



CAST-32A Compliance Solution

- » Produce DO-178C/CAST-32A evidence
- » Evaluate multicore hardware
- » Optimize multicore code for timing performance

CAST-32A Compliance Solution

We provide a unique solution to support CAST-32A compliance for multicore aerospace systems. This provides a path to DO-178C multicore certification to achieve CAST-32A objectives, reducing migration risks and opening up the benefits of increased performance available from using multicore hardware.

“Multicore systems are becoming more popular in critical embedded system development due to the increased performance they offer.

Our CAST-32A Compliance Solution solves an important challenge in using these complex systems; ensuring that the software execution time meets timing deadlines and satisfies certification objectives.

Dr. Guillem Bernat, CEO of Rapita Systems

A unique solution

With the increasing adoption of multicore systems in the critical software industry, new methods are needed to analyze the timing behavior of these systems in line with DO-178C, CAST-32A and upcoming A(M)C 20-193 objectives.

Combining expert knowledge from dedicated engineers, products from groundbreaking academic research and industry-leading software tool support, our solution to CAST-32A compliance is truly unique.

Benefits of our approach

Our approach not only identifies interference channels in multicore systems, but also quantifies them and takes them into account during timing analysis. We take advantage of industry-leading tool automation support to provide a cost-effective solution to analyze multicore timing behavior and produce timing evidence for DO-178C and CAST-32A certification of multicore systems. As the FAA's AC 20-193 and EASA's AMC 20-193 are expected to be very similar to CAST-32A, the solution will also support A(M)C 20-193 compliance.

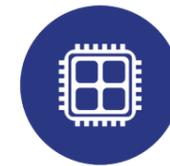
Use cases

Our solution supports a variety of use cases when migrating to, using and verifying multicore systems:



Produce certification evidence

Produce timing evidence for multicore systems to meet DO-178C, CAST-32A and upcoming A(M)C 20-193 objectives.



Evaluate multicore hardware

Evaluate candidate multicore hardware architectures against performance criteria, taking into account the effects of contention from shared resources.



Optimize code for timing

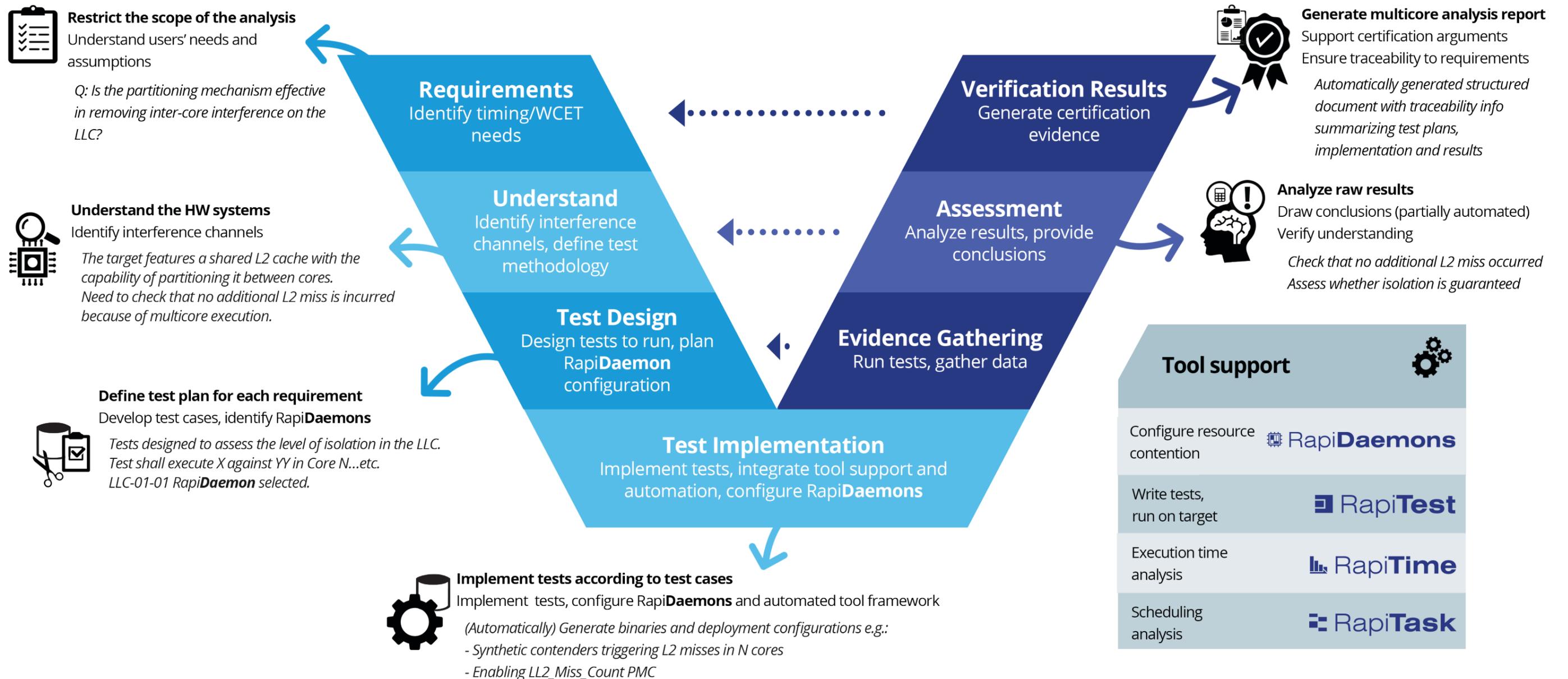
Optimize multicore code for execution time behavior, ensuring that it meets timing deadlines and can be verified against safety objectives.

Working with us

- We recognize that every project is different, and work with you to meet your needs.
- We run services at our engineering facilities in the UK or US. We can support projects with UK / US eyes only requirements.
- We can answer multicore timing questions and produce evidence for you, or implement a method and provide training so you can do so yourself.



How it works



Resource contention and interference

To analyze the timing behavior of multicore systems, the effects of *contention* on shared hardware resources such as caches and buses must be taken into account.

These effects generate *interference* that affects software execution time, and can in some cases have a huge impact. We determine the level of interference that can *realistically* occur in the system, as assuming the maximum level of interference possible leads to timing estimates that are wildly pessimistic and of no practical use.

RapiDaemons

To examine the effects of *resource contention* and *interference* on multicore timing behavior, our multicore timing services use RapiDaemons.

These are specially designed applications that can be integrated with the system under analysis to create a configurable degree of contention for shared resources such as caches and buses when running tests.

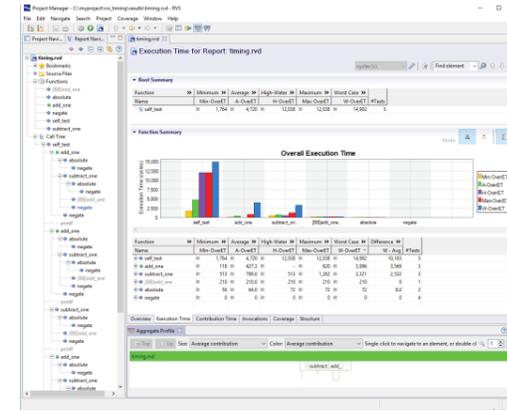
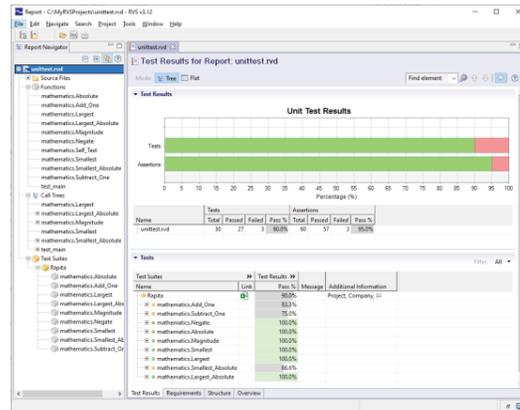
RapiDaemons are built on the Barcelona Supercomputing Center's (BSC) microbenchmark technology (MuBT).

Tool support

RapiTest

RapiTest helps to produce and run tests that exercise multicore software for execution time behavior while taking into account the effects of resource contention and interference (through applying RapiDaemons).

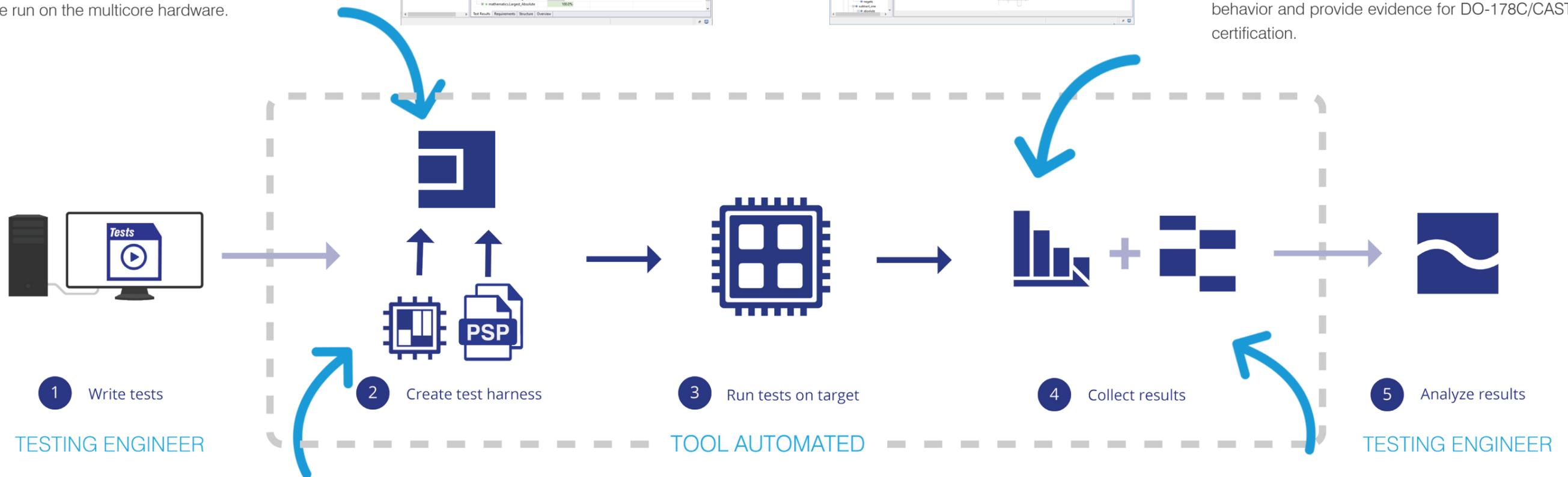
RapiTest automatically converts tests into a test harness that can be run on the multicore hardware.



RapiTime

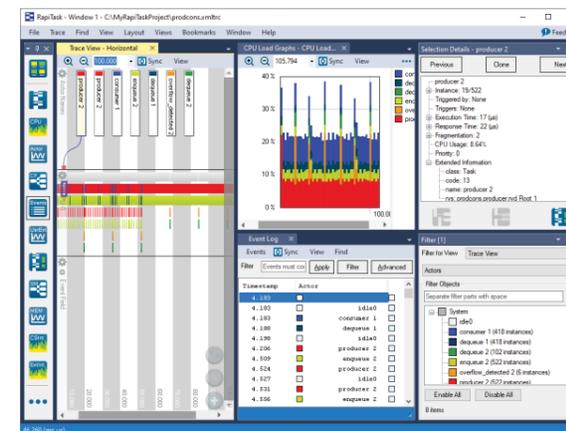
RapiTime automatically calculates execution time metrics when multicore software runs on its target hardware, and reports them in a format that is easy to understand.

These metrics can be used to optimize code for timing behavior and provide evidence for DO-178C/CAST-32A certification.



RapiDaemons

RapiDaemons create resource contention while analyzing a multicore task under analysis. Some microbenchmarks are generic and are available as a standard library, while some are platform-specific and must be adapted to the platform under analysis through an integration service.



RapiTask

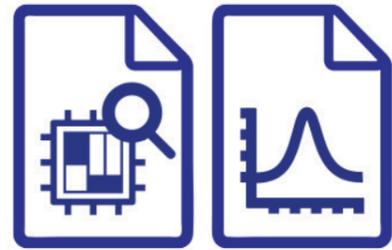
RapiTask automatically measures and reports scheduling metrics for each task under analysis when multicore software runs on its target hardware.

These metrics can be used to identify system capacity issues and rare events such as race conditions in the software.

Services and certification support

Engineering services

Certification support



Analysis and Characterization Services

Our Platform Analysis and Characterization and Software Analysis and Characterization Services provide everything needed to implement the CAST-32A Compliance Solution workflow on a specific multicore platform or application.

This includes performing analysis and characterization activities to produce reports and the development of Rapi**Daemons** and characterization tests.

DO-330 Qualification Kits

R**VS** automation tools are classified as Tool Qualification Level (TQL) 5 tools as per DO-330. Qualification support is available for Rapi**Test** and Rapi**Time** through our DO-330 Qualification kits, which have been used for certification in many DAL A aerospace projects certifying against DO-178C.

Rapi**Daemons** are classified as TQL 5 tools as per DO-330. Qualification support for Rapi**Daemons** is available through our DO-330 Qualification kits.



Target Integration Service

Our Target Integration Service integrates R**VS** tools and Rapi**Daemons** into a specific multicore platform and development environment.



Qualification Services

Supplementing the generic test evidence in our DO-330 qualification kits, our *Qualified Target Integration Service* and *RapiDaemon Qualification Service* provide the evidence needed to qualify the use of R**VS** tools and Rapi**Daemons** on specific multicore platforms.

Consulting and Training

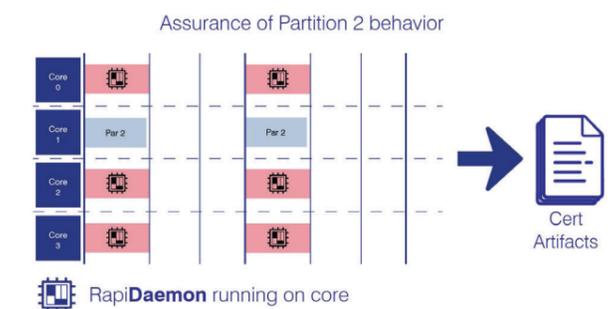
We provide consulting services on DO-178C and CAST-32A compliance including gap analysis consultancy, certification liaison support and consultancy to satisfy all CAST-32A objectives.

We provide training on using the Rapita CAST-32A Compliance workflow and using R**VS** and Rapi**Daemons** to support this workflow.



Incremental Assurance

Using the CAST-32A Compliance Solution, assurance evidence can be developed incrementally and independently for the multicore platform and each hosted application, supporting the development of Integrated Modular Avionics.



*Meeting global testing needs in the critical
embedded software industry since 2004*

 Rapita location  Distributor  Customer



Get in touch

Each safety-critical project is different.
Contact us to arrange a custom solution that meets your needs:

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