



STMicroelectronics STM32F429 Discovery Software Development Tools User Manual

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STMicroelectronics STM32F429 Discovery Software Development Tools



Product Information

Product Name: STM32F429

Discovery Model Number: 32F429IDISCOVERY

Manufacturer: STMicroelectronics (ST)

Release Date: October 2013

User Manual: UM1680

Description

The STM32F429 Discovery is a software development tool designed for building applications around the STM32F429 Discovery board. This tool provides a software environment and development recommendations for novice users to build and run sample applications, as well as create and build their own applications. The STM32F429 Discovery board is equipped with the necessary hardware components to execute and debug firmware applications. System Requirements: Before running any application on the STM32F429 Discovery board, the following system requirements must be fulfilled:

1. **Integrated Development Environment (IDE):** Install your preferred IDE that supports the STM32 family.
2. **ST-LINK V2 Driver:** Install the ST-LINK V2 driver from the ST website.
3. **Firmware Package:** Download the STM32F429I-Discovery firmware from the ST website.
4. **Hardware Connection:** Establish a connection with the STM32F429 Discovery board according to the instructions provided in Figure 1 of the user manual.

Usage Instructions:

Install IDE:

1. Choose your preferred IDE that supports the STM32 family.
2. Follow the installation instructions provided by the IDE manufacturer.

Install ST-LINK V2 Driver:

1. Visit the ST website and download the ST-LINK V2 driver.
2. Follow the installation instructions provided by ST to install the driver.

Download Firmware Package:

1. Visit the ST website and locate the STM32F429I-Discovery firmware package.
2. Download the firmware package to your computer.

Hardware Connection:

1. Refer to Figure 1 in the user manual for the hardware connection setup.
2. Connect the STM32F429 Discovery board to your computer using the appropriate cables and connectors.
Once you have fulfilled the system requirements and established the hardware connection, you are ready to build and run firmware applications on the STM32F429 Discovery board. The user manual provides further instructions and guidelines for executing/debugging firmware using different software toolchains and advanced debugging techniques.

Introduction

This document describes the software environment and development recommendations required to build an application around the STM32F429 Discovery (32F429IDISCOVERY). It provides guidelines to novice users on how to build and run a sample application and to create and build their own application. This document is structured as follows:

- Chapter 1 describes where to find the ST-LINK/V2 driver that should be installed before starting coding on any Integrated Development Environment
- Chapter 2 describes step by step how to execute and debug an existing project with one of the following toolchains:
 - IAR Embedded Workbench® for ARM (EWARM) by IAR Systems
 - Microcontroller Development Kit for ARM (MDK-ARM) by Keil™
 - TrueSTUDIO® by Atollic
- Chapter 3 describes advanced debugging features
- Chapter 4 provides links to detailed information on the previously mentioned toolchains

Although this manual cannot cover all the topics relevant to software development environments; it demonstrates the first basic steps necessary to get started with the compilers/debuggers and provides links to the documents needed to fully understand every single step.

System requirements

Before running your application, you should:

1. Install your preferred Integrated Development Environment (IDE).
2. Install the ST-LINK V2 driver from the ST web site.
3. Download the STM32F429I-Discovery firmware from the ST web site.

4. Establish the connection with the STM32F429 Discovery board as shown in Figure 1.



To run and develop any firmware applications on your STM32F429 Discovery board, the minimum requirements are as follows:

- Windows PC (2000, XP, Vista, 7)
- USB type A to Mini-B' cable, to power the board (through USB connector CN1) from the host PC and connect to the embedded ST-LINK/V2 for debugging and programming.

IDEs supporting STM32 family

STMicroelectronics' STM32 family of 32-bit ARM Cortex-M core-based microcontrollers are supported by a complete range of software tools, encompassing traditional IDEs with C/C++ compilers and debuggers from major 3rd-parties (free versions up to 64KB of code, depending on partner), and completed with innovative tools from STMicroelectronics. Table 1 regroups general information about some IDE versions that officially support the STM32F429I product.

Table 1. Supported Toolchain versions

Toolchain	Company	Compiler	Version	Download link (*)
EWARM	IAR Systems®	IAR C/C++	6.60 and later	www.iar.com/en/Products/IAR-Embedded-Workbench/ARM <ul style="list-style-type: none"> • 30-day evaluation edition • KickStart edition(32 KB Limitation for Cortex M3/M4) • KickStart edition(16 KB Limitation for Cortex M0)
MDK-ARM	Keil™	ARMCC	4.72 and later	www.keil.com/demo/eval/arm.htm MDK-Lite (32 KB Code size limitation)
TrueSTUDIO	© Atollic	GNUC	4.1 and later	www.atollic.com/index.php/request-eval-license(1) <ul style="list-style-type: none"> • 32 KB Limitation (8 KB on Cortex-M0 and Cortex-M1) • 30 day Professional version (Trial)

Registration is required before download

ST-LINK/V2 installation and development

The STM32F429 Discovery board includes an ST-LINK/V2 embedded debug tool interface which requires a dedicated USB driver. This driver is available on the www.st.com ST-LINK V2 page and is supported by these common software toolchains, and others:

- IAR™ Embedded Workbench for ARM (EWARM)
 - The toolchain is installed by default on the PC's local hard disk in the C:\Program Files\IAR Systems\Embedded Workbench x.x directory.
 - After installing EWARM, install the ST-LINK/V2 driver by running ST-Link_V2_USB.exe from [IAR_install_directory]\embedded Workbench x.x \arm\drivers\ST-Link\ST-Link_V2_USBdriver.exe
- RealView Microcontroller Development Kit (MDK-ARM) toolchain
 - The toolchain is installed by default on the PC's local hard disk in the C:\Keil directory; the installer creates a start menu shortcut for µVision4.
 - When connecting the ST-LINK/V2 tool, the PC detects new hardware and asks to install the ST-LINK_V2_USB driver. The "Found New Hardware wizard" guides you through the steps needed to install the driver from the recommended location.
- Atollic TrueSTUDIO® STM32
 - The toolchain is installed by default on the PC's local hard disk in the C:\Program Files\Atollic directory.
 - The ST-Link_V2_USB.exe is installed automatically with the software toolchain.

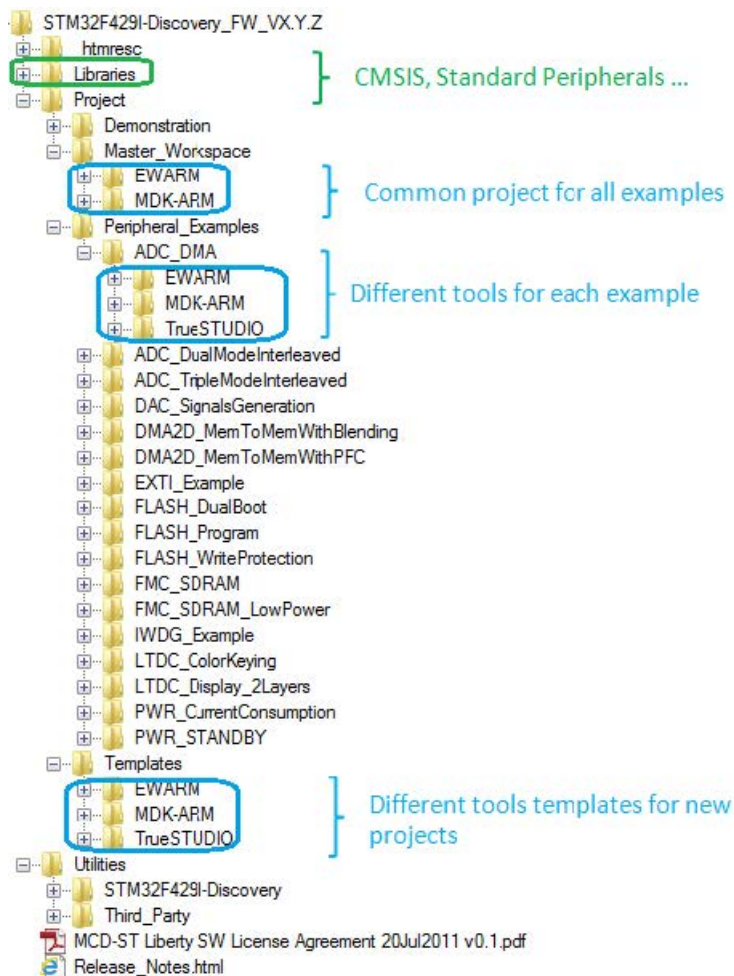
Complementary information on the firmware package and the STM32F429 Discovery requirements are available from the Getting started with STM32 Firmware document.

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

Firmware package

The STM32F429I-Discovery firmware applications, demonstration and IP examples are provided in one package in one zip file. Extracting the zip file generates one folder, STM32F429I-Discovery_FW_VX.Y.Z, which contains the following subfolders:

Figure 2. Package contents



Template project: Pre-configured project with empty main function to be customized by you. This is helpful to start creating your own application based on the peripherals drivers.

Master workspace: Assembly of all projects available within this firmware package. Peripheral examples: Set of examples for each peripheral ready to be run.

Executing / debugging firmware using software toolchains

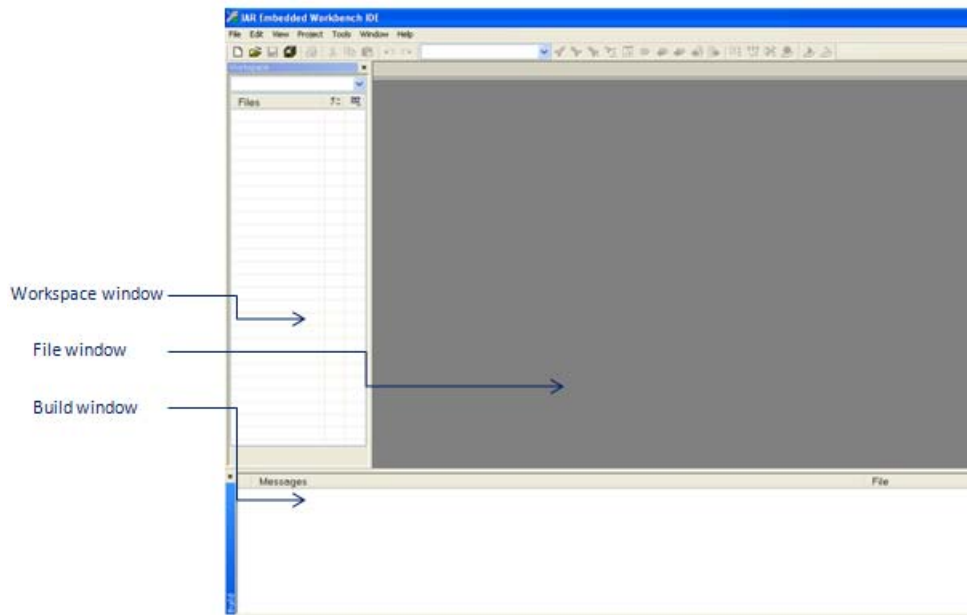
EWARM toolchain

The following procedure compiles, links and executes an existing EWARM project.

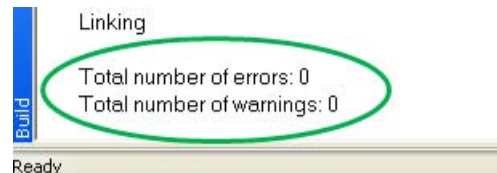
The steps below can be applied to an existing example, demonstration or template project for STM32F429I-Discovery_FW_VX.Y.Z firmware available at www.st.com.

1. Read the firmware readme.txt file which contains the firmware description and hardware/software requirements, then start the EWARM toolchain. Figure 3 shows the basic names of the windows referred to in this document.

Figure 3. IAR Embedded Workbench IDE



2. Select File > Open > Workspace. Browse to select either an example, demonstration or template workspace file and click Open to launch it in the Project window.
3. Select Project > Rebuild All to compile your project. If your project is successfully compiled, the following window is displayed.



If you need to change project settings (Include and preprocessor defines), just go through project options:

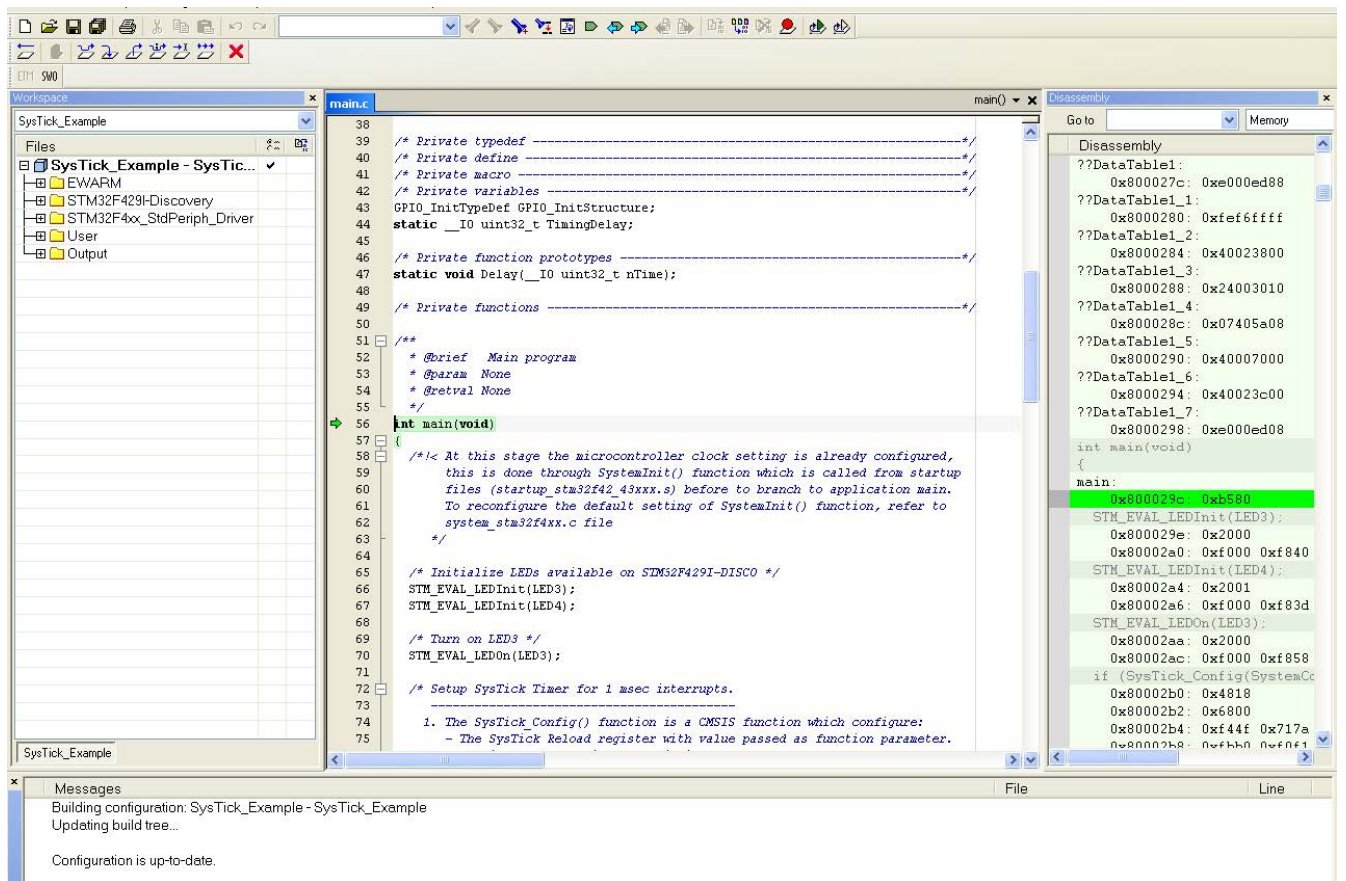
1. For Include directories: Project>Options...>C/C++ compiler>
2. For pre-processor defines: Project>Options...>C/C++ compiler>pre-processor>
4. Select Project > Download and Debug or, alternatively, click the Download and Debug button in the toolbar, to program the Flash memory and begin debugging.

Figure 5. Download and Debug button



5. The debugger in the IAR Embedded Workbench can debug source code at C and assembly levels, set breakpoints, monitor individual variables and watch events during code execution.

Figure 6. IAR Embedded Workbench debugger screen



6. Select Debug > Go to run your application, or click the Go button in the toolbar.

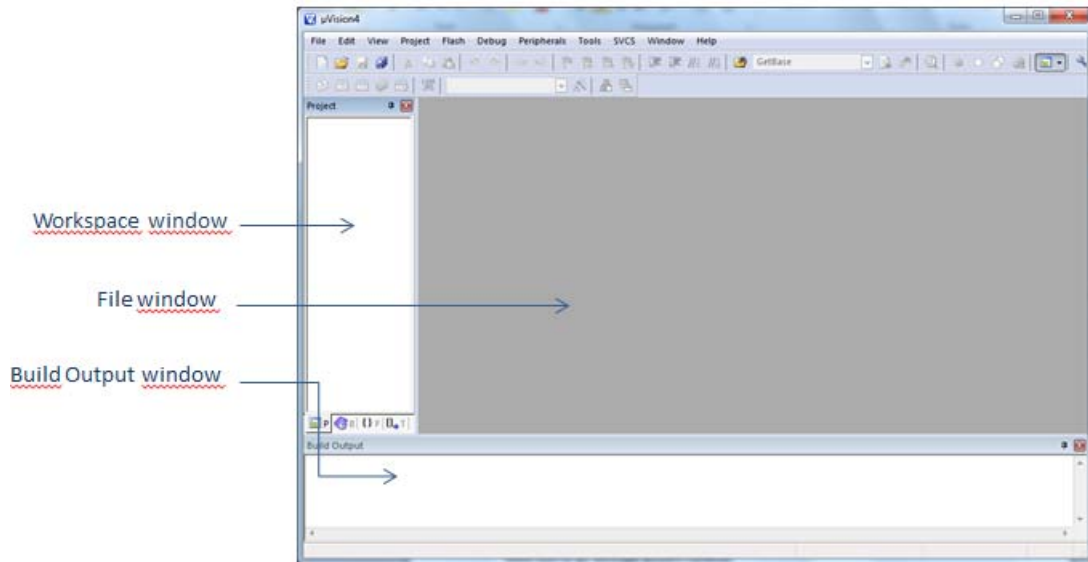
Figure 7. Go button



MDK-ARM toolchain

The following procedure compiles, links and executes an existing MDK-ARM project. The steps below can be applied to an existing example, demonstration or template project for STM32F429I-Discovery_FW_VX.Y.Z firmware available at www.st.com.

1. Open Keil MDK-ARM Microcontroller Kit. Figure 8 shows the basic names of the “Keil uVision4” windows referred to in this document.
2. Figure 8. uVision4 IDE



3. Select Project > Open Project... Browse to select either an example, demonstration or template project file and click Open to launch it in the Project window.
4. Select Project > Rebuild All target files to compile your project. If your project is successfully compiled, the following window is displayed.

Figure 9. MDK-ARM project successfully compiled

```
Build Output
Build target 'SysTick'
linking...
Program Size: Code=852 RO-data=460 RW-data=44 ZI-data=1028
".\SysTick\SysTick.axf" - 0 Error(s), 0 Warning(s).
```

You can change your project settings (Include and preprocessor defines), through the project options:

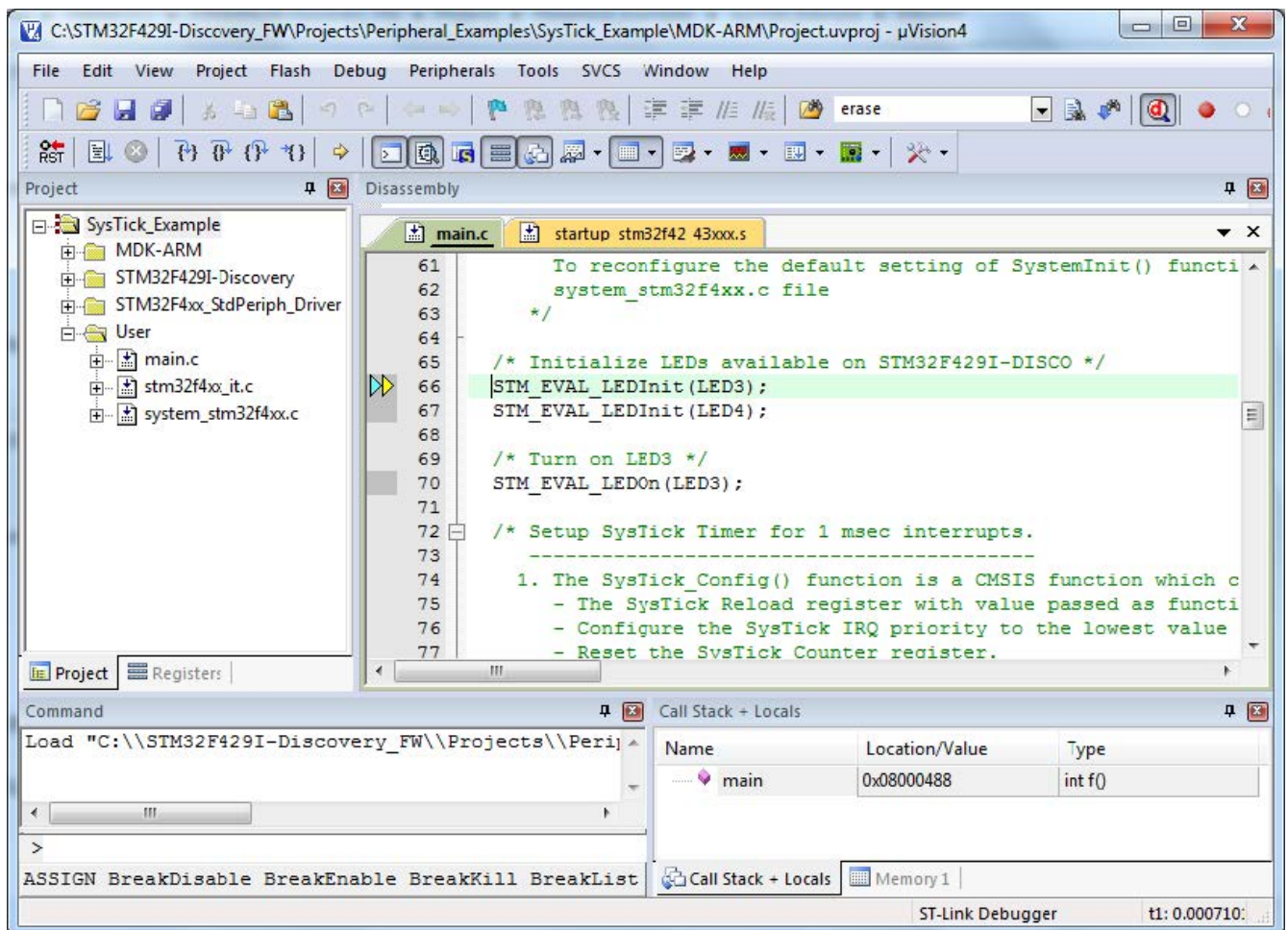
1. For Include directories: Project>Options for Target > C/C++ > Include Paths
 2. For pre-processor defines: Project>Options for Target > C/C++ > Preprocessor symbols > Define
5. Select Debug > Start/Stop Debug Session or, click the Start/Stop Debug Session button in the toolbar, to program the Flash memory and begin debugging.

Figure 10. Start/Stop Debug Session button



6. The MDK-ARM debugger can debug source code at C and assembly levels, set breakpoints, monitor individual variables and watch events during code execution.

Figure 11. MDK-ARM debugger screen



7. Select Debug > Run to run your application, or click the Run button in the toolbar.

Figure 12. Run button

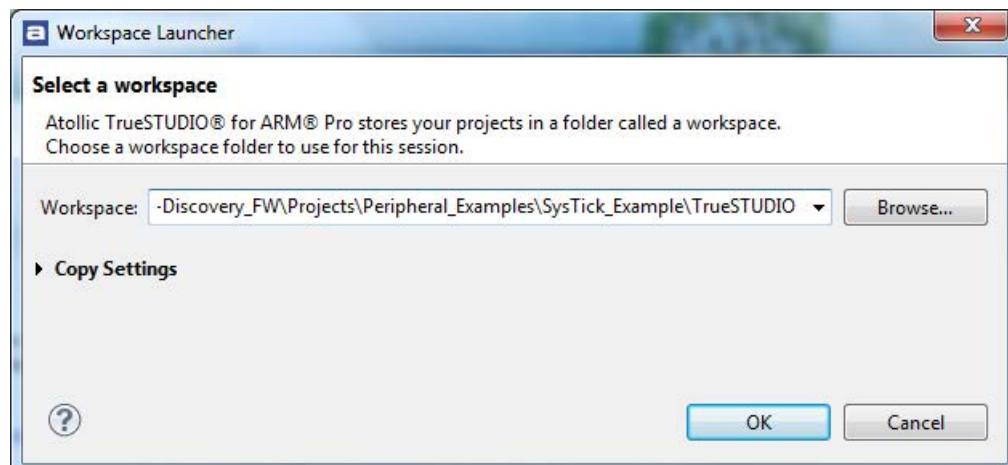


TrueSTUDIO toolchain

The following procedure compiles, links and executes an existing TrueSTUDIO project. The steps below can be applied to an existing example, demonstration or template project for STM32F429I-Discovery_FW_VX.Y.Z firmware available at www.st.com.

1. Open Atollic TrueSTUDIO for ARM. The program launches and asks for a Workspace location.

Figure 13. TrueSTUDIO workspace launcher dialog box

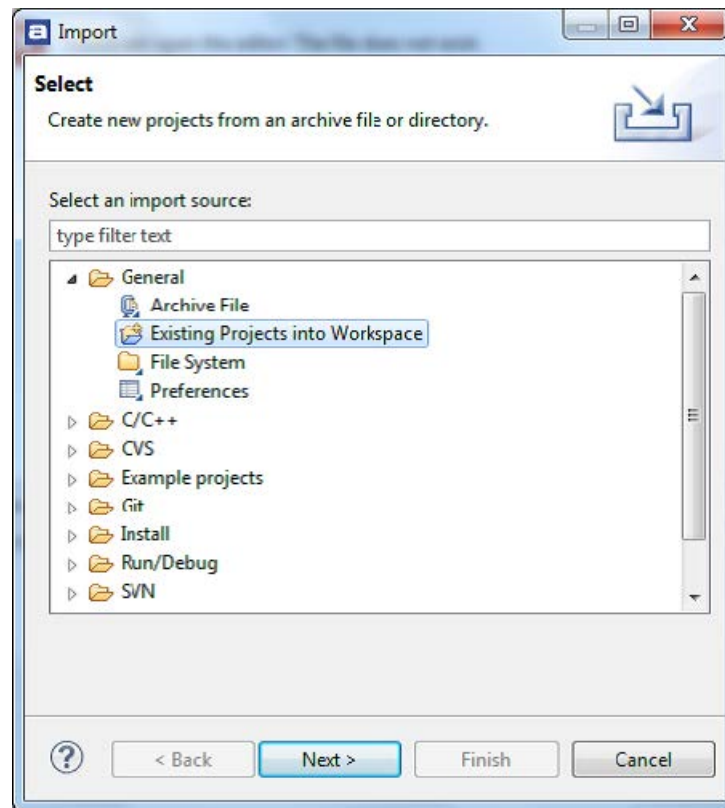


2. Browse to select a TrueSTUDIO workspace of either an example, demonstration or template workspace file

and click OK to load it.

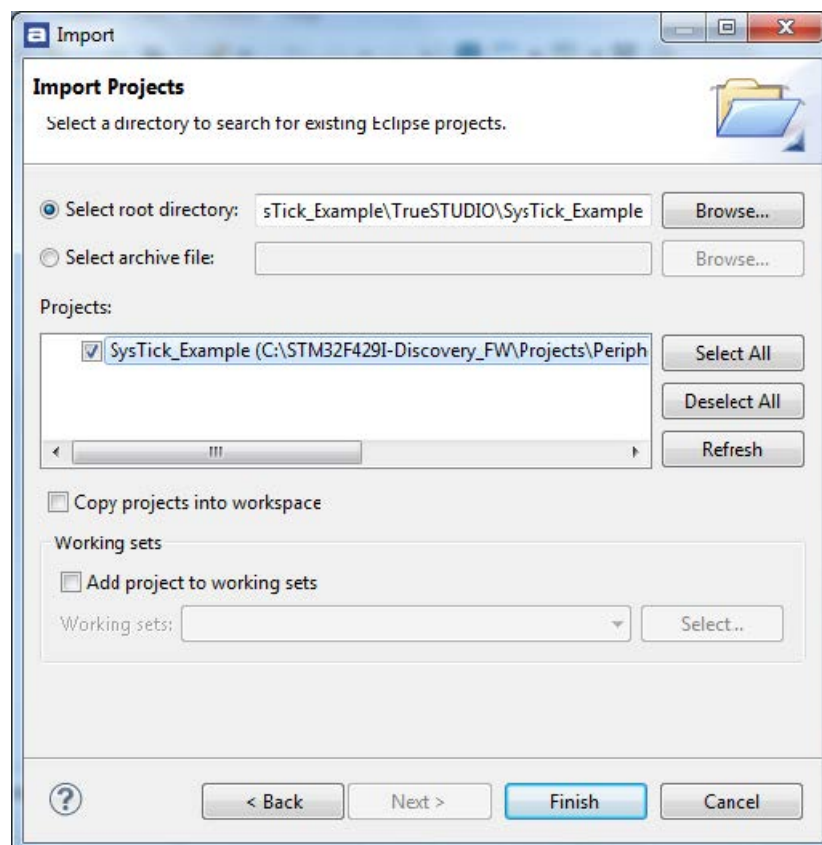
3. To load an existing project in the selected workspace, select File > Import, then General > Existing Projects into Workspace and click Next.

Figure 14. Atollic TrueSTUDIO® import source select dialog box



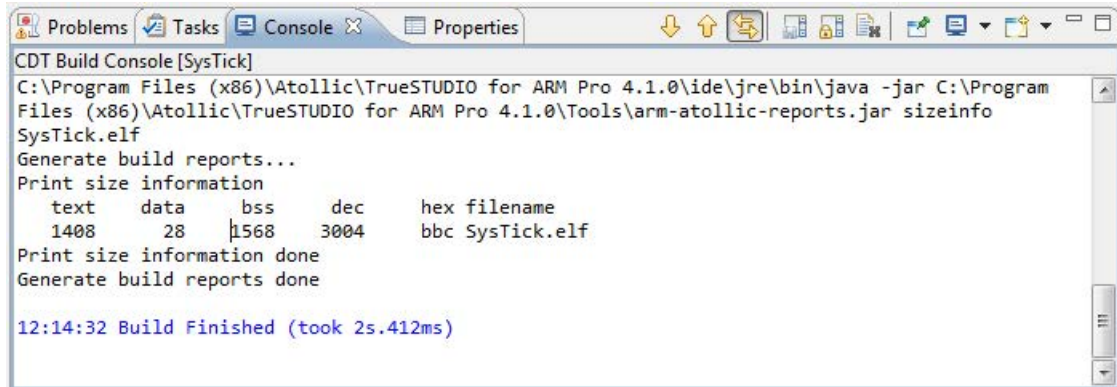
4. Click Select root directory and browse to TrueSTUDIO workspace folder.

Figure 15. Atollic TrueSTUDIO® import projects dialog box



5. In the Projects panel, select the project and click Finish.
6. In the Project Explorer, select the project, open Project menu, and click Build Project.
7. If your project is successfully compiled, the following messages will be displayed on the Console window.

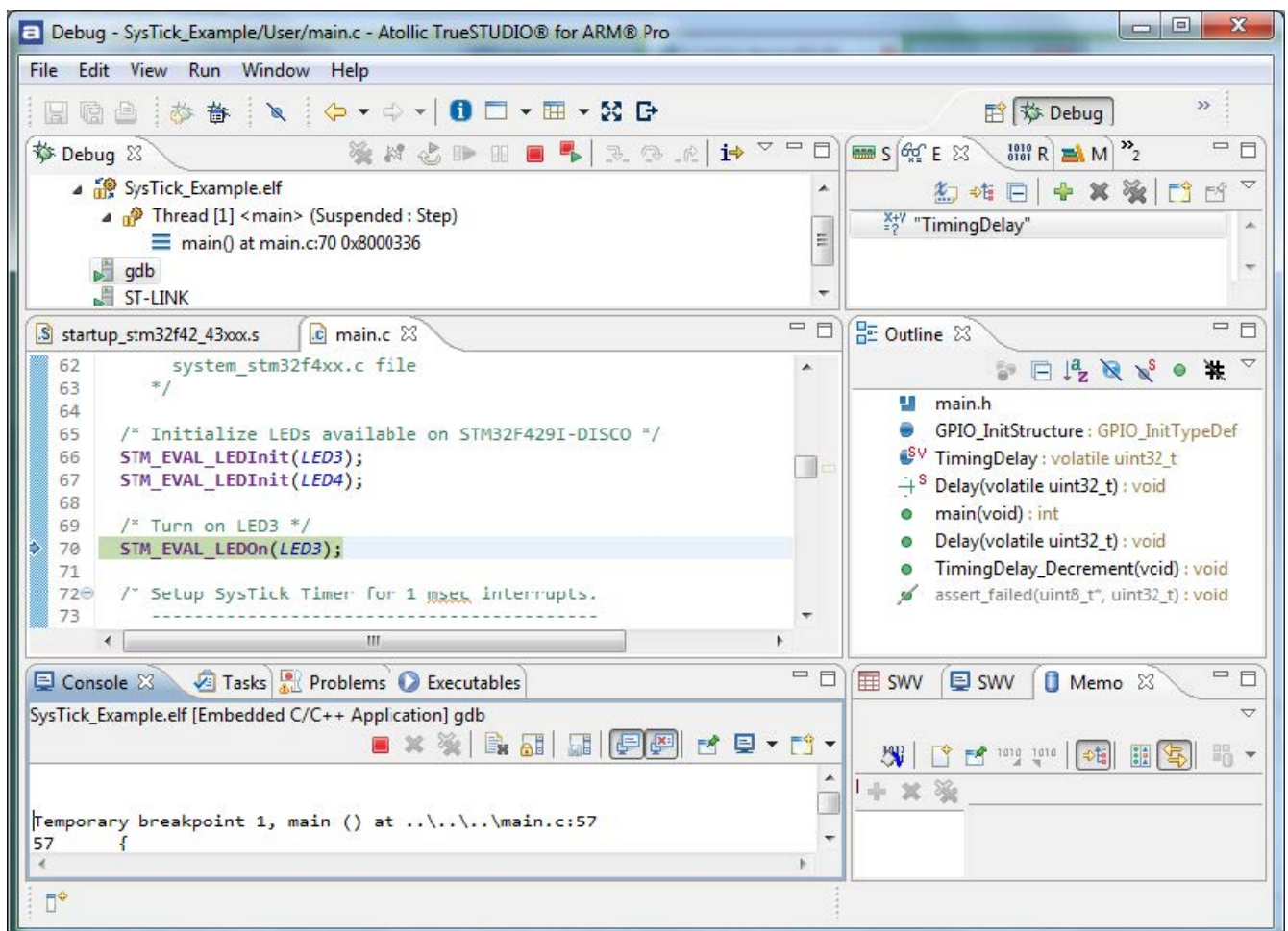
Figure 16. TrueSTUDIO® project successfully compiled



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

1. For Include directories: C Compiler>Directories>Include path
 2. For pre-processor defines: C Compiler>Symbols> Defined symbols
8. To debug and run the application, select the project in the Project Explorer and press F11 to start a debug session (see Figure 17).

Figure 17. TrueSTUDIO debug window



9. The debugger in the Atollic TrueSTUDIO can debug source code at C and assembly levels, set breakpoints, monitor individual variables and watch events during code execution.
10. Select Run > Resume to run your application, or alternatively click the Resume button in the toolbar.

STM32F429 advanced debugging

The STM32 family using the Cortex-M4 processor has many interrupts and it can be difficult to determine when they are being activated and how often.

Serial Wire Viewer (SWV) on the STM32F429 family makes this task easy. In fact, SWV displays PC Samples, Exceptions (including interrupts), data reads and writes, ITM (printf), CPU counters and a timestamp. This information comes from the ARM CoreSight™ debug module integrated into STM32F429 CPU. SWV does not steal any CPU cycles and is non-intrusive (except for ITM Debug printf Viewer). You have already configured Serial Wire Viewer (SWV) on the template project. This allows:

1. Retargeting printf to ITM stimulus port(0). This allows debug messages to display easily. How to use it:

EWARM : View > terminal IO

MDK-ARM : View > Serial Windows Debug (printf) Viewer

TrueSTUDIO: View > SWV Console

2. Exception trace:

Entry: when the exception enters.

Exit: When it exits or returns.

Return: When all the exceptions have returned to the main

EWARM : ST-LINK > Interrupt log

MDK-ARM : View > Trace > Exceptions

TrueSTUDIO: View > SWV Exception Trace Log

3. Function profiler: Shows timing information for the functions in an application

EWARM : ST-LINK > Function Profiler

MDK-ARM : View > Analysis Window > Code Coverage

TrueSTUDIO: View > SWV Statistical Profiling

4. Data Trace Timeline: Shows a graphical representation of the data

EWARM : ST-LINK > Timeline (Data log)

MDK-ARM : View > Analysis Window > Logic Analyzer

TrueSTUDIO: View > SWV Data Trace Timeline

SW Toolchains helpful references and links

The following table regroups useful references about the integrated development environments described in this document:

Table 2. IDE references

Toolchain	Download link
EWARM	www.iar.com/en/Products/IAR-Embedded-Workbench/ARM/ EWARM_UserGuide
MDK-ARM	www.keil.com/demo/eval/arm.htm www.keil.com/arm/mdk.asp
TrueSTUDIO	www.atollic.com/index.php/request-eval-license

Revision history

Table 3. Document revision history

Date	Revision	Changes
26-Oct-2013	1	Initial release.

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Documents / Resources

	<p>STMicroelectronics STM32F429 Discovery Software Development Tools [pdf] User Manual STM32F429 Discovery Software Development Tools, STM32F429, Discovery Software Development Tools, Software Development Tools, Development Tools</p>
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References

-  [Keil MDK](#)
-  [MDK-ARM Version 5.38a Evaluation Software Request](#)

-  [STMicroelectronics: Our technology starts with you](#)

Manuals+.