

Root Summary

Function	Minimum	Average	High-Water	Maximum	Worst Case	#Tests
Name	Min-OverET	A-OverET	H-OverET	Max-OverET	W-OverET	
mathemati...Self_Test	8	18.6	32	32	78	5

Function Summary

Function	Minimum	Average	High-Water	Maximum	Worst Case	Difference	#Tests
Name	Min-OverET	A-OverET	H-OverET	Max-OverET	W-OverET	W - Avg	
.Self_Test	8	18.6	32	32	78	59.4	5
mathematics.Self_Test	8	18.6	32	32	78	59.4	5
.Subtract_One	13	17.0	21	21	21	0	2
mathematics.Subtract_One	13	17.0	21	21	21	0	2
.Add_One	5	12.2	21	21	21	0	2
mathematics.Add_One	5	12.2	21	21	21	0	2
.Subtract_One	21	21.0	21	21	21	0	2
(BB)mathematics.Subtract_One	21	21.0	21	21	21	0	2

Metrics for Function: worker1Task

Name	Minimum	Average	High-Water	Maximum	#Tests
	Min-Over	Avg-Over	HWM-Over	Max-Over	
RVS_TIMING	234,759,079	0.3e9	285,604,661	285,604,661	2,000
L2_interference - control	234,759,079	0.3e9	236,686,579	236,686,579	500
L2_interference - core1_rpd	246,250,147	0.3e9	248,036,899	248,036,899	500
L2_interference - core1_core2_rpd	257,780,965	0.3e9	258,817,302	258,817,302	500
L2_interference - core1_core2_core3_rpd	284,496,720	0.3e9	285,604,661	285,604,661	500
CPU_CYCLES	2.9e9	3.5e9	3,436,789,594	3.5e9	2,000
L2_interference - control	2.9e9	3.5e9	2,848,980,715	2.9e9	500
L2_interference - core1_rpd	3.0e9	3.5e9	2,985,836,851	3.0e9	500
L2_interference - core1_core2_rpd	3.2e9	3.5e9	3,111,574,511	3.2e9	500
L2_interference - core1_core2_core3_rpd	3.5e9	3.5e9	3,436,789,594	3.5e9	500
L2D_CACHE_REFILL	761,892	1,188,280	1,353,467	1,353,369	2,000
L2_interference - control	761,892	1,083,316	927,252	929,453	500
L2_interference - core1_rpd	850,314	1,149,789	1,023,619	1,023,930	500
L2_interference - core1_core2_rpd	990,922	1,227,240	1,126,910	1,126,910	500
L2_interference - core1_core2_core3_rpd	1,204,719	1,292,772	1,353,369	1,353,369	500



Safety through quality

PRODUCT BRIEF

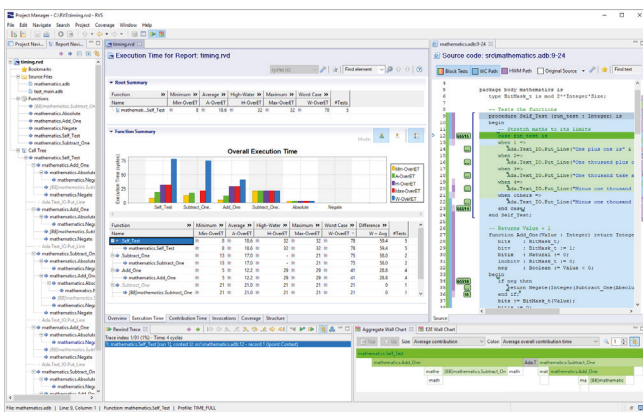
Measurement-based timing and WCET analysis with RapiTime

Product brief: RapiTime

RapiTime

How can RapiTime help you?

RapiTime is an advanced tool for performing timing and worst-case execution time (WCET) analysis, designed specifically to work with embedded targets and to satisfy certification requirements. The timing metrics produced by RapiTime can be used to demonstrate that you have satisfied DO-178B/C objectives.



Execution time results collected by RapiTime

Using a unique hybrid static/dynamic analysis approach, RapiTime automates timing analysis on embedded systems to provide detailed information on their timing behavior and to help identify timing issues and optimize code for timing behavior.

Benefits of using RapiTime

RapiTime helps you reduce the cost, time and effort you need to perform timing analysis and optimization on even the most complex and demanding critical real-time embedded systems.

You can use RapiTime to automate timing data collection and analysis even on very large systems. In one case study, RapiTime produced timing behavior that a customer took 8 months to collect manually in just one day.

RapiTime's minimal overhead means that you can perform timing analysis in every test run, making timing information available throughout your software development. This information will help you to identify timing issues early in development and minimize your code's WCET.

RapiTime use cases

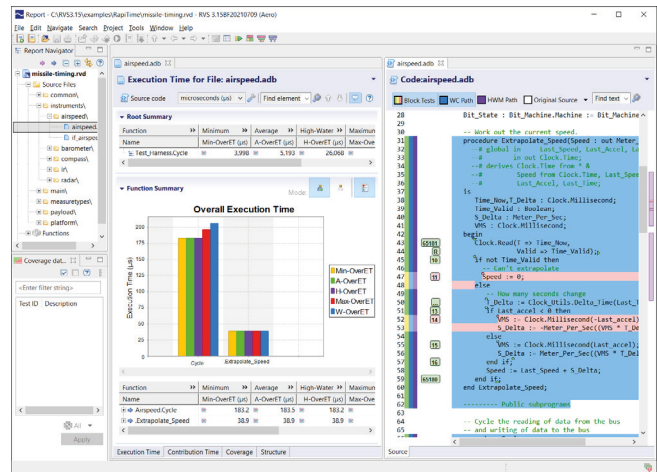
- Demonstrate that software executes within its time constraints.
- Understand timing behavior when upgrading to new targets, even multi-core processors.
- Optimize code to upgrade legacy systems.
- Conduct WCET/high water mark analysis.
- Address DO-178B/C guidelines.

How does RapiTime work?

RapiTime performs static analysis of code and instruments it automatically. When you run your code on-target, RapiTime collects a trace of the program execution that includes timing data. RapiTime then processes this trace to produce qualifiable reports of the timing behavior of your code that you can view using the RapiTime GUI.

The timing reports that RapiTime produces, along with its trace rewind feature, let you quickly identify where your optimization effort will provide the greatest improvements to timing behavior.

RapiTime's integration and instrumentation is flexible, and its extremely low instrumentation overheads ensure that it can efficiently analyze the timing behavior of even the most complex critical embedded software.



RapiTime identifies the worst-case path through your source code

Key features

Timing analysis

- Automated collection of timing metrics on-target and on-host
- Powerful hybrid WCET analysis engine
- High water mark (HWM) analysis
- Analysis configurable to include or exclude specified modules/functions/directories
- Time band analysis to automatically configure instrumentation level
- Calculation of detailed timing metrics for each function and sub-function:
 - Minimum, maximum and average execution time
 - Execution time density
 - Contribution to worst-case and HWM paths
- Collect and analyze metrics from performance monitoring counters on hardware

Analysis engine

- Context-sensitive analysis
- Support for function pointers and recursion
- Powerful annotation mechanism
- Complex code structures

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 **RVS** 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 **RTBx** data logger
- Extremely low overhead instrumentation library for 8, 16, 32 and 64 bit architectures
- No library/run-time dependencies or dynamic memory requirements
- Support for zero overhead instrumentation on selected targets

- 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 multitasking and multi-core processors

Tool qualification

- Qualification kit and service to support DO-178B/C tool qualification

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

- Summary and detailed results views
- Invocation timeline, aggregate profile and treemap charts to help understand timing behavior at a glance
- Trace rewind feature to debug timing behavior
- Code viewer:
 - View source code alongside pre-processed and instrumented code
 - Color-coded by WCET and high water mark paths
- Show other code metrics e.g. #LOC, #loops
- Aggregate timing metrics by directory, file and functions
- Multiple export formats: text, XML, CSV, image formats
- Merge results from different test runs, builds and strategies
- Compare reports
- 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

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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:
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Multicore verification

CAST-32A Compliance

Multicore Timing Solution

Contact

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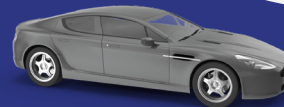
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