



RAPITA
SYSTEMS
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Safety through quality

PRODUCT BRIEF

Lay the foundations for A(M)C 20-193 compliance with
MACH¹⁷⁸ Foundations

Product brief: MACH¹⁷⁸ Foundations



How can **MACH¹⁷⁸** Foundations help you?

MACH¹⁷⁸ Foundations provides a solid foundation for engineering teams working on multicore DO-178C (A(M)C 20-193) projects or related projects e.g. MIL-HDBK-516C (AA-22-01). By providing a collection of plans, procedures, checklists and other resources, **MACH¹⁷⁸** Foundations supports engineers working towards A(M)C 20-193 compliance using the **MACH¹⁷⁸** workflow (see *What is the MACH¹⁷⁸ workflow?*).

MACH¹⁷⁸ Foundations and the **MACH¹⁷⁸** workflow are the culmination of tens of person years of work from specialist multicore hardware and verification engineers at Rapita Systems. The **MACH¹⁷⁸** workflow is a step-by-step workflow for planning for and providing evidence to achieve A(M)C 20-193 compliance, while **MACH¹⁷⁸** Foundations provides the necessary documentation to apply the **MACH¹⁷⁸** workflow to a multicore project.

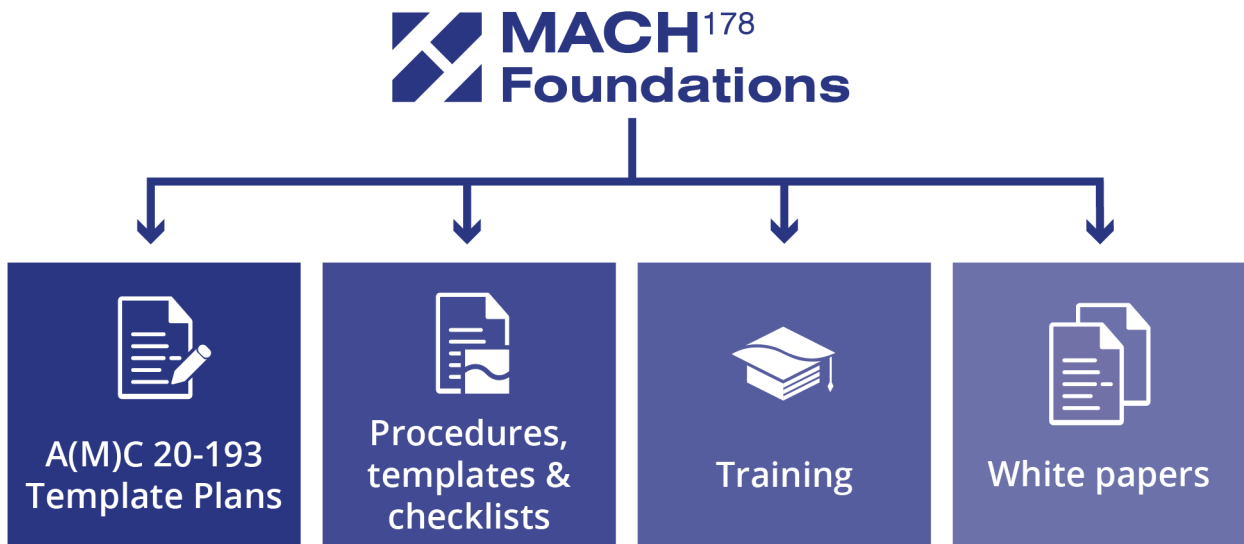
Benefits and use cases

- Reduce time to market for your multicore DO-178C projects
- Derisk your multicore DO-178C projects
- Support your use of the **MACH¹⁷⁸** workflow for A(M)C 20-193 compliance

Product components

MACH¹⁷⁸ Foundations includes the following components to support your multicore compliance journey:

- Template plans for A(M)C 20-193 certification
- Procedures, templates and checklists to support using the **MACH¹⁷⁸** workflow for A(M)C 20-193 compliance
- Training resources to help you get started applying the **MACH¹⁷⁸** workflow to your project
- White papers to provide guidance on specific aspects of multicore certification



Template plans

MACH¹⁷⁸ Foundations includes template plans to help you supplement your DO-178C plans for compliance with A(M)C 20-193 when using the **MACH**¹⁷⁸ workflow. This includes the following documents:

- Plan for Multicore Aspects of Certification (PMAC) – this document provides a breakdown of A(M)C 20-193 objectives and maps them to DO-178C outputs. Information in this document can be integrated into your Plan for Software Aspects of Certification (PSAC) or used standalone and referenced from it.
- Multicore Software Verification Plan (MSVP) – this document lays out the compliance and verification activities you will use for A(M)C 20-193 compliance. Information in this document can be integrated into your Software Verification Plan (SVP) or used standalone and referenced from it.

These documents directly support meeting A(M)C 20-193's MCP_Planning_1 objective.

Procedures, templates and checklists

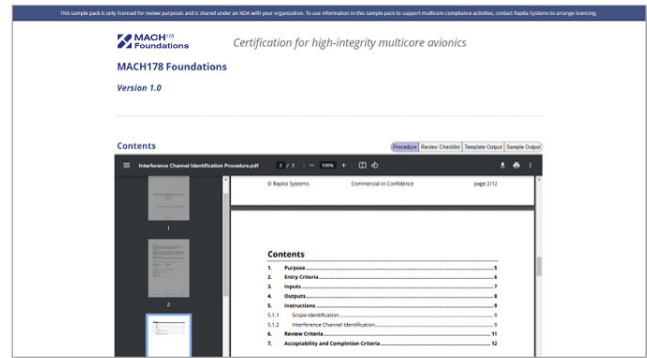
MACH¹⁷⁸ Foundations includes procedures, templates and checklists for key A(M)C 20-193 compliance and verification activities that can be achieved using the **MACH**¹⁷⁸ workflow.

Procedures, templates and checklists are included 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 procedures support the following A(M)C 20-193 verification objectives:

- MCP_Resource_Usage_1
- MCP_Resource_Usage_3
- MCP_Resource_Usage_4
- MCP_Software_1



Training

MACH¹⁷⁸ Foundations includes training resources to help you understand multicore compliance, and understand the **MACH**¹⁷⁸ workflow and how to apply it on a project.

To further support your use of **MACH**¹⁷⁸ Foundations, we provide 5 hours introductory training and a free seat on our popular public multicore DO-178C (A(M)C 20-193) training courses, which operate in Europe and the USA.

Additional training is available through **MACH**¹⁷⁸ Services (see the *MACH*¹⁷⁸ Services Product brief).

If you're wanting to get hands on experience in performing multicore compliance activities with the **MACH**¹⁷⁸ workflow, for example to support your research and development, this is supported by the **MACH**¹⁷⁸ Blueprint (see *More MACH*¹⁷⁸ solutions).

White papers

MACH¹⁷⁸ Foundations includes white papers that provide guidance on various aspects of multicore DO-178C (A(M)C 20-193) certification. This includes the following documents:

- Considerations for Deployment of Multicore Processors with a Single Active Core
- Multicore Processor Selection Considerations Report
- Multicore RTOS Selection Considerations Report
- Software Architecture Considerations Report

New white papers may be developed over time and added to **MACH**¹⁷⁸ Foundations.

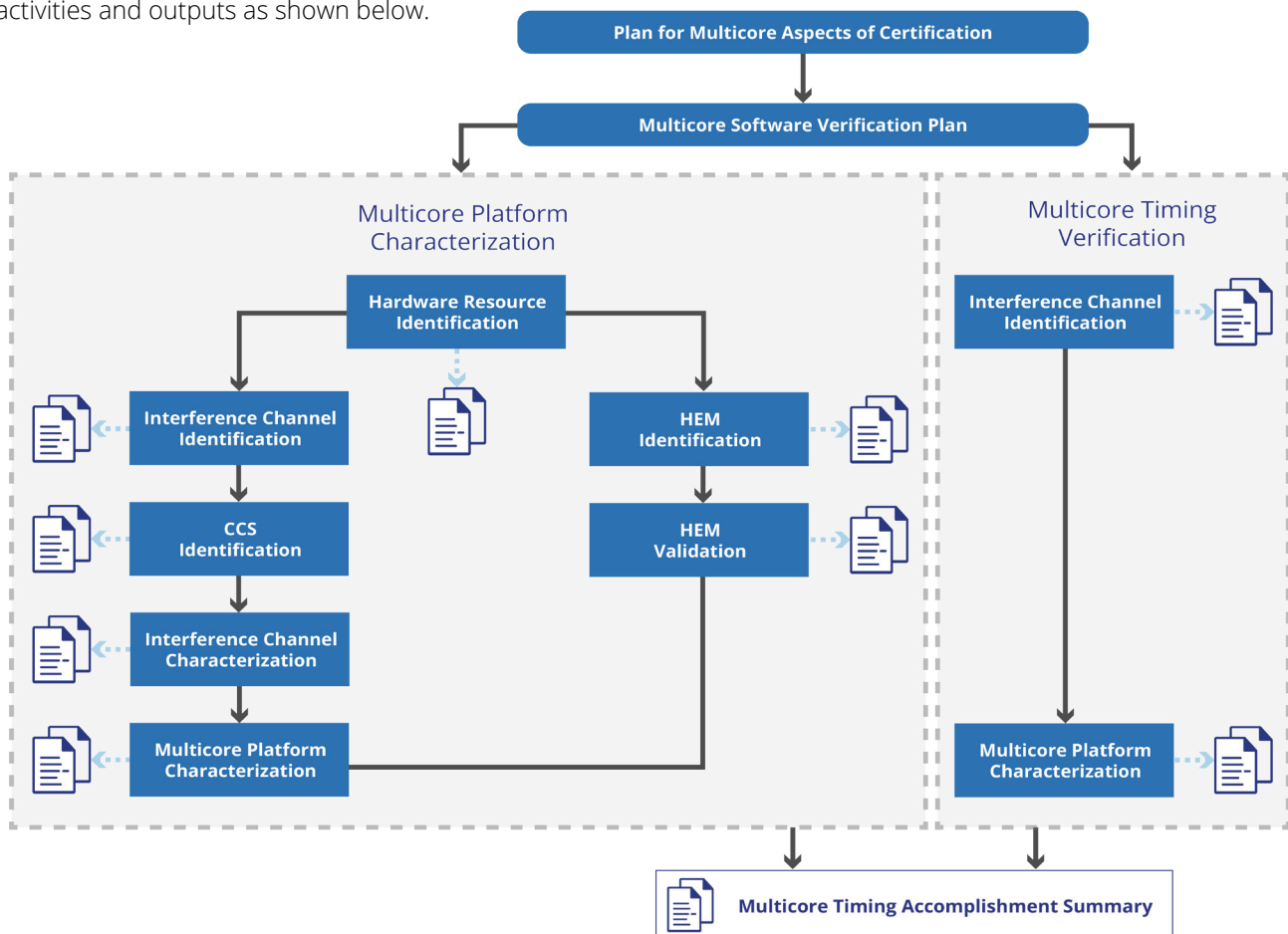
What is the MACH¹⁷⁸ workflow?

The **MACH¹⁷⁸** 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 performance are identified
5. Software Characterization – where the performance of software in interference scenarios is verified
6. Certification – where compliance results are collated, automation tools are qualified, and results are presented to a certification authority

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



MACH¹⁷⁸ Tools

Multicore DO-178C projects require additional testing, making it more crucial than ever that efficient automation is used wherever possible. The following tools from Rapita Systems directly support the **MACH¹⁷⁸** 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 data and values from Hardware Event Monitors on the target hardware during tests
- **RapiTask**, which supports visualization and analysis of task sequencing and scheduling behavior on a multicore platform

DO-330 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**¹⁷⁸ help you?

The **MACH**¹⁷⁸ Blueprint is part of the **MACH**¹⁷⁸ solution. **MACH**¹⁷⁸ 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

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

Support for System Integrators and Certification Applicants

MACH¹⁷⁸ allows System Integrators to perform verification activities demonstrating that a multicore Platform along with its integrated Applications is compliant with 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 A(M)C 20-193 certification evidence.

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

Support for Platform Providers

MACH¹⁷⁸ allows Platform Providers to produce evidence demonstrating that their Platform is compliant with A(M)C 20-193. This evidence can later be used by Application Suppliers, System Integrators and Certification Applicants to support A(M)C 20-193 compliance.

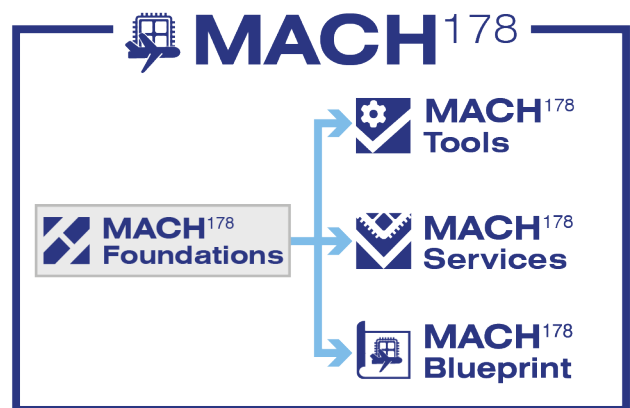
Support for Application Suppliers

MACH¹⁷⁸ allows Application Suppliers to produce evidence demonstrating that their Application, running on the target Platform, is compliant with A(M)C 20-193. This evidence can later be used by System Integrators and Certification Applicants to support A(M)C 20-193 compliance.

More **MACH**¹⁷⁸ solutions

As well as **MACH**¹⁷⁸ Foundations, **MACH**¹⁷⁸ includes other solutions to support your A(M)C 20-193 compliance journey:

- **MACH**¹⁷⁸ Tools – software tools to support applying the **MACH**¹⁷⁸ workflow on a multicore project, with DO-330 qualification kits and services (see *MACH*¹⁷⁸ Tools).
- **MACH**¹⁷⁸ Services – services to support applying the **MACH**¹⁷⁸ workflow to your multicore project. For more information on **MACH**¹⁷⁸ services, see the *MACH*¹⁷⁸ Services product brief.
- **MACH**¹⁷⁸ Blueprint – an off-the-shelf example multicore project and related materials that you can use to learn how to achieve A(M)C 20-193 compliance using the **MACH**¹⁷⁸ workflow. For more information on the **MACH**¹⁷⁸ Blueprint, see the *MACH*¹⁷⁸ Blueprint 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

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

MACH¹⁷⁸

Multicore Timing Solution

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