



Qosmotec
Software Solutions GmbH

Technical Overview
“Test Automation System LTS-F”



Test Automation System LTS-F

TABLE OF CONTENTS

0	DOCUMENT CONTROL	3
1	SYSTEM OVERVIEW	4
2	SYSTEM SETUP	5
3	SYSTEM SOFTWARE	7
4	TEST FEATURES	10



Test Automation System LTS-F

0 Document Control

0.1 Imprint

© Qosmotec Software Solutions GmbH
All rights reserved.

Qosmotec Software Solutions GmbH
Schloss Rahe Str. 3
52072 Aachen
Germany

Telefon: +49 241 8797 510
Fax: +49 241 8797 515
Internet: <http://www.qosmotec.com/>

0.2 Document Description

This document gives a quick overview about the Qosmotec LTS Field Test variant to execute wireless network tests in the live network. It is intended to give potential customers a first technical insight into the architecture and the product's capabilities.

Test Automation System LTS-F

1 System Overview

The Qosmotec LTS-F is a distributed end-to-end test system for verification of wireless network performance as well as for international roaming testing. The goal is to spread test UEs in various places in the network or even in foreign countries, but have them reachable for testing from one central location where the tests are organized and planned and run the tests automatically and unattended. Thus, it is ideally suited for network operators, service and content providers, MVNEs and MVNOs to test the network and the network services in various locations in the field.

Figure 1 shows the setup of a LTS-F system:

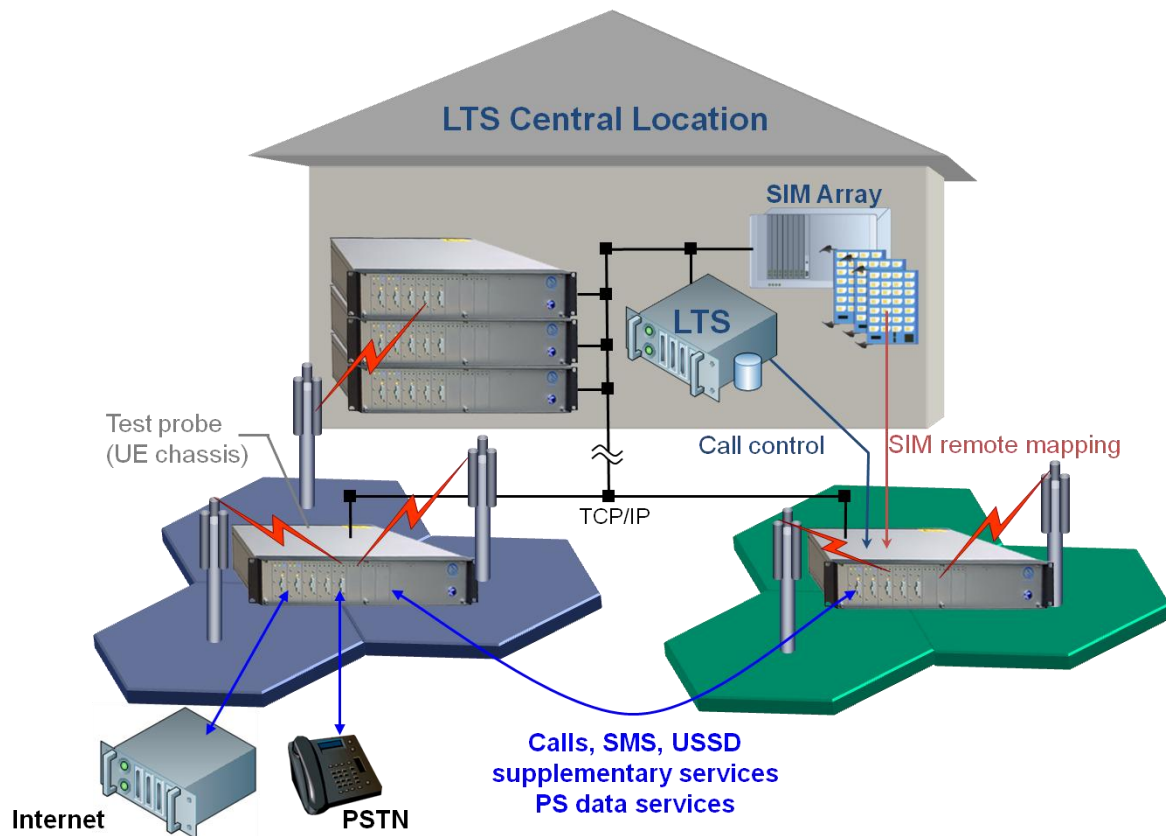


Figure 1: LTS application scheme

Test probes containing real UEs as well as smartphones can be placed in any location, given that they are reachable via ethernet connection. Tests are scheduled on them from a central location. To gain higher flexibility, the system even allows to place the test UEs in the network without a SIM card inside. This can be mapped via software from the central location to each individual test UE.

Test Automation System LTS-F

2 System Setup

The LTS field variant setup is based on a compact **UE chassis**, that consists of an internal CPU and up to 8 industrial terminals for 3G, 3.5G and 4G of the GenPro series, based on Sierra Wireless chipsets. UE chassis variants with 110 – 240 V power supply as well as with 12 V power supply for usage in vehicles are available. The SIM card slots of the industrial modules are front side reachable. On the rear side are antenna connectors (SMA type) for each UE. Additionally, the terminals are equipped with SIM card adapters to receive SIM card information via software (see below). The UE chassis has a compact size (45 cm x 25 cm x 10 cm) making it easily transportable. Additionally, rack mounting brackets can be attached to insert the UE chassis into a standard industrial 19” rack.



Figure 2: UE chassis for up to 8 industrial terminals

The tests are executed on the UE chassis, controlling the contained test UEs. The tests executed on a single UE contain of a sequence of test steps, which can be circuit switched or packet switched functions. Tests can be executed on a single UE (e.g. data tests), between UEs within a UE chassis or even between UEs of different chassis (see Figure 1). For tests including PSTN lines, a separate PSTN server can be included into the test system. Data tests are typically executed against a dedicated test host as part of the system, but can alternatively also be executed against any data source (e.g. download of an arbitrary web site). A complete list of supported test features is listed in chapter 3.

With these compact UE chassis, the LTS field variant can be setup as a distributed test system with a **central application unit** and remote test probes for testing in dedicated problem areas, in foreign networks or on the move. On the central application server, test scenarios are assembled and parameterized. The UEs as well as SIM cards for testing are selected for a specific test run. Test scenarios can either be executed immediately or scheduled for execution at a dedicated point of time. This allows to run tests automatically and unattended in periods of special interest (e.g. peak hours) or out of office time without manual interaction.

Test Automation System LTS-F

To operate LTS for testing, it must be guaranteed that an IP connection between the central application system and the various UE chassis is available. This can be established via WAN, LAN or via a wireless network connection. The possible number of UE chassis controlled from one central LTS application system is unlimited, so that a test system might consist of a high number of UEs, all executing tests in various points of the network and collecting data for benchmarking purposes simultaneously.

An optional extension of the LTS system is the **SIM Server Array**. This allows to assign SIM cards to the test UEs from remote via software. The SIM card is physically not inserted into the UE's SIM slot, but in an array of SIM card holders. From there, any SIM card can be selected to be mapped to a specific UE for a test. The only requirement is an uninterrupted IP connection (via WAN or LAN) between the SIM array and the CPU inside the UE chassis. The SIM server array is available in 3 different sizes:

- as a small rackmountable unit (1U) with space for 1 SIM Board (32 SIM cards),
- as rackmountable unit (6 U) with space for up to 7 SIM Boards (224 SIM cards),
- as rackmountable unit (6 U) with space for up to 13 SIM Boards (416 SIM cards).



Figure 3: SIM Server Array and SIM Board for 32 SIM cards

Typically, the SIM server array is located together with the LTS application server, while the various UE chassis are spread in the network to perform the tests locally and reachable via an internet or wireless connection. The combination of LTS with a SIM server array provides powerful testing capabilities for service providers operating in various regions or countries, like virtual network enablers. How the system fits into the LTS architecture is visualized in Figure 1.

Test Automation System LTS-F

3 System Software

The LTS application software is installed on a Windows PC (2000, XP and 7 supported). The graphical components can be used on the application server itself or be installed on any user PC connecting to the application server. This allows to use LTS in multi-user mode.

The **Test Scenario Editor** allows to create test scenarios from predefined test scripts, each of them describing a set of functions executed on one or several mobiles in order to fulfill a certain test purpose (e.g. a voice call between two mobiles or download of a web-site with an active PS session). In the Test Scenario Editor, the user has the possibility to assign test resources (test UEs and SIM cards) to the various instances, to determine their execution parameters and to schedule them arbitrarily for parallel and sequential execution. By simple drag and drop actions large scenarios consisting of hundreds of test cases can be created within seconds.

Alarms can be configured for the test execution to be informed about failures immediately. These alarms can be generated by E-Mail or via SNMP to integrate LTS into monitoring systems.

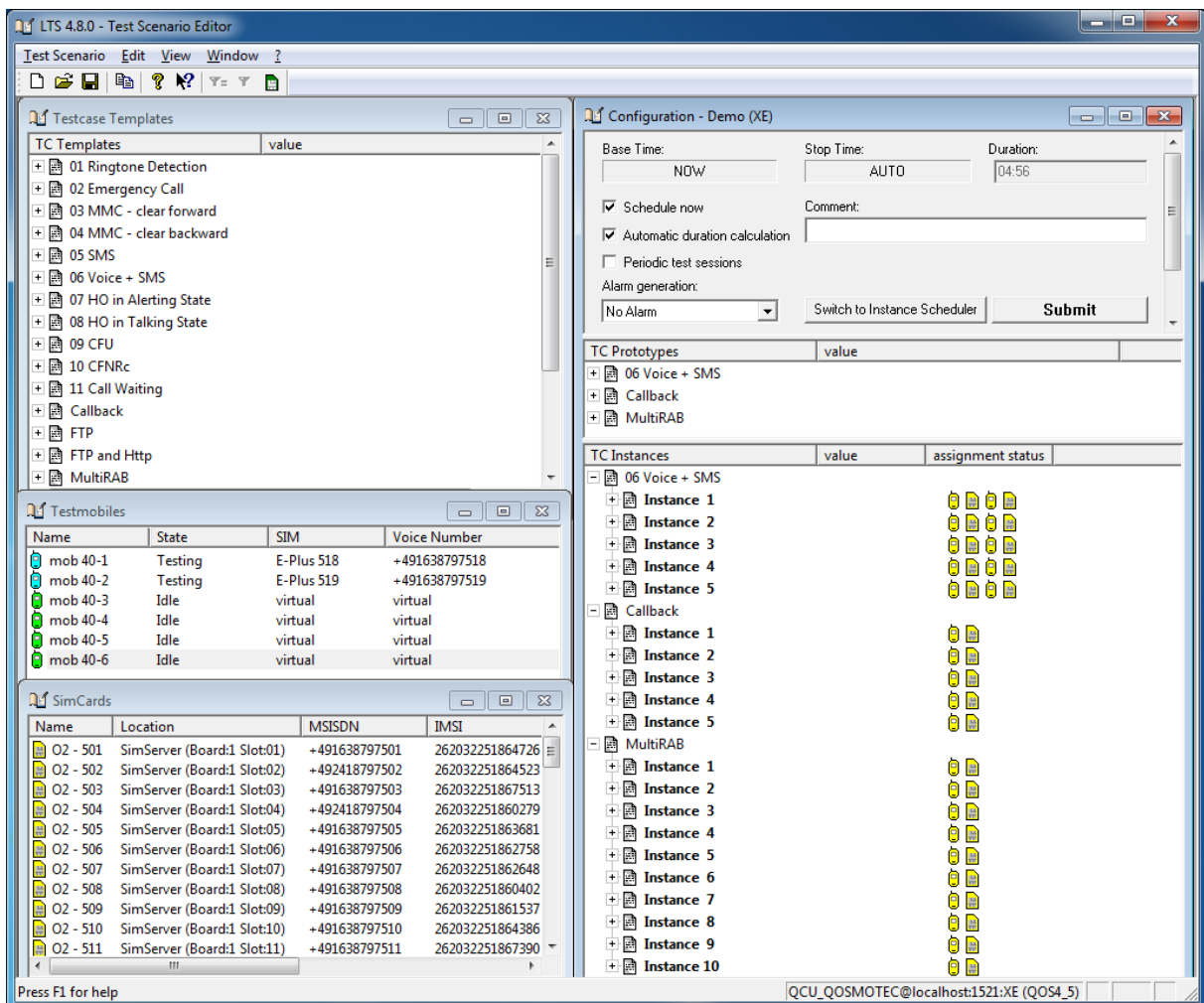


Figure 4: A test scenario created in LTS



Test Automation System LTS-F

The test UEs report results and measurements back to the LTS application server. The **Test Result View** shows the test executions on test scenario basis. A detailed execution log displays each test step in milliseconds accuracy. It has various data views for visualization of the collected data, especially for packet switched tests. All result and data windows are synchronized with each other, so that a selection in one window automatically highlights the respective time frame in all other windows. For reporting needs beyond the capacities of the LTS system, all data can easily be exported into in CSV format for post processing purposes.

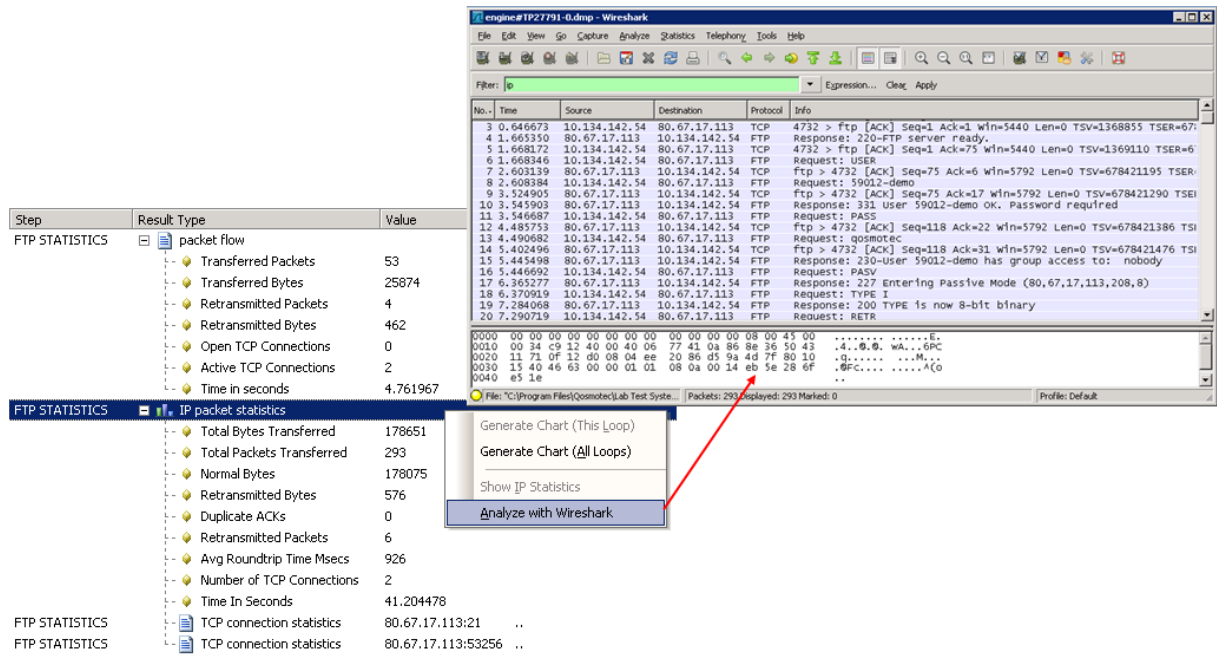
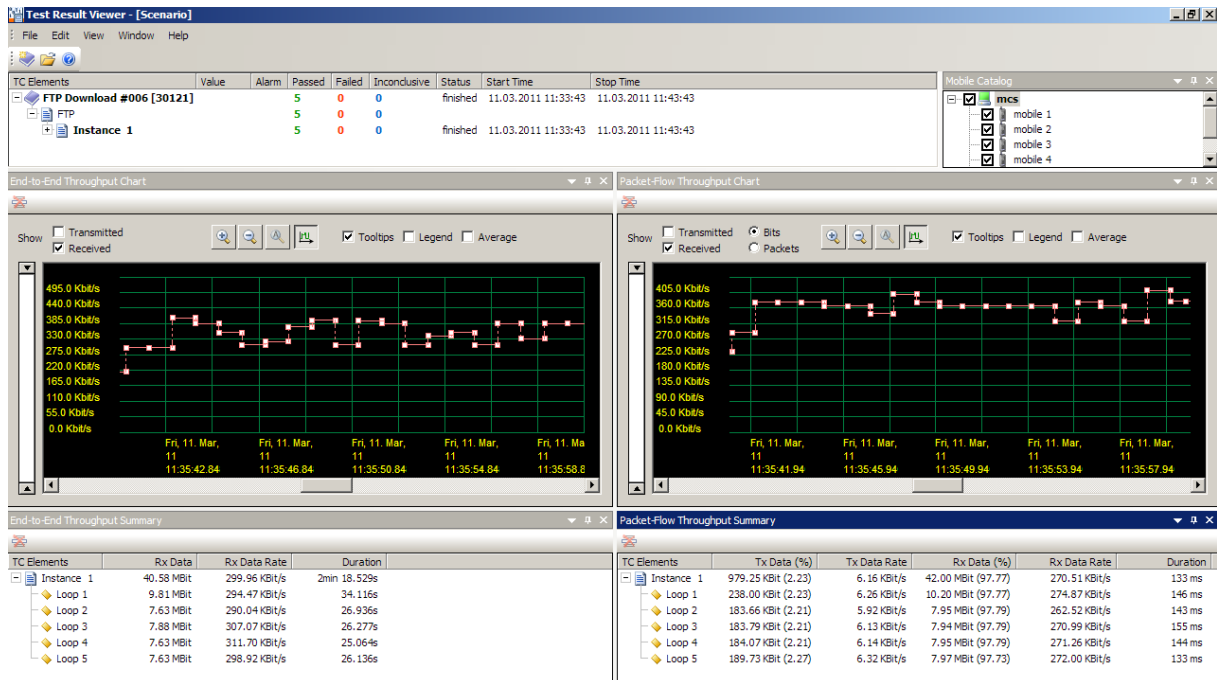


Figure 5: Various Test Result Views

top: Traffic Throughput from end-user perspective vs. network perspective
 bottom: IP dumps stored for the test execution can be opened with Wireshark

Test Automation System LTS-F

In addition to this, the LTS system consists of a **Test Case Editor**, that allows to compose test scripts easily from atomic test steps via drag & drop actions. The test cases composed here appear in the test scenario editor and can be used for test scenario creation.

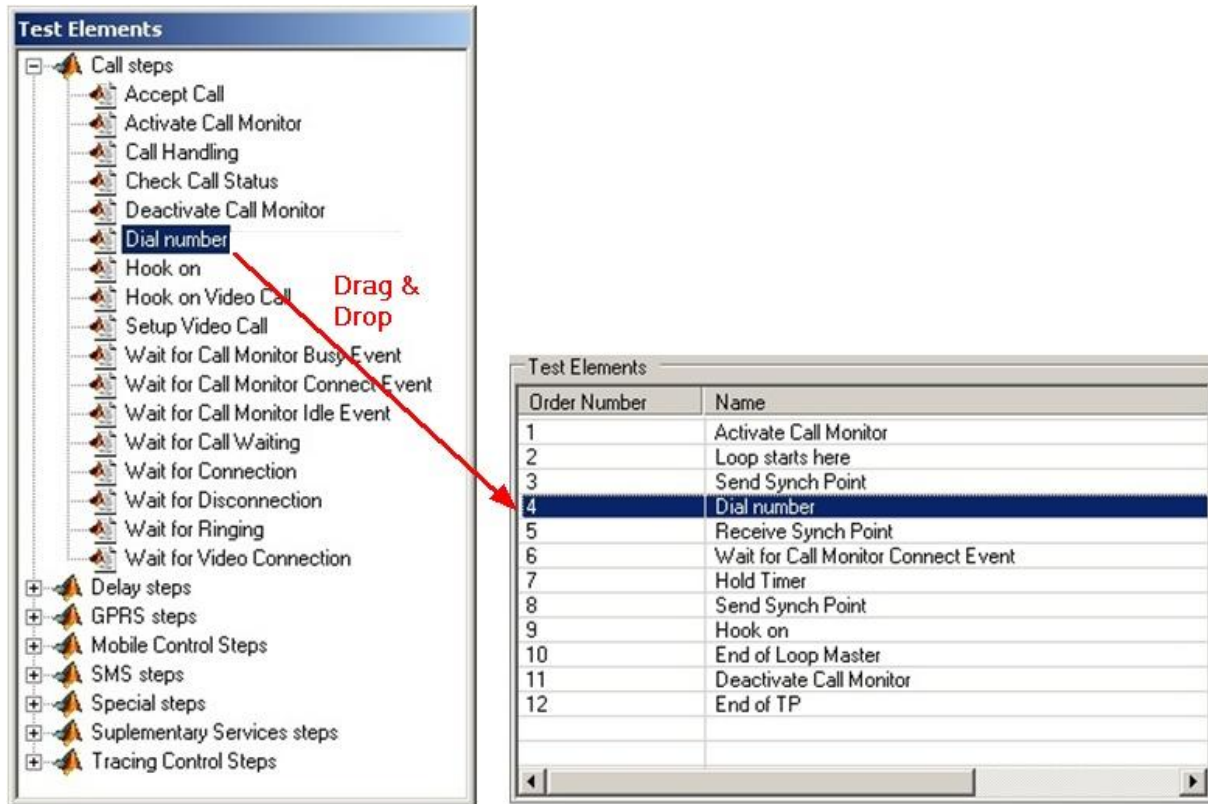


Figure 6: Creating a test case (mobile originated call) with the test case editor

Test Automation System LTS-F

4 Test Features

The system is capable of the following test features (some listed features are dependant on the used test UE):

- Voice Calls (Mobile Originated and Mobile Terminated)
- PSTN Calls (Landline Originated and Landline Terminated)
- VoIP Calls (Outgoing and Incoming)
- Voice Quality analysis based on PESQ standard
- Circuit Switched Data Calls (Mobile Originated and Mobile Terminated)
- SMS (Sending, Reception and Content Evaluation)
- USSD messages
- DTMF (e.g. VAS and Voice Mailbox control)
- Supplementary Services
 - Call Forwarding
 - Call Waiting
 - Call Conferencing
 - Call Barring
 - Calling Line Identity Presentation / Restriction
- Definition of PDP Context
- Definition of Quality of Service Profiles (2.5G and 3G) and setting of connected parameters:
 - Precedence class, Delay Class, Reliability Class, Mean Throughput Class, Peak Throughput Class
 - Traffic Class, Maximum & Guaranteed Bitrate (UL / DL), SDU delivery parameters (in-sequence order, error ratio, delay, traffic handling priority)
- Activation / Deactivation of PDP Context



Test Automation System LTS-F

- Packet Switched Data Transmission:
 - Ping
 - FTP (UL and DL)
 - HTTP
 - WAP
 - E-Mail (SMTP and POP3)
 - UDP Streaming
- MultiRAB (CS Voice + PS Data)
- Data Throughput Measurements and Statistics (Uplink and Downlink)
- Software controlled assignment of remote SIM Cards to mobile phones
- Network registration and deregistration
- Automatic and manual operator selection
- Radio access technology selection (2G, 3G, 4G)
- eMLPP Priority subscription and registration
- Voice Group Call Services
- Voice Broadcast Services