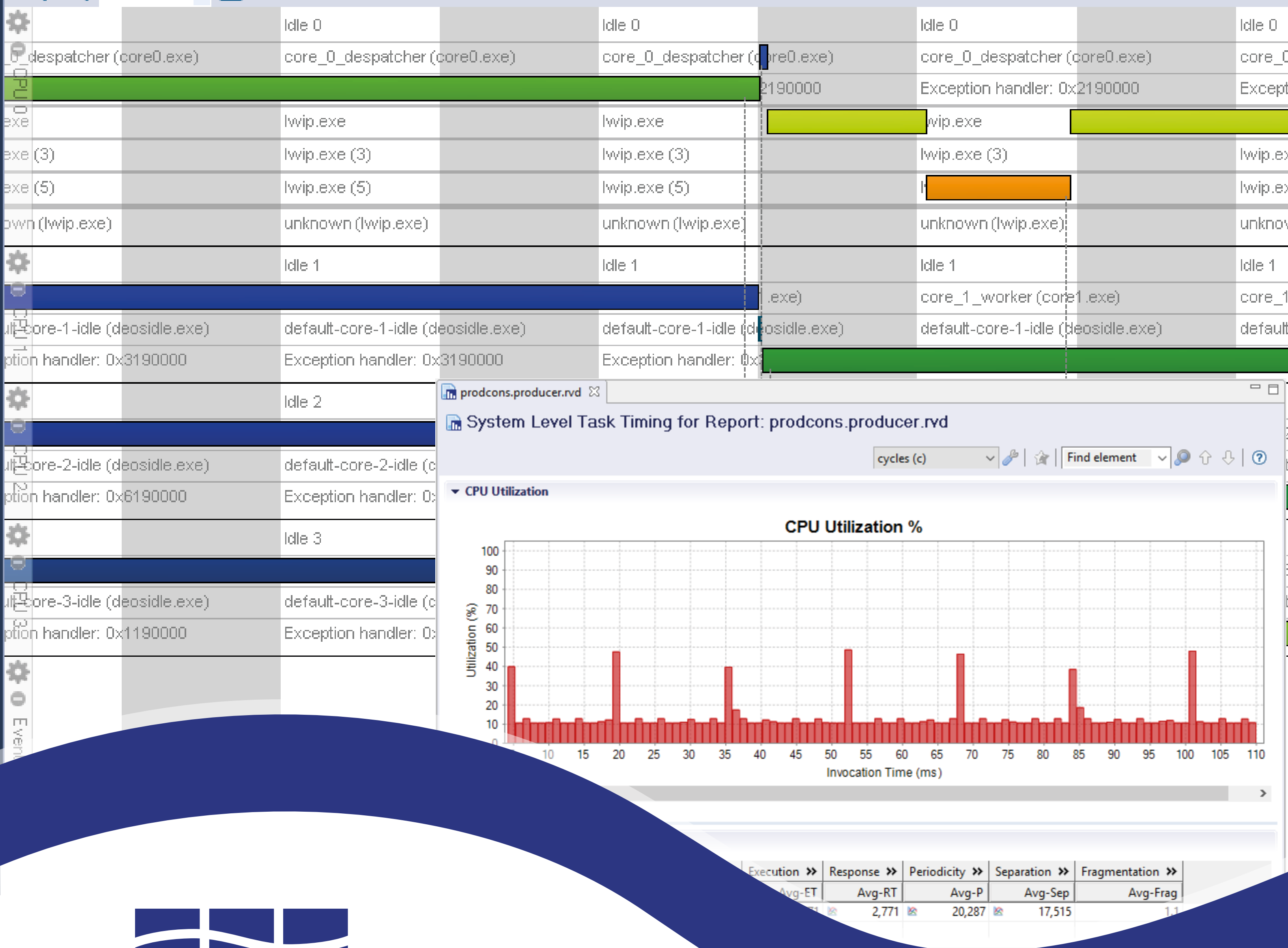
Idle 0
core_0_despatcher (core0.exe)
Exception handler: 0x2190000
lwip.exe
lwip.exe (3)
lwip.exe (5)
unknown (lwip.exe)
Idle 1
core_1_worker (core1.exe)
default-core-1-idle (deosidle.exe)
Exception handler: 0x3190000
Idle 2
default-core-2-idle (deosidle.exe)
Exception handler: 0x6190000
Idle 3
default-core-3-idle (deosidle.exe)
Exception handler: 0x1190000
prodcons.producer.rvd
System Level Task Timing for Report: prodcons.producer.rvd
cycles (c)
Find element
CPU Utilization
CPU Utilization %
Utilization (%)
100
90
80
70
60
50
40
30
20
10
0
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
Invocation Time (ms)

Execution	Response	Periodicity	Separation	Fragmentation
Avg-ET	Avg-RT	Avg-P	Avg-Sep	Avg-Frag
	2,771	20,287	17,515	1.1

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Safety through quality

PRODUCT BRIEF

Visualizing RTOS scheduling and event tracing with Rapi**Task**

Product brief: Rapi**Task**

How can Rapi**Task** help you?

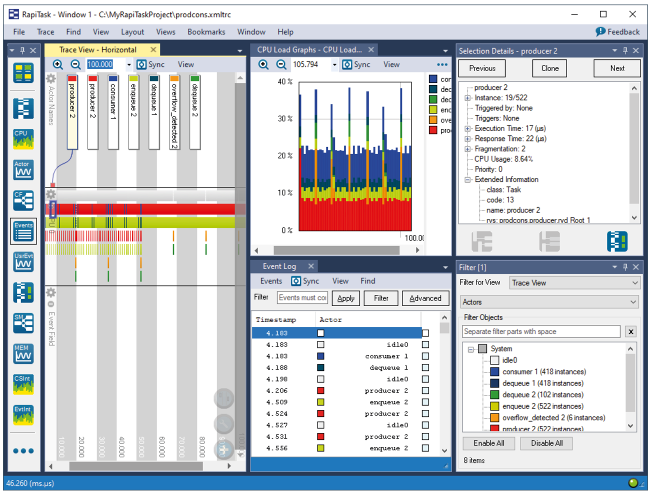
Rapi**Task** helps embedded software engineers to understand the scheduling behavior of their software, and to identify and debug potential issues.

As it is target-independent, Rapi**Task** can help you to understand the scheduling behavior of even the most complex critical systems, including multicore systems.

Use cases of Rapi**Task**

Understand system scheduling behavior

Rapi**Task** lets you see the scheduling behavior across threads and processor cores.


RapiTask - Window 1 - C:\MyRapiTaskProject\prodcons.xmltrc
File Trace Find View Layout Views Bookmarks Window Help
Feedback
Trace View - Horizontal
100.000
Sync View
CPU Load Graphs - CPU Load...
105.794
40 %
30 %
20 %
10 %
0 %
100.00
46.260 (ms.µs)

Selection Details - producer 2

Previous | Clone | Next

- producer 2
- Instance: 19/522
- Triggered by: None
- Triggers: None
- Execution Time: 17 (µs)
- Response Time: 22 (µs)
- Fragmentation: 2
- CPU Usage: 8.64%
- Priority: 0
- Extended Information
  - class: Task
  - code: 13
  - name: producer 2
  - rvs: prodcons.producer.rvd Root 1

Event Log

Events | Sync | View | Find

Filter: Events must co | Apply | Filter | Advanced

Timestamp	Actor	
4.183	□	□
4.183	□ idle0	□
4.183	consumer 1	□
4.188	dequeue 1	□
4.198	□ idle0	□
4.206	producer 2	□
4.509	enqueue 2	□
4.524	producer 2	□
4.527	□ idle0	□
4.531	producer 2	□
4.556	enqueue 2	□

Filter [1]

Filter for View: Trace View

Actors

Filter Objects: Separate filter parts with space

- System
  - idle0
  - consumer 1 (418 instances)
  - dequeue 1 (418 instances)
  - dequeue 2 (102 instances)
  - enqueue 2 (522 instances)
  - overflow_detected 2 (6 instances)
  - producer 2 (522 instances)

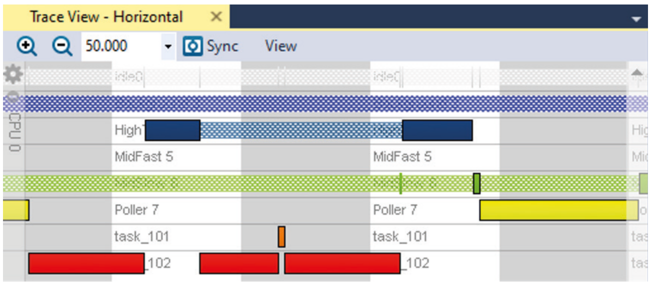
Enable All | Disable All

8 items

*Task-level scheduling results collected by Rapi**Task***

Locate rare timing events such as race conditions

Rapi**Task** lets you easily search large traces for specific timing events and quickly locate specific patterns within a trace.



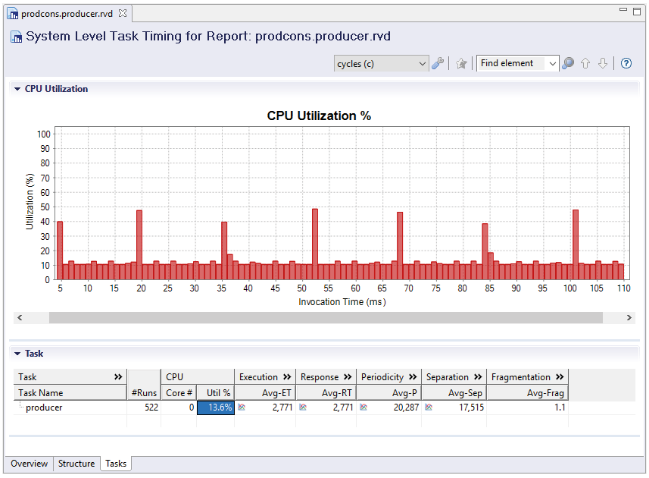
*Locate rare timing events such as race conditions with Rapi**Task***

Verify actual timing behavior

Rapi**Task** helps you to understand the actual timing behavior of your system by providing information on system-level properties such as periodicity and jitter.

Understand system capacity issues

Rapi**Task** shows peak CPU utilization (CPU load), average CPU utilization, and fragmentation (the number of pre-emptions/interrupts). These statistics are summarized in a report.



System Level Task Timing for Report: prodcons.producer.rvd

Task

Task		CPU		Execution	Response	Periodicity	Separation	Fragmentation
Task Name	#Runs	Core #	Util %	Avg-ET	Avg-RT	Avg-P	Avg-Sep	Avg-Frag
producer	522	0	13.6%	2,771	2,771	20,287	17,515	1.1

*CPU load metrics collected by Rapi**Task***

Quickly identify user-level events

Rapi**Task** provides customizable coloring of tasks and supports visualization of OS-level features such as alarms, events, mailboxes, mutexes etc.

Benefits of using Rapi**Task**

- Rapid debugging of timing issues
- Not tied to a specific RTOS vendor
- Streamlines analysis by letting you customize task coloring, hide tasks and jump to trace locations
- Helps you visualize large traces quickly
- Reduces debugging and verification effort
- Easily integrated with R**VS**, offering a wide range of capabilities such as worst-case execution time analysis

Key features

Task-level timing analysis

- Automated collection of task-level timing metrics on-target and on-host
- Analysis configurable to include or exclude specified modules/functions/directories
- Calculation of system-level scheduling metrics and related data:
  - Response time
  - Periodicity
  - Jitter
  - CPU utilization (CPU load)
  - Fragmentation
- RTOS-independent scheduling visualization

Language support

- Ada 83, 95, 2005 and 2012, compilers including GNAT Pro™ and Green Hills®
- C and C++, compilers including Visual Studio®, GCC™, Diab® and TASKING®
- Assembly code insertions
- Mixed language source code

Build integration

- Multiple strategies available:
  - Compiler wrappers
  - Clone integration
  - Scripting into build system directly
- Support for very large code bases
- Support for legacy compilers
- Instrumentation can be split between build cycles
- Shared integration with other R**VS** tools

Target integration

- Flexible trace collection using CAN, Serial, Ethernet, debuggers, in-memory trace buffers, hardware I/O tracing, hardware tracing support e.g. Nexus™, and our own **RTB**x data logger
- Extremely low overhead instrumentation library for 8, 16, 32 and 64 bit architectures
- Minimize instrumentation overheads by only instrumenting context switch routines
- No library/run-time dependencies or dynamic memory requirements
- Timing analysis across power cycles (subject to hardware requirements)
- Data collection freeze and reset to eliminate accidental tracing
- Extremely fast, lock-free, thread-safe tracing mechanism
- Support for multicore processors

Third party integration

- Tools such as Mx-Suite™, MATLAB® Simulink® and GNAT GPS™
- Continuous build servers e.g. Jenkins®, Atlassian Bamboo®
- Debuggers e.g. Lauterbach™, i-SYSTEM®

Integrated testing environment

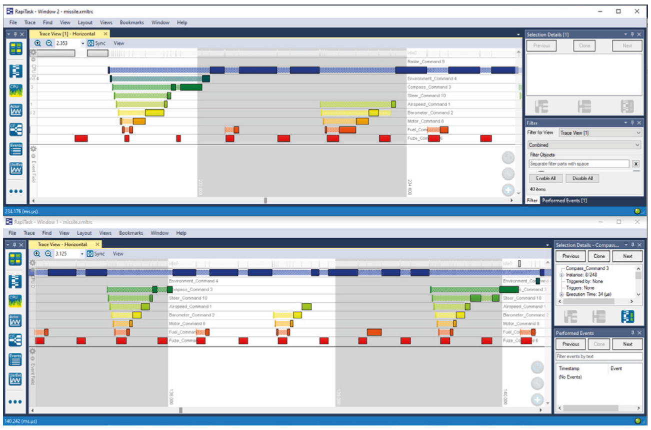
- Invocation timeline charts to help understand timing behavior at a glance
- Custom task coloring
- Hide tasks
- Jump to trace location
- Code viewer:
  - View source code alongside pre-processed and instrumented code
- Show other code metrics e.g. #LOC, #loops
- Aggregate results by directory, file and functions
- Database-like search function

Compatibility

- Runs on host operating systems
  - Windows® 7+ and Windows Server® 2008 R2+
  - Linux® distributions including Ubuntu® and Red Hat®
- Results can be collected from systems without supported operating systems and transferred to a supported system for analysis

Licensing

- Enterprise license gives you access to new versions, support and maintenance
- One-year support and maintenance included in purchase price
- Single price for all features
- Licenses transferrable across projects



Compare scheduling behavior of software running on different real-time operating systems

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About Rapita

Rapita Systems provides on-target software verification tools and services globally to the embedded aerospace and automotive electronics industries.

Our solutions help to increase software quality, deliver evidence to meet safety and certification objectives and reduce costs.

Find out more

A range of free high-quality materials are available at:
rapitasystems.com/downloads

SUPPORTING CUSTOMERS WITH:

Tools	Services	Multicore verification
Rapita **Verification Suite**:	V&V Services	CAST-32A Compliance
Rapi**Test**	Integration Services	Multicore Timing Solution
Rapi**Cover**	Qualification	
Rapi**Time**	SW/HW Engineering	
Rapi**Task**	Compiler Verification	

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