ROHILL

White paper

Sense and nonsense of the TETRA Interoperability process

TetraNode

Introduction

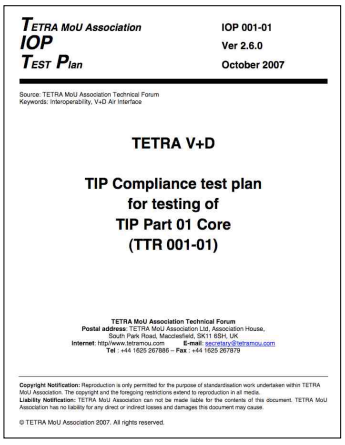
TETRA owes its success in large part to the availability of systems and terminals of several vendors that are interoperable. This multi-vendor approach has resulted in a highly competitive market with solutions targeted at a large number of market segments.

TETRA is an open standard of the European Telecommunications Standards Institute (ETSI). Working groups, in which a large number of manufacturers and end users participated, have drawn up the TETRA standard and have kept it up-to-date ever since.

Parallel to the development of the standard, a number of manufacturers had already started with the development of systems and terminals for TETRA. Soon it became apparent that this equipment included specific functions which made it impossible for terminal equipment of manufacturer A to function properly with the infrastructure of manufacturer B. In some cases it was a deliberate choice of a manufacturer to create vendor lock-in, but it also happened frequently that the specifications could be interpreted in different ways, which showed that the starting points for implementation had been incorrect in the first place.

To avoid proliferation of variations based on the TETRA standard, end users and manufacturers within the TETRA Memorandum of Understanding (MoU), later renamed the TETRA Association, soon decided to work towards specifications and test protocols with the aim of testing each other's systems and terminals. At first, these tests were performed by Tele Danmark, one of the founders of the TETRA Association. Later, this responsibility was handed over to the Italian Instituto Superiore delle Comunicazioni e delle Tecnologie dell Informazione (ISCOM) as the new Certification Body. The certification process is managed by the Technical Forum (TF) of the TETRA Association, whereby the goals and priorities are determined together with the Operators and User Association (OUA).

The specifications of the Interoperability tests are laid down in so-called TETRA Interoperability Profiles (TIPs). The purpose of the TIPs is to establish scenarios, the order of air interface signalling and the possible adoption of all kinds of optional items in the air interface signalling. After approval of the TIP specification by the Technical Forum, an Interoperability Test Plan is created, in which the execution of the tests is described in detail. Finally, a TETRA Interoperability Certification - Requirements Table (TIC-RT) spreadsheet is composed, in which manufacturers can indicate which options are supported for the relevant function. From the TIC-RT spreadsheet follows the list of tests to be executed during an Interoperability Test session.


TETRA MoU Association
IOP
TEST Plan

IOP 001-01
Ver 2.6.0
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TETRA V+D

TIP Compliance test plan
for testing of
TIP Part 01 Core
(TTR 001-01)

TETRA MoU Association Technical Forum
Postal address: TETRA MoU Association Ltd, Association House,
South Park Road, Macclesfield, SK11 8SH, UK
Internet: http://www.tetramou.com E-mail: secretary@tetramou.com
Tel : +44 1625 267886 – Fax : +44 1625 267879

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The tests are executed jointly by the manufacturer of the system, the manufacturer of a terminal, and two observers of ISCOM. As an independent institute, ISCOM is responsible for the planning, the execution and the analysis of these tests, and it draws up the certificate in which the rest results are laid down. Usually, a test session takes a day or four to test all functions of one type of terminal on an infrastructure, whereby other terminals of the same brand are spot checked, provided they are based on the same software platform. This way, an IOP test session can take up to eight to ten weeks in total. After publication, the IOP certificates can be downloaded from the website of the TETRA Association www.tetra-association.com.

Limitations of TETRA Interoperability testing

TETRA Interoperability tests are limited to the functional testing of terminals on systems. After the detailed analysis of the signalling, it can be determined if the equipment complies with the rules of the TETRA standard. That does not mean that a TETRA Interoperability certificate offers guarantees as far as the reliability and performance of the equipment is concerned. For the high-frequency (RF) performance and CE-approval, the manufacturer will have to perform additional tests or have them performed.

Besides, an IOP test session is a random test whereby a specific hardware and software version of a terminal is tested on a specific hardware and software version of an infrastructure. Since especially the software is continuously brought up to date to include new functions and to repair faults, there is a chance that new issues arise. An IOP certificate is therefore a limited guarantee if other software and hardware versions of both the terminals and the systems are used.

Buyers of terminals and systems are therefore well-advised to also draw up their own test protocols to accept terminals on their systems. Normally this is done during the so-called Factory Acceptance Tests (FATs), in particular for the larger projects, but also after that continuous testing is required to ensure that newly added terminals and/or software updates or terminals and systems will not cause any problems.

New developments

As far as the Trunked Mode Operation (TMO) and the Direct Mode Operation (DMO) are concerned, the development of IOP tests has pretty much come to an end. Most IOP specifications and detailed Test Plans have been stable for several years already. Recent developments include extensions in the field of encryption, such as Group Cipher Key (GCK) encryption, Air-to-Ground Communication, Call Out (paging) and Location Services.

The IOP specifications for the TETRA Inter System Interface (ISI) has been a subject for debate for a decade already. After a compromise was reached with difficulty in 2005, only one successful interoperability test has been executed between two systems suppliers since. However, of the 89 test cases for ISI Mobility Management (IMM), ISI Individual Call (IIC) and Short Data Service (ISD), no more than 35 were successful, 6 failed and 48 were not supported by one or both suppliers. Among other things, the migration function for international roaming, including the authentication algorithm required for encryption, was not supported by at least one supplier, which means that there is in fact no working ISI as in GSM roaming. Besides, the group call function, which is essential for the Public Safety sector, is not yet available within the ISI. There has been some progress in the meantime, however, and suppliers will soon get another chance to test interoperability of their systems according the ISI specification, including a simplified form of group communication, the so-called Static Group Linking function.

As far as TETRA Enhanced Data Service (TEDS) is concerned, we see a similar conflict between suppliers. The many options which the TEDS standard offers for modulation forms and possible integration of TEDS in the existing TETRA system architecture, have been incorporated as options in the IOP specifications. As a result, only a small subset of all possibilities will be useful if a specific TEDS terminal is used on a TEDS infrastructure of another supplier, and a situation is imminent where interoperability, in fact, is practically out of the question.

How to benefit from the TETRA Interoperability process

The TETRA Interoperability process has unmistakably contributed to the development of TETRA into a truly open multi-vendor standard. In general, users may expect terminals of different brands to work properly on a TETRA system of several vendors. When inviting tenders, the contracting authority may therefore choose from a large number of vendors for both systems and terminals, which has a positive effect on the price of the total solution and leads to less dependence on a specific vendor.

The test results, for which the public part of the TETRA Association website can be consulted, give a good idea of the available functions in the various different terminals and systems. When drawing up a list of requirements, it is therefore worthwile to base these requirements on functionality available in several terminals and systems, so that there is plenty of choice left.

The extensive set of IOP specifications, the list of options within functions and the detailed description of test results do not make it easy to interpret the IOP certificates, let alone to compare them with other combinations of terminals and systems. That is why Rohill has made a thorough analysis of the results of all system suppliers after publication of the results of its IOP test session in 2010.

After itemizing a number of important functions within the different IOP specifications, it turns out that the results of the Rohill IOP test session stand out head and shoulders above the competition considering the supported functionality and quality of implementation. The chart below makes that very clear. The foundations of this chart are included in a PowerPoint presentation which can be downloaded from the website www.rohill.com under downloads → whitepapers.