

UM1962 User manual

Getting started with STM32F469I discovery software development tools

Introduction

This document describes some software environment recommendations, required to build an application using the STM32F469I Discovery kit (32F469IDISCOVERY).

The document provides users with guidelines about how to build and run a simple example and how to create and build an application. It has the following structure:

- The first chapter presents the software and hardware requirements (some toolchains supporting the STM32 families, ST-LINK/V2-1 installation and firmware package presentation).
- The second chapter provides step by step guidelines on how to execute and debug an application example using the following toolchains:
 - IAR Embedded Workbench[®] for ARM[®] (EWARM) by IAR Systems[®]
 - Microcontroller development kit for ARM[®] (MDK-ARM) by Keil[®]
 - System Workbench for STM32 (SW4STM32) by AC6

Although this user manual does not cover all the topics relevant to software development environment, it demonstrates the first basic steps necessary to get started with the compilers/debuggers and it includes references for complementary information.

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1 System requirements

Before running an application, the user should:

- 1. Install his preferred Integrated Development Environment (IDE).
- 2. Install the ST-LINK V2-1 driver from the *www.st.com* web page.
- 3. Download the STM32F469I Discovery firmware from the *www.st.com* web page.
- 4. Establish the USB connection with the STM32F469 Discovery board by connecting the CN1 connector of the STM32F469 Discovery board to the USB port of the PC, using a type A to Mini-B USB cable (the *Figure 1* shows the connector CN1 inside the red circle).



Figure 1. Hardware environment

The above steps will be detailed in the following sections.



2 IDEs supporting STM32 families

STM32 families of 32-bit ARM[®] Cortex[®] -M core-based microcontrollers are supported by a complete range of software tools. It encompasses traditional integrated development environments IDEs with C/C++ compilers and debuggers from major 3rd-parties (free versions up to 64 Kbytes of code, depending on 3rd-parties), completed with innovative tools from STMicroelectronics.

The following table regroups general information about the three integrated development environments, as well as the version supporting the STM32F469I product.

Toolchain	Company	Compiler	Version	Download link ⁽¹⁾
EWARM	IAR Systems [®]	IAR C/C++	7.40.4 and later	http://www.iar.com 30-day evaluation edition KickStart edition (32-KByte code size limitation)
MDK-ARM	Keil [®]	ARMCC	5.xx and later with STM32F4xx_DFP2.6.0.pack	http://www.keil.com MDK-Lite (32-KByte code size limitation)
SW4STM32	AC6	GNU C	1.4 and later	http://www.openstm32.org Free version: no limitation

Table 1. Toolchains supporting STM32F469I Discovery kit

1. Registration before downloading is required.



3 ST-LINK/V2-1 installation

The STM32F469I Discovery board includes an embedded ST-LINK/V2 debug tool interface. The interface needs an ST-LINK/V2 dedicated USB driver to be installed. This driver is available from the *www.st.com* web page and it is supported by the software toolchains:

• IAR Embedded Workbench for ARM (EWARM).

The toolchain is installed by default in the C:\Program Files\IAR Systems\Embedded Workbench x.x directory on the hard disk of the local PC.

After having installed EWARM, install the ST-LINK/V2 driver by running the ST-Link_V2_USB.exe from IAR_INSTALL_DIRECTORY]\Embedded Workbench x.x\arm\drivers\ST-LINK \ST-Link_V2_USBdriver.exe.

• Keil Microcontroller Development Kit (MDK-ARM) toolchain.

The toolchain is installed by default in the C:\Keil directory on the hard disk of the local PC; the installer creates a $ARM^{\mbox{\tiny R}}$ Keil[®] μ Vision[®]4 shortcut in the start menu.

When connecting the ST-LINK/V2 tool, the PC detects new hardware and prompts user to install the ST-Link_V2_USB driver. The "Found New Hardware" wizard displays and guides the user through the steps, required to install the driver from the recommended location.

• AC6 System Workbench for STM32 (SW4STM32).

The toolchain is installed by default in the C:\Program Files\AC6 directory on the hard disk of the local PC.

The ST-Link_V2_USB.exe is automatically executed, when installing the software toolchain.

For complementary information on the firmware package content and the STM32F469I Discovery requirements, refer to: *STM32CubeF4 demonstration platform* (UM1743 user manual).

Note: The embedded ST-LINK/V2-1 supports only the SWD interface for STM32 devices.



4 Firmware package

The STM32F469I Discovery firmware applications, demonstration and examples are provided in one single.zip file. The extraction of the zip file generates a folder named "STM32Cube_FW_F4_VX.Y.Z", which contains the subfolders shown in *Figure 2*.





Subfolders description

Template: pre-configured project with empty main function to be customized. This is helpful to start creating your own application.

Peripheral examples: including set of examples for each STM32F469 peripheral ready to be run.

Applications: including set of applications for each STM32F469 peripheral ready to be run. **Demonstrations**: including demonstration firmware for STM32F469 boards ready to be run.



5 Compiling, linking and executing firmware using software toolchains

The below steps can be applied to an already existing example, demonstration or template project available inside the STM32F469I Discovery package firmware from the *www.st.com* web site.

First of all, the user must read the readme.txt file, which contains a description of the firmware and hardware/software requirements.

5.1 EWARM toolchain

1. Open the IAR Embedded Workbench for ARM (EWARM). *Figure 3* shows the names of the windows, to which this document refers.

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Figure 3. IAR embedded workbench IDE

- 2. In the **File** menu, select **Open** and click **Workspace**, to display the Open Workspace dialog box. Browse to select either an example or demonstration or template workspace file, and click Open to launch it in the Project window.
- 3. In the Project menu, select Rebuild All to compile the project.
- 4. If the **Project** is successfully compiled, the window, shown in *Figure 4: EWARM project* successfully compiled, is displayed.





Figure 4. EWARM project successfully compiled

To change the project settings (Include and preprocessor defines), simply go through the project options:

- For Include directories
 Project>Options...>C/C++ compiler>
- For pre-processor defines
 Project>Options...C/C++ compiler>pre-processor>
- 5. In the IAR Embedded Workbench IDE, from the Project menu, select Download and Debug or, alternatively, click the Download and Debug button in the toolbar, to program the Flash memory and begin debugging (see *Figure 5*).

Figure 5. Download and debug button



6. The debugger in the IAR Embedded Workbench can be used to debug source code at C and assembly levels, to set breakpoints, to monitor individual variables and watch events during the code execution (see *Figure 6*).



Figure 6. IAR embedded workbench debugger screen

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To run the application, from the Debug menu, select Go. Alternatively, click the Go button in the toolbar to run the application (see *Figure 7*).

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	B	⊉⊿	当之	22) X	
ETM SW	0			Go	
Workspa	ace			× ma	ain.c

Figure 7. IAR Go button

5.2 MDK-ARM toolchain

1. Open the Keil MDK-ARM Microcontroller Kit.

Figure 8 shows the basic names of the "Keil $\mu\text{Vision5}$ " windows to which this document refers.

By pVision File Edit View Project Flash Debug Peripherals Tools SVCS Window Help 이 2월 교 2월 승규 1월 이 안 실 다 한 환 함 함 함 譯 准 准 燈 MED_On 모 과 전 및 으 이 오 및 트루 및	
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Project a	
Workspace window	
File window	
Build Output 9	
Build Output window	

Figure 8. µVision5 IDE

- 2. In the **Project** menu, select **Open Project...** Browse to select either an example or demonstration or template project file, and click **Open** to launch it in the Project window.
- 3. In the **Project** menu, select **Rebuild All target files** to compile the project.



4. If the project is successfully compiled, the following window in *Figure 9* is displayed.



```
Build Output

compiling stm32469i_discovery.c...

compiling system_stm32f4xx.c...

linking...

Program Size: Code=3128 RO-data=484 RW-data=44 ZI-data=1028

"STM32469I_DISCOVERY\STM32469I_DISCOVERY.axf" - 0 Error(s), 0 Warning(s).

Build Time Elapsed: 00:00:35
```

To change the project settings (Include and preprocessor defines), simply go through the project options:

- For Include directories
 Project>Options for Target > C/C++ > Include Paths
- For pre-processor defines
 Project>Options for Target > C/C++ > Preprocessor symbols > Define
- 5. In the MDK-ARM IDE, from the Debug menu, select Start/Stop Debug Session or, alternatively, click the Start/Stop Debug Session button in the toolbar, to program the Flash memory and begin debugging (see *Figure 10*).

Figure 10. Start/Stop debug session button



6. The MDK-ARM debugger can be used to debug source code at C and assembly levels, to set breakpoints, to monitor individual variables and to watch events during the code execution (see *Figure 11*).



File Edit View	Project Flash Debug Peripherals Tools 3 -2 -2 -2 -2 -2 3 -2 -2 -2 -2 -2 4 -0 -2 -2 -2 -2 5 -0 -2 -2 -2 -2	svcs	Window Help	
Register	Value 0x00000099		65: { 66: /* STM32F4xx HAL library initialization: 67: - Configure the Flash prefetch, instruction and Data caches 68: - Systick timer is configured by default as source of time base, but uses	^
R1 R2 R3 R4 R5	0x20000430 0x08000000 0x08000088 0x08000E1C 0x08000E1C		69: can eventually implement his proper time base source (a general purpose 70: timer for example or other time source), keeping in mind that Time base	-
R6 R7 R8 R9 R9 R10	0x0000000 0x0000000 0x0000000 0x0000000 0x000000		<pre>startup.tm22f49xs;mainc</pre>	×
R11 R12 R13 (SP) R14 (LR) R15 (PC)	Cx00000000 Cx00000000 Cx2000430 Cx0000030 Cx0000098 Cx61000000		59 ⊟ /** 60 * @brief Main program 61 * @param None 62 * @retval None 63 *	
Banked System Internal Mode Privilege Stack States	Thread Privileged MSP 1756	-	5 5 5 1 6 6 7 7 - Configure the Flash prefetch, instruction and Data Caches - Sortick timer is configured by default as source of time base, but use can eventually implement his proper time base source (a general purpos timer for example or other time source), keeping in mind that Time bas duration should be kept lms since FPF_TIMEOUT_VALUEs are defined and	Ŧ
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Figure 11. MDK-ARM debugger screen

To run the application, from the Debug menu, select Run. Alternatively, click the Run button in the toolbar to run the application (see *Figure 12*).

Figure 12. Run button





5.3 SW4STM32 toolchain

1. Open the AC6 SW4STM32 for STM32 products. The program launches and prompts for the workspace location (see *Figure 13*).

Select a workspace				
Eclipse stores your p Choose a workspace	rojects in a folder called a worksp folder to use for this session.	pace.		
Workspace: \STM32	469I-Discovery\Examples\LCD_D	OSI\LCD_DSI_ULPM_Dat	ta\SW4ST <mark> </mark> M32 👻	Browse
🔲 Use this as the def	ault and do not ask again		ОК	Cancel

Figure 13. SW4STM32 workspace launcher dialog box

- 2. Browse to select a SW4STM32 workspace of either an example or demonstration or template workspace file and click OK to load it.
- 3. To load an existing project in the selected workspace, select Import from the File menu to display the Import dialog box.
- 4. In the Import window, open General, select Existing Projects into Workspace and click Next (see *Figure 14*).

Figure 14. SW4STM32 import source select dialog box



5. Click Select root directory, browse to the SW4STM32 workspace folder (see *Figure 15*).

Import		
Import Projects Some projects canno	t be imported because they already exist in the workspace	
Select root directory: Select archive file: Projects:	C/\STM32Cube_FW_F4_VX.Y.Z\Projectr\STM32469I-Discovery\Exampler\GPI0\GPI0_EXTLSW4STM32	Browse
RemoteSystems	TempFiles (C:\STM23Cube, PW_F4_VX,Y.2;Projects\STM32469F-Discovery\Examples\GPI0\GPI0_EXTT\SW4STM32\RemoteSystemsTempF OVERY (C\\STM32Cube_FW_F4_VX.Y.2;Projects\STM32469F-Discovery\Examples\GPI0\GPI0_EXTT\SW4STM32\STM3245H2DISCOVERY Discovery\Examples\GPI0_EXT_SW4STM32\STM32469F_DIscovery\Examples\GPI0\GPI0_EXTT\SW4STM32\STM32\STM32\STM32	Select All Deselect All Refresh
Options Search for nested pr Copy projects into v Hide projects that al Working sets	ojects ordspace ready exist in the workspace	
Add project to wor Working sets:	king sets	Select
(?)	< Back Next > Finish	Cancel

Figure 15. SW4STM32 import projects dialog box

- 6. In the Projects panel, select the project and click Finish.
- 7. In the Project Explorer, select the project, open the Project menu, and click Build Project.
- 8. If the project is successfully compiled, the following messages is displayed on the Console window (see *Figure 16*).





To change the project settings (Include directories and preprocessor defines), simply go through Project>Properties, select C/C++ Build>Settings from the left panel:

- For Include directories'
 - C Compiler>Directories>Include path
- For pre-processor defines
 - C Compiler>Symbols> Defined symbols
- 9. To debug and run the application, select the project In the Project Explorer and press F11 to start a debug session.



In the Project Explorer, select the project and press F11 to start a debug session (see *Figure 17*).

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STM32469I_DISCOVERY.eff Josephered #1 (Suspended : Breakpoint)	Name	Туре		Value	
main() at main.cr65 0x8000210					
penocd					
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56⊖ /* STM32F4xx HAL library initialization:			and a second second	5. ⊟ 1.8 of #. 4	40
67 - Configure the Flash prefetch, instruction and Data caches			M main.n		
68 - <u>Systick</u> timer is configured by default as source of time base, but user			++ * SystemClo	ck_Config(void) : void	
69 can eventually implement his proper time base source (a general purpose			++ ³ EXTID_IRQ	Handler_Config(void) : \	roid
70 timer for example or other time source), keeping in mind that Time base			 main/wid 	0 - int	
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72 handled in milliseconds basis.				Handler Config(void) : \	roid
73 - Set NVIC Group Priority to 4				Forth Colling (Forth)	
74 - Low Level Initialization: global MSP (MCU Support Package) initializatio	n		 HAL_GPIC 	_EXTI_Callback(uint10_t	: void
75 */			assert fail	ed(uint8_t*, uint32_t) : vo	bid
76 H01 Toit();			,		
77					
78 /* Configure the system clock to 180 MHz */					
<pre>79 SystemClock_Config(); 80</pre>					
<pre>81 /* -1- Initialize LEDs mounted on STM32469I-DISCOVERY board */</pre>					
Console 🐹 🛃 Tasks 🚉 Problems 🕖 Executables 🕕 Memory		- 35 - E			•
iszkar_biscovekit bebug (kco striksz bebugging) csikco/system workbench 1.2 + 1519/piugins/h.aco.mcu.ex	ternaitools.arm-none.win32_1.20.20130	5291710/tools/com	piler/bit/arm-none-c	abi+geb (7.5.0.20130304	
ning: the current language does not match this frame.					
porary breakpoint 1, main () at C:/STM32Cube_FW_F4_VX.Y.Z/Projects/STM32469I-Discove	ry/Examples/GPIO/GPIO_EXTI/Src	/main.c:65			
{					
{					*

The debugger in the AC6 SW4STM32 can be used to debug source code at the C and assembly levels, to set breakpoints, to monitor individual variables and to watch events during the code execution.

To run the application, from the Run menu, select Resume, or alternatively click the Resume button in the toolbar.



6 Revision history

Table 2. [Document	revision	history
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Date	Revision	Changes
30-Oct-2015	1	Initial release.



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