Protocol Tester R&S®CRTU-W

Validated tests for videotelephony in 3G networks

3G mobile radio standards such as UMTS allow the use of mobile videotelephony to simultaneously transmit audio and video signals. For this purpose, standardization bodies have defined guidelines specifying that video phone calls be made via circuit-switched connections on the basis of the 3G-324M protocol. Whether a mobile phone functions in conformance with these guidelines can now be verified and, if necessary, certified for the first time by performing validated tests with the R&S®CRTU-W protocol tester.

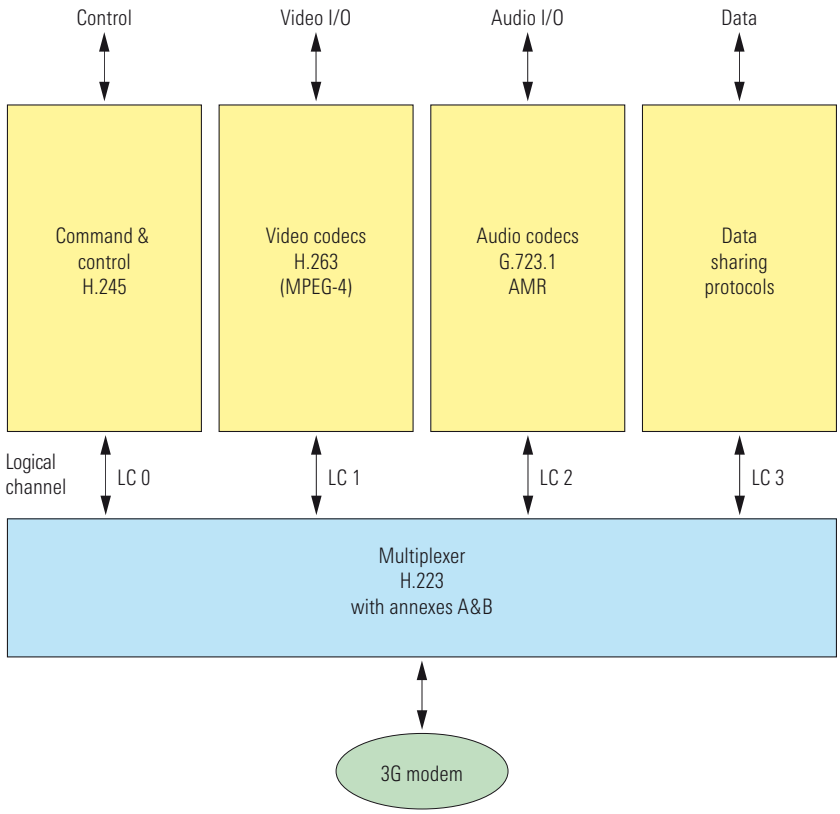
Circuit-switched connections

The standardization bodies' first approach was to base all mobile video applications on the Internet protocol (IP). However, this packet-switched transmission was dropped because latency in transmission is still too high in most current mobile IP networks. Moreover, quality of service (QoS) is insufficient during the entire time of the connection and IP networks require a bandwidth that is several times higher than with circuit-switched connections. Considering these drawbacks, only circuit-switched realtime connections are currently suitable for video applications.

The 3G-324M standard

Based on the H.324 standard, which defines audiovisual communications in public analog telephone networks, the 3G-324M protocol was developed for mobile radio networks, which have a comparatively high susceptibility to transmission errors. The protocol was enhanced by special audio and video codecs for mobile radio. It can thus organize the exchange of audio, video, data and signaling information via separate logical channels on a common transparent 64 kbit/s channel in the transmit and receive direction (FIG 1).

FIG 1 Schematic of a 3G-324M system, derived from the H.324 standard.

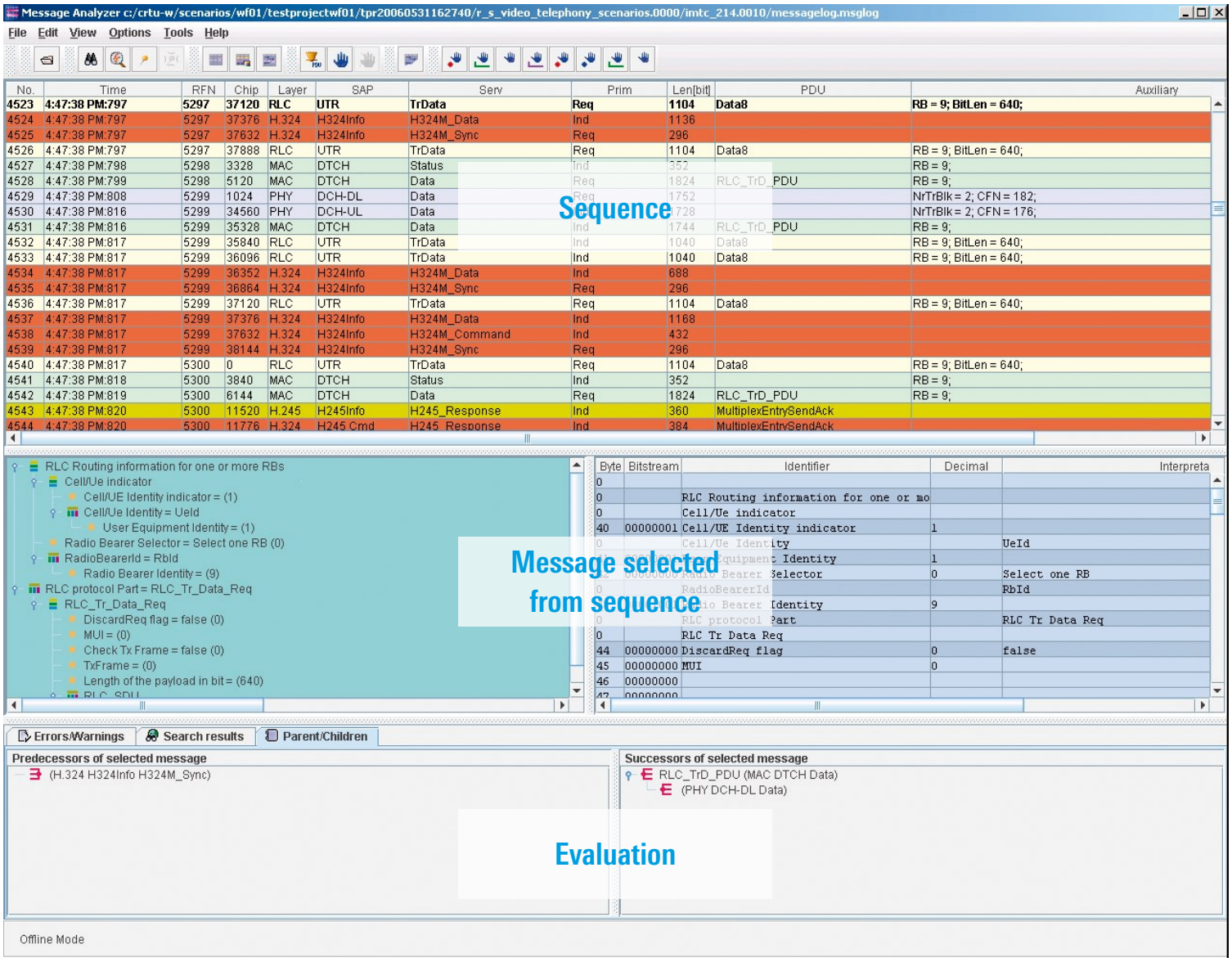


Different logical channels converge in the multiplexers, which play a key role in 3G-324M systems. After a call has been set up between two mobile phones, the multiplexers – in accordance with the 3G-324M protocol – define the start level, which is the highest mobile level supported by both terminals. By selecting the start level, the format and structure of the information to be transmitted is defined. Based on this information, the terminals inform each other about their individual performance features, i.e. about the available audio and video codecs, the multiplexer capacity and the scope of the supported radio options. To avoid potential conflicts during the opening procedures of bidirectional channels, the protocol defines which of the terminals is to act as master and which as slave, and which is to assume control if necessary.

Milliseconds are key to acceptance

The duration of the call setup, the length of the time delay and the synchronization accuracy of voice and pictures significantly contribute to the acceptance and success of videotelephony. Setting up a videotelephony call takes about four seconds, which is twice as long as with pure voice telephony, but is still within the generally accepted limits.

FIG 2 Complete decoding of an ASN.1 (abstract syntax notation) message of the H.245 protocol.



Latency and synchronization of audio and video applications strongly influence how subscribers perceive a mobile videotelephony call. End-to-end latency should therefore be no more than 150 ms; however, modern mobile video services exhibit latencies up to 300 ms. A suitably implemented multiplexer provides considerable room for improvement because the entire data flow is handled via the multiplexer, which makes it a main cause of latencies.

For subscribers to experience video conversations as being natural, the picture / sound skew (lip synchronicity) must be 50 ms or less. However, as it takes much longer to process a video signal than a voice signal, the audio data must be adequately delayed in the multiplexer to achieve a satisfying lip synchronicity result.

Indispensable: the test solution from Rohde & Schwarz

The R&S®CRTU-WF01 option for the R&S®CRTU-W protocol tester from Rohde & Schwarz allows the videotelephony functions of WCDMA mobile phones to be verified and certified by using validated test cases. These test cases, which are part of the GCF WI-19 (Global Certification Forum Work Item) document, help to prove whether signaling, i.e. the exchange of command and control information, is carried out in accordance with the specification. By using specification-conforming useful data, a videotelephony sequence on mobile phones can be tested for proper audiovisual quality.

While a test case is running, the protocol tester records the exchanged signaling information in a message log file (FIGs 2 and 3). By activating several filters, the data volume can be processed for possible subsequent analysis from different angles. A sophisticated algorithm facilitates and visualizes the tracking of the messages via the individual protocol layers. In addition to signaling information, audio and video information is recorded in separate files and is available for postprocessing and analysis.

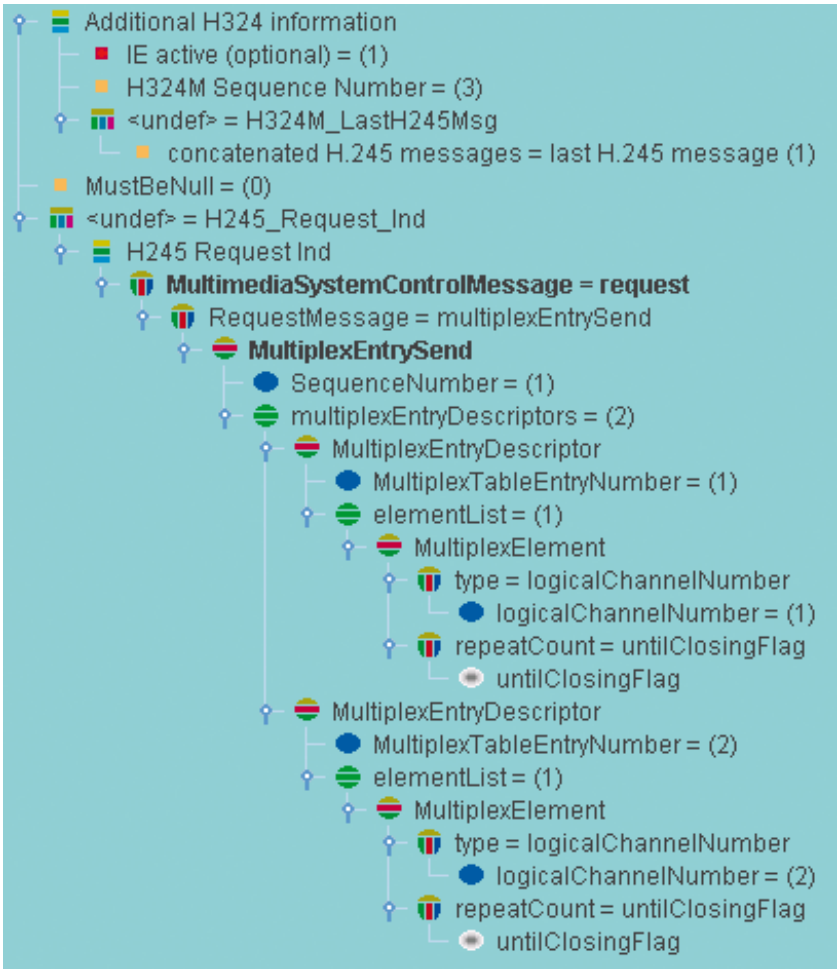


FIG 3 Extract from a message log file.

Future prospects

Limited video services such as multimedia messaging service (MMS) for pictures, video clips and sound are already being exchanged via IP in the mobile radio network. Until IP-based realtime video communications is feasible, manufacturers of mobile phones for videotelephony must rely on the 3G-324M protocol and suitable test methods. The test cases provided by Rohde & Schwarz are indispensable for certification purposes – in addition to being a powerful development tool.

Thomas A. Kneidel

More information and data sheet on the R&S®CRTU at www.rohde-schwarz.com (search term: CRTU)