



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

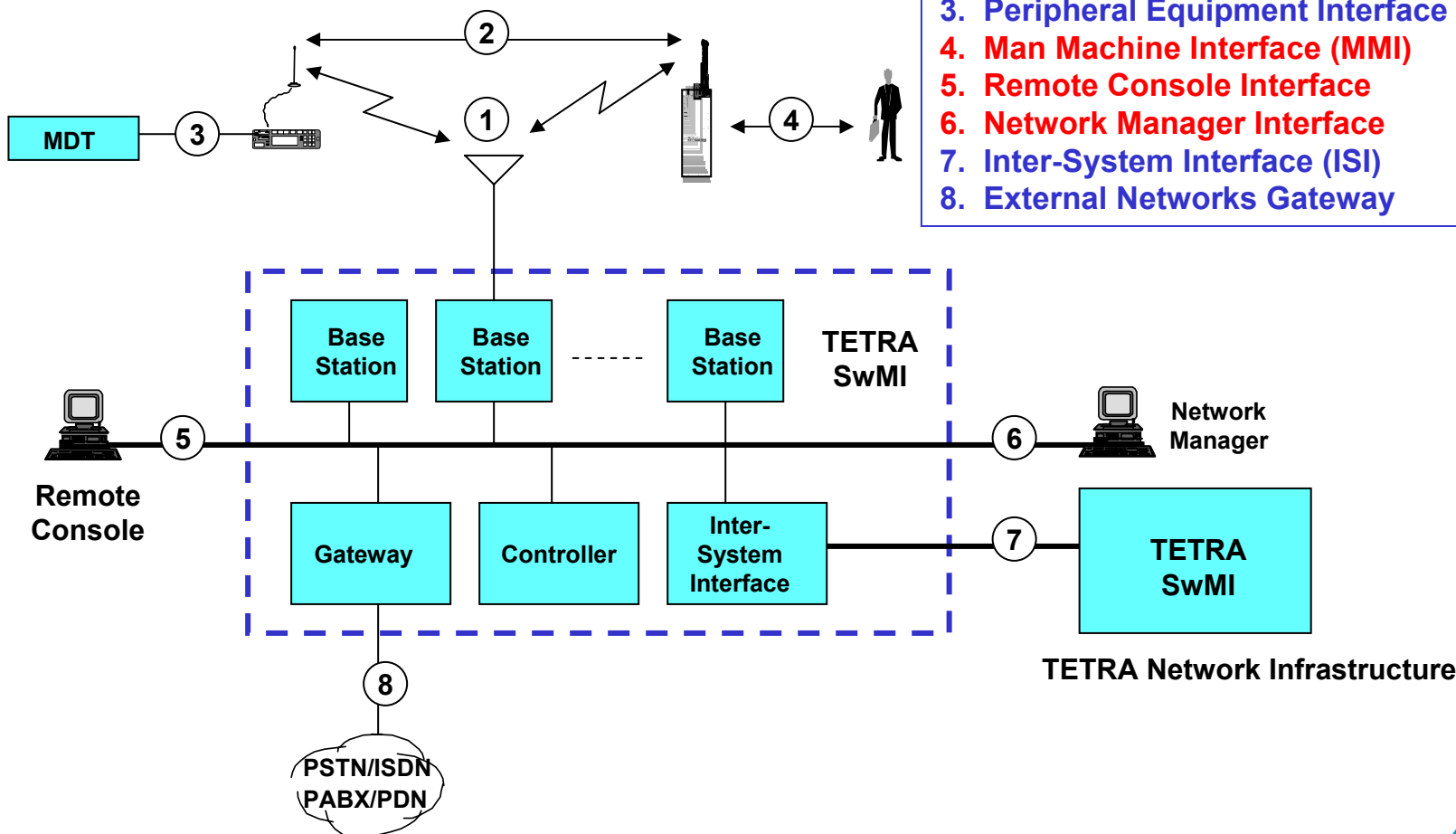
History and Key Milestones

- ❑ Started Life in in 1989 as Mobile Digital Trunked Radio System (MDTRS)
- ❑ In the early 90s' Project name changed to Trans European Trunked Radio (TETRA)
- ❑ In the mid 90s' meaning of the TETRA acronym changed to TErrestrial Trunked Radio as global market potential become 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, handportables, control centre, switch, etc.) became operational in July 1997
- ❑ TETRA Release 2 Enhancement Programme approved by ETSI September 2000.
- ❑ 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

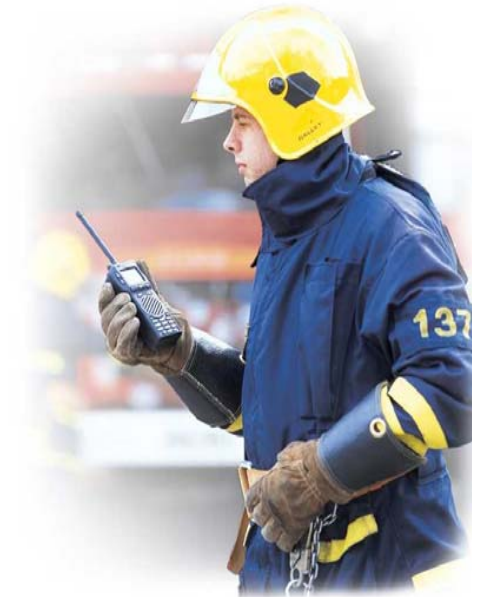
1. Network Air Interface
2. DMO Air Interface
3. Peripheral Equipment Interface (PEI)
4. **Man Machine Interface (MMI)**
5. **Remote Console Interface**
6. **Network Manager Interface**
7. **Inter-System Interface (ISI)**
8. **External Networks Gateway**



The Services and Facilities of TETRA

Voice

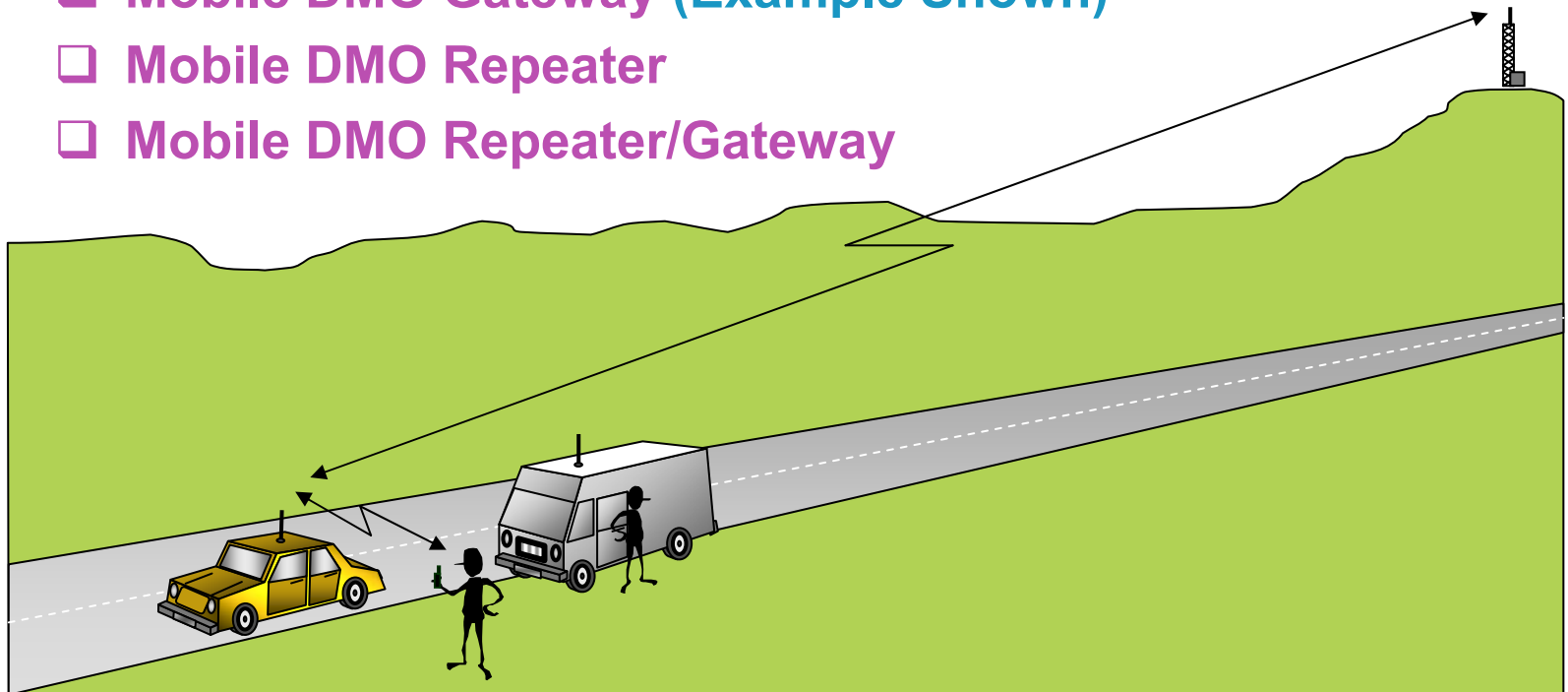
- Excellent voice quality
- Fast call set-up
- Individual (one-to-one) calls
- Push to Talk (PTT) Group communication
 - group calls
 - scanning of groups
 - dynamic regrouping
 - group area selection
 - broadcast groups
- Emergency calls
- Secure encrypted communications
- Direct Mode Operation (DMO)



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

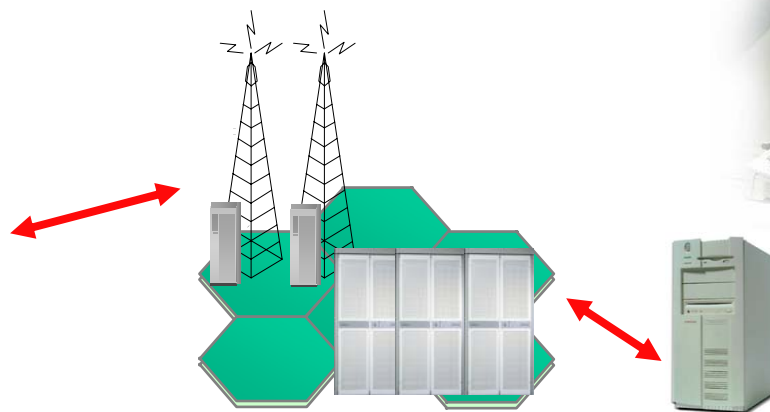
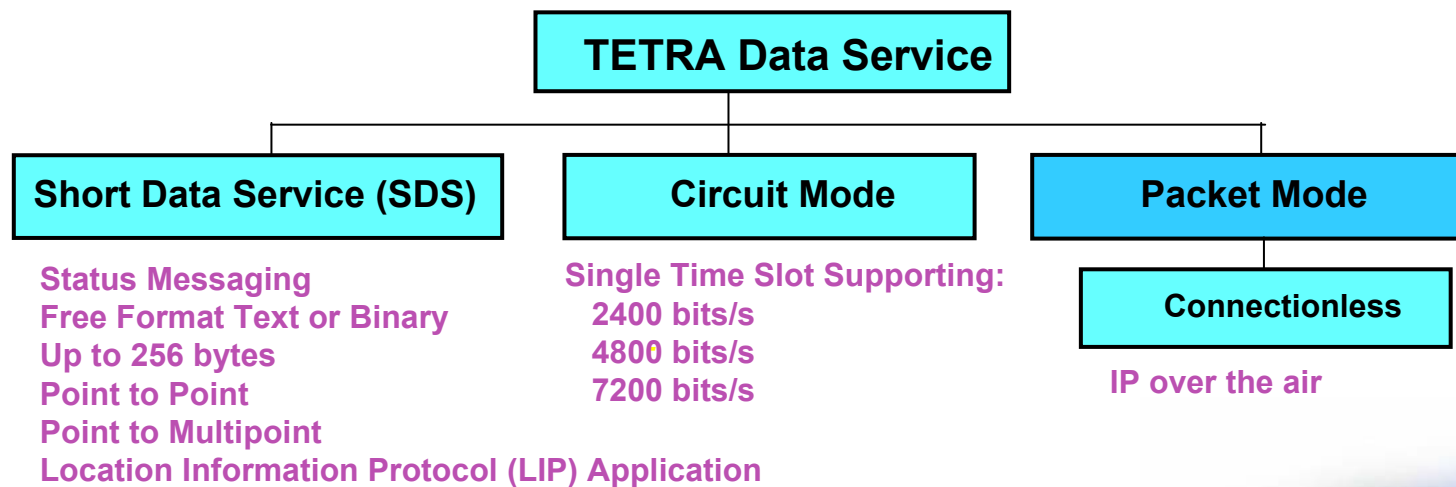


The Services and Facilities of TETRA (Cont.)

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.)



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.

TETRA Release 2

- 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

TETRA Release 2 (Cont.)

- ❑ 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

Channel Type Modulation	25 kHz	50 kHz	100 kHz	
π/4 DQPSK	36			
π/8 D8PSK	54			
4-QAM	38	77	154	230
16-QAM	77	154	307	461
64-QAM	115	230	461	691

Gross Bit Rate (kbts/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

Release 2 Deliverables	2003				2004				2005			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TETRA Advanced Packet Service (TAPS)												
TETRA Enhanced Data Service (TEDS)												
Codecs												
USIM for GSM/GPRS/UMTS/3G												
Interworking/Roaming GSM/GPRS/UMTS												
Air Interface Enhancements												
Harmonised Standard												

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

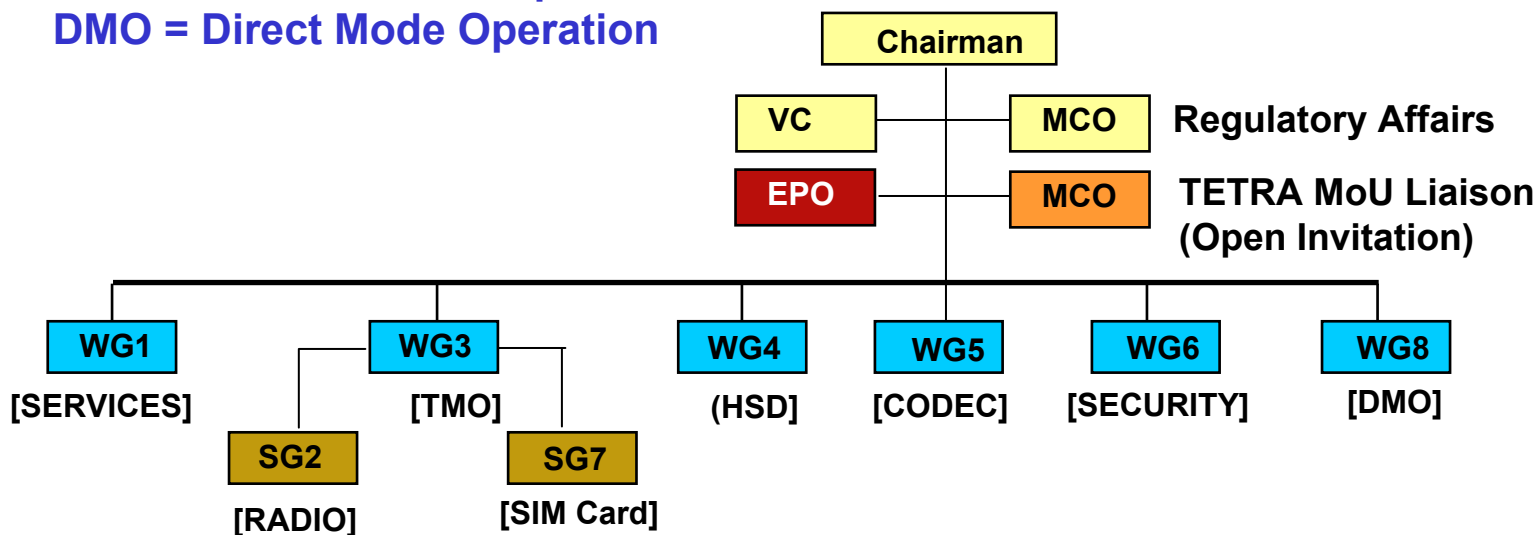
VC = Vice Chairman

EPO = ETSI Project Officer

HSD = High Speed Data

TMO = Trunked Mode Operation

DMO = Direct Mode Operation

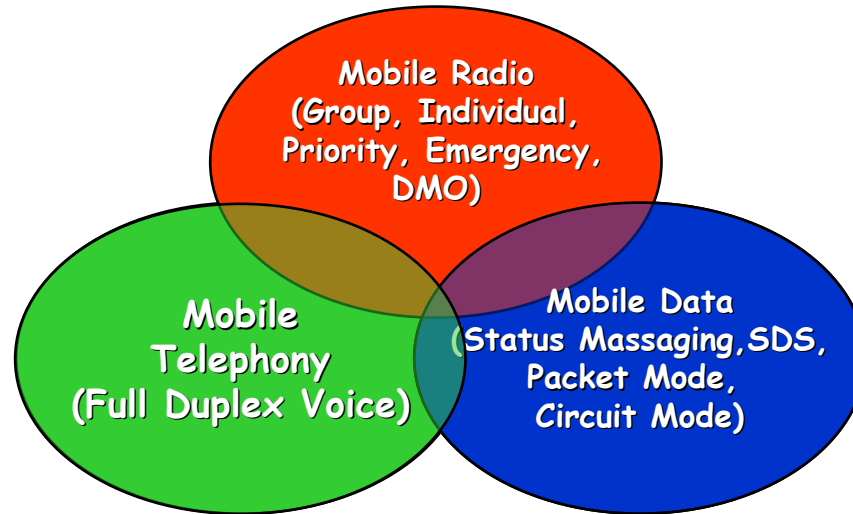


Public Safety User Requirements Capture

- ❑ 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/Privateetc.) 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
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