RTD Rapid Test Designer

A complete system for wireless terminal behaviour analysis
Ubiquitous Wireless Coverage - the next challenge

We travel the world and expect to be able to talk, text, browse and more importantly be informed wherever we are. “Staying connected” is now the norm.

Wireless technologies all compete and collaborate for market share and although GSM started a trend for a Global Standard, many competing systems now appear to provide alternative or hybrid systems.

LTE (Long Term Evolution) is fast becoming the front runner for next generation, with many legacy systems and even variants being integrated. The challenge for terminal developers is to back the winners and also be able to support the other systems to be sure of globally connected devices.

With budgets being cut, and efficiencies examined, it is not an option to continue using traditional methods for development of modern wireless terminals. The multitude of applications expected to work on ever changing and developing networks, means test systems need to be comprehensive and fast to adapt and react.

The next challenge

Anritsu has been at the leading edge of 3rd Generation mobile development programs and is now delivering Intelligent Test Solutions for LTE development teams that need to accelerate their designs to stay competitive.

Anritsu has a mature customer base of 3G installations using the MD8480C W-CDMA Signalling Tester and is now able to provide a cost effective solution to migrate over to LTE with the MD8430A LTE Signalling Tester. This combination makes a comprehensive and flexible solution for the most powerful protocol development system for next generation wireless terminals. The RTD is a proven multi-standard graphical flowchart tool for many organisations. MD8480C has now become a reference as an essential part of test systems reflected by its extensive use in all aspect of the 3G terminal development cycle including R&D, integration, regression, conformance, interoperability and validation. It has the ability to create almost limitless network simulations and is now complimented by the MD8430A for LTE and MD8470A for cdma2000.

The RTD is the fastest and most efficient way to ensure that modern terminal behaviour can be comprehensively exercised...

Increased laboratory testing

There is a growing trend to simulate scenarios found or expected to be found in the field by creating them in the laboratory. This way the development teams have a better chance of isolating and fixing any problems before the products are commercially deployed.

The graphical flow chart method provided by RTD is now adopted by many development teams, who have recognised the time savings and test coverage it can provide.
TERMINAL DEVELOPMENT from R&D to Conformance and Beyond

R&D teams will spend thousands of hours developing, integrating and proving their terminal designs. The RTD now provides LTE design teams with procedures that test low level configuration as well as L3 protocol. Individually the procedure libraries provide tools for teams at different parts of the design process. By combining and merging them, very detailed proving and integration of designs is possible. As specifications evolve, the RTD provides a roadmap that reflects the fast moving needs of the developers. As a consequence increased dependence upon regression testing will be required to ensure changes do not affect the designs. RTD provides all the tools for immediate test definition, analysis and execution.

Key Facts:
- Development environment for layer 1 to layer 3 signalling
- Integration test packages and software tools for developing LTE terminals
- Extensive procedure library with preconfigured messages and signalling
- Proven software tools for integration of legacy scenarios
- One button upgrade process for existing tests

Time to Market
With competition being so great and staff movement an issue, teams cannot afford to add time to development of new products. The RTD provides an intuitive interface that is easy to learn and provides flexible and informative feedback to the operator. This allows developers to accelerate the learning curve for new technology and the tools needed for successful designs.

Regression Testing
Regression testing also needs to be performed as new software is introduced into networks. RTD makes it possible to modify test scripts simply by applying a new set of network parameters or making a change to a reference that can populate a suite of tests. The test suite can then be run overnight or unattended, presenting the operator with an executive summary to enable software stability trends to be mapped.

Maintaining Tests
Wireless terminal developers will build up large libraries of tests for ongoing development and regression testing of their designs. The RTD has the ability to update these libraries using the latest 3GPP Release automatically, saving many hours of test re-creation and debugging.

Beyond Conformance
Although conformance tests prove adherence to specifications, they play little part in simulating “real world” conditions where consideration to interfering signals and user plane data is involved. The RTD makes test scenarios easy to create and then iterate as there is no lengthy compilation stage and tests may be adjusted at run time if required.

Roaming and Network Selection
With multi-mode capability, terminals will have complex algorithms that select preferred networks and still maintain acceptable performance. Revenue streams will be threatened if UEs do not behave correctly and Network Operators will exercise them to ensure the best possible behaviour on their network configurations. RTD provides this type of testing which will be crucial to terminal selection - and rejection.

Simulating Live Network Conditions
Traditionally protocol and RF tests have been kept separate. In order to reduce test times there is a trend to combine fading with protocol tests. The RTD provides a convenient way to add digital baseband fading by Using the MF6900A Fading Simulator to the system.

Where Does TTCN Fit In
Many developers will need to adopt TTCN3 for conformance and Anritsu supports TTCN-3 with its PCTS (Protocol Conformance Test System). TTCN is a powerful language for conformance testing, however it becomes cumbersome and time-consuming when many different test variants are required. Keeping track of version control and syntactical problems during development is a task in itself. A modular solution like RTD which allows simple test and variant creation is essential to improve efficiency.

Evolution to LTE

RTD supports
- GSM
- HSPA Evo
- GPRS
- C2K
- E-GPRS
- LTE
- UMTS

UTRAN/GERAN Signalling Tester
LTE Signaling Tester
C2K Signalling Tester
Inter-System Handover
Evolution to LTE

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With finite bandwidth and ever more traffic generated, the biggest challenge is for network operators to optimise their networks and ensure that terminals obey the rules they set. LTE attempts to make more efficient use of the spectrum available but still needs to inter-work with legacy systems. There are also regional variations and network specific requirements that terminals will be expected to conform to. Load balancing may be important to make best use of network resources and although aesthetics and applications may define a terminal’s popularity, the behaviour under specific conditions needs to be tested to ensure a reliable and friendly user experience.

**Cell Selection and Re-Selection**

The compromise between battery life and continuous caretaking activities will always challenge terminal designers. Thousands of hours of field trials may still not be able to identify why a terminal fails to maintain service on a preferred network. Many conditions can only be reliably exercised using a simulation of network conditions in the laboratory. The RTD has the ability to use network logs and create tests that closely resemble the field environment. Iteration of the test is then straightforward to discover and rectify the problem.

**Application Testing**

As we move to an all packet delivery network, data throughput and integrity is becoming more important. Scenarios with a variety of radio bearers and configurations is possible with RTD, proving that data is not lost during handovers and reselection. As traffic builds up and volume driven state transitions occur the user needs to remain connected. Simultaneous applications are now commonplace, so interaction and priority between services needs simulating. Where high value applications such as financial transactions take place handovers or link failures may be serious. Gaming and social networking may seem less important to test, but is proving to be a differentiator for a young and influential market.

**Roaming Partners**

Simulation of foreign networks using the RTD’s many advanced features allows a convenient way to test roaming between networks with different configurations / parameters and even different ways of implementing procedures. Today the cost of sending engineering teams to perform network testing over many weeks can be a very significant portion of a Network Operator’s proving budget. New Network Services

Most Networks will not allow new terminals onto their live service without some proving. RTD provides a way to test new terminals and also new services that may be ready to be deployed. Future functionality and applications can be proved in a controlled way using a system simulator and problems resolved ahead of deployment.

**Stress Testing**

Terminal stress testing can be automated and run overnight using RTD. With the ability to make thousands of reselections, calls, hand-overs etc. Tests that exercise the extremes and limits of the terminal provide quantitative and qualitative data for terminal selection.

**InterRAT Testing**

Most Network Operators will be adding LTE to their existing infrastructure and will be looking for an evolutionary path forward. Existing GERAN/UTRAN tests written for the MD8480C may be used as part of the overall test strategy for the new network. The RTD is able to perform InterRAT tests by controlling both MD8480C, MD8470A and MD8430A platforms. Existing tests can be updated and used as a basis for LTE inter-working.

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Although high peak data rates grab headlines, the objectives of LTE are as much about increasing efficiency and reducing costs as achieving high performance. Great efforts are being put into creating a global standard to achieve global economies of scale. Despite this, the 3GPP Rel-8 LTE networks will see regional variations in deployment. Different frequency bands will be used in different parts of the world. Different LTE modes (FDD and TDD) also will be used. And, different legacy networks will be used for fall-back—GSM/GPRS/WCDMA/cdma2000. RTD will evolve with future requirements and aims to provide updates every 3 months to ensure tracking of new requirements.
The RTD’s unique flowchart display provides a more natural way of creating scenarios and observing test flow and outcomes. Debugging is especially straightforward as tests can be run and iterative changes made. Because there is no compilation phase, tests can be run immediately and aborted if the wrong path is taken. With well annotated tests, sharing and consolidation is possible and productive.

Why a graphical flow chart?

The RTD’s unique flowchart display provides a more natural way of creating scenarios and observing test flow and outcomes.

Branches can be created for detailed analysis and performance testing.

Soft keys can be created to provide flexibility.

Real time monitoring of parameters is possible during test execution.

The RTD Test System for multimode terminals is a complete solution checking the behaviour of terminals in development and before they are deployed on live networks.

The RTD system provides a flexible simulation of a LTE/W-CDMA/GSM network.

The RTD presents an intuitive and interactive graphical environment for designing test cases, coupled with an expert system that guides the user through the intricacy of 3GPP protocols. This hides much of the complexity of testing 3GPP protocols and allows the user to concentrate on testing specific functions and applications within the terminal without having to be an expert on all the protocol layers or TTCN programming.

It is built upon Anritsu’s many years of experience in testing 3GPP protocols with the leading terminal vendors.

RTD can be used for a wide variety of purposes:

- Acceptance Testing
- Integration Testing
- Interoperability Testing
- Generating Variants
- Application Testing
- Regression Testing
- Pre conformance Testing
- Prototyping Tests
The RTD provides many ways that test execution can be made more efficient using remote control, terminal control and campaign management tools.

**RTD Top Features**

**Edit**
- Intuitive editing means faster test development
- Easier test maintenance
- Automatic simulator configuration
- Code re-use

**Regression**
- Tests and entire archives can be updated to the latest 3GPP release using a single command
- Backup generated and archived automatically for regression tests

**Control**
- AT commands can be included in all tests
- Automation of tests using campaigns or from a host system using CLI

**Automate**
- Campaigns created using graphical interface
- Reports generated
- Export to other databases

**Future**
- MD8480C proven in 3G development and testing
- MD8430A provides an evolutionary route to LTE
- GSM/GPRS/E-GPRS/HSPA/HSPA Evo/LTE FDD/LTE TDD

**Automation**

The RTD includes a campaign management tool. This provides the user with the ability to create test runs that can be run remotely without the need for any further control equipment. Tests can be repeated depending on rules set by the user. Results are generated in a tabular form and can be exported to form part of a formal report.

A campaign may be used to run an entire suite of conformance tests, or inter-operability tests, or any other large grouping of tests. Rules may be set to run all tests and then retest those that fail, making best use of time.

The RTD produces comprehensive logs for debug and development of terminals.
The Total System Solution

For some, the RTD will be a new concept and we aim to provide the tools and support to make the experience productive and logical.

Using the RTD
An RTD test is constructed and edited using a graphical environment, which supports procedures, loops, delays & interactive dialogs. Compared to traditional “C” and “TTCN” based languages this GUI provides fast and simple test creation. Typically a test that may have taken several days to create may be created in hours using the RTD.

Reference Tests
These reference tests are samples of commonly used functions to act as templates for the user. They allow Network specific parameters to be added manually or by means of a “catalogue” function. Packages of other test cases are also available on request.

Test Execution Engine
RTD tests are run immediately after they have been checked for simple errors, without a compile or build cycle.

Test Criteria Editor
The test operative may use this tool to automatically make objective decisions on whether the right actions have been made by the UE. Criteria may be changed post testing and applied to existing results. This avoids the need to re-run the tests.

Detailed Test Log Analyzer
The protocol log analyzer, which maintains the same look and feel as other Anritsu products, is provided to examine the message sequences that are produced by the terminal under test.

Procedure Libraries
Procedures are the building blocks from which all tests are created. The RTD Procedures can be selected from a palette and added to the User Test simply by dragging onto the edit page. Compound procedures can be created to allow frequently used scripts to be added in a single action, further simplifying test creation.

These procedures are configured using parameters, which can be changed at three levels:
1) Parameter sets held in catalogues can be selected to parameterise groups of procedures rapidly.
2) The user can edit individual parameters after they have been selected from catalogue components, overriding values if they wish to. These parameters are used to populate the actual protocol messages sent by the procedure.
3) The expert user can edit the individual messages sent by the procedure, if needed, overriding any parameters previously selected or changed.

Wireless terminals will continue to evolve and in order to keep in touch with market changes and 3GPP specifications, the RTD has a full suite of support and training options to suit different users and applications. This allows users to gain the most benefit from the product and in turn to increase productivity and maximize revenue.

Software Update and Maintenance Contract
Customers are encouraged to take out software update and maintenance contracts to ensure that they keep up with both the latest software features and tracking with the latest 3GPP version supported. Approximately every three months a new version of the RTD software is introduced and made available to all participants in the scheme. The updates are available electronically and come with full release documentation to ensure backward compatibility with existing tests.

Premium Support
Anritsu provide access to their engineering support for users that reach a critical milestones or require specialist assistance during development and proving of their terminal designs. This can be purchased on a per day basis and can be arranged in advance where it needs to be planned into a development program and can even be supplied as an on-site activity if required.

On Site Installation and Commissioning
Installation and commissioning is usually expected to take approximately one day. This service is offered in addition to the initial training for the product.

Cost of Ownership

As the RTD is continuously tracking the 3GPP standards, the details given in this document are subject to change. For the latest information about the RTD, please go to the www.anritsu.com
The Fastest Protocol Conformance Testing for Wireless Terminals

Anritsu supports the RAN5 standards and provides extensive resources to create the required tests to meet the certification requirements of the GCF and PTCRB. Anritsu was the first Test & Measurement Company to provide GCF validations on both LTE RF and protocol conformance tests’.

The Anritsu Protocol Conformance Test System (PCTS) is designed to meet the 3GPP TS 36.523 test requirements using TTCN-3 for LTE and TS 34.123 tests using TTCN-2 for UTRAN.

To complement the RTD, Anritsu also has Protocol Conformance Test Solutions for all major technologies from Rel99 UTRAN to LTE.

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For more detailed specifications of our conformance products please visit www.anritsu.com

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