

*Safety through quality*

## PRODUCT BRIEF

Derisk your multicore certification approach with the  
**MACH<sup>178</sup>** Blueprint

# Product brief: **MACH**<sup>178</sup> Blueprint



## How can the **MACH**<sup>178</sup> Blueprint help you?

The **MACH**<sup>178</sup> Blueprint provides a training platform through which you can understand what is required for multicore certification in accordance with airworthiness guidance including AC 20-193, AMC 20-193, CAST-32A and AA-22-01, and derisk your multicore certification approach.

The solution supports the certification of multicore processors both in conventional LRUs and in Integrated Modular Avionics (IMA) systems, where it can support System Integrators, Platform Providers and Application Suppliers.

## How does it work?

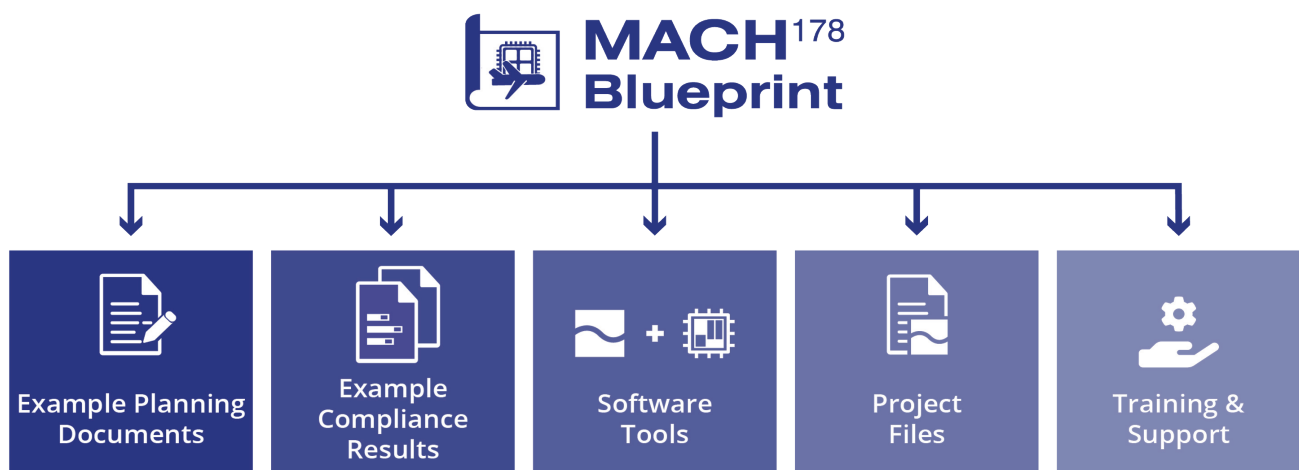
The **MACH**<sup>178</sup> Blueprint is based on Rapita Systems' **MACH**<sup>178</sup> approach for AC 20-193 / AMC 20-193 compliance, which is being used to support the certification of multicore DO-178C software up to and including DAL A globally. For more information on **MACH**<sup>178</sup>, see the **MACH**<sup>178</sup> Product brief.

The **MACH**<sup>178</sup> Blueprint demonstrates how you can address key AC 20-193 / AMC 20-193 objectives using the **MACH**<sup>178</sup> workflow. It includes results from following the workflow on the Blueprint project (see *Blueprint project*), software tools and project files to support running part of the workflow on the Blueprint project, and template plans and procedures that support using the workflow.

This is delivered along with support and training to help you understand and repeat the **MACH**<sup>178</sup> workflow.

## Benefits and use cases

- Understand how to meet AC 20-193 and AMC 20-193 compliance objectives from planning to submitting results using the **MACH**<sup>178</sup> workflow
- Develop in-house expertise to support AC 20-193 and AMC 20-193 compliance
- Derisk your multicore DO-178C projects



## What's included?

The **MACH**<sup>178</sup> Blueprint includes the following components.

### Example Planning Documents

The **MACH**<sup>178</sup> Blueprint includes example multicore DO-178C planning documents that have been instantiated for the Blueprint project. This includes the following documents:

- Plan for Multicore Aspects of Certification
- Multicore Software Verification Plan

These documents are instantiated versions of the template planning documents available in **MACH**<sup>178</sup> Foundations.

### Example Compliance Results

The **MACH**<sup>178</sup> Blueprint includes results generated from running the **MACH**<sup>178</sup> workflow to identify and characterize the impact of an interference channel on the Blueprint project.

This includes results and completed checklists for the following activities:

- Hardware Resource Identification
- Interference Channel Identification
- Critical Configuration Settings Identification
- Hardware Event Monitor Identification
- Hardware Event Monitor Validation

- Interference Channel Characterization
- Timing Requirements Analysis
- Software Characterization

These documents are instantiated versions of template documents available in **MACH**<sup>178</sup> Foundations.

### Software Tools

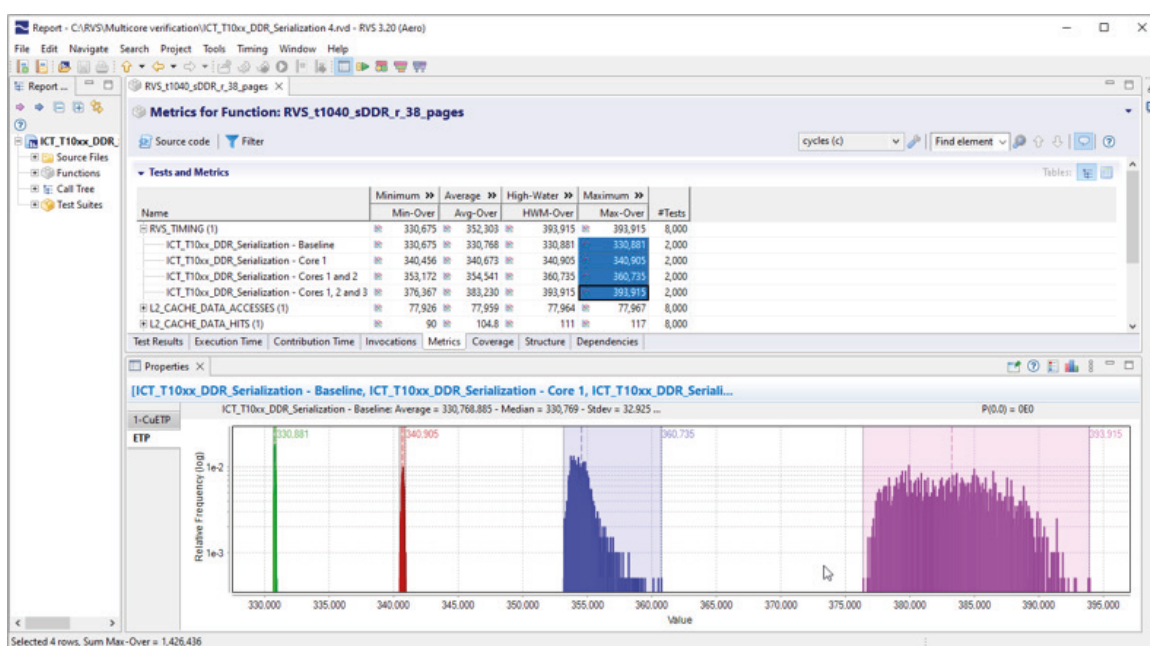
The **MACH**<sup>178</sup> Blueprint includes software tools that you can use to repeat key stages in the **MACH**<sup>178</sup> workflow; this includes:

- The **RVS** toolsuite to browse, review and edit tests, and review and export results
- Rapi**Daemons** to support the characterization of interference effects on the Blueprint project

### Project Files

The **MACH**<sup>178</sup> Blueprint includes project files that were used to produce results on the Blueprint project, and which can be used to perform select activities in the **MACH**<sup>178</sup> workflow. This includes:

- Timing tests for the Blueprint application, which you can browse, review and edit within the **RVS** software
- Pre-generated test results files and export configuration files, with which you can re-configure and re-export result export files



Training

To support your use of the **MACH**<sup>178</sup> Blueprint, we provide 40 hours of training for up to 10 engineers. This includes a mix of theoretical and practical sessions covering how to apply the **MACH**<sup>178</sup> workflow on an example project.

Additional training is available through **MACH**<sup>178</sup> Services.

Support

We provide support for your use of the **MACH**<sup>178</sup> Blueprint, including setup and use of the software tools.

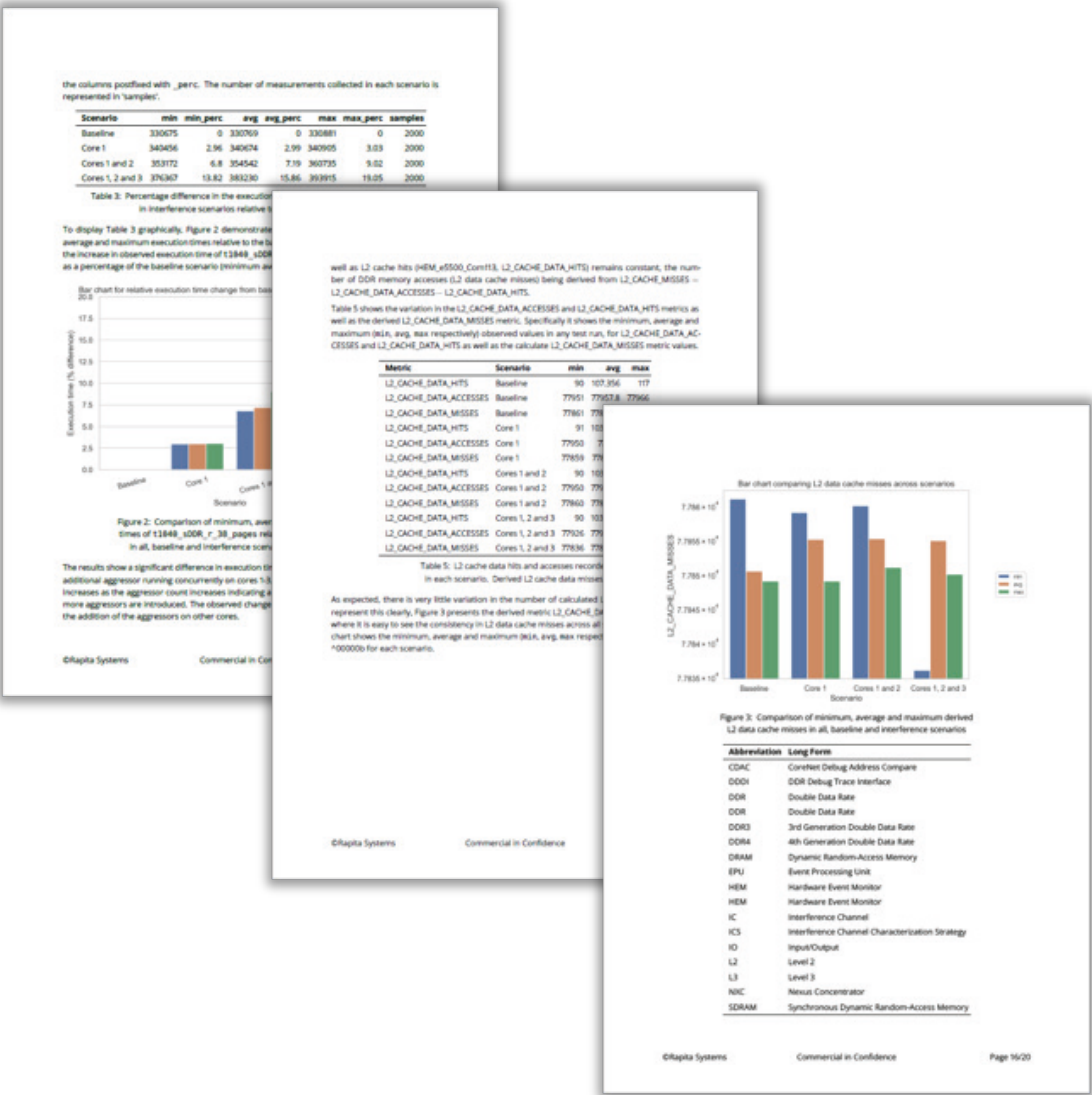
Blueprint project

The **MACH**<sup>178</sup> Blueprint project is an application running on an NXP® T1040RDB processor with a DDC-I Deos™ operating system.

Interference channels

Understanding interference channels and characterizing the effects of interference is a key part of addressing AC 20-193 and AMC 20-193 objectives.

Artifacts delivered in the **MACH**<sup>178</sup> Blueprint focus on a DDR-related interference channel on the Blueprint project.

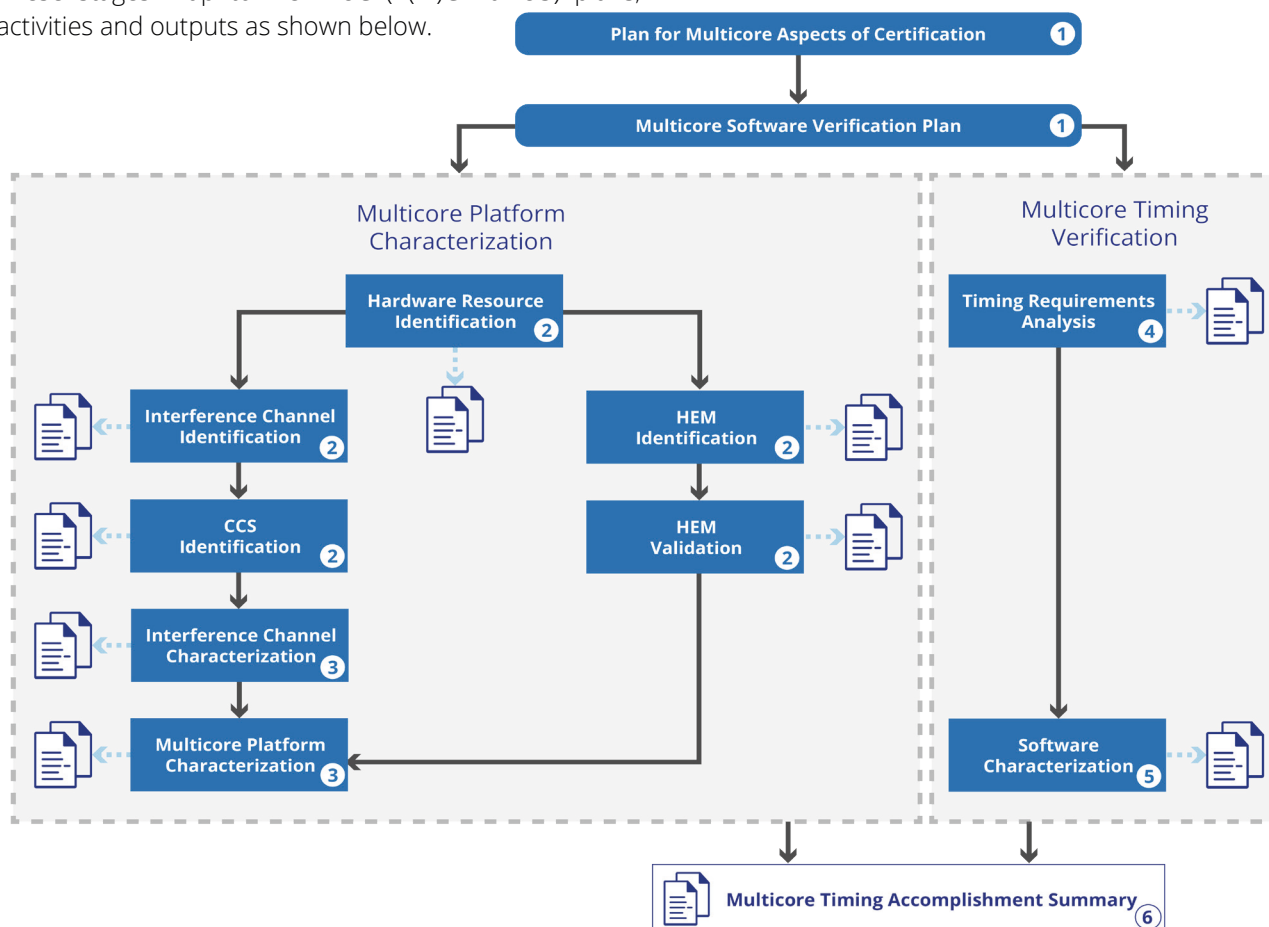


## What is the **MACH**<sup>178</sup> workflow?

The **MACH**<sup>178</sup> workflow is a compliance workflow designed to support DO-178C (A(M)C 20-193) compliance activities. It has been developed to provide an optimized path to planning for understanding, mitigating and quantifying multicore interference, and producing A(M)C 20-193 compliance evidence. The workflow includes the following stages:

1. Planning – where planning documents for the compliance process are developed
2. Platform Analysis – where platform resources and interference channels are identified
3. Platform Characterization – where the impact of interference on each interference channel is quantified
4. Software Analysis – where requirements on software timing behavior are identified
5. Software Characterization – where software timing behavior is measured when subjected to multicore interference
6. Certification – where compliance results are collated, automation tools are qualified, and results are submitted to a certification authority

These stages map to DO-178C (A(M)C 20-193) plans, activities and outputs as shown below.



## **MACH**<sup>178</sup> Tools

Multicore DO-178C projects require additional testing, making it more crucial than ever that efficient tools and automation are used wherever possible. The following tools from Rapita Systems directly support the **MACH**<sup>178</sup> workflow:

- **RapiDaemons**, which support the targeted generation of interference on specific hardware resources, allowing the observation of interference effects
- **RapiTest**, which supports the authoring and execution of multicore timing tests on a multicore platform
- **RapiTime**, which supports the observation and analysis of execution time and resource usage data on the target hardware during tests
- **RapiTask**, which supports visualization and analysis of task sequencing and scheduling behavior on a multicore platform

DO-330/ED-215 qualification kits and a Qualified Target Integration Service are available for **RapiDaemons**, **RapiTest** and **RapiTime** to support the use of these tools in DO-178C projects.



## How can **MACH**<sup>178</sup> help you?

The **MACH**<sup>178</sup> Blueprint is part of the **MACH**<sup>178</sup> solution. **MACH**<sup>178</sup> is a package of products and services designed to support the certification of multicore DO-178C software according to relevant airworthiness guidelines:

- DO-178C / ED-12C
- AC 20-193 / AMC 20-193 / CAST-32A (superseded)
- DO-330 / ED-215

As these guidelines represent the “gold standard” for certification of critical embedded software, **MACH**<sup>178</sup> can also be used to support airworthiness certification in other contexts such as eVTOL or military & defense avionics certification, e.g. MIL-HDBK-516C (AA-22-01).

### *Support for System Integrators and Certification Applicants*

**MACH**<sup>178</sup> allows System Integrators to perform verification activities demonstrating that a multicore Platform along with its integrated Applications is compliant with the multicore DO-178C objectives in A(M)C 20-193. When combined with the incremental assurance evidence provided by Platform Providers and Application Suppliers, this forms a complete set of certification evidence.

We help develop supplier frameworks and processes that can be used as acceptance criteria for activities to meet A(M)C 20-193 objectives performed by Platform Providers and Application Suppliers on the project.

### *Support for Platform Providers*

**MACH**<sup>178</sup> allows Platform Providers to produce evidence demonstrating that their Platform meets the objectives of A(M)C 20-193. This evidence can later be used by Application Suppliers, System Integrators and Certification Applicants to support multicore DO-178C compliance.

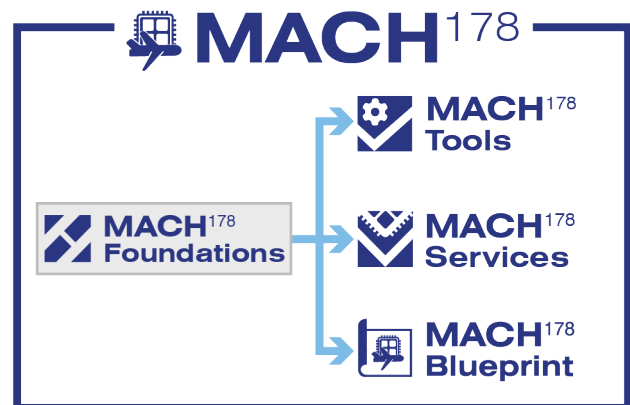
### *Support for Application Suppliers*

**MACH**<sup>178</sup> allows Application Suppliers to produce evidence demonstrating that their Application, running on the target Platform, meets the objectives of A(M)C 20-193. This evidence can later be used by System Integrators and Certification Applicants to support multicore DO-178C compliance.

## More **MACH**<sup>178</sup> solutions

As well as the **MACH**<sup>178</sup> Blueprint, **MACH**<sup>178</sup> includes other solutions to support your A(M)C 20-193 compliance journey:

- **MACH**<sup>178</sup> Foundations – a document repository including template planning documents, procedures and checklists to apply the **MACH**<sup>178</sup> workflow for multicore DO-178C (A(M)C 20-193) compliance. For more information on **MACH**<sup>178</sup> Foundations, see the *MACH<sup>178</sup> Foundations Product brief.*
- **MACH**<sup>178</sup> Tools – software tools to support applying the **MACH**<sup>178</sup> workflow on a multicore project, with DO-330/ED-215 qualification kits and services (see *MACH<sup>178</sup> Tools).*
- **MACH**<sup>178</sup> Services – services to support applying the **MACH**<sup>178</sup> workflow to your multicore project. For more information on **MACH**<sup>178</sup> services, see the *MACH<sup>178</sup> Services product brief.*





## 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](http://rapitasystems.com/downloads)

## SUPPORTING CUSTOMERS WITH:

### Tools

#### Rapita **Verification Suite:**

Rapi**Test**

Rapi**Cover**

Rapi**Time**

Rapi**Task**

### Engineering Services

#### V&V Services

Integration Services

Qualification

SW/HW Engineering

Compiler Verification

### Multicore verification

#### **MACH**<sup>178</sup>

Multicore Timing Solution

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