

# Turning raw drive test data into actionable information

The new R&S®ROMES network problem analyzer software analyzes the large volumes of data captured in drive tests and breaks it down into relevant problem spots to help operators identify and clearly document weak points in mobile radio networks.

## Gaining and maintaining a clear picture

It is a problem that mobile network operators know all too well: Drive tests generate vast quantities of data that need to be analyzed to identify weak points and gaps in network coverage. Manually analyzing data on this scale can be a laborious process — one that calls for special tools. For R&S®ROMES users, though, life is a whole lot easier, because the drive test software provides a useful array of tools designed to sequentially analyze individual measurements.

With the R&S®ROMES network problem analyzer (NPA) software, things are simpler still. This new tool can automatically evaluate mass test data and even entire drive test campaigns, either on a computer in the vehicle during an actual drive, or later, back in the office. Resorting to manual evaluation is only necessary in rare instances.

The software consists of a core analysis engine (which processes the test data from R&S®ROMES and dispatches it to a number of analysis plug-ins) and a user interface that displays the results in a clearly organized form.

The NPA uses dedicated analysis plug-ins for each of the tasks involved in post-processing the data. This modern architecture means that the software can be expanded quickly and easily to handle new or highly specialized tasks — by creating special analysis plug-ins (e.g. to identify uplink interference or to support new standards like LTE) or by implementing new views in the user interface to enhance the presentation of results. The optional software development kit (SDK) is also simple to use, enabling even users with a limited knowledge of programming to create their own plug-ins for any kind of drive test data processing.

FIG 1 A section of the page displayed when the R&S®ROMES NPA starts: It explains the basic workflow to help users familiarize themselves with the software quickly.

### Welcome

Welcome to the Rohde&Schwarz Network Problem Analyzer. This application is designed to help you automate the analysis of measurement data recorded with the ROMES measurement software.

### First Steps

#### Adding Data Sources

 The first step in working with the NPA is to add some data sources that contain measurement files. Data Sources are local file folders containing ROMES measurement files. Either drag some measurement files or folders from an explorer window into the Data Source window on the left, or use the Add Folder menu entry or toolbar icon.

#### Analyzing Files

 Once you have imported some folders or files into the Data Source tree, you can select one or more measurement files that you want to analyze. Use the context menu or the Run Analysis command from the menu/toolbar to start the analysis (illustrated with the brain icon).

#### Showing Analysis Results

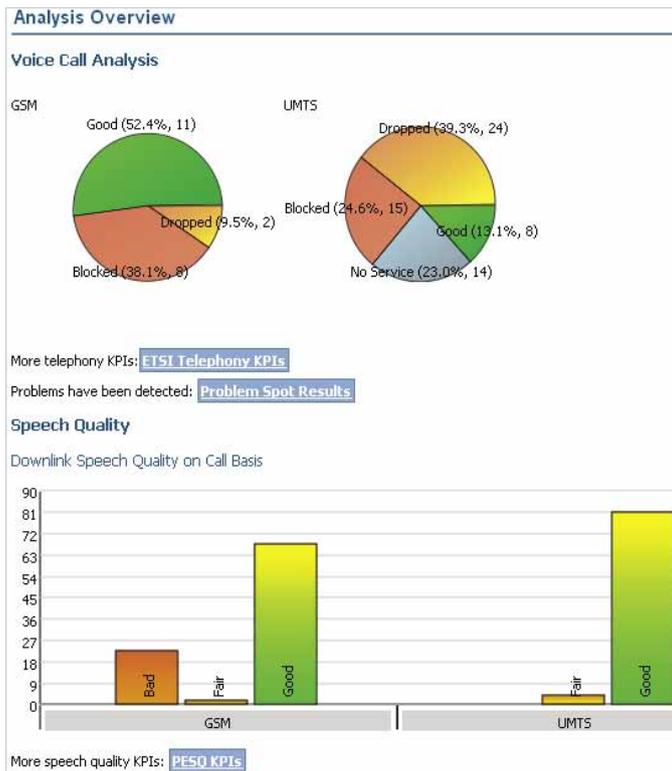
 Result files are shown in the Data Source tree below the related measurement file. Click on the Open Overview Page button in the toolbar to view the content of the analysis file. Read [here](#) for more details on adding additional files to the analysis view.

### Easy-to-use interface ...

The R&S®ROMES network problem analyzer software has a user-friendly browser-like interface designed to guide network optimizers and field engineers easily through the workflow. The start page contains all of the main functions and explains how these work together (FIG 1). It also includes links that display detailed views. This makes learning to use the software a simple process and enables users to produce usable results exceptionally fast. The results are displayed as problem lists, as tables of transactions, and as pie and bar charts of statistics (FIG 2).

Users can run the R&S®ROMES drive test software directly from any item in the problem lists. The software presents a problem area as a combination of time and location information, ready for deeper analysis. Due to this drill-down ability, which is performed automatically via a menu entry, it is not necessary to replay the test file at the desired point. This significantly accelerates file loading, especially with large files (FIGs 4 and 5). Users can increase and reduce the content of individual pages easily using drag-and-drop. For instance, they can drag additional results into the analysis view and extend tables and charts by inserting more data.

FIG 2 An overview of results from a statistical analysis of several drive test files.



**Problem Spot Attributes:**

File: D:/RomesData/NQA/testzug.rscmd  
 Category: Interference problem  
 Title: Dropped CS Call MOC  
 Description: interference problem at drop timestamp (left window)  
 Network Provider: Vodafone D2 GmbH  
 RAT: GSM  
 Device: Z500 [1]  
 Start Time: Dienstag, 29. Januar 2008 16:49:06 (385598 ms)  
 End Time: Dienstag, 29. Januar 2008 16:50:05 (444471 ms)

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**Problem Causes identified:**

*High Priority:*  
 \* interference problem at drop timestamp (left window) [199]

*Medium Priority:*  
 \* handoverFailure with cause: ( 3 ) Abnormal release,timer expired; Cell-ID: 0 [202]  
 \* handoverComplete after handoverFailure [208]

*Low Priority:*  
 \* Handover incomplete before drop [209]

FIG 3 A prioritized list of a problem spot's causes.

The analysis modules (called test data processors) are configured through the user interface. The settings for these modules can be combined to create comprehensive analysis configurations — e.g. to evaluate specific campaigns at a lower or higher threshold, or to confine processing to specific types of analyses.

### ... and highly analytical core

The NPA's core analysis engine processes the R&S®ROMES test files, then conditions and passes the data to the analysis modules. The NPA can be expanded with little effort through its lean C++ programming interface. The software library supplied eases implementing new modules, because all the user needs to do is define the specific analysis logic. This means network operators and service providers can create their own NPA expansions — a valuable capability that makes sure in-house expertise stays in-house and that engineers can rapidly produce specially tailored analyses when they have to fix specific network problems quickly.

The basic version of the NPA provides comprehensive analysis functionality for voice calls in GSM/WCDMA networks. Depending on the outcome of voice call analysis, the software can run various problem detectors — to examine handover procedures, check coverage and interference, and identify network and mobile handset malfunctions, for example. This produces a catalog of problem spots, plus a prioritized list of causes identified for each problem spot (FIG 3).

FIG 4 A simple mouse click is all it takes to drill down from a problem spot into a detailed R&S\*ROMES analysis.

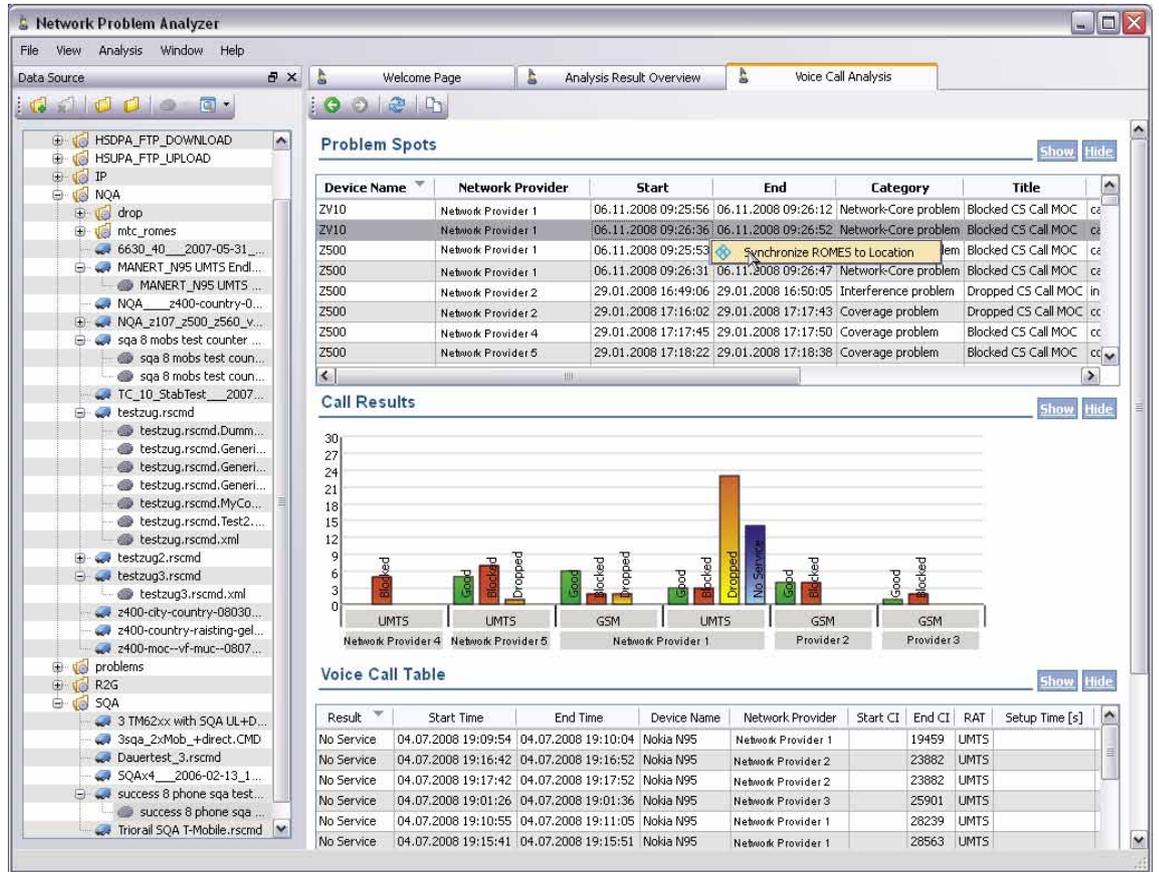
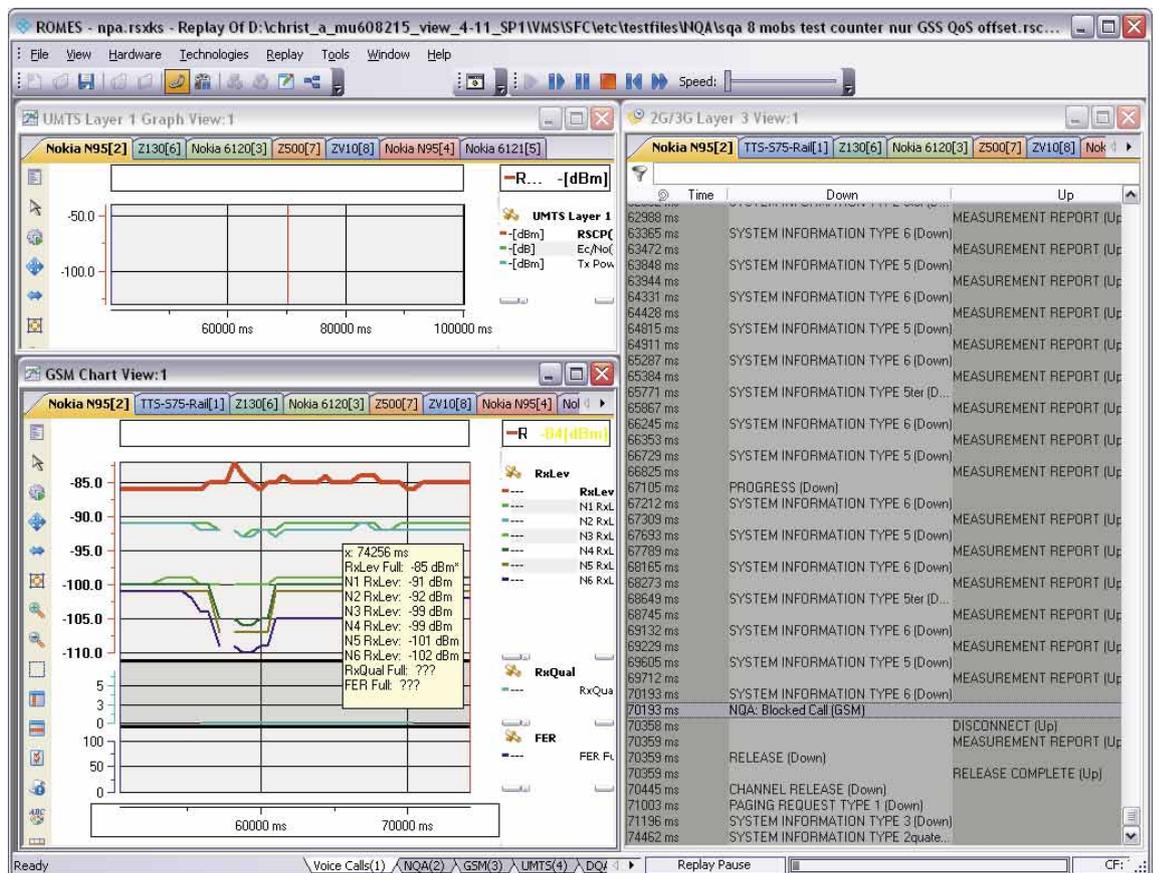


FIG 5 R&S\*ROMES synchronizes instantly with the NPA.



Other analysis modules can extract ETSI key performance indicators (KPIs) identified by R&S®ROMES and condition them so that they can be grouped and combined according to a variety of criteria. And if data throughput problems and their causes need to be identified, data transactions over HSDPA and HSUPA can be analyzed separately. The software assigns identified causes to different categories so that users can see which element in the network is causing a specific throughput problem.

In contrast to the analysis modules described above, the generic signal processor in the NPA enables the modules available in R&S®ROMES to be combined with mathematical and logical operators to create complex test data processors. These can either compile new problem lists or, alternatively, generate statistics from the signal processing results (FIG 6). This means that, in principle, there are no limits on how data acquired in drive tests can be post-processed.

### Summary and future developments

The R&S®ROMES NPA greatly simplifies working with large volumes of drive test data. Its ability to access numerous powerful tools in the R&S®ROMES drive test software leverages capabilities in order to create a feature-rich solution

that is greater than the sum of its parts. This new and powerful tool from Rohde&Schwarz delivers advanced post-processing functionalities that complement R&S®ROMES and R&S®ROMES2GO\* to create a comprehensive drive test portfolio.

Additional analysis modules are currently being developed. These include a module for problem analysis during LTE network setup and an IP analyzer for failed data transactions that can identify where precisely a problem has occurred during call setup or data transmission, along with possible causes.

Likewise in the pipeline are new visualizations for the user interface, additional filtering options, and user-configurable views. The software will also include print-ready views to enable users to produce reports based on R&S®ROMES data and will allow analysis results to be stored in a database to enable even larger volumes of drive test data to be managed and evaluated efficiently.

Andreas Christiansen

\* All the trumps in one hand — with R&S®ROMES2GO. News from Rohde&Schwarz (2008) No. 198, pp 6–9

FIG 6 The editor for the general signal processor enables users to create their own analysis modules by combining basic components to form complex test data processors.

