

IP-based application testing on WiMAX™ mobile stations

Application-level testing – based on data transmission or video streaming, for example – plays a crucial role in the process of designing WiMAX™ mobile stations. This form of testing delivers valuable results when it comes to optimizing parameters that are of major importance for network operators and end users alike in their daily work.

The challenge of high data rates

The WiMAX™ mobile communications standard, in line with IEEE 802.16e-2005, enables wireless Internet access at high data rates. It offers an alternative to DSL networks in places where laying cables is uneconomical – for example, on the periphery of cities or in rural areas. But it also presents manufacturers of WiMAX™ mobile stations with a special challenge: They need to optimize their product designs to make sure their devices are capable of supporting the high volumes of data commonly associated with services such as FTP or video streaming.

The R&S®CMW270 WiMAX™, one of a new generation of wireless communications testers from Rohde&Schwarz, is a first-rate tool for this purpose. With its functions for testing

The R&S®CMW270 WiMAX™ communication tester is the first real all-in-one solution for the cost-optimized mass production of WiMAX™ mobile stations. It was first presented in News from Rohde&Schwarz 196 / 08, p. 22–27.



Test setup and layer model

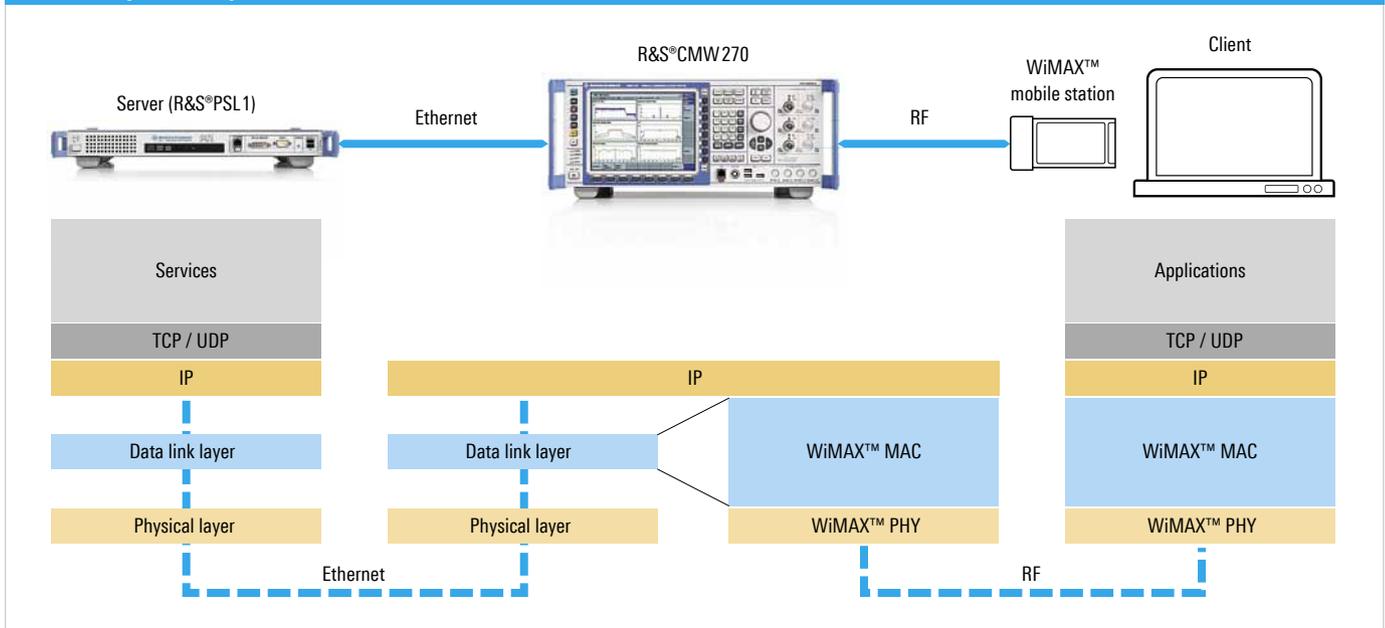


FIG 1 The setup for end-to-end testing of WiMAX™ mobile stations and the layer model.

both the physical layer (PHY) and the protocol layer (MAC) and with its integrated signaling unit (used to emulate a base station), it offers an easy-to-configure, affordable alternative to real WiMAX™ base stations and delivers stable, reproducible test results.

In combination with the R&S®CMW-KA700 application enabler option, the R&S®CMW270 tests the downlink and uplink data rates that WiMAX™ mobile stations can achieve and helps to optimize the products for typical end-to-end testing applications, where maximum throughput is particularly important for users and network operators. The mobile station needs to be able to receive incoming data without interruption or retransmission. Otherwise, the allocated transmission capacity is not utilized properly, which reduces the data rates at the user end, and decreases the economic efficiency of network operation.

Application tests are the only way to verify the overall performance of mobile stations

Most Internet applications operate over the Internet protocol (IP) on a client/server basis. The client uses a WiMAX™ mobile station to access services provided by a server via a network (FIG 1). In this test setup, an external server is connected to the R&S®CMW270 via Ethernet. The tester emulates a WiMAX™ base station located between the server and the client and transmits data packets from the server to the client over the WiMAX™ air interface. The open architecture means that there are numerous possibilities to test the design using typical end-to-end applications such as the following:

- Web browsing (http)
- Video streaming
- Data transfer (FTP)
- Voice over IP (VoIP)

An IP performance testing tool such as Iperf can be used to measure TCP and UDP data throughput between the server and the client. The results can help to identify performance bottlenecks.

Comprehensive RF and protocol analyses

During the end-to-end tests, essential RF parameters of the mobile station such as EVM, burst power and spectral flatness can be tested concurrently using WiMAX™ measurement functions in the R&S®CMW270 (by means of the R&S®CMW-KM700 and R&S®CMW-KM701 options) (FIG 3). This enables design flaws that adversely affect RF performance to be identified quickly.

Errors and delays that diminish performance may also occur as a result of repeat transmissions or high processor load in the WiMAX™ mobile station. Analyzing and remedying this kind of problem involves examining the stream of messages between the base station and the mobile station. This is what the R&S®CMW-KT700 message analyzer does. This software option seamlessly logs all of the downlink and uplink messages in realtime and with time stamps. The data flow on the transport layer can be displayed and analyzed with user-defined filters (FIG 2), enabling errors in the WiMAX™ MAC layer to be quickly identified and corrected using simple methods.

Summary

The new R&S®CMW-KA700 application enabler option expands the R&S®CMW270 WiMAX™ communication tester's scope of applications and enables comprehensive end-to-end performance tests. Users are able to modify parameters on both the physical layer (PHY) and the protocol layer (MAC) and create test scenarios that simulate live operation in a WiMAX™ network. Design flaws can be identified extremely quickly and WiMAX™ mobile stations can be optimized for practical applications that rely on high data rates.

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Abbreviations

DSL	Digital subscriber line
EVM	Error vector magnitude
FTP	File transfer protocol
HTTP	Hypertext transfer protocol
IP	Internet protocol
MAC	Medium access control
TCP	Transmission control protocol
UDP	User datagram protocol
WiMAX™	Worldwide interoperability for microwave access

FIG 2 The R&S®CMW-KT700 message analyzer in action ...

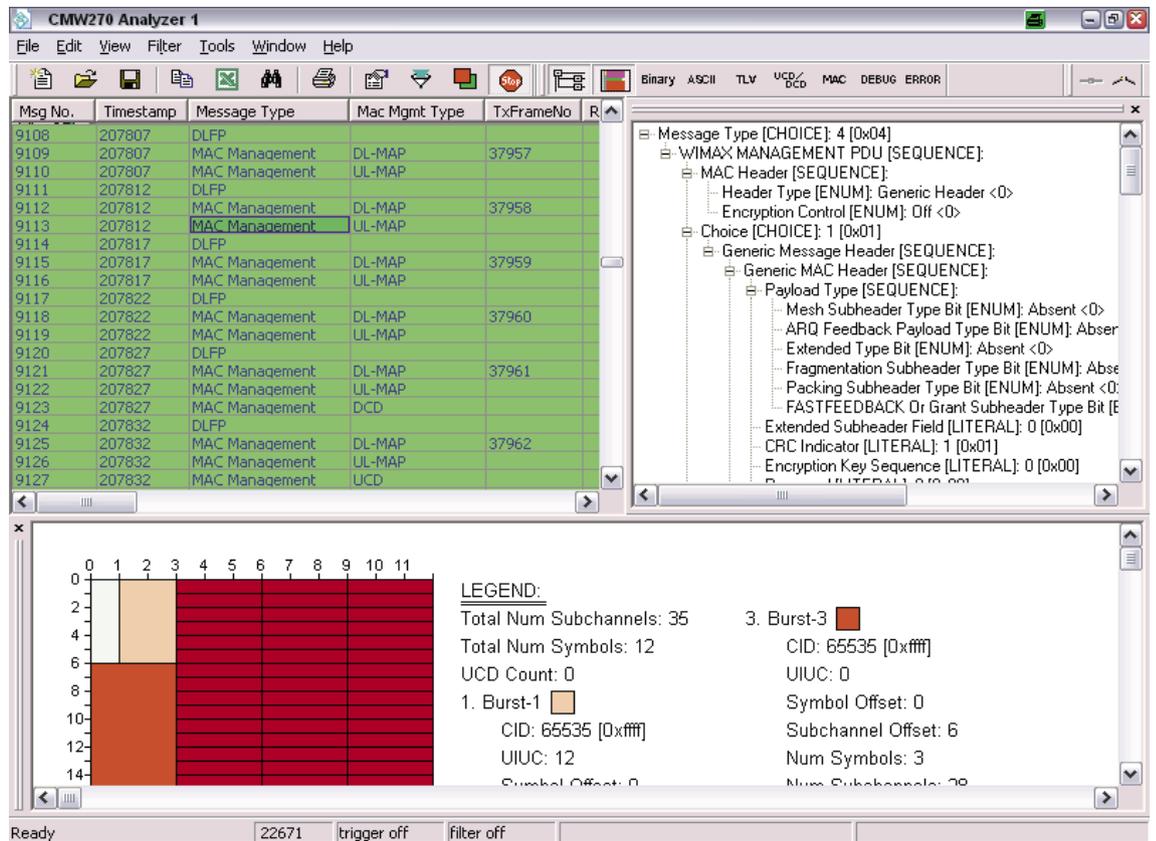


FIG 3 ... and the correlated RF measurements.

