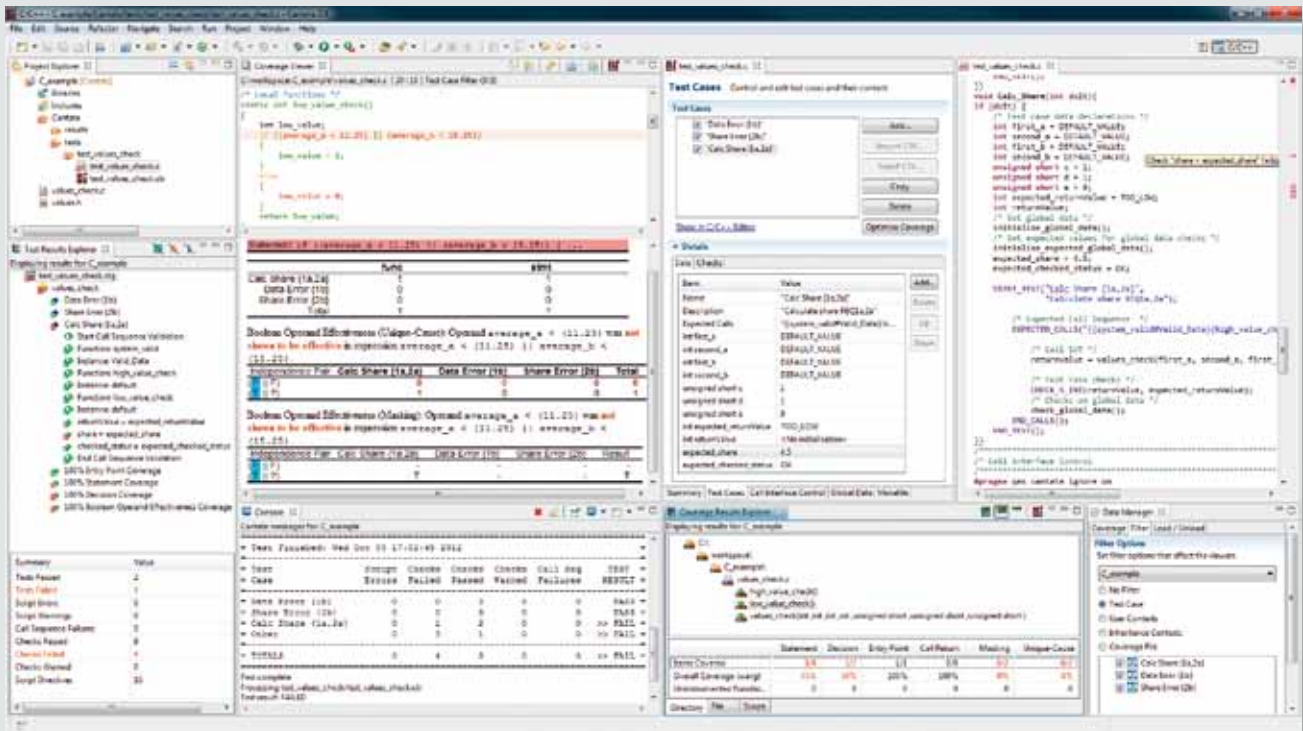


# CANTATA

INTELLIGENT TESTING

Supplied by UK Distributor:  
Phaedrus Systems Ltd  
T: 08081800 458  
W: www.phaedsys.com  
E: info@phaedsys.com

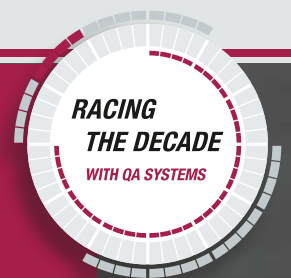
## Technical Overview 6.2

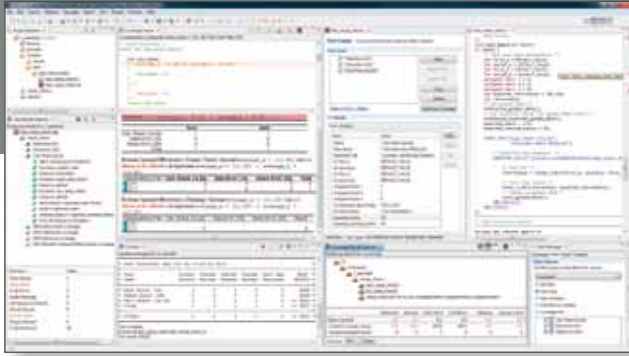


- › Cantata is the most cost effective way to dynamically prove code with intelligent unit and integration testing
- › Cantata provides a complete test development environment built on Eclipse
- › It easily integrates with the developer desktop, compilers and embedded target platforms



**Free Trial**  
Free trial of Cantata on your host or embedded target platform  
**REQUEST NOW**  
Or contact your local supplier.





## Test Planning

- **Static Analysis** generates over 300 source code metrics (procedural and object oriented) in csv format. The metrics for maintainability and complexity aid estimating test effort.
- **Requirements Based Testing** is supported through tagging of test cases for requirements traceability into reports.



## Test Automation

- **Platform Deployment** of Cantata to the user's specific host or embedded target build environment by end users through a deployment wizard.
- **Test Script Generation** by parsing source code to derive parameter, calls and data information with call interface control (Stubs, Isolates and Wrappers) generated into the test script(s). Optional initial values for variables and returns enable tests to run immediately.
- **Test Script Manager** provides graphical development, editing and management of tests synchronised with the C/C++ editor.
- **Re-use of xUnit Tests** within Cantata tests, retains investment in open source scripts, allowing them to be re-used in and extended with Cantata features.
- **Intuitive Test Directives** reduce manual scripting, by calling library of helper functions to provide structured, readable, independent, repeatable tests with clear and unambiguous results.

## Text Execution

- **Cantata Makefiles** are automatically generated at test creation to compile, link, deploy, execute and retrieve results for suites of tests in batch mode. They are easily integrated with open source or commercial Continuous Integration tools, and can be used with existing code trees / make files and edited via the Test Script Manager UI.
- **Single Click 'Run-on-Target'** An add-on available to build, download, execute and collect test results directly back into the Cantata IDE with a single-click Build/Run button or on the CLI. Can be used where Cantata Makefiles alone cannot automate all these steps.

## Interface Control

All calls (external and internal to the compilation unit boundary) may be simulated by Stubs / Isolates or intercepted using the real call via Wrappers.

- **Interface Control Selection** for method used on each call at test script creation (with defaults), and script editing, with call list is refreshed on each code build.
- **Optional Automatic Checks** of all parameters / returns passed over call interfaces.
- **Programmable Test Control Points** are available at each call interface control through named instances to set and check data, raise exceptions etc
- **Automated Stubs** provide replacement simulation of called object interface.
- **Automated Isolates** provide simulation of linked called object interface, and support system and variadic functions.
- **Automated Wrappers** provide interception of linked called object interface with Before/After and Before/Replace modes to intercept or simulate. More powerful and flexible control over interfaces than stubs or isolates.



- **Call Sequence Verification** provide full control over call order and use of Stub, Isolate or Wrapper instances in each test case, with exact sequence or any time matches.

## Black & White-Box Testing

Cantata provides a high degree of automation at unit and integration levels for both black-box and more efficient / thorough white-box testing.

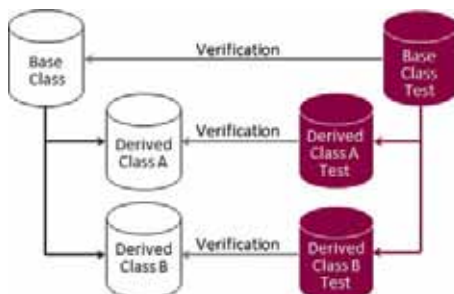
- **Per Function Testing** generates a complete template test case for each function/method in the code with all parameters, accessible data and calls to control identified,
- **Table-driven Testing** provides multiple input value ranges, combinatorial effect calculator and CSV import/export for large data set black-box verification.

- **Robustness Testing** with pre-defined values for basic data types, in table driven test cases.
- **Automated Global Data Checks** to verify expected and unexpected changes to all global data accessible to the software under test.
- **Automatic White-Box Access** provides the ability to efficiently call functions or methods, and set/check data directly from the test script without conditional compilation:
  - > Static functions and private methods
  - > Private data and data static to the file
- **Automated C++ Exception Verification** of multiple expected and unexpected exceptions.

## Object Oriented Testing

Cantata unit and integration testing supports: C++ functions, templates, classes or clusters of classes in single or multiple source files. Test scripts for classes are written in C++ as a test class.

- **Automated Test Case Re-use** via parallel inheritance hierarchy, retains benefit of code re-use for testing, and verify that a derived/specialised class has the same semantics as a base or template class (the Liskov Substitution Principle).



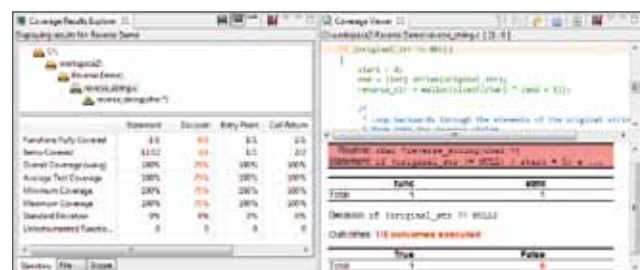
- **Automatic Test Class Inheritance** structure created for inherited classes, so child class tests inherit from parents.
- **Automatic Implementation** of abstract base classes (ABCs) or pure virtual methods, with generation of appropriate stubs in the script. Supports use of the factory method.

## Code Coverage

Coverage analysis of C/C++ and Java provides objective measurement of how effective testing has been in executing the source code.

- **Code Coverage Metrics** supported include:
  - > Entry points
  - > Call Returns
  - > Statements
  - > Basic Blocks
  - > Decisions (branches)
  - > MC/DC (Masking and Unique Cause)
  - > Relational Operators
  - > Loops
  - > Conditions
- **Coverage by Context** provides coverage by
  - > Each Cantata Test case
  - > Derived inheritance contexts
  - > User defined context for multiple states, threads and data contexts (for DO-178B/C data coupling analysis)
  - > Any non-Cantata test run
- **Configurable Coverage Requirements** are easily defined in simple Rule Sets.
- **Coverage Target Checks** on metrics are integrated into dynamic tests resulting in Pass/Fail for coverage requirements.

- **Automatic Test Case Optimisation** provides option to remove/ disable test cases which do not contribute additional coverage.
- **Project Code Coverage Trees** for multiple projects with filters for coverage types / fully covered code items and drilldown to highlighted source code.
- **Source Code Coverage Views** highlight individual code constructs(not just by line) with additional diagnostics by test case, test run and metric type.



## Baseline Test Legacy Code

Cantata Baseline Testing automatically generates complete passing unit test scripts to:

- > Reduce reliance on system tests
- > Support Continuous Integration
- > Automatically close gaps in coverage
- > Identify testability problems in code
- > Easily change unit testing tools

■ **Configurable Test Depth** with code paths determined by selecting the metric types in a code coverage Rule Set.

■ **Configurable Automatic Verification** using standard workspace preferences for passing checks on function(s) in each file of:

- > Return value from function
- > Output parameters from function
- > Accessible global data values
- > Order of function calls made
- > Parameter values to function calls

■ **IDE Test Generation** for selected source files or directly into existing test scripts.

■ **CLI Test Generation** for larger code bases selected by source directories, files and functions.

■ **Separate Standard Licence Feature** allows controlled use of Baseline Testing

■ **Testability Issues Identified** with warning messages for problems in code preventing generation of complete passing tests:

- > Dynamically unreachable code
- > Crash scenarios
- > Data uninitialised or function static
- > Implicit function declarations
- > Compiler type truncation

■ **Baseline Test Generation** Report created as HTML report for fully, partially or untested files and functions.

■ **Automatic Regression Suite** of Baseline Tests created using Cantata Makefiles for CLI invocation.

■ **Ongoing Maintainability of Baseline** is simplified as testscripts are standard Cantata style, with re-use of call instances and detailed path solving description for each generated test case.

## Diagnostics & Reports

Cantata offers powerful filterable diagnostics of test and code coverage results within the UI, and flexible user configurable reports.

Detailed Test Diagnostics for all checks of expected against actual results by test case for:

- > Global data
- > Parameters and returns
- > Exceptions
- > Call order
- > Code coverage targets

■ **Printable Views** from within Cantata UI for all test and coverage results displays.

■ **Test Summary Reports** for test build and execution results of all tests with Makefiles.



■ **Project Level Tree Views** of test pass/fail results with drill-down hyperlinked navigation to individual test cases and checks.

■ **Configurable XML** reports with summary or full test details consolidate across multiple projects.

■ **ASCII Text Report** available with passes and fails highlighted inside Cantata with outline view, or as plain text results file for high integrity certification needs.

## Platform Availability

Host Operating System	Host Compilers	Targets
Windows XP, Vista, 7	Microsoft Visual C++: 6.0, 2003, 2005, 2008, 2010 GNU GCC/g++: 3.3x to 4.7.x	Any 16, 32, 64 bit architecture.
Linux kernel 2.4, 2.6 distributions	GNU GCC/g++: 3.3x to 4.7.x	Contact supplier for details.

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Phaedrus Systems Ltd

T: 08081800 458

W: www.phaedsys.com

E: info@phaedsys.com

**QA Systems GmbH** • Schwieberdinger Strasse 56 • 70435 Stuttgart • Germany  
Tel +49 (0)711 / 13 81 83 - 0 • Fax +49 (0)711 / 13 81 83 - 10 • www.qa-systems.de

**QA Systems Ltd** • 2 Palace Yard Mews • Bath, BA1 2NH • United Kingdom  
Tel +44 (0)1225 321 888 • Fax +44 (0) 1225 581150 • www.qa-systems.com