

Renesas e² studio ISDE

Renesas Integrated Solution Development Environment

Rev.1.00
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Overview

Renesas e² studio is the common Integrated Solution Development Environment (ISDE) tool for Renesas embedded microcontrollers. e² studio is based on the industry-standard open-source eclipse C/C++ Development Tooling (CDT) project that covers build (editor, compiler, and linker control) and debug phases with an extended GNU Debug (GDB) interface support. Renesas has enhanced this powerful tool to give developers the kind of production-grade tools they need to create exciting new Internet of Things (IoT) applications.

The e² studio provides support for the Renesas Synergy Software Package (SSP), including applications, Hardware Abstraction Layer (HAL) drivers, and Board Support Package (BSP) drivers for Renesas projects. The SSP provides a complete driver library for developing Renesas Synergy applications in e² studio.

The e² studio ISDE includes multiple Graphical User Interface (GUI) wizards for auto-generating code, for including existing drivers, for configuring build and debug options, and for running the applications you create. Driver documentation and hardware documentation at the register level are integrated in the form of tooltips, which are available in the code editor view.

The Renesas Synergy products are included in release 4.0 and higher of the Renesas e² studio ISDE. Multiple views and editors are available to support specifically Renesas Synergy ARM[®] Cortex[®]-M-based microcontrollers and the open-source GNU ARM tool chain. Renesas also supports the powerful IAR Embedded Workbench for ARM (EWARM) for Renesas Synergy inside of this ISDE.

The Renesas Synergy add-ons provide easy-to-navigate wizards for configuring hardware and for managing the extensive Renesas Synergy software library.

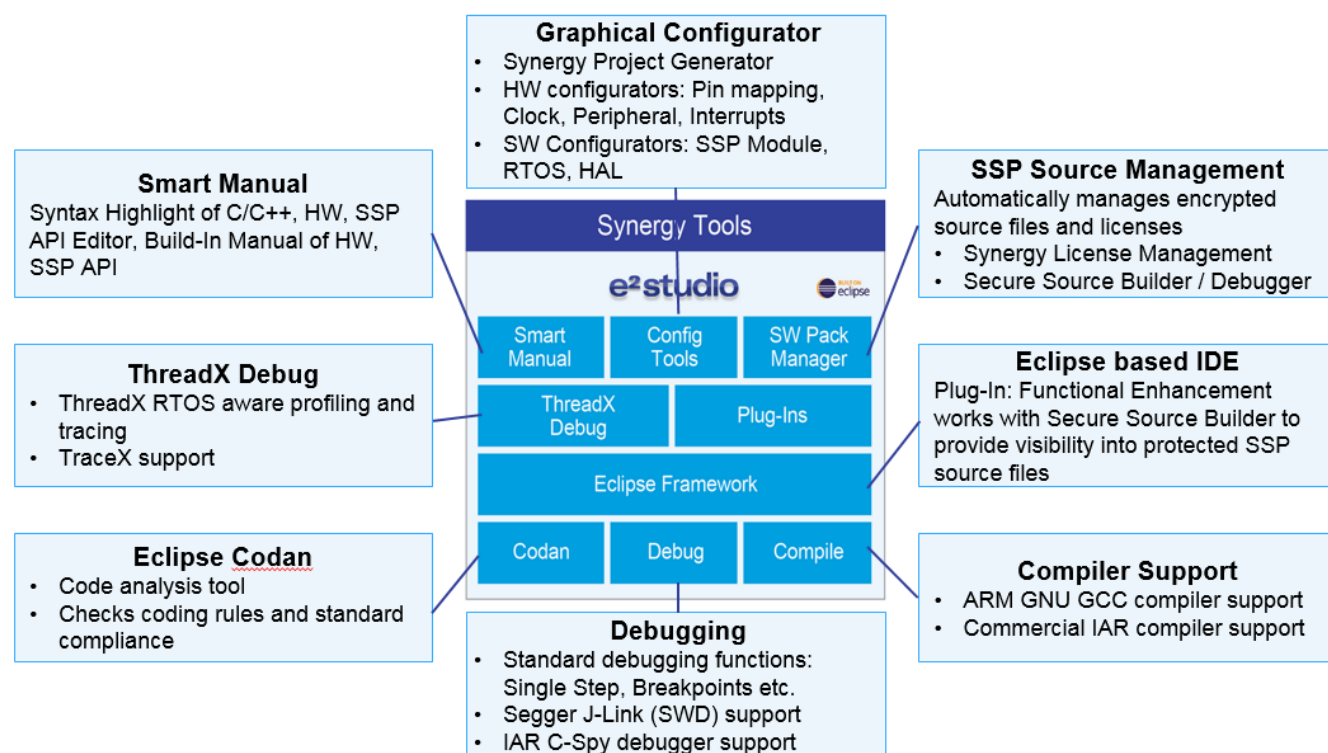
Key features of e² studio:

- Automatic code generation
- A comprehensive smart user manual
- Keyword color coding of source code
- Powerful code navigation
- Jump to declarations
- Automated code formatting
- Code templates
- Automated code constructs (if, while, do...while, and others)
- Auto variable completion while writing
- Built-in spell checker

The e² studio ISDE for Renesas Synergy features additional tools and plug-ins that guide, assist, error-check, and make alternate recommendations as needed while configuring Renesas Synergy microcontroller (MCU) functions and Renesas Synergy Software API function calls. These tools include:

- Graphical configurators to make MCU pin function assignments, clock and peripheral settings, and interrupts source assignments. Renesas Synergy MCU's offer highly multiplexed and configurable pins; the Pin Configurator makes programming easy and straightforward.
- Graphical software configurator to assign individual real-time operating system (RTOS) thread objects and to customize peripheral drivers and the hardware abstraction layer (HAL).
- Based on configurator selections, the ISDE generates C header files and initialization C code enabling end-application code development to start immediately.
- Smart manual with immediate reference to user manual information just by hovering mouse over highlighted MCU register names and API structures.
- Management of Renesas Synergy Software Package (SSP) source and license files.

e² studio Block Diagram



Functional components of e² Studio ISDE

Examples for graphical configurators.

■ Preparing a new Project

Each new project starts with configuration of the system. e² studio offers multiple configurators to accelerate the development process.

• Pin Configurator

The Pin Configurator providing a graphical interface to assign functions to individual MCU pins. Sometimes there are as many as 16 different function choices per pin, and some Renesas Synergy MCUs have more than 200 pins, so the Pin Configurator performs live error checking while issuing advice during all selections. Developers will select a desired peripheral and the pin configurator offers available options which pins can perform the I/O functions of the selected peripherals.

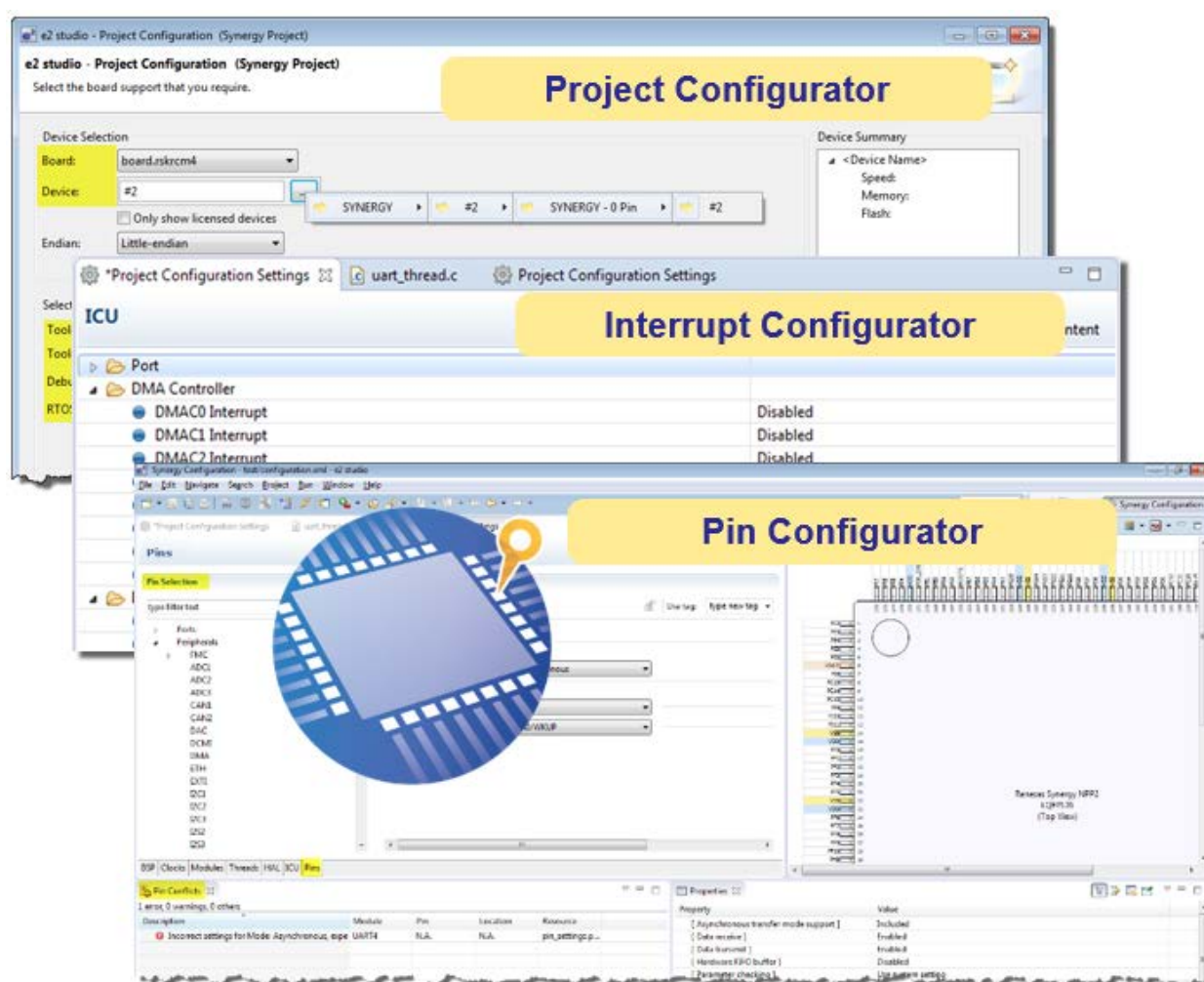
• Interrupt Configurator

A similar graphical interface is provided for setting up interrupts. The S7 series has a large number of interrupt sources on the MCU, and it can become difficult to keep track of all the priority assignments already performed. With the Interrupt Configurator, all related information is combined in a few graphical screens.

• Clock Configurator

Different serial interfaces require specific frequencies to work properly. It is very important to provide 50 MHz to the Ethernet block while 48 MHz is required for USB. This is just one example of clock assignments and some peripherals cannot function properly when they are not clocked with the specified frequency. Using the Clock Configurator will show the developer multiple clock trees and flag instances where a mandatory frequency is not assigned.

After using the configurators, header files and startup code will be auto-generated and the software developer can start writing differentiating code right away.



Various Configurators

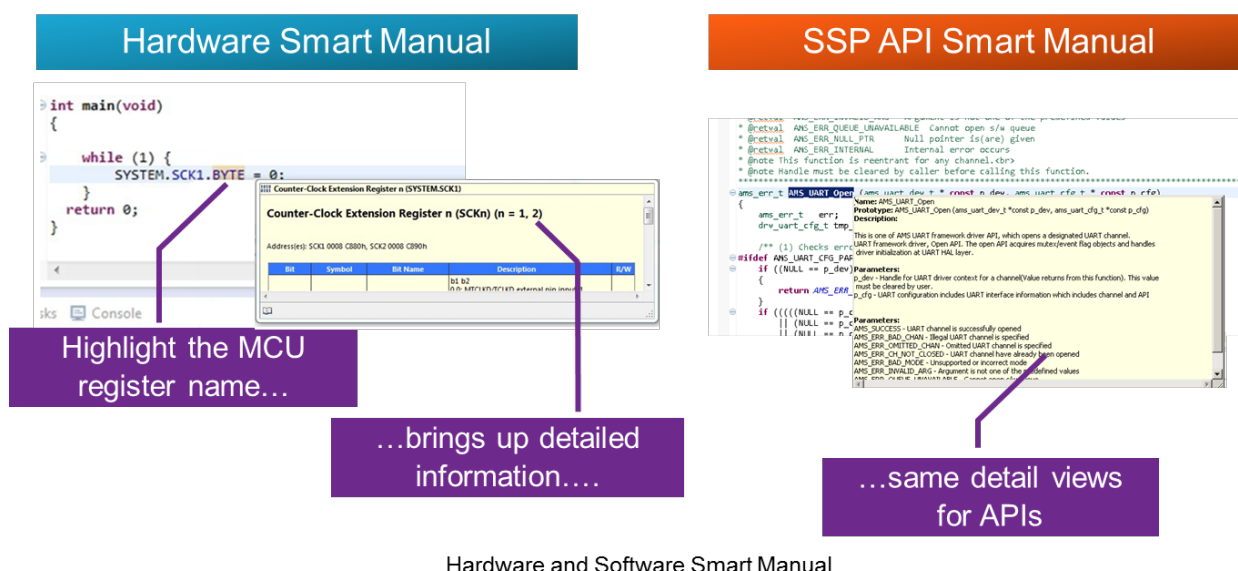
■ Building a project

To increase productivity, SSP offers many software modules that can be selected in the e² studio ISDE. The build phase is all about application code development. Writing and editing code is assisted with features such as:

- Automatic code completion
- Keyword color coding of source code
- Built-in spell checker
- Powerful code navigation
- Jump to declarations
- Automated code formatting
- Code templates
- Automated code constructs (if, while, do...while, and others)
- Auto variable completion while writing
- The Codan static Code Analysis plug-in for Eclipse

- **Smart Manual**

During code development, an innovative Smart Manual system is in place to provide context-aware, wiki-based help. Typically, an engineer needs a PDF manual that is opened in a separate window. It requires switching back and forth between the reader and the development environment. The Smart Manual is built in. With an online help desk, the information is there without having to leave the e² studio ISDE.



For example, the ISDE highlights key words such as an MCU register name or a SSP API. Hovering the mouse over the highlighted word, brings up helpful information such as the function description and prototype, parameter details, or MCU register bit definition. The Smart Manual even pulls in relevant application notes and media-rich instructional material if available.

■ Debugging a project

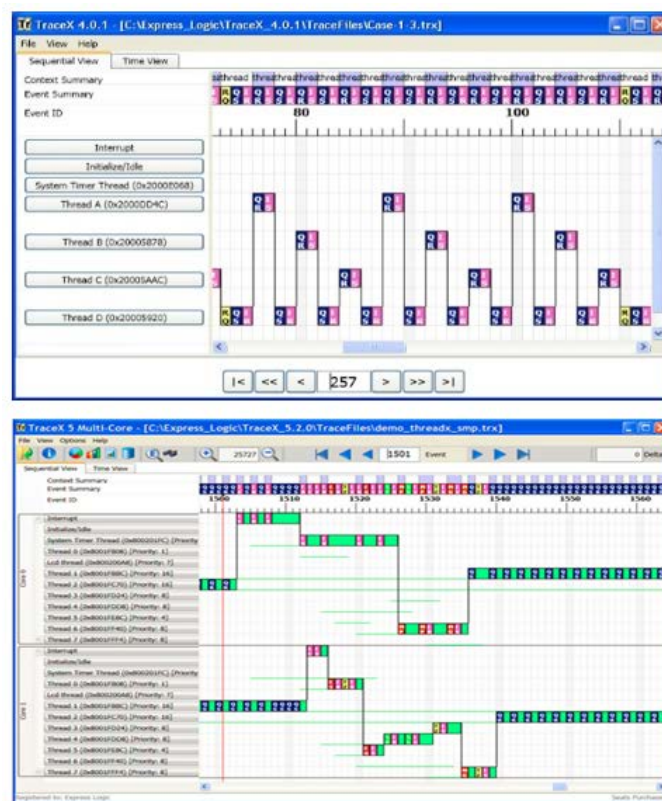
The e² studio ISDE provides multiple ways to gain deep visibility into code execution, and kernel-aware features look at the entire code design holistically, including the RTOS with a view of threads, queues and semaphores during debugging.

SEGGER J-Link is built into Renesas Synergy Kits and is supported by the ISDE. J-Link is the quasi-standard for ARM® Cortex®-M processor-based systems and offers special features such as Flash breakpoints, which are additional breakpoints when the developer runs out of core-provided breakpoints. If the IAR C compiler is chosen, the ISDE supports the IAR C-SPY debugger as an Eclipse plug-in.

The ThreadX[®] Windows-hosted Execution Profile Kit (EPK) provides an infrastructure for applications to dynamically track execution time for threads, Interrupt Service Routines (ISRs), and idle system conditions. This is especially useful when optimizing and tuning an application for maximum performance.

■ TraceX[®] - ThreadX[®] Performance & Monitoring

The PC-based tool TraceX seamlessly integrates with the Renesas Synergy Software Platform, providing run-time performance information, and is available on a per-object basis as well as over an entire object class. For example, if performance information is enabled for thread objects, ThreadX keeps track of thread resumptions, suspensions, preemptions, priority inversions, time-slices, timeouts, and much more for each thread and for all threads collectively. With Run-time stack analysis, an Execution Profile Kit, and a built-in System Trace, this powerful tool helps squash bugs and speeds your time to market. These and other features in e² studio ISDE allow you to take full advantage of the powerful and qualified software modules that are included in the Renesas Synergy Software Package, making it easy to create a stable software foundation that is customized to your embedded project. e² studio ISDE provides multiple ways to gain deep visibility into code execution, include kernel-aware features to look holistically at the entire code design including the RTOS with a view of threads, queues and semaphores during debugging.



TraceX[®]

■ GUIX[™] Studio

GUIX[™] Studio provides a complete WYSIWYG screen design environment that enables a developer to drag-and-drop graphical elements used to build their user interface (UI) screens. In addition, GUIX[™] Studio allows customization of the default colors and drawing styles used by the GUIX[™] widgets, allowing developers to tune the appearance of GUIX[™] very easily. GUIX[™] Studio automatically generates C code compatible with the GUIX[™] library, ready to be compiled and run on the MCU target device within the e² studio ISDE. Developers can produce pre-rendered fonts for use with within an application using the integrated GUIX[™] Studio font generation tool.

A complete GUIX[™] UI application can be executed on a PC desktop within the GUIX[™] Studio environment, allowing a quick and easy generation and demonstration of UI concepts, testing of screen flows, and observation of screen transitions and animations.

System Requirements

To use e² studio ISDE, ensure that your PC meets the following minimum requirements:

- Microsoft® Windows® 7 with Intel® Core™ family processor running at 2.0 GHz or higher (or equivalent processor)
- Memory: 8 GB minimum
- Minimum 250-GB hard disk minimum
- USB 2.0
- Connection to the internet

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