CANTATA HYBRID
Certification Engine for Google Tests

WORLD'S FIRST CERTIFICATION ENGINE

SGS TüV SAAR
CERTIFIED

Unique
Safety Standards Compliance
for GoogleTest Suites

QA SYSTEMS
The Software Quality Company

**Driving embedded
software quality**

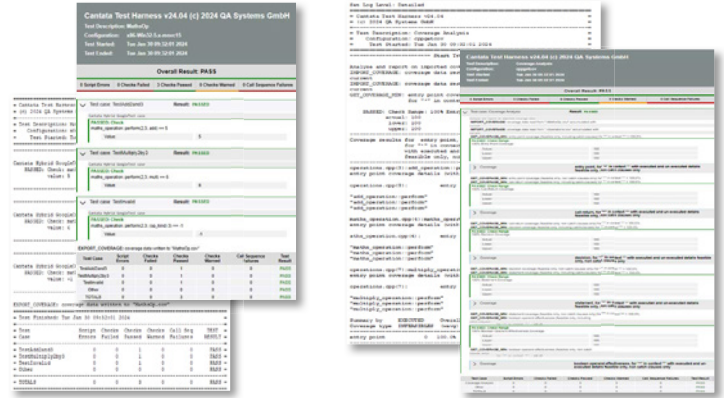# CANTATA HYBRID
Certification Engine for Google Tests

Generate certified Cantata test results from existing Google tests

Cantata Hybrid is a specialized subset of Cantata® that enables tests to be run with non-Cantata test suites (i.e., GoogleTest® and GoogleMock®) as inputs to generate Cantata test results evidence combined with code coverage from a certified unit test tool.

The Cantata Core Product, including Cantata Hybrid, has been independently certified by SGS-TÜV GmbH as suitable for use at the highest safety integrity level for all the main software functional safety standards.

This hybrid of Cantata & GoogleTest delivers a fully automated certification engine for Google tests.

Cantata Hybrid does not require users to learn Cantata or to modify their existing GTest suites or mock objects and how they are built and run.

Certified Cantata Test Results
for each GTest® - including aggregate code coverage achieved in both ASCII and HTML formats

How Cantata Hybrid works

Each GTest macro maps to equivalent Cantata directive

Google Test Process

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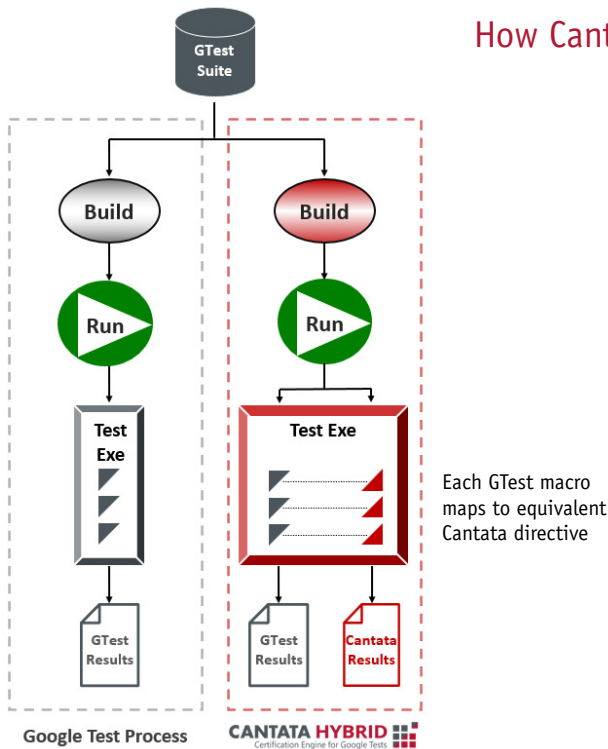
Cantata Hybrid is invoked on the command line for scripted batch execution. It utilizes the certified Core Component Cantata Compiler Driver and Instrumenter (CPPCCD) to set Cantata directives and options, including code coverage, in order to build a test executable from inputs defined in a GoogleTest suite.

A deployment of the Cantata library for the target environment is linked with the source code and the GoogleTest suite. As this hybrid test exe runs, it executes all the GoogleTest and GoogleMock macros from the GoogleTest suites in parallel with their equivalent Cantata test framework directives, gathering Cantata code coverage achieved by each test.

Cantata Hybrid runs both the standard Google tests and equivalent Cantata tests in parallel, producing results for each, along with both detailed and aggregate code coverage results for all test suites. Coverage reports are generated in certified formats using the Cantata utility (CPPGETCOV).

Tests run on host or target platforms

Google tests under Cantata Hybrid can run on any target platforms for which Cantata target-specific deployments have been made available (simulators, emulators, or physical target boards). When the test exe is run on a target, the functional and code coverage test results are directed back to the host for report generation.

A copy of the source code under test is instrumented with Cantata test directives and code coverage, ensuring that the production code is never modified for testing.
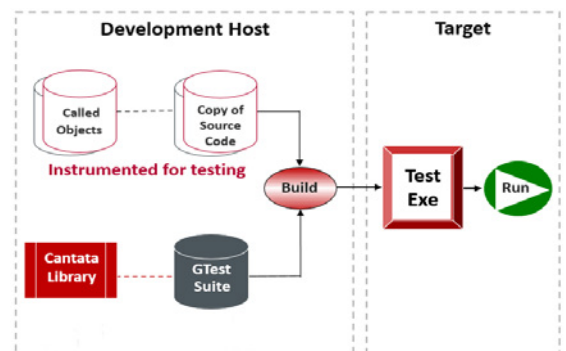
Why use a certification engine for Google tests?

Safety standards require certified tools

All main safety-related standards require that all test tools be demonstrated as suitable for verifying safety-critical application software. This can be achieved through either tool qualification or the use of pre-certified tools, depending on the standard.

GoogleTest and GoogleMock are open-source xUnit style tools that are not certified. Google® does not operate in the safety-critical software market and therefore does not provide a tool qualification kit or tool certification kit.

Most commercial unit test vendors, including QA Systems, have attained independent certification for their tools (e.g. Cantata), or they support users in qualifying their tools when necessary (e.g. for DO-178C).

GTest tool qualification is expensive

Open-source tools such as GoogleTest and GoogleMock can be qualified by the end user. However, the costs associated with such an exercise can be prohibitively expensive and time-consuming, as it involves:

€ Defining requirements for all tool features used

€ Conducting tests to demonstrate that all features comply with the requirements in the tool operating environment(s)

€ Maintaining the qualification data for each tool version and tool use environment

€ Paying an independent third-party organization to perform the above tasks for you.

For these reasons, most developers of safety-critical software do not qualify GoogleTest and GoogleMock but instead opt for a certified test tool like Cantata.

GTest tool qualification alternatives

One option is to rewrite existing GTests using a pre-certified or qualifiable unit test tool, such as Cantata. However, depending on the number of GTests in existence, this can be an expensive test migration option.

Cantata Hybrid serves as the automated certification engine for Google tests, providing a more cost-effective alternative to the expensive tool qualification of the GTest and GMock tools.

Cantata Hybrid is a specialized subset of the certified Cantata tool which offers a unique means to execute existing Google tests without any modifications within the certified Cantata tool. It produces all the necessary certification test and code coverage results to comply with safety standards.

Key Benefits

Cheaper than GoogleTest tool qualification
Cantata Hybrid is priced significantly lower than the cost of qualifying GoogleTest and GoogleMock for safety standards compliance. *See the back page for license details*.

No need to migrate or modify Google Tests
Cantata Hybrid uses Google Test suites unchanged, so teams can maintain their existing and develop new Google Tests.

No need to learn a new test tool
It's simple to use Cantata Hybrid to run Google Tests from the CLI. Certified test and code coverage results are produced automatically.

No need for a certified code coverage tool
gcov (the GNU coverage tool) is also not a certified code coverage tool. Cantata Hybrid coverage is certified and checks for 100% code coverage against all standard metrics up to MC/DC.

Extensible using standard Cantata
Where existing Google Tests do not achieve 100% code coverage, standard Cantata (including AutoTest)can plug these coverage gaps, with the same format reports as Cantata Hybrid.

Usable on multiple platforms
Cantata Hybrid has no platform license restrictions and supports the following:

› GoogleTest version v1.13 upwards on Windows or Linux

› g++ up to v13.2 & Visual Studio up to 2019

› Any embedded target environment (cross-compiled for simulator, emulator, physical hardware) for which a Cantata target deployment is available

› Visual Studio Code with Cantata CTR VSCode Extension

Certified tests & code coverage results

Cantata Hybrid, as part of Cantata, is independently certified by SGS TÜV as suitable for use up to the highest safety integrity levels for all the main functional safety standards.

Coverage metrics:
› Entry points
› Call Returns
› Statements
› Basic Blocks
› Decisions (branches)
› Conditions
› MC/DC
› Loops
› Relational Operators

Certified for:

🚗 ISO 26262:2018

🚆 EN 50128:2011/A2:2020

EN 50657:2017

💗 IEC 62304:2006
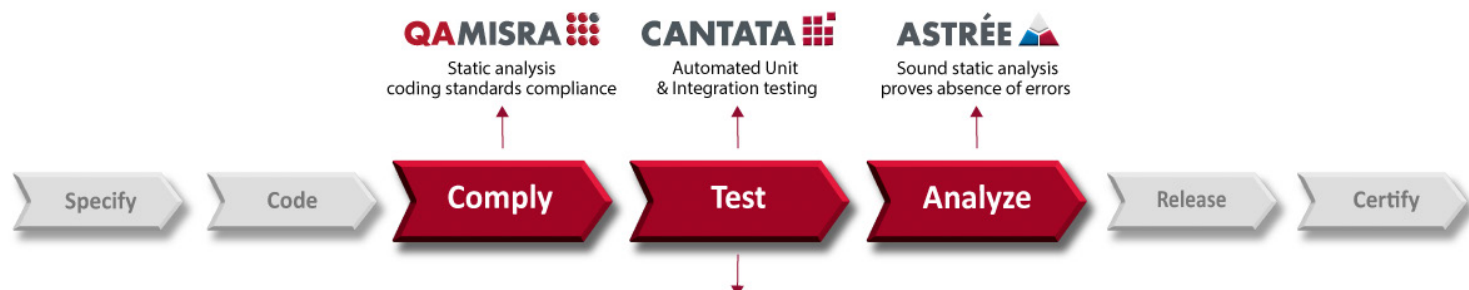
⚙ IEC 61508:2010

⚛ IEC 60880:2006

Qualifiable for:

✈ DO-178C / DO-330

Other standards as required

SGS TÜV
S A A R

QA Systems Verification Centric Tools

QA Systems static analysis and dynamic software testing tools support verification in the linear flow of software development below. We recommend applying a sequential approach to these verification stages with tools targeted for each purpose.

QA MISRA
Static analysis
coding standards compliance

CANTATA
Automated Unit
& Integration testing

ASTRÉE
Sound static analysis
proves absence of errors

Specify › Code › **Comply** › **Test** › **Analyze** › Release › Certify

CANTATA HYBRID
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What you get

- Host (Windows | Linux) installation of Cantata
- Cantata Hybrid User Guide
- Full Cantata User Documentation
- Cantata (including Cantata Hybrid) Certification Kit
- Cantata Target deployment (if required)
  at extra one-off service delivery cost

How it is licensed

- 1-year floating user tool subscription license including maintenance and technical support
- No geographic use restrictions
- One concurrent User or Unlimited User option
- Pack of license use tokens
  1 token used for each GTest test case built

qa-systems.com/cantatahybrid

Start free trial

Take Cantata Hybrid for a test drive with your own GTest suites.

[START TRIAL]

What to expect in trial

› Installation and deployment for your compiler environment.

› Proof Of Concept execution for all your GoogleTest suites.

Learn more