AN10862 LPC1000 software development toolchain Rev. 03 – 25 January 2010

Application note

Document information

Info	Content
Keywords	LPC1000, GNU-GCC
Abstract	How to use the GNU toolchain with the Cortex LPC1000 series



Revision history

Rev	Date	Description
03	20100125	Include "SWD" in debug config and IAR test examples
02	20091214	Include Keil test examples
01	20090827	Initial version

Contact information

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Application note

1. Introduction

LPC1000 is the new chip series that is based on the ARM Cortex processor family with many advanced features.

This document will show how to use the toolchain in LPC1000 series such as: LPC17xx (Cortex-M3), LPC13xx (Cortex-M3) and LPC11xx (Cortex-M0) families.

In this document, we will illustrate the setup for microcontroller LPC1768 on Keil MCB1700 evaluation board.

2. Software update requirement

Here is a list of setup files should be installed:

- Java Runtime Environment (required by IDE Eclipse)
- CodeSourcery Toolchain
- C/C++ Eclipse IDE
- Zylin CDT plugin for Eclipse.
- Segger J-link GDB server and driver.
- Flash magic.

2.1 Java Runtime Enviroment

First, we must check for Java Runtime Environment on system since Eclipse IDE is written partially in JAVA.

Go to the command prompt, type command "Java –version" and look at the result.

🛛 C:\WINDOWS\system32\cmd.exe	- 🗆 🗙
licrosoft Windows XP [Version 5. (C) Copyright 1985-2001 Microsof	
C:\Documents and Settings\nxpmig java version "1.6.0_05" Java(TM) SE Runtime Environment Java HotSpot(TM) Client VM (buil C:\Documents and Settings\nxpmig	(build 1.6.0_05-b13) Ld 10.0-b19, mixed mode)
	▼ ▶

Fig 1. JAVA version check

 If windows can not recognize this command or the version is not equal to or higher than 1.6.0_01, it means that you need to also download and install JRE in the next step.

Downloading Java Runtime Environment

- Go to the website: http://www.nxp.com/redirect/java.sun.com
- Look for "Download" item, follow these links and find the setup file "Java Run Time Environment" (JRE) (newest version) like this:

Java Runtime Environment (JRE) 6 Update 6 The Java SE Runtime Environment (JRE) allows end-users to run Java applications. Installation Instructions | ReadMe | ReleaseNotes | Sun License | Third Party Licenses Fig 2. Download JAVA Runtime Environment

The version found on the website may be slightly different than the example given in this application note.

2.2 CodeSourcery toolchain

Go to <u>http://www.nxp.com/redirect/codesourcery.com/release830</u> and download the latest package release for Windows platform, and then install this package in your system after removing the previous version of CodeSourcery Lite.

Please note that the GNU version in "makeconfig" file must be changed to correspond to this release version.

Download	MD5 Checksum			
Rec	ommended Packages	WHAT'S IN THIS RELEASE?		
IA32 GNU/Linux Installer	474331dcf4140c8211f70d1ab169957b			
IA32 Windows Installer	55bc4ea8beca7cd20da629cb804f6334	The datasheet provides information about key components of Sourcery G++		
A	dvanced Packages	Lite 2009q1-161.		
IA32 GNU/Linux TAR	940024f157f6775bc2a02ef12cd67801			
IA32 Windows TAR	8d47fdfc36de50ba8c3380754ca7ddc3			
Source TAR	58be5107bd73f87f2d86ff5a7af0def9			

Fig 3. Update CodeSourcery toolchain

2.3 Downloading Eclipse IDE and plug-in

2.3.1 Download Eclipse IDE for C/C++

Go to this website to download the Integrated Development Environment – IDE of Eclipse:

http://www.nxp.com/redirect/eclipse.org/downloads



Eclipse IDE for C/C++ Developers (68 MB) An IDE for C/C++ developers with Mylyn integration. **More...**

Downloads: 326,029

Fig 4. Choose "Eclipse IDE for C/C++ Developers" item to download

Install Eclipse IDE after downloading and set all options to default during installation.

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2.3.2 Install Zylin CDT plug-in

	🚳 Welcome	
	Help Contents	
	💯 Search	
	Dynamic Help	
	Key Assist	Ctrl+Shift+L
	Tips and Tricks	
	🚚 Report Bug or Enhancement	
	Cheat Sheets	
	Subversive	•
	Software Updates	
	About Eclipse Platform	
Fig 5. Choose Software Update in E	clipse	

Go through Help → Software update...

If the site <u>http://download.eclipse.org/tools/cdt/releases/ganymede</u> exists in Available Software, choose all items inside there, and then click Install... Follow remaining steps to complete the update.

ype filter text		
Name	Version	Install
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Garrymede Opdate Site	t/releases/gapymede	
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Show only the latest versions of available soft	ware	
Include items that have already been installed		
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pen the <u>'Automatic Updates'</u> preference page to	set up an automatic update schedule.	
2		Close

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If this site address does not exist, click Add Site and fill this address in to dialog http://www.nxp.com/redirect/download.eclipse.org/ganymede

For the Zylin Embedded CDT plug-in, because its repository has been removed and changed to <u>http://opensource.zylin.com/zylincdt</u>, we need to re-target this link in Eclipse software update.

Click the Add Site button as shown in <u>Fig 6</u>, fill in the location field with the new site address, and follow the remaining steps to complete the update.

	🖨 Add Site	
	Location: http://opensource.zylin.com/zylincdt	
	OK Cancel	
Fig 7. Update Zylin	ncdt with new repository	

2.4 Segger J-link

Go through <u>http://www.nxp.com/redirect/segger.com/download_jlink.html</u> to download the latest J-Link software.

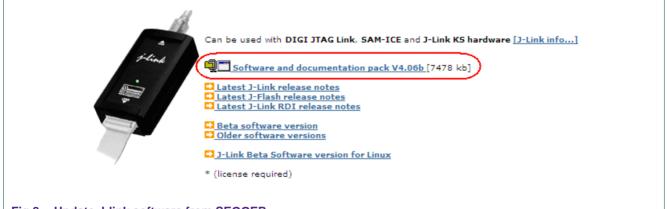


Fig 8. Update J-link software from SEGGER

2.5 Flash Magic

Flash Magic has supported flash downloading for LPC17xx series.

http://www.nxp.com/redirect/flashmagictool.com/

3. Running Eclipse for the first time

3.1 Eclipse workspace setup

• Initialize Eclipse on the desktop:



Fig 9. Initialize eclipse icon on the desktop

 Set workplace for the first time here. In this case, a new workspace named "nxpdrv" (also the name of the new folder) will be created in the root of the C: drive; all the projects will be located in "C:\nxpdrv\".

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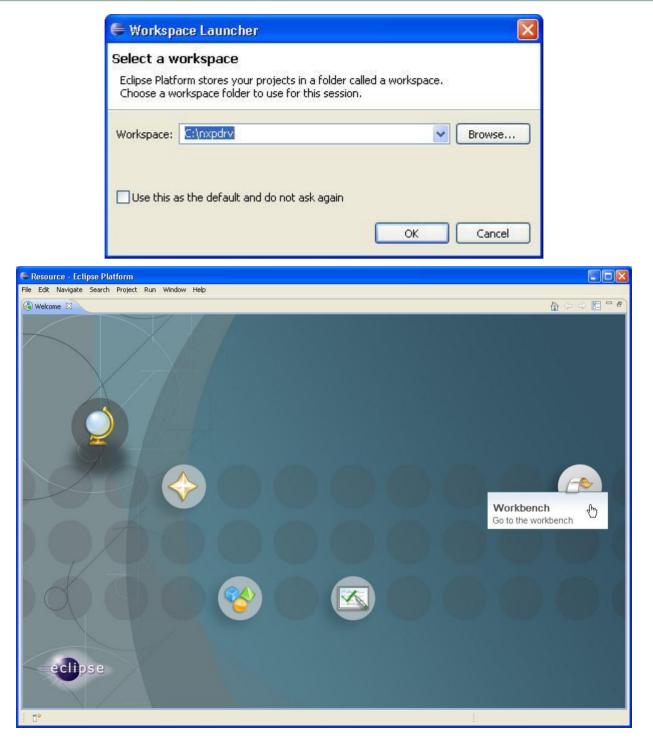


Fig 10. Set workplace and Eclipse for the first time

• Open perspective: Window → Open Perspective → Other ...

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	Preferences		
	Problems 🕴 🧔 Tasks 📮 C	onsole 🔲 Properties	* ▽ □ □
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	ream synchronizing		
1		al.	
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3.2 Setting up External tools for Eclipse

We could add some tools to Eclipse for convenience. All tools we can add here are:

• Flash magic.

- GDB Server
- Serial terminal (existing on Windows)

Flash magic tool

Run \rightarrow External Tools \rightarrow Open External Tools Dialog...

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				rnal Tools Dialog				
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Name: Flash magic Main Refresh To Environment Common Location: C:\Program Files\Flash Magic\FlashMagic.exe
Browse Workspace Browse File System Variables Working Directory: C:\Program Files\Flash Magic Browse Workspace Browse File System Variables Arguments: Variables Variables
Note: Enclose an argument containing spaces using double-quotes ("). Apply Revert

Run a program	
type filter text Program New_configuration	Name: Flash magic Image: Main & Refresh To Environment Save as Image: Common O Local file Image: Display the second s
	Display in favorites menu Console Encoding Image: Console Encoding Image: Console Encoding
Filter matched 2 of 2 items	Apply Revert Run Close

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	Project Run Window Help					
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		Run As Q Open External Tools Dialog Organize Favorites	•			· 🗆
		Console Properties			비 전 대 카 전 대	
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		Resource	Path	Location		· 8
	0 errors, 0 warnings, 0 infos	Resource	Path	Location		° 8
	0 errors, 0 warnings, 0 infos	Resource	Path	Location		
	0 errors, 0 warnings, 0 infos	Resource	Path	Location		

Fig 15. The result after setting

Follow these steps above to add other tools

• GDB server is located at directory that Jlink was installed, such as: "C:\Program Files\SEGGER\JLinkARM_Vxxx\JLinkGDBServer.exe"

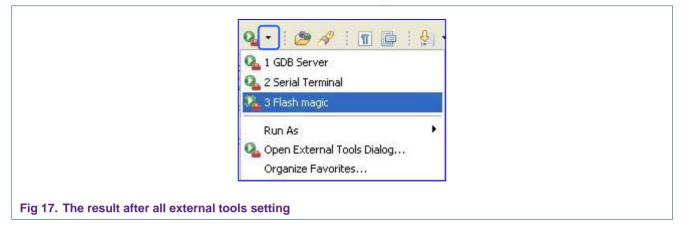
where Vxxx is the Jlink version that you're using.

Ex: JLinkARM_V408, JLinkARM_V409j...

Note: If you want to use SWD debug mode (for LPC13xx and LPC11xx devices only support SWD), include "-if SWD" in Argument tab in External Tools Configurations of gdb program.

reate, manage, and run config Run a program	urations
Ů 🗎 🗶 🖨 券 •	Name: gdb
type filter text	Main Refresh Build Se Environment Common Location: C:\Program Files\SEGGER\JLinkARM_V409j\JLinkGDBServer.exe Browse Workspace Browsg File System Variables Working Directory: C:\Program Files\SEGGER\JLinkARM_V409j Browse Workspace Browse File System Variables Arguments:
ilter matched 2 of 2 items	Variables Note: Enclose an argument containing spaces using double-quotes ("). Apply Reyert
0	

• Serial terminal is located at C:\Program Files\Windows NT".



4. Creating and working with LPC1000CMSIS project

These following steps demonstrate how to build examples in project with CodeSourcery Lite/GNU toolchain in Eclipse IDE:

The project we used to represent here is LPC1700CMSIS. Other LPC1000CMSIS project are correlative.

4.1 Create new workspace

In this case, a "nxpdrv" workspace is created on C:\ drive.

4.2 Create new project

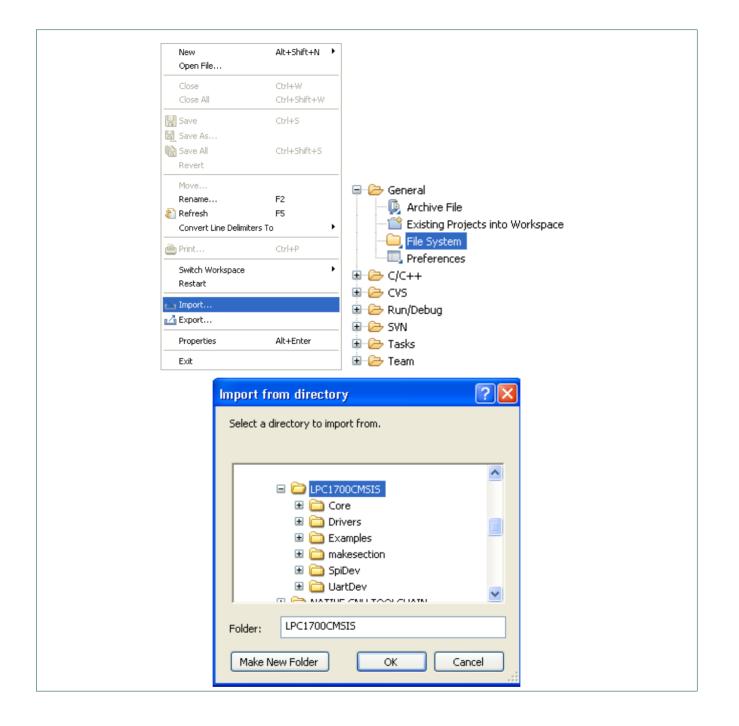
In this case, a new project is created with the name "LPC1700CMSIS".

4.3 Extract the package

In this case, the "zip" package is extracted on D:\ driver, a folder named "LPC1700CMSIS" will be generated on D:\ drive.

4.4 Import package resource file into project

Import all the source files in project package (File \rightarrow Import... \rightarrow Choose File System \rightarrow Browse to D:\LPC1700CMSIS)

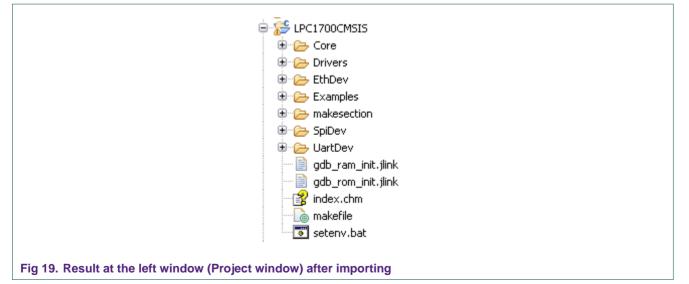


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	🚔 Import 📃 🗖 🔀
	File system
	Ocannot import into a workspace with no open projects. Please create a project before importing.
	From directory: D:\LPC1700CMSIS
	
	Filter Types Select All Deselect All
	Into folder: Browse
	Options Overwrite existing resources without warning
	Create complete folder structure
	Oreate selected folders only
	(?) < Back Next > Finish Cancel
Fig 18. Import File syste	em in resource package

The result should be like this on the left window (project window):



Configure "make" environment: Open "makeconfig" file and edit the "PROJ_ROOT" symbol as shown in Fig 20:

EPC17xx		
E Drivers		
Examples		
- Commence		
🛓 🗁 makerule		
- makeconfig		
makeconfig		
🗄 🗁 SpiDev		
🕀 🗁 SpiDev 🕀 🗁 UartDev	PROL BOOT	=C:\nxndrv\LPC1700CMSIS
▣	PROJ ROOT	
 ■	CMCORE_TYPE	=C:\nxpdrv\LPC1700CMSIS =CM3 =LPC17xx
⊕		

Fig 20. Configure "make" environment in "makeconfig" file

(In this case, "nxpdrv" means the eclipse workspace that was created first, and "LPC1700CMSIS" is the name of this project; note the forward slash style is used).

Close the Eclipse IDE.

4.5 Configure environment of "make utility"

In this case, all "make tool" resides in C:\nxpdrv\LPC1700CMSIS\makesection\tools

In order to make the system recognize the command located in private tool that its path is not included in the existing PATH variable of the system and user environment, the user must set the path of private tool to the "path" variable of the system variable environment.

In each project after importing the file system, all of the required tools are in the in "tools" folder; the user must set the path of the "tools" at the head of the "path" in system variables.

Note: Make sure all old paths of previous similar utility tools are removed in both user and system variables.

On desktop, go to Start → Control Panel → System...

System Res	store	Automatic Updates		Bemote
General	Compute	er Name	Hardware	Advanced
Performance			or to make most of mory usage, and v	
– User Profiles Desktop setti	ngs related to	o your logon		Jettings
Startup and F	1972		[Settings
System startu	ıp, system fail	ure, and debu	igging information	Settings
	Envi	ironment Varia	ables Error	Reporting
		ОК	Cancel	Apply

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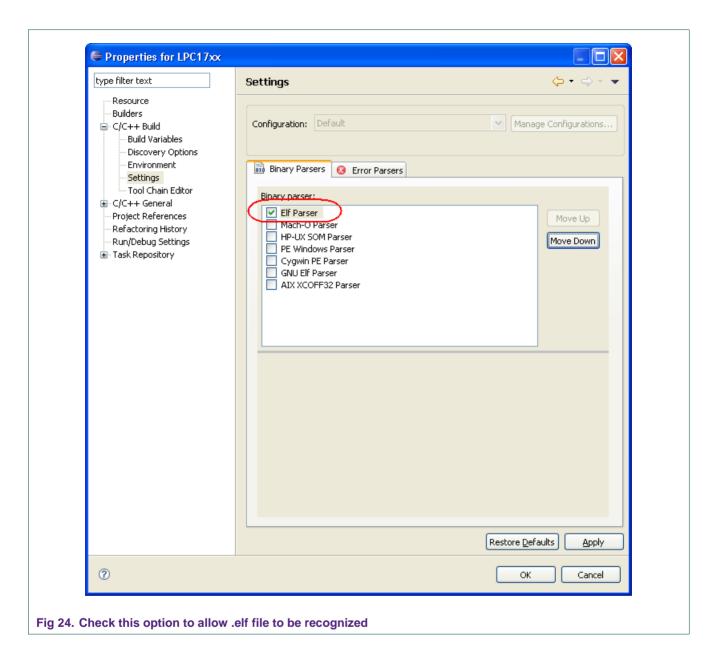
Fr	nvironment Varia	ables ?X
1. C	User variables for n	xpmig
	Variable	Value
	PATH	D:\DrvProj\lpc2148_svn\software\tools;
	TEMP TMP	C:\Documents and Settings\nxpmig\Loc C:\Documents and Settings\nxpmig\Loc
	10.2	
		New Edit Delete
1	System variables	
	Variable	Value
	OS Path	Windows NT C:\WINDOWS\SYSTEM32;C:\WINDOWS
	PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;
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		New Edit Delete
		OK Cancel
Edit	System Varia	ble ? 🔀
		Vacant Vacant
Useis	able <u>n</u> ame:	Path Must be at the HEAD
Varia	pie Hamer	
Varia	able <u>v</u> alue:	C:\nxpdrv\LPC1700CMSIS\makesection\too
		OK Cancel
Fig 22. Environment configuration	on (Step 2)	

4.6 Compile project

Re-open Eclipse, and then go through Project \rightarrow Property... to configure the properties for the "LPC1700CMSIS" project as shown in Fig 23:

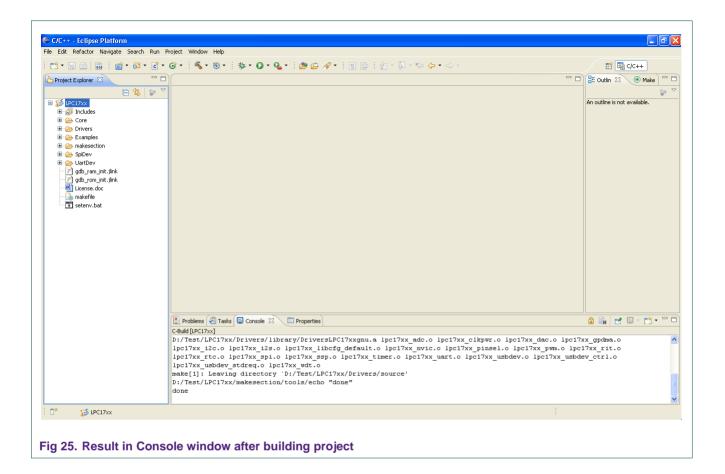
type filter text	$C/C++$ Build $\Rightarrow \Rightarrow \Rightarrow = =$
····· Resource	
⊖ C/C++ Build Build Variables	Configuration: Default Manage Configurations
- Discovery Options	
Environment Settings	Builder Settings 💿 Behaviour
Tool Chain Editor	C Build settings
⊕ C/C++ General	Stop on first build error Use parallel build
Project References	O Use optimal jobs number
Refactoring History Run/Debug Settings	💿 Use parallel jobs: 🛛 1 🔶
⊞ Task Repository	
	Workbench Build Behavior
	Workbench build type: Make build target:
	Build on resource save (Auto build) all Variables
	Note: See Workbench automatic build preference
	Build (Incremental build)
	Clean Variables
	Restore Defaults Apply
0	OK Cancel

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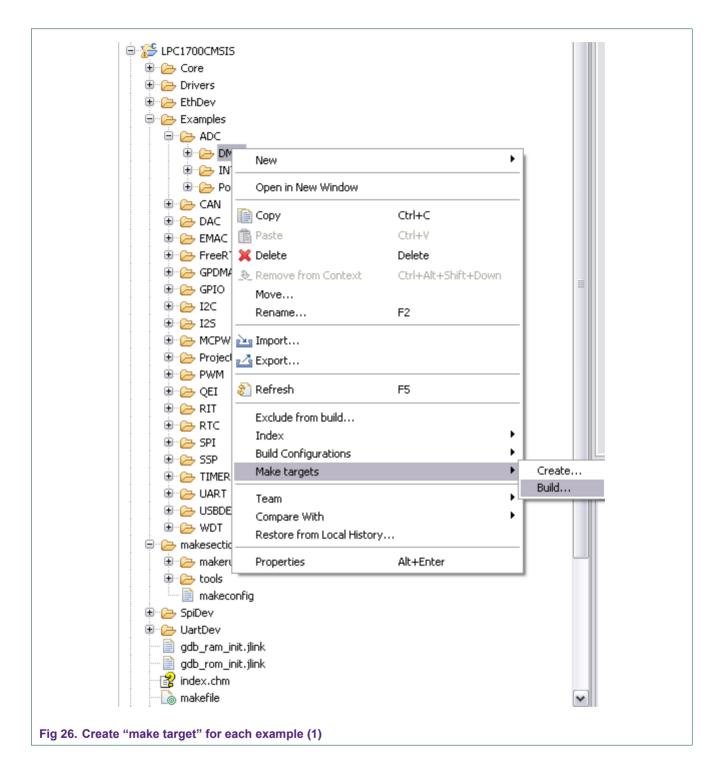
Now, build entire the project...

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To build the example, right click on the root of that example \rightarrow Make target \rightarrow Build...

(Note: In this case, the example is placed at C:\nxpdrv\LPC1700CMSIS\Examples\, for each peripheral. There are some sub-folders that contain specific examples for various purposes to test this peripheral)



Create these "make target": "clean", "ram" and "rom"...

- RAM mode, target name is 'ram'
- ROM mode, target name is 'rom'
- Clean: should be named as 'cleanall' in each example, this target
- should be executed before any 'make' session!!!

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Create a new Make target Target Name: clean Make Target Make Target: Make Target: cleanall Build command Use defaulti Build command: make Build Setting Stop on first build error. Run all project builders. Create Cancel	 Create a new Make target Target Name: ram Make Target Make Target: ram Build command Use default Build command: make Build Setting Stop on first build error. Run all project builders.
Create a new Make target Target Name: rom Make Target Make Target: rom Build command UJse default Build command: make Build Setting V Stop on first build error. V Run all project builders. Create Cancel	Make Targets X Make Targets for: LPC17xx/Examples/ADC/DMA Target Location Add @ clean @ ram @ rom Edit Build Cancel

Now, build the example in ram mode...

The result should like the example shown in $\underline{Fig 28}$ after building successfully at the left window (Project window).

in adc_dma_test.c
💼 🖻 debug_frmwrk.c
👜 📠 debug_frmwrk.h
🝙 庙 lpc17xx_libcfg.h
🝙 🐝 adc_dma_test.elf - [arm/le]
🝙 🔜 adc_dma_test.o - [arm/le]
🝙 🗟 debug_frmwrk.o - [arm/le]
📄 abstract.txt
ial adc_dma_test.map
📄 adc_dma_test.srec
📄 dep.wrn
line 💦 🚵 makefile
Fig 28. Result after building the "DMA" example

For more details, please refer to the "Using CodeSourcery toolchain and Eclipse IDE" document.

4.7 Execute example in ROM mode

Use FlashMagic to burn an image file (.hex) file (that can be observed only after building in ROM mode).

4.8 Debug the project

Basically, each example can be built in RAM mode or ROM (FLASH) mode.

Debugging in RAM mode requires fewer steps than ROM mode because the image file after building in RAM mode is loaded directly into the RAM section without any external tools.

4.8.1 Debug in RAM mode

Note: "make ram" must be completed before debugging in RAM mode

In this case, the "uart_interrupt" example is used to debug in RAM mode.

• Setting up Debug session: Go to menu Run → Open Debug Dialog...

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	Zylin Embedded debug				
C Zylin ZPU simulator det	Application conscile				
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LPC1700CMSIS		Binaries:			
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		Qualifier:			
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	OK Cancel				

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GDB debugger: C:\Program Files\CodeSourcery\Sourcery G++ Lite\bin\arm-none-eabi-gdb.exe	Browse
GDB command file: C:\nxpdrv\LPC1700CMSIS\gdb_ram_init.jlink	Browse
(Warning: Some commands in this file may interfere with the startup operation of the debugger, for ex-	ample "run".)
GDB command set: Standard	
Protocol:	
Verbose console mode	
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Apply	Re <u>v</u> ert
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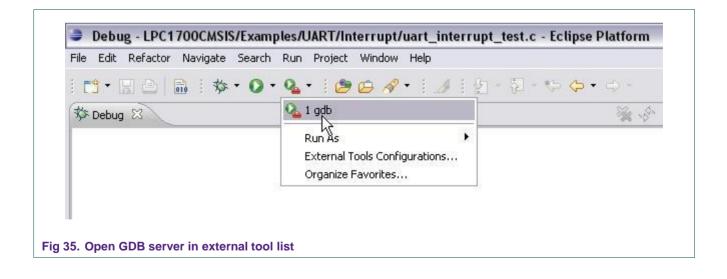
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Display in favorites menu	Console Encoding
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	Other ISO-8859-1
Standard Input and Output Image: Allocate Console (necessary for input)	
File:	
	Workspace File System Variables
Append	
Launch in background	

• Debugging in RAM mode (Note: Open "uart_interrupt_test.c" file to set breakpoint in next step).

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Search Run Project	Window Help		
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t 4142		# products. This s	oftware i

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Debug - LPC1700CMSIS/Examples/UART/Interrupt/uart_interrup Edit Refactor Navigate Search Run Project Window Help								
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		2						
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<pre>wdd[lc1y00cMs5] c]mcet.uby_lesc.mex program files/codesurcery/sourcery g++ cc/bin//lb/gcc/arm-nome-eabi/4.3.3////. cext.URAT2_StdIntHandler' in file 'E:/NXF/nxpmcu/L program files/codesourcery/sourcery g++ ce/bin//lb/gcc/arm-nome-eabi/4.3.3////./ cext.URAT3 stdIntHandler' in file 'E:/NXF/nxpmcu/L</pre>	PC1700CMSIS/Drivers/source/lpc17xx_uart.o' arm-none-eabi/bin/ld.exe: Removing unused section	~						
program files/codesourcery/sourcery g++ .c/bin//lib/gcc/arm-none-eab1/4.3.3/////	5. a c	(10)						-
h frame' in file 'c:/program files/codesourcery/s		 						
).			Writable	Smart Insert	347 : 43			



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File Help		
GDB Waiting for connection J-Link Connected Target Cortex-M3, Core Id: 0x4 Log output: Clear log	Initial JTAG speed 500 kHz Stay on top Current JTAG speed 500 kHz Generate lo Cache read BA00477 3.24 V Little endian Verify down Init regs on	indow gfile Is Ioad
Hardware: V8.00 S/N: 158001041 OEM: IAR J-Link found 1 JTAG JTAG ID: 0x4BA00477	RM V8 compiled Sep 29 2009 13:58:32 S device, Total IRLen = 4	
Free mode: To be us		>

Debug 🕄 🕴 🕫 1 uart_int	100 C
	🍇 🚸 🗉
Image: Second system Image: Second system <td></td>	

	🍇 🚸 🕪 🗉 📕 🕅 🔊 🔊 . A 🗮 🖬 🕬 🛒
Fig 39. All function buttons	

uart_	interrupt_test.c 🕱	-
	100	2
	// DeInit NVIC and SCBNVIC	
	NVIC_DeInit();	
5	NVIC_SCBDeInit();	
	/* Configure the NVIC Preemption Priority Bits:	
	* two (2) bits of preemption priority, six (6) bits of sub-priority.	
	* Since the Number of Bits used for Priority Levels is five (5), so the	
	* actual bit number of sub-priority is three (3)	
	*/	
	<pre>NVIC_SetPriorityGrouping(0x05);</pre>	c
	// Set Vector table offset value	
#if	(RAM MODE == 1)	
	NVIC_SetVTOR(0x10000000);	
#el:	se	-
1		3

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🍇 🛷 📭 II 🔳 14 🔍	🐟 🧟 🗮 🚺 😿 🎽 🗉 🎋 uart_interrupt_test.elf	<u>^</u>
🖃 💁 gdb [Program]		
C:\Program Files\SEGGER\JLinkARM_V4	409j\JLinkGDBServer.exe	
🖻 🕫 uart_int [Zylin Embedded debug (Native)]		
😑 🞯 Embedded GDB (12/15/09 11:29 AM) (9		
😑 🍄 Thread [1] (Suspended: Breakpoint		
2 c_entry() e:\nxp\nxpmcu\lpc:		
1 main() e:\nxp\nxpmcu\lpc170		
C:\Program Files\CodeSourcery\Source	ery G++ Lite\bin\arm-none-e	
		~
¢]	>	< >
e uart interrupt test s 😚 🖪 1	much vector cortex m() 0x10000000	
🖸 uart_interrupt_test.c 🛛 🔽 🚺cs3_inter	rrupt_vector_cortex_m() 0x10000000	
// DeInit NVIC and SCBNV:		
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit();</pre>		
// DeInit NVIC and SCBNV:		
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit();</pre>	IC	
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Press</pre>	IC eemption Priority Bits:	
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pre * two (2) bits of preemy</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pre * two (2) bits of preemp * Since the Number of B:</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5)	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pret * two (2) bits of preemp * Since the Number of B: * actual bit number of s</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio	rity.
<pre>// DeInit NVIC and SCENV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pre * two (2) bits of preemp * Since the Number of B:</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3)	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pre * two (2) bits of preemp * Since the Number of B: * actual bit number of s */</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3)	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pre * two (2) bits of preemp * Since the Number of B: * actual bit number of s */</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3) (0x05);	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pret * two (2) bits of preemp * Since the Number of B: * actual bit number of s */ NVIC_SetPriorityGrouping</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3) (0x05);	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pret * two (2) bits of preemp * Since the Number of B: * actual bit number of s */ NVIC_SetPriorityGrouping // Set Vector table offs</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3) (0x05); set value	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pret * two (2) bits of preemp * Since the Number of B: * actual bit number of s */ NVIC_SetPriorityGrouping // Set Vector table offs #if (RAM_MODE==1)</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3) (0x05); set value	rity.
<pre>// DeInit NVIC and SCBNV: NVIC_DeInit(); NVIC_SCBDeInit(); /* Configure the NVIC Pret * two (2) bits of preemp * Since the Number of B: * actual bit number of s */ NVIC_SetPriorityGrouping // Set Vector table offs #if (RAM_MODE==1) NVIC_SetVTOR(0x10000000);</pre>	IC eemption Priority Bits: ption priority, six (6) bits of sub-prio its used for Priority Levels is five (5) sub-priority is three (3) (0x05); set value	rity.

4.8.2 Debug in ROM (FLASH) mode

- Build the example in ROM mode first.
- Use Flash Magic to burn an image file (.hex) into the chip
- Start a debug session in ROM mode.

Steps to configure debugging session in ROM mode are the same with RAM mode.

In fact, Flash downloading using J-link is possible but this requires some license from SEGGER.

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5. Compiling in command line

The package project is supported to build without Eclipse IDE.

5.1 Extract the package

In this case, the "zip" package is extracted on C:\nxpdrv, and a folder named "LPC1700CMSIS" will be generated on C:\nxpdrv.

Modify the value of symbol "PROJ_ROOT" in the "makeconfig" file corresponding to the current location of project root (note that a forward slash is used in this case):

PROJ_ROOT = C:\nxpdrv\LPC1700CMSIS

Set environment: Refer to chapter 4.5.

Here is the way to build the UART1 Full Modem example in RAM mode

C:\nxpdrv\LPC1700CMSIS\Example\UART\UART1_FullModem>make_ram_

Fig 42. Build example in RAM mode (Command prompt window)

C:\WINDOWS\system32\cmd.exe

C:\WINDOWS\system32\cmd.exe

C:\nxpdrv\LPC1700CMSIS\Example\UART\UART1_FullModem>make rom

Fig 43. Build example in ROM mode (Command prompt window)



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6. Using LPC1000CMSIS driver package with extension tools

The project we used to represent here is LPC1700CMSIS. Other LPC1000CMSIS project are correlative.

6.1 Keil RealView - MDK

There's a Keil Project template inside .\Examples\Project_Template\Keil_RealView_MDK directory.

This project is configured to add all required startup file (asm file used for RealView compiler), ARM Cortex-M3 core files and driver source files.

Following target properties have been configured:

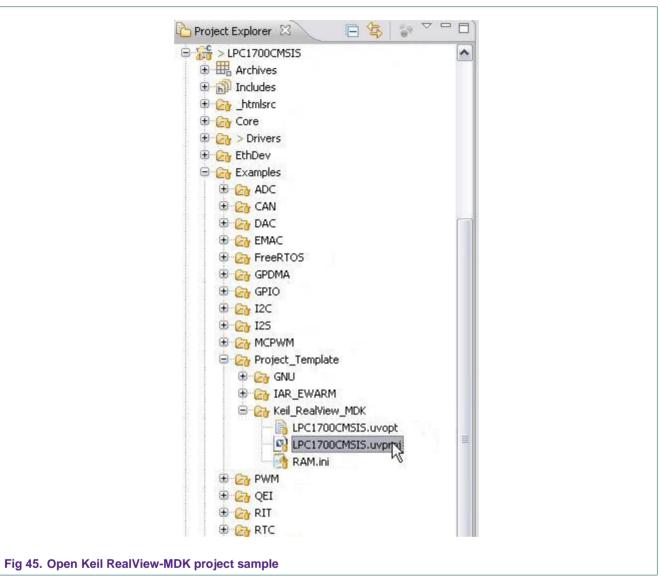
- Target device (LPC1768)
- Memory layout with linker.
- Output and list directory.
- C/C++ definitions and Common C/C++ Include Paths
 (.\Core\CM3\CoreSupport; .\Core\CM3\DeviceSupport\NXP\LPC17xx; .\Drivers\include)
- Flash programming and debug tool.

The main program is template.c for demonstration. However, this demo program can be easily removed to add other main program source files for user's purposes.

Here're all steps to import demo (main program) source file into exist Keil RealView-MDK project sample:

6.1.1 Open Keil RealView project

Follow .\Examples\Project_Template\Keil_RealView_MDK to open LPC1700CMSIS.uvproj (or .uv2 with older Keil project version) project file.



6.1.2 Add main program source files

ADC Polling example is used in this case. Add all required source files (*.c) in .\Examples\ADC\Polling directory:

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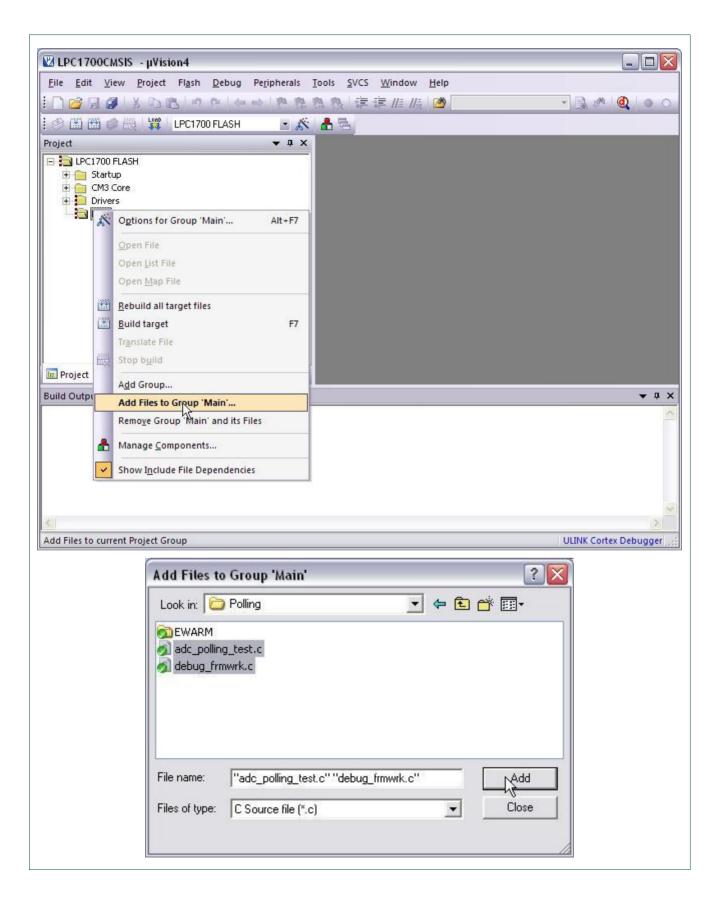


Fig 46. Add main program source file to project

6.1.3 Add Included Path

Add .\Examples\ADC\Polling into C/C++ Include Path of project.

vice Target Output Listing	User C/C++ Asm Linker Debug Utilities			
Preprocessor Symbols				
Dense:BUILD_WITH_E	XAMPLE_=1,RAM_MODE_=0			
Undefine:				
Language / Code Generation—				
	🔲 Strict ANSI C	Warnings:		
Optimization: Level 0 (-00)	 Enum Container always int 	<unspecified></unspecified>		
C Optimize for Time	🗖 Plain Char is Signed	Thumb Mode		
🔲 Split Load and Store Multiple	e 🦳 🔲 Read-Only Position Independent			
🔲 One ELF Section per Functi	on 🦳 Read-Write Position Independent			
Paths Misc Controls Compiler -cdevice DARMP	DeviceSupport\NXP\LPC17xx;\\Drivers\include() 1 -DMICROLIB -g -00apcs=interwork -I\\Core KP\LPC17xx -I\\Drivers\include -I\\ADC\Polling	NCM3		
string	OK Cancel Defaults	Y Normal Help		

Note:

There's a file named "lpc17xx_libcfg.h" in each example directory. This file used to enable/disable individual peripheral driver in driver source code for compiler to build.

Specified symbol should be defined in order to enable corresponding peripheral driver used in main program.

For example:

If ADC, UART0 and TIMER are used in this demo program, corresponded symbol for these two peripheral drivers should be defined:

#define _ADC 1

#define _UART 1

#define _UART0 1

#define _TIM 1

See more in .\Drivers\Include\Ipc17xx_libcfg_default.h to know more detail about these symbols.

6.1.4 Build project and get target

The rest is very common. Execute build then burn image file into target and let it run!

6.2 IAR Embedded Workbench IDE

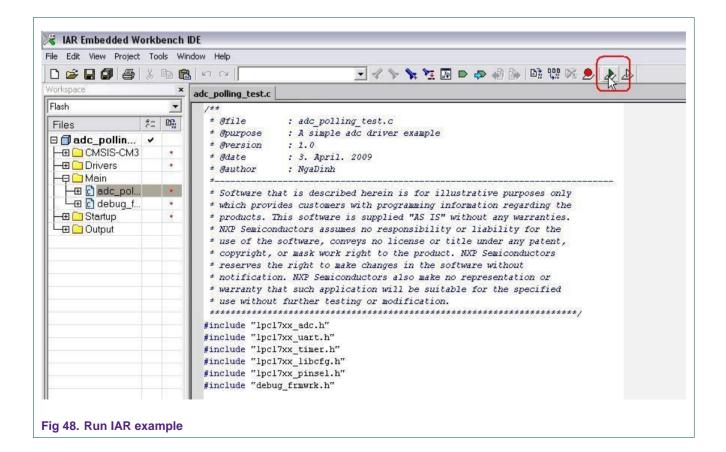
In each example has attached IAR project in EWARM folder. It allows you run this example in IAR Embedded Workbench IDE. This project is configured to add all required startup file (asm file used for IAR compiler), ARM Cortex-M3 core files and driver source files.

Here're all steps to run exist IAR examples or import demo source file into exist IAR project sample.

6.2.1 Use exist IAR example

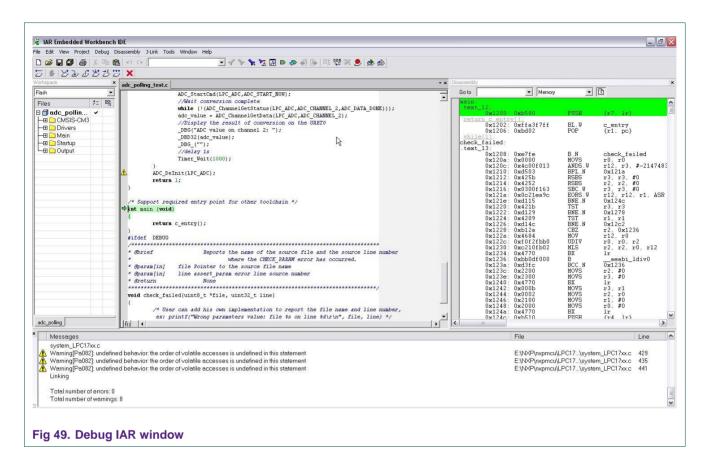
Run .eww file in EWARM folder. Such as: follow .\Example\ADC\Polling\EWARM to open adc_polling.eww file.

Click "Dowload and Debug" icon to start building and let it run.

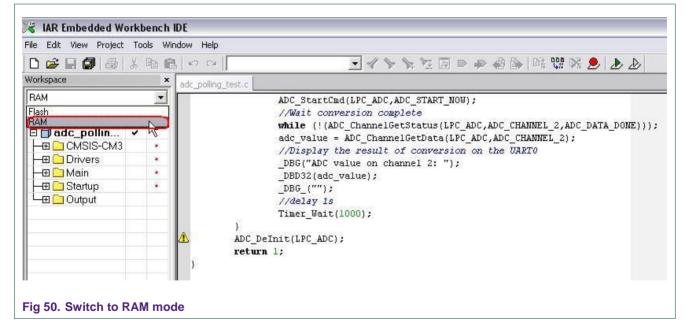


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Switch to RAM workspace if want to run in RAM mode.



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6.2.2 Import demo source code in exist IAR project sample

There's a IAR Project template inside .\Examples\Project_Template\IAR_EWARM directory. The main program is template.c for demonstration. However, this demo program can be easily removed to add other main program source files for user's purposes.

6.2.2.1 Open IAR project

Follow .\Example\Project_Template\IAR_EWARM directory to open LPC1700CMSIS.eww file.

IAR Embedded Workbench IDE		ŧ	Project_Template GNU IAR_EWARM IB LPC1700CMSIS.ewd IPC1700CMSIS.ewp IR LPC1700CMSIS.eww IB Ram.mac Keil_RealView_MDK
ile Edit View Project Tools Window	Help		
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E DLPC1700CMSIS - Flash	· · ·	10	
		A	
		*	
		*	
🗕 🖸 Startup		*	
L-🕀 🛄 Output			

6.2.2.2 Add main source code

ADC Polling example is used in this case. Add all required source files (*.c) in .\Examples\ADC\Polling directory:

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workspace		10	×		• 4	
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- 🖽 🗀 Startup	Opt	ions.	8			
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	Stop Build					
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	Rer	nove			Add Group	
	Ren	name.				
	Sou	irce C	ode Co	ontrol 🕨		
	File Properties					
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LPC1000 software development toolchain

Look in:	Polling		-	(- E	r 🗄 🎝	
My Recent Documents Desktop	EWARM adc_polling_tes debug_frmwrk. debug_frmwrk. pc17xx_libcfg.	c h				
My Documents						
My Computer						
My Network	File name:	"adc_polling_test.c" "debug	_frmwrk.	с''	•	Open
Places					a) 🕶	Cancel

6.2.2.3 Add include path

Open Option window by right click into LPC1700CMSIS-Flash workspace. Add .\Examples\ADC\Polling into C/C++ Compiler/ Preprocessor tab as follows:

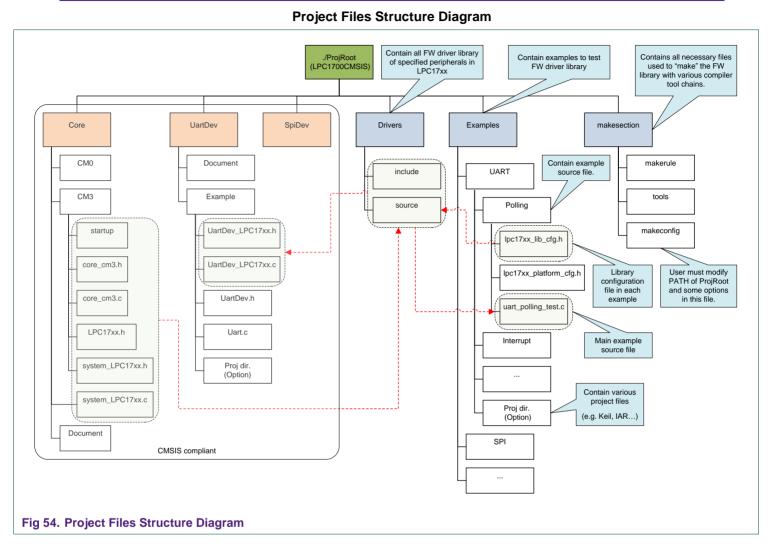
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LMI FTDI Preinclude file:	Macraigor RDI ST-Link	Defined symbols: (one per line) RAM_MODE=0 BUILD_WITH_EXAMPLE
---------------------------	-----------------------------	---

Now, follow the same steps in "Use exist IAR example" to run it.

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7. Appendix



8. Legal information

8.1 Definitions

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