MicroEJ®

STM32F429I-DISCO: Build a Java Platform (RTX, Keil)

Getting Started

Reference	TLT-0724-MAN-PlatformGettingStarted-STM32F429I-DISCO
Revision	A
Architecture	ARM Cortex-M4
Compiler	Keil uVision
Board	STM32F429I-DISCO

Confidentiality & Intellectual Property

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1 Introduction

1.1 Intended Audience

The intended audience for this document are developers who wish to develop their first Java application with MicroEJ. Notes:

- This document is for STM32F429I-DISCO board.
- This document is not a user guide for the C development environment used for the final application link. Please consult the supplier of the C development environment for more information.
- Please visit the website http://www.is2t.com/get-started for more information about MicroEJ® products (platforms, videos, examples, application notes, etc.).

1.2 Scope

This document describes, step by step, how to start your development with MicroEJ:

- Register your product.
- Understand the package.
- Create your own platform.
- Run a Java application on the simulation platform (SimJPF) and on the embedded platform (EmbJPF).

1.3 Prerequisites

- PC with Windows XP or later.
- The MicroEJ® environment must be installed.
- STM32F429I-DISCO board.
- The ST-LINK utility (normally installed as part of the MicroEJ installation).
- Keil µVision 4.60 or higher. The Keil µVision evaluation version is 32Kb code size limited. To get a Keil µVision evaluation license for MicroEJ, please visit the website https://is2t.microej.com.

  Keil µVision 4.5x is sufficient except for deploying your application on the board using a probe.

  For Keil µVision 5.x, the legacy pack "MD5 Version 5 - Legacy Support" must be installed.

1.4 Terminology

A Java platform (JPF) is a library that, at a minimum, embeds a JVM (the MicroJvm® virtual machine from IS2T), some native libraries (also called firmware, or drivers, or BSP), and some Java libraries that characterize an application domain. Depending on these libraries, some specific tools are provided too.

Every embedded JPF (EmbJPF) has a sibling platform that simulates it on a PC, called the SimJPF. The SimJPF exactly mimics the semantics of the JPF. The SimJPF can be extended with Mocks to simulate the native (C, Ada, asm, ...) code of the JPF, such as drivers, or to connect hardware to the workstation.

Mocks can feed the SimJPF with real external stimuli, so that the Java application can behave as if it was running on the EmbJPF. SimJPF allows the design and functional testing of an embedded Java application in a development environment.

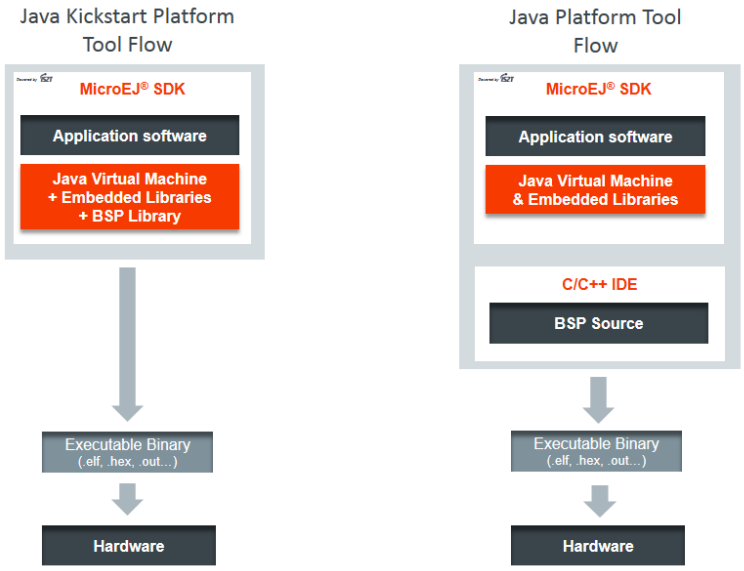

Figure 1.1. Platforms Flow

2 Product Registration

The development version of MicroEJ uses hardware activation keys.

- Open MicroEJ.
- Open welcome page: `Help > Welcome`.

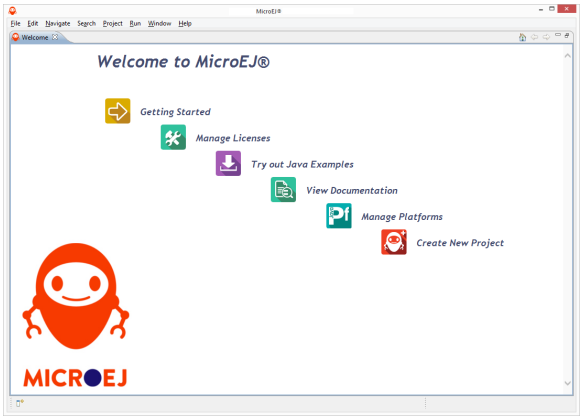

Figure 2.1. MicroEJ Welcome Page

- Insert your USB dongle.
- Press the Manage Licenses button. Hardware dongles are automatically detected when the MicroEJ preferences main page is shown.
- Click on Refresh when a new hardware dongle is plugged in.

Note

The MicroEJ preferences page is also accessible from the menu `Window > Preferences > MicroEJ`.

3 Overview

3.1 Platforms

Several Java platforms (JPF) are pre-installed in MicroEJ.

- Open MicroEJ.
- Open the welcome page: `Help > Welcome`.
- Press the `Manage Platforms` button.

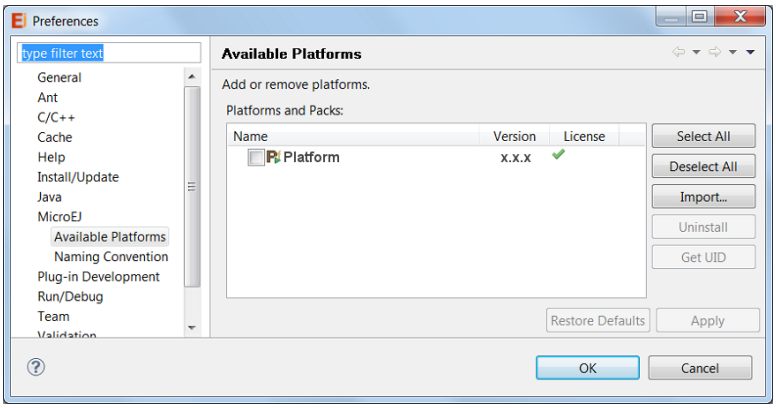

Figure 3.1. Available Platforms

This Available Platforms page shows all platforms installed in MicroEJ. Each platform has its own characteristics and specific behavior.

Note

- The Available Platforms page is automatically populated by the work-in-progress JPFs.
- The Available Platforms page is also accessible from the menu `Window > Preferences > MicroEJ > Available Platforms`.

3.2 ARM Cortex-M4 ARMCC

This Java platform architecture has been designed to be extended to run on any board with a CORTEX-M4-based CPU. The Section 4, “Create and Use Your First Java Platform” uses this platform to run your first Java application on your first extended platform.

This platform requires the Keil µVision C compiler to create the final binary file for a Java application.

4 Create and Use Your First Java Platform

The aim of this chapter is to create a platform from a Java platform architecture. The platform will then be used to run a Java application in subsequent chapters.

Although it is possible to use MicroEJ to create every aspect of a platform in accordance with specific requirements, in this chapter we will use a pre-packaged example of a platform that is already configured for the STM32F429I-DISCO.

- Open MicroEJ.
- Open the Java Platform Example wizard: `File > New > Java Platform`.
- Select the Java platform architectue `ARM Cortex-M4 ARMCC` from the combo box. A list of examples is available:

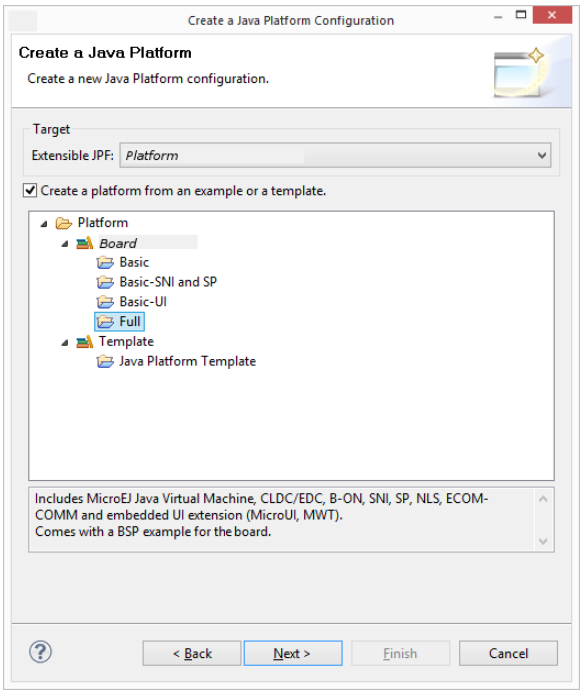

Figure 4.1. Java Platform Configuration (page 1)

- Select the example configuration `Full` in menu STM32F429I-DISCO.
- Click on Next. Give a name which be used as prefix for all platform projects. For instance: `MyPlatform`.

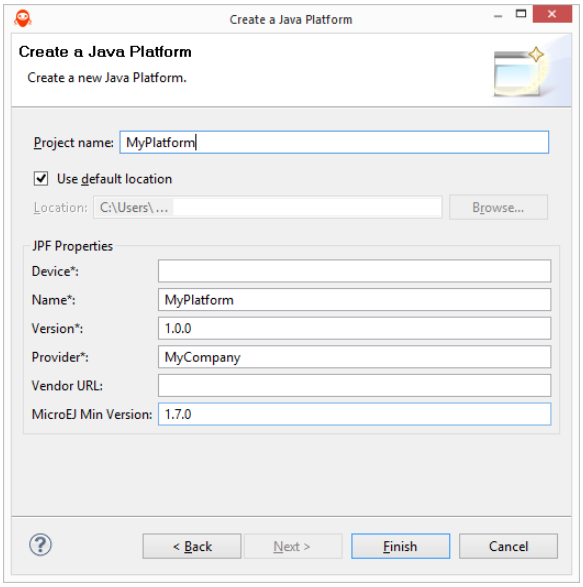

Figure 4.2. Java Platform Configuration (page 2)

- Click on Finish. The selected example is imported as several projects prefixed by the given name:
  - `STM32F429IDISCO-MyPlatform-CM4_ARMCC-bsp` contains a ready-to-use package for Keil µVision on STM32F429I-DISCO board.
  - `STM32F429IDISCO-MyPlatform-CM4_ARMCC-configuration` contains some files to configure the platform automatically.
  - `STM32F429IDISCO-MyPlatform-CM4_ARMCC-microuiGeneratorExtension` contains some files to extend the MicroUI Image Generator tool.

A README file and a platform configuration file are automatically opened. The README file explains the aim of the projects and how to launch an example. We recommend you follow the steps described in this document, and refer to the README file for more detail and latest changes.

The platform needs to be built with several additional modules (Java and natives libraries, scripts etc.).

- From the platform configuration file, click on the link `Build Platform`

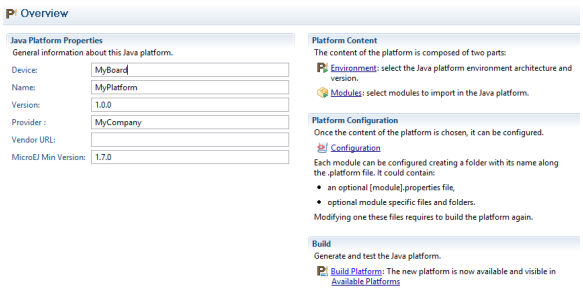

Figure 4.3. Platform Configuration File

The build starts. This step can take several minutes. You can see the progress of the build steps in the Eclipse console. Please wait for the final message `BUILD SUCCESSFUL`.

At the end of the execution the platform is fully built for the STM32F429I-DISCO board and is ready to be linked into the Keil µVision project. The name of this platform is STM32F429IDISCO-MyPlatform-CM4_ARMCC.

The platform is now ready for use and available in the Platforms list of your MicroEJ repository (`Windows > Preferences > MicroEJ`)

5 Run an Example on the Simulated Java Platform (SimJPF)

The aim of this chapter is to create a simple Java application from a built-in example. This example will initially be run on the simulator (SimJPF) of the platform created in the previous chapter. Then, in the next chapter, this application will be compiled and deployed on the STM32F429I-DISCO board using the EmbJPF.

5.1 Create Example

- Open MicroEJ.
- Open the welcome page: `Help > Welcome`.
- Press the Try out Java Examples button to open the New Java Example Project wizard.
- Select the Java platform STM32F429IDISCO-MyPlatform-CM4_ARMCC from the combo box.
- Select the example `Examples > MicroUI > MVC`.

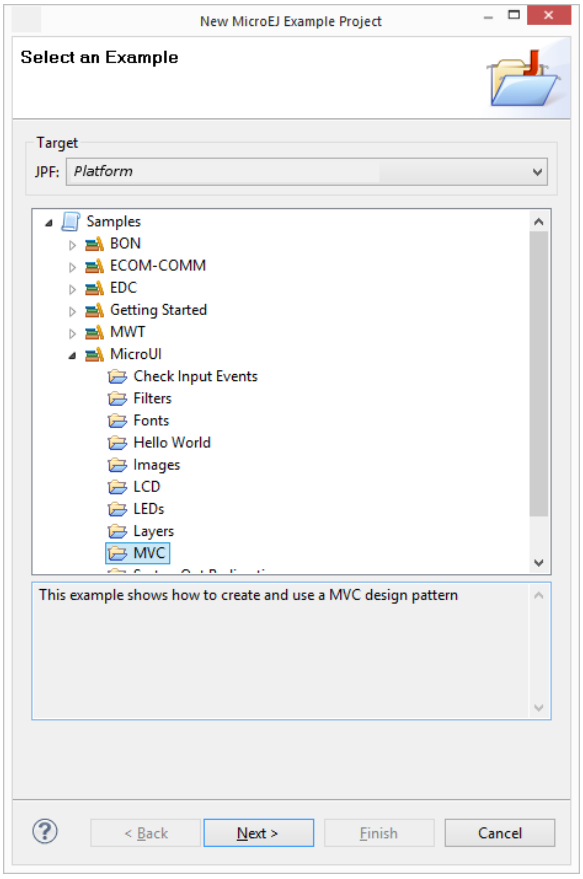

Figure 5.1. New MicroEJ Example Project (page 1)

- Click on Next. The next page suggests a name for the new project.

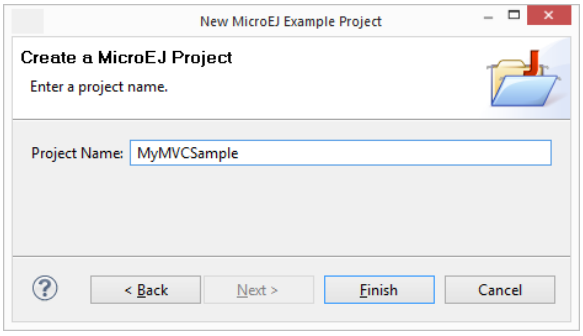

Figure 5.2. New MicroEJ Example Project (page 2)

- Click on Finish. The selected example is imported into a project with the given name. The main class (the Java class which contains the main() method, here: MVCDemo.java) is automatically opened.

Note

Note: The New Java Example Project wizard is also accessible from the menu `File > New > Java Example`.

5.2 Run Example

- Open the run dialog (`Run > Run configurations...`) and select the MicroEJ launcher MyMVCSample SimJPF.

- Click on `Run`: the application starts. It is executed on the simulator (SimJPF) of the selected JPF (STM32F429IDISCO-MyPlatform-CM4_ARMCC). A picture of the board appears. The result of the execution is shown on the display of the board. The touchscreen can be used to adjust the division of the screen areas.

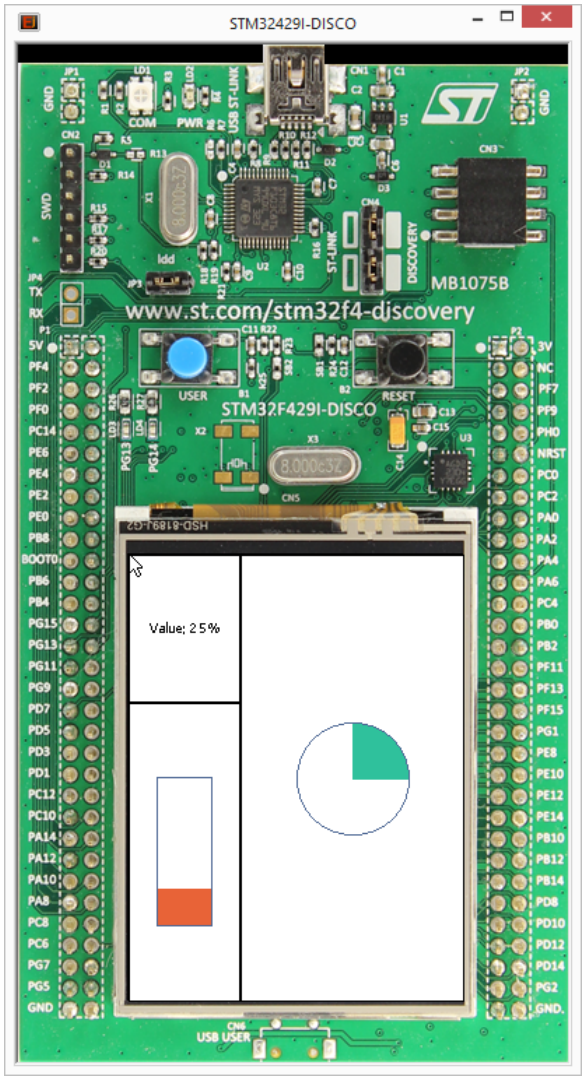

Figure 5.3. MVC Example on the Simulator

6 Run the Example on the STM32F429I-DISCO Board (Emb-JPF)

6.1 Compile Java Application

- Open the run dialog (`Run > Run configurations...`) and select the MicroEJ launcher `MyMVCSample EmbJPF`.
- Click Run: the application is compiled, and the compilation result (an ELF file) is copied into a well-known location in the workspace. The Keil µVision BSP project will look for it there when it performs the final link.

6.2 Link and Deploy Java Application

The aim of the final step is to:

- Compile the BSP project (such as drivers).
- Link the BSP and the others libraries (MicroJvm Virtual Machine, native stacks, Java application).
- Deploy the full application on the STM32F429I-DISCO board.

Note

This final step uses Keil µVision 4.74.

- In MicroEJ, expand the project `STM32F429IDISCO-MyPlatform-CM4_ARMCC-bsp` and the folder Project/MicroEJ/MDK-ARM. A Keil µVision project file (`Project.uvproj`) is available.

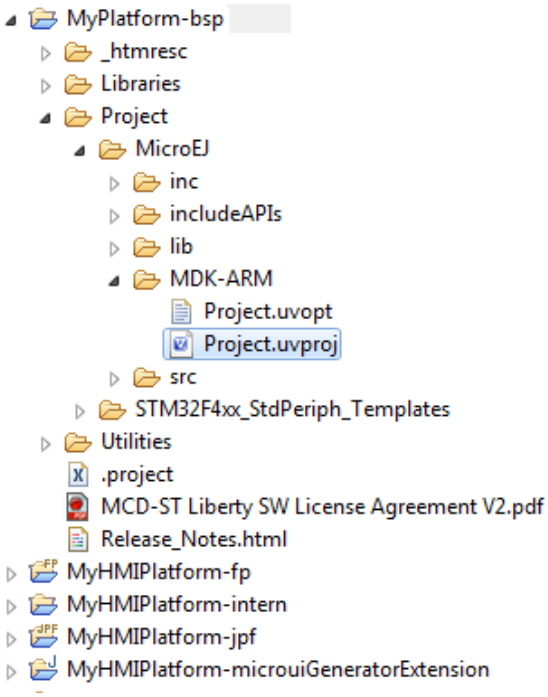

Figure 6.1. Keil µVision Project File

- Double-click on this file to open Keil µVision.

The remaining steps are performed within Keil µVision.

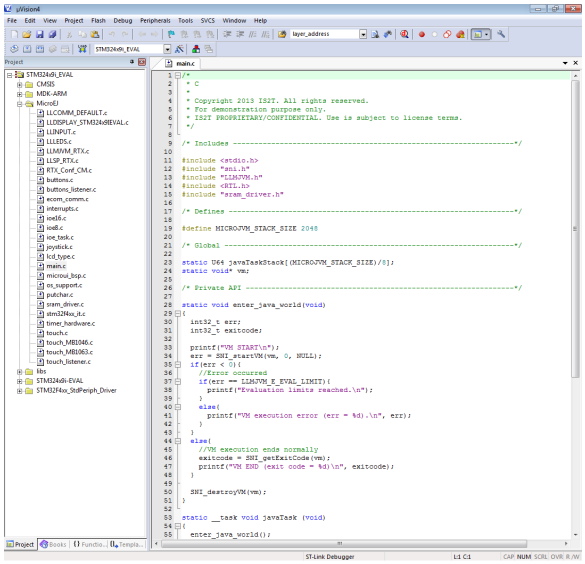

Figure 6.2. C IDE

- Build the Keil µVision project by clicking on the menu `Project > Build target`. The project is compiled and linked.
- Deploy the link result on the STM32F429I-DISCO board by clicking on the menu `Flash > Download`.

The application starts. The result of the execution is shown on the display of the board.

Congratulations, you have built the Java application on your own platform!

7 Appendix

7.1 STM32F429I-DISCO Technical Specifications

The following table illustrates some board features used by the Java platform. It doesn't list all board features (such as all available memories on the board).

MCU architecture	Cortex-M4 (STM32F429ZIT6)
MCU Clock speed	180MHz (225 DMIPS)
Internal Flash	2 MBytes
Internal RAM	128 KBytes
External RAM	8 MBytes (SDRAM)

Table 7.1. STM32F429I-DISCO Technical Specifications

7.2 Platform Configuration

7.2.1 Trace Port

All traces (`System.out.print`) and debug traces (Java exceptions) out on `USART 2`. The TX (RX is useless) of this USART is available on the P1 connector: PD5. On the computer, connect a serial sniffer: 115200 bauds, 8 bits of data, 1 stop bit, no parity.

7.2.2 ECOM Comm Ports

The ECOM Comm implementation manages one Comm port. The RX and TX pins are available on the P1 connector, respectively PA10 and PA9.

7.2.3 MicroUI Input Events

The hardware switch (USER) sends the event Command `ESC` to MicroUI library.

7.2.4 MicroUI LEDs

MicroUI uses the IDs 0 and 1 to target the LEDs, respectively the green and red LEDs.

7.3 Board Setup

This section explains how to configure and connect the STM32F429I-DISCO board.

7.3.1 Jumpers and Switches

Set all jumpers and switches to their default settings: please refer to the STM32F429I-DISCO documentation (STMicroelectronics documentation: User manual STM32F429I-DISCO kit board).

7.3.2 Power Supply

Select your power supply mode: please refer to the STM32F429I-DISCO documentation (STMicroelectronics documentation: UM1662 User manual STM32F429I-DISCO kit board).

7.3.3 Summary

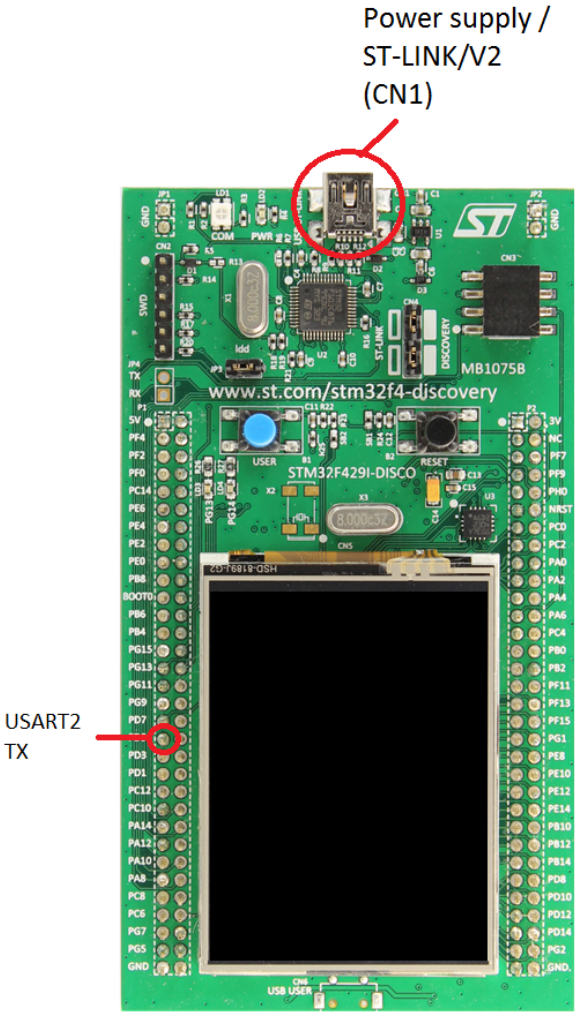

Figure 7.1. Board configuration

7.4 Keil µVision

7.4.1 Project Compatibility

The µVision projects available as Java platform examples are compatible Keil µVision [4.60, 5.0[. Several options have to be updated manually to be compatible with Keil µVision 5.x (such as the choice of the microprocessor).

7.4.2 Probe Configuration

This chapter explains how to use a custom probe instead of using the default configured probe. This step is useful if you use Keil µVision 4.5.x, as older versions of Keil µVision do not manage the configured probe well.

- Open a Keil µVision project.
- Open the menu `Project > Options for Target` '(your target)'.
- Open the tab `Utilities`.
- Select the item corresponding to the probe to use in the combo box of the menu `Use Target Driver for Flash Programming`.

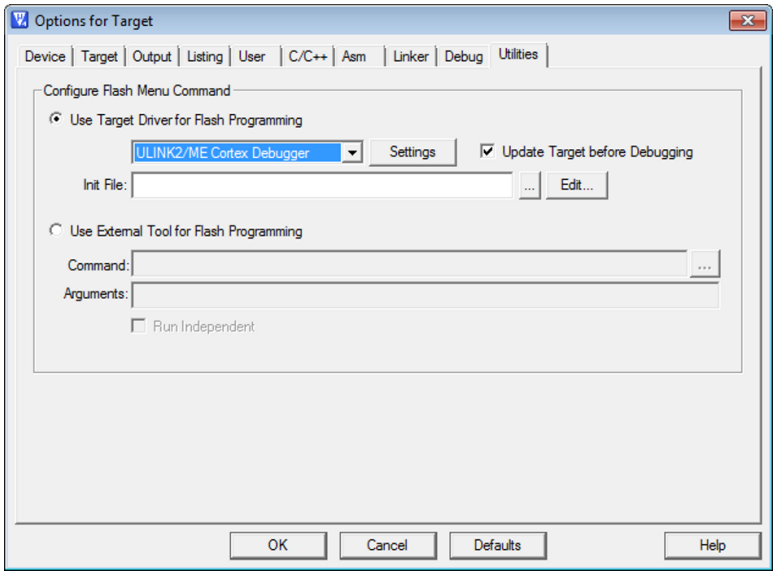

Figure 7.2. ULINK Probe Configuration

- Click on OK.

7.5 Demos Installation

This chapter explains how to install extra demos and application notes. They have to be imported as a standard Eclipse project archive file:

- Go to the website http://www.is2t.com/download.
- Download zip files containing one or more demos.
- Open MicroEJ.
- Open the wizard Import: `File > Import`.
- Select the item `General > Existing Projects into Workspace`.
- Click on Next.
- Select the downloaded zip file.

8 Document History

Date	Revision	Description
May 22th 2014	A	First release