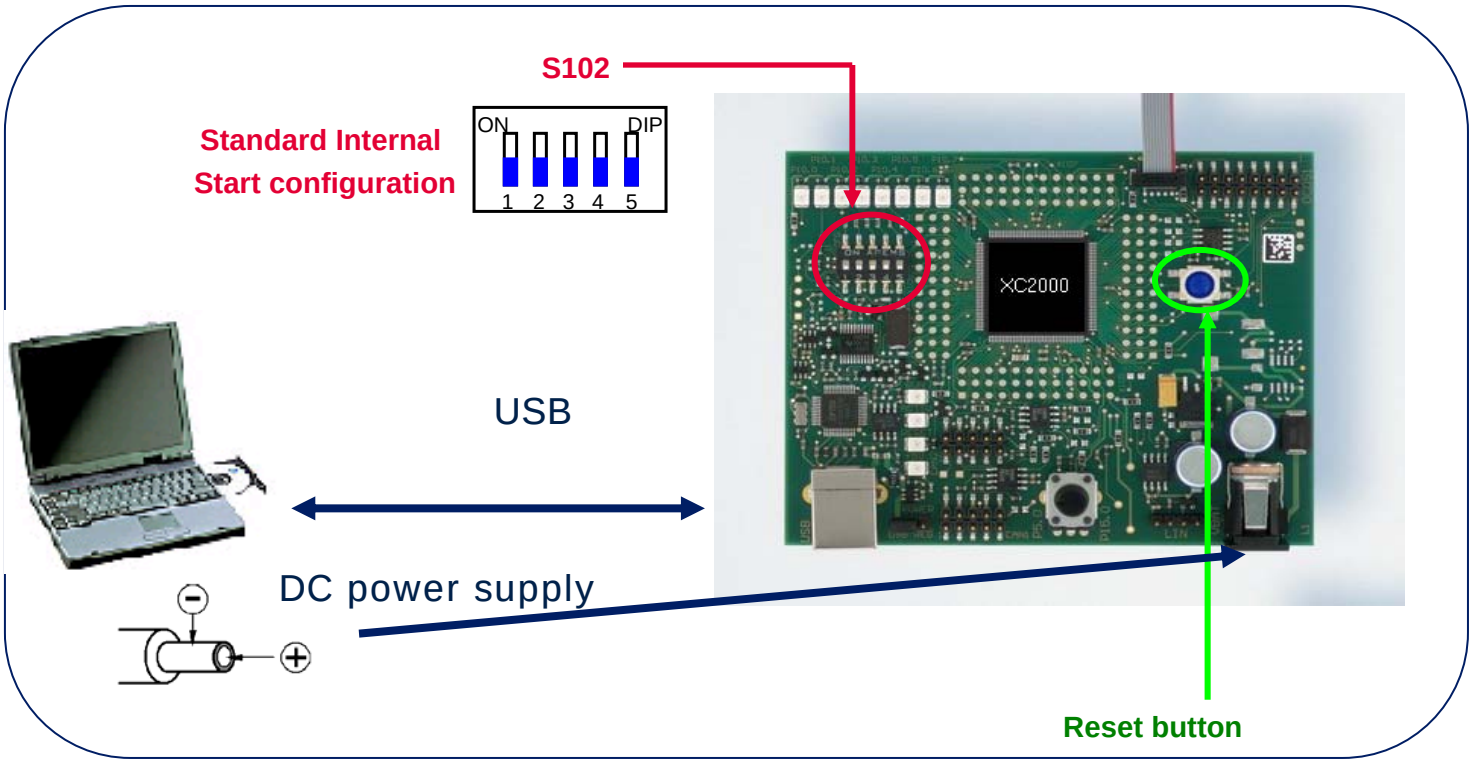
# HOT Exercise CAN_2
# Connect XC2287M Board

- Disconnect power supply from the board
- Connect CAN nodes: Connect wires from node A to node B (connect CAN1_L to CAN2_L and CAN1_H to CAN2_H)



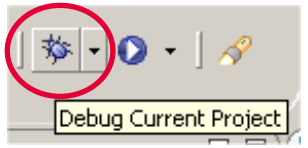
# HOT Exercise CAN_2
# Connect XC2287M Board

- **Internal start from Flash**
  - Connect XC2287M Board to PC
  - Modify the DIP switch settings, S102: **OFF-OFF-OFF-OFF-OFF**
  - Reset the board (press the reset button)

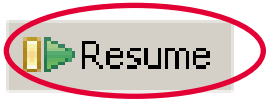


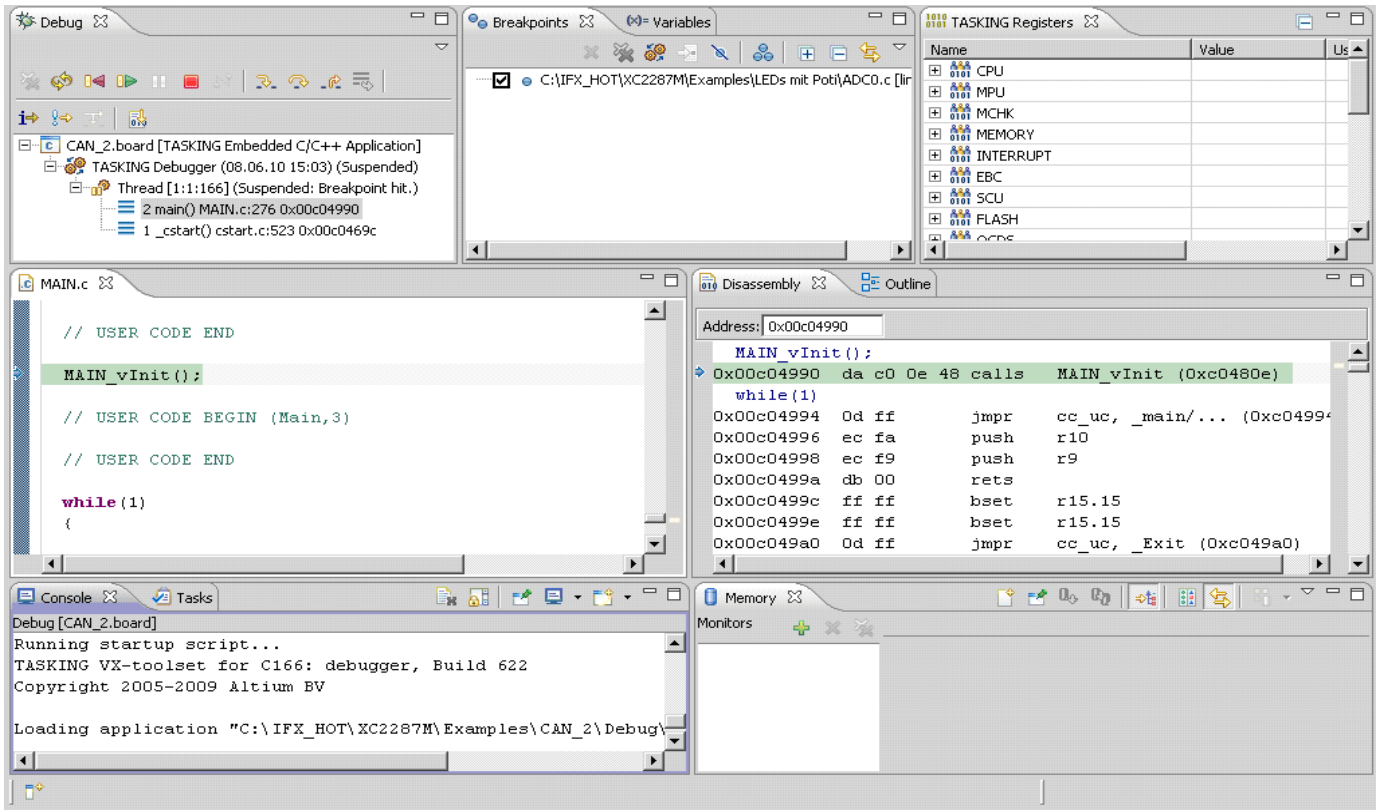
# HOT Exercise CAN_2 – Tasking VX Toolset Run Debugger

- Click on



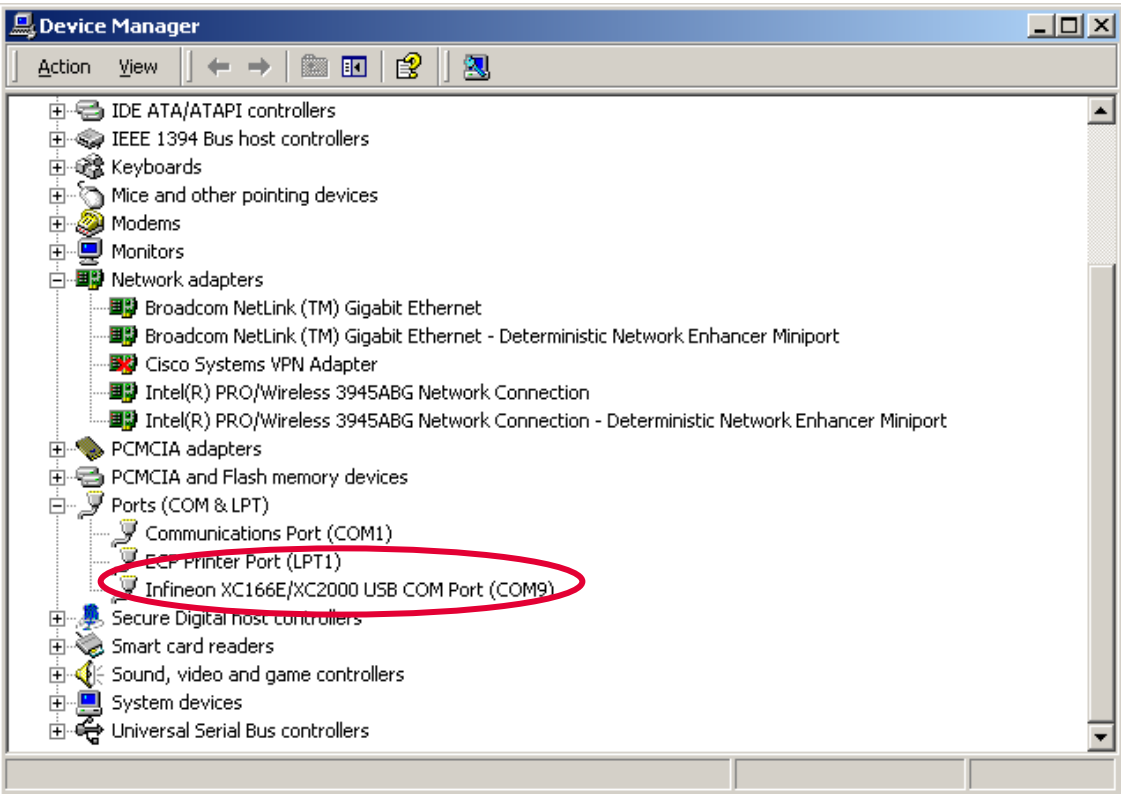

- Click on ‘Resume’ and start program



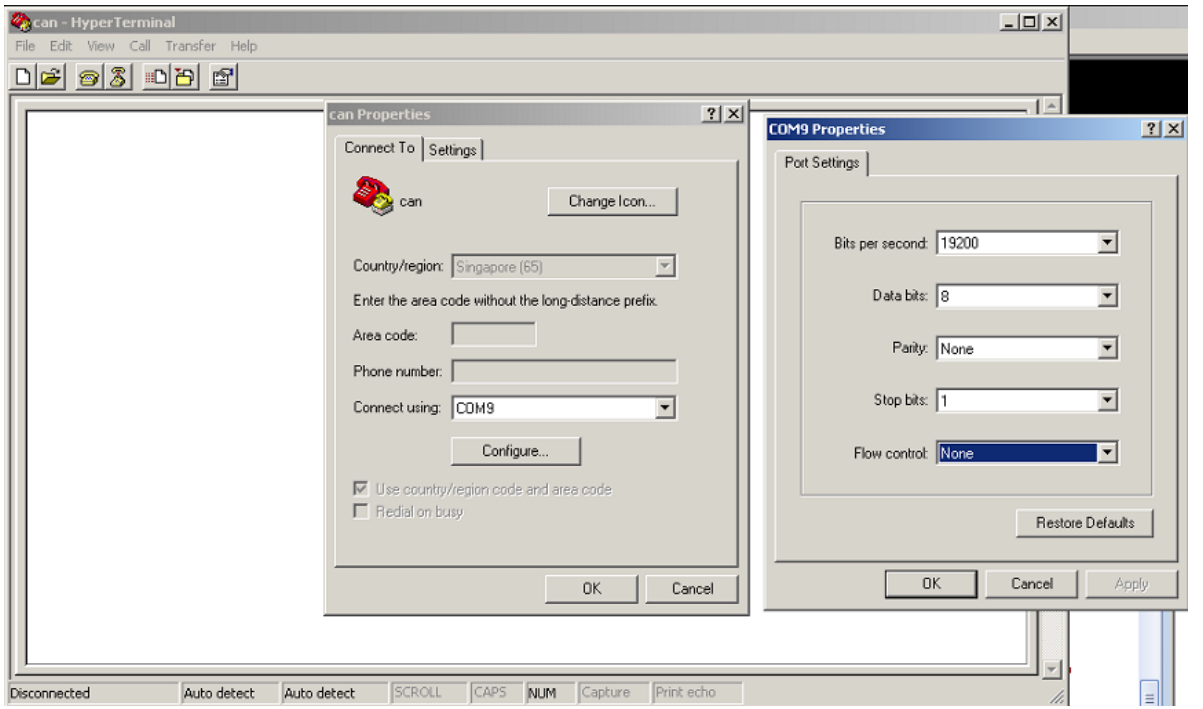
# HOT Exercise CAN_2
# Start HyperTerminal

- With the FTDI chip an on board, USB interface can be used for UART. FTDI device will converts the USB protocol the ASC protocol. Both USB and UART can be used at the same time.
- Open Device Manger and check which COM port is activated for the FTDI chip



# HOT Exercise CAN_2
# Start HyperTerminal

1. Start->Programs->Accessories->Communications->HyperTerminal
2. Enter any name and click ‘OK’
3. Connect using: COMx (COM port activated for the FTDI chip)
4. Click ‘Configure’ to enter Port settings
5. Select 19200 baud, no Parity, 8 Data Bits and 1 Stop Bit
6. Click ‘OK’



# HOT Exercise CAN_2
# Running the program

- **Start typing**
  - Enter ASCII characters in the HyperTerminal
  - The characters you enter are sent to the XC2287M, through the CAN bus and back to the Terminal Program so that you can read them on the screen
  - The characters are not sent directly from the keyboard to the screen!

# HOT Exercise CAN_2
# See Result

- The yellow LED will toggle when data is receive in CAN Node1

**LED blinking**

# HOT Exercise CAN_2
# Verification

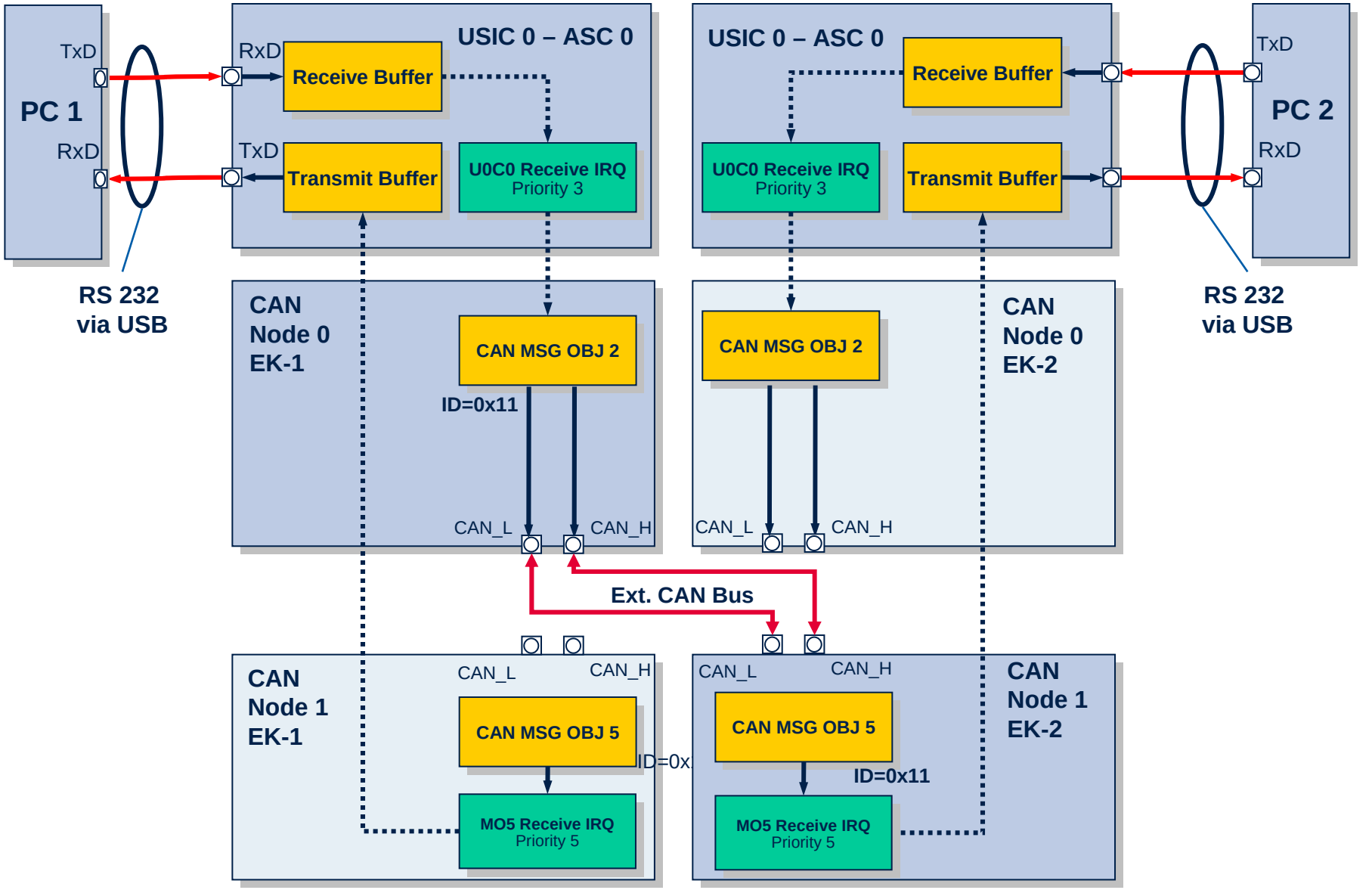
- Verification 1: (stop the program)
  - Go to Tasking debugger
  - Click on ‘Suspend’ 
  - Go back to the terminal program and start typing again:

    ⇒ you will no longer see what you are typing.

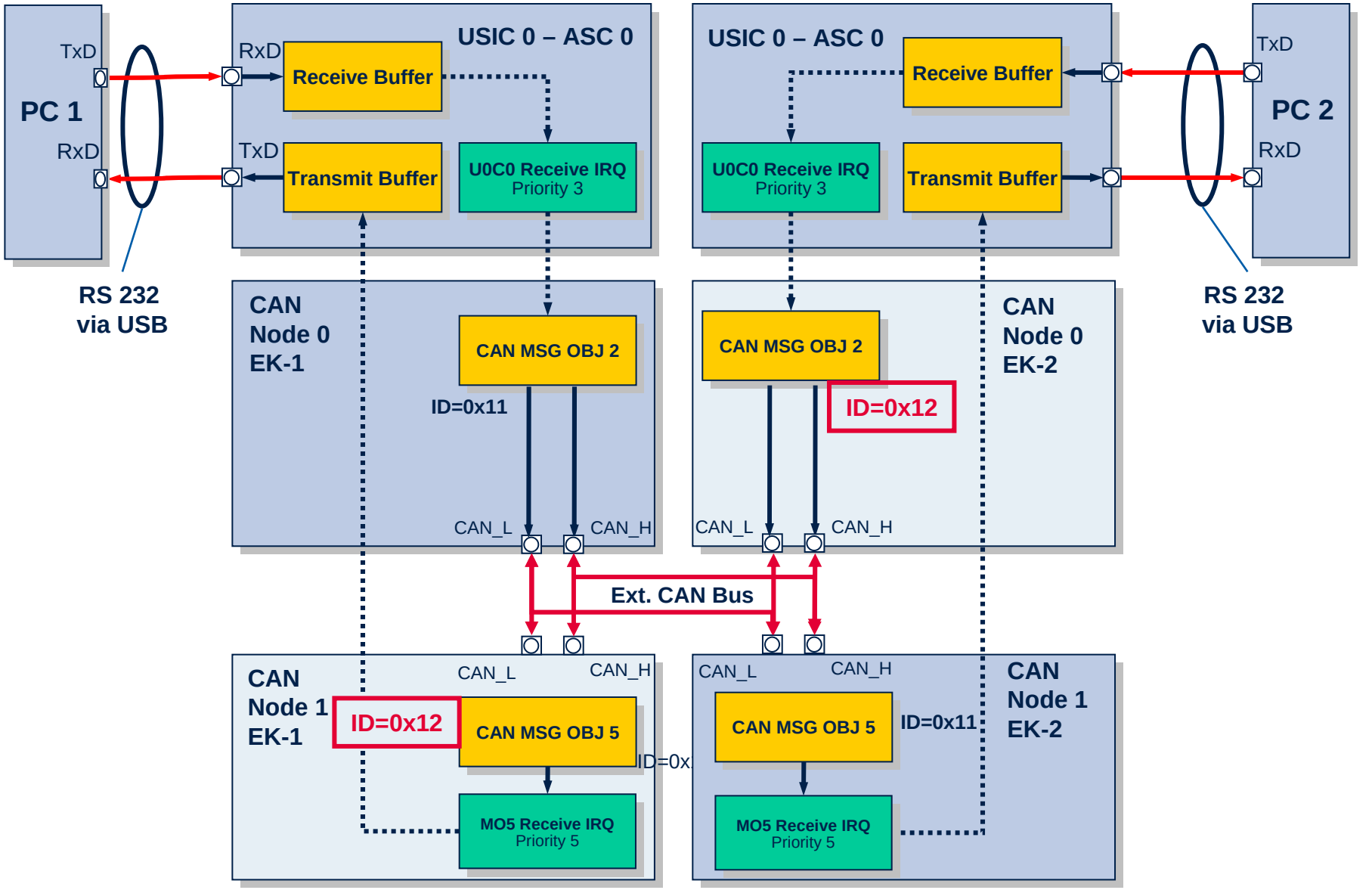
- Verification 2: (start the program)
  - Go to Tasking debugger and start the program. 
  - Go back to the terminal program and start typing again:
  - Pull out the CAN cable

    ⇒ you will no longer see what you are typing

# CAN Bonus Exercise 1 (Unidirectional)



# CAN Bonus Exercise 2 (Bidirectional)



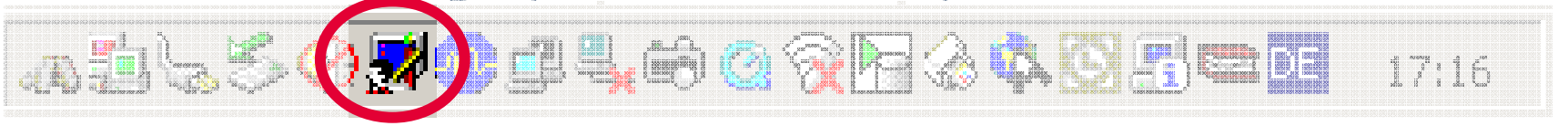
# Tasking Viper
# "Profile Storage Space Exceeded"

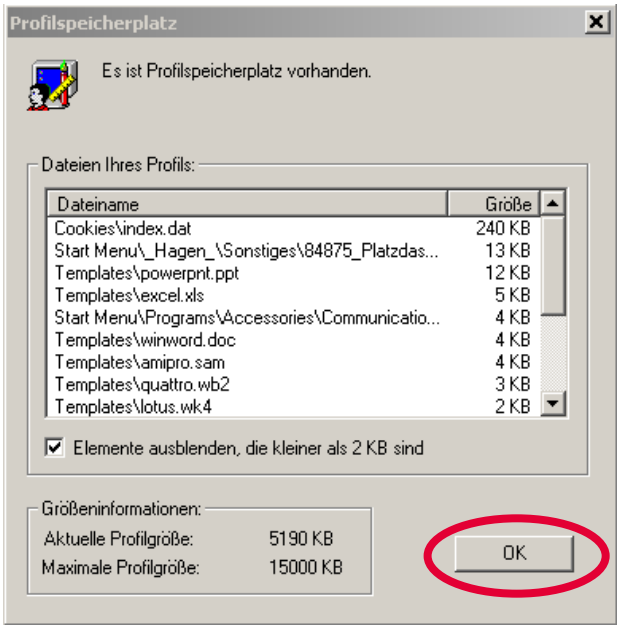
- Edit config.ini
  - C:\Program Files\TASKING\C166-VX v2.4r1\eclipse\configuration\

```
. . .

# The default configuration location for this run of the platform. The configuration
# determines what plug-ins will run as well as various other system settings.
# osgi.configuration.area = @user.home/.eclipse_c166_v2.4r/config
osgi.configuration.area = C:/UserData/_login-name_/.eclipse_c166_v2.4r/config

# The default location of the user area. The user area contains data (e.g., preferences)
# specific to the OS user and independent of any Eclipse install, configuration or instance.
# osgi.user.area = @user.home/.eclipse_c166_v2.4r
osgi.user.area = C:/UserData/_login-name_/.eclipse_c166_v2.4r

# The default workspace location
# osgi.instance.area.default = @user.home/workspace_c166_v2.4r
osgi.instance.area.default = C:/UserData/_login-name_/workspace_c166_v2.4r

# TASKING plugins require at least Java runtime environment v1.5
osgi.requiredJavaVersion = 1.5.0

# The build identifier
eclipse.buildId=I20070625-1500

# End of file marker - must be here
eof=eof
```

# Tasking Viper
# "Profile Storage Space Exceeded"

- Delete old directories in profile space
  - C:\Documents and Settings_login-name_\.eclipse_c166_v2.4r

- Rescan Profile Storage (double click; OK)
  - 


Never stop thinking