The TETRA Memorandum of Understanding (TETRA MoU) association is currently expanding the TETRA standard for higher transmission rates. The new standard TETRA V2 will not be ready for quite a while. However, Rohde & Schwarz already offers a solution.

**Increasing requirements**

The current transmission data rates specified in the TETRA standard (max. 28.8 kbit/s) are adequate for many applications. However, the advent of new techniques for increasing speed inspires the imagination. When “data transmission” was first introduced, many users were satisfied with being able to send short text files. Today, however, users want or need to quickly transmit large quantities by radio. As a result, they are now demanding higher transmission rates. Recognizing this need, TETRA MoU is currently expanding the standard (TETRA V2). But this expansion will not be available for a while to come.

**The Rohde & Schwarz solution**

In the meantime, Rohde & Schwarz has devised a solution that can meet these requirements today. Since we are experts in numerous fields in radio and broadcasting, our specialists joined together to create an application for high-speed data transmission. This application is based on the TETRA radio.
system ACCESSNET®-T from Rohde & Schwarz [*] and the broadcast standards DAB-T/DVB-T*. It operates using asynchronous transmission.

DAB/DVB radio networks are pure broadcast networks. They do not have a return channel via which customer-specific requests, for example, can be carried out. The application described here combines the advantages of both network types, opening up new possibilities in data transmission. The main principle is as follows: The request to transmit a data record via DAB/DVB is initiated by a TETRA network. It is then sent to a streaming or data server via the TETRA network ACCESSNET®-T and a gateway. These servers send the data to the DAB/DVB network. The data is then routed to DAB/DVB receivers, which forward it to the final destination for evaluation and processing.

**DAB or DVB?**

Depending on the specific requirements, ACCESSNET®-T is linked to a DAB or DVB network. The primary factor determining which of the two is used is the maximum data rate needed. DAB provides a rate of approx. 1.8 Mbit/s (net), and DVB provides a rate between 5 Mbit/s and 34 Mbit/s. Two other important factors are whether you need mobile operation in vehicles and the maximum speed that has been planned. DAB is highly suitable for mobile purposes and can also be used at speeds >300 km/h. DVB reception is limited in mobile operation and performs well only up to speeds of 130 km/h.

**How it works**

FIG 1 shows the setup at the mobile receiver end. The serial interface connects the laptop with the TETRA terminal. The peripheral equipment interface (PEI) of the terminal is used to control the instrument. The DAB/DVB receiver is connected to the laptop via the USB interface or via a PCMCIA plug-in card.

A gateway and LAN provide the TETRA network ACCESSNET®-T with access to the DAB/DVB network (FIG 2). To enable rapid transmission, the receiver end initiates a request over ACCESSNET®-T by

[FIG 1 Basic setup of the mobile receiver end.]

[FIG 2 Radio infrastructure of the application.]

* The abbreviation DAB/DVB is used in this article.
means of SDS or via a CMD connection to the data or streaming server. The server acknowledges the request via the TETRA network. Together with the request, the encryption parameters for the data to be sent are transmitted over an intercept-proof network. The requested data is routed over the LAN to the DAB/DVB network and transmitted. If encryption parameters are transferred, the transmission is encrypted. The DAB/DVB receiver receives the requested data and makes it available for further processing. If the data is received without errors, the receiver sends an acknowledgement to the server via the TETRA system. If the received data contains errors, the system sends information about the missing or defective data packets back to the host via the TETRA network. The host then tries to retransmit the missing data.

Numerous applications

High-speed data transmission can be highly beneficial, such as within a BOS network that must be secure. For example, site and building plans can be sent to fire fighters. Or photos of individuals or stolen vehicles can be transmitted during an investigation. It is even possible to transmit video sequences.

You can also use this application to transmit large volumes of data in local public transportation, e.g. commercials or information for commuters. In industrial networks, just one of the many possible applications is to call up data about monitored machines and systems. The possibilities are virtually endless.

Summary

TETRA’s flexibility makes it right for numerous applications. Even tasks that do not appear to closely fit the standard become possible at an affordable price by using ACCESSNET®-T and applying new ideas. One of the major cost advantages is that standardized interfaces and commercially available components are used, underscoring the benefits of an open standard.

You can also implement an existing DAB/DVB network with this application if needed. If you do not have access to a DAB/DVB network, we can devise cost-effective solutions using your own infrastructure.

Harald Haage

Glossary

ACCESSNET®-T Digital trunked radio system from Rohde & Schwarz in accordance with the TETRA standard
BOS Government authorities and organizations with security missions
CMD Circuit Mode Data (circuit-switched data service in the TETRA standard)
DAB-T Digital Audio Broadcasting Terrestrial (standard)
R&S®DSP020 Digital Sound Broadcast Data Inserter from Rohde & Schwarz
R&S®DSS-500 Digital Small System, TETRA base station with exchange and power supply from Rohde & Schwarz
DVB-T Digital Video Broadcasting Terrestrial (standard)
LAN Local Area Network
PCMCIA Personal Computer Memory Card International Association: industry standard for memory cards and other peripheral devices in check-card format
PEI Peripheral Equipment Interface: standardized interface for TETRA terminals
R&S®SDB601 DAB Transmitter from Rohde & Schwarz
SDS Short Data Service: service for transmitting short data packages with TETRA
TETRA Terrestrial Trunked Radio: only digital trunked radio standard adopted by the European Telecommunications Standards Institute (ETSI)
TETRA MoU TETRA Memorandum of Understanding: association of manufacturers and users of the TETRA standard that are responsible for establishing the standard on the market

The articles on pages 24 and 25 describe projects in Croatia and Bangkok where ACCESSNET®-T has been implemented successfully.