An Overview of TETRA

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Agenda

- History and Key Milestones
- The ETSI TETRA Standard
- The Services and Facilities of TETRA
- TETRA Release 2
- ETSI Project TETRA Organization
- Public Safety User Requirements Capture
- Possible Future User Requirements Capture Solutions
History and Key Milestones

- Started Life in 1989 as Mobile Digital Trunked Radio System (MDTRS)
- In the early 90s’ Project name changed to Trans European Trunked RA dio (TETRA)
- In the mid 90s’ meaning of the TETRA acronym changed to Terrestrial Trunked RA dio as global market potential became apparent
- The TETRA Air Interface standard became a full ETS in December 1995
- First TETRA contracts placed in 1996
- First TETRA system (base stations, mobiles, handheld portables, control centre, switch, etc.) became operational in July 1997
- At the TETRA World Congress in November 2004, it was reported by the TETRA MoU Association that 622 contracts had been placed for TETRA spanning 70 countries world-wide (90% increase over those recorded in 2003)
The ETSI TETRA Standard

Interfaces
1. Network Air Interface
2. DMO Air Interface
3. Peripheral Equipment Interface (PEI)
4. Man Machine Interface (MMI)
5. Remote Console Interface
6. Network Manager Interface
7. Inter-System Interface (ISI)
8. External Networks Gateway
The Services and Facilities of TETRA

**Voice**
- Excellent voice quality
- Fast call set-up
- Individual (one-to-one) calls
- Push to Talk (PTT) Group communication
  - group calls
  - scanning of groups
  - dynamic regrouping
  - group area selection
  - broadcast groups
- Emergency calls
- Secure encrypted communications
- Direct Mode Operation (DMO)
The Services and Facilities of TETRA (Cont.)

DMO
- DMO Terminal to DMO Terminal
- Dual Watch (DMO/TMO)
- Mobile DMO Gateway (Example Shown)
- Mobile DMO Repeater
- Mobile DMO Repeater/Gateway
The Services and Facilities of TETRA (Cont.)

Telephony
- Full Duplex Voice
- PSTN/PABX Telephone Interconnect
- Facilities such as:
  - Call Forward
  - Call Divert
  - Call Hold
  - Call Barring (outgoing and incoming)
The Services and Facilities of TETRA (Cont.)

TETRA Data Service

Short Data Service (SDS)
- Status Messaging
- Free Format Text or Binary
- Up to 256 bytes
- Point to Point
- Point to Multipoint
- Location Information Protocol (LIP) Application

Circuit Mode
- Single Time Slot Supporting:
  - 2400 bits/s
  - 4800 bits/s
  - 7200 bits/s

Packet Mode
- Connectionless
- IP over the air
The Services and Facilities of TETRA (Cont.)

Security

- Over the Air TETRA Encryption Algorithms (TEAs)
  - TEA 1: European commercial Use
  - TEA 2: EU public Safety organizations
  - TEA 3: Public safety organizations outside EU
  - TEA 4: Commercial organizations outside EU

- End to End Encryption
  - The Advanced Encryption Standard (EAS) is the default interoperability algorithm for end-to-end encryption
  - The International Data Encryption Algorithm (IDEA) is also a standard encryption solution
  - The TETRA standard is also able to support encryption modules that are required by specific organizations and nations
The Services and Facilities of TETRA (Cont.)

Security (cont.)

- Encryption keys
  - Multiple keys are supported in the TEA standards to allow different organizations use the same encryption algorithm but have their own unique key to prevent eavesdropping.
  - Keys can be ‘static’ and/or ‘dynamic’ dependent on security needs.
This early planning work in 1999 by EP TETRA and the TETRA MoU resulted in the following recommended enhancement areas for TETRA Release 2:

- 10 fold increase in data throughput
- New voice codecs with enhanced voice quality for interworking between GSM and UMTS/3G
- Air interface enhancements to optimise
  - spectrum efficiency
  - network capacity
  - system performance
  - size of terminals and battery life
- Range extension for ‘ground to air’, ‘rural telephony’ and ‘linear’ networks
- TETRA network interworking between GSM, GPRS, UMTS/3G
- Evolution of TETRA SIM to U-SIM
Besides these planned enhancements, TETRA Release 2 should:

- Allow provision for new ETSI deliverables to support further user/market driven requirements
- Ensure full backwards compatibility and integration of new services with existing TETRA
- Allow operation in frequency bands already assigned for TETRA

On 6th September 2000, the ETSI Board approved the new Terms of Reference of EP TETRA for TETRA Release 2

To show industry commitment, selected EP TETRA members volunteered to fund 50% of the Specialist Task Force (STF) costs

NOTE: This joint STF funding initiative by TETRA failed to set a trend for all new standard activities in ETSI
TETRA Release 2 (Cont.)

- **TETRA Enhanced Data Service (TEDS)**
  - Multi-carrier platform with TDMA carriers
  - Adaptive selection of modulation and coding according to propagation conditions
  - Turbo coding together with the chosen parameters provides highly efficient channels

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<th>Channel Type Modulation</th>
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<th>50 kHz</th>
<th>100 kHz</th>
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<td>64-QAM</td>
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<td>461</td>
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Gross Bit Rate (kb/s) Using 4 Time Slots
TETRA Release 2 (Cont.)

After significant Market Changes and Prioritisation the Main Deliverables are:

- High Speed Data (TAPS & TEDS)
- AMR Codec and NATO low bit rate codec (STANAG 4591)
- Long range ‘Air-to-Ground’ (Air Interface Enhancement)
- Location Information Protocol (LIP) Application

TETRA Release 2 is expected to be completed by the end of 2005
ETSI Project TETRA Organisation

**KEY**
EP TETRA = ETSI Project TETRA
WG = Working Group
SG = Sub Group
MCO = Management Committee Officer
VC = Vice Chairman
EPO = ETSI Project Officer
HSD = High Speed Data
TMO = Trunked Mode Operation
DMO = Direct Mode Operation
Public Safety User Requirements Capture

- User requirements mainly captured through participation of User Organizations in WG1
- Questionnaires used to capture requirements for TETRA Release 2 with assistance from TETRA MoU Association
- Workshops hosted by TETRA MoU Association to refine user requirements
  - DMO Gateways and Repeaters
  - TEDS Data Rate, Coverage and Frequency Spectrum
  - Inter-System Interface (ISI)
  - Peripheral Equipment Interface (PEI)
  - Authentication Key Distribution (AKD)
Possible Future User Requirements Capture Solutions

- Participation of User Organizations in ETSI Technical Bodies (TB) of Interest (TETRA, MESA, 3GPP, TIPHON, etc., etc.)
- Participation of User Organizations in special TB’s (eg. Wireless/Fixed, Data/Voice, Public/Private ......etc.) formed to capture all User Requirements
- Participation of User Organizations in one ETSI TB to capture all User Requirements (eg. EMTEL)
- ETSI Liaison with User Bodies/Associations etc., to formally communicate user requirements (eg. Person designated as ETSI Liaison Officer in User Bodies/Associations)
- ETSI List of User Representatives (not necessarily ETSI members) that can be contacted via e-mail for Ad Hoc User Questionnaires and Surveys (as required by specific ETSI TB’s)
- A Combination of the above
An Overview of TETRA

Thank You
Doug Gray