Comprehensive Renesas Synergy™ Tools & Kits Support Accelerates End-Product Development

*New approach to tools and kits meets the needs of today’s highly-competitive IoT market*

With market growth projections going through the roof, the IoT market clearly offers tremendous opportunities. Innovative companies who can beat their competitors to market, successfully drive down total cost of ownership, and circumvent the typical barriers to entry will likely see success. Yet, the traditional approach to tool and kit support in the embedded MCU market is still filled with obstacles that block rapid prototyping and product development. MCU suppliers frequently require their customers to source development tools from multiple vendors, opening the door to a time-consuming and inefficient process.
The development kits that vendors offer often do not comprehensively address the needs for ease-of-use and reliable expansion of connectivity and functionality. Embedded system developers, especially those bringing IoT products to market, are often forced to use software development tools with severe limitations on compiled code size unless extra fees are paid. Furthermore, many times these tools are typically not completely integrated with respect to MCU architecture and debugging options, operating systems and communication stacks, software maintenance and easy licensing, product documentation and project management.

Each of these factors contributes to longer development cycles, higher cost of ownership and missed market opportunities. IoT product developers need a platform that addresses all the development needs they encounter throughout the development life cycle of their end-products. The initial needs of this life cycle are very important. Development tools and kits must work together seamlessly without forcing developers to access multiple disparate resources before they become productive in their engineering tasks.

Clearly the key to success is a comprehensive Integrated Development Environment (IDE) that encompasses the total embedded solution and that is seamlessly paired with a scalable series of expandable development kits to meet the needs of a wide range of applications.
Full Featured Integrated Solution Development Environment (ISDE)

The Renesas Synergy Platform eliminates many of the limitations found in today’s IDEs and MCU development kits. Renesas Synergy MCUs are supported by the Eclipse-based e² studio tool for software development. Eclipse is the de-facto standard when it comes to embedded IDEs and, by adding new, solution-oriented components, Renesas’ engineers have transformed this environment into a true Integrated Solution Development Environment (ISDE). As a standard Eclipse-based platform, the e² studio ISDE can be readily extended in the future with tool components from Renesas and from third-party tool vendors as Eclipse plug-ins.

The following three capabilities – deep software debugging, clear trace visibility of real-time events within the context of a real-time operating system (RTOS), and intelligent guidance of MCU pin configuration – offer excellent examples of how Renesas’ e² studio ISDE provides unique solution-based assistance.

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Today, embedded designers need a comprehensive, standards-based development environment to meet market needs.
Valuable Debugging Capabilities

The ISDE’s debugging capability addresses a wide array of functions including simple breakpoints, single-step, instruction, data pattern targeting, CPU register display, and run control. With these functions, developers can quickly identify and fix errors by stepping through code from instruction-to-instruction, viewing how the software performs and what errors lead to a bug. In addition, all of the Renesas Synergy Platform’s development and starter kits feature an on-board version of the SEGGER J-Link® JTAG-based debugger that eliminates the need to purchase and connect external debugging probes. Viewed by many as a quasi-standard for ARM® Cortex®-M-based systems, SEGGER J-Link® is the most widely-used line of debug probes available today. To help accelerate code debug, the J-Link® features additional breakpoints for use when core-provided breakpoints are exhausted.

Deep Program Flow Tracing

The ISDE’s tracing capability is a balance between real-time capture of data locally within the MCU device itself and post-processing this captured data externally within the ISDE tool. This gives the developer a historical view of the MCU’s internal instruction flow and data manipulation with extremely high granularity. That capability provides insight into detailed software execution correlated to stimulus events that led to erroneous software behavior, including a view of what occurred just after the error.

The more data that can be captured in real-time on the MCU device, the better for full tracing. All Renesas Synergy MCUs have generous on-chip trace storage capability with 1KB trace buffers on the Renesas Synergy S1 and S3 Series MCUs and a 2KB trace buffer on the S7 Series MCUs. Through compression techniques, these buffer sizes can capture up to 64 instruction branches before needing to send trace data from the MCU device off to the ISDE. The S7 MCU devices go a step further by providing a streaming trace capability to bring out information in real-time during code execution. This capability enables developers to follow program flow as it steps through thousands of instructions and branches.

The Renesas Synergy Platform includes the comprehensive Renesas Synergy Software Package (SSP). The SSP offers developers a complete, qualified embedded software framework built around Express Logic’s ThreadX® multitasking RTOS. To effectively aid development of complex real-time systems that have high-speed connectivity, the e² studio ISDE integrates a high level of RTOS awareness. The Renesas Synergy Platform includes, at no charge, the use of Express Logic’s host-based analysis tool TraceX® that gives developers detailed graphical visibility of real-time system events, allowing them to visualize how their system operates within context of the RTOS.

By tracking the occurrence of system events such as interrupts and context switches, TraceX® displays events graphically on the horizontal axis representing time, with the individual application threads along a vertical axis. Taken together with the ISDE’s traditional hardware debug capabilities, this extended visibility gives developers who are using the SSP tracing capability on both the MCU and RTOS levels.
Intelligent Guidance Speeds Project Startup

To simplify and automate configuration of Renesas Synergy MCU functions and code generation, the e² studio ISDE offers many graphical configurators to guide user selections and prevent errors when starting a new design. Renesas Synergy MCU’s can support many different functions (up to 16) on a single pin to provide complete flexibility during the layout design of a circuit board. The pin configurator guides developers to select the desired function of each pin graphically, checks for conflicts and suggests alternatives if needed, and documents the design for easy circuit board layout. The MCU system clock configurator guides the selection of correct clock sources and frequencies by performing dynamic validation during the selection process. The RTOS configurator makes simple work of assigning and managing individual RTOS threads to tasks. Another configurator gives intuitive guidance to select optional operation of individual peripheral driver modules. A final configurator helps correctly assign interrupt sources to MCU interrupt inputs and prepares a total consistency check. At the end of the configuration process, the ISDE automatically generates C header files and initialization C source code reflecting all the choices to enable the developer to start writing application code immediately for the end-product.

Multiple graphical configurators simplify code development.
Smart Manual

One of the more challenging problems developers face as embedded designs grow increasingly complex is how to efficiently manage and use the thousands of pages of documentation for MCU devices and software that accompany each design, especially in IoT applications. Developers can spend many extra hours trying to track down the information they need.

To address this problem and simplify development, the e² studio ISDE for Renesas Synergy uses an innovative new feature called Smart Manual, which is part of the overall Smart Documentation system in the Renesas Synergy Platform. As an interactive source of assistance within the ISDE, the Smart Manuals is context-aware meaning it presents the user with information that is needed, when it’s needed. For example, if a developer is writing application code and wants to know more detailed information about a particular MCU register or a particular API function call within the SSP, as he or she moves the cursor over each MCU register name or software API, the tool pops up the associated details for structure, bit definition, parameter types, and more. When the engineer clicks on this information or accesses help, a context-aware link to additional information associated with that particular feature appears. The system even collects relevant application notes and media-rich instructional material associated with the topic in question. The Smart Manual saves time by eliminating the need to search resources outside of the e² studio ISDE.

Renesas’ innovative Smart Manual offers context-aware links within the e² studio project editor providing additional data for both MCU registers and SSP API function calls.
Renesas Synergy Development Kits and Starter Kits

To ensure immediate start-up and smooth development all the way to the prototype stage, it is very important that the software development environment is tightly coupled with the MCU development kits. Planned from the outset, the e² studio ISDE is structured to work seamlessly with a wide range of kits for the Renesas Synergy Platform to match the varying technical expertise of users and varying complexity of different end-applications. There are pre-configured board support packages (BSP’s) available in the ISDE for each Renesas Synergy kit for immediate start up and easy modification to expand and alter the functionality of the kits.

Renesas Synergy Development Kits, also known as DK’s, are available for every series of Renesas Synergy MCUs. DKs enable full access to all the MCU features and pins to evaluating MCU device performance and measure power consumption; build application software until the end-product’s prototype hardware development platform is available; and even to expand capabilities by plugging specialized circuit boards into DK expansion connectors including industry standard Pmod™ connectors.

To make the evaluation and development process more geared towards software developers, Renesas Synergy DK’s also feature active multiplexers on the GPIOs that allow developers to dynamically configure the signals with just a single switch, setting rather than manually setting many tiny jumpers that can cause errors and consume time.

Renesas Synergy Starter Kits, or SK’s, offer high value at a very affordable price. These basic kits provide an excellent introduction to the Renesas Synergy Platform while addressing the vast majority of Renesas Synergy MCU functions. SKs are targeted at developers who may not have a specific application in mind yet, but want to try out the Renesas Synergy Platform at minimal cost. Each

The SK-S7G2 Starter Kit is an extremely low-cost way to access the entire Renesas Synergy Platform to enable full development using the vast majority of all Synergy Software Package (SSP) functions.
SK provides access to most MCU pins and also provides function expansion through sets of connectors based on the Pmod™ standard and on the Arduino™ format for Arduino™ Shield plug-in boards.

All Renesas Synergy DK’s and SK’s include J-Link® on-board (J-Link® OB) JTAG debug access using a simple USB connection.

Conclusion

Today’s embedded and IoT applications demand a comprehensive development suite that integrates the capabilities of an ISDE with an extensive selection of hardware kits. At the same time, developers need tools that are not only productive, but also easy to use. By combining new capabilities such as a context-aware smart manual, automated project configuration, RTOS awareness, and enhanced tracing functionality, Renesas has given Renesas Synergy Platform users the tools they need to rapidly develop exciting new embedded applications and beat their competitors to market.

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