

Development environment with GNU Tool Chain

32-BIT MICROCONTROLLER FM3 Family Application note APPLICATION NOTE



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Target products

This application note is described about below products;

(TYPE0)

Series	Product Number (not included Package suffix)
MB9A100A	MB9AF102NA,MB9AF104NA,MB9AF105NA
	MB9AF102RA,MB9AF104RA,MB9AF105RA
MB9B100A	MB9BF102NA,MB9BF104NA,MB9BF105NA,MB9BF106NA
	MB9BF102RA,MB9BF104RA,MB9BF105RA,MB9BF106RA
MB9B300B	MB9BF304NB,MB9BF305NB,MB9BF306NB
	MB9BF304RB,MB9BF305RB,MB9BF306RB
MB9B400A	MB9BF404NA,MB9BF405NA,MB9BF406NA
	MB9BF404RA,MB9BF405RA,MB9BF406RA
MB9B500B	MB9BF504NB,MB9BF505NB,MB9BF506NB
	MB9BF504RB,MB9BF505RB,MB9BF506RB

(TYPE1)

Series	Product Number (not included Package suffix)
MB9A110A	MB9AF111LA,MB9AF112LA,MB9AF114LA
	MB9AF111MA,MB9AF112MA,MB9AF114MA,MB9AF115MA,MB9AF116MA
	MB9AF111NA,MB9AF112NA,MB9AF114NA,MB9AF115NA,MB9AF116NA
MB9A310A	MB9AF311LA,MB9AF312LA,MB9AF314LA
	MB9AF311MA,MB9AF312MA,MB9AF314MA,MB9AF315MA,MB9AF316MA
	MB9AF311NA,MB9AF312NA,MB9AF314NA,MB9AF315NA,MB9AF316NA



(TYPE2)

Series	Product Number (not included Package suffix)
MB9B110T	MB9BF116S,MB9BF117S,MB9BF118S
	MB9BF116T,MB9BF117T,MB9BF118T
MB9B210T	MB9BF216S,MB9BF217S,MB9BF218S
	MB9BF216T,MB9BF217T,MB9BF218T
MB9B310T	MB9BF316S,MB9BF317S,MB9BF318S
	MB9BF316T,MB9BF317T,MB9BF318T
MB9B410T	MB9BF416S,MB9BF417S,MB9BF418S
	MB9BF416T,MB9BF417T,MB9BF418T
MB9B510T	MB9BF516S,MB9BF517S,MB9BF518S
	MB9BF516T,MB9BF517T,MB9BF518T
MB9B610T	MB9BF616S,MB9BF617S,MB9BF618S
	MB9BF616T,MB9BF617T,MB9BF618T
MB9BD10T	MB9BFD16S,MB9BFD17S,MB9BFD18S
	MB9BFD16T,MB9BFD17T,MB9BFD18T

(TYPE3)

Series	Product Number (not included Package suffix)
MB9A130LA	MB9AF131KA,MB9AF132KA
	MB9AF131LA,MB9AF132LA

(TYPE4)

Series	Product Number (not included Package suffix)
MB9B110R	MB9BF112N,MB9BF114N,MB9BF115N,MB9BF116N
	MB9BF112R,MB9BF114R,MB9BF115R,MB9BF116R
MB9B310R	MB9BF312N,MB9BF314N,MB9BF315N,MB9BF316N
	MB9BF312R,MB9BF314R,MB9BF315R,MB9BF316R
MB9B410R	MB9BF412N,MB9BF414N,MB9BF415N,MB9BF416N
	MB9BF412R,MB9BF414R,MB9BF415R,MB9BF416R
MB9B510R	MB9BF512N,MB9BF514N,MB9BF515N,MB9BF516N
	MB9BF512R,MB9BF514R,MB9BF515R,MB9BF516R



(TYPE5)

Series	Product Number (not included Package suffix)
MB9A110K	MB9AF111K,MB9AF112K
MB9A310K	MB9AF311K,MB9AF312K

(TYPE6)

Series	Product Number (not included Package suffix)
MB9A140NA	MB9AF141LA,MB9AF142LA,MB9AF144LA
	MB9AF141MA,MB9AF142MA,MB9AF144MA
	MB9AF141NA,MB9AF142NA,MB9AF144NA
MB9A340NA	MB9AF341LA,MB9AF342LA,MB9AF344LA
	MB9AF341MA,MB9AF342MA,MB9AF344MA
	MB9AF341NA,MB9AF342NA,MB9AF344NA
MB9AA40NA	MB9AFA41LA,MB9AFA42LA,MB9AFA44LA
	MB9AFA41MA,MB9AFA42MA,MB9AFA44MA
	MB9AFA41NA,MB9AFA42NA,MB9AFA44NA
MB9AB40NA	MB9AFB41LA,MB9AFB42LA,MB9AFB44LA
	MB9AFB41MA,MB9AFB42MA,MB9AFB44MA
	MB9AFB41NA,MB9AFB42NA,MB9AFB44NA

(TYPE7)

Series	Product Number (not included Package suffix)
MB9A130N	MB9AF131M,MB9AF132M
	MB9AF131N,MB9AF132N
MB9AA30N	MB9AFA31L,MB9AFA32L
	MB9AFA31M,MB9AFA32M
	MB9AFA31N,MB9AFA32N

(TYPE8)

Series	Product Number (not included Package suffix)
MB9A150R	MB9AF154M,MB9AF155M,MB9AF156M
	MB9AF154N,MB9AF155N,MB9AF156N
	MB9AF154R,MB9AF155R,MB9AF156R



(TYPE9)

Series	Product Number (not included Package suffix)
MB9B120M	MB9BF121K,MB9BF122K,MB9BF124K
	MB9BF121L,MB9BF122L,MB9BF124L
	MB9BF121M,MB9BF122M,MB9BF124M
MB9B320M	MB9BF321K,MB9BF322K,MB9BF324K
	MB9BF321L,MB9BF322L,MB9BF324L
	MB9BF321M,MB9BF322M,MB9BF324M
MB9B520M	MB9BF521K,MB9BF522K,MB9BF524K
	MB9BF521L,MB9BF522L,MB9BF524L
	MB9BF521M,MB9BF522M,MB9BF524M



1 Introduction

1.1 Description

This documentation describes the implementation of GNU tool chain on the Eclipse platform for the FM3 family. The hardware of a host and the target are following.

This documentation describes the	method to use J-Link or ARM-USB-TINY in ICE.
----------------------------------	--

Host OS	Windows7(32bit)
ICE	J-Link / ARM-USB-TINY
Target board	SK-FM3-176PMC-ETHERNET V1.1
Target MCU	MB9BFD18T

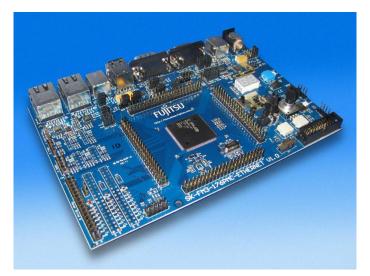


Figure 1 Spansion starterkit SK-FM3-176PMC-ETHERNET

The following programs are used to implement development environment in this documentation.

Compiler	YAGARTO
Driver	LibUSB
Debugger	OpenOCD
IDE	Eclipse + C/C++ development tooling(CDT)
Other	Java Runtime Environment



1.2 JTAG Interface

For flashing and debugging software on the MCU, the JTAG port of the board is used, and thus a JTAG interface is also needed.

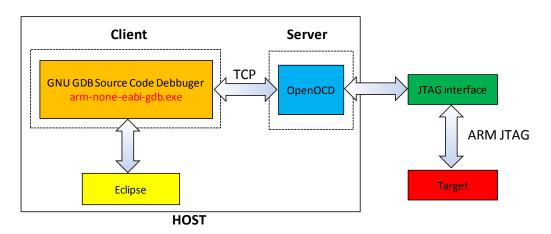


Figure 2 Relations of the host and the target with JTAG interface



1.3 J-Link

JTAG interface is the "J-Link". This interface is product of the company IAR Systems.



Figure 3 J-Link from IAR Systems

The IAR Systems "J-Link" has the following features. For more information about the J-Link: <u>http://www.iar.com/Global/Products/Hardware-Debug-probes/DS-J-Link-ARM-09.pdf</u>

- USB powered JTAG emulator for Cortex-M devices
- License for J-Link GDB server
- Support download in RAM and Flash
- License for the flash breakpoints
- SWD / SWV
- Voltage range: 1.2V-5V



1.4 ARM-USB-TINY

Another JTAG interface is the "ARM-USB-TINY". This interface is product of the company olimex.



Figure 4 ARM-USB-TINY from olimex

The olimex "ARM-USB-TINY" has the following features. For more information about the ARM-USB-TINY: <u>https://www.olimex.com/Products/ARM/JTAG/ARM-USB-TINY/</u>

- Debug all ARM microcontrollers supported by OpenOCD
- Fast speed USB 2.0 JTAG dongle interface
- Uses ARM's standard 2*10 pin JTAG connector
- Voltage range: 2V-5V
- Software supported by OpenOCD



2 Compiler

2.1 Yet another GNU ARM Tool Chain (YAGARTO)

There are a number of pre-built GNU ARM compiler toolsets available on the web. This application note uses the YAGARTO pre-built ARM compiler tool suite developed by Michael Fischer. This version of the GNU compiler toolset for ARM has been natively compiled for the Intel/Windows platform.

Except the ARM compiler toolset the Yagarto project provides also other tools needed to build a make file project on Eclipse CDT e.g. make utility.

2.2 Downloading Yagarto Tools

The Yagarto components can be downloading from the Yagarto Website:

http://www.yagarto.de/

# • • • • •	Web www.yagarto.de
YAGAR	RTO Yet another GNU ARM toolchain HOME HOW TO PROJECTS LINKS IMPRINT
HOME (hy? owto? ownload penOCD upport icense information on-commercial version ote	 Why another GNU ARM toolchain? Initially I was searching for a toolchain with the following features: not based on Cygwin works with Eclipse cheap for the beginners Ifound some native Windows toolchains based on MinGW, but the GDB of these toolchains doesn't work properly under Eclipse. That's why I decide to create a new toolchain suited for my requirements. YAGARTO was born (in 2006). YAGARTO is divided in three packages with the following components: JTAG debugger interface like the J-Link GDB Server or the Open On-Chip Debugger. Binutils, Newlib, GCC compiler, and the GDB debugger Eclipse Platform Runtime Binary and Eclipse CDT. YAGARTO is a hobby project and supported only by the community. If you want a faster start, a smoother workflow and professional support, take a look at a commercial toolchain like CrossWorks for ARM.

Use the "Download" link on the left menu pane.



=	* -	0	#	Web	www.yagarto.de/#download	
---	-----	---	---	-----	--------------------------	--

Download

The packages of YAGARTO can be found here:

Package	Version	Date
YAGARTO Tools (2 MB) (md5: 07a87ac3cd10bf32a0761390b5176895) Include tools like make, sh, touch, uname and more.	20100703	03.07.2010
TAGARTO GNU ARM toolchain (18 MB) (md5: 9ec8c449295b0b8dd60a7a22169e374c) This version is an EABI version now. If you update from an older YAGARTO version you must replace arm-elf- by arm-none-eabi- in your makefile. Note: I got a info that this version has some problems if the "svc 0" assembler instruction is used. (Error: SVC is not permitted on this architecture) It seems that this is a problem of the gas from binutils 2.21. If you also have this problem, use the YAGARTO version before.	Binutils-2.21 Newlib-1.19.0 GCC-4.5.2 GDB-7.2	23.12.2010
Integrated Development Environment You must download the IDE from eclipse.org, but the link above will give you some instructions.	Eclipse Eclipse CDT	

It is recommended to use the latest versions provided on the website.

Only the first two packages are recommended at this moment, because the installation description of the third package "Eclipse IDE" and "Eclipse CDT" will be separately explained in detail in chapter 7.

2.3 Installing YAGARTO tools

After saving the package, e.g. in the temporary folder "Yagarto-Downloads", the installation procedure of these tools can be started.



After downloading, start the installation of the make utility tools "*yagarto-tools-20100703-setup*" or newer.



SYAGARTO Tools 20100	703 Setup	🛛 🕏 YAGARTO Tools 20100703 Setup
	Welcome to the YAGARTO Tools 20100703 Setup Wizard	License Agreement Please review the license terms before installing YAGARTO Tools 20100703.
	This wizard will guide you through the installation of YAGARTO Tools 20100703.	Press Page Down to see the rest of the agreement.
	It is recommended that you close all other applications	GNU GENERAL PUBLIC LICENSE
	before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.	Copyright (C) 1989, 1991 Free Software Foundation, Inc. 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA Everyone is permitted to copy and distribute verbatim copies
B and I	Click Next to continue.	of this license document, but changing it is not allowed. Preamble
Park		If you accept the terms of the agreement, select the first option below. You must accept the agreement to install YAGARTO Tools 20100703. Click Next to continue.
		 G I accept the terms of the License Agreement C I do not accept the terms of the License Agreement
	Next > Cancel	VAGARTO Tools 20100703
S YAGARTO Tools 20100	703 Setup	🛛 🐼 YAGARTO Tools 20100703 Setup
	Choose Components Choose which features of YAGARTO Tools 20100703 you wani install.	to Choose Install Location Choose the folder in which to install YAGARTO Tools 20100703.
Check the components you winstall. Click Next to continue.	ant to install and uncheck the components you don't want to	Setup will install YAGARTO Tools 20100703 in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Select components to install:	Add the make utils to the PATH variable	
		Destination Folder
		C:\Yagarto\yagarto-tools-20100703 Browse
Space required: 2.6MB	Poscription Position your mouse over a component to see its	Space required: 2.6MB
YAGARTO Tools 20100703	description.	Space available: 3.4GB VAGARTO Tools 20100703
	< Back Next > Cancel	< Back Next > Cancel
SYAGARTO Tools 201007	703 Setup	P YAGARTO Tools 20100703 Setup
	Choose Start Menu Folder Choose a Start Menu folder for the YAGARTO Tools 20100703 shortcuts,	Installation Complete Setup was completed successfully.
Select the Start Menu folder ir can also enter a name to crea	n which you would like to create the program's shortcuts. You te a new folder.	Completed
YAGARTO Tools		Show details
Autostart Avira	<u>^</u>	· · · · · · · · · · · · · · · · · · ·
Cygwin ElsterFormular Microsoft Office		
OpenOffice.org 3.3 Packard Bell ImageWriter		
Panda Security Sandboxie Spiele		
Verwaltung	×	
YAGARTO Tools 20100703	< Back Install Cancel	VAGARTO Tools 20100703
	S YAGARTO Tools 20100703 Setu	
		pleting the YAGARTO Tools 00703 Setup Wizard
	YAGAR	TO Tools 20100703 has been installed on your
		iish to close this wizard.
	Personal Providence of the Pro	
	TAS	
	Visit the	a YAGARTO site for the latest news.
		< Back. Finish Cancel



Next, start the following installation of the ARM compiler toolset "yagarto-bu-2.21_gcc-4.5.2-c-c++_nl-1.19.0_gdb-7.2_eabi_20101223" or newer.





3 Driver

3.1 LibUSB

Note, this chapter describes the method which set a driver with J-Link. But this method is common for ARM-USB-TINY.

J-Link must be set a driver to use OpenOCD. In this documentation, use "LibUSB" driver. Because ordinary J-Link driver doesn't support OpenOCD, it must be replaced in LibUSB. When replace it, using "Zadig" which is free tool (LGPL). Because LibUSB is included in Zadig beforehand, it doesn't need to download LibUSB in individual. Zadig can available from the following website.

http://sourceforge.net/projects/libwdi/files/zadig/

3.2 Installing LibUSB

Please connect J-Link and your PC. If ordinary driver is set in J-Link, it doesn't need deleting. When Zadig starts, the next window below will be displayed.

Zadig	
Device Options Help	✓ Edit More Information WinUSB (libusbx) libusb-win32
WCID ² Install WCID Driver	libusbK WinUSB (Microsoft) Zadig v20.1.157



evice	Options Help		
	List All Devices v Ignore Hubs or Composite Parents		Edit
	 ✓ <u>O</u>reate a Catalog File ✓ <u>Sign</u> Catalog & Install Autogenerated Certificat 		More Information
Driver USB II	<u>A</u> dvanced Mode).16385)	WinUSB (libusbx) libusb-win32
	2 Install W	CID Driver	l <u>ibusbK</u> <u>WinUSB (Microsoft)</u>

Please Click on Option→List All Devices.

Chose J-Link driver from pull-down menu, please set libusb-win32 (v1.2.6.0) in Driver.

adig <u>)</u> evice <u>O</u> ptions	<u>H</u> elp		
J-Link driver			Edit
Driver jlink (v2 USB ID 1366	2.6.5.0)	libusb-win32 (v1.2.6.0)	More Information <u>WinUSB (libusbx)</u> libusb-win32
WCID ²		Replace Driver	libusbK WinUSB (Microsoft)

If click on Replace Driver, replacing of driver will start.

Driver	Installation
į	The driver was installed successfully.
	Close



Please confirm that *J-Link driver* is included in *libusb-win32 devices* from the device manager window.

鳥 デバイス マネージャ	
ファイル(E) 操作(A) 表示(V) ヘルブ(H)	
10 🖆 👙 😢 💷 🧏 ≈ 🗶 🗶	
■ PC102208 ● ● DVD/OD-ROM ドライブ ● DVD/OD-ROM ドライブ ● DD ATA/ATAPI コントローラ ● ● Dussb-win32 devices ● ● Ususb-win32 devices ● ● ジステム ディスクレータ ● ● ジステム ンクーク フィク ンタークコイス デバイス ● ● ジスト (COM と LPT) ● ● マウスとそのほかのポインティング デバイス ● ● ご能爆球ポリューム	



4 Debugger

4.1 Open On-Chip Debugger (OpenOCD)

The Open On-Chip debugger is an open source software solution for accessing embedded ARM cores via JTAG hardware interface "JTAG dongle".

OpenOCD support many of JTAG dongles. The most of this dongles are based of the FTDI USB device chip FT2232D from Future Technology Devices International Ltd. This chapter describes the method to use OpenOCD.

4.2 Using LibUSB driver

4.2.1 Installing OpenOCD which supported LibUSB

The Windows installer program for the version of OpenOCD that support LibUSB driver can be downloaded from the website: (Please use OpenOCD 0.5.0 or later for FM3 family) http://openocd.sourceforge.net/

For the next steps it is needed to recall the location of the folder, where OpenOCD was installed, e.g. *C:*¥OpenOCD_LibUSB.



4.2.2 Run OpenOCD

A configuration script file openocd.cfg for OpenOCD is also needed (This file is included in the software package of this application note). The OpenOCD configuration file openocd.cfg for the MB9BFD18T example is shown below

```
#interface jlink  If using J-Link, please set this line enable.
#interface ft2232
                                                   lf
                                                      using ARM-USB-TINY,
#ft2232 device desc "Olimex OpenOCD JTAG TINY"
#ft2232 layout olimex-jtag
                                                  please set these lines enable.
#ft2232 vid pid 0x15ba 0x0004
# Fujitsu Cortex-M3 with 1MB Flash and 64*2 kB RAM
if { [info exists CHIPNAME] } {
      set _CHIPNAME $CHIPNAME
} else {
       set CHIPNAME mb9bfxx6
}
if { [info exists ENDIAN] } {
     set _ENDIAN $ENDIAN
} else {
      set ENDIAN little
}
if { [info exists CPUTAPID ] } {
      set _CPUTAPID $CPUTAPID
} else {
      set CPUTAPID 0x4ba00477
}
#delays on reset lines
jtag nsrst delay 100
jtag_ntrst_delay 100
# Fujitsu cortex-M3 reset configuration
# reset config trst only
reset config trst and srst
jtag newtap $ CHIPNAME cpu -irlen 4 -ircapture 0x1 -irmask 0xf -expected-id
$ CPUTAPID
set TARGETNAME $ CHIPNAME.cpu
target create $ TARGETNAME cortex m3 -endian $ ENDIAN -chain-position
$ TARGETNAME
# MB9BFD18 has 64*2kB of RAM on its main system bus
$ TARGETNAME configure -work-area-phys 0x1FFF0008 -work-area-size 0x8000
-work-area-backup 0
```



MB9BFD18 has 1MB of user-available FLASH # flash bank mb9bf500 <base> <size> 0 0 <target#> <variant> <cclk> [calc_checksum] set _FLASHNAME \$_CHIPNAME.flash flash bank \$_FLASHNAME fm3 0 0 0 0 \$_TARGETNAME mb9bfxx6 # 4MHz / 6 = 666kHz, so use 500 jtag_khz 500



To run the OpenOCD server, start the windows prompt and go to the folder, where the OpenOCD executable file was generated, and run this program with the -f argument with the path to the configuration file above. For example:

>Openocd-0.5.0 -f < Your path to the Eclipse workspace project >/ openocd.cfg

If using J-Link, please confirm that the following window is displayed.

🔤 コマンドプロンプト - openood-0.5.0 -f/openood.ofg - 🗖 3
C:¥0penOCD_LibUSB¥bin>openocd-0.5.0 -f/openocd.cfg
Open On-Chip Debugger 0.5.0 (2011-08-09-23:21)
Licensed under GNU GPL v2
For bug reports, read
http://openocd.berlios.de/doc/doxygen/bugs.html
Warn : Adapter driver 'jlink' did not declare which transports it allows; assumi
ng legacy JTAG-only
Info : only one transport option; autoselect 'jtag'
adapter_nsrst_delay: 100 jtag_ntrst_delay: 100
trst_and_srst_genay. noo trst_and_srst_separate_srst_gates_jtag_trst_push_pull_srst_open_drain
Info : ******HWE* FLASH CMD Parameter mb9bfxx6.cpu
Info : *****HWE* fm3 Variant set to: mb9bfxx6
500 kHz
Info : J-Link initialization started / target CPU reset initiated
Info : J-Link ARM V8 compiled Dec 6 2011 18:57:44
Info : J-Link caps 0xb9ff7bbf
Info : J-Link hw version 80000
Info : J-Link hw type J-Link Jafa : J-Link may may black 0440
Info : J-Link max mem block 9440 Info : J-Link configuration
Info : USB-Address: 0x0
Info : Kickstart power on JTAG-pin 19: 0x1
Info : Vref = 4.296 TCK = 1 TDI = 0 TDO = 1 TMS = 0 SRST = 0 TRST = 0
Info : J-Link JTAG Interface ready
Info : clock speed 500 kHz
Info : JTAG tap: mb9bfxx6.cpu tap/device found: 0x4ba00477 (mfg: 0x23b, part: 0x
ba00, ver: 0x4)
Info : mb9bfxx6.cpu: hardware has 6 breakpoints, 4 watchpoints



If using ARM-USB-TINY, please confirm that the following window is displayed.

🗪 コマンド プロンプト - openocd-0.5.0.exe -f ./openocd.cfg	- 🗆	<
C:¥OpenOCD_LibUSB¥bin>openocd-0.5.0.exe -f ./openocd.cfg Open On-Chip Debugger 0.5.0 (2011-08-09-23:21) Licensed under GNU GPL v2	1	3
For bug reports, read http://openocd.berlios.de/doc/doxygen/bugs.html		
Info : only one transport option; autoselect 'jtag' adapter_nsrst_delay: 100		
jtag_ntrst_delay: 100 trst_and_srst separate srst_gates_jtag trst_push_pull srst_open_drain Info : ******#WE* FLASH CMD Parameter mb9bfxx6.cpu Info : ******#WE* fm3 Variant set to: mb9bfxx6 500 kHz		
Info : clock speed 500 kHz Info : JTAG tap: mb9bfxx6.cpu tap/device found: 0x4ba00477 (mfg: 0x23b, part ba00, ver: 0x4)	:: 0×	
Info : mb9bfxx6.cpu: hardware has 6 breakpoints, 4 watchpoints		-1



5 Java Runtime Environment (JRE)

5.1 Checking for JRE

The installation of Eclipse requires the availability of Java as a virtual machine on system.

To check, that Java already exists on the system, type the command Java -version on DOS console.

C:\WINDOWS\system32\cmd.exe	- 🗆 ×
(C) Copyright 1985-2001 Microsoft Corp.	•
C:\Dokumente und Einstellungen\>java -version java version "1.6.0_24" Java(TM) SE Runtime Environment (build 1.6.0_24-b07) Java HotSpot(TM) Client VM (build 19.1-b02, mixed mode, sharing)	
C:\Dokumente und Einstellungen\	-

If windows cannot recognize this command, Java Runtime Environment (JRE) is needed to be installed.

5.2 Installing Java JRE

Download JRE from following URL:

```
http://java.com/
                                                                                                                                            👻 🛃 👻 Such
                        java.com/en/download/windows\_manual.jsp
                                                                                                                                 Search
                                                                                                                                                   Q
                                  ajava.cor
                                                       Java Downloads for Windows
                                                       Recommended Version 6 Update 24
                                                       Select the file according to your operating system from the list below to get the latest Java for your
                                                       computer
                                                        > All Java Downloads
                                                                                       Remove Older Versions
                                                                                                                              > What is Java?
                                                       By downloading Java you acknowledge that you have read and accepted the terms of the <u>end user</u>
                                                       license agreement
                                                           🎥 Windows
                                                                Windows 7/XP/Vista/2000/2003/2008 Online
                                                                                                                                     Verify Now
                                                                                                               Instructions
                                                                 filesize: ~ 10 MB *
                                                                                                                               After installing Java
                                                           O Windows 7/XP/Vista/2000/2003/2008 Offline
                                                                                                                               restart your browser and
                                                                                                               Instructions
                                                                                                                               <u>verify Java has been</u>
                                                                filesize: 15.3 MB
                                                                                                                               installed correctly.
                                                        » Information about the 64-bit Java plug-in
                                                        * Typical download size is 10 MB, which is the minimum download. The size may increase if
                                                        additional features are selected.
                                                       What is Java?
```

Java installation can be done online or offline. Download one of the installation programs and start the installation procedure to install JRE.



- 6 Eclipse platform
- 6.1 Eclipse platform

The latest release of eclipse is available to download from the web site:

http://download.eclipse.org/eclipse/downloads/

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6 + + +	ft Q web download edges	arg/edgen/devrheald/		•] [🚮 -] Suche set Google	1
eclipse downlo				Friend of DSE	
				Support Eclipsel Become a triand	
Latest Downloads					
problems downloading	g the drops, contact the webmast	y the <u>Eclipse Project</u> . To get starts ter, if you have problems installing a of the <u>Eclipse Foundation Softwa</u>	or getting the workbench to ru	ugh the user and developer documentation provided in the online help system. If you have <u> <u> <u> </u> <u> </u></u></u>	
See other eclipse org	project downloads				
	project downloads clipse translations - check out 10	Babel project			
Help out with Ex		e Babel project			
Kelp out with En	clipse translations - check out 10	9.00	ved builds (including language	packs), or see a list of o2 update sides.	
SDK Terrents SDK Terrents See also the <u>build sch</u>	clipse translations - check out 10	9.00	<u>wed builds</u> (including language Baild Status	packs), or see a list of <u>o2 update sites</u> . Build Date	
Help out with Ex SDK Torrents See also the <u>build sch</u> Build Type	clipse translations - check out 10	Serent <u>kinds of builds</u> , access <u>arch</u>			
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The Helios release 3.6.1 (or later) consists of various packages. These packages are available on the left menu of the download website of the Eclipse project.

For our system it is required a minimum eclipse platform to be realized. The package needed for this can be found by the menu section "Platform Runtime Binary".





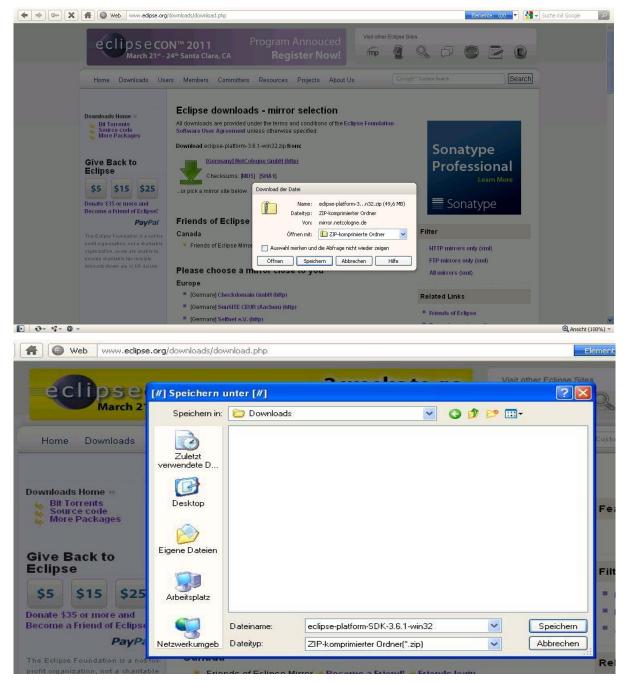
The Eclipse platform binary package is available for many operating systems.

For Windows systems with 32 bit CPU use the first "http" location of this list to download the adequate Eclipse package for this system.

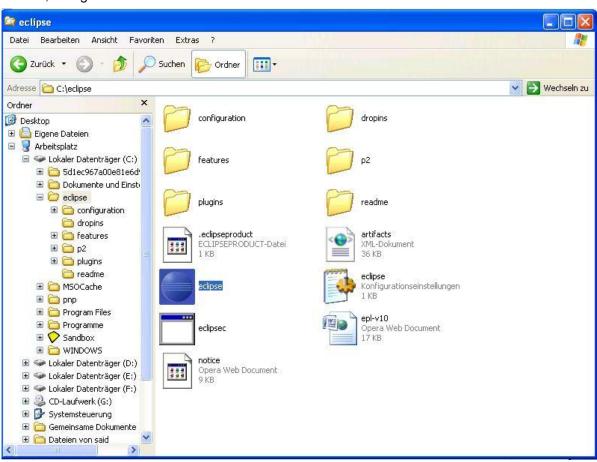
Platfor	Platform Runtime Binary 🎛					
Status	Platform	Download	Size			
•	Windows (Supported Versions)	(http)	57 MB			
•	Windows (x86_64) (Supported Versions)	(http)	57 MB			
•	Linux (x86/GTK 2) (Supported Versions)	(http)	57 MB			
	Linux (x86_64/GTK 2) (Supported Versions)	(http)	57 MB			



The Eclipse platform binary is available from many http mirrors. After choosing one of these mirrors the software can be downloaded.







After downloading and saving the zip file eclipse-platform-SDK-3.6.1-win32.zip, decompress this file, to e.g. *C*:¥

With the installation of Eclipse platform runtime binary, this installation of Eclipse is finished.



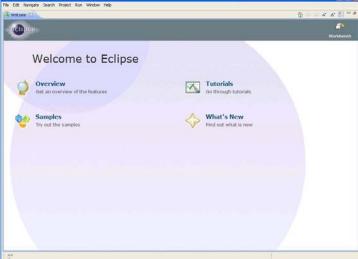
6.2 Start Eclipse IDE

The Eclipse IDE is now ready to start; for this start eclipse.exe from the folder *C:¥eclipse*. At first the workspace, where Eclipse should store the project files, has to be specified.

🛢 Worksp	ace Launcher	
	rorkspace orm stores your projects in a folder called a workspace. orkspace folder to use for this session.	
Workspace:	C:\Dokumente und Einstellungen\said\workspace	Browse
Use this a	is the default and do not ask again	OK Cancel

After the selection of the workspace, Eclipse starts.







7 C/C++ Development Tooling CDT

7.1 Installation of new software on Eclipse

After the installation of Eclipse, it is necessary to import the CDT package to Eclipse for developing C or C++ applications. The CDT package is available as a plug-in.

To install new software on Eclipse, start Eclipse and follow the installation instruction via the $Help \rightarrow Install$ New Software menu.

🖨 Resource - Eclipse Platform		
File Edit Navigate Search Project Run Window	Help	
🚳 Welcome 🖾	🚳 Welcome	
Tutorials Samples What's New	 Pelp Contents Search Dynamic Help 	
Overview The Eclipse Platform is a kind of	Key Assist Ctrl+Shift+L Tips and Tricks Cheat Sheets	
	Check for Updates	xtensible IDE for anything a
	Install New Software	
	About Eclipse Platform	
Get familiar with the C/C++ Development	velopment Tools (CDT)	

The installation of CDT plug-in or any another package to the Eclipse platform depends on the procedure, which the user selects to add this software to the platform. After clicking of the *add* button the *Add Repository* window appears.

🖨 Install		- 😅 (
Available Soft Select a site or er	ware hter the location of a site.		
Work with: type	e or select a site	Add	
type filter text	E Add Repository	nore software by working with the <u>"Available Software Sites"</u> prefere	inces.
Name There Select All Details	Name: Location: http:// 2 Deselect All	OK Cancel	
Group items by	atest versions of available softw category ate sites during install to find rea	What is <u>already installed</u> ?	



Eclipse supports two different methods to implement new plug-ins to the platform:

When the plug-in is available locally on the system as *JAR* or *ZIP* file, the installation can be done offline.

Resource - Eclipse Platform	
e Edit Navigate Search Project Run Window He	
Welcome X	🖨 install
Tutorials Samples What's New	Available Software Select a site or enter the location of a site.
Overview	Work with: type or select a site Add Find more software by working with the " <u>Available Software Sites</u> " preferences.
The Eclipse Platform is a kind of ur	type filter text
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Repository archive	Name:
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Zuletzt verwendete D Desktop Eigene Dateien	OK Cancel OK Cancel Hide Rems that are already installed What is <u>already installed</u> ? d software
Arbeitsplatz Dateiname: Netzwerkumgeb Dateityp: *jar,",zip	Öffnen Abbrechen

When the plug-in is available from an http project website, a new installation or update of this software is done online.

🖨 Install				
Available Select a site	or enter the	ocation of a site. Repository		
Work with:	ty Name:	CDT	Local)
	Location	http://download.eclipse.org/tools/cdt/releases/helio	Archive) <u>re Sites"</u> preferences.

The online method is recommended. For this procedure first adapt the Eclipse network settings to the network configuration before initiate the installation procedure.



7.2 Eclipse Network Configuration

From the Eclipse sub menu *Preferences* on the category *Window*, configure the settings for your network.

🗲 Resource - Eclipse Platform				
File Edit Navigate Search Project Run 🕚	Window Help			
Welcome X	New Window New Editor Show Toolbar			1 () () () () () () () () () (
Tutorials Samples Wr	Open Perspective Show View	•		Workbench
Overview The Eclipse Platform is a	Customize Perspective Save Perspective As Reset Perspective Close Perspective Close All Perspectives		form - an open extensible IDE for anything and nothing in particular.	0
	Navigation	•		
Get familiar with the C/C	Preferences ++ Development Tool	ls (i	сот)	

The configuration of the network can be realized from the *Network connections* field. From this field, edit the network setting entry and do the necessary changes to enable for Eclipse the communication to the internet.

Resource - Eclipse Platform	🗖 🗖 🔀				
File Edit Navigate Search Project Run Window Help					
😣 Welcome 🗙	🟠 🗇 🖧 🛣 🖀 🗖 🖻				
Tutorials Samples What's New	Workbench				
type filter text	Network Connections				
The Eclipse Platform is a ki General Get familiar with the C/C+ Get familiar with the C/C+	Active Provider: Native				
Workbench basics -SSH2 Learn about basic Eclipse ∋search Startup and Shutdown ⊕ Workspace ⊕ Team support ⊕ Find out how to collaborat ⊕ Image: Nate of the state	HTTP Manual False HTTPS Manual False SOCKS Manual False E Edit Proxy Entry Chema: HTTP Ost: Requires Authentication: ser: assword: OK Cancel				
0	Restore Defaults Apply OK Cancel				

After this change click the *Apply* button to save the new network configuration. Now the online installation of the CDT plug-in can be done.



7.3 Eclipse CDT Plug-In

The CDT plug-in exists in a Standard and a Zylin version, but only the installation of one version is required.

For the integration of new CDT plug-ins on eclipse-platform, the demonstration of this installation follows below.

Under Help menu, click on Install New Software....

Help	_	
🛞 Welcome	🏠 🗘 🖒 🖈 👔	* 🖀 🗖 🖷
 Pelp Contents Search Dynamic Help 	w	/orkbench
Key Assist Ctrl+Shift+L Tips and Tricks Cheat Sheets		
Check for Updates Install New Software		
About Eclipse Platform	Tutorials	
res	Go through tutorials	
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	Find out what is new	
	 Help Contents Search Dynamic Help Key Assist Ctrl+Shift+L Tips and Tricks Cheat Sheets Check for Updates Install New Software 	Welcome Key Assist Check for Updates Totad New Software About Eclipse Platform res What's New

On the next window, click on *Available Software Sites* to look for a CDT downloading mirror, if existing. The mirror is: <u>http://download.eclipse.org/tools/cdt/releases/helios/</u>.

		Version	
ted. Preferences		1. H. M. H.	
pe filter text			
General	Available Software Sites		Contraction of the second second
C/C++	type filter text		
Help Install/Update	Name -	Location	
Automatic Updates		http://download.eclipse.org/datatools/upda	And .
Available Software Sites		http://download.eclipse.org/dsdp/mtj/updat	Edt
Remote Systems Run/Debug		http://download.eclipse.org/dsdp/mtj/updat	Remove
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		http://download.eclipse.org/mat/1.0/updates	Ensble
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		hite.//doi.uda.sd.scipsc.org/no.com/mat/	
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Otherwise click on *Add* to set the required mirror. Enter *CDT* for the name and <u>http://download.eclipse.org/tools/cdt/releases/helios/</u> for the web location.

E Navigata Search Project Run Window Heb	
Deser	Available Software: 50 MB eclass-slatform-3.6 1-wm/32.936_64.pp Select a site or elitier the locabilities a site. eclass-slatform-3.6 1-wm/32.936_64.pp mitrix 49 MB eclass-slatform-3.6 1-imuestic ter az
Welcome to Ed	Work with: type or select a site
Overview Get an overview of the features	Name CDT Local Location: tp://download.edipse.org/tools/cdt/releases/helos/f Archive
Samples Try out the samples	Select All Cancel
	Show only the latest versions of available software Hide items that are already installed Group items by category What is <u>already installed</u> Contact all update sites during install to find required software
	(?) <back next=""> Frank Cancel</back>

Click on *OK* and the next window below will be displayed. Select both *CDT MAIN Features* and the *CDT Optional Features* listed below only.

ame	Version
OT Main Features	1.152.001
C/C++ Development Tools	7.0.2.201102110609
C/C++ Development Tools SDK	7.0.2.201102110609
CDT Optional Features	
C/C++ Code Analysis Framework (Codan)	1.0.0.201102110609
C/C++ Debugger Services Framework (DSF) Examples	2.1.0.201102110609
C/C++ Development Platform	7.0.2.201102110609
C/C++ DSF GDB Debugger Integration	2.1.0.201102110609
C/C++ GCC Cross Compiler Support	1.0.0.201102110609
🔽 🍫 C/C++ GDB Hardware Debugging	7.0,0.201102110609
🗹 🍫 C/C++ GNU Toolchain Build Support	7.0.0.201102110609
🗹 🍫 C/C++ GNU Tookhain Debug Support	7.0.1.201102110609
C/C++ Memory View Enhancements	2.1.0.201102110609
C/C++ Remote Launch	6.0.0.201102110609
C99 LR Parser	5.1.1.201102110609
Que Constant SDK	5.1.1.201102110609
CDT Tests	7.0.0.201102110609
Eclipse Debugger for C/C++	1.0.0.201102110609
Miscellaneous C/C++ Utilities	5.1.0.201102110609
🗖 🧐 P2 C/C++ Toolchain Installer	1.0.0.201102110609
Unified Parallel C Berkeley UPC Tookhain Support	1.0.3.201102110609
Unified Parallel C Support	5.1.0.201102110609
Unified Parallel C Support SDK	5.1.0.201102110609
M. C/C++ Compiler Support	6.1.0.201102110609
□ 4 XL C/C++ Compiler Support SDK	6.1.0.201102110609



Follow the next steps to start the plug-in installation.

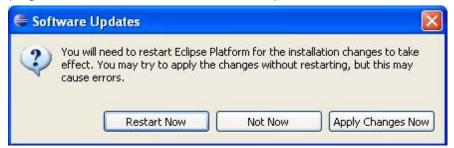
Construction Yearson Image: Construction<		
Work with: Of - http://download.ndpre.or.og/book/ub/ielesses/helio/ Add. Work with: Of - http://download.ndpre.or.og/book/ub/ielesses/helio/ Add. Inter met Werkin Of - http://download.ndpre.or.og/book.ndp.ielesses/helio/ Add. Inter met Werkin 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ Inter met Werkin 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ Inter met Werkin 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ Inter met Yee Of Cit+Development Tokin 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ Inter met Yee Of Cit+Development Tokin 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ 7.02.20110211or.og.ex.odp.odp.ielesses/helio/ Inter met Yee Of Cit+Development Tokin 7.02.20110211or.og.	,	
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Contact all updates stress of available software Contact all updates stres during installs indices are software Contact all updates stres during installs indices are software Contact all updates stress Licensess Licensess must be reviewed and accepted before the software can be installed.		
Show only the latest versions of available software Show only the latest versions of available software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during install to find required software Contact all update sites during installed Contact all update sites during installed Contact a		
Licenses: License hads	ory what a es during instal to find required software	2 <back next=""> Finds Cancel</back>
Licebe text	Licenses:	
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Resk Next > Finish Cancel	•	Finish Cancel



Eclipse starts then the installation of CDT plug-in.

Resource - Eclipse Platform	
File Edit Navigate Search Project Run Window Help	
⊗ Welcome ⊠	🏠 🗇 📣 🖍 🖾 🗖 🗗
eclipse	~
	Workbench
Welcome to Eclipse	
Welcome to Eclipse	
Overview Installing Software	
Get an overview of the featur Installing Software	
$\mathbf{\nabla}$	X
Samples	
Samples Try out the samples	
Always run in background	
Run in Background Cancel Details >>	
	1
Installing :	Software: (29%)

When the plug-in installation has finished, restart Eclipse IDE.





- 8 Working with the Eclipse IDE
- C/C++ perspective 8.1

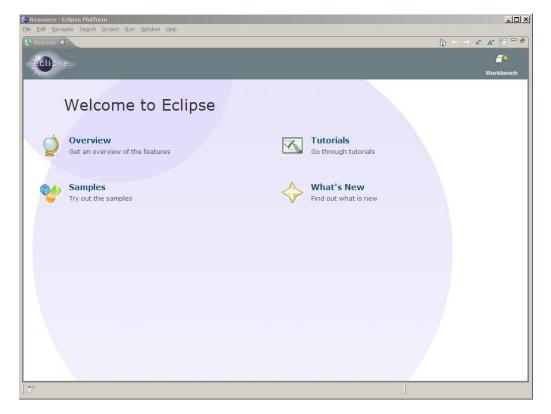
Start the Eclipse IDE.



At this point, Eclipse will present a "Workspace Launcher" dialog, shown below. This is where you specify the location of the "workspace" that will hold your Eclipse/CDT projects (see also the previous chapter 6.2)

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🖶 Workspace Launcher	×
Select a workspace	
Eclipse Platform stores your projects in a folder called a workspace. Choose a workspace folder to use for this session.	
Workspace: H:\My Documents\eclipse-workspace Browse Browse	
☑ Use this as the default and do not ask again OK Cancel	

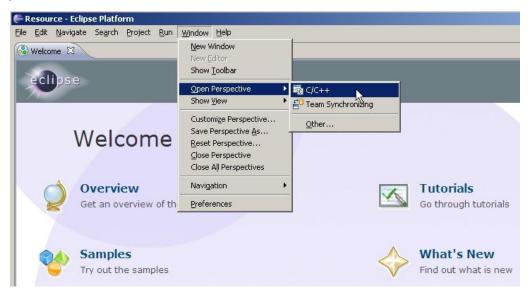




Now Eclipse will officially start and show the "Welcome" page shown below.

For project developing on C/C++, switch to the C/C++ perspective.

Choose *Window* \rightarrow *Open Perspective*, then click on *C*/*C*++ to open Eclipse in the C/C++ perspective.





8.2 Creating a C or C++ project with Eclipse

In the Eclipse C/C++ perspective a new project for your target can be created, here: Spansion Cortex M3. For this choose $File \rightarrow New \rightarrow C$ Project.

New	efac <u>t</u> or <u>N</u> avigate Se Alt+Shift+N	arch Project Run Window Help Makefile Project with Existing Code	1
Open File <u>.</u>	HICTORICTIV	C++ Project	0
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Refresh	F5	G Class	
Con <u>v</u> ert Line Delim	iters To	Ctrl+N	
Print	Ctrl+P		

In the "New Project wizard" shown below-left, expand the *Makefile project* branch by clicking on it's "+" sign and then select *Empty Project*. Enter the sample project name e.g. "*mb9bfxxx_ioport_counter*". Then click on *Next* to continue.

On the below-right window just close the wizard with Finish.

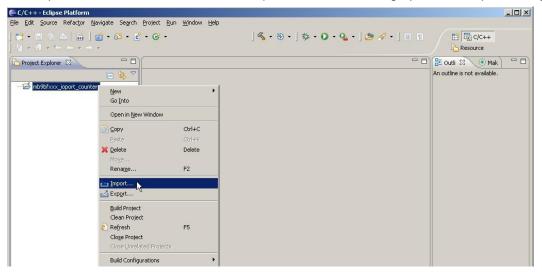
E C Project	-10) ×1	F C Project	
C Project Create C project of selected type		Select Configurations Select platforms and configurations you wish to deploy on	
Project name: [nb/bf/coc_joport_counter]	counter Brown	Project type: Makefile project Toolchains: Confligurations:	
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Empty Project Empty Project Empty Project Empty Project Static Library Static Library Austric Library Mutafile project Empty Project	Other Toolchan Cygwin GCC Fujtsu Cortex-M3 Tools Fujtsu-Cortex-M3-Toolchan		Advanced settings
Show project types and tookhains only i	f they are supported on the platform	Use "Advanced settings" button to edit project's properties. Additional configurations can be added after project creation. Use "Manage configurations" buttons either on toobar or on proper	ty pages.
(2) < (30)	Next > Brish Cancel	() (Back there >	Enish Cancel



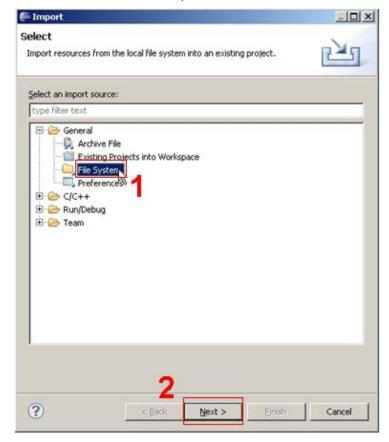
APPLICATION NOTE

Now the C/C++ perspective shows a valid project, as shown below in the C/C++ Projects view on the left, but there are no source files in that project. Normally you would select $File \rightarrow New \rightarrow Source \ File$ and enter a file name and start typing. This time, however, we will import already existing source files.

In the Eclipse screen below click on *File→Import*.... This will bring up the file import dialog.



In the "Import" screen below, click on File System and then click Next to continue.





In the Import \rightarrow File System screen below, use the Browse button associated with the From directory text box to search for the sample project to be imported.

The project template *io-port* used in this application note, which is included in the note's software package archive. The sample project *io-port* should be then saved, in a directory folder e. g. *C:¥downloads¥io-port*.

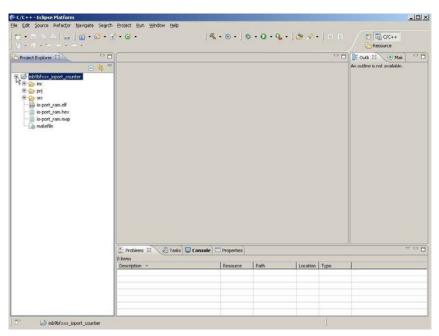
🥌 Import	_ [D] ×
File system Source must not be empty.	4
From directory:	Browse
	Import from directory 2 X Select a directory to import from.
Filter Types Select All [] Into folder: [mb9bfxxx_loport_counter] Options	Folder: IO-port
()	< Back Next > Enistr Cancel

Check the box for the folder of the *io-port* example and then click the **Select All** button below because we want to import each of its files. Click *Finish* to start the file import operation.

Import				_101 ×
ile system Import resources from the local file syste	ŧm.			
From directory: C:\downloads\io-port				Browse
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Filter Types Select All Dr Into folder: mb9bfxxx_loport_counter Options	eselect All		1	Browse
Qverwrite existing resources withou Greate complete folder structure Greate sglected folders only Advanced >>	t warning			
		3		
(?)	< <u>B</u> ack	Mext >	Einish	Cancel



Expanding the *mb9bfxxx_ioport_counter* project in the *C/C++ Projects* view seen below, shows that all the source files, which have been imported into the project. By clicking on the "+" sign on the project name in the C/C++ Projects panel on the left, the imported files are expanded in a tree view.



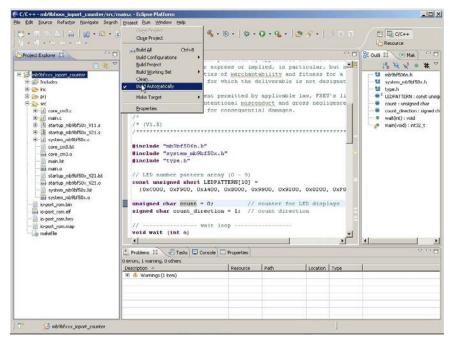
In the Eclipse window below, the *main.c* file has been selected by clicking on it and it thus be displayed in the source file editor view in the center. In the project explorer window the *main.c* module is expanded to reveal its variables and functions. By clicking e. g. on the variable count, the source window jumps to the definition of that variable.

C/C++ - mb9bfxxx_ioport_counter/src,						
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😑 🗁 src		extent permitted b				😑 C LEDPATTERN : const u
🗄 💽 core_cm3.c		to intentional misc			gence	count : unsigned char
🖻 📝 main.c		able for consequent	ial damage	з.		count_direction : signer
mb9bf506n.h	/*					wait(int) : void
system_mb9bf50x.h	/* (V1.5)	*****				o main(void) : int32_t
type.h	/					
count 🚬	#include "mb9bf50	5 m / 11				
● count_direction ● LEDPATTERN	#include "system n					
main(void)	#include "type.h"	IDSDISOX.II				
man(void) wait(int)	#Include cype.n					
wak(int) startup_mb9bf50x_V11.s	// LED number pat	ern array (0 - 9)				
		ort LEDPATTERN[10]	-			
E system mb9bf50x.c		0xA400, 0xB000, 0		200. 0x8200.	OxF8	
core_cm3.lst						
core_cm3.o	unsigned char cou	nt = 0; //	counter f	or LED displ	ays	
main.lst	signed char count	direction = 1; //	count dir	ection		
main.o						
- 📄 startup_mb9bf50x_V21.lst	//	wait loop		<u></u>		
- 🗟 startup_mb9bf50x_V21.o	void wait (int a)				-	
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/mb9bfxxx_ioport_counter/src	/main.c - [count]					

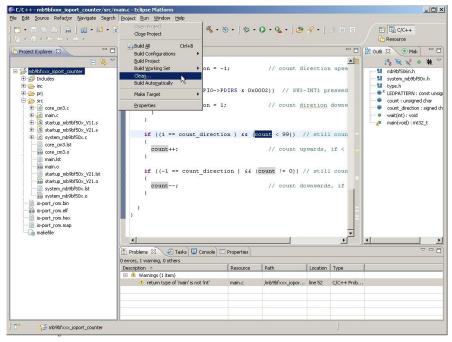


8.3 Cleaning the selected project

For compiling a project, first disable the automatically build. Select the project and from the category *Project* on the IDE menu uncheck *Build Automatically*.



Now clean the project. In the same way select the project *mb9bfxxx_ioport_counter* from the project explorer window the category *Project*, and on the IDE menu choose *Clean...*.



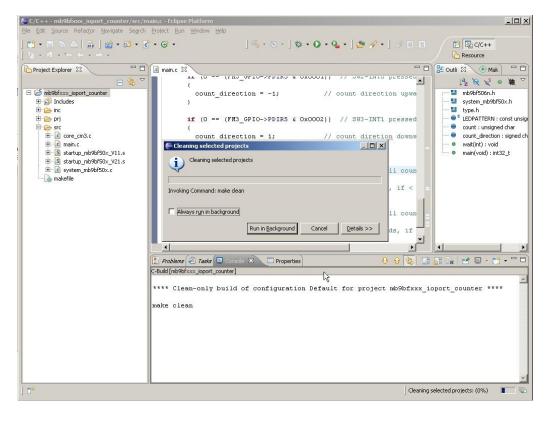


APPLICATION NOTE

On the clean window deselect the option *Clean all projects* and select our project. Deselect also the option *Start a build immediately*.

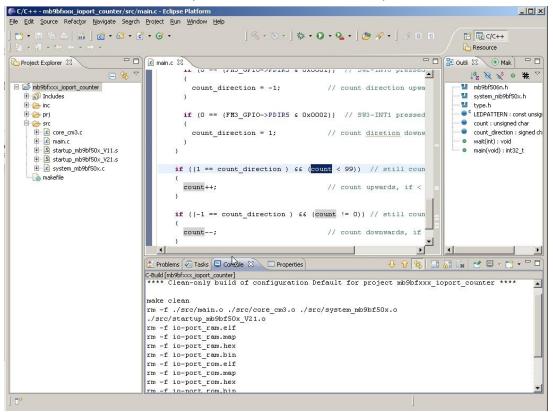
urs the projects will be rebuilt fi	2 10 10 10 10 10 10 10 10 10 10 10 10 10
Clean all projects	Clean projects selected below
Employed States	r
Start a build immediately	

Finish the configuration by clicking on the OK button and the clean process will start.





To show the results of the clean process, look at the "Console" panel located below.

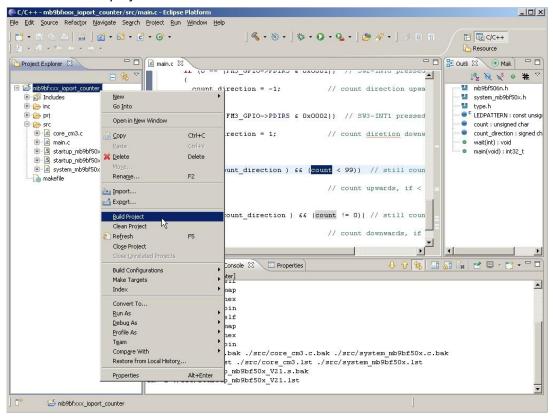




8.4 Building the selected project

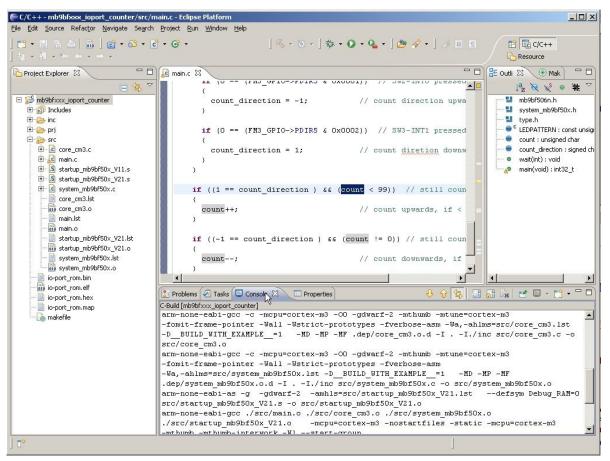
Important note: If you use the makefile of the software package of this application note, check all paths (e.g. to *OpenOCD*) and modify them to your individual installation paths!

The project *mb9bfxxx_ioport_counter* can be compiled with the preinstalled Yagarto tool chain. To start this procedure, select the project *mb9bfxxx_ioport_counter* on the "Project Explorer" view. With a click on the right mouse button on the selected project start the build process with *Build project*.





The result will be than show on the IDE "Console" like below.



On the "Project Explorer" view, it can be seen that the project output files (*.bin, *.elf ...) are generated.



8.5 Create make target

The make targets are pre-defined in the example project *mb9bfxxx_ioport_counter*. This paragraph shows the creation process, if a new project is set-up or the targets were deleted accidentally.

The make file for the project *mb9bfxxx_ioport_counter* manages the project build process. This file generates output files for debugging in RAM and ROM. The make file generates also the final output file for programming the Flash with an external tool like the Spansion Flash Programmer.

It is needed to create a make target to separate the build processes for RAM and ROM (Flash). Also add the clean process to "Make Target".

To create a make target, select the project *mb9bfxxx_ioport_counter* on the "Project Explorer" view. Click with the right mouse button on the selected project and select *Make Targets*.

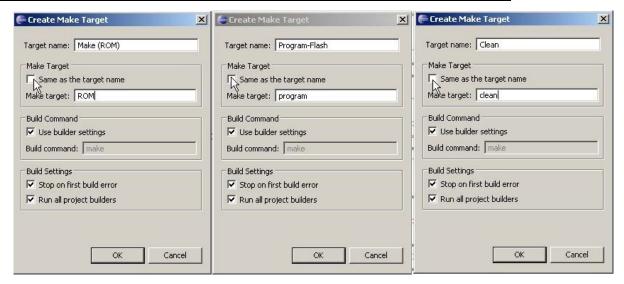


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sic sic	Open in New Window		- (FH3_GPIO->PDIR5 6	0x00021) 77 5#5	e count	: unsigned char
E core_cm3.c	Easte	Ctrl+C Ctrl+V	_direction = 1;	// count d		_direction : signed char x) : void
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i mb984xxx_	Properties	At+Door Incode - eabled Incode	ke Target Make (RAM) make (RAM) ke target name RAM make make ke target name make ke target name make ke target name ke target	rt_rom.elf t_rom.elf io-port e -O binary io-por	rom.hex rt_rom.elf io-;	
in the first froor _	Properties	At+Door Incode - eabled Incode	A size of the set of t	rt_rom.elf t_rom.elf io-port e -O binary io-por	rom.hex rt_rom.elf io-;	

Enter "Make (RAM)" for the target name, uncheck *Same as the target name* and write "RAM" in the text box "Make target". Click on *OK* to create a "Make (RAM)" build target. On the same way, create a make target for "Make (ROM)", "Program-Flash" and "Clean".



APPLICATION NOTE



On the next figure the "Make Target" view can be seen. To start the build process for "Make (RAM)", "Make (ROM)" or "Clean", simply double click on the respective target.

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	180 to : to	
	181 @ echo "compiling"	
	182 \$ (CC) -c \$ (CPFLAGS) -I . \$ (INCDIR) \$< -o \$0	
	183	
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	185 @ echo "assembling"	
	186 \$(AS) \$(ASFLAGS) \$< -0 \$0	
	187 188 tram.elf: \$(OBJS)	
	189 @ echo "linking"	
	190 \$ (CC) \$ (OBJS) \$ (LK) \$ (LDFLAGS RAM) \$ (LIBS) -0 \$0	
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	rm -f io-port_rom.map	_
	rm -f io-port rom.hex	
	rm -f io-port_rom.bin	
	rm -f io-port rom.mbx	
	rm -f ./src/main.c.bak ./src/core_cm3.c.bak ./src/system_mb9bf50x.c.bak	
	rm -f ./src/main.lst ./src/core_cm3.lst ./src/system_mb9bf50x.lst	
	rm -f ./src/startup_mb9bf50x_V21.s.bak rm -f ./src/startup_mb9bf50x_V21.1st	
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On the IDE "Console" view, the output shows that the clean process was successfully done.



9 Example Eclipse Project Template

The project template used in this application note has the following structure:

Project Explorer 🛛 🖓 🗖	🗋 makefile 😫 🔽 main.c
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 FM3 Mb9bfxxx_joport_counter Includes includes includes include include include include folder include folder include folder folder	<pre># # # End of default section ####################################</pre>
makefile	UADEFS =
	<pre># List C source files here SRC = ./src/main.c \</pre>
	./src/core cm3.c \
	./src/system_mb9bf50x.c
	<pre># List ASM source files here ASRC = ./src/startup_mb9bf50x_V21.s</pre>
	<pre># List all user directories here UINCDIR = ./inc</pre>

The *inc* folder consists of the FM3 I/O header file used with all projects. Also the CMSIS header files and system start-up header are included here. The *prj* folder contains the linker script files and in *src* are located the source files.

The *makefile* is also included to the template.

The *Includes* directory contains the Yagarto libraries (e.g. *stdint.h*) needed during the build process. To add other sources file use the folder *src*.

New header files can be added to the folder *inc* or to the *Includes* directory.

Important note: Check all paths (e.g. to *OpenOCD*) in the makefile(s) and modify them to your individual installation paths!



9.1 Add other Files to the Template Folder

Open the selected project folder, where new files should be added. Click with the right mouse key on the selected folder and use *Import*.

=C/C++ - mb9bfxxx_ioport_counter/makefi	
le <u>E</u> dit <u>S</u> ource Refac <u>t</u> or <u>N</u> avigate Se <u>a</u> rch	<u>Project R</u> un <u>W</u> indow <u>H</u> elp
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Project Explorer 🛛 🗖 🗖	ြာ makefile ဆြ 💽 main.c
	DLIBS =
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É	# End of default section
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E (/yagarto/yagarto-toolchain/lib/g E (/yagarto/yagarto-toolchain/lib/g	
	# Start of user section
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🕀 庙 Go Into	
÷	ine project name here
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+	(22,3
🗄 🖻 Refresh F5	t C source files here
	= ./src/main.c \
Make Targets	./src/core_cm3.c \
_	./src/system_mb9bf50x.c
Resource Configurations	
Team	st ASM source files here
Comp <u>a</u> re With	<pre>> = ./src/startup_mb9bf50x_V21</pre>
Restore from Local History	
P <u>r</u> operties Al	t+Enter all user directories here
	UINCDIR = ./inc



Select File System and click on the Next button.

€ Import	
Select Import resources from the local file system into an existing project.	Ľ
Select an import source: type filter text General File System File System File System File C/C++ Run/Debug Team	
(?) < Back Next Enish	Cancel

Click on the Browse button to locate the new files.

Import from directory	? ×
Select a directory to import from.	
TEMP	-
totalcmd Government totalcmd windows	
.metadata	
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Make New Folder OK	Cancel
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After selecting the folder, check the files which should be imported in he list.

With a click to *Finish*, the selected header files are added to the folder *inc*.



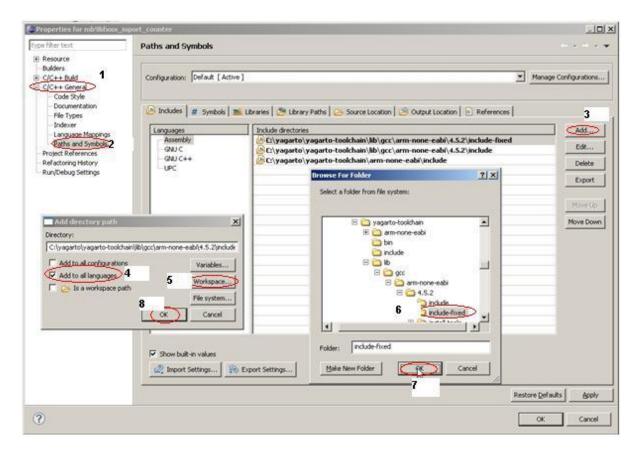
9.2 Add other Libraries to the "Includes" Directory

Some library headers (e.g. "*stdint.h*") must be included explicitly from the Yagarto installation directory. To set the *Includes* directory in your template or to add new libraries in this directory, select the project and click with the right mouse key to *Proprieties*. Here changes to the configuration options for the selected project can be done.

C/C++ - mb9bfxxx ioport o	ounter/src/main.c - Eclipse Platform	
	igate Se <u>a</u> rch <u>P</u> roject <u>R</u> un <u>W</u> indow <u>ł</u>	<u>H</u> elp
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	Restore from Local History	
		ount_direction
	Properties Alt+Enter	



- 1. Select C/C++ General
- 2. Double click on Paths and Symbols
- 3. Click on Add
- 4. Enable the box Add to all languages
- 5. Select File system to locate the include directory
- 6. Select the include directory
- 7. Click on OK in the "browser" child window
- 8. Click on OK in the "Add directory path" child window





The new libraries folder is newly added to the *Includes* directory.

E/C++ - mb9bfxxx_ioport_counter/makefile - Eclipse Platform	
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Project Explorer X FM3 Mo90fxxx_ioport_counter Mo90fxxx_ioport_counter C:/yagarto/yagarto-toolchain/arm-none-eabi/include C:/yagarto/yagarto-toolchain/lb/gcc/arm-none-eabi/4.5.2/include C:/yagarto/yagarto-toolchain/lb/g	
 	<pre># Define ASM defines here UADEFS = # List C source files here SRC = ./src/main.c \ ./src/core_cm3.c \ ./src/system_mb9bf50x.c # List ASM source files here ASRC = ./src/startup_mb9bf50x_V21.s # List all user directories here UINCDIR = ./inc</pre>

9.3 Make File

The make file is composed of many instructions to the GNU make tool. These instructions are used to set the information needed by the make builder and to initiate the project build process. It can be found in the application note's software package archive.

The make file instructions are described below in detail. The make file is divided here into many parts to get a better overview about the meaning of these instructions.

In the first part of the make file the GNU tools needed to compile (*arm-none-eabi-gcc.exe*), assemble (*arm-none-eabi-as.exe*) and link (*arm-none-eabi-ld.exe*) the project are set. The files created by compiling and assembling are so-called object files (*.o). In addition to the GNU compiler and assembler, it is needed to set the GNU tool (*arm-none-eabi-objcopy.exe*) to create out of the output file (*.*elf*), generated by the linker, another formats, e.g. hex file (*.*hex*) or binary file (*.*bin*).

```
TRGT = arm-none-eabi-
CC = $(TRGT)gcc
AS = $(TRGT)as
LD = $(TRGT)ld -v
CP = $(TRGT)objcopy
```

It is here considered that all needed GNU tools are installed and added to Windows path by the Yagarto installation procedure described in the chapter2. These tools can be found on the folder *bin* of the Yagarto GNU ARM tool chain installation directory.

Next statements on the make file are the options needed for the GNU *Objcopy* tool to create other format from the GNU linker generated output file (*.*elf*).

The first line is to create the Intel-format hex file (*.*hex*). The second one is to generate the binary file (*.*bin*) and the last one for the Motorola S-record hex format (*.*mhx*).

```
HEX = (CP) -O ihex
BIN = (CP) -I elf32-little -O binary
SREC = (CP) -O srec
```

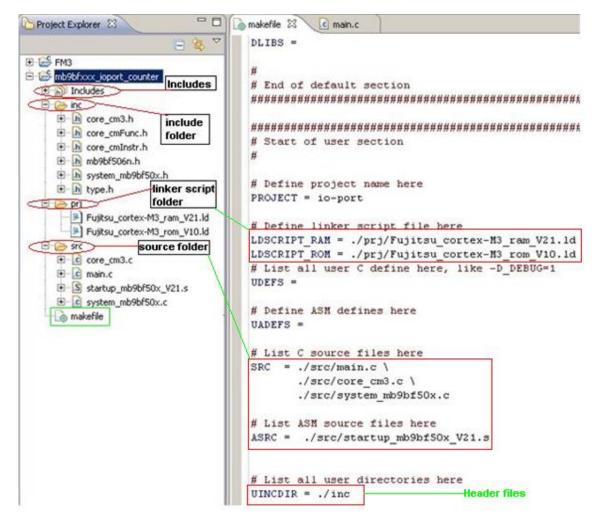


The next lines define the over-all project name. This name will then be used to the for the output file generated by the GNU linker and copied to other format by the GNU *Objcopy* tool.

```
# Define project name here
PROJECT = io-port
```

The example Eclipse project template consists of the following project folder:

- inc: includes all the header files
- prj: includes all the linker script files
- src: includes all source files (*.c and *.s)





This folder structure is defined as follows:

```
# Define linker script file here
LDSCRIPT_RAM = ./prj/MB9BFD18_ram.ld
LDSCRIPT_ROM = ./prj/MB9BFD18_rom.ld
# List C source files here
SRC = ./src/main.c ¥
        ./src/core_cm3.c ¥
        ./src/system_mb9bfd1x.c
# List ASM source files here
ASRC = ./src/ startup_mb9bfd1x.s
# List all user directories here
UINCDIR = ./inc
```



The next part isn't used. If the user has the intention to add some defines or library modules, this makefile part can be used.

```
**********
# Start of default and user defines
#
# List all default C defines here, like -D_DEBUG=1
DDEFS =
# List all default ASM defines here, like -D DEBUG=1
DADEFS =
# List all default directories to look for include files here
DINCDIR =
# List the default directory to look for the libraries here
DLIBDIR =
# List all default libraries here
DLIBS =
# List all user C define here, like -D DEBUG=1
UDEFS =
# Define all user ASM defines here
UADEFS =
# List the user directory to look for the libraries here
ULIBDIR =
# List all user libraries here
ULIBS =
#
# End of default and user defines
******
```



APPLICATION NOTE

The added defines and locations, where the included header files and the used library modules are located, are provided in the next makefile part to the compiler, assembler and linker as options used by building the project.

- INCDIR: Compiler directories options, e.g. the C-headers are in "UINCDIR=./inc"
- LIBDIR: Linker libraries directories options
- DEFS: Compiler defines options
- ADEFS: Assembler defines options
- LIBS: Linker libraries options

This part does not need to be changed. All definitions are set in the previously makefile part (default and user defines).

```
INCDIR = $ (patsubst %, -I%, $ (DINCDIR) $ (UINCDIR) )
LIBDIR = $ (patsubst %, -L%, $ (DLIBDIR) $ (ULIBDIR) )
DEFS = $ (DDEFS) $ (UDEFS)
ADEFS = $ (DADEFS) $ (UADEFS)
LIBS = $ (DLIBS) $ (ULIBS)
```

The next lines determine the object files, which will be created by compiling and assembling the project; from all C and assembler (*.s) files located in "**src**" folder are object files (*.o) generated.

OBJS = \$(SRC:.c=.o) \$(ASRC:.s=.o)

Next the compiler optimization level option is set.

```
# Define optimization level here
OPT = -00
```

The following instructions specify the name of the target ARM processor (cortex-m3). The compiler and assembler uses this option to determine what instruction set to be used, when generating the assembly code.

```
MCU = cortex-m3
MCFLAGS = -mcpu=$(MCU)
```



All options used by the GNU Compiler are started in the next part.

CPFLAGS	= \$(MCFLAGS)
CPFLAGS	+= \$(OPT)
CPFLAGS	+= -gdwarf-2
CPFLAGS	+= -mthumb
CPFLAGS	+= -mapcs-frame
CPFLAGS	+= -msoft-float
CPFLAGS	+= -mno-sched-prolog
CPFLAGS	+= -fno-hosted
CPFLAGS	+= -mtune=cortex-m3
CPFLAGS	+= -mfix-cortex-m3-ldrd
CPFLAGS	+= -ffunction-sections
CPFLAGS	+= -fdata-sections
CPFLAGS	+= -fomit-frame-pointer
CPFLAGS	+= -Wall
CPFLAGS	+= -Wstrict-prototypes
CPFLAGS	+= -fverbose-asm
CPFLAGS	+= -Wa,-ahlms=\$(<:.c=.lst)
CPFLAGS	+= \$(DEFS)

To generate dependency information between the C sources files and the header files included in this source files, a compiler flag to generate these information is enabled. The generating information will then be deleted by cleaning the project with *make clean*.

Generate dependency information
CPFLAGS += -MD -MP -MF .dep/\$(@F).d

The following lines are the GNU assembler flags.

ASFLAGS	= \$(MCFLAGS)
ASFLAGS	+= −g
ASFLAGS	+= -gdwarf-2
ASFLAGS	+= -mthumb
ASFLAGS	+= -amhls=\$(<:.s=.lst)
ASFLAGS	+= \$(ADEFS)

The next part determines the general linker flags.

LK	= -static -mcpu=cortex-m3 -mthumb -mthumb-interwork
LK	+= -nostartfiles
LK	+= -Wl,start-group
LK	+= -lc -lg -lstdc++ -lsupc++
LK	+= -lgcc -lm
LK	+= -Wl,end-group



Because this makefile manages the building process to generate output files (*.*elf*) for RAM and ROM debugging, a linker script file for each debugging configuration must be set individually.

- 1. Set the RAM linker script file *Fujitsu_cortex-M3_ram_V21.ld* located in *prj* folder and provided with the makefile instruction LDSCRIPT RAM
- 2. Generate a map file (*.map)
- 3. Provide the library directories, if they are set in the defines part

```
LDFLAGS_RAM = -T$(LDSCRIPT_RAM)
LDFLAGS_RAM += -Wl,-Map=$(PROJECT)_ram.map,--cref,--no-warn-mismatch
LDFLAGS_RAM += $(LIBDIR)
```

The next instructions set **ROM** linker flags:

- 1. Set the ROM linker script file *Fujitsu_cortex-M3_rom_V10.ld* located in *prj* folder and provided with the makefile instruction LDSCRIPT ROM
- 2. Generate a map file (*.map)
- 3. Provide the library directories, if they are set in the defines part

```
LDFLAGS_ROM = -T$(LDSCRIPT_ROM)
LDFLAGS_ROM += -Wl,-Map=$(PROJECT)_rom.map,--cref,--no-warn-mismatch
LDFLAGS_ROM += $(LIBDIR)
```

In the next part follow the make rules to create a **RAM** target. By building the RAM target, all object files (*.o) and output files (*.elf, *.bin, *.hex, *.mhx) will be created.

- The first definition flag is dedicated to the assembler to set the variable Debug_RAM to 1. This variable is implemented in the "if case" at the startup_mb9bfd1x.s file to differentiate between the RAM and ROM initialization routine.
- 2. A target clean is made before starting building the object files (\$ (OBJS))
- 3. Starting building the output file (*.elf)
- 4. Starting building the output file (*.hex)
- 5. Starting building the output file (*.bin)
- 6. Starting building the output file (*.mhx)

```
RAM: ASFLAGS += --defsym Debug_RAM=1
RAM: clean $(OBJS) $(PROJECT)_ram.elf $(PROJECT)_ram.hex
RAM: $(PROJECT)_ram.bin
RAM: $(PROJECT)_ram.mhx
```



Here the **ROM** target definition is described. The ROM target is defined as default make target. By giving *make all* the building process for ROM target will be started.

all: ROM

To the Debug_RAM variable is now set to 0. Other instruction lines are similar to the RAM target, only the output files are ROM based (*_rom.elf, *_rom.hex, etc.).

```
ROM: ASFLAGS += --defsym Debug_RAM=0
ROM: clean $(OBJS) $(PROJECT)_rom.elf $(PROJECT)_rom.hex
ROM: $(PROJECT) rom.bin
```

By starting the building process the object files (*.o) will be generated from all source files (*.c and *.s).

By compiling the (*.*c*) files, the GNU compiler (CC=arm-none-eabi-gcc.exe) is called. The flags (CPFLAGS) are provided to the compiler and the directory, where the header files are located, is also provided.

```
%0 : %c
    @ echo "--compiling--"
    $(CC) -c $(CPFLAGS) -I . $(INCDIR) $< -0 $@</pre>
```

Next lines are the assembling procedure.

The GNU assembler (AS=arm-none-eabi-as.exe) will be started to create the object files. The ASFLAGS are the flags which were defined for ROM or RAM building configuration before.

```
%0 : %s
    @ echo "--assembling--"
    $(AS) $(ASFLAGS) $< -0 $@</pre>
```

For the linking procedure the GNU compiler (CC=arm-none-eabi-gcc.exe) combines all object files (\$(OBJS)=*.o) generated by compiling and assembling to an output file (*.elf).

For the **ROM** target build, the GNU linker uses the options \$(LDFLAGS_ROM) (LDFLAGS ROM = -T\$(LDSCRIPT ROM)) to identify the ROM linker script file.

```
%rom.elf: $(OBJS)
    @ echo "--linking--"
    $(CC) $(OBJS) $(LK) $(LDFLAGS_ROM) $(LIBS) -0 $@
```



For the RAM target build, the GNU linker uses the options \$(LDFLAGS_RAM)
(LDFLAGS_RAM = -T\$(LDSCRIPT_RAM)) to identify the RAM linker script file
LDSCRIPT_RAM = ./prj/MB9BFD18_ram.ld

```
%ram.elf: $(OBJS)
    @ echo "--linking--"
    $(CC) $(OBJS) $(LK) $(LDFLAGS_RAM) $(LIBS) -0 $@
```

In the next part, the output file (*.*elf*) will be converted to other formats (*.*hex*, *.*bin*, *.*mhx*). The GNU utility (CP=arm-none-eabi-objcopy.exe) can be used by the building process to generate the respective format.

The GNU *Objcopy* tool is called with the macros HEX, BIN and SREC on begin of this makefile. The *Objcopy* options are also set with these macros.

```
%hex: %elf
   $(HEX) $< $@
%bin: %elf
   $(BIN) $< $@
%mhx: %elf
   $(SREC) $< $@</pre>
```

The clean target is managed with the rule clean. Assuming the command *make clean* will delete all object files (*.*o*), the related file (*.*lst*) and the output files (*.*elf*, *.*hex*, *.*bin* and *.*mhx*) generated by building the project. The clean rule is also called every time, when a RAM or ROM target will be build.

```
clean:
       -rm -f $(OBJS)
       -rm -f $(PROJECT) ram.elf
      -rm -f $(PROJECT)_ram.map
       -rm -f $(PROJECT) ram.hex
       -rm -f $(PROJECT) ram.bin
       -rm -f $(PROJECT) ram.mhx
       -rm -f $(PROJECT) rom.elf
       -rm -f $(PROJECT) rom.map
       -rm -f $(PROJECT) rom.hex
       -rm -f $(PROJECT) rom.bin
       -rm -f $(PROJECT) rom.mhx
       -rm -f $(SRC:.c=.c.bak)
       -rm -f $(SRC:.c=.lst)
       -rm -f $(ASRC:.s=.s.bak)
       -rm -f $(ASRC:.s=.lst)
```



The next part of the makefile is used to program the internal flash with OpenOCD. This part is also not needed, when the user prefers to download and debug the output file (*.*elf*) with J-Link GDB Server.

With the first macro the location where the OpenOCD executable will be found is set.

The second macro will set the OpenOCD server (*openocd.exe*). Because this server needs mandatorily a script configuration, the configuration script (*openocd.cfg*) in the project directory (. /) may be used.

```
# specify the directory where openocd executable and configuration files reside
OPENOCD_DIR = <u><HERE YOUR PATH TO OPENOCD></u>/openocd-0.5.0/src
# specify OpenOCD executable
OPENOCD = $(OPENOCD_DIR)openocd-0.5.0.exe
# specify OpenOCD configuration file (pick the one for your device)
OPENOCD_CFG = -f ./openocd.cfg
```

In the next part follows the OpenOCD commands used to program the flash on the FM3

```
# specify OpenOCD flash programing commandos for FM3
OPENOCD_C += -c init
OPENOCD_C += -c jtag_khz 500
OPENOCD_C += -c reset init
OPENOCD_C += -c verify_ircapture disable
OPENOCD_C += -c halt
OPENOCD_C += -c poll
OPENOCD_C += -c 'FM3 mass_erase 0'
OPENOCD_C += -c 'flash write_image $(PROJECT)_rom.bin 0x0 bin'
OPENOCD_C += -c shutdown
```

The second to last part implements the target rule program.

First the server will be started with the assigned configuration script (*openocd.cfg*). After this the server will execute the giving commands. When the programming achieved the server will be shutdown and eclipse console will display the message:

"Flash Programming Finished."

```
# program the FM3 internal flash memory
program:
    @echo "Flash Programming with OpenOCD..."
    $(OPENOCD) $(OPENOCD_CFG) $(OPENOCD_C)
    @echo "Flash Programming Finished."
```



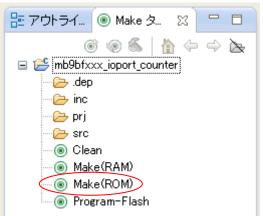
- 10 Programing the Flash memory
- 10.1 OpenOCD and Flash Programming

To use OpenOCD for programming the internal Flash memory, a target *Program-Flash* was already created. See chapter 8.5 for usage.

In chapter 9.3 a description of all section used in the makefile was given. The last section implemented in this makefile manages the make target *Program-Flash* used on Eclipse "C/C++ perspective" to program the internal Flash.

Connect the SK-FM3-176PMC-ETHERNET board via JTAG interface to the USB interface of your computer.

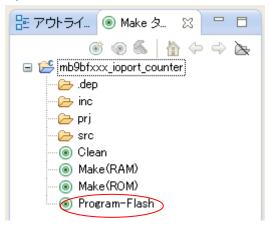
To program the internal Flash, first it is needed to build the target *Make (ROM)*. The binary file *io-port_rom.bin* will be then generated. See chapter 8.5 for usage. Click on the target *Make (ROM)*.





C/C++ - io-port_sk-fm3-100pmc/makefile -		
Ele Edit Source Refactor Navigate Search E		
	• @ •] % • % •] % • Q • Q •] @ % •] @ 11] 2 • % • % • ÷ ÷	😭 🎋 Debug 🔤 C/C++
🎦 Project Explorer 🛛 📄 🔄 🔽 🗖		- 🛛 🗄 Outline 💿 Make Ta 🙁 👘 🗆
😑 靜 io-port_sk-fm3-100pmc	243 OPENOCD_C += -c halt	▲ 🛛 💿 🚳 💧 🗁 📐
🕀 🐝 Binaries	244 OPENOCD_C += -c poll	E-12 io-port_sk-fm3-100pmc
⊕ 😭 Includes ⊕ 📯 inc	245 OPENOCD_C += -c 'fm3 chip_erase 0'	🗁 .dep
the pri	246 OPENOCD_C += -c reset halt	🧀 .settings
E Src	247 OPENOCD_C += -c 'flash write_image %(PROJECT)_rom.bin 0x0 bin'	🧀 inc
🗄 🌽 sic 🖻 🕉 io-port_rom.elf - [arm/le]	248 OPENOCD_C += -c reset run	🗁 prj
A io-port rom.bin	249 OPENOCD_C += -c shutdown 250	STC
io-port rom.hex	250	Clean
io-port_rom.map	251 252 # program the FH3 internal flash memory with OpenOCD	Make (RAM)
io-port rom.mhx	252 # program the rms internal flash memory with openots	Make (ROM) Program-Flash-J-Flash
	254 Becho "Flash Programming with OpenOCD"	Program-Hash-J-Hash Program-Flash-OpenOCD
🐻 makefile	255 \$(OPENOCD) \$(OPENOCD CFG) \$(OPENOCD C)	General Strengtheren
	256 Recho "Flash Programming Finished."	E-G io-port_sk-fm3-64pmc1
🕀 🐸 io-port_sk-fm3-48pmc-usbstick	257	In porc_skinio-orpinci
🗄 😂 io-port_sk-fm3-64pmc1	258 #	
	259 # Include the dependency files, should be the last of the makefile	
	2.60 #	
	261 -include \$(shell mkdir .dep 2>/dev/null) \$(wildcard .dep/*)	
	2.62	
	263 HANNANANANANANANANANANANANANANANANANANA	
	264 jflash = C:/Programs/SEGGER/JLink&RM_V442c/JFlash&RM.exe	
	265 jflash_p = C:/Programs/SEGGER/JLinkARM_V442c/Samples/JFlash/ProjectFiles/MB9xFxxx.jflash	
	266	
	267 jflash_c += -openprj\$(jflash_p) 268 jflash c += -open\$(PROJECT) rom.bin,0x0	
	269 jflash c += -opens (rROLCI)_rom.bin,0x0	
	270 jflash c += -exit	
	271	
	272 # program the FM3 internal flash memory with J-FLash	
	273 proglink:	
	274 Becho "Flash Programming with 1-link"	
	275 \$(jflash) \$(jflash c)	
	276 Becho "Flash Programming Finished."	
	277	
	278 # *** FOF ***	2
		· 🔽 - 📬 🖬 📾 - 📬 - 🗆 🗎
	C-Build [io-port_sk-fm3-100pmc]	
		<u>^</u>
		-
D* io-port_sk-fm3-100pmc/makefile		

After building the project, the target *Program-Flash* now can be build. Click on it, start the Flash programming with OpenOCD.





The next figure shows the messages displayed on the Eclipse console during the Flash programming realized via OpenOCD.

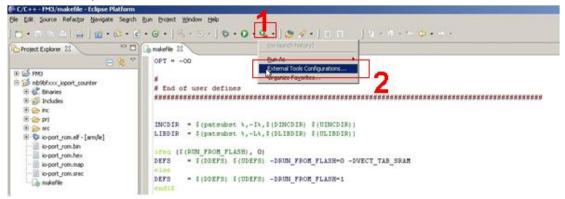
🖳 Console 🛛 🔣 Problems 🕴 🗧 🖓 👘 👘 🖓 🖓 👘 🖓 👘 🖓 👘 🖓 🖓
C-Build [io-port]
target halted due to debug-request, current mode: Thread
xPSR: 0x21000000 pc: 0x00000154 msp: 0x20007ff0
Info : Fujitsu MB9Bxxx: Chip Erase (may take several seconds)
fm3 chip erase complete
Info : Fujitsu MB9B500: FLASH Write
wrote 1768 bytes from file io-port_rom.bin in 0.218754s (7.893 KiB/s)
Info : JTAG tap: mb9bfxx6.cpu tap/device found: 0x4ba00477 (mfg: 0x23b, part: 0xba00, ver: 0x4)
Warn : Only resetting the Cortex-M3 core, use a reset-init event handler to reset any peripherals
shutdown command invoked
"Flash Programming Finished."



- 11 Set up Eclipse External Tools
- 11.1 Further External Tools

Note, that all configurations described below use the paths from the chapter 4. Use *your* individual installation paths instead, when setting up the configurations!

The tools installed by *External Tools Configurations...* menu can be conveniently started from the *Run* pull-down menu or via a toolbar button.



11.2 OpenOCD as an Eclipse external tool

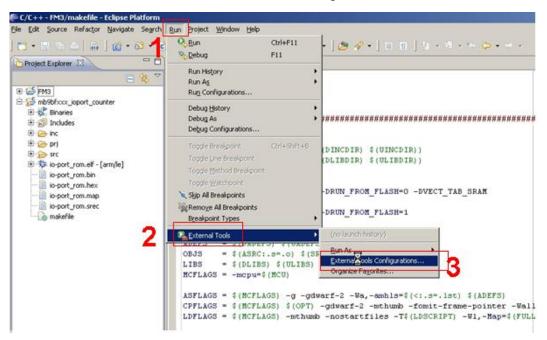
If using J-Link in JTAG interface, OpenOCD must be set as external tool for using J-Link with it.

Beforehand, please copy configuration file *openocd.cfg* in the directory ¥*OpneOCD_LibUSB* (*C*:¥*OpenOCD_LibUSB*).

<u>File E</u> dit <u>V</u> iew F <u>a</u> vorites <u>T</u> ool	s <u>H</u> elp		
🌀 Back 🔹 🕥 👻 <u></u> 🔊 Se	earch 🛛 😥 Fold	lers 🛛 🔁 🏂 🗙	v
Address C:\OpenOCD_LibUSB			
Name 🔺	Size	Туре	Date Modified
🚞 bin		File Folder	4/12/2011 1:49 PM
🚞 board		File Folder	4/12/2011 1:49 PM
🚞 drivers		File Folder	4/12/2011 1:49 PM
🚞 interface		File Folder	4/12/2011 1:49 PM
source		File Folder	4/12/2011 1:49 PM
🚞 target		File Folder	4/12/2011 1:49 PM
🗊 changelog-0.1.0-0.2.0.txt	4 KB	Text Document	7/14/2009 10:11 AM
🗐 changelog-0.2.0-0.3.0.txt	4 KB	Text Document	11/5/2009 4:40 AM
🗐 changelog-0.3.0-0.4.0.txt	4 KB	Text Document	2/21/2010 9:17 PM
🗐 info.txt	1 KB	Text Document	2/23/2010 5:56 PM
🗊 license_libftdi.txt	25 KB	Text Document	1/16/2010 2:07 PM
🗊 license_libusb-win32.txt	27 KB	Text Document	7/7/2009 5:53 PM
🗊 license_openocd.txt	18 KB	Text Document	7/2/2009 12:30 PM
🖬 log	118 KB	File	4/26/2011 10:11 AM
DpenOCD User's Guide.pdf	856 KB	Adobe Acrobat Doc	2/22/2010 7:09 PM
openocd.cfg	2 KB	CFG File	4/20/2011 5:09 PM



APPLICATION NOTE



Click on Run→External Tools→External Tools Configurations....

The "External Tools" window will appear. Click on *Program* and then *New* button to establish a new external tool.





Double click Program.

External Tools Configurations				×
Create, manage, and run con Please specify the location of the ext				
Image: System of the system	Name: New_configuration Main Refresh Image: Build Im	Environment 🔲 Common	Brows <u>e</u> File System	Variables
	Arguments:	Browse Workspace	Browse File System	Variables



Fill out the "External Tools" form exactly as described below.

In the "Name" text box call this external tool "OpenOCD"

In the "Location:" pane, use the *Browse File System...* button to search for the OpenOCD executable. It is located in the following folder:

C:¥OpenOCD_LibUSB¥bin¥openocd-0.5.0.exe

In the "Working Directory" pane, use the *Browse File System...* button to specify *C:YOpenOCD_LibUSB* as the working directory.

In the "Arguments" pane, enter the argument "-f <*your project path*>¥openocd.cfg" to specify the OpenOCD configuration file.

External Tools Configurations	<u> x</u>
Create, manage, and run cont	igurations 💫 👔
Run a program	
Ype filter text Program OpenOCD OpenOCD OpenOCD OpenOCD	Name: OpenOCD(LIbUSB) Main Refresh Main Refresh Location: C:\OpenOCD_LibUSB\bin\openocd.exe Browse Worksgace Browse File System Working Directory: C:\OpenOCD_LibUSB C:\OpenOCD_LibUSB Browse Workspace Browse File System Variables Arguments: -f ./openocd.cfg -f ./openocd.cfg Variables Variables Variables
Filter matched 3 of 3 items	Apply
?	



In the Build tab uncheck Build before launch.

ame: OpenOCD(LibUSB)		
	nment 🔲 🖸 Common	
Build before launch		

No changes are required to the other tabs in the other forms (*Refresh*, *Environment*, and *Common*).

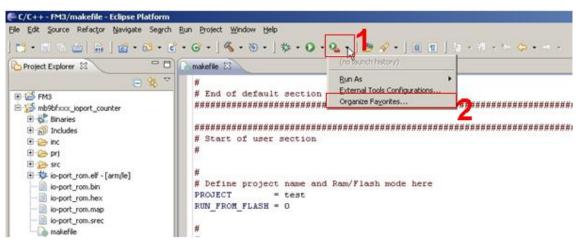
Click on Apply and Close to register OpenOCD as an external tool.

To check this setup, choose $Run \rightarrow External$ Tools $\rightarrow External$ Tools Configurations... then select OpenOCD.

Now organize all external tools needed for debugging.

From the bar menu select the following configuration window:

Click on Organize Favourites.....



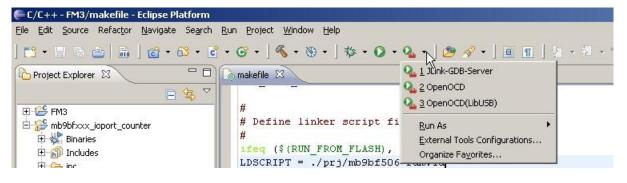


APPLICATION NOTE

Click on Add and select all tools.

😓 Organize External Tools Favorites	×	
Fayorites:	1	Add External Tools Favorites
	Ad <u>d</u> Remove	Image: Select gedich Conniglations. Image: Select gedich Conniglations.
	Down	
		Select All Deselect All
?	Cancel	

Click on *Ok* to save the configuration. The external tools are added as favorites. They can be then started from the bar menu as shown below.







12 Eclipse CDT Debug Perspective

In chapter 8 a sample FM3 project was created and the build process to create all application output files (**.bin*, **.mhx* or **.hex*) needed to program the Flash was explained. These output files include also debug information files (**.elf*) needed for debugging program code in Flash or RAM.

To start the debug process, first change from Eclipse CDT "C/C++ Perspective" to "Debug Perspective".

Select from Eclipse menu *Windows* and go to *Open perspective*. Click on *Debug*. The debug Perspective can be also found under *Other*....

Project Run	Window Help						
• @ •]	New Window New Editor	🕨 •] 🧶 👟] 🧷 🖬 🔳					
	Open Perspective Show Yew	* Debug					
	Customize Perspective Save Perspective <u>A</u> s <u>R</u> eset Perspective <u>Close Perspective</u> Close All Perspectives	Qther					
	Navigation Preferences	1202 1203 This function 1204 It returns 1 1205					
		1206 \return					

After this the following window will be displayed.

le Edit Navigate	kefile - Eclipse Plati									
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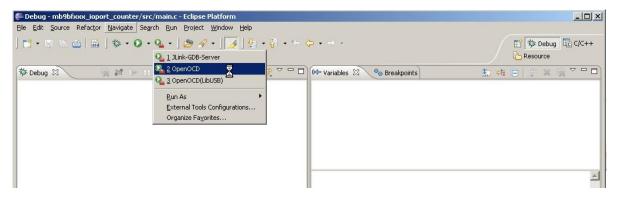
12.1 Using the OpenOCD Server to debug a Flash Application

Connect the SK-FM3-176PMC-ETHERNET board via JTAG interface to the USB interface of your computer. As the interface tool for this connection use e.g. the JTAG dongle "J-Link" and "ARM-USB-TINY".



If using J-Link or ARM-USB-TINY in ICE, the following explanation are common for them. After this start the "OpenOCD". OpenOCD runs as a daemon, which means, that a program runs in the background waiting for commands to be submitted to it.

Click on OpenOCD and the external tool will be started as shown below.





In the console view at the bottom, check that the daemon server has been started.

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The makefile The main.c 🛛	- 0	Disassembly 2	3	- 0
<pre>void wait (int a) void wait (int a) while(a);)</pre>		No debug context	Enter location 1	here 🗾 E in 💽 🎽
// main program	•			
OpenOCD [Program] C:\OpenOCD_FTDI\openocd-0.4.0\src\openocd.exe				
Open On-Chip Debugger 0.4.0 (2011-05-05-17:02) Licensed under GNU GPL v2 For bug reports, read http://openocd.berlios.de/doc/doxygen/bugs.html jtag_nsrst_delay: 100 jtag ntrst_delay: 100		Ş		*
Info: Severity is severe trst_push_pull SOD kHz Info: device: 6 "2232H" Info: deviceID: 67353570 Info: SevielNumber: FFSK6HASA Info: Description: KT-LINK A				
Info : max TCK change to: 30000 kHz Info : clock speed 500 kHz Info : JTAG tap: mb9bf506.cpu tap/device found: 0x4ba00477 (m Info : mb9bf506.cpu: hardware has 6 breakpoints, 4 watchpoint		part: OxbaOO,	ver: 0x4)	v F
j □ *	Writable	Smart Insert	49:2 J	

Then, the MCU must be changed to halt state. Because if it is run state, an error may occur between GDB server and OpenOCD.

Please connect to OpenOCD with the terminal emulator(using Tera Term in this documentation).

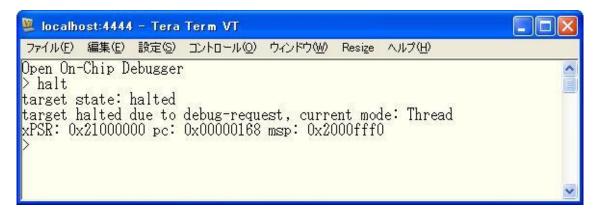
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If displayed with "Open On-Chip Debugger", connection is success.

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By halt command, confirm that the target is halt state.



Now create a new "Debug Configuration". For this, click on the *Debug Configurations...* as shown below.

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QueroCD [Program] Detru Configurations GrdSize Fayorites		
🚡 makefile 🔀 main.c 😣	🗖 🗖 🧱 Disassembly 🕅	- 0



The first debug configuration with "J-Link GDB Server" was saved, but also a special configuration for debugging with OpenOCD is needed.

To create a new debug configuration select "GDB Hardware Debugging" and click on *New*. Rename the debug configuration. To avoid confusion with other debug configurations (using J-Link GDB Server), it is recommended that the selected name a reference to the project name (*io-port*) and to the used external tool (*OpenOCD*).

In the "Project" text box, use the Browse button to find the project ioport_sk-fm3-****.

In the "C/C++ Application" text box, use the *Search Project…* button to locate the application debugger file *io-port_rom.elf*.

Set the "Build configuration" text box to "Use Active".

10 X 🖯 🄅 •	Name: Debug-io-port-OpenOCD				
pe filter text	🗋 Main 🗱 Debugger 🍉 Startup 🎼	Source Gommon			
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Launch Group	Build (if required) before launching				
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	C Enable auto build	C Disable auto build			
	Use workspace settings	Configure Workspace	Settings		



Click on *Select other....* by "Using GDB (DSF) Hardware Debugging launcher" as shown below and select "Standard GDB Hardware Debugging launcher". Click on *OK*.

Select Preferred Launcher	
This dialog allows you to specify which launcher available for a configuration and launch mode.	to use when multiple launchers are
☑ Use configuration specific settings	Change Workspace Settings
Launchers:	
GDB (OSF) Hardware Debugging Launcher Standard GDB Hardware Debugging Launcher	1
Description Jtag hardware debugging using the standard	J debugger Framework (CDI).
?	OK Cancel

Now select the "Debugger" tab as shown below. In the dialog labeled "Debugger Options", use the *Browse* button to locate the GDB Debugger *arm-none-eabi-gdb.exe* file. It can be found e.g. in: *C:yagartoyagarto-toolchainybin*.

Uncheck Use remote target.

E Debug Configurations		×
Create, manage, and run conf	igurations	Ť.
C/C++ Application C/C++ Application C/C++ Astach to Application C/C++ Bostmotime Debugging D/C 00B Hardware Debugging D/D Bubug-io-port-Zhrk-GDE D Debug-io-port-Zhrk-GDE D D D D D D D D D D D D D D D D D D D	Name: Debugeo-o-port-OpenOCD Main Source Common GDB Setup GDB Command: C(lyagartolyagarto-toolchain\bin\arm-none-eabl-gdb.exe Command Set: Standard (Windows) Image: Standard (Windows) Protocol Version: Image: Standard (Windows) Image: Standard (Windows) Post number: Image: Im	Browse Variables
Filter matched 9 of 9 items	Using Standard GDB Hardware Debugging Launcher - <u>Select other</u>	ApplyRevert
•		Debug Close



Now select the "Startup" tab as shown below.

On the "Initialization Commands" panel copy or type the following lines:

```
# connect to the OpenOCD gdb server
target remote localhost:3333
monitor reset init
monitor soft_reset_halt
load
```

On the "Run Commands" panel add the following lines:

```
monitor gdb_breakpoint_override soft
break main
Continue
```

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Sype filter text C D <th>Main (\$> Debugger > Startup > Source Common > reset and Delay (Seconds): 3 > Hait # connect to the OpenOCD gdb server target remote locahost:3333 monitor reset init</th> <th></th>	Main (\$> Debugger > Startup > Source Common > reset and Delay (Seconds): 3 > Hait # connect to the OpenOCD gdb server target remote locahost:3333 monitor reset init	
	Load Image and Symbols C Load Image Use project binary: io-port_rom.elf Use file: Image offset (hex): Load symbols Use project binary: io-port_rom.elf Use file:	Workspace File System
	Symbols offset (hex): Runtime Options Set program counter at (hex): Set breakpoint at: Resume Run Commands	



The rest of the configuration window can be left in its default setting. Click on *Debug* button to start the debug process.

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E C Debug-to-port-OpenOCD (GDB Hardware Debugging)	### r12	0
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🖻 🧬 Thread [1] (Suspended)	IIII b	1707
I main() main.cr54 0x00000176	iiii pc	0x00000177
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Undefined command: "". Try "help".		
target remote localhost:3333		-6
OxOOOOOOOO incs3_interrupt_vector_cortex_m ()		
monitor soft_reset_halt		
load		_
No executable file specified. Use the "file" or "exec-file" command.		
<pre>load C:\\workspase\\mb9bfxxx_ioport_counter\\io-port_rom.elf Loading section .text, size 0x6ec ima 0x0</pre>		
Loading section .text, size 0x6ec isa 0x0 Loading section .ARM.exidx, size 0x8 ima 0x6ec		-
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The following figure shows a successful debug start. To resume, simply click on the *Resume* button.

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I main() main.c:71 0x0000274	ITT FO	0	
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After starting the debug procedure, the debug process can be terminated at any time by clicking on the "*Suspend*" button.



12.2 Debug on the RAM

In the paragraph before the Flash debug was explained from the chapter 12.1. It is also possible to link and download an application for and to the RAM memory of the device. For this the needed RAM application must be created first. To do this, return to the "C/C++ Perspective".

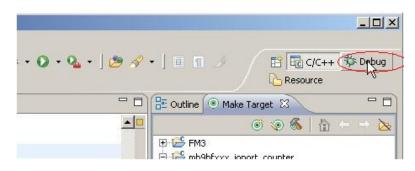


Double click on *C/C*++ and the IDE will change be to C/C++ development perspective. Click on *Make (RAM)* to build the RAM make target. The RAM debug application will be generated then (Note, that the application code and the data must not exceed the RAM memory size).

C/C++ - mb9bfxxx_ioport_counter	
<u>Edit Source Refactor N</u> avigate	Se <u>a</u> rch <u>P</u> roject <u>R</u> un <u>W</u> indow <u>H</u> elp
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EM3	164,# ⊞ 😂 FM3
- 1995 mb9bfxxx ioport counter	165# makefile rules
E Binaries	166#
E m Includes	167 Ginc
	168 all: ROM
E Cori	169 E src
E C src	170 ROM: ASFLAGS +=defsym Debug_RAM=0
🗄 🏇 io-port_ram.elf - [arm/le]	171 ROM: clean \$(OBJS) \$(PROJECT)_rom.elf \$(PROJECT)_rom.hex
io-port_ram.bin	172 ROM: \$ (PROJECT)_rom.bin - @ Make (ROM)
io-port_ram.hex	173 ROM: \$ (PROJECT) rom.mhx
io-port_ram.map	174
io-port ram.mhx	175 RAM: ASFLAGS +=defsym Debug RAM=1
a makefile	176 RAM: clean \$(OBJS) \$(PROJECT) ram.elf \$(PROJECT) ram.hex
	177 RAM: \$ (PROJECT) ram.bin
	178 RAM: \$ (PROJECT) ram.mhx
	179
	180 %0 : %0
	181 @ echo "compiling"
	182 \$ (CC) -c \$ (CPFLAGS) -I . \$ (INCDIR) \$< -o \$0
	183
	184%0 : %8
	185 @ echo "assembling"
	186 \$(AS) \$(ASFLAGS) \$< -0 \$0
	187
	188 %ram.elf: %(OBJS)
	189 0 echo "linking"
	190 \$(CC) \$(OBJS) \$(LK) \$(LDFLAGS_RAM) \$(LIBS) -0 \$8
	🗄 Problems 🖉 Tasks 🔲 Properties 🕼 History 🖳 Console 🕴 🎋 Debug 🤚 🔂 🔩 🛃 🖓 🖆 👘 🖆 🖷 👘 😭
	C-Build [mb9bfxxx_ioport_counter]
	arm-none-eabi-gcc-4.5.2 ./src/main.o ./src/core cm3.o ./src/system mb9bf50x.o
	./src/startup mb9bf50x V21.o -static -mcpu=cortex-m3 -mthumb -mthumb-interwork -nostartfiles
	-W1,start-group -lc -lg -lstdc++ -lsupc++ -lgcc -lm -W1,end-group
	-T./prj/Fujitsu cortex-M3 ram V21.ld -W1,-Map=io-port ram.map,cref,no-warn-mismatch -o
	io-port ram.elf
	arm-none-eabi-objcopy -0 ihex io-port ram.elf io-port ram.hex
	arm-none-eabi-objcopy -I elf32-little -O binary io-port ram.elf io-port ram.bin
	arm-none-eabi-objcopy -O srec io-port ram.elf io-port ram.mhx

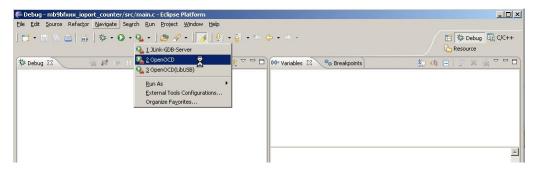


Now switch back to the Debug perspective to initiate the RAM debug process.



Reconnect the SK-FM3-176PMC-ETHERNET board via the JTAG interface to the USB interface of your computer.

After reconnecting, please start OpenOCD. As follows, click on OpenOCD to start the external tool.





In the console view at the bottom, confirm that the server was started

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1 - 7				
// main program	-			T
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Tasks 🕃 Problems 🕥 Executables 📮 Console 🛛				🖉 🛃 • 📑 • 🗖 🗐
OpenOCD [Program] C:\OpenOCD_FTDI\openocd-0.4.0\src\openocd.exe				
Open On-Chip Debugger 0.4.0 (2011-05-05-17:02)				<u> </u>
Licensed under GNU GPL v2		A		
For bug reports, read http://openocd.berlios.de/doc/doxygen/bugs.html				
jtag nsrst delay: 100				
jtag ntrst delay: 100				
trst_only separate trst_push_pull				
500 kHz				
Info : device: 6 "2232H" Info : deviceID: 67353570				
Info : SerialNumber: FFSK6HASA				
Info : Description: KT-LINK &				
Info : max TCK change to: 30000 kHz				
Info : clock speed 500 kHz				
Info : JTAG tap: mb9bf506.cpu tap/device found: 0x4ba00477 (m		art: Oxba00, ver	: 0x4)	
 Info : mb9bf506.cpu: hardware has 6 breakpoints, 4 watchpoint 	5			T
		1 1		<u>></u>
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To create e new debug configuration, choose *Debug Configurations...* as shown below.

E Debug - mb9bfxxx_ioport_counter/src/main.c - Eclipse Platform		
<u>Eile Edit Source Refactor Navigate Search Project Run Window Help</u>		
] 🖹 • 🖩 🐘 🚠 🏧 • O • O₂ • 🍠 🔗 •] 🧷 ½ - № • + <		😰 🏇 Debug 🛛 👋
Debug I Debug-lo-port-JLINk-GDB-RAM OpenOCD [Program] Debug-lo-port-OpenOCD C:\OpenOCD_FTD1\ Debug-lo-port-JLINk-GDB Debug As Debug As Debug Configurations Origenize Fagorites	(X)= Variables 23 💁 Breakpoints	
	a.	A V
🕞 makefile 😥 main.c 🛛		- 8
<pre>void wait (int a) (while (a);</pre>		
<pre>) // main program int32_t main (void)</pre>		
€ 		
🖉 Tasks 🔝 Problems 🚺 Executables 📮 Console 🛛		× 🔌 🕞 🖉 🛃 🕊 🗳 • 📬 • 🗖 •
OpenOCD [Program] C:\OpenOCD_FTDI\openocd-0.4.0\src\openocd.exe		
trst_only separate trst_push_pull 500 kHz Info : device: 6 "2232H"		
Info : deviceID: 67353570 Info : SerialNumber: FFSK6HASA		
Info : Description: KT-LINK A		
Info : max TCK change to: 30000 kHz Info : clock speed 500 kHz		
Info: JTAG tap: mb9bf506.cpu tap/device found: 0x4ba00477 (mfr Info : mb9bf506.cpu: hardware has 6 breakpoints, 4 watchpoints	;: Ox23b, part: OxbaOO, ve	er: 0x4)
3		
∫ t [¢]	Writable Smart Insert 48 :	1



APPLICATION NOTE

Then select "GDB Hardware Debugging" and click on New.

Rename the debug configuration. For differencing the RAM debug from the Flash debug, give the name also a suffix "_RAM" to avoid confusions with the configurations already saved.

In the "Project" text box, use the *Browse* button to find the project *mb9bfxxx_ioport_counter*. In the "C/C++ Application" text box, use the *Search Project…* button to find the application file *io-port_ram.elf*.

Set the "Build configuration" text box to "Use Active", and check the box "disable auto build". Click on *Select other....* by "Using GDB (DSF) Hardware Debugging launcher" as shown below and select "Standart GDB Hardware Debugging launcher". Click on *OK*.

Debug Configurations		
reate, manage, and run conf	igurations	1
type filter text C/C++ Application C/C++ Attach to Application C/C++ Postmortem Debugger GDB Hardware Debugging Debug-io-port-3Link-GDB	Name: Debug-io-port-OpenOCD-RAM	Search Project Browse
C Debug-io-port-JLink-GDB-RAM Debug-io-port-OpenOCD Debug-io-port-OpenOCD-RAM Launch Group Zylin Embedded debug (Cygwin) Zylin Embedded debug (Native)	Build (if required) before launching Build configuration: Use Active C Enable auto build	re Workspace Settings
	Using Standard GDB Hardware Debugging Launcher - <u>Select other</u>	Apply



Click on *Select other*, please change "GDB(DSF) Hardware Debugging launcher" to "Standard GDB Hardware Debugging launcher". After changing, click on *OK*.

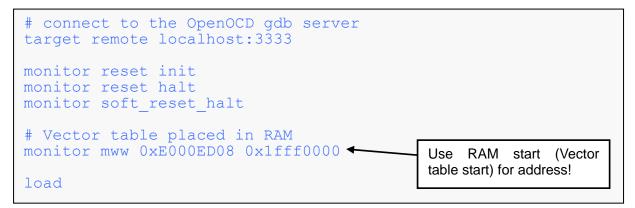
E Select Preferred Launcher	
This dialog allows you to specify which launcher t available for a configuration and launch mode.	to use when multiple launchers are
Use configuration specific settings	Change Workspace Settings
Launchers:	
GDB (DSP) Hardware Debugging Launcher Standard GDB Hardware Debugging Launcher	
Description Jtag hardware debugging using the standard (debugger Framework (CDI).
•	OK Cancel

The "Debugger" configuration tab is the same by all configurations.

ate, manage, and run cor)C
K K	Cityagartolyagarto-toolchain(bin)arm-none-eabi-gdb.exe Command Set: Standard (Windows)	Browse Variables
r matched 9 of 9 items	Using Standard GDB Hardware Debugging Launcher - <u>Select other</u>	Apply



In the "Startup" tab copy into the "Initialization Commands" panel the following command lines:



In the "Startup" tab copy into the "Run Commands" panel the following command lines:

<pre>break main set \$r13 = *(int*)0x1fffE000 </pre>	Stack pointer for address!
<pre>set \$pc = *(int*)0x1fff0004 ← continue</pre>	Use RAM start (Vector table start) + 4 Bytes for address!

The rest of the configuration window can be left in its default settings. Click on *Debug* button to start the debug process.

1 🗈 🗶 🕒 🏇 •	Name: Debug-io-port-OpenOCD-RAM	
ype filter text	Main 🏂 Debugger 🍉 Startup 🖕 Source 🗔 Common	
C C/C++ Application C C/C++ Attach to Applicatior C C/C++ Postmortem Debugg	Initialization Commands ✓ Reset and Delay (seconds): 3 ✓ Halt	
C Debug-io-port-JLink-GDE C Debug-io-port-JLink-GDE C Debug-io-port-OpenOCC C Debug-io-port-OpenOCC	# connect to the OpenOCD gdb server target remote localhost:3333 monitor reset init monitor reset halt	×
Launch Group	Load Image and Symbols	
₽C Zylin Embedded debug (Cygr ₽C Zylin Embedded debug (Nati	☑ Load image	
	Use project binary: io-port_ram.elf	
	C Use file:	Workspace File System
	Image offset (hex):	
	☑ Load symbols	
	Use project binary: io-port_ram.elf	
	C Use file:	Workspace File System
	Symbols offset (hex):	
	Runtime Options	
	Set program counter at (hex):	
	Set breakpoint at:	
	☐ Resume	
	Run Commands	
	break main continue	*
er matched 11 of 11 items	Using Standard GDB Hardware Debugging Launcher - <u>Select other</u>	Apply Reyert



The screenshot below shows a successful RAM debug process start. To resume, simply click on the *Resume* button.

E Debug - mb9bfxxx_ioport_counter/src/main.c - Eclipse Platform		_ _
Ele Edit Source Refactor Navigate Search Project Run Window Help		
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🎏 Debug 🕴 👔 🕼 陳 🗉 🔳 🔄 🚴 🔅 🗮 📴 🕾 🔽 🖓	🗱 Variables 💁 Breakpoints	illi Registers 🛛 📑 Modules 👘 🖘 🗖 🗖
E-Q OpenOCD [Program]	Name	Value
C:\OpenOCD_FTDI\openocd-0.4.0\src\openocd.exe	1010 0101 r12	0
E Debug-io-port-OpenOCD-RAM [GDB Hardware Debugging]	lill sp	0x20007ff8
🕀 🚱 GDB Hardware Debugger (5/9/11 6:29 PM) (Suspended)	inin k	536839815
	1010 pc	0×1fff8153
T man() man.c:54 Ux1ff8152 Style="background-color: selected;" Style="background-color: selec	1010 FO	0
C:(yagarco(yagarco-coolchain(pin(arm-hone-eabi-gdb.exe (5/9)11 6:29 PM)	•101 F4	0
	3	۲ ۲
🚡 makefile 🔒 main.c 🛛 💽		
int32_t main(void)		<u> </u>
(
FM3_GPIO->ADE = OxOOFF; // No Analog Inputs		
FM3 GPIO->DDR1 = OxFF00; // P18-P1F: LED-SEG1 output		
FM3_GPIO->DDR3 = OxFFOO; // P38-P3F: LED-SEG2 output		
		_
FM3_GPIO->PFR1 = 0x0000; // P10-P1F: LED-SEG1 GPIO		× F
	-	
Tasks R Problems Executables Console C Memory		< % 🕯 🗟 🕞 🖉 🔙 😃 🖻 🔍 😷 🗖
Debug-io-port-OpenOCD-RAM [GDB Hardware Debugging] C:\yagarto\yagarto-toolchain\bin\arm-none-r	eabi-gdb.exe (5/9/11 6:29 PM)	
		-
#monitor gdb breakpoint override soft		
Undefined command: "". Try "help".		
break main		
Breakpoint 8 at 0x1fff8152: file src/main.c, line 54.		
continue		
Breakpoint 1, main () at src/main.c:54		
54 FM3_GPIO->ADE = OxOOFF; // No Analog Inputs		-
		E
1.	Writable Smart Insert	54:1

On the "Disassembly" view, the current instruction can be observed for example. This view can be selected from the eclipse menu *Window* under *Show View*.

%0 threadpoints #111 Registers 10 10 10 10 12 3 Mit Modules 10 10 10 12 3 0 0 10 10 10 0 0 1 0 1 10 0 1 0 1 1 assembly 3 Enter location here 1 1 0 1 1013101 MAUU 15, 15 10 1
• On Breakports ## Registers 32 • Moddles • Clip = ???? 12 • O • Moddles • O 12 • O </th
Value A 12 0 00 0 0 0 0 0 1 0 2 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
12 3 の 0.20207110 2 32658777 2 0.0201118145 0 0 1 1 0 1 1 0 1 3 5 5 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0 0:0000700 x 0:0000700 x 0:0000700 1 0 1 0 2 Enter location here 10:10:11 WALW 137, 13 10:10:11 WALW 137, 13
c 0:Iff0145
0 0 H 0 1 assembly 3 [Other location here] 0 0 0 Location 1 0 0 0 0 0 0 0 0 0 0 Location 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 2 assembly (3 Enter location here 2 2 1 1 1 2 2 2 1 1 2 2 2 2 2 2 2 2 2
assembly 3 [Ster location here 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
10130: UXLD 13, 13 1813e: ldr r2, [sp, #4]
10130: UXUD 13, 13 1813e: ldr r2, [sp, #4]
10130: UXUD 13, 13 1813e: ldr r2, [sp, #4]
1813e: 1dr r2, [sp, #4]
18140: mdd.w r2, r2, #4294967295
18144: Debug Current Instruction Pointer
18146: cmp r3, #0
f8148: bne.n 0x1fff8132 <wait+6></wait+6>
1814a: add sp, #8
f814c: bx lr
f814e: nop
1
main:
f8150: push (r3, 1r)
FRIS CPIO->ADE = 0x00FF; // No Analog Inp
■ × x ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
9/11 6:29 PM)
2



13 Eclipse Embedded Systems Register View Plug-In

The Eclipse plug-in "EmbSysRegView" is useful to get an adequate Eclipse I/O register view allowing a structured display and modification ability of the peripheral register values of all FM3 MCU resources.

13.1 Plug-In installation

To install the Eclipse Embedded Systems Register View plug-in "EmbSysRegView", open the Eclipse menu *help* and select *Install New Software*.

₩indow	Help	- 22
	Stelcome	
	(?) Help Contents	
	Sgarch	E
_	Qyriamic Help	
	Key Assist Ctrl+Shift+L	
	Tips and Tricks	
	gheat Sheets	
	Check for Updates	
	Instal New Software	
	About Eclipse Platform	

Click on the *Add* button. Enter, e.g. "EmbSysRegView" as name and in the location text box the following link: <u>http://embsysregview.sourceforge.net/update</u> Confirm the repository with *OK*.

😂 Install	×
Available Software Select a site or enter the location of a site.	
Work with: Type or select a site	Find more software by working with the " <u>Available Software Sites"</u> preferences.
type filter text	
Name There is no site selecter Add Repository	
2 Name: EmbSysRegView	v tgcal eqview.sourceforge.net/update Archive
Select All Deselect All	3 Cancel
(Construction)	=
Show only the latest versions of available software Group items by category	Hide items that are already installed What is <u>already installed</u> ?
Contact all update sites during install to find required softwar	re
0	< Back Next > Enish Cancel



After the confirmation select all plug-in feature and click on Next.

🖶 Install		<u>_ ×</u>
Available Software Check the items that you wish to install.		BE
Work with: EmbSysRegView - http://embsysregview.sourceforge.net	/update Find more software by working with the "#	Add
type filter text		
Name	Version	
R 2 100 embsysregview	0,1.8	
Select All Deselect All 1 item selected		
│ Details		Е
Show only the latest versions of available software	Hide items that are already installed	1
Group items by category	What is already installed?	
 Gontact all update sites during install to find required software 		
?	< <u>B</u> ack <u>N</u> ext >	Enish Cancel

Click on Next to confirm the installation detail.

Install			
install Details Review the items to be installed.			
Name	Version	Id	
🖗 embsysregview_feature	0.1.8	org.eclipse.cdt.embsysregview_feat	
ze: Unknown			
Details			
			-
(?)		< Back	Einish Cancel



Read the license text thoroughly, check the radio button for "I accept the terms of the license agreement" (or skip the usage in terms of doubts) and close with *Finish*.

🖶 Install				
Review Licenses Licenses must be reviewed and accepted before the software can be installed.				
License text (for embsysregview_feature 0.1.8):				
EmbSysRegView is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version. EmbSysRegView is distributed in the hope that it will be useful, but WITHOUT ANY WARANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. You should have received a copy of the GNU General Public License along with EmbSysRegView. If not, see &hthttp://www.gnu.org/licenses/>.				*
I accept the terms of the license agreement $I_{\rm I}$ do not accept the terms of the license agreement				
0	< <u>B</u> ack	Next >	Einish	Cancel

Eclipse will ask for IDE restart. Click on Restart Now.



The Eclipse software is now up-to-date and the "EmbSysRegView" is also installed.



13.2 Using the Eclipse Register View

The plug-in "EmbSysRegView" is now installed. To support the peripherals Register viewing for the FM3 MCU, it is needed to use the two FM3 xml description files from Spansion, which comes along with the application note's software package archive, and copy these files to Eclipse plug-ins directory.

Name 🔺	Size	Туре	Date Modified
configuration		File Folder	5/25/2011 1:30 PM
🛅 dropins		File Folder	9/9/2010 11:52 AM
🛅 features		File Folder	5/25/2011 1:04 PM
⊇ p2		File Folder	12/6/2010 10:38 AM
plugins .		File Folder	5/25/2011 1:04 PM
🛅 readme 🗸		File Folder	12/6/2010 10:29 AM
🗟 .eclipseproduct	1 KB	ECLIPSEPRODUCT File	7/29/2010 11:37 AM
🕋 artifacts.×ml	54 KB	XML Document	5/25/2011 1:04 PM
🥏 eclipse.exe	52 KB	Application	8/10/2010 5:48 PM
🢁 eclipse . ini	1 KB	Configuration Settings	5/25/2011 1:29 PM
eclipsec.exe	24 KB	Application	8/10/2010 5:48 PM
🖄 epl-v10.html	17 KB	Opera Web Document	2/25/2005 7:53 PM
🛅 notice.html	9 KB	Opera Web Document	4/27/2010 4:23 PM

The Eclipse installation directory should have the following structure:

Open the directory ¥*plugins* and look for the installation directory for the installed plug-in "EmbSysRegView".

Address C:\eclipse	Address C:\eclipse\plugins		
Name 🔺	Name 🔺		
 configuration dropins features p2 plugins readme eclipseproduct artifacts.xml eclipse.exe eclipse.ini eclipse.exe eclipse.exe 	 com.zylin.embeddedcdt_4.16.1 org.apache.ant_1.7.1.v20100518-1145 org.eclipse.cdt.core.win32_5.2.0.201009241320 org.eclipse.cdt_embsysregview_0.1.8 org.eclipse.cot%.runtime.compatibility.registry_3.3.0 org.eclipse.equinox.launcher.win32.win32.x86_1.1.1 org.eclipse.platform_3.6.1.v201009090800 org.eclipse.ui.intro.universal_3.2.402.r36_v20100702 org.eclipse.ui.workbench.compatibility_3.2.100.I2010 com.ibm.icu_4.2.1.v20100412.jar com.jcraft.jsch_0.1.41.v200903070017.jar 		
epl-v10.html	 fujitsu.embsysregview.jar javax.servlet.jsp_2.0.0.v200806031607.jar javax.servlet_2.5.0.v200910301333.jar org.apache.commons.codec_1.3.0.v20100518-1140.jar 		

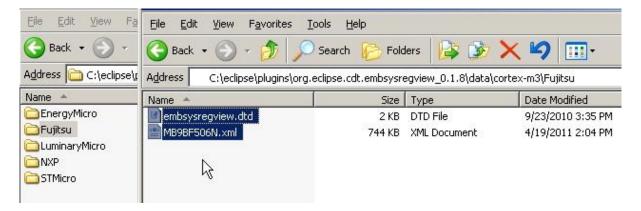


APPLICATION NOTE

Open the selected directory and create a new folder with the name e.g. *Fujitsu* to directory: *¥data¥cortex-m3*

G Back 🔹 🐑	🚱 Back 🔹 🕥	🔇 Back 🔹 🕥 🖌 🏂 🔎	Search 🧭 Folders	· 🕼 🌶 🕽	× 🍤 💷 -
Address C:\e	Address 🛅 C:\eclip	Address C:\eclipse\plugins\org.	eclipse.cdt.embsysregv	iew_0.1.8\data\co	rtex-m3
Name 🔺 📄 Data	Name 🔺	Name 🔺	Size T	уре	Date Modified
icons META-INF org contexts.xml jdom.jar miglayout-3.7- plugin.xml	Cortex-m3		Fi	ile Folder ile Folder ile Folder ile Folder	5/25/2011 1:04 PM 5/25/2011 1:04 PM 5/25/2011 1:04 PM 5/25/2011 1:04 PM
		Ne <u>w</u> P <u>r</u> operties	 Eolver Shortcut 		

When the folder *Fujitsu* is created, add both description files *embsysregview.dtd* and *MB9BF506N.xml* to it.





Now go back to Eclipse IDE and use the installed Register view.

For this, open *Preferences* in the Eclipse's *Window* pull-down menu.



Select the correct device as shown in the figure below.

ype filter text	EmbSys Register View	(m + m) + 🕶
e General □-C/C++ 1	A Periperal Register View for embedded sys	
Appearance Build	Architecture:	description
E Code Style	cortex-m3 💌 🛃	
Debug 2	Vendor:	
-Breakpoint Actions	Fujitsu 🔽 5	
 Common Source Lookup Path Debugger Types 	Chip:	
Disassembly	MB9BF506N	
EmbSys Register View 3	Board:	
GDB		
- GDB MI - Tracepoint Actions	none 💌	
Editor		
File Types		
Indexer		
- Language Mappings		
 New CDT Project Wizard Property Pages Settings 		
- Task Tags		
- Template Default Values		
€ Help		
Install/Update		
⊞ Run/Debug ⊕ Team		
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~		

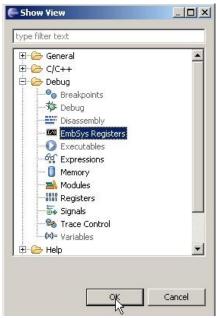


After Confirming the Register view configuration, the tool can be now used.

To open a register viewer in the CDT debug perspective (see chapter 12 for detailed information), select *Show View* \rightarrow *Other...* in the Eclipse's *Window* pull-down menu.

Project G →] (<u>Window</u> <u>Help</u> <u>New Window</u> New Editor	••] 🕭 🛷 •]	n h • *
	Open Perspective		
	Show <u>V</u> iew	C/C++ Projects	
	Customize Perspective Save Perspective <u>A</u> s Reset Perspective Glose Perspective Close All Perspectives	Console Con	Alt+Shift+Q, C
	Navigation	_ 📴 Outline	Alt+Shift+Q, O
_	Preferences	 Problems Project Explorer Properties 	Alt+Shift+Q, X
		🔗 Search 🔕 Tasks	Alt+Shift+Q, S
		Other	Alt+Shift+Q, Q

Then expand the "Debug" node and select "EmbSys Registers". Confirm with OK.





During debugging on the RAM or ROM (Flash), the debug process must be stopped in a breakpoint to get content (and refresh) of a certain register. Double click on this register to start viewing its content. Registers which are selected get a green font. Changes in register contents are shown with red values. When hovering over a register's description column you see a short description for that register.

1 • B V	6 🙆 🗟 🛛 🍄	• 🔾 • 💁 • 🛛 🥭 🛷	•]]]]]	* 🔿 *			😭 🏇 Debug 🔤 C/C
Debug 🕅	V 🖗 M	0 11 🔳 55 3. 9) 🗆 🗟 🚺 🚺 🖉 🖓 🗖	0= Variables	egisters 8	3 🛋 Module:	i) 🗄 📲 🏹 🗖
- Q OpenO	CD [Program]			Name			Value
C:\r	OpenOCD_FTDI\open	ocd-0.4.0\src\openocd.exe		🖃 👬 Main			
Debug-	io-port-OpenOCD [GD	6 Hardware Debugging]		3111 r0			373
⇒ in the second sec			ed)	0101 r1			1792
				11111 12			1023
	1 main() main.c:5		14				
		:hain\bin\arm-none-eabi-gdb.e					
- C:\r	workspase\io-port\io-p	port_rom.elf (5/25/11 2:54 PM	0	0			
main.c 🛛			-	Disassemb	W ES	Enter loo	ation here 💽 👔 🧞 🔽 🖻
50	~				2	ov.w r3, #1	
	m	ain program		0000017			2288 ; UX3000 387 ; OX4003
	t main(void)			0000017		ov.w r2, #2	
53 (0000018		tr.w r2, [r	
54 FM3	GPIO->ADE =	OxOOFF; // No Anal	log Inputs	56			R1 = 0xFF00; // P18-P1F: LED
55			100	0000018		ov.w r3, #1	
CC PNO	CDTO SDDD1 -	0	P. IPD 2801	k I A	•		E E
Construction of the local division of the lo	1				_لنــ		and the second s
Tasks 🔡 A	Problems 😥 Executa	ables 📮 Console 🕮 EmbS	ys Registers 🛛 🚺 Memory				5
	Vendor: Fujitsu Chip	: MB9BF506N_Board: non					
egister		Hex	Bin	Reset	Access	Address	Description
ADC1_:							The 12-bit A/D converter is a function that conve
B 🈂 ADC2_:							The 12-bit A/D converter is a function that conv
adc2_: B 🗁 Exti	12bit						The 12-bit A/D converter is a function that conv The functions and operations of the external into
ADC2_: E > EXTI							The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o
ADC2_: EXTI EXTI E Drterru	12bit ptSourceCheck						The 12-bit A/D converter is a function that conv The functions and operations of the external into
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ADC2_: EXTI	12bit ptSourceCheck PORT PFR0	0x0000001F	000000000000000000000000000000000000000	11 0×00000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o
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ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	12bit ptSourceCheck PORT PFR0 P00 (bit 0) P01 (bit 1)			111 0×00000000	RW	0×40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	12bit ptSourceCheck PORT PFR0 P00 (bit 0)	0×1 0×1	1	11 0×00000000	RW	0×40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	12bit ptSourceCheck PORT PFR0 P00 (bit 0) P00 (bit 0) P01 (bit 1) P02 (bit 2)	0×1 0×1 0×1	1 1 1	11 0×00000000	RW	Dx40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	12bit PCRT PFR0 P P00 (bit 0) P P01 (bit 1) P P02 (bit 2) P 02 (bit 2) P 03 (bit 3)	0x1 0x1 0x1 0x1 0x1	1 1 1 1	11 0x0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	12bit PORT PFR0 PO0 (bit 0) P00 (bit 1) P02 (bit 2) P02 (bit 2) P04 (bit 4)	0×1 0×1 0×1 0×1 0×1	1 1 1 1 1	11 0×0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	L2bit pSourceCheck PPR0 Image: PP04 Image: PP04	0×1 0×1 0×1 0×1 0×1 0×1 0×1	1 1 1 1 1 0	11 0×0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	zbit ptSourceCheck PORT PR0 P00 (bit 0) P01 (bit 1) P02 (bit 2) P04 (bit 4) P05 (bit 5) P06 (bit 6) P05 (bit 5) P06 (bit 6)	0x1 0x1 0x1 0x1 0x1 0x0 0x0 0x0 0x0 0x0	1 1 1 1 0 0 0 0 0 0 0 0	11 0×0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	I2bit pptSourceCheck pPR0 pPr00 p00 (bit 0) p00 (clic 1) p00 (clic 2) p00 (clic 3) p00 (clic 4) p00 (clic 6) p00 (clic 8) p00 (clic 9)	0x1 0x1 0x1 0x1 0x1 0x1 0x0 0x0 0x0 0x0	1 1 1 1 0 0 0 0 0 0 0 0 0 0	11 0×0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
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ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	I2bit PORT PPR0 P00 (bit 0) P01 (bit 1) P02 (bit 1) P03 (bit 4) P04 (bit 4) P05 (bit 6) P06 (bit 6) P06 (bit 6) P09 (bit 6) P09 (bit 7) P09 (bit 8) P09 (bit 9) P09 (bit 9) P09 (bit 9) P09 (bit 9)	0x1 0x1 0x1 0x1 0x0 0x0 0x0 0x0 0x0 0x0	1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11 0×0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	IZBR pcSourceCheck PPR0 P00 (bit 0) P01 (bit 1) P03 (bit 5) P05 (bit 5) P06 (bit 5) P06 (bit 5) P06 (bit 6) P06 (bit 7) P06 (bit 10) P06 (bit 10) P06 (bit 12)	0:4 0:4 0:4 0:1 0:1 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0	1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11 0.0000000	RW	0x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
ADC2_: ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: EXTI ADC2_: ADC2_: EXTI ADC2_: ADC2	L2bit pcR5urceCheck pPR0 pr00(bit 0) pr01(bit 1) pr02(bit 2) pr03(bit 3) pr04(bit 4) pr05(bit 6) pr05(bit 13)	0:4 0:1 0:1 0:1 0:4 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0	1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	11 0×0000000	RW	8x40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
	IZbit pcSourceCheck PPR0 P00 (bit 0) P01 (bit 1) P02 (bit 2) P03 (bit 5) P04 (bit 4) P05 (bit 5) P05 (bit 6) P06 (bit 6) P07 (bit 7) P08 (bit 6) P09 (bit 7) P09 (bit 7) P09 (bit 1) P09 (bit 1) P09 (bit 11) P09 (bit 12) P00 (bit 12) P00 (bit 14)	0:4 0:4 0:4 0:1 0:1 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0	1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	11 0.0000000	RW	0:+40033000	The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers
	L2bit pcSourceCheck pPR0 pro0 (bit 0) pro1 (bit 1) pro2 (bit 0) pro3 (bit 0) pro3 (bit 0) pro4 (bit 4) pro5 (bit 6) pro6 (bit 6) pro6 (bit 6) pro6 (bit 1) pro6 (bit 13) pro6 (bit 13) pro6 (bit 15)	0:4 0:1 0:1 0:1 0:4 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0	1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0-0000000	RW		The 12-bit A/D converter is a function that conv The functions and operations of the external into The interrupt controller determines the priority o General Purpose I/O Registers



14 Eclipse Features

14.1 Overview

The Eclipse CDT provides many tools and features, which can help the user for the embedded software development for a FM3 MCU.

In the next paragraphs some of these features of the debug perspective are discussed.

14.2 Disassembly View

To display the "Disassembly" view in the CDT debug perspective (see chapter12 for details), select *Show View→Disassembly* in Eclipse's *Window* pull-down menu.

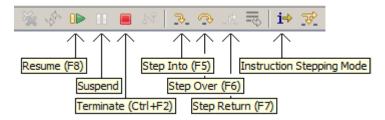
rm					
Run Project	<u>W</u> indow <u>H</u> elp				
•] 😂 🛷	<u>N</u> ew Window New <u>E</u> ditor		(→ → →) (M= Variables 😒		
1 38 B C	Open Perspective	► 🖾 🗱 🗱 Variables 🖾			
	Show <u>V</u> iew	💽 🍳 Breakpoints	Alt+Shift+Q, B		
openocd.exe = ebugging] · PM) (Suspende	Customize Perspective Save Perspective <u>A</u> s		Alt+Shift+Q, C		
1117 (505)01100	<u>R</u> eset Perspective	E Disassembly			
, none-eabi-gdb.e	Close Perspective Close A∥ Perspectives	Executables 60 Expressions	73		
5/25/11 2:54 PM	Navigation	Memory			
ujitsu cortex-M:	Preferences	🛋 Modules			
	50	💳 🗄 Outline	Alt+Shift+Q, O		
cam		🛃 Problems 1911 Registers 54 Signals	Alt+Shift+Q, X		
// No Analo	g Inputs	🧟 Tasks			
	: LED-SEG1 outp : LED-SEG2 outp	(X)= Variables	Alt+Shift+Q, V		
		Other	Alt+Shift+Q, Q		



The view will be then displayed as shown below.

QuenoCD [Program] QuenoCD [PTD](apenood-0.4.0)src(apenood.exe QuenoCD [PTD](apenood-0.4.0)src(apenood.exe QuenoCD [OBP Hardware Debugging] @ GDB Hardware Debuggint (S(25)11 2:54 PM) (Suspended) Defund [1] (Suspended)			ane		Yalue	
= 1 main() main.c:54 0x0 = C:lyagartolyagarto-tookhari) = C:lworlspaseljo-port/lo-port_r	binljarm-none-eabi-gdb.exe (5/25/11 2:54 i		Disassembly 2	Enter locatio	o here	2 8 6 8 ^{7 0}
S0 S1//	program DFF; // No Analog Inputs F00; // P18-P1F: LED-SEGI F00; // P18-P1F: LED-SEGI D00; // P10-P1F: LED-SEGI D00; // P10-P1F: SW2-INTO D00; // P18-P1F: SW2-INTO D00; // P10-P1F: SW2-INTO LEDPATTERN(count / 10); LEDPATTERN(count - ((count	OUTPUT GPIO GPIO , SW3-INT1 , SW3-INT1	000001723	nop main: { push (r3, lr) FM3_GPIO->ADE mov.w r3, #122; mov.w r3, #122; mov.w r3, #123; mov.w r3, #123; mov.w r2, #25; str.w r2, [r3, FM3_GPIO->DDR1 mov.w r2, #652; str.w r3, #1638; mov.w r3, #123; mov.w r3, #1638; mov.w r2, #652; str.w r2, [r3,	<pre>= 0x00FF; 88</pre>	// No Analog Inp 0x3000

On this view a pointer to the current instruction will be set, so that the user can break the debugging process any time by clicking on the button *Suspend*. Do not mix it up with *Terminate*, which will end the debug session!

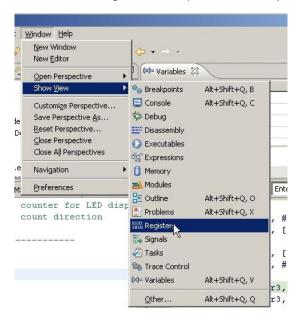




14.3 CPU Register View

The Eclipse CDT provides a register view that enables read and write access to the core registers.

To get this view, select Show View→Register in Eclipse's Window pull-down menu.



The selected view displays all core registers and their contents. Open the tree "Main" to get a CPU registers overview.

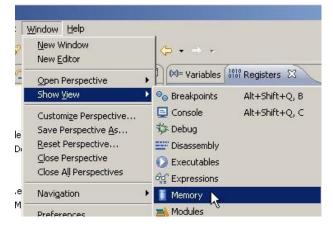
Name Value ClopenOCD [Program] Image: Standard St	1 44 E 7 E	
□ □ ↓ </th <th></th>		
□ C Debug-to-port-OpenOCD [GD8 Hardware Debugging] IIII r0 1000000 □ ⊕ GD8 Hardware Debugging] IIII r0 1000000 □ ⊕ GD8 Hardware Debugging] IIII r0 5 □ ⊕ Thread [1] (Supended: Signal SiGN1' received. Description: Interrupt.) IIII r2 204009 □ ⊇ west(main.cH8 0m00000162) □ C □		
	1000000	
= 2 wat() man.c+8 0x00000162		
	284009	
= 1 main() main.cr/1 0x0000274 100 r4		
- 🖧 C:\yagarto\yagarto-tookhan\bin\arm-none-eabi-gdb.exe (5/25/11 2:54 PM) IIII rS 0		
Silvorkspaseljo-portjo-port_rom.elf (5/25/11 2:54 PM)		
100 17 0		
and the O		
0 0		
2021 r10 0		
×		
<u>1</u>		
🕼 main.c. 🕅 🗋 io-port_rom.map 👘 🗖 🎬 Disassembly 🖄 🔹 Enter location here 🔄 👔	0 6 8	
42 unsigned char count = 0; // counter for LED displ 0000015c: moveq r3, #0 43 signed char count_direction = 1; // count direction 0000015c: moveq r3, #1 44	1	
46 void wait (int a) 00000164: add.w r2, #4294967295		
47 (
10 while (a); 0000016a: cmp r3, #0		

To edit the content of a register, select the register and double click on it.



14.4 Memory View

Eclipse's memory monitor view is a default part of the debug view. Select *Show View*→*Memory* in Eclipse's "*Window*" pull-down menu.



To add a new memory monitor, click to the green plus sign in the Monitor pane.

The figure below shows the active memory monitors at address 0x20000000.

the state of the s	
	Pait loop 00000162: ldr r2, [sp, #4]
46 void wait (int a)	00000164: add.w r2, r2, #4294967295
47 (. 00000168: str r2, (sp, #4)
48 while (a) :	0000016a: cmp r3, #0
49)	0000016c: bne.n 0x156 <wait+6></wait+6>
50	0000016e: add sp, #8
51// 108	n program Add Memory 00000170: bx ir
52 int32_t main (void)	
53 (Monitor
	COFF: // No Apriog Inputs . 53 (
55	000001784 June tet
Tasks T Problems D Executable	y 🖸 Genesie 🛲 EmbSys Registers 🕕 Memory 🕄 🔪 👘 🕫 🖓 👘 🕫 🖓
Monitors	◆)
- · · 2000000	Address 0 - 3 4 - 7 8 - 5 C - 7
La	20000000 5505FFFF 00405CFF 0503FFEB 2504EEFB
	20000010 F0C4BCFE 0100FFBF 000077BF 30009FFA
	20000020 C4C47DFF 0000FFBF 2000D7F7 000AFEA7
	20000030 A424EBFF 43005FED 100CF97B 0000AAAA
	20000040 5575FFEF 00400DFF 2108FFEB 21D0EFF9
	20000050 80C17CFE 01007FAF 000077CE 3000495F
	20000060 004575FB 4002F5FB 400057F7 0006FEED
	20000070 8404FABF 45006FF5 9504BE7F 0000AAAA
	SODDODBO SEDEFFFF DADDAFFF DEDTFORD DEDTFORD
0	
	Monitor Memory
	Enter address or expression to monitor:
	Lince address of expression to monitor,
	0x2000þ000
	10-10-10-10-10-10-10-10-10-10-10-10-10-1
	OK Cancel
	(?) OK _N Cancel
	Curicor

The content of a selected memory address (RAM and some I/O resources) can be edited and changed by double clicking on the respective address.



14.5 Using Breakpoints on Eclipse Debug Perspective

After starting a debug session, the debugger will set a breakpoint at the main function.

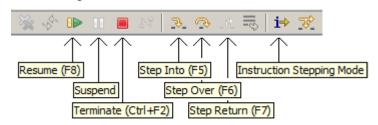
QuenoCD [Program] New C:(openoCD_FID)period-0.4.0(src(openoed.exe Image: Comparison of the second	Main Main 111 r0 111 r2 111 r2 111 r3 111 r4 111 r5	Vok 373 179 102 102 0	1 12 13	
Clyworkspaseljo-portjo	### #0 ### #1 ### #2 ### #3 ### #4	179 102 102	2 3	
GD6 Hardware Debugger (5/26/11 2:08 PM) (Suspended) Go Hardware Debugger (5/26/11 2:08 PM) (Suspended) Go Hardware Debugger (5/26/11 2:08 PM) Glyworkspase(io-port)o-port_rom.eff (5/26/11 2:08 PM) Clyworkspase(io-port)o-port_rom.eff (5/26/11 2:08 PM)	r1 11 r2 13 11 r4	179 102 102	2 3	=1
Thread [1] (Suspended) Thread [1] (Suspended) The set of the set	1111 r2 1111 r3 1111 r4	102 102	3	
Clyagartolyagarto-tookhainibinijam-none-eabi-gdb.exe (5/25/11 2:08 PM)	1111 r3 1111 r4	102		
C:/yagatolyagato-toolchan/bin/am-none-eabi-gdb.exe (5/26/11 2:08 PM) C:/workspaseljo-port/jo-port_rom.eff (5/26/11 2:08 PM)	1112 e 4		3	
Ci/workspase/jo-port/jo-port_rom.elf (5/26/11 2:08 PM)		0		
	0000 10	0		
				_ <u>></u>
<u> </u>				2
🗋 lo-port_rom.map 👔 main.c 😫 🗖 🗖	Disassembly 33	Enter location h	ere 💌 🐑 🗗 🖻	000
48 while (a);	• 00000176:	mov.w r3, #12288	; 0x3000	-
49)	0000017a:	movt r3, #16387 :		
50	0000017e;	mov.w r2, #255 ;		12
51 // main program	00000182:	atr.w r2, [r3, #		1.1
52 Line breakpoint: main.c [line: 52]	56		OxFF00; // P18-P1F:	LED
	00000186:	mov.w r3, #12288		
54 FH3_GPIO->ADE = 0x00FF; // No Analog Inputs	0000018a:	movt r3, #16387 ;		
56 FH3 GPIO->DDR1 = 0xFF00; // P18-P1F; LED-SEG1 output	0000018e:	mov.w r2, #65280		
57 FH3 GPIO->DDR3 = 0xFF00; // P38-P3F; LED-SEG2 output	000001921	str.w r2, [r3, #		
58	57		OxFF00; // P38-P3F:	C PED
59 FM3 GPIO->PFR1 = 0x0000; // P10-P1F: LED-SEG1 GPIO	00000196: 0000019a:	mov.w r3, #12288 movt r3, #16387		
60 FM3 GPIO->PFP3 = 0x0000; // P30-P3F: LED-SEG2 GPIO	0000019a:	mov.w r2, #65280		100
61	00000192:	str.w r2, [r3, #		
62 FM3 GPIO->DDR5 = 0x0000; // P18-P1F: SW2-INTO, SW3-INT1	59		0x0000; // P10-P1F:	1.80
63	000001a6:	mov.w r3, #12288		
64 FH3 GPIO->PFR5 = 0x0000; // P10-P1F: BW2-INTO, SW3-INT1	000001aa:	movt r3, #16387 ;		
65	000001ae:	mov.w r2, #0	2. 20.242.0	
66 while(1)	000001b2:	str r2, [r3, #4]		-
تر الله الله الله الله الله الله الله الل		•		- 1
	A	111		
Tasks 🚺 Problems 🖸 Executables 📮 Console 🕄 🗰 EmbSys Registers 🚺 Memory				1
ebug-io-port-OpenOCD [GDB Hardware Debugging] Cilyaganto/yaganto-tookhan/bin/arm-none-eabi-gdb.ex 'ransfer rate: 37 KB/sec, 596 bytes/write.	ie (\$/26/11 2:08 PM)			

Other breakpoints can be set by double clicking in the left pane in the source code tab beside the line numbers.

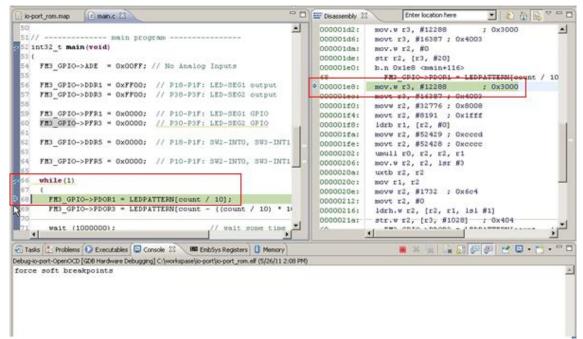
io-port_rom.map	Disessembly	23 Enter location here	2000	7 O E
21//	click here 0000017a: 0000017e:	movt r3, #16387 ; 0x4003 mov.w r2, #255 ; 0xff		-
55 56 FH3_GPIO->DDR1 = 0xFF00; // P18-P1F: 57 FH3_GPIO->DDR3 = 0xFF00; // P38-P3F:	LED-SEG1 output 00000186:	movt r3, #16387 ; 0x4003	; 0x3000	χp.
61	LED-SE02 GPI0 57 000001961	FM3_GPIO->DDR3 = 0xFF00; mov.w r3, #12288	// P38-P3F: L : 0x3000	.ED
62 FH3_GPIO->DDRS = 0x0000; // P18-P1F; 63 64 FH3_GPIO->PFR5 = 0x0000; // P10-P1F; 65	SW2-INTO, SW3-INT1 0000019e: SW2-INTO, SW3-INT1 59	mov.w r2, #65280 str.w r2, [r3, #524] FM3_GPIO->PFR1 = 0x0000;	; 0xff00 ; 0x20c // P10-P1F: L	.ED
<pre>66 while(1) 66 FH3_GPIO->PDOR1 = LEDPATTERN[count / 69 FH3_GPIO->PDOR3 = LEDPATTERN[count - 60 FH3_GPIO->PDOR3 = LEDPATTE</pre>		movt r3, #16387 ; 0x4003 mov.w r2, #0	; 0×3000	<u>ب</u>



Now Resume the debug session.



The next figure demonstrates debug process, if a breakpoint was hit.





15 Appendix

15.1 Glossary

Used abbreviations in this document

Abbr.	Meaning	Short Explanation
*.bin (file extension)	Binary Format File	A file that contains program data in raw binary form without any additional information
*.elf (file extension)	<u>E</u> xecutable and <u>L</u> inkable <u>F</u> ormat	Object code containing debug information (symbols, addresses, modules, etc.)
*.hex (file extension)	Hexadecimal format file (Intel)	A file that contains program data and address information (Intel format)
*.mhx (file extension)	<u>M</u> otorola <u>H</u> e <u>x</u> adecimal Format File	A file that contains program data and address information (Motorola S-Records format)
CDT	<u>C</u> /C++ <u>D</u> evelopment <u>T</u> ooling	Tool Chain with is used by Eclipse in this configuration
EABI	Embedded- <u>A</u> pplication Binary Interface	Standard format convention interface for embedded applications (used in Linux systems \rightarrow cf. None-EABI)
FTDI	<u>Future Technology Devices</u> International Ltd.	Company, which provides the JTAG-to-USB interface chips et al.
JTAG	Joint Test Action Group	IEEE Standard 1149.1 for testing and debugging hardware (here: MCUs)
JRE	<u>J</u> ava <u>R</u> untime <u>E</u> nvironment	Environment software for a virtual machine, which allows to run JAVA applets (e.g. Eclipse) on the PC
GDB	<u>G</u> NU <u>D</u> ebugger	Debugger software for the GNU Tool Chain
GNU	" <u>G</u> NU's <u>n</u> ot <u>U</u> nix"	Development Tool Chain
LibUSB	Library for USB	Open source library for USB drivers, here the Windows compilation is used
None-EABI	<u>None-E</u> mbedded- <u>A</u> pplication <u>B</u> inary <u>I</u> nterface	Embedded application layer interface for non-Linux systems, here: Windows OS $(\rightarrow cf. EABI$
OCD	<u>O</u> n- <u>C</u> hip <u>D</u> ebugger/Debugging	Debugger software for on-chip debugging, here using the JTAG protocol
OpenOCD	<u>Open</u> Source <u>O</u> n- <u>C</u> hip <u>D</u> ebugger	Open Source Code Debugger Software
YAGARTO	" <u>Y</u> et <u>a</u> nother <u>G</u> NU <u>AR</u> M <u>to</u> ol chain"	GNU tool chain ported and precompiled for Windows OS



15.2 Links

15.2.1 Software

Eclipse IDE: http://download.eclipse.org/eclipse/downloads/

Yagarto Tool Chain: <u>www.yagarto.de</u>

OpenOCD: <u>http://openocd.sourceforge.net/</u>

LibUSB: http://sourceforge.net/projects/libusb-win32/files/

Embedded System Register View Plug-In for Eclipse: http://sourceforge.net/projects/embsysreqview/

JRE: http://java.com/

15.2.2 Hardware

J-Link from IAR http://www.iar.com/Global/Products/Hardware-Debug-probes/DS-J-Link-ARM-09.pdf

ARM-USB-TINY from olimex https://www.olimex.com/Products/ARM/JTAG/ARM-USB-TINY/

SK-FM3-176PMC-ETHERNET V1.1 from Spansion Semiconductor

http://www.spansion.com/products/microcontrollers/pages/tool-detail-sk-fm3-176pmc-et hernet.aspx

NOTE : These URLs are subject to change without notice.



16 Additional Information

Information about Spansion's Microcontroller can be found on the following Internet page: http://www.spansion.com/



APPLICATION NOTE

Revision History

Rev	Date	Remark
1.0	Jan. 07, 2013	First Edition
1.1	Jan. 31, 2014	Company name and layout design change



Colophon

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