Automotive mobility testing with R&S®CMWcards

R&S®CMWcards, an intuitive and user-friendly software application, makes mobility verification easier than ever.

Your task

Cellular technology has become widely adopted by the automotive industry and is considered an important block in the automotive telematics control unit. Providing seamless and reliable mobile service (voice and data) is essential to ensure a good user experience. An important key performance indicator (KPI) is to benchmark the cellular modem in the vehicle. The dawn of autonomous driving will herald in a new era in the entire automotive industry, which will require seamless mobility without degrading quality of service.

Verifying the mobility feature of your device can be tedious and expensive due to field trials during the verification phase. These costs could increase even further if issues are discovered later on.

A car driving along the border to neighboring countries will often experience handover procedures between several cross-border cellular network providers who operate different radio access technologies (RAT), e.g. LTE and WCDMA. The mobility of the device has to be ensured and that involves testing the following key areas:
❙ Cell selection/reselection in RRC idle mode
❙ Handover
❙ Redirection

The above-mentioned device protocol procedures need to be verified under various network scenarios before product launch to ensure that the device handles mobility behavior smoothly.

A variety of negative scenarios also have to be simulated to test out-of-coverage cases and verify various failure situations.

Real-life channel conditions can be simulated by adding different fading profiles such as vehicles, pedestrians and high speed trains in order to evaluate device performance. Real-life IP conditions can also be simulated. Network impairments, e.g. introducing package jitter, delay and loss, can be added to verify the robustness of the IP data connection together with the mobility scenario.

Rohde & Schwarz solution

R&S®CMWcards is a graphic test script creation tool that runs on the R&S®CMW500 radio communication tester and requires no prior programming knowledge. By simply setting up a hand of cards, various signaling test scripts can be created to simulate mobility scenarios and verify the protocol behavior of your device. Each card comprises a predefined protocol procedure, yet provides the flexibility to allow the user to adjust the signaling parameters. The built-in error checking functionality of each card ensures the conformity of the signaling flows.

ROHDE & SCHWARZ

R&S®CMWcards provides a repeatable and deterministic test environment in which test scenarios can easily be combined.

Application

The example test script below shows how to create a test script to verify a device's handover functionality (handover from LTE to WCDMA) with R&S®CMWcards. The test script performs the following steps:
▪ Sets up and acivates LTE and WCDMA cells ("LTE and WCDMA cells" macro card)
▪ Increases the power level of the LTE cell and decreases the power level of the WCDMA cell ("LTE Power Change" and "WCDMA Power Change" cards)
▪ Starts and registers the DUT on the LTE cell ("Registration" card)

▪ Starts data transmission verification using ping ("Start IP Data Service" card)
▪ Increases the power level of the WCDMA cell ("WCDMA Power Change" card)
▪ Performs handover from LTE cell to WCDMA cell ("Handover to WCDMA" card)
▪ Stops data transmission verification ("Stop IP Data Service" card)
▪ Deactivates primary PDP context ("Deactivate Primary PDP Idle" card)

This simple test can easily be extended to add fading and IP impairments by just adding two more cards to the test script.

See also
https://www.rohde-schwarz.com/CMWcards

Example test script of handover (LTE to WCDMA) testing
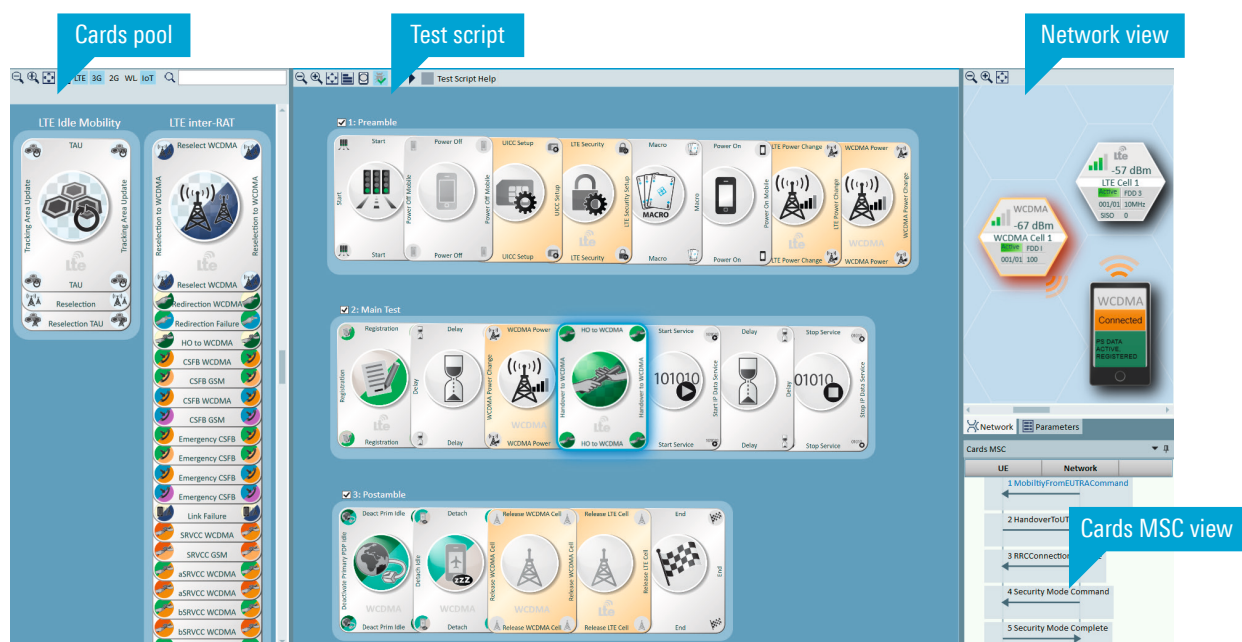
Designation	Type	Order No.
R&S®CMWcards framework	R&S®CMW-KP091	1211.0540.02
R&S®CMWcards	R&S®CMW-KT022	1207.9301.02
R&S®CMWcards advanced extension	R&S®CMW-KT026	1209.1750.02
R&S®CMWcards field-to-lab signaling extension	R&S®CMW-KT030	1211.2850.02

3609216992