3G

discover...

A complete system for 3G terminal interoperability and behaviour analysis

For UE design through to Network Operator evaluation

RTD

www.eu.anritsu.com

Anritsu

Discover What's Possible™

Leading the way in 3G Rollout

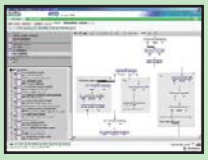
Anritsu has pioneered 3rd Generation mobile development programs and has been delivering Intelligent Test Solutions for all the 3G development teams that need to accelerate their designs to stay competitive. With firmly established R&D centres in Europe, Japan and North America, Anritsu can claim to be a truly International company with in-house expertise that no other company can match.
Anritsu has taken a lead with many innovative and advanced tools. It was the first with a complex simulation of a 3rd generation mobile network. As the first to market with working 3G test cases it has established itself in all the major UE development teams with the MD8480 Signalling tester.

The MD8480 has now become a worldwide reference and an essential part of test systems reflected by its extensive use in all aspect of the 3G UE development cycle including R&D, integration, conformance, interoperability and validation. It has the ability to create almost limitless network simulations, with up to 4 W-CDMA and 1 GSM cells as standard and many more by adding a 2nd unit.

The RTD is the latest tool from Anritsu's 3G stable to provide fast network simulation in a laboratory. This ensures that the behaviour of dual mode UEs can be comprehensively exercised.

Anritsu 3G Milestones

- **First to market with system simulator MD8480**
  -Industry standard system simulator, default system in use worldwide
- **Industry standard Protocol Test System**
  -default system in use worldwide
  -only supplier with integrated W-CDMA/GSM/GPRS for InterRAT tests
- **First to market with W-CDMA call processing**
  One Box Tester
  -Full test loop modes and power control testing
- **First to market with HSDPA test solutions**
- **First to market with system RF Conformance Test**
  -First for CE marking using R&TTE test cases
  -First full set of Tx/Rx
  -First Performance testing
  -First RRM System
- **First to market for W-CDMA service tester**
  -Full call processing and test loop modes
- **Leading the industry in next generation of system simulator testing**
  -RTD speeds up protocol testing
  -MD8470A brings application testing and test networks to the laboratory



MX786201
(Protocol Test System)
Uses Graphical MMI for Interoperability Testing

RTD

MD8480

W-CDMA/GSM System Simulator

MX785201
(Protocol Test System)
Uses TTCN for Protocol Conformance Testing

TS 34.123-3
TTCN Protocol Conformance Tests

RRM
(TRX/Performance Test System)
Uses TTCN for RRM Conformance Testing

TS 34.121 Clause 5 &RRM Resource Management tests

ME7873A
(TRX/Performance Test System)
Uses TTCN for FR Conformance Testing

TS 34.121
Clause 5 RF TX Tests
Clause 6 RF RX Tests
Clause 7 RF Performance Tests

Network Operators risk losing customers and their reputation if UEs do not behave correctly on their networks. UE development teams need to simulate conditions in networks that may be thousands of miles away and may not yet support the new functionality present in new handsets. Test simulations need to be created quickly and accurately. The RTD (Rapid Test Designer) system builds on Anritsu's pedigree of 3rd Generation Test Products and provides the tools to perform comprehensive Interoperability and Field Trial tests that cannot easily be performed on live networks, or indeed may not yet be present, for Dual mode W-CDMA/GSM UEs.

Third Generation Wireless - a significant technological challenge

Users of 3G phones will not be aware that UMTS is a significantly more complex and challenging handset technology than GSM. They will expect applications to work efficiently and seamlessly in order to justify the upgrade from GSM which has already set high expectations, particularly in size and battery life.

The problem is that many organisations have underestimated what will be required to achieve an acceptable level of test coverage in what is still a remarkably chaotic and disorganised market.
It has been estimated that more than 10,000 tests are required today to prove the behaviour of a 3G UE. However this is only to get to market with a limited number of functions. Proving correct operation on different networks and with many different applications is the next big challenge.

Beyond Conformance

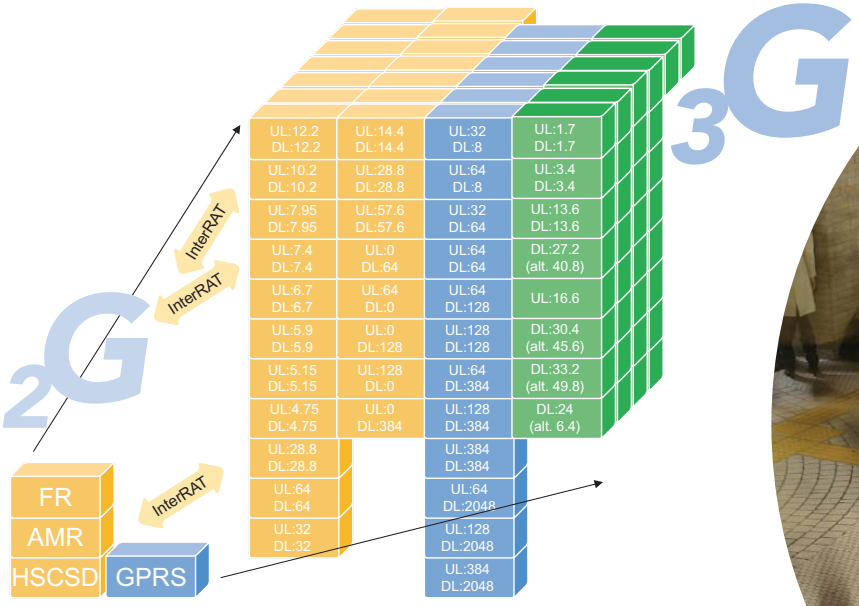
The GCF and ETSI have worked hard to create a set of conformance tests that prove a UE meets the various 3GPP specifications. The tests are written in TTCN and a great deal of resource has been used to ensure that these tests describe and perform correctly to TS 34.123. This only gets a design to the starting gate as there will be many tests that are needed to prove Interoperability and applications. Although conformance tests prove adherence to specifications, they play little part in simulating "real world" conditions where the impact of interfering signals and user plane data is assessed.

Security Issues

For 3G - with its enhanced data communication capabilities - security risks are several orders of magnitude higher. In fact 3G could replace the Internet as the primary target for the armies of highly intelligent and capable 'hackers'. No application developer can guarantee security without thorough real world testing.
Furthermore, the cost of failure is too high to allow this type of testing to be done in the field risking actual network exposure. It has to be done under controlled laboratory conditions where all manner of technical faults and even nefarious hacking scenarios can be thrown at the application to see how it responds. There are also many conditions that are difficult, unwise or impossible to create on a live network, so a method of emulating the network in a controlled and repeatable way is essential.

Roaming & Network Selection

With dual mode capability, UEs 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 want to exercise them to ensure the best possible behaviour on their network configurations. This type of testing will be crucial to UE selection - or rejection.



UE Development

R&D teams have already spent thousands of man hours in developing, integrating and proving their UE designs. These designs have only scratched the surface of the 3GPP capability and with new functions like HSDPA the task grows by the day. As the 3GPP specifications evolve, UE platform changes will be needed to reflect this. As a consequence, increased dependence upon regression testing will be required to ensure changes do not affect the existing features. As well as testing for correct operation, failure modes need examining in detail.

How many tests to prove a design

The vast number of different radio bearers and combinations of set-up and reconfiguration puts a heavy demand on the quantity of scripts needed to examine UE behaviour. Although TTCN is a powerful language for conformance testing, it becomes cumbersome and time-consuming when many different variants are required. Keeping track of version control and syntactical problems during development is a task in itself. A modular solution which allows simple test and variant creation is essential to improve test throughput.

Conformance testing and beyond

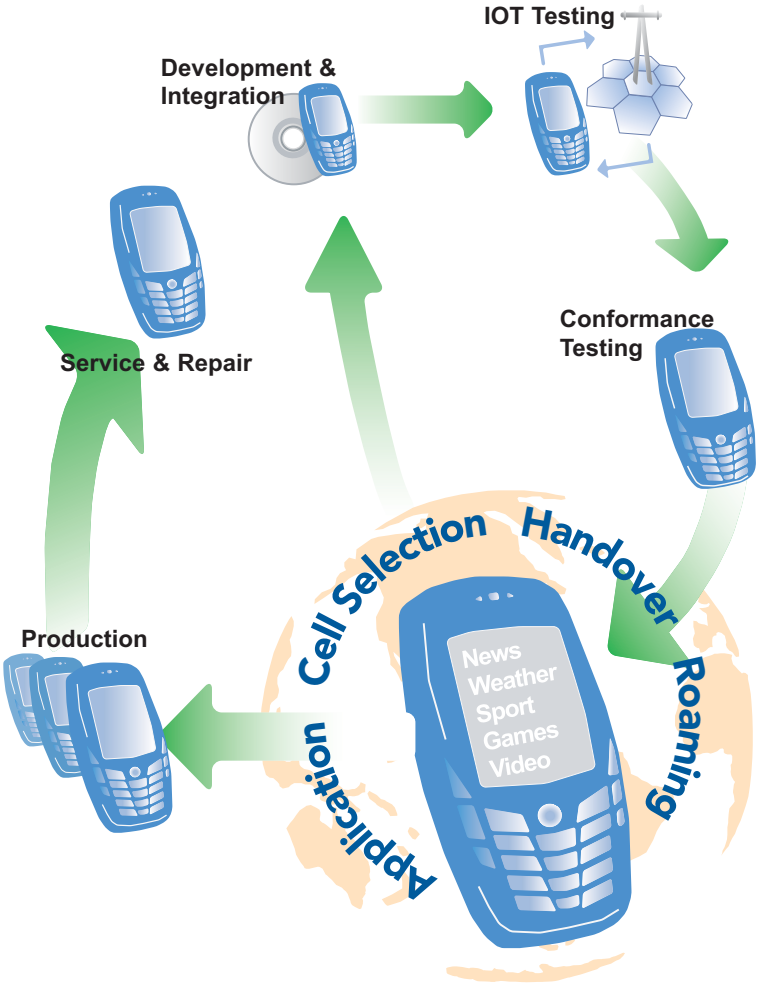
Conformance tests are an essential element in any test regime, however the tests are quite prescriptive and do not really reflect the environment seen in real networks. Although network interoperability will be performed on test networks, there are many tests that must be done on a flexible system simulator with the option to simulate different vendor's equipment.

Time to market

With competition increasing and loss of experienced staff an issue, these test requirements cannot afford to add time to the development of new products. Test systems must be able to reduce time to market while increasing test coverage. Being able to accelerate the learning curve and get staff up to speed is an essential element of any next generation test system.

Regression testing

Regression testing will also need to be performed as new software is introduced into networks or UEs. It should be possible to modify test criteria simply by applying a new set of network parameters. Also test automation is preferred to allow tests to be run unattended, presenting the operator with an executive summary of the various outcomes, enabling software stability trends to be mapped.



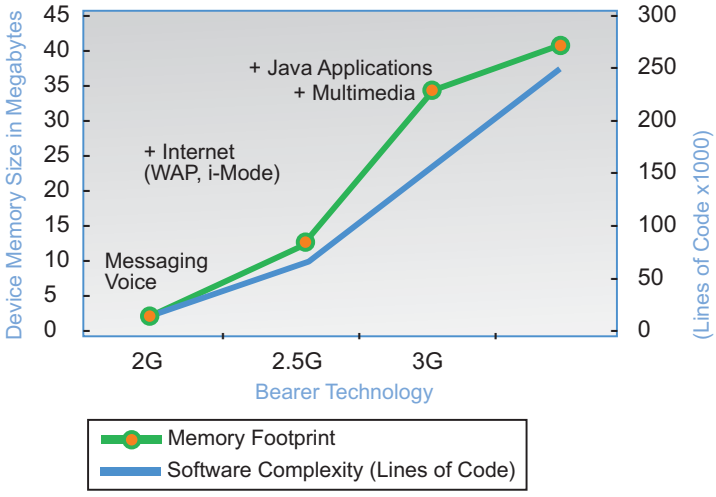
Users will expect to see benefits from 3G

3G users will expect faster data downloads, seamless applications and multiple applications running without any compromises. As data rates change under different traffic loads, users will expect to be able to use their UEs anywhere and on the move without any discernable degradation in performance.

They will expect to play games, download videos, talk and see other users. Power users will expect to do business with the same expectations they get on wired connections.

Business transactions will vary from stock market transactions to micro payments and will all need secure and simple processes. Buying a book over the WWWW (Wireless World Wide Web) needs to be a secure and simple process.

Today's generation of high spending power users will not expect to wait until the signal strength is good or they are stationary before making use of 3G.



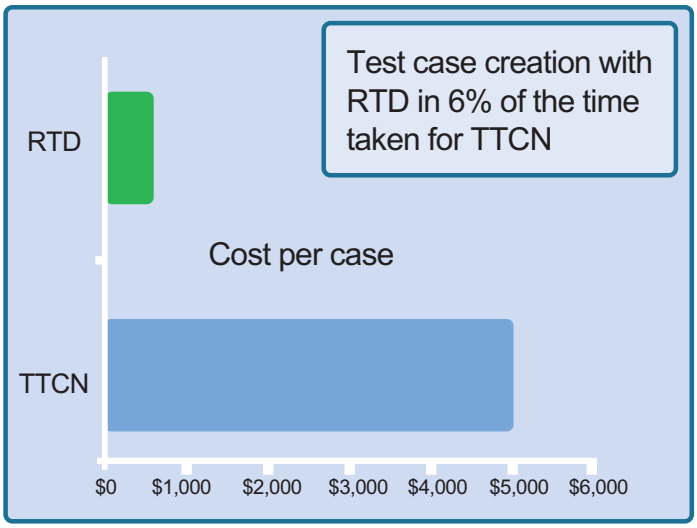
Test Case Example:

TTCN Test Cases, similar to Conformance Test Cases 9.4.2.1 & 9.4.2.4 took more than 6 days each to create and debug for one UE.
Using the RTD, the same tests were designed, debugged, executed on 3 different UEs in less than 3 hours.

RTD Provides

- **Fast turnaround of field problems**
- **Reliable automatic testing**
- **Cost saving by use of standard libraries and catalogs**

Cost Per Test Case



Network Operators

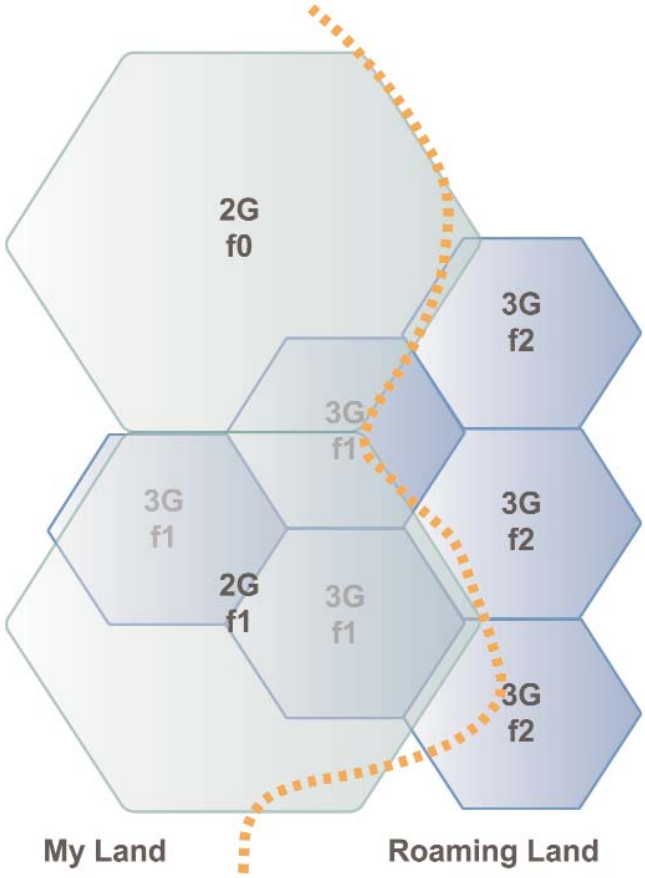
To maximise revenue, Network Operators must ensure that UEs stay on their own network or preferred roaming partners' networks and perform better than their competitors. As well as aesthetics, the UEs chosen to perform specific applications must also provide a reliable and friendly user experience. Where possible UEs will be selected to work in harmony with the network.

Cell selection and re-selection

There is always a compromise between battery life and continuous caretaking activities that a UE must perform to ensure that the correct network cell is used. Thousands of hours of field trials may still not be able to identify why a UE fails to maintain service on a preferred network.
Being able to set up controlled network simulations in the laboratory is the best way to check that UE algorithms perform correctly.

Simulation of Foreign Networks

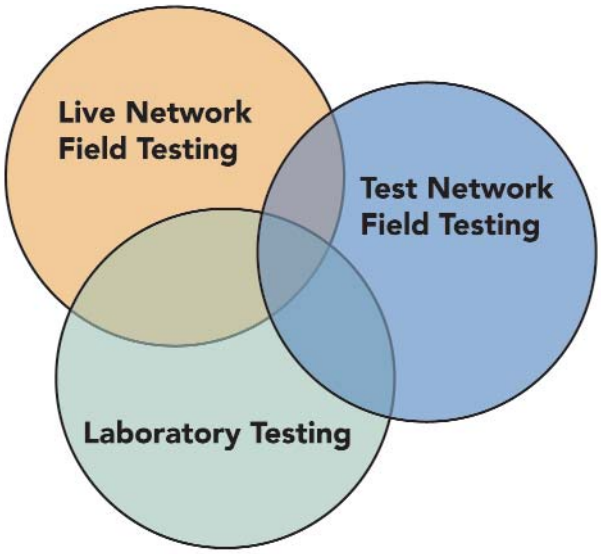
Roaming between networks with different configurations / parameters and even different ways of implementing procedures will create unpredictable outcomes. Today the cost of sending engineering teams to perform network testing over many weeks can be a very significant portion of a Network Operators proving budget.



New Services

Some Services may not be available at launch, so UEs claiming to support these services need to be tested before mass deployment.
Future functionality and applications can be provided in a controlled way using a system simulator and potential problems eliminated ahead of deployment.

Field Trials vs System Simulators



Live network testing will always be required, however System Simulation in a lab is now a viable alternative using the RTD.

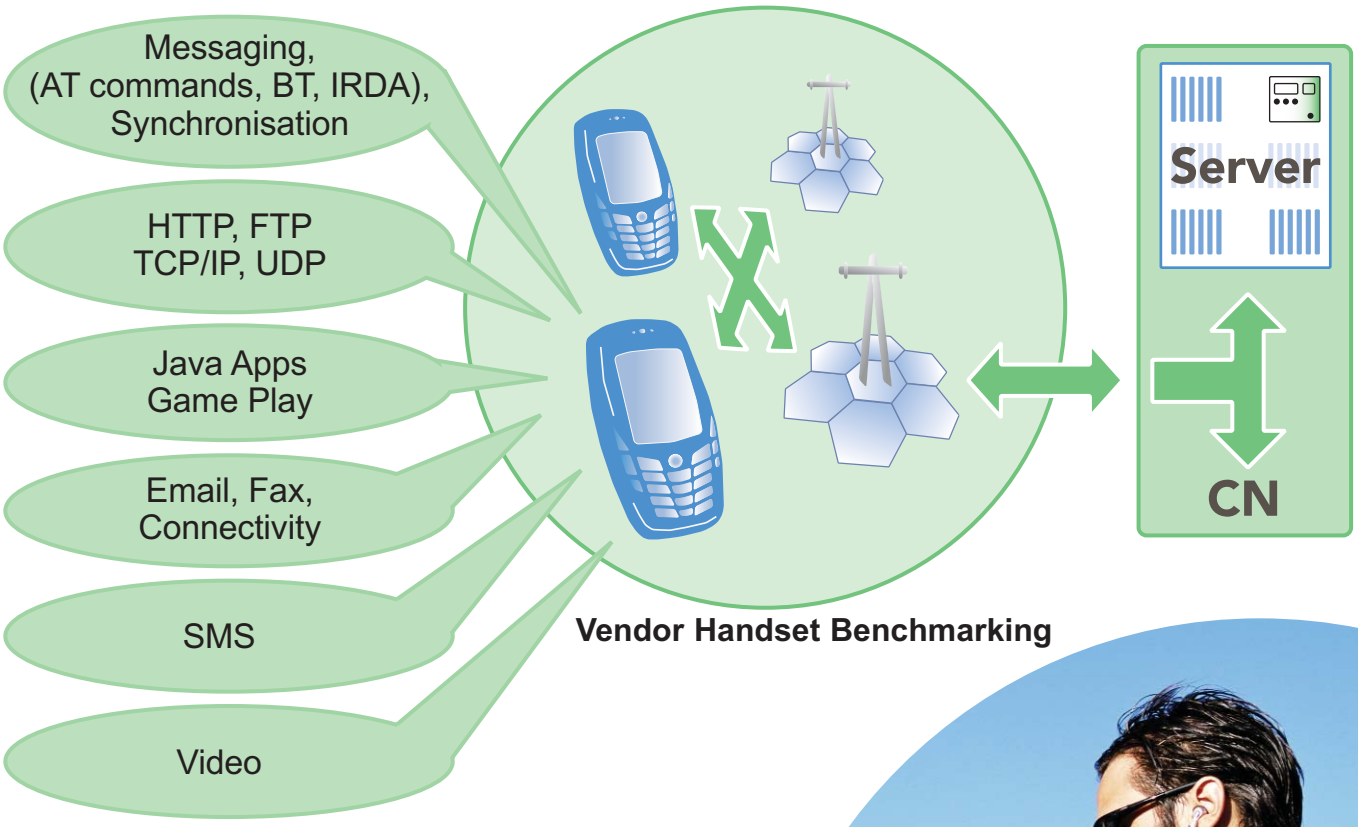
Application testing

Data throughput and delays need to be tested with a variety of radio bearers and configurations. Data must not be lost during handovers and reselection. As traffic builds up and volume driven state transitions occur the user needs to remain connected. Video is likely to play a big part in rollout and needs testing thoroughly.
Simultaneous applications will be commonplace in 3rd Generation systems, so interaction and priority between services will need simulating. E.g. calls must be received while creating an SMS or taking a picture, an incoming SMSs received while browsing.

Where high value applications such as financial transactions take place: handovers or link failures may be serious. Gaming may seem less important to test, but is proving to be a differentiator for a young and influential market.

Stress Testing

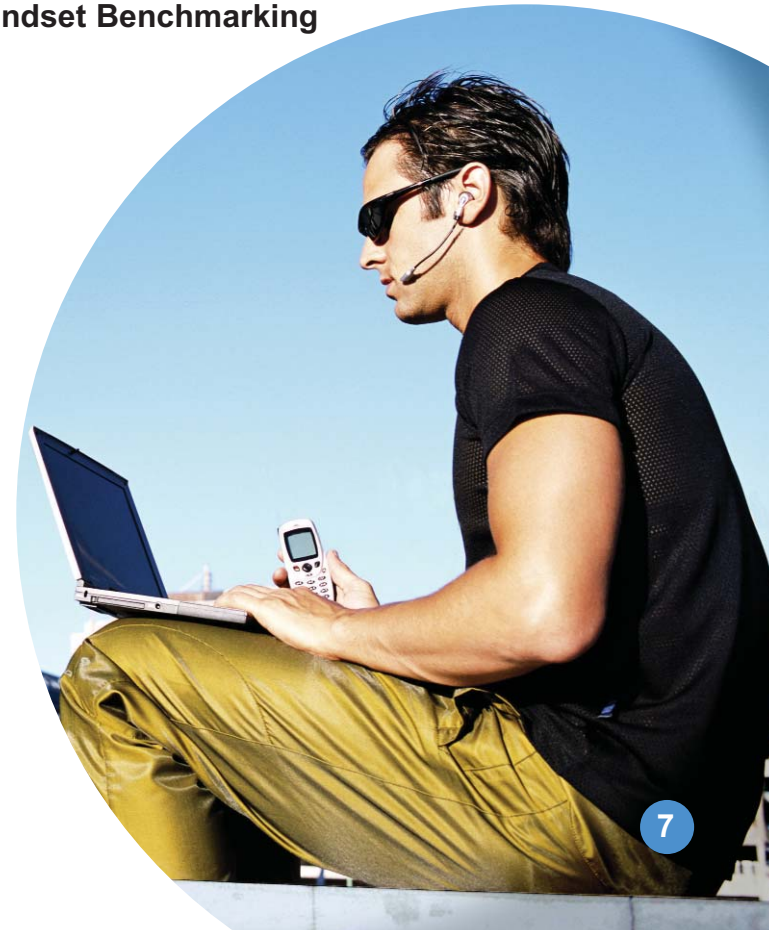
UE Stress testing can be automated and run overnight. With the ability to make thousands of reselections, calls, hand-overs etc. Tests that exercise the extremes and limits of UE provide quantitive and qualitative data for UE selection.



Vendor Handset Benchmarking

Test Case Example:

Using the RTD, a leading Western European Network Operator, developed a test case from a high level specification and tested successfully on UEs from 3 different manufacturers within 1 hour.
The test case was required by the operator as part of their interoperability tests and was part of a critical path activity for a WCDMA network launch.



RTD (Rapid Test Designer)

The RTD test system for dual mode UEs is a complete solution for anyone wanting to check the behaviour of UEs in development and before they are deployed on live networks.

The basic RTD system provides a simulation of a W-CDMA/GSM network with up to 4 W-CDMA and one GSM cell. More cells can be added for more sophisticated network simulations with additional hardware.

Building blocks from the tools' procedure library are simply added to the creationpage in the form of a flow chart to simulate network conditions. It is possible to change parameters to both simulate foreign and home networks or a combination of both. As well as a faster, sophisticated, richer experience for the user, RTD brings a growing number of applications and features via Test Libraries.

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 UE 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 UE vendors.

The MD8480 is used by all major UE development teams in a variety of test systems.

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
- HW & SW Integration
- SW Development

RTD Tools

The RTD consists of a set of core tools designed to support the process of creating, analysing, testing and providing evidence of the outcome with logs of the test run. Sophisticated post test criteria analysis can be done automatically to save manual analysis together with a number of optional components that allow the RTD to easily support specialised testing activities.

The tools within RTD

Procedure Libraries
These are building blocks for creation of tests. They are pre-tested to ensure minimum of effort to make creation easy, especially where knowledge of 3GPP may be limited. The finest level of granularity of procedures to enable any 3G functionality to be exercised is provided with accurate mapping on to all the air interface messages.

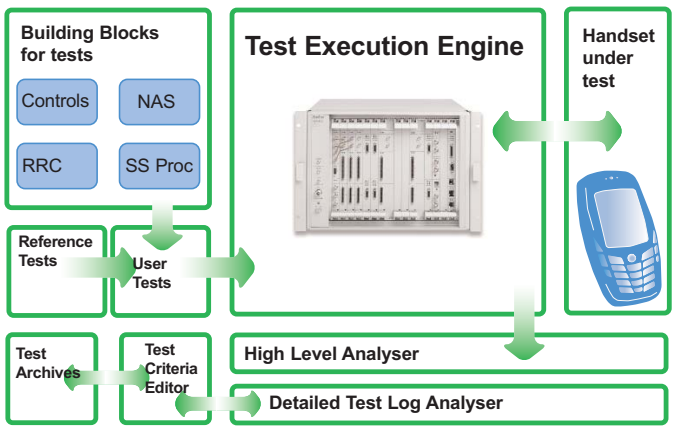
Reference: Tests
These reference tests are samples of commonly used functions to act as templates for the user. They allow Network specific parameters to be added manually or by means of a "catalogue" function. Libraries of custom test cases are also available on request.

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 after testing where needed.

High Level Analyser
This reduces the need for manual analysis. It uses criteria set by the user and may be changed as the test progresses.

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



RTD Tools

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.

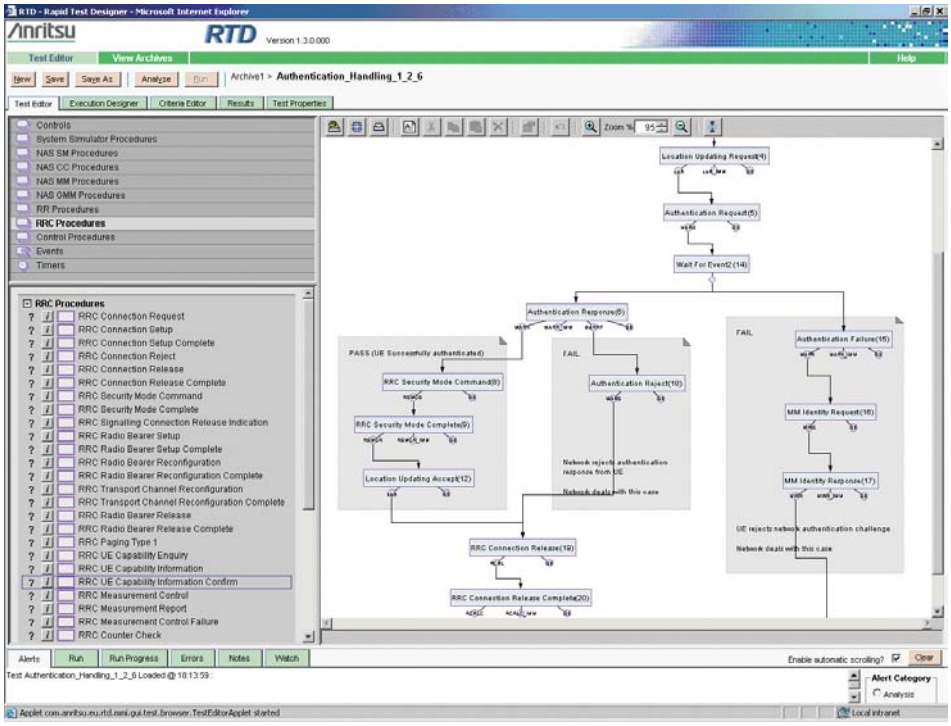
A local source of all relevant 3GPP specs are presented to the user in the form of context sensitive help, reducing the need to carry mounds of paperwork to a shared development terminal.

The RTD Procedures can be selected from a palette and added to your User Test simply by dragging onto the 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 the 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.

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 Anritsu web site
www.eu.anritsu.com (Keyword 'RTD')



Support & Training for the future

3rd Generation UEs will continue to evolve for many years. In order to keep in touch with market changes and the 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 increase productivity and maximise revenue.

Software Update & 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 track the evolving 3GPP specifications. 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 around 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. It can also be supplied as an on-site activity if required.

On Site Installation & Commissioning

Installation and commissioning is usually expected to take approximately two days. This service is offered in addition to the initial training for the product.

Using the Anritsu Test System On-Line Help

The aim of the help is to familiarise the user with the basic features and capabilities of the system by the use of working examples. Using the on-line help system is very easy, making use of the browser to navigate through the menus.
First time users will find explanations throughout the "help" to guide them through and help understand the software and operation of the system.

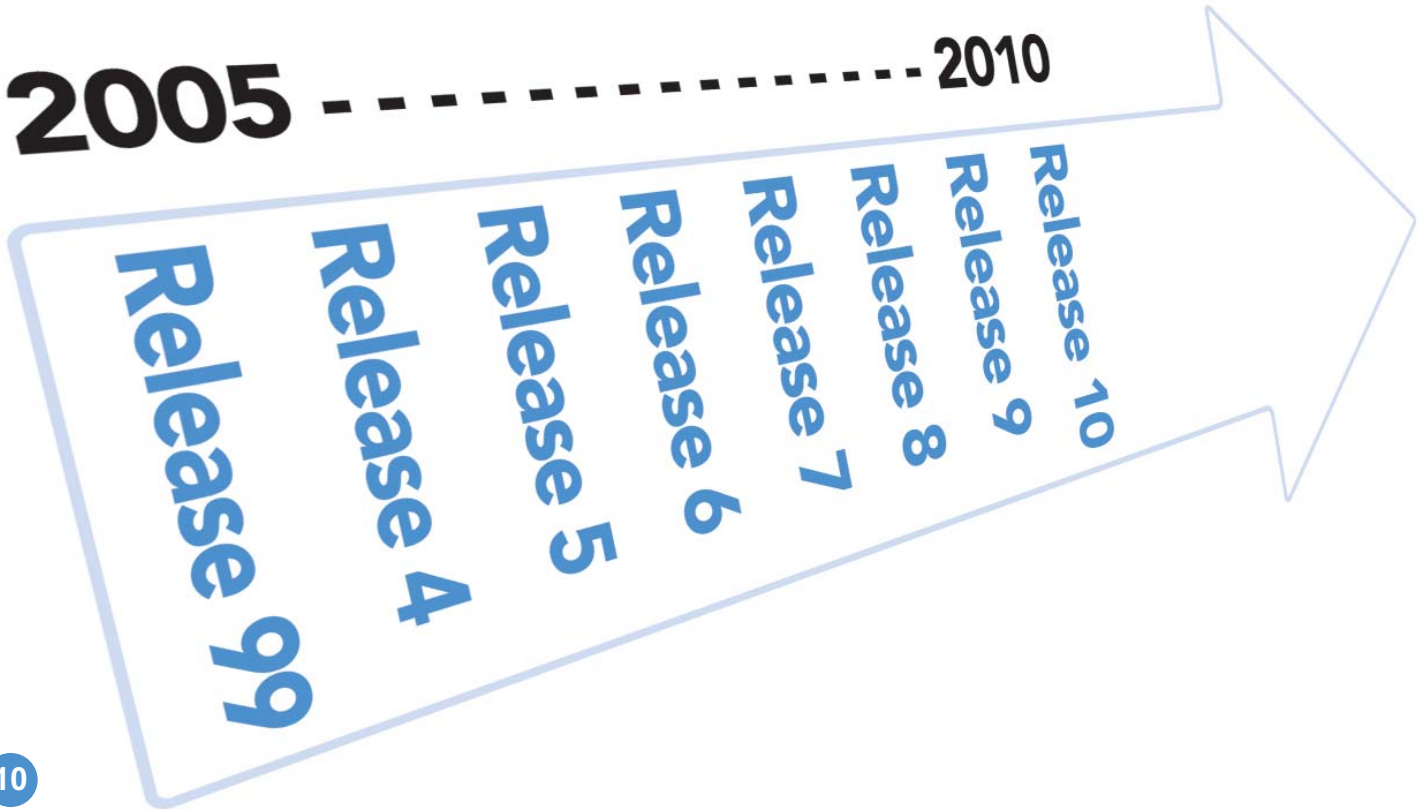
Training

A two-day product training course is available as an option with the RTD and comprises a combination of classroom and practical activities. Training can be provided either at the customer site or at Anritsu facilities. This training should not be seen as a substitute for comprehensive training on the 3GPP protocol although the tool itself provides an excellent way of learning.

Support Desk

Where possible we provide local support in territory or from a local field office. This is the first line of support, which is backed up from our International support desks. From day one we aim to provide an efficient support service and fast response time to technical questions.

For full details of the functionality currently available and planned for the future, please contact your local Anritsu Sales office.



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