Test Environment for Apex Ada

Rational TestMate

Integrated Testing Environment for Rational Apex Applications

Software test engineers want to spend their time testing, not developing and maintaining a test environment. For Rational® Apex programmers, Rational TestMate® provides the complete testing infrastructure needed to test complex multi-platform Ada programs for both native and embedded applications. TestMate allows users to create test cases, logically group them together into test lists, run their tests on either a host or embedded, real-time target platform, perform code coverage analysis, and analyze test results.

Automated Test Generation

Using Rational TestMate, a software developer can quickly generate a test suite for a newly created software module — even if the software module needs other software modules that aren't yet available. Because TestMate has access to the semantic information about the software module, it can automatically create a test driver for it.

If the software being tested requires external software modules that are not yet available, Rational TestMate can automatically generate stubs to simulate the behavior of these software modules. TestMate supports thorough internal testing of the software module by providing access to objects in Ada programs such as child packages, private types, and hidden subprograms, that are typically difficult to test.

Powerful Test Management

Complex applications often involve hundreds or thousands of software units. This number easily quadruples during testing because of the need for artifacts such as test drivers, test cases, test input files, and test output files. Rational TestMate's test management feature organizes these artifacts and maintains their interrelationships.

TestMate's test repository is integrated into the structure of the software architecture, allowing the association of test artifacts with a particular Rational Subsystem and the association of multiple versions of these artifacts with multiple versions of a Rational Subsystem. Rational TestMate's integration with both Rational ClearCase® and Summit/CM allows all versions of test artifacts to be automatically placed under configuration management and version control. TestMate also provides hypertext navigation capabilities to quickly traverse from one test artifact to another.

Maximize Test Suite Quality

Reusable, complete, and portable test suites require a consistent testing infrastructure. Rational TestMate provides features to support these needs. TestMate generates uniform and consistent test cases by leveraging general-purpose test templates. TestMate combines these test templates with the test data specified by the user and automatically constructs a test script. Test scripts can be either UNIX shell scripts or Ada subprograms. If they are Ada subprograms, TestMate automatically compiles and links them to ensure that the test executable is up-to-date and consistent with the application being tested.

System, Integration and Module Testing

Rational TestMate supports a variety of different testing paradigms such as system, integration, module, black box, or white box testing. In addition, TestMate supports all phases of software testing — from test planning to results analysis. System-level test cases and lists can be created independent of application development. Traceability matrices can be generated by populating these system-level test cases and lists with traceability information such as keywords or requirements identifiers.

HIGHLIGHTS

Comprehensive test management for testing complex Ada 95/83 systems

Consistent integrated UNIX testing environment for simplified and automated multi-platform testing

Automated stub generation, test case generation and test data generation allow developers to quickly test their code, prior to integration

Code coverage analyzers provide both object and source code coverage analysis with minimal impact on the code being tested

Code coverage analyzer options provide DO-178B-compliant statement, decision, and MCDC coverage analysis

Integrated embedded target testing support provides easy transition from host-based testing to target-based testing

Powerful analysis tools for meaningful results and regression analyses

Integration with Rational ClearCase and Summit/CM allows all test artifacts to be controlled and tracked

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Even before the software application exists, with Rational TestMate, testers know how well the tests cover the requirements. TestMate's code coverage analyzer helps identify additional areas for testing. Using that information, the user can augment system-level tests with integration and module level tests.

Results Analysis and Regression Analysis

Although it is time consuming, small projects may be able to manage manual analysis of test results for small test suites. However, for large projects that may involve hundreds or thousands of tests, the job demands automated tool support. TestMate automates regression analysis by comparing multiple versions of test results and providing a summary of the differences such as new test failures or test passes.

Source Code and Object Code Coverage Analysis

Developers can gauge the completeness of their test suite using Rational TestMate's coverage analyzers, which work on both host-based and embedded target-based applications. TestMate provides many different coverage analysis options including support of:

- DO-178B compliant statement coverage analysis
- DO-178B compliant decision coverage analysis
- DO-178B compliant MCDC analysis
- Object code basic block coverage

Using TestMate's code coverage analyzers is as easy as checking off a box when executing a test. Unlike other coverage analyzers, TestMate does not need to include a source code parser (i.e. a compiler front end) to perform coverage analysis. Instead, TestMate utilizes Apex's full semantic intermediate representation of the software being tested. This eliminates many problems associated with differences between a coverage analyzer's parser and the actual compiler being used. Because it is tightly integrated with the Apex environment, TestMate automatically manages any intermediate files required for code coverage analysis (such as instrumented source code files) and automatically performs recompilation or relinking as needed.

Rational TestMate utilizes two powerful code coverage technologies to support different types of coverage analysis requirements. TestMate's optional source code instrumentor supports high-level coverage metrics such as DO-178B compliant statement, decision, and MCDC coverage analysis.

For those instances where it is necessary to also cover differences between the object code and the source code of your application (such as what is often introduced by an Ada compiler), TestMate offers an object code coverage analyzer. This tool performs code coverage at the object code level and reports if the object code blocks (inserted by the compiler) are not executed as part of the user's tests.

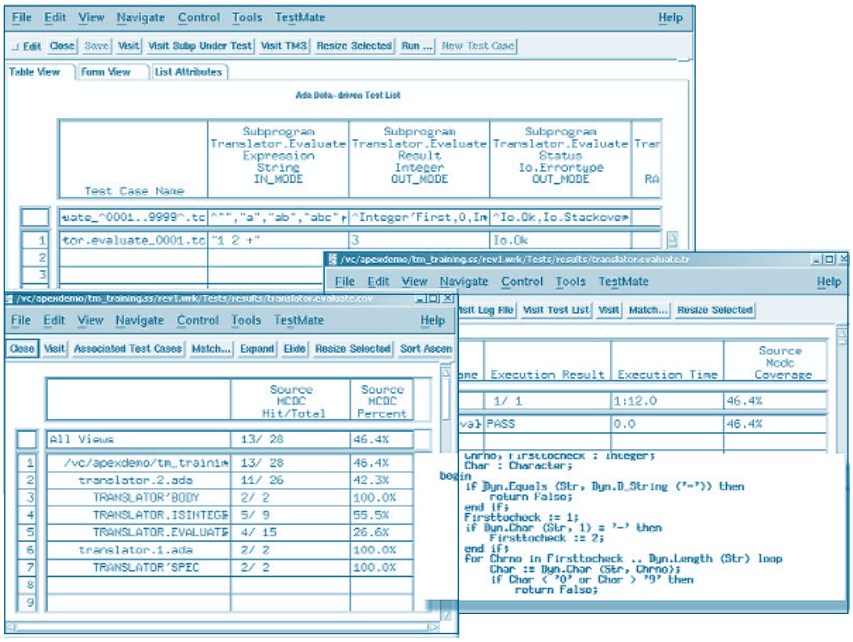
For both code coverage analyzers, Rational TestMate displays a concise summary of the coverage analysis for each software unit and subprogram. Hypertext links allow quick navigation from summary information to the actual source code with uncovered segments of the source code highlighted.

DO-178B Tool Qualification

Rational TestMate provides coverage analyzer options that are fully compliant with popular safety-critical test standards such as DO-178B. These options provide the ability to do statement, decision, and modified condition/decision coverage (MCDC) analysis on both the host and target platform. MCDC was introduced by the commercial avionics industry to ensure that safety-critical applications are adequately tested. TestMate supports two popular variants of this technology: traditional MCDC and masking MCDC.

Some safety-critical standards (e.g. DO-178B) require that verification tools (such as a code coverage analyzer) be qualified for use. This process generally involves testing the tool in the user's own environment to verify that the tool performs as expected. Rational offers the following qualification data to assist in this effort:

- Tool Operational Requirements
- Tool Qualification Plan (including qualification history of the tool)
- Tool Test Test Plan
- Tool Test Results Template
- Qualification Tests that can be run in the user's environment



TestMate makes collecting code coverage from your application easy

Rational TestMate's code coverage analyzers have been previously qualified for use on DO-178B Level A, B, and C applications.

Support for Testing on Host and Target

The optional Rational TestMate Cross feature allows tests developed and debugged on the host platform to be executed on a target (embedded) platform. This allows software testers to develop entire test suites on the host environment without the need for target hardware, which may not yet be available. Popular TestMate features such as coverage analysis and test automation are available on the target with TestMate Cross. TestMate Cross is fully integrated with the Rational Apex Embedded software development environment and can also be used with other compilation environments.

TestMate automates many tedious tasks associated with embedded target testing, including:

- Managing all test artifacts and enforcing consistency between test artifacts
- Compiling, linking, downloading and executing tests on the target environment
- Performing results analysis and regression analysis
- Providing test automation facilities such as stub generation, test data generation and test driver generation
- Performing coverage analysis for code executing on the target processor including object block, segment, decision and MCDC coverage

Supports Your Testing Process

Rational TestMate Ada is configurable and flexible to adapt to many different testing processes. It can be used as part of a structured, cleanroom testing environment, such as that specified in DO-178B or a flexible development-based testing environment. A complete API and command-line interface allows for easy integration with third party tools such as requirements management tools and GUI testers. Rational's documentation automation tool, Rational SoDA, tightly integrates with Rational TestMate. SoDA automatically generates documentation such as test plans and results documents by querying the TestMate repository.

SPECIFICATIONS

Platforms:

- Sun Solaris
- HP-UX
- Digital UNIX
- SGI IRIX
- IBM
- RS 6000 AIX

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