RAPITA Systems
A DANLAW Company

Multicore timing analysis solution

for aerospace

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

Multicore timing analysis

We provide a unique solution to support the use of multicore hardware in critical 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 multicore timing analysis solutions solve 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 objectives.

Combining expert knowledge from dedicated engineers, products from groundbreaking academic research and industry-leading software tool support, our solution to multicore timing analysis is truly unique.

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 and CAST-32A 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 it meets timing deadlines and can be verified against safety objectives.

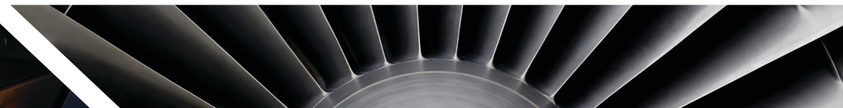
Benefits of our approach

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.

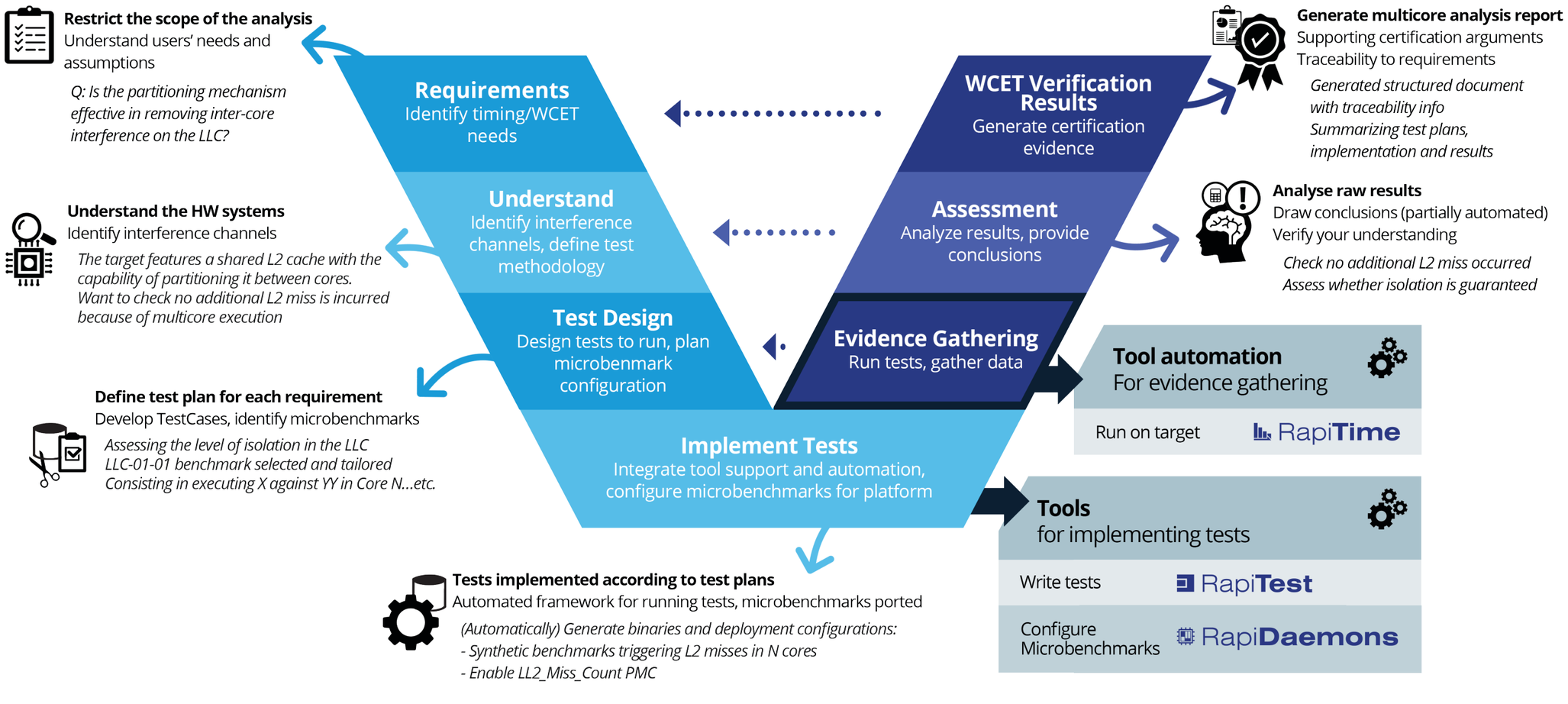
Working with us

- 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.

Microbenchmarks

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

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.

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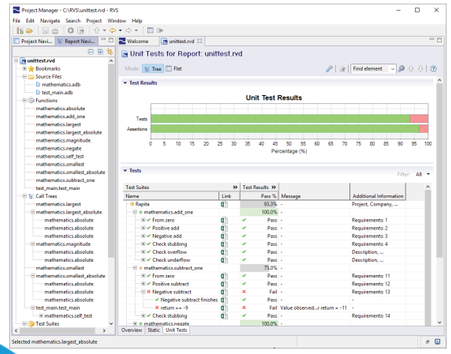
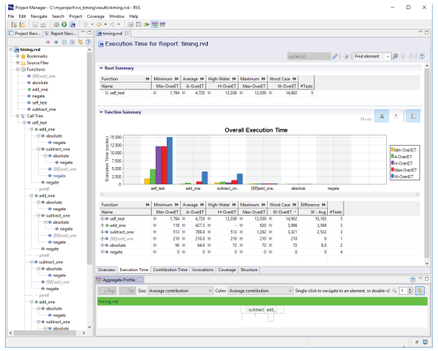
Tool support

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 **microbenchmarks**).

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

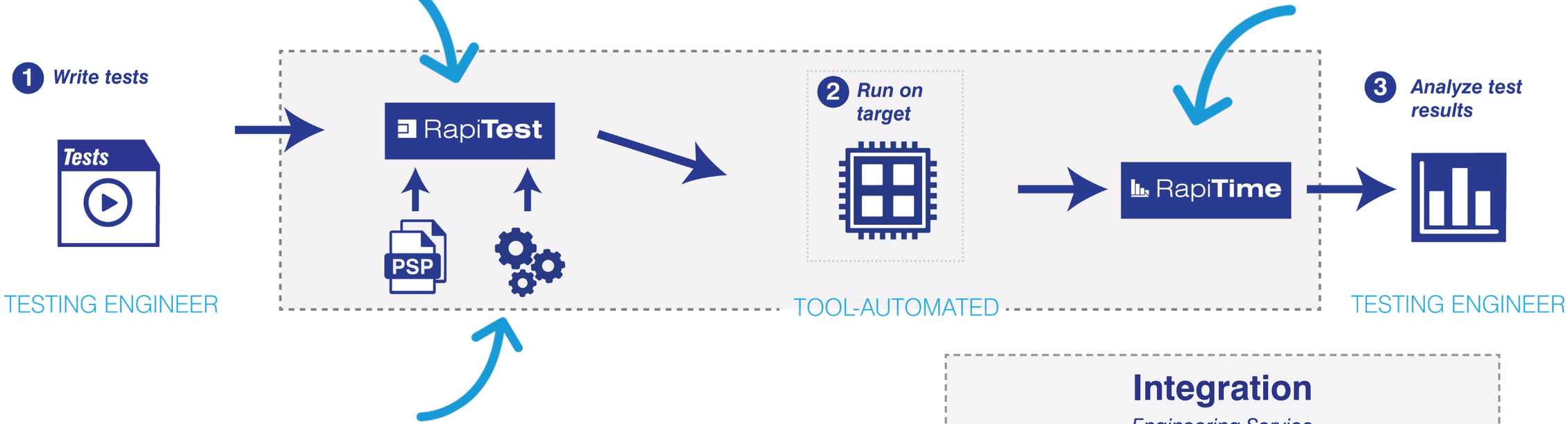




RapiTime

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 (right).

Integration

Engineering Service

To perform multicore timing analysis, we integrate our tools into your multicore system. This involves developing a **Platform Support Package** (PSP) defining configurations of your system, configuring **microbenchmarks** to generate interference on your system, and integrating RapiTest and RapiTime to work with your development environment.

During the integration, one of our *Field Application Engineers* will work with you either remotely or on-site to set up the integration, and will produce a report describing how it works.

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

Get in touch

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

Visit: www.rapitasystems.com/contact
Email: enquiries@rapitasystems.com

UK office
Tel: +44 1904 413945

Rapita Systems Ltd.
Atlas House
Osbaldwick Link Road
York, YO10 3JB
UK

USA office
Tel: +1 248-957-9801

Rapita System Inc.
41131 Vincenti Ct.
Novi
MI 48375
USA