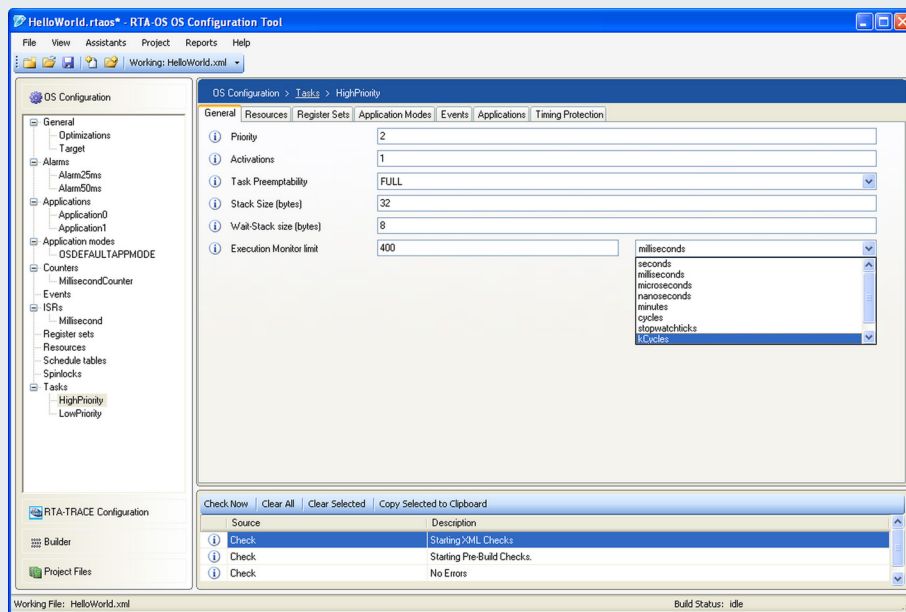


RTA-OS

Renesas RH850x2 with the Green Hills Compiler



Features at a Glance

AUTOSAR R4.3 compliant
Multicore OS

Supports all scalability
classes

MISRA-C:2012 compliant

RTOS overhead:
69 bytes RAM
0 bytes ROM

Category 2 ISR latency:
83 CPU cycles

RTA-OS

RTA-OS is the new generation operating system from ETAS that conforms to the AUTOSAR OS specification and builds on the benefits of the successful RTA-OSEK product. It provides a toolsuite that includes a PC-based graphical configuration tool and adaptive OS generation capabilities to deliver flexible, fast solutions for a wide range of automotive microcontrollers.

The graphical configuration tool allows all OS objects to be configured, and creates AUTOSAR conformant XML files describing the OS configuration. In addition, it provides automatic verification against the AUTOSAR XML schema and allows users to create projects for easy management of multiple files.

RTA-OS improves on RTA-OSEK in several areas, including better runtime performance and smaller memory footprint,

support for multiple processor environments, and automatic support for up to 1024 tasks. The powerful performance analysis tools developed for RTA-OSEK have been updated for RTA-OS to allow hard real-time requirements to be met.

RTA Product Family

RTA-OS integrates seamlessly with other tools in the RTA product family, including:

- RTA-RTE – a mature, robust production quality AUTOSAR RTE Generator.
- RTA-TRACE – a software logic analyser that allows the runtime behaviour of RTA-OS to be observed.

Microcontroller Support

RTA-OS supports all variants of the Renesas RH850x2 family of microcontrollers.

Compiler Toolchain

RTA-OS for the Renesas RH850x2 has been developed with the Green Hills v2018.1.5 compiler.

Due to the adaptive code generation of RTA-OS, it is possible to use other versions of this compiler to build applications.

ORTI Debugger Support

RTA-OS can generate OSEK Runtime Interface information for the Lauterbach debugger.

Interrupt Model

RTA-OS supports the multiple interrupt priority levels on the RH850x2.

Memory Model

RTA-OS supports the standard RH850 memory model.

Maximum Number of OS Objects Allowed by RTA-OS

	BCC1	BCC2	ECC1	ECC2
Max. no. of tasks	Up to 1024			
Max. tasks per priority	Up to 1024			
Max. queued activations	1	$2^{32}-1$	1	$2^{32}-1$
Max. events per task	n/a	n/a	32	32
Max. alarms	$2^{32}-1$			
Max. software counters	$2^{32}-1$			
Max. hardware counters	$2^{32}-1$			
Max. nested resources	$2^{32}-1$			
Max. standard resources	$2^{32}-1$			
Max. internal resources	Not limited by RTA-OS			
Max. application modes	$2^{32}-1$			
Max. schedule tables	$2^{32}-1$			
Max. expiry points per schedule table	$2^{32}-1$			

Memory Overhead of RTA-OS

Memory Type	Overhead (bytes)
RAM	69
ROM/Flash	0

In addition to the OS overhead, each object used by an application has the following memory requirements:

Object	RAM (bytes)	ROM (bytes)
Task	0	20
Category 2 ISR	0	8
Resource	4	8
Alarm	12	2
Counter	4	20
Schedule Table	12	16
Expiry Point	0	4

Performance

The following table gives the key RTA-OS kernel performance data measured in CPU cycles. All measurements were taken on a RH850/E2GM with a 400MHz clock speed.

Task Type	Execution Time	Ref.
Pre-emption	93	A
Normal Termination	62	B
Task Switch	98	C
ChainTask	134	D
WaitEvent	237	E
SetEvent	310	F
Schedule	88	G
ReleaseResource	87	H
Category 2 ISR Entry Latency	83	I
Category 2 ISR Exit Latency resuming interrupted task	94	J
Category 2 ISR Exit Latency with task switch	96	K
Category 1 ISR Latency	51	L

The following figures illustrate how the RTA-OS kernel overheads are allocated during the operations given in the above table:

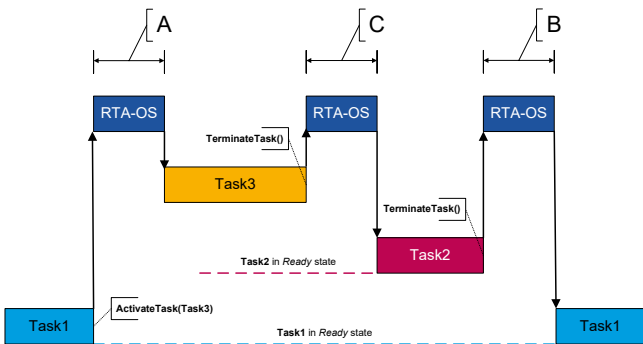


Figure 1 - Task1 is preempted by Task3, followed by a task switch and then normal termination of Task2

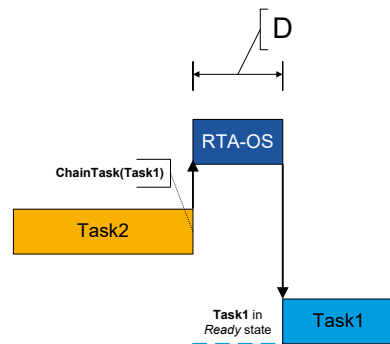


Figure 2 - Task2 chains Task1

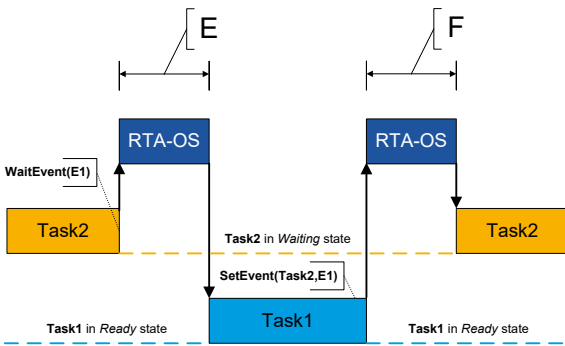


Figure 3 - Task2 waits for an event set by Task1

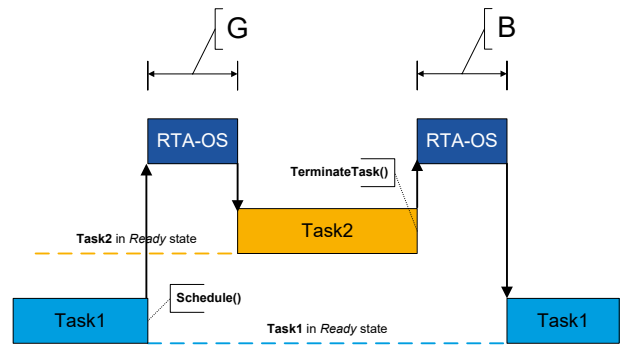


Figure 4 - Task1 allows cooperative scheduling by Task2

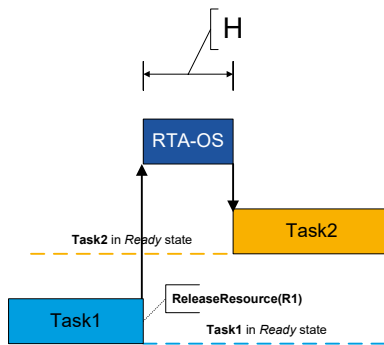


Figure 5 - Task1 releases a resource

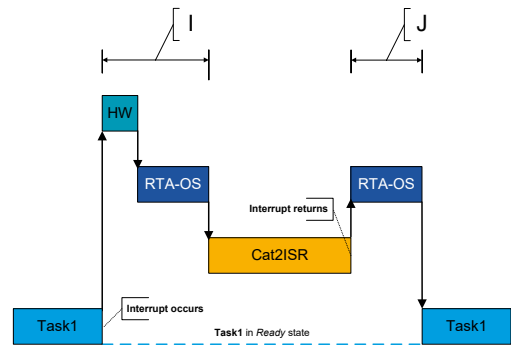


Figure 6 - Category2 ISR entry and exit latency

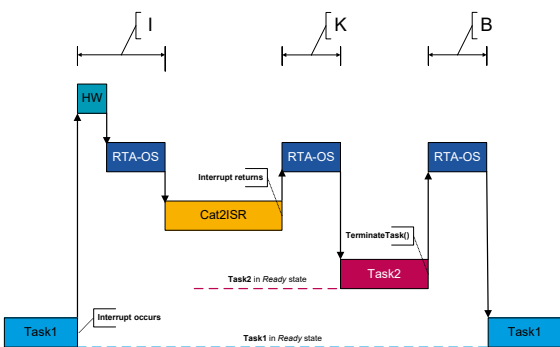


Figure 7 - Category2 ISR switches to Task2

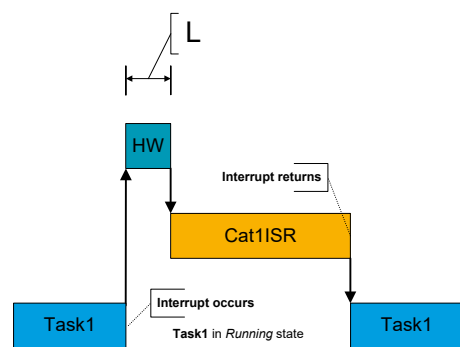


Figure 8 - Category1 ISR entry latency

Order Information

To use RTA-OS it is necessary to purchase a development license for the tools together with an add-on license for the Renesas RH850x2 Green Hills port. Machine-named, user-named and floating licenses are available.

RTA-OS Tools Order Information

Item	Characteristics	Object
F 00K 107 119	Machine-named license for RTA-OS for Windows PC	LD_RTA-OS_VRTA_SC34_LIC-MP
F 00K 107 120	User-named license for RTA-OS for Windows PC	LD_RTA-OS_VRTA_SC34_LIC-UP
F 00K 107 121	Floating license for RTA-OS for Windows PC	LD_RTA-OS_VRTA_SC34_LIC-CP
F 00K 107 136	Product CD for RTA-OS	LD_RTA-OS_VRTA_SC34_PROD

RTA-OS Renesas RH850x2 Green Hills Port Order Information

Item	Characteristics	Object
F 00K 111 782	Machine-named license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 & 2	ES_RTA-OS_RH850X2GHS_SC12_LIC-MP
F 00K 111 783	User-named license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 & 2	ES_RTA-OS_RH850X2GHS_SC12_LIC-UP
F 00K 111 784	Floating license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 & 2	ES_RTA-OS_RH850X2GHS_SC12_LIC-CP
F 00K 111 793	Machine-named license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 to 4	ES_RTA-OS_RH850X2GHS_SC34_LIC-MP
F 00K 111 794	User-named license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 to 4	ES_RTA-OS_RH850X2GHS_SC34_LIC-UP
F 00K 111 795	Floating license for RTA-OS for Renesas RH850x2 Green Hills Scalability Classes 1 to 4	ES_RTA-OS_RH850X2GHS_SC34_LIC-CP
F 00K 111 789	Product CD for RTA-OS for Renesas RH850x2 Green Hills	ES_RTA-OS_RH850X2GHS_PROD

ETAS GmbH

70469 Stuttgart, Germany
 Phone +49 711 3423-0
 Fax +49 711 3423-2106
 sales.de@etas.com

ETAS S.A.S.

93404 Saint-Ouen Cedex
 France
 Phone +33 1 75 34 50-50
 Fax +33 1 40 10 11-64
 sales.fr@etas.com

ETAS Ltd.

Derby DE21 4SU
 United Kingdom
 Phone +44 1332 253770
 Fax +44 1332 253779
 sales.uk@etas.com

ETAS Inc.

Ann Arbor, MI 48103, USA
 Phone +1 888 ETAS INC
 Fax +1 734 997-9449
 sales.us@etas.com

ETAS K.K.

Yokohama 220-6217, Japan
 Phone +81 45 222-0900
 Fax +81 45 222-0956
 sales.jp@etas.com

ETAS Korea Co., Ltd.

Gyeonggi-do 13488, Korea
 Phone +82 31 326 6200
 Fax +82 31 326 6209
 sales.kr@etas.com

ETAS (Shanghai) Co., Ltd.

Shanghai 200335, P.R. China
 Phone +86 21 2218 5858
 Fax +86 21 5037 2221
 sales.cn@etas.com

ETAS Automotive India Pvt. Ltd.

Bangalore 560 068, India
 Phone +91 80 6783 6333
 Fax +91 80 6783 6424
 sales.in@etas.com

www.etas.com