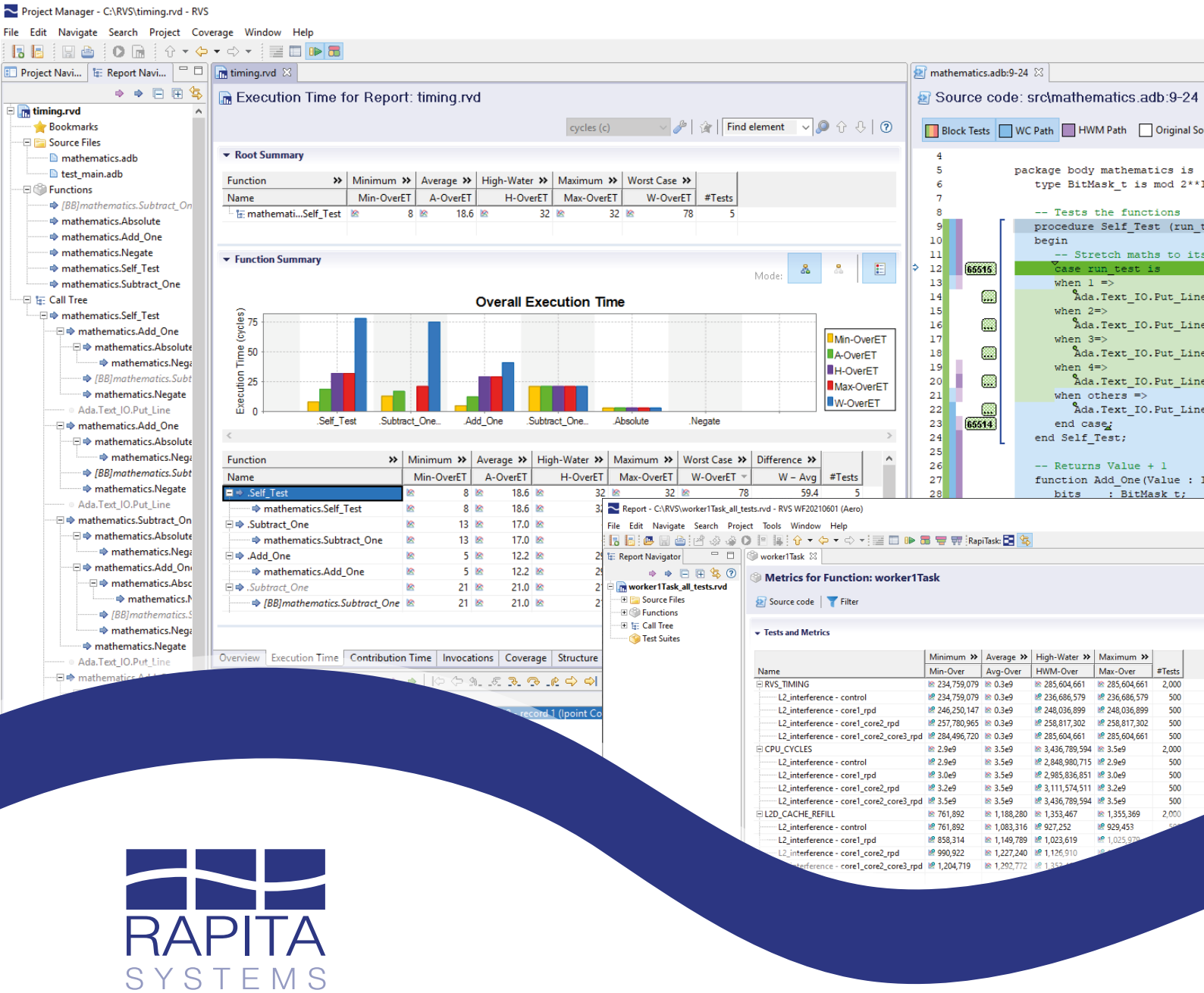


RAPITA SYSTEMS
A DANLAW COMPANY

Safety through quality

PRODUCT BRIEF

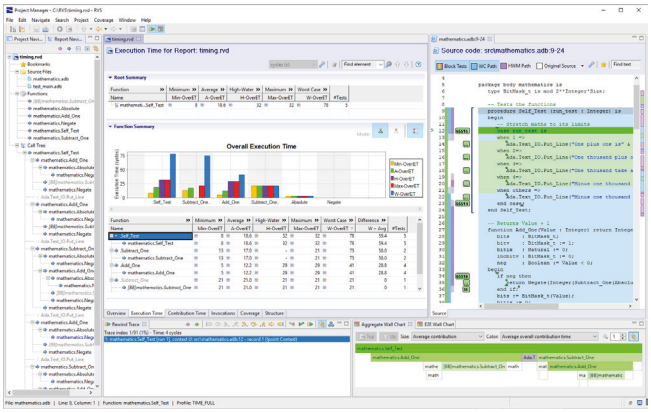
Measurement-based timing and WCET analysis with Rapi**Time**

Product brief: Rapi**Time**

RapiTime

How can Rapi**Time** help you?

Rapi**Time** supports on-target performance, timing and worst-case execution time (WCET) analysis for embedded software. It helps you understand and optimize timing behavior, and supports producing certification evidence on timing behavior for avionics, automotive, and space software guidelines and standards.



*Execution time results collected by Rapi**Time***

Using a unique hybrid static/dynamic analysis approach, Rapi**Time** 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 Rapi**Time**

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

Rapi**Time**'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.

Rapi**Time** use cases

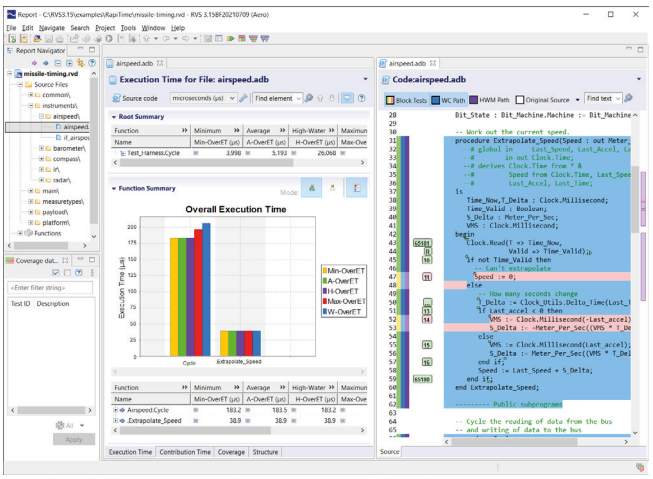
- Demonstrate that software executes within its time constraints.
- Understand timing behavior when upgrading to new targets, even multi-core processors.
- Optimize code to upgrade legacy systems and improve worst-case timing behavior.
- Conduct WCET/high water mark analysis.
- Address avionics software guidelines: DO-178B/C, A(M)C 20-193, MIL-HDBK-512C, AA-22-01, AMACC ...
- Address space software standards: NASA NPR 7150.2d and ECSS-E-ST-40C.
- Address ISO 26262 requirements.

How does Rapi**Time** work?

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

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

Rapi**Time**'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.



*Rapi**Time** identifies the worst-case path through your source code*

Key features

Timing analysis

- Automated collection of timing metrics on-target and on-host
- Worst-case execution time and high water mark analysis
- Measure times e.g. response, separation, periodicity across user-defined points in code
- 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 hardware event monitors

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 large code bases and legacy compilers
- Instrumentation can be split between build cycles
- Shared integration with other R**VS** tools

Target integration

- Flexible trace collection using Ethernet, debuggers, in-memory trace buffers, hardware I/O tracing, hardware tracing support e.g. Nexus™, and our **RTB**x 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®, ANSYS® SCADE® Test™ and GNAT GPS™
- Continuous build servers e.g. Jenkins®, Atlassian Bamboo®
- Generate Rapi**Time** integration with a button from DDCI®'s OpenArbor™
- Debuggers e.g. Lauterbach™, i-SYSTEM®
- Software Configuration Management systems

Integrated testing environment

- Summary and detailed results views
- Invocation timeline, aggregate profile and treemap charts to help understand timing behavior at a glance
- Project and code base insights including code complexity, treemaps, call dependencies, and LOC
- 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
- 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 x86-64 host operating systems:
  - Windows® 10+ and Windows Server® 2016+
  - Linux® distributions including Ubuntu®
- 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 transferable 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:
rapitasystems.com/downloads

SUPPORTING CUSTOMERS WITH:

Tools	Engineering Services	Multicore verification
Rapita **Verification Suite**:	V&V Services	**MACH**[178]
Rapi**Test**	Integration Services	Multicore Timing Solution
Rapi**Cover**	Qualification	
Rapi**Time**	SW/HW Engineering	
Rapi**Task**	Compiler Verification	

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