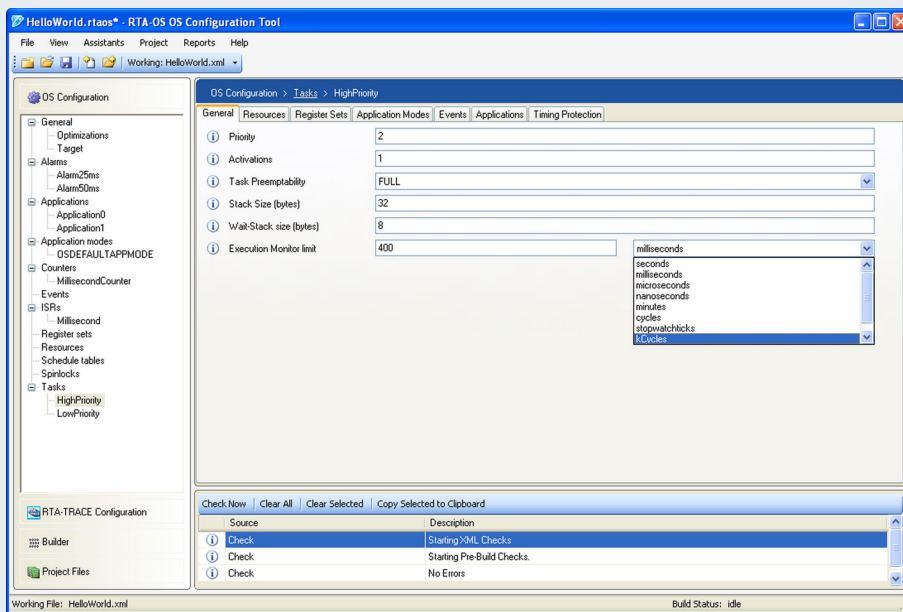


RTA-OS TriCore with the Tasking Compiler



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 TriCore family of microcontrollers.

Features at a Glance

AUTOSAR R4.3 compliant
Multicore OS

Supports all scalability
classes

MISRA-C:2012 compliant

RTOS overhead:
70 bytes RAM
0 bytes ROM

Category 2 ISR latency:
48 CPU cycles

Compiler Toolchain

RTA-OS for the TriCore has been developed with the Tasking v6.2r2p2 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 up to 256 nested interrupt priority levels on the Infineon TriCore

Memory Model

RTA-OS supports the near and far memory models provided by the Tasking compiler.

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	70
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	16	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 TC27xC on TC2x5 v1.0 with a 80MHz clock speed.

Task Type	Execution Time	Ref.
Pre-emption	132	A
Normal Termination	58	B
Task Switch	80	C
ChainTask	140	D
WaitEvent	500	E
SetEvent	656	F
Schedule	128	G
ReleaseResource	122	H
Category 2 ISR Entry Latency	48	I
Category 2 ISR Exit Latency resuming interrupted task	40	J
Category 2 ISR Exit Latency with task switch	108	K
Category 1 ISR Latency	20	L

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

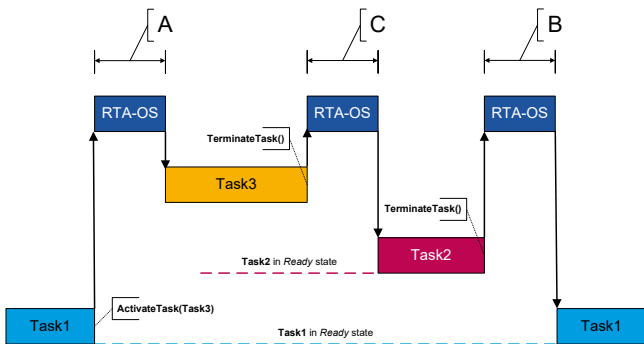


Figure 1 - Task1 is preempted by Task3, followed by a task switch and then normal termination of Task2

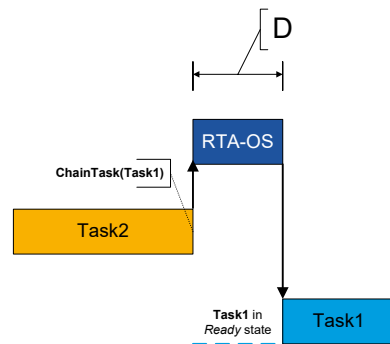


Figure 2 - Task2 chains Task1

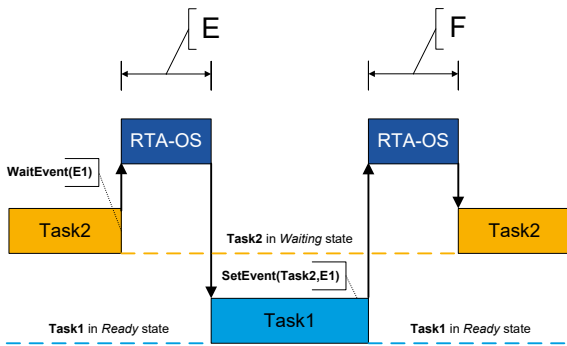


Figure 3 - Task2 waits for an event set by Task1

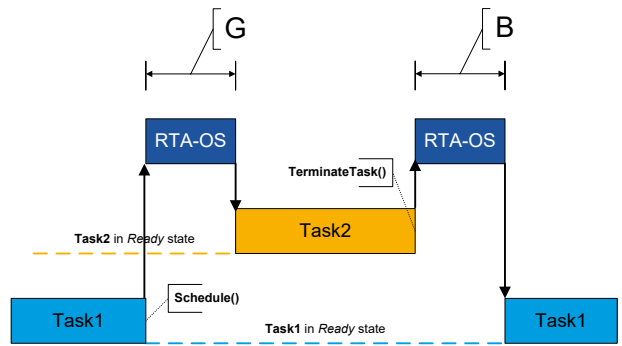


Figure 4 - Task1 allows cooperative scheduling by Task2

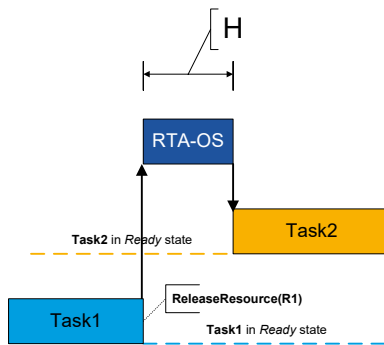


Figure 5 - Task1 releases a resource

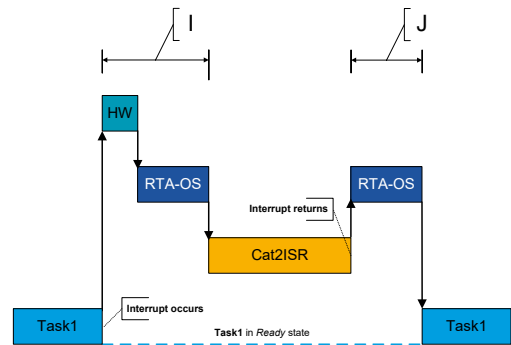


Figure 6 - Category2 ISR entry and exit latency

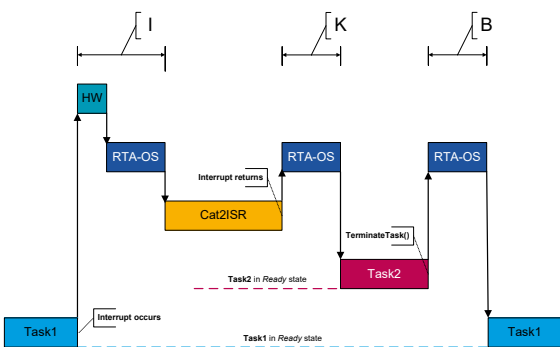


Figure 7 - Category2 ISR switches to Task2

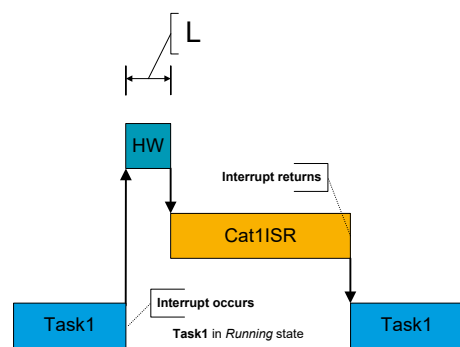


Figure 8 - Category1 ISR entry latency

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 TriCore Tasking port. Machine-named, user-named and floating licenses are available.

To use any operating system code generated by RTA-OS in ECU applications, a valid production license is required. Please contact your local ETAS Sales Office for details of production licenses for RTA-OS.

RTA-OS Tools Order Information

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

RTA-OS TriCore Tasking Port Order Information

Item	Characteristics	Object
F 00K 107 828	Machine-named license for RTA-OS for TriCore Tasking Scalability Classes 1 & 2	ES_RTА-OS_TRITASK_SC12_LIC-MP
F 00K 107 829	User-named license for RTA-OS for TriCore Tasking Scalability Classes 1 & 2	ES_RTА-OS_TRITASK_SC12_LIC-UP
F 00K 107 830	Floating license for RTA-OS for TriCore Tasking Scalability Classes 1 & 2	ES_RTА-OS_TRITASK_SC12_LIC-CP
F 00K 107 831	Machine-named license for RTA-OS for TriCore Tasking Scalability Classes 1 to 4	ES_RTА-OS_TRITASK_SC34_LIC-MP
F 00K 107 832	User-named license for RTA-OS for TriCore Tasking Scalability Classes 1 to 4	ES_RTА-OS_TRITASK_SC34_LIC-UP
F 00K 107 833	Floating license for RTA-OS for TriCore Tasking Scalability Classes 1 to 4	ES_RTА-OS_TRITASK_SC34_LIC-CP
F 00K 107 840	Product CD for RTA-OS for TriCore Tasking	ES_RTА-OS_TRITASK_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