



**ETSI
TECHNICAL
REPORT**

ETR 086-2

January 1994

Source: ETSI TC-RES

Reference: DTR/RES-06001

ICS: 33.060

Key words: TETRA, PDO

**Trans European Trunked Radio (TETRA) system;
Technical requirements specification
Part 2: Packet Data Optimised (PDO) systems**

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

Copyright Notification: No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 1994. All rights reserved.

Contents

| | |
|--|----|
| Foreword | 5 |
| 1 Scope | 7 |
| 2 References | 7 |
| 3 Definitions and abbreviations (TETRA 01.04) | 7 |
| 3.1 Definitions | 7 |
| 3.2 General abbreviations | 14 |
| 3.3 Supplementary service abbreviations | 15 |
| 4 Packet Data Optimised (PDO) service descriptions (TETRA 02.03) | 16 |
| 4.1 General | 16 |
| 4.1.1 Bearer services | 16 |
| 4.1.2 Supplementary services | 16 |
| 4.1.3 Facilities for connection oriented service | 16 |
| 4.1.4 Facilities for specific connectionless service | 16 |
| 4.2 Network principles and basic concepts | 16 |
| 5 Connection oriented services | 17 |
| 5.1 General | 17 |
| 5.2 Mobile station operation | 17 |
| 5.2.1 General | 17 |
| 5.2.2 Non-integrated service arrangements | 17 |
| 5.2.3 Integrated service arrangements | 17 |
| 5.2.4 Packet Assembler/Disassembler (PAD) character-mode access | 19 |
| 5.3 Fixed terminal operation | 19 |
| 5.4 Interconnection to other PDNs or RPDNs | 20 |
| 5.5 Operation of air interface for connection oriented service | 20 |
| 5.5.1 Addressing | 20 |
| 5.5.1.1 Virtual Point of Attachment (VPA) | 20 |
| 5.5.1.2 Transferable subscription | 20 |
| 5.5.2 Air interface resource sharing | 20 |
| 5.6 Air interface performance requirements | 21 |
| 5.6.1 Air interface connection establishment | 21 |
| 5.6.2 Air interface VPA re-establishment | 21 |
| 5.7 Security features | 22 |
| 5.7.1 Authentication | 22 |
| 5.7.2 Ciphering | 22 |
| 5.8 Facilities for connection oriented service | 22 |
| 6 Connectionless services | 24 |
| 6.1 General | 24 |
| 6.2 Mobile station operation | 25 |
| 6.2.1 Services supported | 25 |
| 6.3 Fixed terminal operation | 25 |
| 6.4 Interconnection to other PDNs or RPDNs | 25 |
| 6.5 Operation of air interface for connectionless service | 25 |
| 6.5.1 Addressing | 25 |
| 6.5.1.1 Virtual Point of Attachment (VPA) | 25 |
| 6.5.1.2 Transferable subscription | 25 |
| 6.5.2 Air interface resource sharing | 26 |
| 6.6 Air interface performance requirements | 26 |
| 6.7 Security | 26 |
| 6.8 Facilities for specific connectionless service | 27 |
| 6.8.1 Summary of facilities | 27 |
| 6.8.2 Delivery disposition | 27 |

| | | |
|---------------|---|----|
| 6.8.3 | Priority..... | 27 |
| 6.8.4 | Multicast..... | 27 |
| 6.8.5 | Area selection | 28 |
| 6.8.6 | Packet identity..... | 28 |
| 6.8.7 | Packet storage..... | 28 |
| 6.8.8 | Subaddressing..... | 28 |
| | 6.8.8.1 User access to specific connectionless facilities | 28 |
| History | | 29 |

Foreword

This ETSI Technical Report (ETR) has been prepared by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status.

An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

This ETR contains the specification of the Packet Data Optimised (PDO) services and facilities of the Trans European Trunked Radio (TETRA) system.

This ETR will be subject to revision and therefore future editions.

This ETR is divided into three parts:

- Part 1: Voice plus Data (V+D) systems;
- Part 2: Packet Data Optimized (PDO) systems;**
- Part 3: Security aspects.

Blank page

1 Scope

This ETSI Technical Report (ETR) contains the technical requirements specification for Packet Data Optimised (PDO) systems used in the TETRA system. It is a complementary document to the Voice plus Data (V+D) technical requirements specification given in Part 1 of this ETR, and the parts are cross referenced as appropriate.

2 References

For the purposes of this ETR the following references apply:

- [1] ITU-T Recommendation X.2 (1993): "International data transmission services and optional user facilities in public data networks and ISDNs".
- [2] ITU-T Recommendation X.25 (1993): "Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [3] ITU-T Recommendation X.32 (1993): "Interface between DTE and DCE for terminals operating in the packet mode and accessing a packet switched public data network through a public switched telephone network or an ISDN or a circuit switched public data network".
- [4] ITU-T Recommendation X.75 (1993): "Packet-switched signalling system between public networks providing data transmission services".
- [5] CCITT Recommendation X.121 (1992): "International numbering plan for public data networks".
- [6] ISO/IEC 8208 (1990): "Information technology - Data communications - X.25 Packet Layer Protocol for Data Terminal Equipment".
- [7] ISO/IEC 8473 (1988): "Information processing systems - Data communications - Protocol for providing the connectionless-mode network service".
- [8] ISO/IEC TR 10029 (1989): "Information technology - Telecommunications and information exchange between systems - Operation of an X.25 interworking unit".
- [9] ETR 086-3: "Trans European Trunked Radio (TETRA) system; Technical requirements specification; Part 3: Security Aspects".

3 Definitions and abbreviations (TETRA 01.04)

3.1 Definitions

For the purposes of this ETR the following definitions apply:

Access control: the prevention of unauthorized use of resources, including the use of a resource in an unauthorized manner.

Authentication: the act of positively verifying that the true identity of an entity (network, user) is the same as the claimed identity.

Base Radio Stack (BRS): a logical grouping that includes all of the air interface protocol element in one base station (the fixed side of the air interface).

Base Station (BS): a physical grouping of equipment which provides the fixed portion of the air interface. One base station transmits and receives radio signals to and from a single location area (a single region of geographical coverage). A BS contains at least one Base Radio Stack (BRS).

Base Station Radio Part (BSRP): one physical sub-group of a base station which contains all the radio end points (one or more) that are connected to a single antenna system.

Bearer service: a type of telecommunication service that provides the capability for the transmission of signals between user-network interfaces.

Bi-directional channel: a channel that can carry information in both directions.

Broadcast call: a multipoint call in which the same information is transmitted simultaneously by the calling terminal to all available terminals.

Call: a complete information exchange between two or more parties.

NOTE 1: See also call transaction.

Call re-establishment (slow handover): the action of switching a call in progress from one cell to another or between radio channels in the same cell.

NOTE 2: Call re-establishment is used to allow established calls to continue when mobile stations move from one cell to another cell, or as a method to escape from co-channel interference.

Call transaction: all events associated with one continuous transmission of information during a call (including control signalling). A call consists of one or more call transactions.

NOTE 3: In a half-duplex call, the call consists of a sequence of unidirectional transactions.

Carrier (Radio Frequency (RF) carrier): the centre frequency of one radio transmission. A modulated carrier is used either for one uplink or one downlink.

Carrier pair: two different carriers which are allocated together to provide one uplink and one downlink. Normally the two carriers are allocated at a fixed frequency spacing (the duplex separation).

NOTE 4: Carrier pairs only refer to allocation of carriers, not to their use. For example, a bi-directional logical channel may be assigned to an uplink from one carrier pair plus a downlink from a different carrier pair.

Cell: the smallest geographical area where TETRA services may be obtained, using a certain set of radio frequencies.

NOTE 5: Each adjacent cell (touching or overlapping) should use a different set of radio frequencies to avoid co-channel interference.

Challenge-Response pair (C/R): a pair of 32 bit binary numbers linked by a security algorithm.

NOTE 6: When a user pays a subscription a key is distributed by the operator. This key is also stored in the subscriber information database.

Circuit switched connection: a connection that is established on request between two or more terminals and provides the exclusive use of the connection for information transfer until it is released.

Circuit switched data service: a data service that uses a circuit-switched connection to transfer data between data terminal equipment.

Circuit switched speech service: a service that uses a circuit-switched connection to transfer speech information between voice terminal equipment.

Closed user group: a (logical) group of users who are not allowed to communicate outside their group.

NOTE 7: Gateways to other networks and to particular subscribers may be accessible as a supplementary service.

Confidentiality (1): rendering information into the form of ciphertext, such that the information is only intelligible by entities that possess the reverse algorithm (i.e. the ability to recover the plaintext from the ciphertext).

Confidentiality (2): the property that information may not be available or disclosed to unauthorized individuals, entities or processes.

Connectionless packet data service: a service which transfers a single packet of data from one source node to one or more destination nodes in a single phase (i.e. without establishing a logical connection or virtual circuit).

Connection oriented packet data service: a service that transfers data from one source node to one destination node using a multi-phase protocol that establishes (and releases) logical connections or virtual circuits between end users that are then used to transferring packet data.

Data compression: a reversible process that reduces the quantity of data, without any loss of information.

Data integrity: the property that data has not been altered or destroyed in an unauthorized manner.

Data origin authentication: the corroboration that the origin of the source of data received is as claimed.

Direct mode: a mode of simplex operation where mobile subscriber radio units may communicate using radio frequencies which are outside the control of the network and without intervention of any base station.

Downlink: a unidirectional radio pathway for the transmission of signals from one Base Station (BS) to one or more Mobile Stations (MSs).

Duplex (full duplex): a mode of operation by which information can be transferred in both directions and where the two directions are independent. See also half duplex.

NOTE 8: In a packet switching environment (PDO or V+D signalling) protocols can be duplex at one layer and half duplex at another layer.

Encryption: the conversion of plaintext to ciphertext.

End to end: is within the TETRA boundaries:

- from TETRA terminal to TETRA terminal (LS or MS);
- from TETRA terminal to gateways;
- including inter system interface.

External user: an application which does recognize TETRA messages and cannot therefore directly invoke TETRA services.

NOTE 9: An external user may be involved in communications which also involve TETRA equipment, but the external user has no direct control over the TETRA facilities.

Facility: the means to assist the performance of an action.

Gateway: a device which will enable the interconnecting of two networks which inherently use different and incompatible protocols.

Half duplex (semi duplex): a mode of operation by which information can be transferred in both directions but the transfers are mutually dependent (i.e. uplink and downlink transfers share some resources). See also duplex.

NOTE 10: In a packet switching environment (PDO or V+D signalling) protocols can be duplex at one layer and half duplex at another layer.

Home Data Base (HDB): the data base in the MS's home TETRA network. In the HDB all necessary information about the MS is collected and stored permanently. Also information about how to find a migrating MS is stored in the HDB. There is logically only one data base in a TETRA network.

Identity exchange: a procedure in which the individual MS identity (i.e. ITSI, ISSI or ASSI) is exchanged for an alias identity (i.e. ISSI or ASSI).

NOTE 11: This is carried out for one of two purposes, either for security purposes where the real ISSI is not sent over the air interface or for exchanging a migrating MS's long ITSI identity to an unambiguous short ISSI or ASSI identity.

Implicit registration: is when the location of the MS is noticed through messages other than location updating messages, e.g. CC messages.

Incoming call: a terminating call which, from the viewpoint of an individual party, is a call that was initiated by another party.

NOTE 12: See also outgoing call.

Inter-operability: an attribute that describes the ability of a given subscriber terminal to obtain service from a given infrastructure, using the appropriate standard TETRA interface protocols.

NOTE 13: See also level of inter-operability and profile.

Inter-system inter-working capability: the ability of a particular TETRA infrastructure to exchange meaningful information with other TETRA infrastructures, using the standard TETRA inter-system inter-working protocols.

NOTE 14: An infrastructure can be characterized by the combination of its inter-system inter-working capability and its air interface profile. See also the definition of profile, and level of inter-working.

Key: a sequence of symbols that controls the operations of encipherment and decipherment.

Key management: the generation, selection, storage, distribution, deletion, archiving and application of keys in accordance with a security policy.

Level of inter-operability: the maximum level of service that can be obtained from a particular pair of equipment (one subscriber terminal and one infrastructure).

NOTE 15: See also interoperability and profile.

Level of inter-working: the maximum level of inter-system inter-working information transfer that is possible between a particular pair of equipment's (i.e. between two particular TETRA's).

NOTE 16: See also inter-system inter-working capability.

Local Line Connected Terminal (LLCT): a type of subscriber terminal which allows a TETRA user to communicate via a cable which is linked directly (i.e. not via a transit network) to the TETRA Switching and Management Infrastructure (SwMI).

Location Area (LA): an area within a TETRA network that may comprise one, several or all cells. An MS may move freely without re-registering within a location area. An MS has continuity of service within a location area. A location area is geographically static.

Logical channel: a logical communications pathway between two or more parties. A logical channel may be unidirectional or bidirectional.

Message trunking: a method of traffic channel organization where each traffic channel is permanently allocated for the complete duration of the call, which may include several separate call transactions (several pressel activations by separate terminals). The channel is only de-allocated if the call is (explicitly) released or if a timeout expires.

NOTE 17: See also transmission trunking, quasi-transmission trunking, statistical multiplexing and quasi-statistical multiplexing.

Migration: the change of location area, each belonging to different TETRA network.

Mobility: the act of a subscriber terminal changing its physical location.

Multicast: the transmission of the same information from one source node to a defined set of destination nodes.

Multiple registration: when a mobile is allowed to simultaneously be registered in more than one location area.

Mobile Radio Stack (MRS): a logical grouping that includes all of the air interface protocol element in one MS (the mobile side of the air interface).

Mobile Station (MS): a physical grouping that contains all of the mobile equipment that is used to obtain TETRA services. By definition, a mobile station contains at least one Mobile Radio Stack (MRS).

Network: a collection of subscriber terminals interconnected through telecommunications devices.

Network management entity: an entity that has access to all parts of the network.

Node: a point at which a packet is manipulated (e.g. sourced, sunk, routed or switched).

Open channel: a dedicated traffic channel that is reserved for the exclusive use of a closed user group.

NOTE 18: See also pseudo open channel.

Outgoing call: a call which, from the viewpoint of an individual participant in the call, is initiated by that participant.

NOTE 19: See also incoming call.

Phase: one discrete part of a procedure, where the start and end of the part can be clearly identified (e.g. by the dispatch of a primitive).

Plaintext: information (including data) which is intelligible to all entities.

Primitive: a distinct data element that is exchanged between adjacent protocol layers.

NOTE 20: A primitive may be defined in either an abstract or concrete format.

NOTE 21: A service primitive contains one Service Data Unit (SDU).

Private system: a TETRA system established by a private organization so that a group of subscriber terminals that are part of the system can establish calls between one another using the facilities of the private TETRA system.

Process: the exact mechanism whereby a given service is performed.

NOTE 22: If a service conforms to a standard process, it should be performed according to the process defined in the standard.

Profile: the capability of a particular equipment. This is defined separately for individual subscriber terminals and individual infrastructures.

NOTE 23: See also inter-operability and level of inter-operability.

Provision: the act of supplying a given service.

NOTE 24: A Switching and Management Infrastructure (SwMI) may be capable of supporting a service. However, it may not supply the service to certain subscriber terminals for which the service is not subscribed.

Pseudo open channel: a method of assigning traffic channels to a closed user group such that the group appear to have exclusive use of a dedicated traffic channel.

NOTE 25: See also open channel.

Public system: a TETRA network which is established and operated by an organization for the purpose of providing services to subscribing members of the public and third party organizations.

Quasi-statistical multiplexing (quasi-statistical trunking): a multiplexing method which assigns one or more traffic channels to packets from several sources on an "as-needed" basis. Each packet is assigned to one channel, but several packets may be served by a given channel at the same time (the channel capacity being shared amongst them).

NOTE 26: See also transmission trunking, message trunking, quasi-transmission trunking and statistical multiplexing.

Quasi-transmission trunking: a method of traffic channel organization where each traffic channel is allocated for the each call transaction (while the pressel is activated) and in addition the channel de-allocation is delayed for a short period at the end of the transaction (after the pressel release). During this "channel hold-time" the channel allocation may be re-used for a new call transaction that is part of the same call. A delayed channel de-allocation procedure will apply at the end of each transaction.

NOTE 27: See also transmission trunking, message trunking, statistical multiplexing, and quasi-statistical multiplexing.

Radio End Point (REP): the location of the radio function of transmitting or receiving on one carrier.

NOTE 28: A base station will contain several radio endpoints, typically half will be transmitters and half will be receivers.

Radio Packet Data Infrastructure (RPDI): all of the TETRA equipment for a Packet Data Optimised (PDO) network except for subscriber terminals. The RPDI enables subscriber terminals to communicate with each other via the RPDI.

NOTE 29: The RPDI may also make it possible for subscriber equipment to communicate via other transit networks to external applications. MSs can access the RPDI using the air interface.

Registered Area (RA): the total area for which a MS is currently registered. The RA is defined by the list of location areas contained in the latest successful registration.

NOTE 30: The registered area may be non-contiguous.

Registration: a function which allows an MS to tell the TETRA network that it has changed location area (roaming or migration), TETRA subscriber identity or mode of operation. This function enables the network to keep track of the MS.

Roaming: the change of location area within the same TETRA network.

Remote Line Connected Terminal (RLCT): a type of subscriber terminal which allows a TETRA user to communicate via a pathway which includes a transit network and the TETRA Switching and Management Infrastructure (SwMI).

Repudiation: denial by one of the entities involved in a communication of having participated in all or part of a communication.

Search Area (SA): an area comprising all location areas where a MS may search for service.

Security service: a service provided by a layer of communicating open systems which ensures adequate security of the systems or of data transfers.

Signalling: the exchange of Information specifically concerned with the establishment and control of connections, and with management, in a telecommunication network.

Statistical multiplexing: a multiplexing method which assigns one or more traffic channels to packets from several sources on an "as-needed" basis. Each packet is assigned to one channel, and each channel serves the packets sequentially (each packet is completed before a new packet is started).

NOTE 31: See also transmission trunking, message trunking, quasi-transmission trunking and quasi-statistical multiplexing.

Subscriber terminals: an equipment which an internal user can use to communicate with another user. Mobile Stations (MS), Local Line Connected Terminals (LLCT) and Remote Line Connected Terminals (RLCT) are the only types of subscriber terminal.

Supplementary service: a supplementary service modifies or supplements a bearer service or a teleservice. A supplementary service cannot be offered to a customer as a stand alone service. It should be offered in combination with a bearer service or a teleservice.

Switching and Management Infrastructure (SwMI): all of the TETRA equipment for a Voice plus Data (V+D) network except for subscriber terminals. The SwMI enables subscriber terminals to communicate with each other via the SwMI.

NOTE 32: The SwMI may also make it possible for subscriber equipment to communicate via other transit networks to external applications. Mobile Stations (MS) can access the SwMI using the air interface.

Teleservice: a type of telecommunications service that provides the complete capability, including terminal equipment functions, for communication between users according to agreed protocols.

Tetra Equipment Identity (TEI): an electronic serial number which is permanently connected to the TETRA equipment. When it is transmitted over the air interface, it is protected by an algorithm.

Threat: a potential violation of security.

Transaction (packet transaction): all the processes and procedures associated with the transmission of one packet of information between peer network layer protocol entities on opposite sides of the air interface.

Transaction (voice transaction): all of the processes and procedures associated with the unidirectional transmission of one packet of (user) information between network layer service boundaries that lie on opposite sides of the air interface.

Transmission trunking: a method of traffic channel organization where each traffic channel is individually allocated for each call transaction (for each activation of the pressel). The channel is immediately de-allocated at the end of the call transaction (subject to unavoidable protocol delays).

NOTE 33: See also message trunking, quasi-transmission trunking, statistical multiplexing and quasi-statistical multiplexing.

Two-frequency simplex: a physical layer mode of operation, where a radio end point is either receiving on one RF carrier or transmitting on another (different) RF carrier. The transmit and receive operations are dependent; transmission implies no reception, and reception implies no transmission.

Two-frequency simultaneous duplex (two frequency duplex) (two frequency full duplex): a physical layer mode of operation where a radio end point is receiving on one RF carrier and transmitting on another (different) RF carrier at the same time (the periods of transmission and reception are not separated in time). The transmit and receive operations are independent.

NOTE 34: The word duplex always implies the existence of independent transmit and receive operations. A duplex radio requires extra processing compared to a simplex radio.

Two frequency time division duplex (two frequency semi-duplex) (two frequency half-duplex): a physical layer mode of operation where a radio end point is receiving on one RF carrier and also transmitting on another (different) RF carrier, but the periods of transmission and reception are displaced (interleaved) in time. The transmit and receive operations are independent.

Unidirectional channel: a channel that can only carry information in one direction.

Uplink: a unidirectional radio communication pathway for the transmission of signals from one or more MSs to one BS.

Visited Data Base (VDB): is the data base in a visited TETRA network. When an MS has migrated to a TETRA network and exchanged its ITSI to an ISSI or an ASSI belonging to the VDB, subsequent roaming will take place in the visited network without contact with the HDB. There is logically only one VDB per TETRA system.

3.2 General abbreviations

For the purposes of this ETR the following general abbreviations apply:

| | |
|----------|---|
| ASSI | Alias Short Subscriber Identity |
| ATSI | Alias TETRA Subscriber Identity |
| BS | Base Station |
| C/R | Challenge-Response pair |
| CL (C/L) | Connectionless |
| CLNP | Connectionless Network Protocol |
| CLNS | Connectionless Network Service |
| CMCE | Circuit Mode Control Entity |
| CO (C/O) | Connection Oriented |
| CONP | Connection-Oriented Network Protocol |
| CONS | Connection-Oriented Network Service |
| DCE | Data Circuit-terminating Equipment |
| DGNA | Dynamic Group Number Assignment |
| DLC | Data Link Control |
| DM | Direct Mode |
| DTE | Data Terminating Equipment |
| ETSI | European Telecommunications Standards Institute |
| GSSI | Group Short Subscriber Identity |
| GTSI | Group TETRA Subscriber Identity |
| HDB | Home Data Base |
| ISDN | Integrated Services Digital Network |
| ISI | Inter System Interface |
| ISO | International Organisation for Standardisation |
| ISSI | Individual Short Subscriber Identity |
| ITSI | Individual TETRA Subscriber Identity |
| LA | Location Area |
| LLC | Logical Link Control |
| LS | Line Station |
| MAC | Medium Access Control |
| MCC | Mobile Country Code (Identity), part of ITSI |
| MLE | Mobile Link Entity |
| MM | Mobility Management |

| | |
|--------|--|
| MNC | Mobile Network Code (Identity), part of ITSI |
| MS | Mobile Station |
| MSI | Mobile Subscriber Identity |
| MT | Mobile Termination |
| MTU | Mobile Terminating Unit |
| NT | Network Termination |
| NWK | Network |
| OSI | Open Systems Interconnection |
| PAD | Packet Assembler/ Disassembler |
| PD | Protocol Discriminator |
| PDN | Public Data Network |
| PDO | Packet Data Optimised |
| PDU | Protocol Data Unit |
| PICS | Protocol Implementation Conformance Statement |
| PSTN | Public Switched Telephone Network |
| PTN | Private Telephone Network |
| PTNX | Private Telephone Network eXchange |
| PVC | Permanent Virtual Circuit |
| RES-6 | ETSI Sub-Technical Committee RES-6 (Radio Equipment and Systems - 6) |
| RA | Registered Area |
| RPDI | Radio Packet Data Infrastructure |
| RPDN | Radio Packet Data Network |
| S-CLNP | Specific Connectionless Network Protocol |
| S-CLNS | Specific Connectionless Network Service |
| SA | Search Area |
| SAP | Service Access Point |
| SDL | (Functional) Specification and Description Language |
| SDU | Service Data Unit |
| SNAcP | Sub-Network Access Protocol |
| SNDCCP | Sub-Network Dependent Convergence Protocol |
| SNICP | Sub-Network Independent Convergence Protocol |
| SS | Supplementary Service |

NOTE: The abbreviation SS is only used when referring to a specific Supplementary Service.

| | |
|----------|---|
| SwMI | Switching and Management Infrastructure |
| TBD | To Be Determined |
| TDC | Transient Data Channel |
| TE | Terminal Equipment |
| TEI | TETRA Equipment Identity |
| TETRA | Trans European Trunked RAdio |
| TMI | TETRA Management Identity |
| USSI | Unexchanged Short Subscriber Identity |
| V+D | Voice Plus Data |
| VC | Virtual Call |
| VDB | Visited Data Base |
| VPA | Virtual Point of Attachment |
| X.25 PLP | X.25 Packet Layer Protocol (Layer 3 of ITU-T Recommendation X.25 [2]) |

3.3 Supplementary service abbreviations

| | |
|-------|--|
| AL | Ambience Listening |
| AoC | Advice of Charge |
| AP | Access Priority |
| AS | Area Selection |
| BIC | Barring of Incoming Calls |
| BOC | Barring of Outgoing Calls |
| CAD | Call Authorized by Dispatcher |
| CCBS | Call Completion to Busy Subscriber |
| CCNR | Call Completion on No Reply |
| CFB | Call Forwarding on Busy |
| CFNRy | Call Forwarding on No Reply |
| CFNRc | Call Forwarding on Mobile Subscriber Not Reachable |

| | |
|------|---|
| CFU | Call Forwarding Unconditional |
| CLIP | Calling Line Identification Presentation |
| CLIR | Calling/Connected Line Identification Restriction |
| COLP | Connected Line Identification Presentation |
| CR | Call Report |
| CRT | Call Retention |
| CW | Call Waiting |
| DGNA | Dynamic Group Number Assignment |
| DL | Discreet Listening |
| HOLD | Call Hold |
| IC | Include Call |
| LE | Late Entry |
| LSC | List Search Call |
| PC | Priority Call |
| PPC | Pre-emptive Priority Call |
| SNA | Short Number Addressing |
| TC | Transfer of Control of Call |
| TPI | Talking Party Identification |

4 Packet Data Optimised (PDO) service descriptions (TETRA 02.03)

4.1 General

4.1.1 Bearer services

PDO systems should provide the following bearer services:

- connection oriented packet-mode service:
 - point-to-point;
- specific connectionless packet-mode services:
 - point-to-point;
 - point-to-multipoint (multicast).

4.1.2 Supplementary services

No supplementary services should be supported. Equivalent services are provided by some of the standard facilities and functions.

4.1.3 Facilities for connection oriented service

A set of standard ISO/IEC 8208 [6] user facilities should be supported for the connection oriented bearer services as described in subclause 5.8 which correspond to the facilities provided by current fixed packet networks.

4.1.4 Facilities for specific connectionless service

The user facilities that are supported for the specific connectionless bearer services are described in subclause 6.8. These user facilities are specific requirements that require special TETRA designs. These facilities distinguish the specific connectionless service from the standard service.

4.2 Network principles and basic concepts

Packet data optimised systems should provide the same functionality and similar performance (see subclauses 5.6 and 6.6) as provided by current fixed Packet Data Networks (PDNs). The wide range of applications and communications software that is used across fixed PDNs should thus be available to mobile users.

The term Radio Packet Data Network (RPDN) will be used in this ETR to refer to the TETRA network. Logically, the RPDN comprises all of the Radio Packet Data Infrastructure (RPDI) (the fixed infrastructure)

plus part of each mobile station (MS). The network part of the mobile station is called the Mobile Terminating Unit (MTU). The MTU contains all of the air interface protocol elements (one mobile radio stack) together with other application specific access elements.

5 Connection oriented services

5.1 General

The connection oriented packet mode service should be based on the ISO Connection Oriented Network Service (CONS). A suitable network layer protocol is the ISO/IEC 8208 [6] standard, which is closely based on the ITU-T Recommendation X.25 [2]. In the following paragraphs this network layer protocol is referred to as X.25 PLP.

TETRA should provide the standard X.25 PLP services and facilities including:

- Virtual Call (VC) and Permanent Virtual Circuit (PVC) services;
- standard X.25 PLP packet sizes and window sizes;
- the possibility to support any or all of the standard X.25 PLP facilities, as described in subclause 5.8.

VCS should allow both fixed and mobile users to establish a connection to any other user of the network (subject to any subscription restrictions). VC establishment should be based on the use of CCITT Recommendation X.121 [5] addresses.

5.2 Mobile station operation

5.2.1 General

The Mobile Terminating Unit (MTU) part of the Mobile Station (MS) is logically part of the RPDN. Thus, for the mobile application, the point of attachment to the network is always fixed, and no special identification procedures (e.g. ITU-T Recommendation X.32 [3]) should be required.

VCS and PVCs operation should appear standard to the user, subject to remaining within range of any base station of his chosen operator.

Special procedures will be required over the air interface to support mobility of the mobile stations, and to provide rapid creation of an air interface connection in response to traffic demands. These requirements are described in subclause 5.5.

The two primary protocol configurations for mobile stations are shown in figures 1 and figure 2.

Figure 1 shows a non-integrated MTU that provides a X.25 packet-mode access (DTE-DCE interface) for a (physically) separate terminal. Figure 1a shows the normal layer 1 and layer 2 arrangement for packet-mode access. Figure 1b shows how alternative layer 1 and layer 2 protocols may be supported (e.g. an internal computer interface within a laptop computer) but in both cases the access layer 3 protocol is a standard X.25 DTE packet layer. This use of a standard layer 3 protocol ensures that the network layer service boundary conforms to the standard X.25 service boundary.

5.2.2 Non-integrated service arrangements

Figure 1 shows a non-integrated MTU that provides a X.25 packet-mode access (DTE-DCE interface) for a (physically) separate terminal. Figure 1a shows the normal layer 1 and layer 2 arrangement for packet-mode access. Figure 1b shows how alternative layer 1 and layer 2 protocols may be supported (e.g. an internal computer interface within a laptop computer) but in both cases the access layer 3 protocol is a standard X.25 DTE packet layer. This use of a standard layer 3 protocol ensures that the network layer service boundary conforms to the standard X.25 service boundary.

5.2.3 Integrated service arrangements

Figure 2 shows a physically integrated MTU that provides a X.25 network layer service boundary without using the standard X.25 access protocols. This differs from case 1 in allowing the complete elimination of the layer 1 and layer 2 access protocols.

In figure 2a, the functional blocks of X.25 DTE, X.25 DCE and AI-3 are shown as distinct entities in order to show the conceptual alignment with figure 1. In practice, the AI-3 protocol should be designed to allow for a more integrated implementation. Ideally, as shown in figure 2b, it should be possible to implement the X.25 DTE service boundary with a simple convergence sublayer above the AI-3 service boundary.

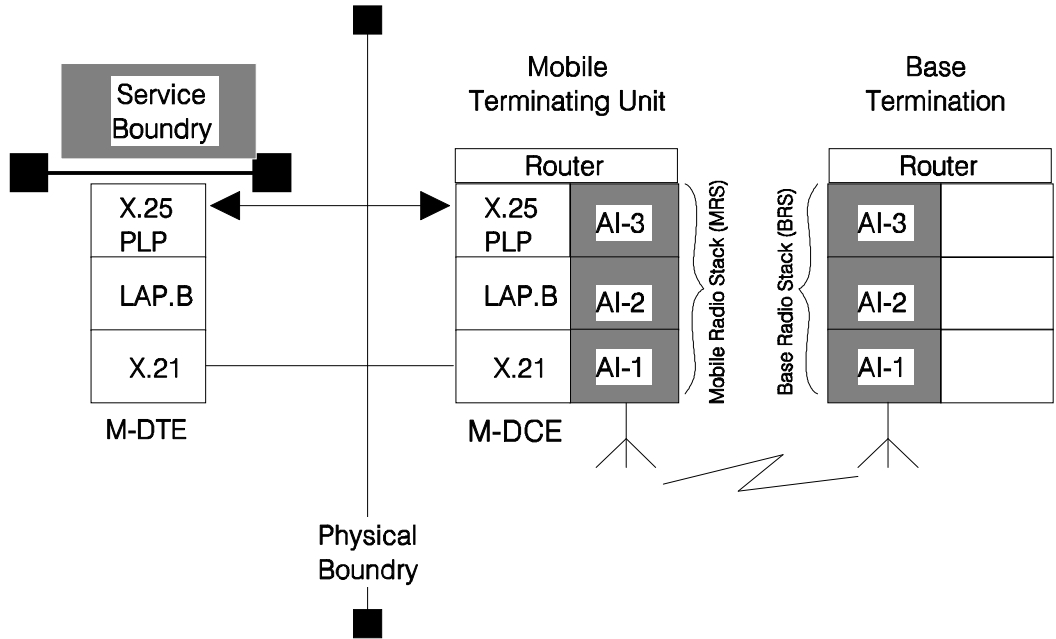


Figure 1a: Standard X.25 packet-mode interface

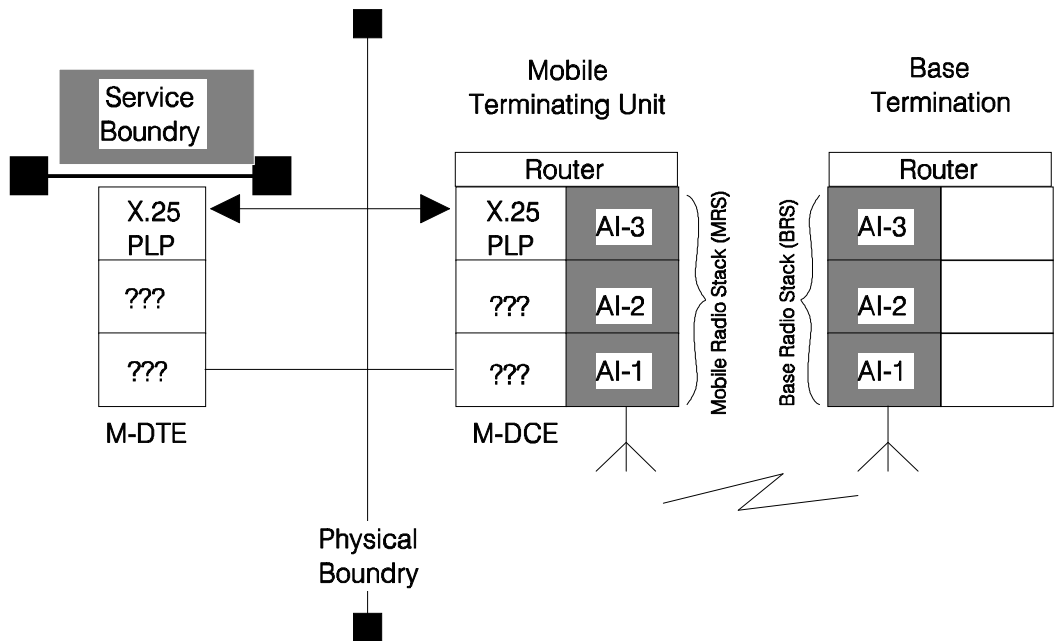


Figure 1b: Non-standard X.25 packet-mode interface

Figure 1: Non-integrated mobile service arrangements: Packet-mode (DCE-DTE) service

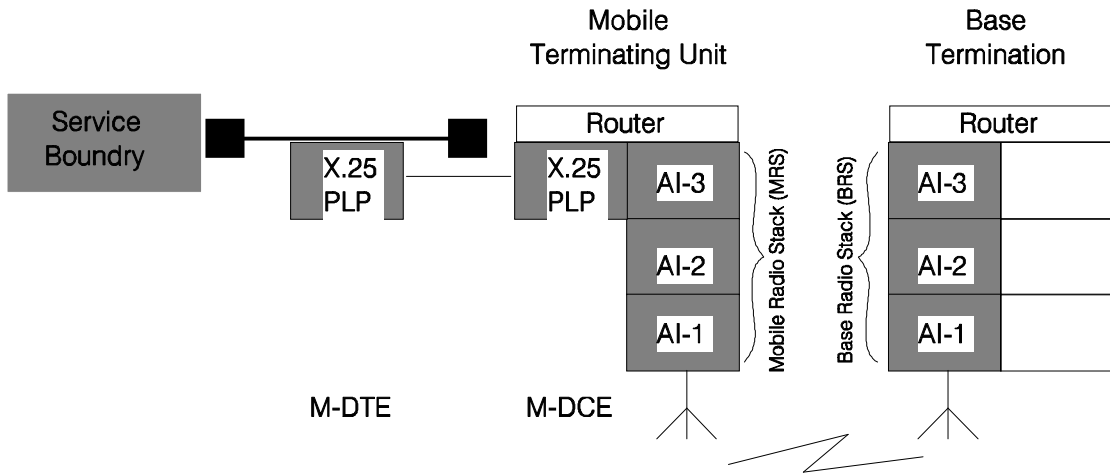


Figure 2a: Integrated connection: Conceptual (expanded) view

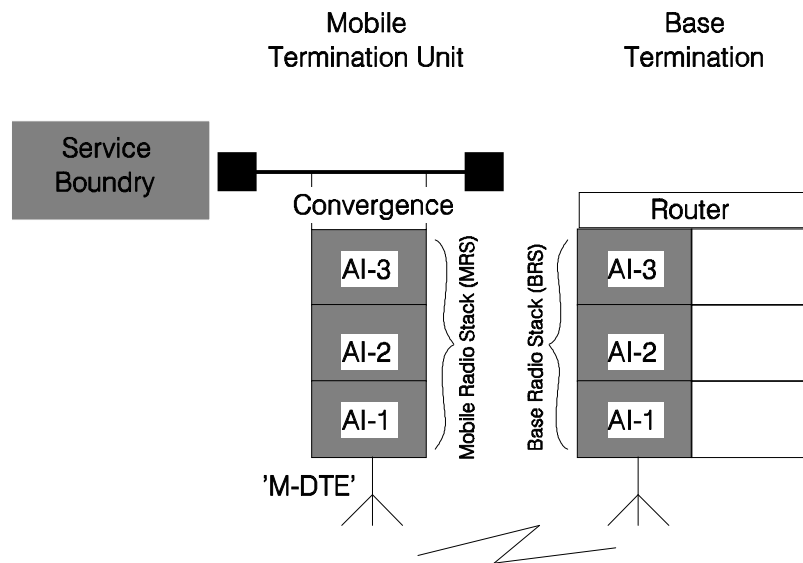


Figure 2b: Integrated connection: Actual (condensed) view

Figure 2: Integrated mobile service arrangement: (Packet mode service)

5.2.4 Packet Assembler/Disassembler (PAD) character-mode access

As a consequence of supporting packet mode access it should be possible to provide a PAD character-mode access. In particular a standard X.3/X.28/X.29 (Triple X) PAD is assumed to be possible by attaching it via the X.25 DTE-DCE interface.

5.3 Fixed terminal operation

The RPDN should provide standard access for fixed users by providing direct X.25 DCE ports. PAD character based access ports may be provided as an option.

The primary protocol configuration for fixed terminals is shown in figure 3.

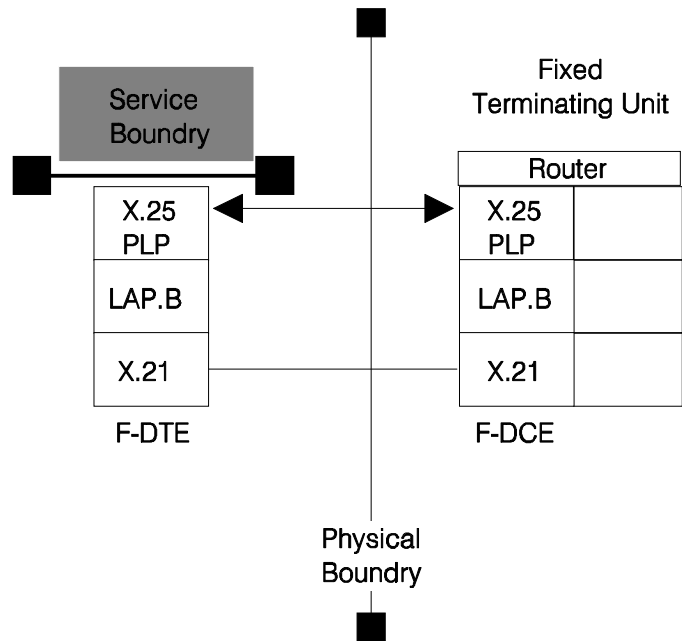


Figure 3: Fixed user service arrangement: Packet-mode (DCE-DTE) service

5.4 Interconnection to other PDNs or RPDNs

Interconnection to X.25 PDNs or RPDNs should be based on normal methods such as ITU-T Recommendation X.75 [4].

5.5 Operation of air interface for connection oriented service

5.5.1 Addressing

5.5.1.1 Virtual Point of Attachment (VPA)

Each MTU is required to maintain at least one VPA. This definition of a single VPA means that a MTU is only required to be attached to a single base station at any one time. Note that the term "virtual" refers to a logical association that should be maintained by the RPDI in order to manage the mobility of the MTU.

NOTE: There may be more than one complementary process that are defined to support mobility, such as packet forwarding and routing table updates. The VPA concept is intended to include all such procedures, and no specific mechanism is intended.

The VPA is defined by the TETRA subscriber address (ITSI family).

5.5.1.2 Transferable subscription

The TETRA subscriber identity should be assigned independently of any physical equipment. Ideally a subscriber should be able to obtain service using any suitable equipment.

5.5.2 Air interface resource sharing

Each base station is expected to support a small number of independent but concurrent packet-data channels. These are defined as logical (layer 2) traffic channels that are may be used by any of the active mobile stations that are registered at that base station.

Each packet to and from a MTU should be treated as a separate transaction, and should be processed separately by the air interface. There is no requirement for circuit mode operation, and it is assumed that air interface resources are only reserved for the duration of the transaction (i.e. for the duration of one packet). Packets to and from the different mobile users should be multiplexed into these logical traffic

channels in a statistical manner by the creation and use of Transient Data Channels (TDCs). Additional multiplexing techniques (e.g. quasi-statistical multiplexing) may be required to share the resources between competing users in the event of concurrent requests for service.

NOTE 1: Logical traffic channels and TDCs are defined for description purposes only: no implementation requirement is intended.

NOTE 2: Statistical multiplexing is considered essential to obtain optimum performance, and time division multiplexing (i.e. fixed partitioning of the resources) is not required. The exact multiplexing algorithm(s) are for further study.

5.6 Air interface performance requirements

5.6.1 Air interface connection establishment

The normal state of each MDU will be idle corresponding the idle state of the associated VCs and PVCs. A MDU should be activated automatically (i.e. with no user intervention) in response to the following events:

- a) a request for transmission of user data either to the MS or from the MS using an existing VC or PVC;
- b) a request for establishment or disconnection of a VC, originated from either side.

The complete service time, including activation of the TDC(s) and transmission of the packet across the air interface, should meet the following performance requirements for case a):

- mean packet transit time across the air interface: 100 ms.

NOTE 1: This figure applies to a reference packet of 128 octets at "busy-hour". "Transit time" refers to the total time from submission of the complete packet at the source side to delivery of the complete packet at the destination side.

NOTE 2: Good coverage is defined to be where the mean packet transit time target is achieved.

The complete service time, including activation of the TDC(s) and transmission of all packets should meet the following performance requirements for case b):

- mean VC establish time: 150 ms.

NOTE 3: The performance of case (b) is defined to be equivalent to current fixed PDNs. This is for further study.

NOTE 4: Assuming a call setup packet is 128 octets.

NOTE 5: The establishment time between the MS and the infrastructure excluding any onward call setup to another MS or LS.

5.6.2 Air interface VPA re-establishment

Whilst in the idle state, a MTU may re-establish its VPA to a new base station. This process should provide continuity of VCs and PVCs for a roaming user (i.e. no VC re-establishment should be required as a result of a VPA re-establishment).

Normal VPA re-establishment is expected to be fast enough to be invisible to the user. However, if a data transmission request is received during the re-establishment procedure, the request is queued until the re-establishment is completed, and the user will notice a significant increase in packet transmission time.

If, in exceptional circumstances, the normal VPA re-establishment fails, then all of the VCs and PVCs are assumed to be released. In this event the user will be notified of the failure (e.g. by a "restart" indication) and will be required to re-establish the VCs when (eventually) the VPA is re-established. The PVCs (by definition) will be automatically re-established as soon as the VPA is re-established.

Normal VPA re-establishment should meet the following performance requirements:

- maximum re-establishment time: [30] seconds.

NOTE: This figure is for further study. The figure of [30] seconds is proposed as 50 % of the X.25 PLP retransmission timeout. "Re-establishment time" refers to the total time from release of the "radio" connection at the old base station to creation of a TDC at the new base station.

Following successful VPA re-establishment the normal performance requirements listed in subclause 5.6.1 should apply.

5.7 Security features

The security features are defined in Part 3 of this ETR [9] with the following priorities set in descending order of importance:

- authentication of the user;
- authentication of the network;
- authentication of the TEI;
- authentication of the TMI;
- user identity confidentiality;
- group identity confidentiality;
- data integrity and data origin authentication for signalling data;
- signalling information confidentiality;
- functions for air interface key management.

5.7.1 Authentication

Procedures will be defined to provide added security, see Part 3 of this ETR [9]. These may include (but are not restricted to) the use of the ITU-T Recommendation X.32 [3] identification procedures.

5.7.2 Ciphering

The requirements for ciphering are defined in Part 3 of this ETR [9].

5.8 Facilities for connection oriented service

The facilities should be identical to the facilities specified for a direct connection to a packet switched data transmission service as defined in ISO/IEC 8208 [6] Clause 13 and table 9.

Table 9 from ISO/IEC 8208 [6] is reproduced here for ease of reference.

NOTE: ITU-T Recommendation X.25 [2] has inherent features (e.g. the conveying of an extension address) which are not listed in table 1. Such features are fully explained in ITU-T Recommendation X.25 [2] and are so-called "ITU-T defined DTE facilities".

Table 1: Packet layer optional user facilities

| Optional user facility | Classification (NOTE 1) | | Agree for period of time ? | Applies per call ? | Applies to DTE/DTE operation ? (NOTE 6) |
|---|-------------------------|-----|----------------------------|--------------------|---|
| | VC | PVC | | | |
| On-line facility registration | A | A | Yes | No | Yes ² |
| Extended packet sequence numbering | A | A | Yes | No | Yes |
| D-bit modification | A | A | Yes | No | No |
| Packet retransmission | A | A | Yes | No | Yes ² |
| Incoming calls barred | E | - | Yes | No | No ³ |
| Outgoing calls barred | E | - | Yes | No | No ³ |
| One-way logical channel outgoing | E | - | Yes | No | Yes |
| One-way logical channel incoming | A | - | Yes | No | Yes |
| Nonstandard default packet sizes | A | A | Yes | No | Yes |
| Nonstandard default window sizes | A | A | Yes | No | Yes |
| Default throughput classes assignment | A | A | Yes | No | Yes |
| Flow control parameter negotiation | E | - | Yes | Yes ⁴ | Yes |
| Throughput class negotiation | E | - | Yes | Yes ⁴ | Yes |
| Closed user group related facilities: | | | | | |
| -Closed user group | E | - | Yes | No | No |
| -Closed user group with outgoing access | A | - | Yes | No | No |
| -Closed user group with incoming access | A | - | Yes | No | No |
| -Incoming calls barred within a Closed user group | A | - | Yes | No | No |
| -Outgoing calls barred within a Closed user group | A | - | Yes | No | No |
| -Closed user group selection | E | - | No | Yes ⁴ | No |
| -Closed user group with outgoing access selection | A | - | No | Yes ⁴ | No |
| Bilateral closed user group related facilities: | | | | | |
| -Bilateral closed user group | A | - | Yes | No | No |
| -Bilateral closed user group with outgoing access | A | - | Yes | No | No |
| -Bilateral closed user group selection | A | - | No | Yes ⁴ | No |
| Fast select | E | - | No | Yes | Yes ⁵ |
| Fast select acceptance | E | - | Yes | No | No ³ |
| Reverse charging | A | - | No | Yes | No |

(continued)

Table 1: Packet layer optional user facilities (concluded)

| Optional user facility | Classification (NOTE 1) | | Agree for period of time? | Applies per call? | Applies to DTE/DTE operation ? (NOTE 6) |
|---|-------------------------|-----|---------------------------|-------------------|---|
| | VC | PVC | | | |
| Reverse charging acceptance | A | - | Yes | No | No |
| Local charging prevention | A | - | Yes | No | No |
| Network user identification related facilities | | | | | |
| - NUI subscription | A | - | Yes | No | No |
| - NUI override | A | - | Yes | No | No |
| - NUI selection | A | - | No | Yes ⁴ | No |
| Charging information | A | - | Yes | Yes | No |
| RPOA related facilities | | | | | |
| - RPOA subscription | A | - | Yes | No | No |
| - RPOA selection | A | - | No | Yes | No |
| Hunt group | A | - | Yes | No | No |
| Call redirection and call Deflection related facilities | | | | | |
| - call redirection | A | - | Yes | No | No |
| - call deflection subscription | A | - | Yes | No | No |
| - call deflection selection | A | - | No | Yes ⁴ | No |
| - call redirection or call Deflection notification | A | - | No | Yes | No |
| Called line address, modified notification | A | - | No | Yes | No |
| Transit delay selection and indication | E | - | No | Yes | No |

VC = Virtual Call

PVC = Permanent Virtual Circuit

NOTE 1: The classification indicates whether the facility should be provided by an X.25 network (an E - Essential facility), may optionally be provided by an X.25 network (an A - Additional facility), or does not apply (shown as a dash) as given in ITU-T Recommendation X.2 [1].

NOTE 2: In a DTE/DTE environment, use of these facilities is agreed to separately for each direction of transmission.

NOTE 3: In a DTE/DTE environment, these facilities may apply only through the use of the On-Line Facility Registration (OLFR) facility.

NOTE 4: These VC facilities cannot be used unless the corresponding facility has been agreed to for a period of time.

NOTE 5: In a DTE/DTE environment, use of this facility requires agreement by both DTEs for a period of time.

NOTE 6: Annex A of ISO/IEC 8208 [6] and ISO/IEC TR 10029 [8] apply in lieu of this column for DTE-to-DTE operation in the case where one DTE is acting as an intermediate system exporting facilities of a packet network to one or more other DTEs.

6 Connectionless services

6.1 General

Two specific connectionless packet mode services should be provided:

- FULL S-CLNS;
- SLIM S-CLNS

The SLIM service only provides a basic connectionless data transfer capability. The FULL service provides the same data transfer capability but with the addition of a defined set of TETRA specific facilities. These services will be provided by a TETRA specific protocol, where the SLIM protocol is a subset of the FULL protocol. In the following paragraphs these network layer protocols are jointly referred to as "S-CLNP".

The SLIM specific connectionless service should be suitable for operation as a sub-network service for the standard ISO connectionless packet-mode protocol, as defined in Clause 8 of ISO/IEC 8473 [7]. In the following paragraphs the ISO/IEC 8473 [7] protocol is referred to as "CLNP".

It should be possible to implement the CLNP protocol over the SLIM option of the TETRA specific connectionless service with a simple convergence function. This should support CLNP operation as either a "sending node" or a "receiving node" according to the definitions given in ISO/IEC 8473 [7].

NOTE: The main consequence of this arrangement is that the CLNP addresses are owned by the user, and not by the network.

Support for the Internet Protocol (IP) is for further study.

6.2 Mobile station operation

6.2.1 Services supported

Mobile station operation may support either or both of the connectionless services. The support of these services will be an operator choice, and may also be subject to individual (per subscriber) agreements.

6.3 Fixed terminal operation

Fixed terminals that are directly attached to the RPDN may support either or both of the specific connectionless services. The support of these services will be an operator choice, and may also be subject to individual (per subscriber) agreements.

NOTE: The transit network may be unable to support routing of packets belonging to the specific service.

Fixed terminal operation is for further study.

6.4 Interconnection to other PDNs or RPDNs

Interconnection should use ITU-T Recommendation X.25 [2] or ITU-T Recommendation X.75 [4] to provide a bearer service.

6.5 Operation of air interface for connectionless service

6.5.1 Addressing

6.5.1.1 Virtual Point of Attachment (VPA)

The air interface operation is expected to be similar to the connection oriented service.

A single VPA will be required to provide routing for the connectionless packets. A single VPA (a single ITSI address) could support both connectionless services together with the connection oriented service because the essential requirement is the same for all services.

6.5.1.2 Transferable subscription

Refer to subclause 5.6.1.2.

6.5.2 Air interface resource sharing

Connectionless packets are expected to be statistically multiplexed (similar to for connection oriented packets, see subclause 5.5.2).

Connectionless packets will be expected to share the air interface (the transmission capacity) with connection oriented packets. It should be possible to allow connectionless packets and connection oriented packets to operate with different priorities (e.g. by using different logical channels).

NOTE: The specific connectionless service may define different levels of priority. This is assumed to indicate queuing priority, but it may also indicate air interface access priority. This is for further study.

6.6 Air interface performance requirements

The normal state of each MDU will be "idle" corresponding the idle state of the associated VCs and PVCs. A MDU should be activated automatically (i.e. with no user intervention) in response to the following events:

- a request for transmission of user data either to the MS or from the MS.

The complete service time, including activation of the TDCs and transmission of the packet across the air interface, should meet the following performance requirements:

- mean packet transit time across the air interface: 100 ms.

NOTE 1: This figure applies to a reference packet of 128 octets at "busy-hour". "Transit time" refers to the total time from submission of the complete packet at the source side to delivery of the complete packet at the destination side.

NOTE 2: Good coverage is defined to be where the mean packet transit time target is achieved.

6.7 Security

Security should follow the technical requirements described in Part 3 of this ETR [9].

6.8 Facilities for specific connectionless service

6.8.1 Summary of facilities

The facilities shown in table 2 should be included in the TETRA standard.

Table 2: Facilities for specific connectionless service

| Facility | Classification | Agree for period of time | Applies per packet |
|----------------------|----------------|--------------------------|--------------------|
| Delivery disposition | F | No | Yes |
| Priority | F,S | Yes | Yes |
| Multicast | F | Yes | Yes |
| Area selection | F | Yes | Yes |
| Timestamping | F | No | Yes |
| Packet storage | F | Yes | Yes |
| Subaddressing | F,S | No | Yes |

NOTE 1: The classification indicates whether the facility should be provided by the Full (F) protocol or the Slim (S) protocol.

NOTE 2: This table is not intended to define the coding method of the facilities. Facilities may be coded with an optional field, or with a fixed field or any combination of the two.

NOTE 3: The area selection facility should only be used together with the multicast facility. Area selection for point-to-point (individual) calls is not supported.

6.8.2 Delivery disposition

The delivery disposition facility provides the sending user with interim progress reports from the network as to the disposition of the packet. The following set of interim reports are required:

- a) acceptance of the packet by the destination (receiving) node (point-to-point packets only);
- b) multicast packet successfully transmitted (multicast packets only, no air interface acknowledgement expected).

NOTE: Additional delivery disposition reports may also be defined (e.g. message store reports). These are for further study.

6.8.3 Priority

Multiple levels of priority should be provided for all packets sent from a mobile station. Higher priority packets should be transmitted ahead of lower priority packets.

This facility is assumed to refer to queuing priority, similar to ISO/IEC 8473 [7] for intermediate nodes. At the air interface this is expected to also include a requirement for different access priority on the uplink access channels (e.g. during high traffic periods) when the use of the uplink access channels may be restricted to high priority messages.

6.8.4 Multicast

The multicast facility allows a single packet (a single SDU) to be sent to multiple destinations, where a single destination address is used to identify a defined group of stations.

A reserved "all mobile stations" address should be provided to allow for broadcast operation as a special case of the multicast facility.

The air interface protocol should support true multicast operation whereby a single transmission can be received by multiple destinations.

6.8.5 Area selection

The area selection facility allows the sending user to specify which areas of radio coverage (e.g. which base stations) should be used to transmit a message.

This facility should only be used in combination with the multicast facility, it is not required for point-to-point packets.

The area selection parameter should allow one of a small number of predefined values to be specified on a per-packet basis. The meaning of this parameter is not defined in the TETRA standard, and these predefined values should have only local significance (i.e. network and/or user specific).

NOTE: The area selection parameters only have local significance, e.g. they may be individually defined for each subscription. No standard codings for geographic areas are required.

6.8.6 Packet identity

Confirmation of delivery of packets, where requested, is accompanied by the return of the first two bytes of user data.

6.8.7 Packet storage

This facility allows the sending user to request the network to store a packet if the network is unable to deliver the message immediately. Different levels of storage may be provided, with storage times from minutes to days.

NOTE: This facility may be provided as an RPDI application (e.g. provided by a network "feature-node").

6.8.8 Subaddressing

The ability for the sending user to invoke a specific destination subaddress. This facility allows the sending user to address independent higher layer users (applications) using a single instance of S-CLNP.

This facility should always be provided, and the sending user should define the subaddress individually for each packet (for each service invocation) to define the required subaddress at the destination.

Certain subaddress values may be predefined to support system or network applications (e.g. a management subaddress). This is for further study.

6.8.8.1 User access to specific connectionless facilities

The specific connectionless facilities should be accessed by the user using normal service primitives. The per-packet facilities should be defined in one primitive - the same primitive that contains the SDU (the user data).

An "infrastructure confirmation" should be returned to the sending user in response to each packet submission. This should provide a confirmation to the sending user that the packet has been accepted (for onward transmission) by the fixed infrastructure. For mobile stations, this indication should correspond to a successful transmission of the packet to the base station (uplink transfer over the air interface).

History

| Document history | |
|------------------|---|
| January 1994 | First Edition |
| October 1995 | Converted into Adobe Acrobat Portable Document Format (PDF) |
| | |
| | |
| | |