eSOL Releases eMCOS POSIX, a Scalable POSIX-Compliant RTOS that Maximizes Performance of the Renesas R-Car H3 Automotive SoC with Heterogenous Multi-Core Processors

eMCOS POSIX Provides the High Levels of Real-Time Capability and Safety Needed for Autonomous Driving

A Single RTOS Controls all Eight Cores of the 64-Bit ARM Cortex-A57/A53 and Extracts Maximum Performance

Tokyo, Japan. April 11, 2017 –eSOL, a leading developer of real-time embedded software solutions, today announced that eMCOS POSIX, its scalable POSIX-compliant real-time operating system (RTOS), now supports the R-Car H3 SoC for automotive systems from Renesas Electronics Corporation. Use of a newly adopted Distributed Microkernel Architecture means that this single RTOS can extract maximum performance from the R-Car H3, controlling all eight cores in its heterogenous hardware configuration that includes both an ARM® Cortex®-A57 and ARM® Cortex®-A53. This delivers high levels of real-time capability and safety in applications that make heavy demands on computing power, such as autonomous driving systems and advanced driver assistance systems (ADAS).

A high-end version of Renesas's third-generation R-Car, the R-Car H3 is an SoC for automotive systems that is intended to serve as an automotive computing platform for the era of autonomous driving, featuring significantly enhanced computing performance compared to the previous R-Car H2. It incorporates an ARM Cortex-A57 and ARM Cortex-A53, both of which are quad-core processors that use ARM's latest 64-bit architecture. This provides processing performance in excess of 40,000 Dhrystone millions of instructions per second (DMIPS). In safe driving support systems, such as autonomous driving systems and ADAS, that demand instantaneous execution for recognition of the environment around the vehicle as well as judgement and actuation, these capabilities improve computing performance for the accurate, real-time control of the large amounts of information input from vehicle-mounted cameras and other sensors. For automotive information systems in the era of the IoT, in which integration with smartphones or the cloud has become essential, it also enhances the computing performance needed for the accurate, real-time processing of large amounts of

information received from external sources and for providing it to the driver via a rich and intuitive human-machine interface (HMI). R-Car H3 also complies with the ISO 26262 ASIL B standard for functional safety in automobiles.

eMCOS POSIX is a fully POSIX-compliant RTOS that complies with POSIX 1003.13 PSE 53 and provides full support for multiple processes and multithreading, loadable processes, and shared libraries. It makes the reuse of Linux software assets easy and has demonstrated its ability to run the Autoware open source software (OSS) for autonomous driving systems. It is also scalable, with its distributed microkernel architecture (in which the microkernel runs on all cores) providing support for the heterogenous hardware configuration (different architectures) of the hardware in the R-Car H3.

eMCOS also has a proprietary semi-priority-based scheduling algorithm (patent numbers 5734941 and 5945617) that maximizes CPU throughput while also guaranteeing real-time capability. The scheduling algorithm guarantees real-time capability by identifying the high priority threads, up to the number of cores available, and executing these exclusively on the designated cores. Throughput is maximized by scheduling the low priority threads to run on the remaining cores based on their processing load and priority in a way that distributes the load. It also includes a function for designating which core to use for processing that demands hard real-time capability. By combining throughput with real-time capability, eMCOS is a good fit with the R-Car H3 concept of supporting both driving assistance and autonomous driving functions that need hard real-time capability and automotive information systems with sophisticated and intuitive HMIs.

For application development, eSOL provides eBinder as a dedicated development tool for eMCOS. eBinder includes system analysis tools and utilities designed for use with eMCOS. Combined with the eMBP model-based parallelizer and consulting services backed up by skills and knowledge derived from extensive experience with automotive system development, this provides strong support for the design and development of automotive software for the R-Car H3.

eSOL also provides support for compliance with functional safety standards in user systems that demand high levels of safety and reliability, such as automotive systems, factory automation, and industrial equipment. Certification that eT-Kernel, a widely used TRON-based RTOS, satisfies the highest safety levels in both the ISO 26262 and IEC 61508 functional safety standards (for automobiles and industrial equipment, respectively) has been obtained from SGS-TÜV Saar GmbH of Germany, an international certification agency. The development processes for eSOL's RTOS products have also been certified as compliant with the IEC 62304:2006 "Medical device software-Software life cycle processes" safety

standard for the development and maintenance of software for medical devices.

"I welcome the provision of support for the R-Car H3 in eMCOS from eSOL, a company with top-level skills and know-how in real-time operating systems. I am confident that users will benefit significantly from access to support provided by a well-respected company like eSOL, who can assist them with the development of complex software for SoCs with multiple cores," said Masayasu Yoshida, Senior Expert, 1st Solution Business Unit, Renesas Electronics Corporation.

"eMCOS has proven its high levels of reliability and real-time capability through its use to run the Autoware OSS for autonomous driving systems that is already being deployed on demo vehicles. As a Platinum Partner of Renesas, eSOL intends to continue supplying comprehensive support for system development for the R-Car H3, supplying a platform based on eMCOS for system development using the R-Car H3 and other Renesas CPUs," said Nobuyuki Ueyama, Executive Vice President of eSOL.