Tutorial - Using the USBDM

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Revisions

| Version	Date	Changes
1.0	2013-02-26	First release (USBDM 4.10.4)
1.1	2013-05-08	Update (USBDM 4.10.5)
1.2	2013-06-02	Update (USBDM 4.10.5b - Released due to some issues with 4.10.5)
1.3	2013-10-13	Update (USBDM 4.10.6c for CodeWarrior 10.5)
1.4	2014-05-04	Update (USBDM 4.10.6.140 for CodeWarrior 10.6)
1.5	2014-06-01	First programming of the target microcontroller added
1.6	2014-10-19	Update (USBDM 4.10.6.200 for CodeWarrior 10.6)

Introduction

The USBDM is an open source programming cable for Freescale microcontrollers released by PGO. Several hardware versions are available depending of the targets you want to program. All source files, firmware, schematics are available on http://usbdm.sourceforge.net.

MyFreescaleWebPage proposes its own USBDM. It is based on "USBDM_SWD_JS16CWJ" schematic from PGO and is able to program HCS08, HCS12, Coldfire V1 and Kinetis SWD microcontrollers. This makes it a very good choice if you want to begin with Freescale microcontrollers!
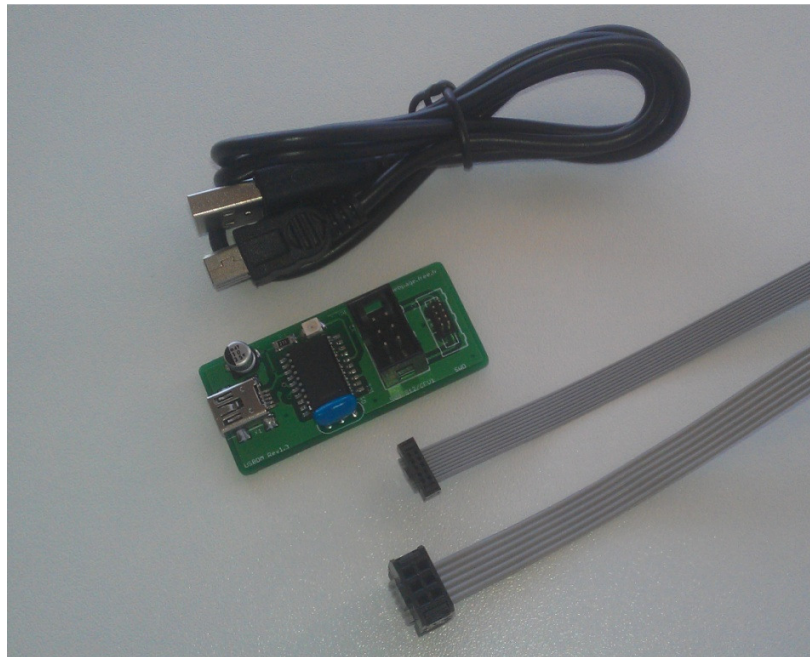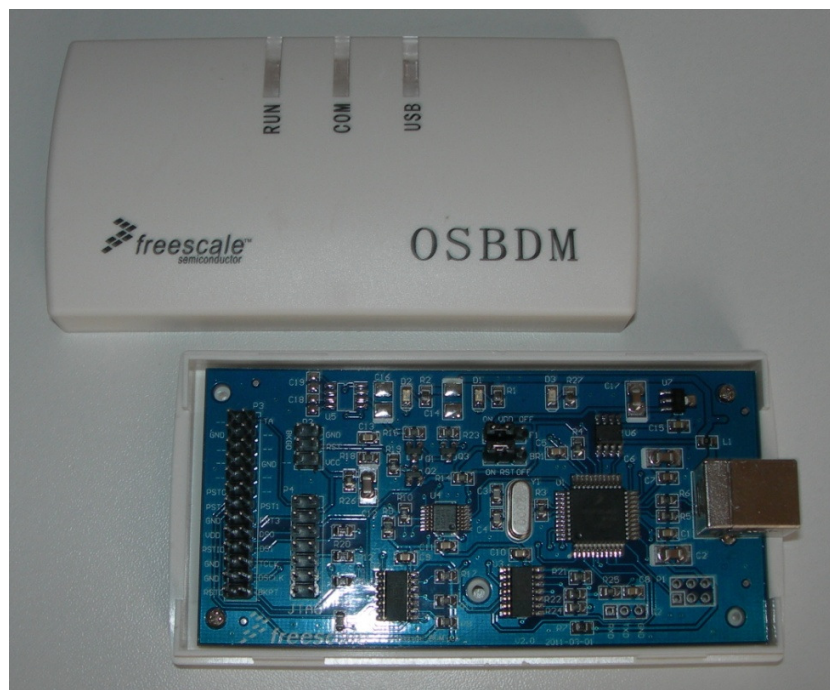

This cheap but powerful USBDM is provided with BDM, SWD and USB cables. You can get it on the following page: http://myfreescalewebpage.free.fr/toolbox/usbdm/shop.htm.

TheUno and BigBrother evaluation boards are based on the USBDM with an additional serial port used to communicate with the target.
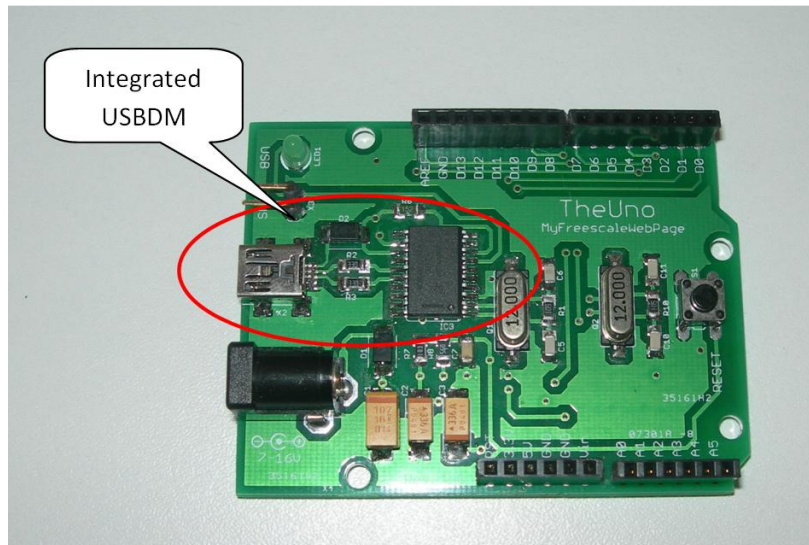
The following USBDM (found on eBay) is able to program RS08, HCS08, HCS12, CFV1, CFV2, CFV3, CFV4, Kinetis and DSC microcontrollers and is able to supply the target with 3.3 or 5V voltage.

This other USBDM (also found on eBay from BlackBoxStudio seller at http://www.ebay.fr/itm/Freescale-Debugger-Programmer-for-HCS08-HCS12-Coldfire-V1-/110958979630?) is compatible with HCS08, HCS12 and CFV1 microcontrollers.

This tutorial explains how to use the USBDM: installation, update, programming the target with standalone software and Freescale CodeWarrior.
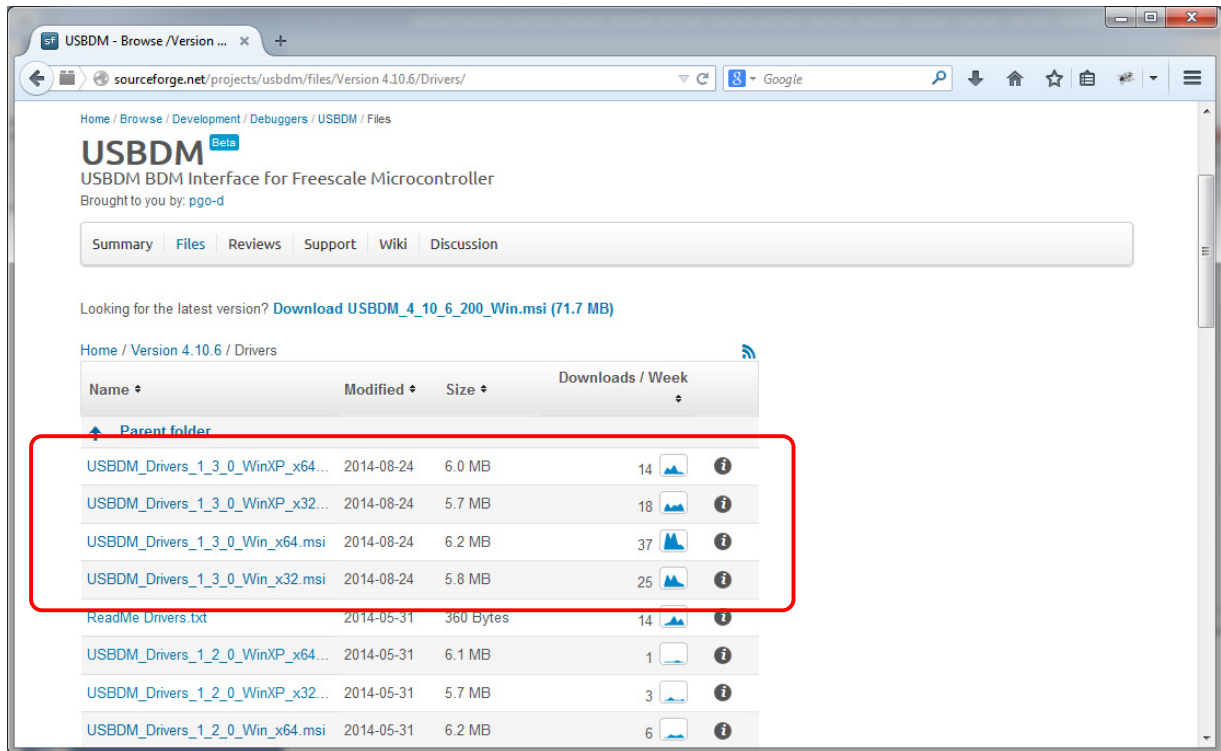
If you want to use your USBDM with CodeWarrior, you must first installed CodeWarrior and then the USBDM. A tutorial is available on my website at http://myfreescalewebpage.free.fr in you need help.

1 Download the USBDM installation files

Today the last USBDM release is V4.10.6.200. The installation files are available on Sourceforge on the following page: http://sourceforge.net/projects/usbdm/files/Version%204.10.6/Software.
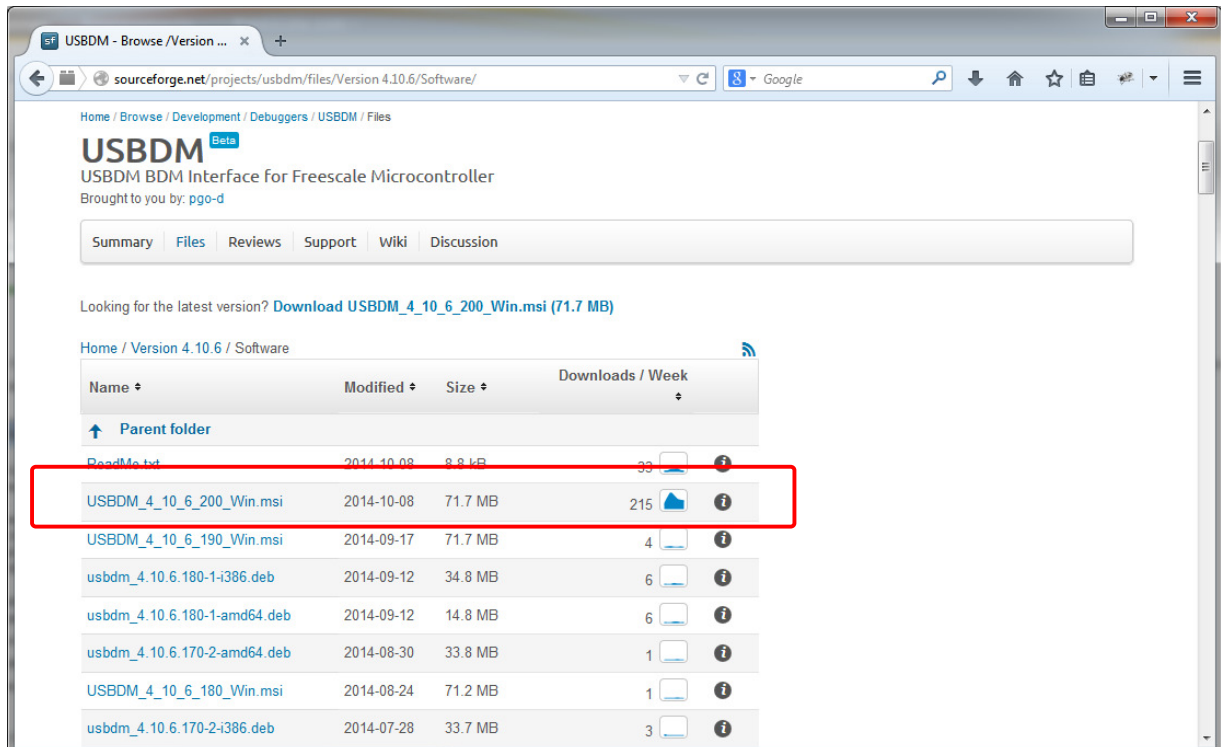
The drivers are available on the following page:
http://sourceforge.net/projects/usbdm/files/Version%204.10.6/Drivers.
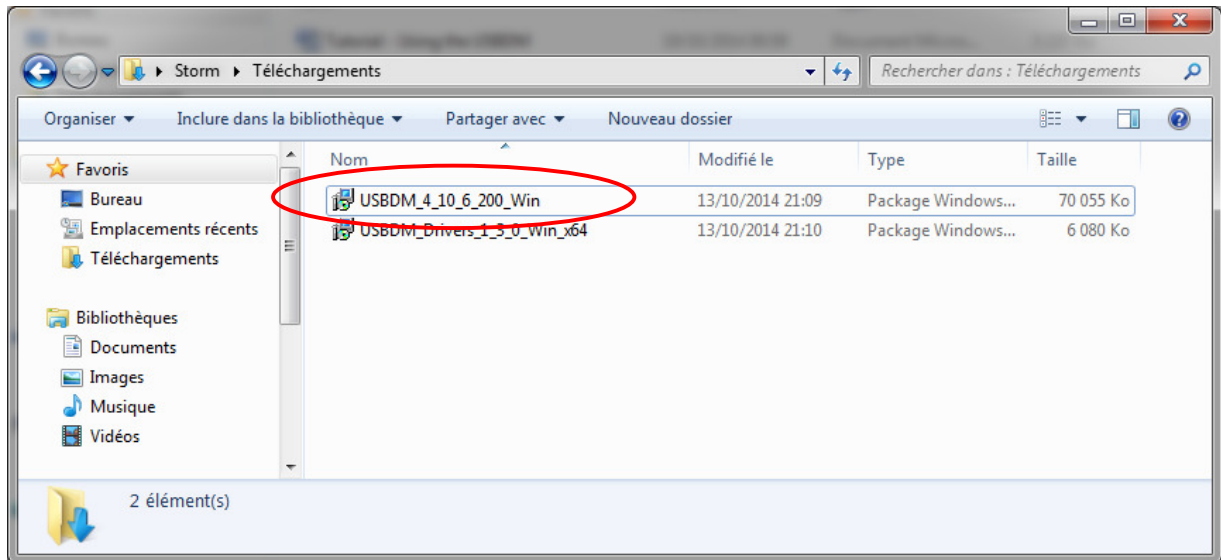
Download the USBDM Installer and the right USBDM Drivers according to your computer.
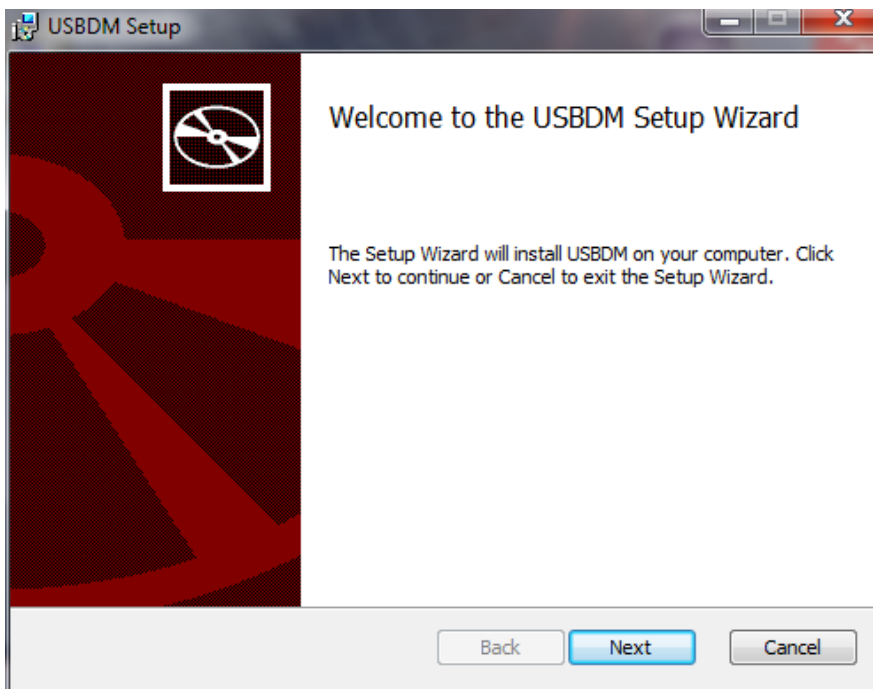
2 Installation of the USBDM

Please note that it is recommend to remove your previous USBDM installation before installing the last version. See "Appendix - Uninstalling the USBDM" for more details.
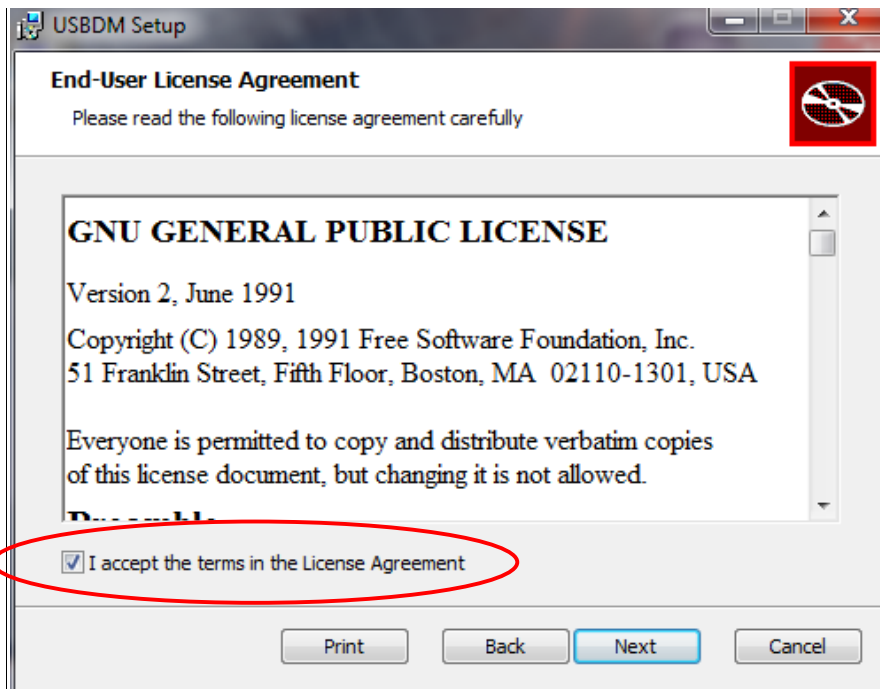
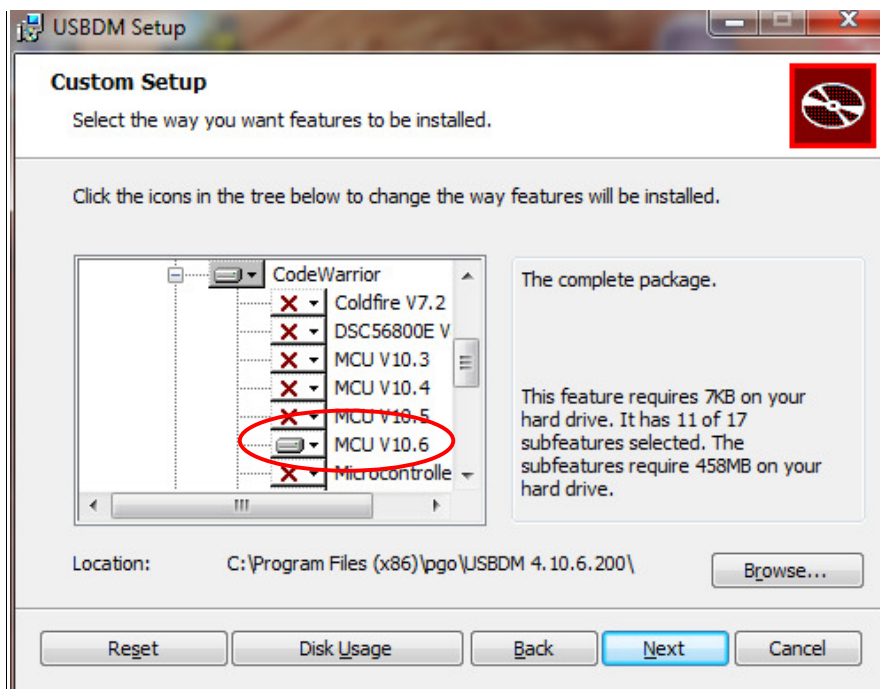To install the USBDM, execute the installer.

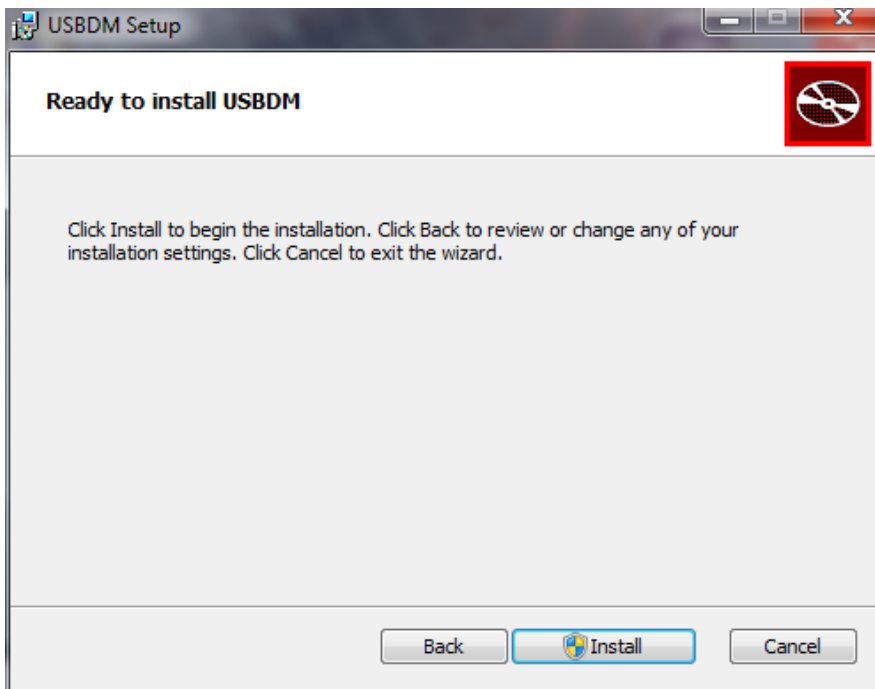
A wizard is displayed. Click "Next".

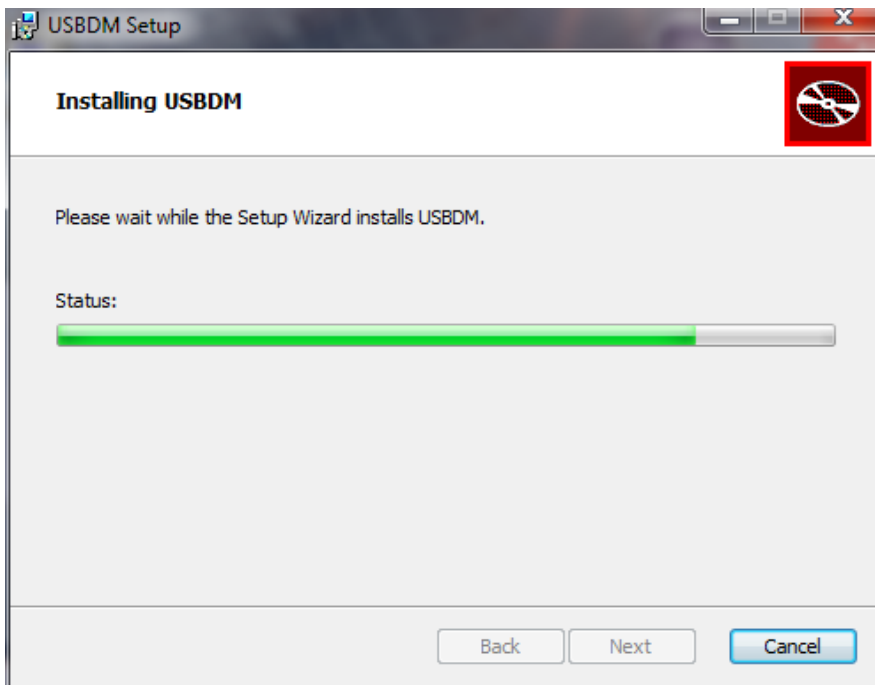Accept the License Agreement and click "Next".

It is possible to custom the installation. I have only verified that the installer detected my CodeWarrior installation (Eclipse Special Edition V10.6) has shown on the following screenshot. Click "Next" to perform the USBDM installation.
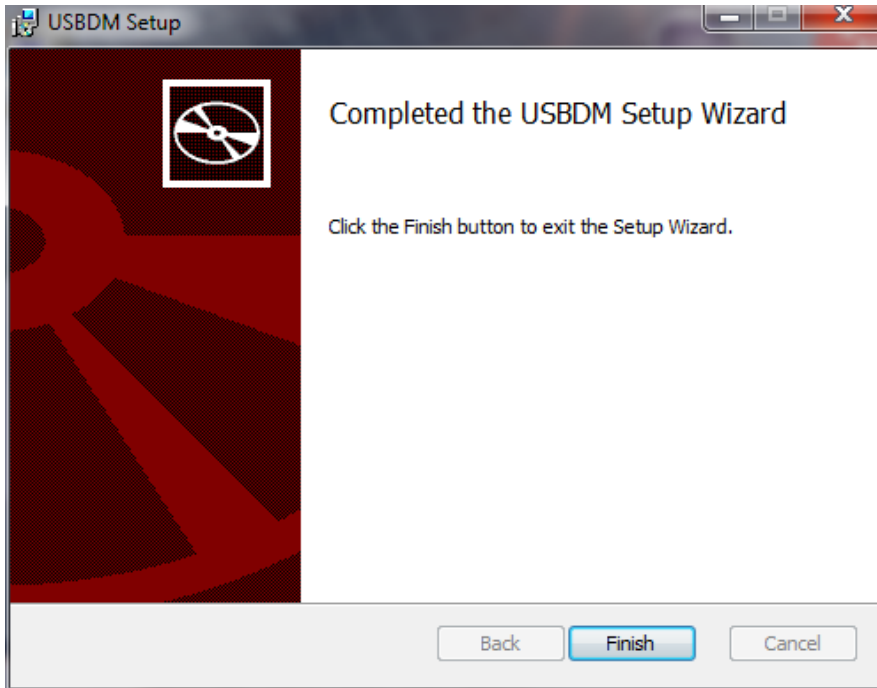
Click "Install".
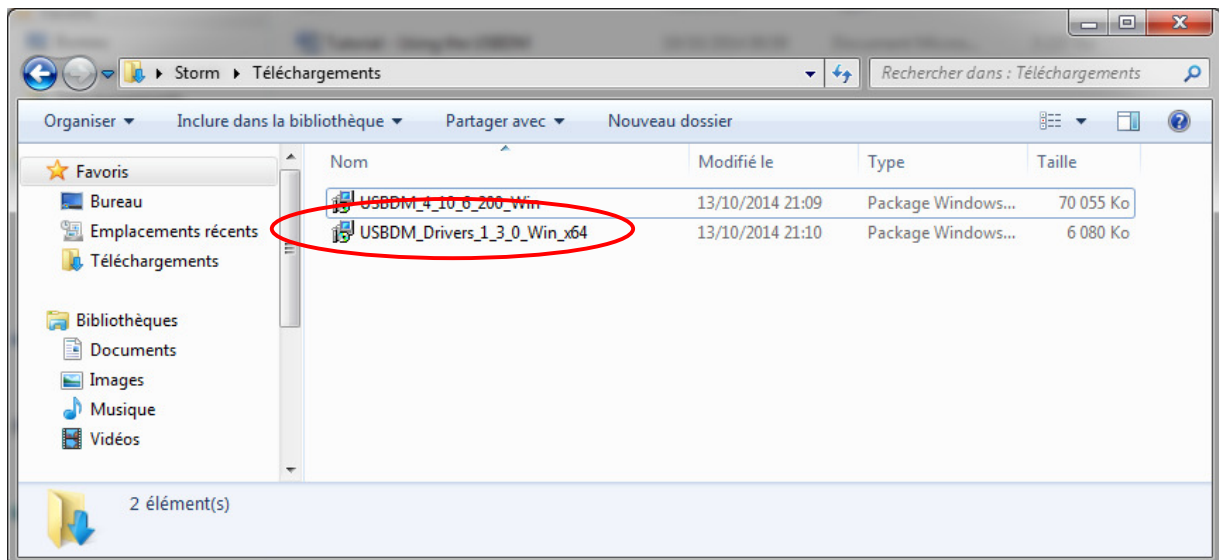

The setup takes several minutes to complete.

The installation ends. Click "Finish" to close the wizard.

It's now time to install the USBDM Drivers. Execute the right USBDM Drivers installer according to your configuration (Windows XP or not, x86 or x64 operating system).

A wizard is displayed. Accept the License Agreement and click "Install".

The wizard install the USBDM Drivers.
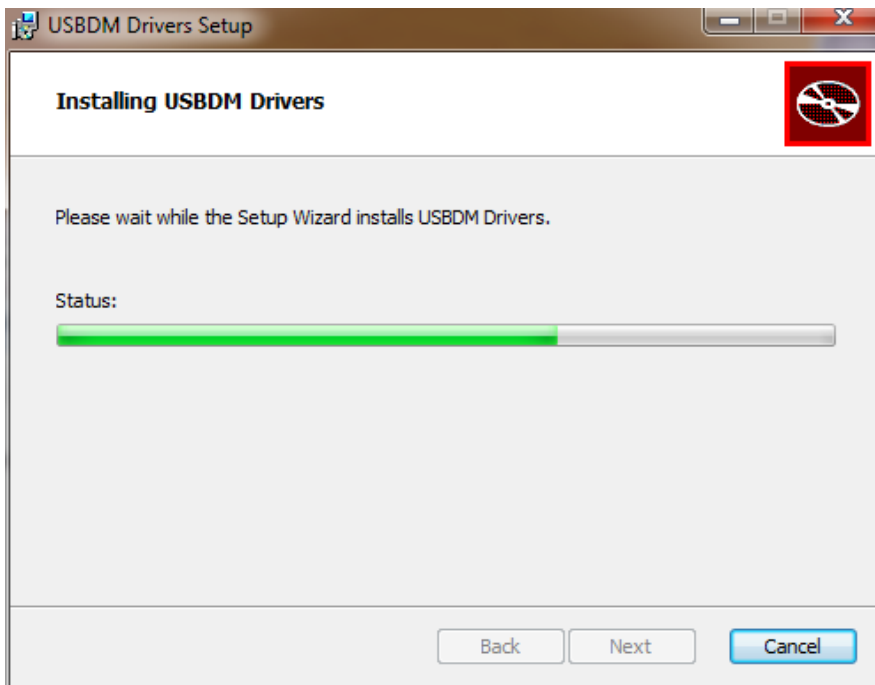
Window can't verify the publisher of the driver software. Validate the installation.
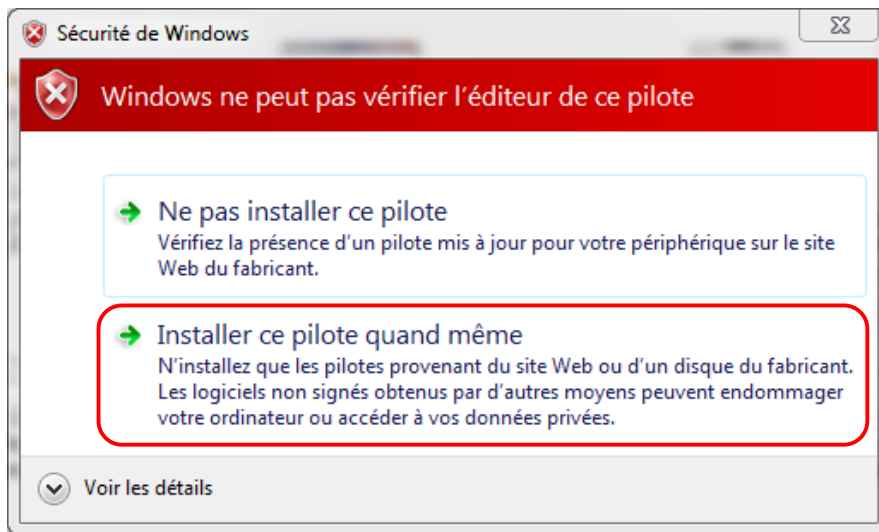
The installation takes only some few seconds. The wizard says that it is now possible to connect the USBDM. Click "OK".

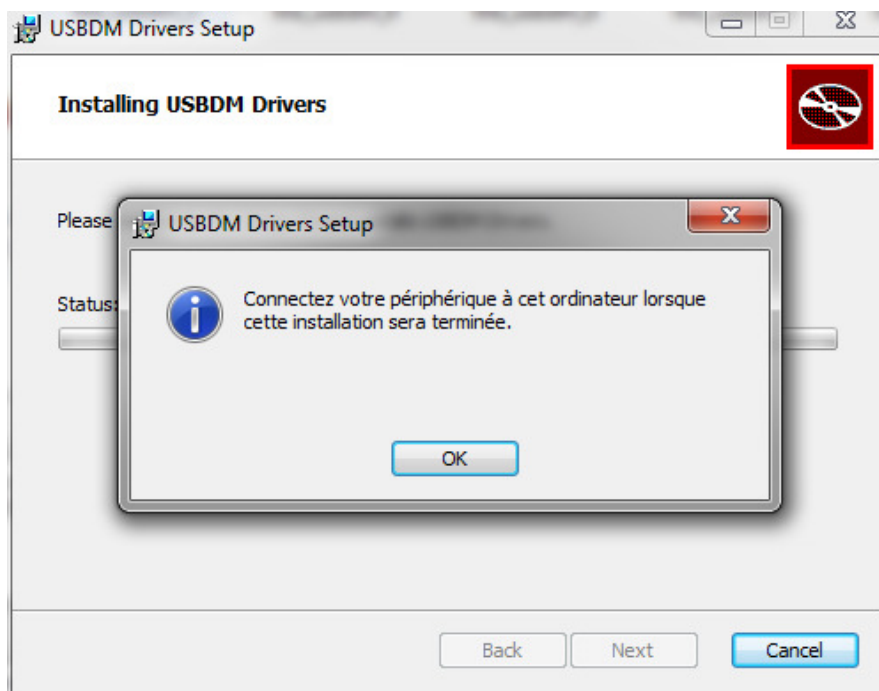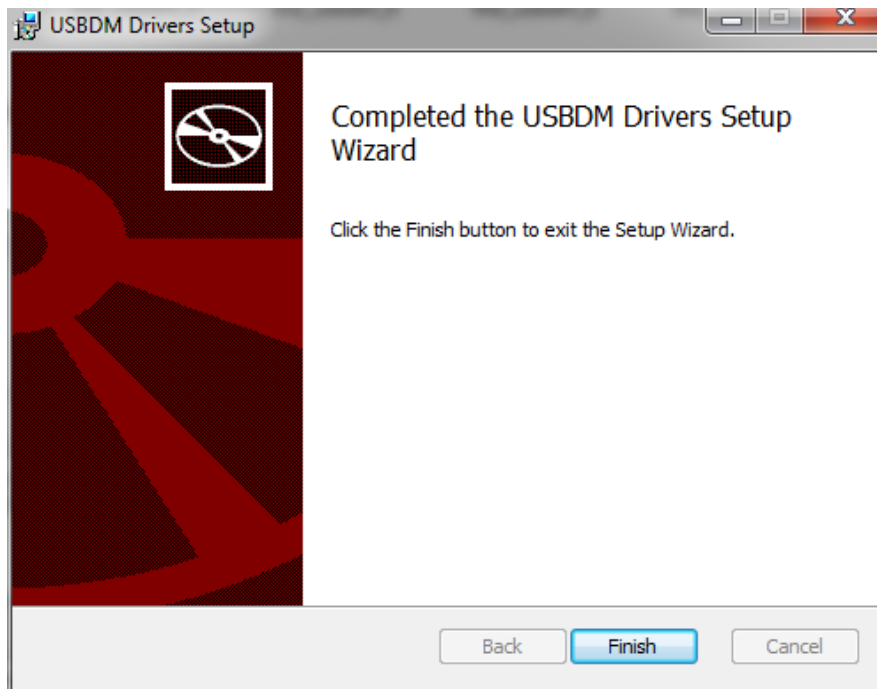Click "Finish" to close the wizard.

The installation is finished. USBDM shortcuts are available in the start menu.

3   Flashing the USBDM firmware

The microcontroller of the USBDM must be programmed with the right USBDM firmware. The table below present several USBDM versions and their features.

Description	Based On	Supported Devices & Features	Firmware
USBDM_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1	USBDM_JS16CWJ_V4
USBDM_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1 - Serial Port	USBDM_SER_JS16CWJ_V4
USBDM_SWD_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, Kinetis	USBDM_SWD_JS16CWJ_V4
USBDM_SWD_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, Kinetis - Target Power, Serial Port	USBDM_SWD_SER_JS16CWJ_V4
USBDM_CF_JS16CWJ	HCS08JS16	CFV2, CFV3, CFV4, Kinetis, DSC	USBDM_CF_JS16CWJ_V4
USBDM_CF_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, CFV2, CFV3, CFV4, Kinetis, DSC - Serial Port	USBDM_CF_SER_JS16CWJ_V4
USBDM_CF_JMxxCLD_V3	HCS08JM60	RS08, HCS08, HCS12, CFV1, CFV2, CFV3, CFV4, Kinetis, DSC - Target Power, Serial Port	USBDM_CF_JMxxCLD_V4

The USBDM schematics and firmware are available in the "BDM Flash Images" directory of the USBDM installation (a shortcut is available in the start menu following the installation of the USBDM).

The USBDM based on the HCS08JM60 microcontroller must be flashed using an external tool (another USBDM for example). The USBDM based on the HCS08JS16 microcontroller can be flashed using the internal USB bootloader present in this device.

3.1   Flashing the USBDM firmware with an external tool

This will depend of the programmer used. You can refer to §5 "Programming microcontrollers" if you are using another USBDM.

## 3.2   Flashing the USBDM firmware with the internal bootloader of the HCS08JS16 microcontroller

The internal bootloader of the HCS08JS16 microcontroller is very convenient and can be used to flash the USBDM firmware. The internal bootloader is a specific peripheral and is always available.

First short the BLMS pin of the HCS08JS16 microcontroller to the ground. As shown below, on TheUno it is done by shorting X3 with a simple jumper. Adapt this step to your own USBDM. Please note that this is not necessary if the USBDM is blank (never programmed before), because it is starting by default with the internal bootloader in this case.
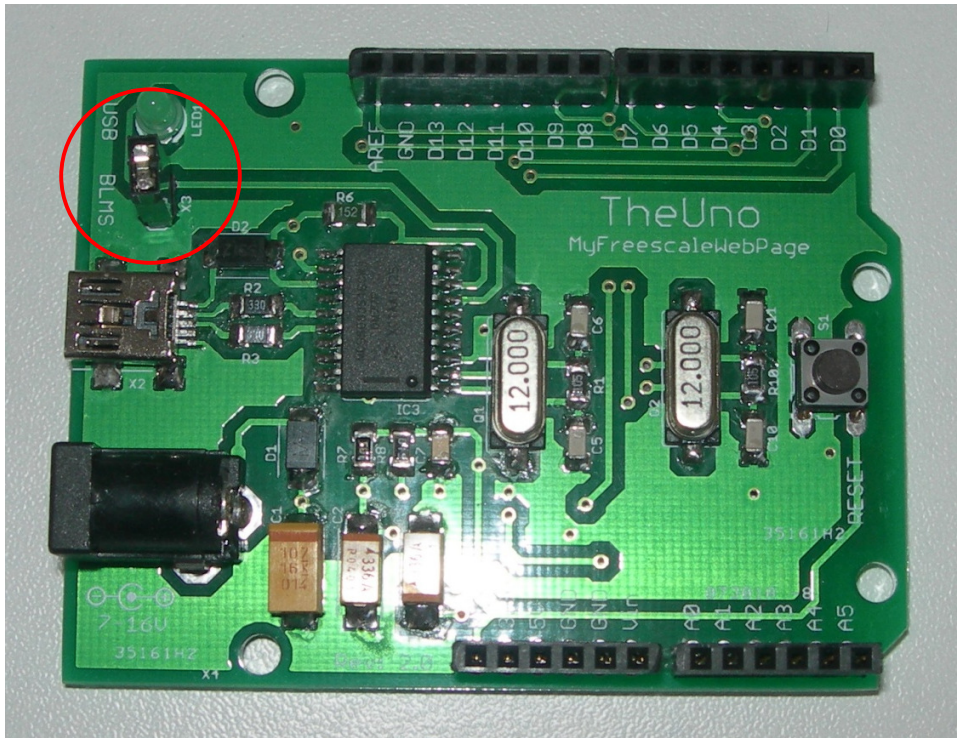
Now connect the USBDM to your computer. A new peripheral called "JS16" is detected and automatically installed.

Start "JS16 First Level Bootloader" utility.
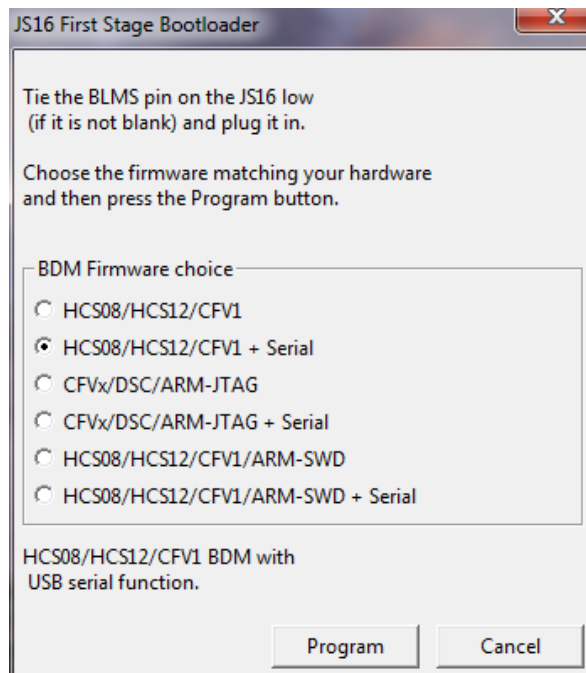
Select the right firmware according to your USBDM.

| Description	Firmware	BDM Firmware choice
USBDM_JS16CWJ	USBDM_JS16CWJ_V4	HCS08/HCS12/CFV1
USBDM_SER_JS16CWJ	USBDM_SER_JS16CWJ_V4	HCS08/HCS12/CFV1 + Serial
USBDM_SWD_JS16CWJ	USBDM_SWD_JS16CWJ_V4	HCS08/HCS12/CFV1/ARM-SWD
USBDM_SWD_SER_JS16CWJ	USBDM_SWD_SER_JS16CWJ_V4	HCS08/HCS12/CFV1/ARM-SWD + Serial
USBDM_CF_JS16CWJ	USBDM_CF_JS16CWJ_V4	CFVx/DSC/ARM_JTAG
USBDM_CF_SER_JS16CWJ	USBDM_CF_SER_JS16CWJ_V4	CFVx/DSC/ARM_JTAG + Serial

Click "Program" to flash the USBDM.

Wait some few seconds. The following message is finally displayed to indicate that the USBDM has been correctly flashed.
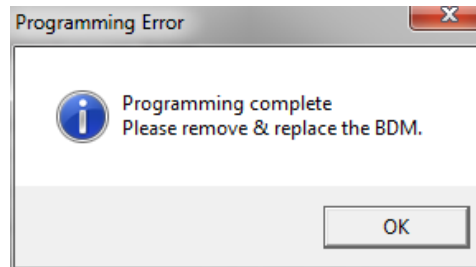
Click "OK" and disconnect the USBDM. It is now possible to use the USBDM.

4   Updating the USBDM firmware

Connect the USBDM to your computer and start "USBDM Firmware Updater" utility.
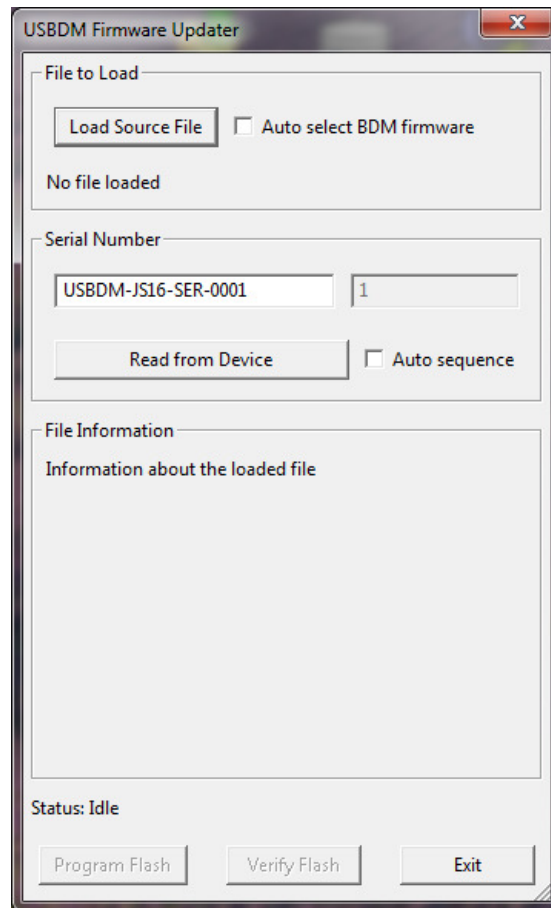
You can check "Auto select BDM firmware" to automatically chose the right USBDM firmware. Note that the Serial Number of the USBDM will be set to its default value in this case.

Instead, you can load the right firmware yourself by clicking "Load Source File" button and browsing to the USBDM firmware. It is then possible to set the Serial Number yourself or to click "Read from device" to reuse the existing Serial Number. This is very useful if you have several USBDM because you will be able to use them at the same time on your computer by giving them different Serial Number values.
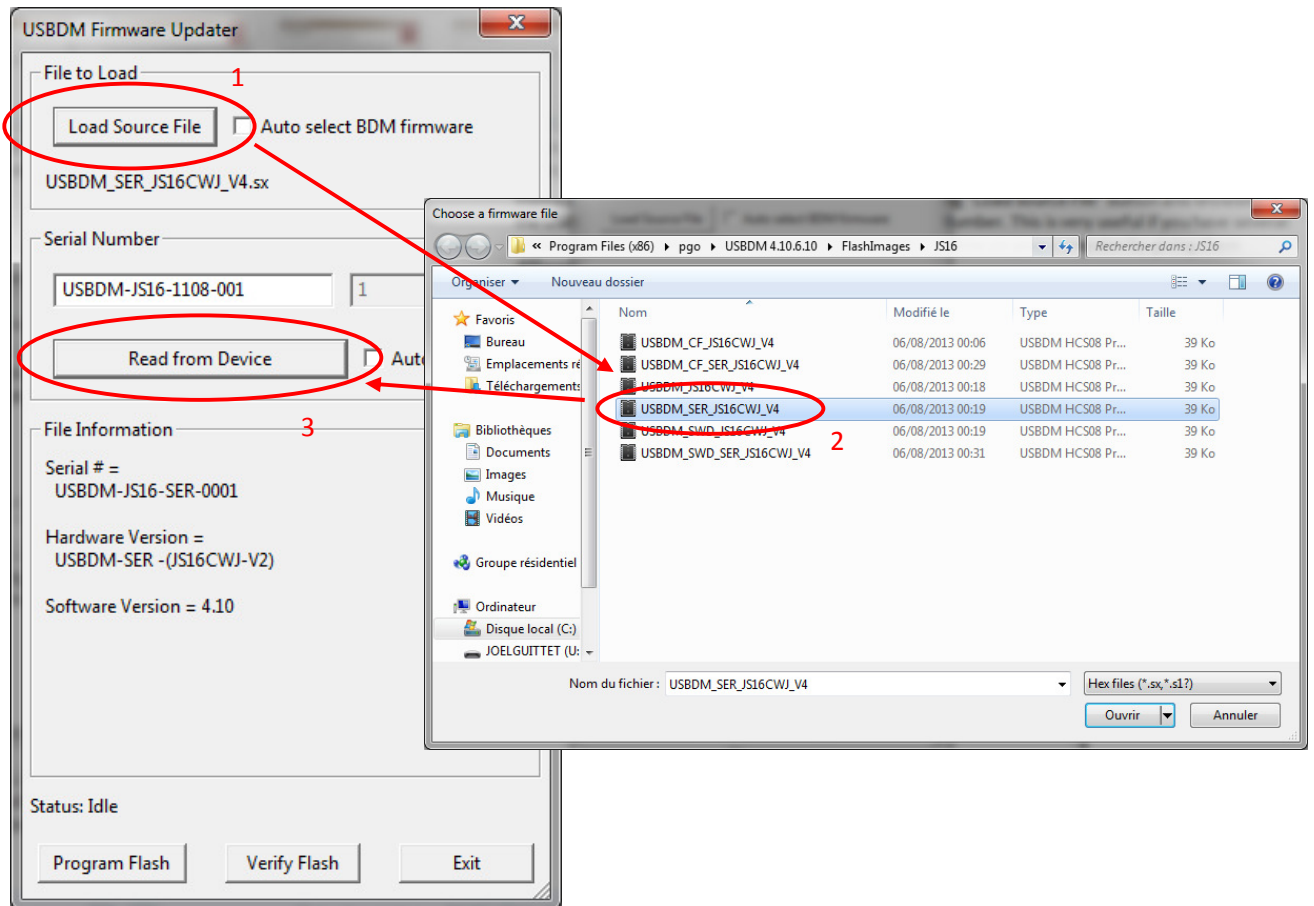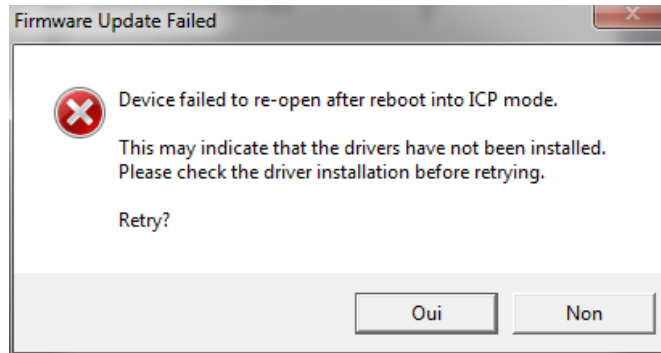

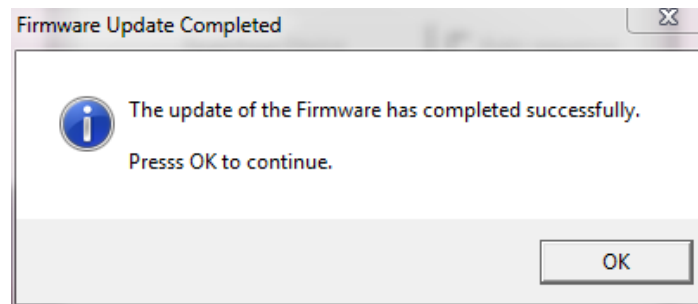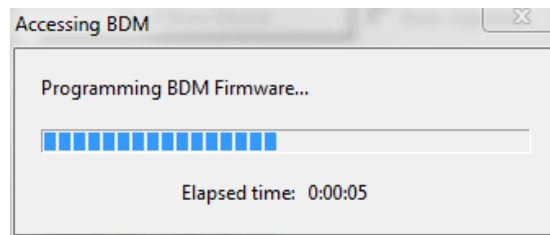Click on "Program Flash" button. The following window is displayed.
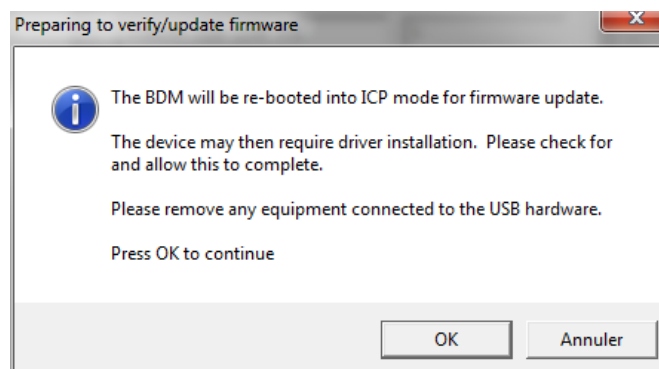
Click "OK" to validate. The USBDM reboots.

On my computer this is sometimes failing and the following message is displayed.

Click "No" to cancel the operation and try again by pressing "Program Flash" button.

The firmware of the USBDM is updated and verified.

It is now possible to use the USBDM.

5 Programming microcontrollers

5.1 Using standalone programmer

Some applications are provided by PGO to program microcontrollers with the USBDM. The following example is done using TheUno, on which the target microcontroller is a HCS08DZ60 device.

Connect the USBDM and start "HCS08 Programmer". The following window is displayed. The USBDM has been detected. Click "Detect" if not.
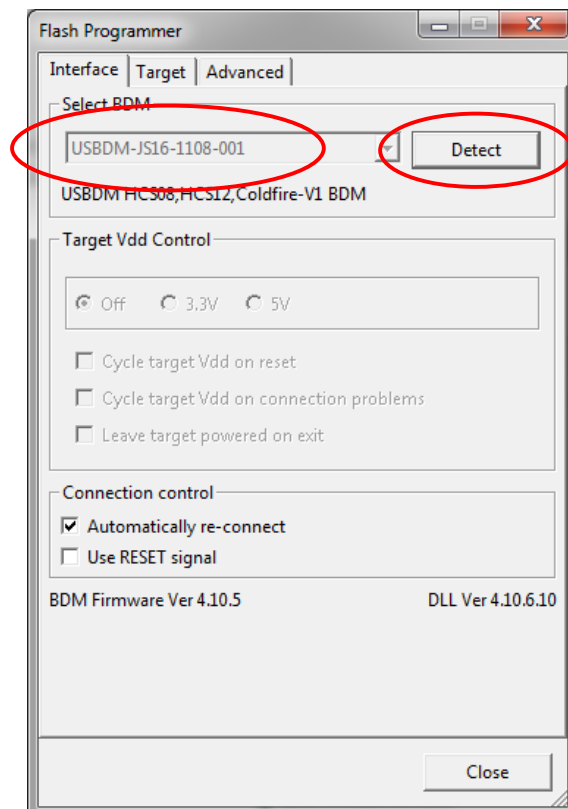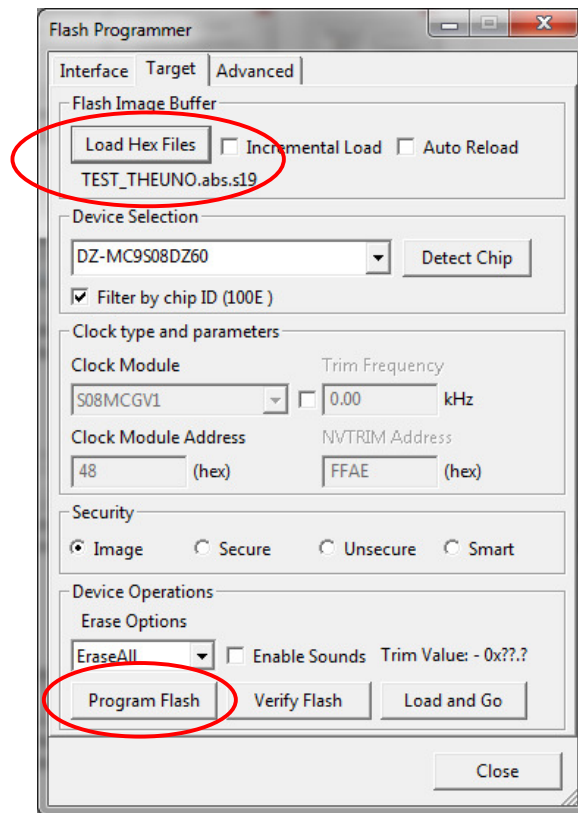
Go to the "Target" tab.

Click on "Detect Chip" to check the target microcontroller.
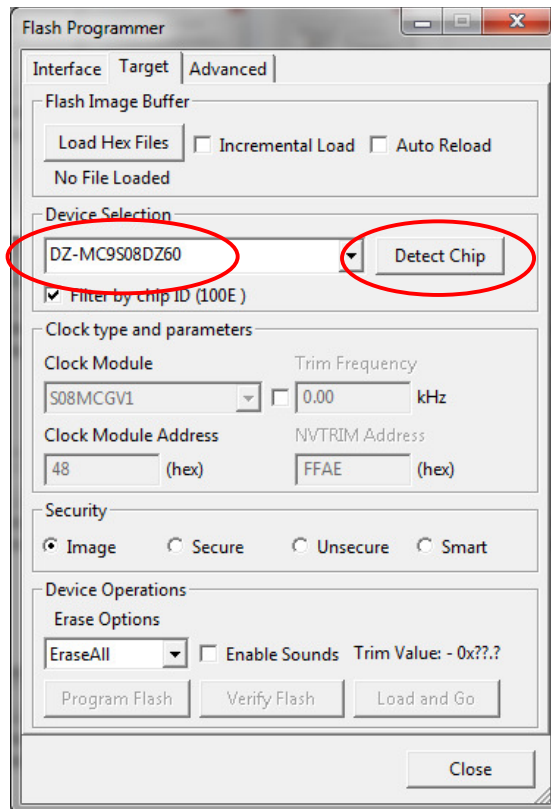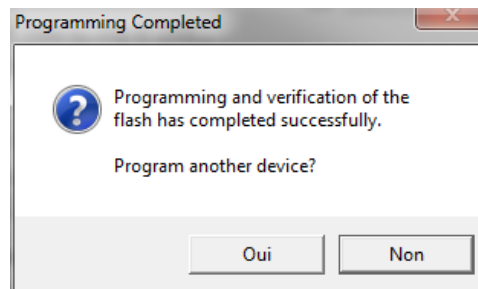

Choose the right microcontroller in the device selection list ("DZ-MC9S08DZ60" in this example).

Click on "Load Hex Files" to select the application you want to program. Finally click on "Program Flash".

The device is programmed and a message is displayed to indicate that the operation completed.
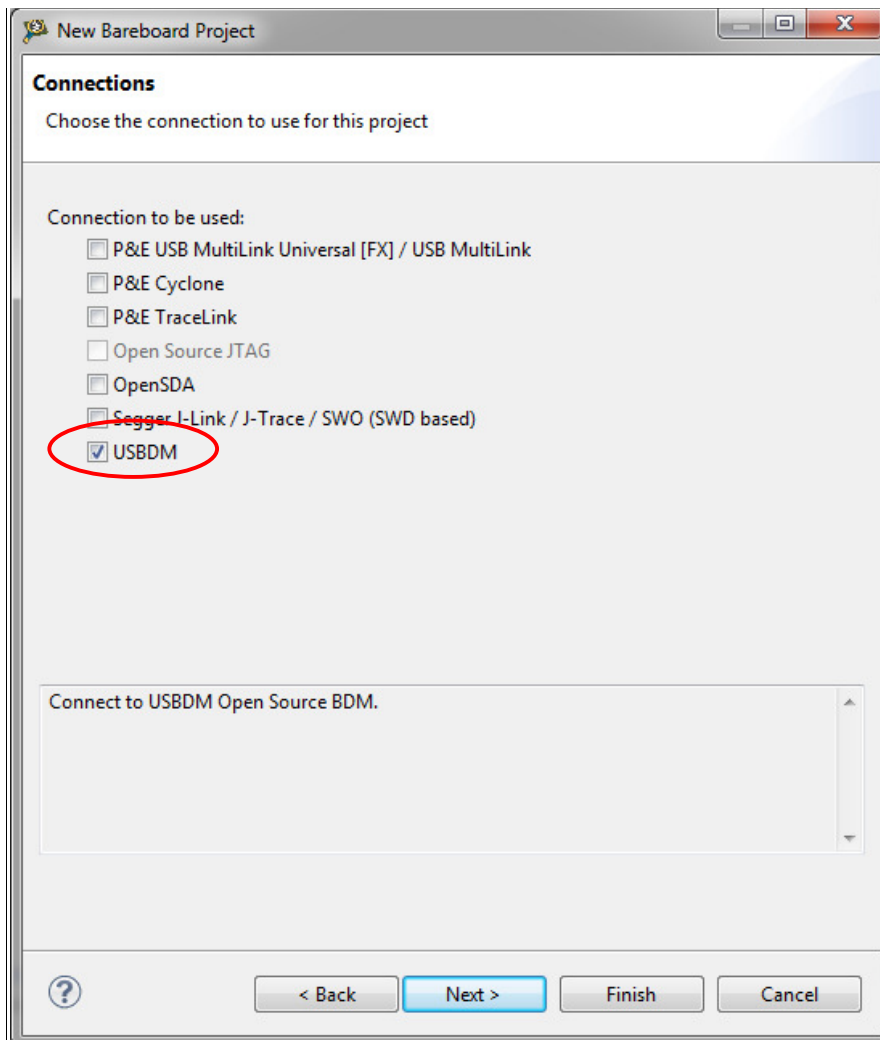

Click "No" and close the HCS08 Programmer utility.

5.2   Using Freescale CodeWarrior

It is possible to use the USBDM with Freescale CodeWarrior to load and debug applications.

Simply choose the USBDM in the connection list during the creation of the project, as shown on the following screenshot (Freescale CodeWarrior V10.6).

Then, it is possible to load and debug applications with the USBDM as done if you were using any other tool.

5.3   Target microcontroller "secured" - Programming failed

The target microcontroller may be "secured" the first time you attempt to perform the programming or if you have secured it. This means that the content of the Flash memory is protected and the USBDM fails to program the microcontroller in this case.

To unsecure the device, first power off your target, make a short circuit on BKGD signal with the ground and power on the target again. Finally remove the short circuit and load your program. This should now succeed (the microcontroller is no more secured).
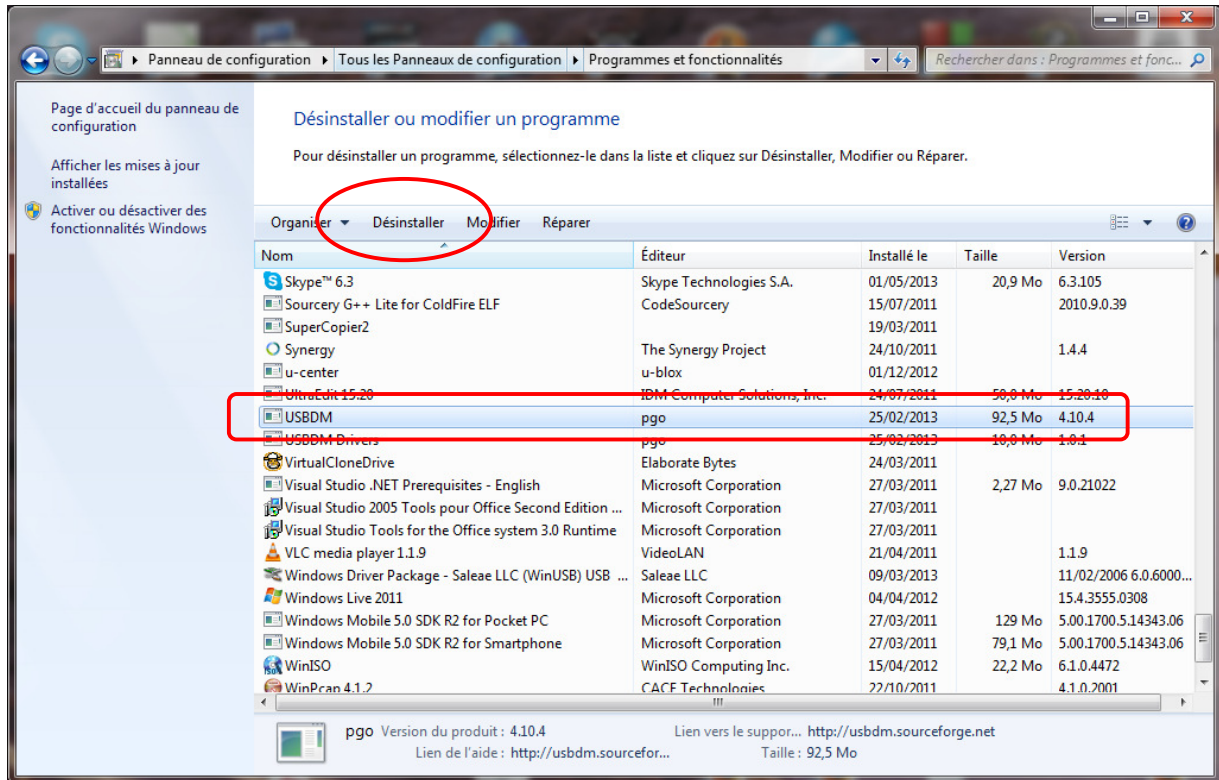
Conclusion

The USBDM is a powerful device. It is regularly updated to support new microcontrollers. You are now ready to build your own USBDM and use it to load and debug applications on many Freescale devices.
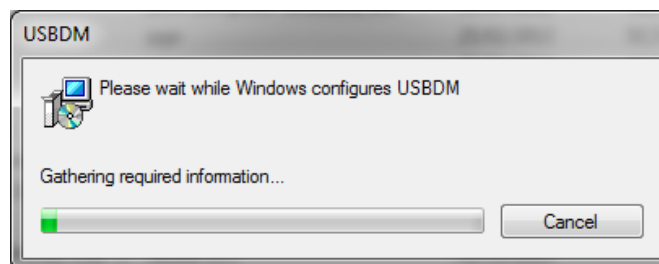
Appendix - Uninstalling the USBDM

Uninstalling the USBDM is done very simply using the Control Panel.
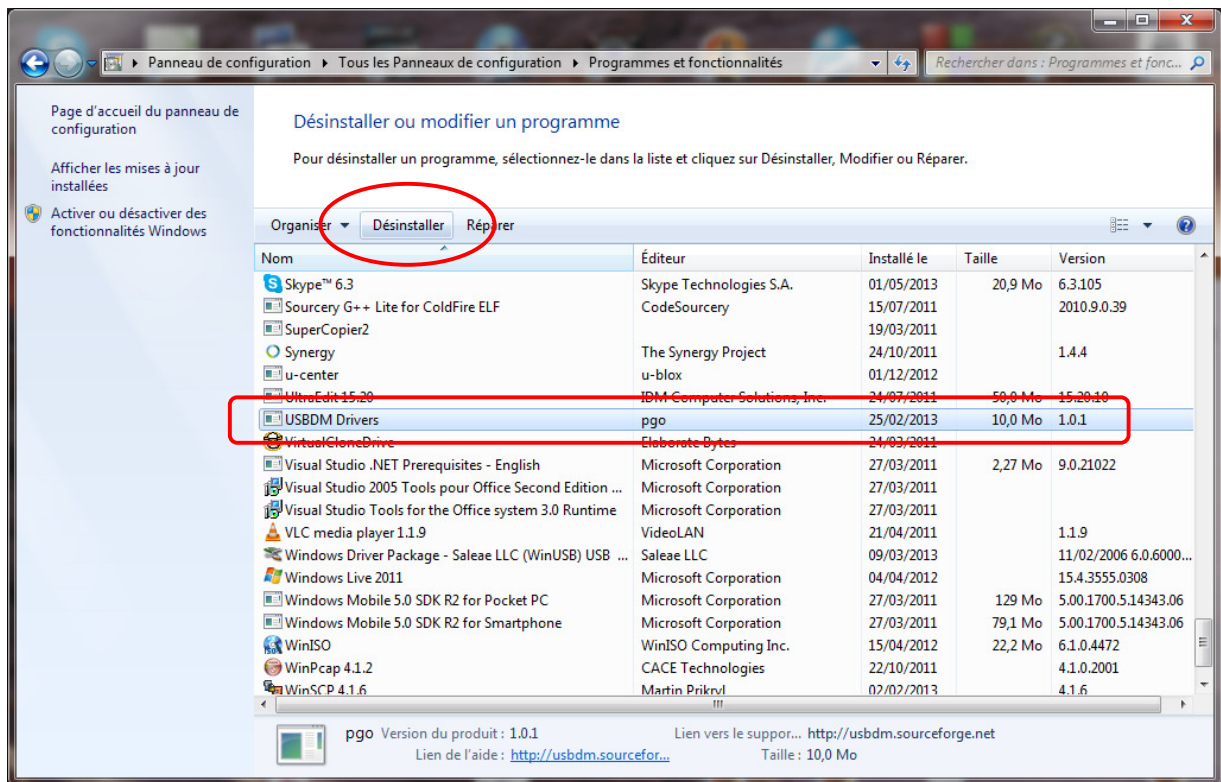
Select USBDM and click "Uninstall" button.

The USBDM is uninstalled.

Finally select USBDM Drivers and click "Uninstall" button.

The USBDM Drivers are uninstalled.