Case Study

Using TTCN-3 and TTworkbench for the Automation of System and Component Testing of the R&S ACCESSNET®-T TETRA Network

Mobile Communications – System and Component Testing – TETRA

About R&S BICK Mobilfunk

As established specialist for mobile communication technology and strong member of the Rohde & Schwarz group of companies, R&S BICK Mobilfunk has been a trend-setter for professional digital radio networks for many years. Right from its foundation, R&S BICK Mobilfunk has started playing a competent and active role in the development of the TETRA standard by working together with ETSI. R&S BICK has considerably influenced the implementation of user friendly and state-of-theart radio communication solutions.

Expanding its leading position in the world market R&S BICK Mobilfunk has also developed sophisticated customized solutions in digital TETRA networks: for public transport companies, public safety organisations, for multiple industries, as also for airport networks, and oil or gas related enterprises.

R&S BICK's core product is the ACCESSNET®-T TETRA network solution, which - as a terminal supplier independent system - intensely supports the multi vendor principle by fully complying with the open European TETRA standards. But also a constantly growing number of applications worldwide harmonize with the ACCESSNET®-T system infrastructure. Especially the integration of applications via its common application interface A-CAPI® is promoted by the Rohde & Schwarz ACCESSNET®-T TETRA Application Partner Program A-TAPP®.

Project Description

The main test suite performs tests by operating TETRA handsets and mobiles via the Peripheral Equipment Interface (PEI), a TETRA enhanced AT command set, in clear or encrypted mode. The ACCESSNET®-T network is stimulated by setting up voice calls, sending SDS and status messages or transmitting circuit mode data. Channels can be blocked automatically by executing SNMP commands to verify queuing scenarios. Other test suites test only specific system components or -interfaces like the A-CAPI®, which is used for example by dispatcher applications.

Requirements on a Test Language and Tool

R&S BICK Mobilfunk did require a tool to run automated system and component tests of its primary product, the ACCESSNET ®-T TETRA network, to reduce time consuming and repetitive manual tests. Expecting thousands of test cases to be created, R&S BICK needed a stable and future-proof solution, which was perfectly met by using TTCN-3 as the only test language standardized by ETSI.

TTCN-3 has been designed specifically for testing protocol based status machines, i.e. reactive systems, like the protocol stacks of today's digital mobile networks. When using a common scripting language one usually has to provide a message system, blocking states, etc. on a do-it-yourself basis - basic elements already provided by TTCN-3! So TTCN-3 was our first choice considering the testing language.

Reasons for Choosing Tools of Testing Technologies (now Spirent)

The decision to use TTworkbench as TTCN-3 tool resulted from a thorough and extensive evaluation of the Rohde & Schwarz test equipment department at Munich and R&S BICK Mobilfunk. While R&S Munich's interest was on an adaptable and extendable platform for integrated protocol testers, we valued the flexibility of a PC based TTCN-3 tool running on either Windows or Linux. The richness of the Eclipse based IDE and GUI was quite compelling in contrast to other tools taken into regard.

Concerns about a lack of performance of a JAVA based test system have been reduced quickly, since Testing Technologies' (now Spirent) development team has managed to improve the performance of TTworkbench constantly. The release of version 1.1.1, that highlighted a leap in performance, convinced R&S BICK to use TTworkbench for load, performance and long-term tests as well.

TTworkbench provides a test designer and -executor with all imaginable test automation tools (e.g. an MSC based editor or a message wizard for creating templates) in one integrated test environment. Also, Testing Technologies (now Spirent) proved to be open-minded for ideas regarding the further improvement of TTworkbench. We have found TTworkbench to be the perfect solution to meet our requirements for running automated system tests, preferably at nighttime, to reduce the daily burden of endless manual testing.

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Kinds of Systems Tested

R&S BICK is testing TETRA network elements on a system and component test level either directly by e.g. network connections or via air interface by controlling TETRA mobiles and handsets. As the system is being stimulated via several interfaces using various connections and protocols like TCP, UDP, serial COM, GPIB, etc., the test adapters and e.g. codecs for proprietary message formats had to be implemented before writing any test cases. But the JAVA language, which TTworkbench and the generated code are based on, turned out to be easy to learn. The reference designs, provided by Testing Technologies (now Spirent), have been very useful for creating test adapters and codecs on our own.

Inhouse Creation of Test Cases and Future Plans

Since there are currently no TTCN-3 test cases available for TETRA from ETSI, R&S BICK had to create its own test cases, which turned out to be easy-going once the test adapter and codec framework was set up. After participating in the three day TTCN-3 Tutorial at Testing Technologies' (now Spirent) in Berlin, our team had a good start getting into TTCN-3 business.

Future plans of R&S BICK Mobilfunk include cell re-selection tests by operating GPIB controlled RF attenuators and additional system components.

Testing Technologies' (now Spirent) Reaction Time, Support and Quality

In most cases, the response time of Testing Technologies' (now Spirent) support team has been considerably fast. Solutions or patches are generally provided within days or even hours, seldom later (depending on the complexity of the problem), if not even solved directly by phone.

"R&S BICK needed a stable and extensible platform for running automated system and component tests. TTworkbench turned out to be the perfect solution for our requirements, providing all kinds of test automation features in one integrated test environment. Expecting thousands of test cases to be created, we value this future-proof, PC based TTCN-3 tool with such flexibility, i.e. concerning test interfaces. By running our tests automated, preferably at night time, we expect to clearly reduce the daily burden of manual testing."

(Michael Dralle, Development and Test Engineer,
R&S BICK Mobilfunk GmbH, Germany)

About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

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