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# TETRAPOL Specifications;
# Part 10: Inter System Interface;
# Part 3: ISI protocol design

## TETRAPOL FORUM

**TETRAPOL Secretariat**

**Postal address:** BP 40 78392 Bois d'Arcy CEDEX - FRANCE
Tel.: +33 1 34 60 55 88 - Fax: +33 1 30 45 28 35

# Contents

## Foreword

This document is the Publicly Available Specification (PAS) of the TETRAPOL Land Mobile Radio System, which shall provide digital Narrow Band Voice, Messaging, and Data Services. Its main objective is to provide specifications dedicated to the more demanding PMR segment: the Public Safety. These specifications are also applicable to most PMR networks.

This PAS is a multipart document which consists of:

Part 1 General Network Design

Part 2 Radio Air Interface

Part 3 Air Interface Protocol

Part 4 Data-Gateway to X.400

Part 5 Interface to Dispatch Centre

Part 6 Line Connected Terminal Interface

Part 7 CODEC

Part 8 Radio conformance tests

Part 9 Air Interface Protocol conformance tests

**Part 10 Inter System Interface**

Part 11 Gateway to external networks

Part 12 Network Management Centre Interface

Part 13 User Data Terminal to System Terminal Interface

Part 14 Mobile Station and Base Station Simulators

Part 15 Data Gateway to External Data Terminal (EDT)

Part 16 Security

Part 18 Base station (BS) to Radioswitch (RSW) interface

Part 19 Stand Alone Dispatch Position (SADP) Interface

## 1. Scope

Interoperability between PMR systems requires a common inter-system interface. This network-to-network interface is referred to as the ISI.

The ISI shall both permit communications between independently operated systems and protect each system in the event of any failure or unauthorised use of the other system.

The ISI protocol is considered here between two TETRAPOL systems, or between a TETRAPOL system and another digital PMR system. Between a TETRAPOL system and another digital PMR system, the ISI may also act as a gateway interface with protocol conversion and filtering.

This document corresponds to sub-part 10.3 of the TETRAPOL inter-system interface which is divided into three sub-parts:

- Part 10.1 ISI Technical requirements;
- Part 10.2 ISI Architecture;
- **Part 10.3 ISI Protocol design.**

This sub-part specifies the protocol for the support of the inter-system services on the signalling plane and on the user information plane at R9 reference point between TETRAPOL SwMIs. The requirements are specified in terms of ISI services embodied by network features above an ad-hoc bearer service.

This sub-part also specifies the interworking requirements for the support of the inter-system services on the signalling plane and on the user information plane at R11 reference point between a TETRAPOL SwMI and another PMR system.

## 2. Normative references

This PAS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

[1] PAS 0001-1: TETRAPOL Specifications; General network design.

[2] PAS 0001-10-1: TETRAPOL Specifications; Inter-system Interface Technical Requirements.

[3] ETS 300 402: Integrated Services Digital Network (ISDN); Digital subscriber signalling system 1 (DSS1) protocol; Data link layer.

[4] ETS 300 172: Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Circuit mode basic services. [ISO/IEC 11572 (1994) modified]

[5] ETS 300 239: Private Integrated Service Network (PISN); Inter-exchange signalling protocol; Generic functional protocol for the support of supplementary services. [ISO/IEC 11582 (1995), modified]

[6] ITU-T Recommendation X.25: 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 circuits.

[7] ITU-T Recommendation X.229: Remote operations; protocol specification.

[8] ITU-T Recommendation X.209: Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).

[9] ITU-T Recommendation Z.100: Specification and Description Language.

[10] draft prETS 300 392-3 TETRA interworking (march 1997).

[11] ETS 300 303: "Integrated Services Digital Network (ISDN); ISDN - Global System for Mobile communications (GSM) Public Land Mobile Network (PLMN) signalling interface".

# 3. Definitions, symbols and abbreviations

## 3.1. Definitions

For the purposes of this PAS, the following definitions apply:

**Bearer:** A bearer provides the capability for information transfer in a SwMI, between network access points, using one information transfer mode.

**Call:** A voice service invocation.

**Call master SwMI**: The switching and management infrastructure (SwMI) in charge of the synchronisation of the call establishment over ISI and the call release procedures between SwMIs.

**Connection:** An association of logical channels established to provide a means for user information transfer.

**Destination SwMI**: A SwMI to which a call is routed over the ISI from the call master SwMI.

**Home SwMI**: The individual home SwMI of a system terminal is the SwMI that is designated by the country code and network code of its long individual explicit address. The group home SwMI of a network group or of a regional operational group is the SwMI that is designated by the country code and network code of its long group address. Federal groups have no unique home SwMI.

**Home location register:** Database containing subscription information, for the purpose of terminal location and service profile management.

**Incoming call**: A call that is originated outside of the local system. A call over ISI is said to be an incoming call for a SwMI when its establishment propagates from the ISI to the SwMI.

**Local SwMI:** A SwMI a system manager is in charge of.

**Network**: The switching and management infrastructure and the base stations within a system.

**Originating SwMI:** The SwMI in which the calling user is registered when requesting a call establishment.

**Outgoing call**: A call that is originated from the local system. A call over ISI is said to be an outgoing call for a SwMI when its establishment propagates from the SwMI over the ISI.

**Participating SwMI:** A SwMI that is involved in the coverage of a call, as defined before the call activation.

**Protocol data unit:** Combination of protocol control information and service data unit to support the flow for a service provided at the related layer of a protocol stack.

**Radio terminal**: System terminal connected to the infrastructure by a radio link, equivalent to the Mobile termination unit MTU.

**Service data unit**: Signalling data and user information created at the upper layers of the protocol stack and that shall be transferred using the service of the related layer. A service data unit is the payload contents of a protocol data unit.

**SwMI:** Switching and management infrastructure.

**System:** A system comprises a network and a set of terminals.

**System manager**: The manager in charge of the operation of a system.

**System Terminal:** A service access reference point provided to the user by the System. System terminals ST are Radio terminals, Line connected terminals, Stand alone dispatch positions

**Visited SwMI**: A SwMI is referred to as the visited SwMI of a terminal, if the terminal is attached to this SwMI and this SwMI is not the home SwMI of the terminal.

**Visitor location register**: Database containing sub-parts of a subscription profile and location indication for terminals visiting the base network of a SwMI.

### 3.2. Abbreviations

For the purpose of ISI, the following abbreviations apply:

| | |
|---|---|
| A/I | Air Interface |
| ANF | Additional Network Feature |
| APDU | Application Protocol Data Unit |
| ASN.1 | Abstract Syntax Notation 1 |
| BC | Broadcast call |
| BN | Base Network |
| CC | Call control or country code |
| DCE | Data circuit-terminating equipment |
| DLCI | Data link connection identifier |
| DTE | Data terminal equipment |
| GC | Group call |
| GLR | Gateway location register of a SwMI |
| GSW | Gateway switch |
| HLR | Home location register of a SwMI |
| IC | Individual call |
| ISI | Inter-system interface |
| MM | Mobility management |
| MOCH | Multisite open channel |
| NC | Network code of a SwMI in a country |
| OG | Operational group |
| PINX | Private Integrated Services Network Exchange |
| PISN | Private Integrated Services Network |
| PDU | Protocol data unit |
| PSS1 | Private Signalling System Number 1 |
| RT | Radio terminal |
| RSW | Radio switch, providing routeing capability to base stations |
| SAP | Service Access Point |
| SDL | Specification and Description Language |
| ST | System terminal |
| SwMI | Switching and management infrastructure of a system |
| VLR | Visitor location register in a base network of a SwMI |

## 4. Elements of the inter-system interface design

### 4.1. TETRAPOL services invocation

A call over the ISI is an invocation of a TETRAPOL service, in network connected mode, in order to establish, maintain and release a communication over more than one SwMI. Non-call related services include mobility management some security services. The ISI enables service to be delivery across multiple systems.

The TETRAPOL general network design [1] defines all TETRAPOL services available in network connected mode from one system. The subset of the TETRAPOL services that are relevant for the protocol defined in this document comply with the following constraints:

- Interworking between TETRAPOL systems for voice services is limited to those services that may have a scope broader than one cell and that need specific requirements from the network. (Thus, for instance, the scanning services, whose features are totally implemented in terminals, are not explicitly supported over the ISI.)

- Interworking between TETRAPOL systems for messaging and data services shall use the protocol defined in either TETRAPOL PAS Part 4 Data gateway to X.400, or TETRAPOL PAS Part 11 Gateway to external networks, Interworking with packet data networks, X.25 sub-part or TCP/IP access sub-part.

- The mobility management protocol between autonomous systems has been limited to mandatory procedures only, with the requirement that the integrity of the databases from each SwMI is kept under control of each system, providing no total access to the complete profile of the subscribers, nor allowing modification of data without the home data consents.

- A database recovery plan requiring flows between autonomous systems shall be strictly forbidden. Should a visitor database loose its data about migrated terminals, then the ISI protocol requires that all migrated terminals shall register again in the visited system by executing the complete registration procedure with the home database. A home system shall be the master source for the information related to its subscribers. Hence, should a home database loose its data related to a subscriber, it shall not trust the location update requests and profile update requests from other systems any more, until it recovers by its own internal means.

- The ISI protocol and the system architecture with gateway RSW (GSW) and gateway database access (GLR) shall prevent a remote system from tracking a terminal within another system, by repetitive location request with too precise location information.

- The protocol specified in this document provides all security-related information flows as far as service data units are concerned, but their use is specified in TETRAPOL PAS Part 16 Security.

- TETRAPOL systems support several types of supplementary services:

    - Call related supplementary services with impact of the network (e.g. call transfer) are specified in the ISI protocol.
    - Call related supplementary services that impact only the signalling on the air interface or the terminal behaviour only (e.g. channel saving or outgoing call barring) are implicitly supported with no extra signalling on the ISI.
    - Non-call related signalling between autonomous systems shall be restricted to few security features (e.g.remote terminal disabling).

### 4.2. Call control and bearer control

There are two levels of interworking over the ISI: one level is related to the services, with their global semantics and control procedures, the other is the management of an underlying bearer over the inter-system interface.

The call control functions are located in each systems for the following purposes:

- Service invocation in a SwMI, e.g. for the purpose of a call.
- Service negotiation between SwMI.
- End-to-end call setup, maintenance and release.
- Management of the establishment requests and release requests to a bearer.
- Association of a bearer to a service invoke.

Upon a service invocation, a bearer shall be selected and the bearer control functions shall be used to provide the requested bearer capabilities, including the following procedures:

- establish, maintain and release point-to-point or multipoint bearer connections between SwMIs;
- provide the association between different bearer connections;
- allocate bearer resources;
- optionally monitor QoS parameters of active bearer connections;
- optionally handle flow control.

### 4.3. Connection management and information transfer modes

A connection over ISI is an association of logical channels from several SwMI, each featuring a certain bandwidth on a physical channel or through a network resource, established to provide a means for a transfer of information between those SwMI. Such a connection over ISI is needed for TETRAPOL voice services to have a coverage that spreads over several systems.

Information transfer modes are circuit mode, fast circuit mode, packet mode or frame mode. For the purpose of the information transfer modes, a physical path is defined as a topological tree made of physical channels on transmission media and network resources connected together.

Circuit mode is a transfer mode in which information transfer is achieved with the allocation of a fixed bandwidth on a physical path for the duration of the bearer service invocation, i.e. for the duration of the call that invoked the bearer service.

Fast circuit mode is a transfer mode in which information transfer is achieved with the allocation of a fixed bandwidth on a physical path for the duration of an activation of the call that invoked the bearer service.

Packet mode, frame mode and similar modes, are transfer modes in which information transfer is achieved with the allocation of a bandwidth on-demand on a physical path for the duration of a transmission using the bearer service. Packet mode and frame mode differ on protocol issues.

In TETRAPOL systems, circuit mode bearer shall be associated to message trunking scheme, while fast circuit mode, packet mode and frame mode bearers are associated to a quasi-transmission scheme.

A bearer provides the capability for information transfer in a SwMI and through a connection, using one information transfer mode. Thus, one or several bearers shall be established, maintained and released in each SwMI and over the ISI, either prior to the service invocation or simultaneously to a service invocation.

### 4.4. Planes involved in the ISI protocol stack

The different planes involved in the interworking over the ISI are illustrated in the following figure.

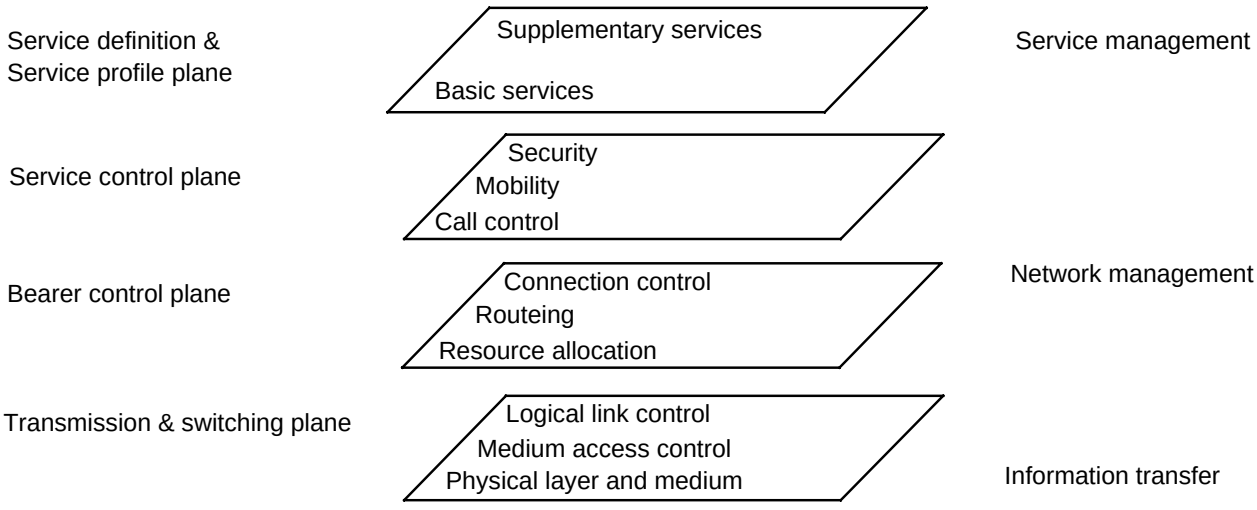


**Figure 1: Planes of the ISI protocol stack**

# 5. Inter-system requirements

## 5.1. ISI service requirements

### 5.1.1. Roles of ISI network features

The TETRAPOL basic services are handled over the inter-system interface by network features (ANF) that shall cater for two types of requirements:

- TETRAPOL service flows between several SwMI, handling TETRAPOL basic service semantics for the purpose of end-to-end service processing, in both the signalling plane and in the transmission plane;
- Connection control between network resources from each involved SwMI, as provided by an underlying bearer service.

ANF_ISIIC shall handle private call network features (both individual call and multiparty call):
- Private call service flows for the establishment, maintenance and release of a private call between a calling party and one or more called parties spread over several SwMI,
- Connection control of the related network resources between involved SwMI over the ISI.

ANF_ISIGC shall handle group call network features:
- Group call service flows for the establishment, maintenance and release of a group call between a calling party in a SwMI and a group spread over a coverage encompassing more than one SwMI;
- Connection control of the related network resources between involved SwMI over the ISI

ANF_ISIMOCH shall handle multisite open channel network features:
- Connection control of the moch-related network resources between involved SwMI over the ISI;
- Moch service flows for the maintenance of the moch

ANF_ISITKG shall handle a talkgroup network feature:
- Talkgroup service flow for the maintenance of the talkgroup over a dynamically allocated coverage instance.

ANF_ISICOV shall handle a coverage network feature:
- Connection control of several network resources in each involved SwMI and over the ISI.

ANF_ISIMM shall handle a mobility network feature:
- Mobility management and subscriber services flows over the ISI.

ANF_ISISEC shall handle a security network feature:
- Security service flows over the ISI.

Note: In the PSS1 domain for circuit mode bearer services, the ISI network features are referred-to as additional network features (ANF) that complement PSS1 information flows for the purpose of QSIG basic services and generic features.

### 5.1.2. ISI primitives

The ISI primitives are provided as described in the following figure at the service access points of the network features when two SwMI are interworking over the ISI:

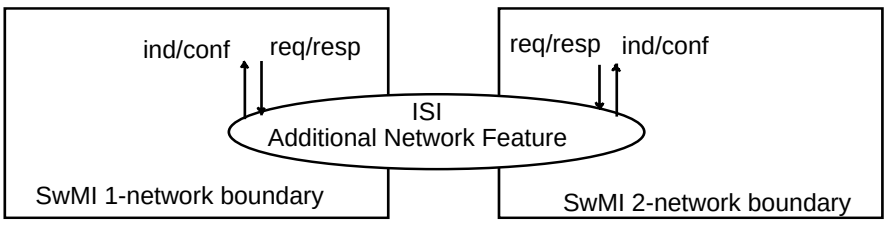


**Figure 2: point-to-point ISI topology**

The ISI primitives are provided as described in the following figure at the service access points of the network features when more than two SwMI are interworking over the ISI:

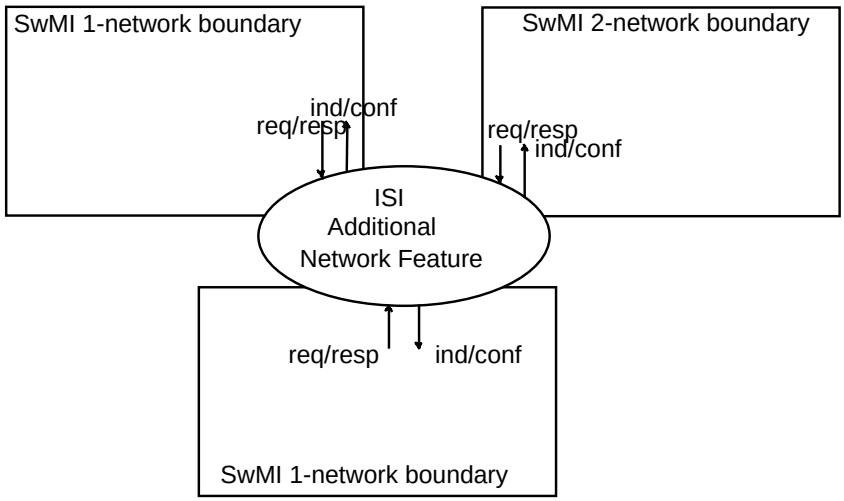


**Figure 3: multipoint ISI topology**

### 5.1.3. ISI service data units

The ISI service data units provided by the network features and described in a subsequent clause of this specification shall be transferred over the ISI by the appropriate bearer protocol.

### 5.1.4. Bearer service and connection management

The bearer shall provide a capability to transfer user information between several ISI connections of several SwMIs.

In a circuit mode configuration, the ISI service data units are conveyed in the protocol data units of the relevant bearer service through the ad-hoc signalling connection.

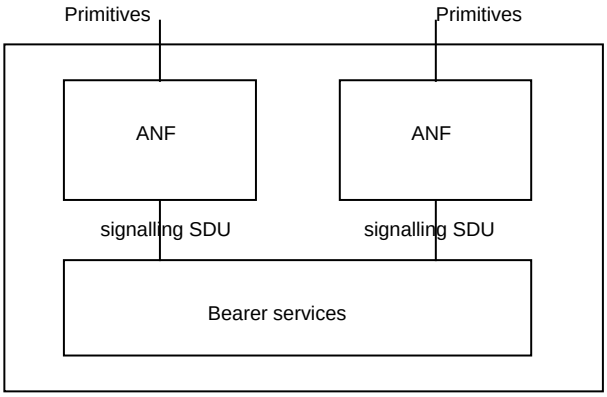


**Figure 4: ISI Protocol layer model in the signalling plane**

Speech items shall be conveyed by the relevant bearer service through the ad-hoc user information connection, that is either separated from or the same as the signalling connection.

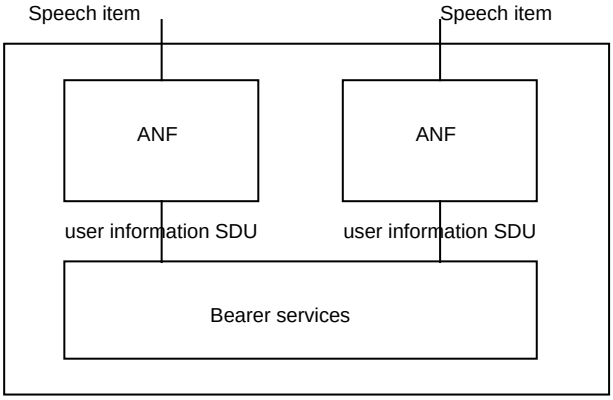


**Figure 5: ISI Protocol layer model in the user information transmission plane**

The bearer service shall handle the management of connections between SwMI over the ISI. It shall provide the ANF with a connection identifier that characterises a (virtual) circuit between SwMI.

## 5.2. ISI operational requirements

### 5.2.1. Requirement on the originating SwMI

The originating SwMI shall be able to identify the address of a destination SwMI or a home SwMI from the address of a subscriber. A private call shall be routed through a gateway switch (GSW) that hides the topology of the SwMI to the other SwMI.

The GSW shall be able to handle the connection of the SwMI network resources and the ISI ones in order to define a coverage that spans over more than one SwMI, and shall hide the SwMI internal topology.

### 5.2.2. Requirement on the call master SwMI

The call master SwMI shall be able to handle push-to-talk arbitrations in a relevant RSW and the push-to-talk signalling shall flow through the GSW from that RSW to the ISI and vice versa.

#### 5.2.3. Requirement on a destination SwMI

The destination SwMI shall be able to provide a gateway location register (GLR) functional entity for migrated subscribers, allowing calls to be routed to them and services to be provided to them.

The destination SwMI shall be able to handle properly simultaneous call setup to a subscriber migrating from that SwMI.

#### 5.2.4. Requirement on the GLR-HLR of a home SwMI

The home SwMI shall be able to provide database information for a subscriber, providing the address of that subscriber. The HLR in the home SwMI of a migrated system terminal shall keep track of the SwMI where the terminal is actually registered. The HLR shall be requested from the ISI via the gateway location register (GLR) of the home SwMI, whose purpose is to hide the database addresses and structure in the SwMI.

#### 5.2.5. Requirement on the GLR of a visited SwMI

Upon migration of a terminal into a visited SwMI, the terminal shall register in a base network of the SwMI: the visitor location register (VLR) in the base network shall be updated. Upon analysis of the terminal address, the VLR shall inform the gateway location register (GLR) of the SwMI, which in turn shall inform through the ISI the home location register (HLR) of the migrated terminal in its home SwMI. The GLR is then in charge of retrieve the appropriate profile information from the remote HLR that are relevant to the migrated terminal.

When a location enquiry is requested upon the migrated terminal in the visited SwMI, the requesting entity shall analyse the party address. Upon recognition that the party is a migrated one, the enquiry shall be routed to the GLR entity, that shall provide the relevant VLR address if the terminal is still in that SwMI or that shall forward the enquiry to the home GLR-HLR in the terminal home SwMI for actual information retrieval.

A visited SwMI shall be able to identify the address of the home GLR/HLR of a migrated subscriber.

#### 5.2.6. Requirement on a transit SwMI

A transit SwMI shall comply with the requirements of the circuit mode bearer service and shall forward the service flows to the destination SwMI.

## 6. Primitives for the ISI network features

### 6.1. Security network feature

#### 6.1.1. Scope and purpose

ANF_ISISEC is an additional network feature which enables security related features to be considered over the ISI.

Security related features include call related aspects, terminal related aspects and inter-system specific aspects. Further details are specified in the Security part of the TETRAPOL PAS.

#### 6.1.2. ANF_ISISEC primitives

ANF_ISISEC supports the primitives associated to the following flow: SECURITY.

In the tables listing the service elements in information flows related to the primitive, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.1.3. SECURITY

Related PDU: ISI_SECURITY

Direction: From any ANF_ISISEC

Short description: SECURITY primitives provide a confirmed information flow over the ISI that indicates call-related or terminal-related security information, including key management, authentication, encryption type and group partitioning. The following table lists the service elements within the SECURITY information flow.

**Table 1: Contents of SECURITY**

| Service element | Request | Confirm |
|---|---|---|
| octet string data | O.1 | - |
| security parameters | O.1 | - |
| ackResult | O.1 | O |
| NOTE: At least one of the items shall be used in the request | | |

### 6.2. Call related network features

#### 6.2.1. Scope

The call related ANF shall be invoked when a subscriber makes a call request and selects a bearer so that it establishes connections between resources from all involved SwMI for the purpose of establishing the call there over at the same time.

#### 6.2.2. ANF for private calls

##### 6.2.2.1.Purpose

ANF_ISIIC is an additional network feature which enables an individual call to be routed over the ISI between the SwMI where the calling subscriber is located and the SwMI where the called subscriber is actually located.

This ANF_ISIIC applies also to a multiparty call to be routed over the ISI between the SwMI where the calling subscriber is located and one or several SwMI where some called subscribers are actually located.

ANF_ISIIC shall provide the relevant service flows to support the private call services.

##### 6.2.2.2. ANF_ISIIC primitives

The primitives provided by ANF_ISIIC shall support the following procedures:

- call establishment;
- intrusion into an on-going call;
- call proceeding and party alerting signalling;
- complete establishment synchronisation;
- call maintenance;
- remote call clearing;
- call disconnection;
- call transfer.

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.2.2.3. Private_call_SETUP

Related PDU: ISI_SETUP, ISI_CONNECT

Direction: From originating ANF_ISIIC

Short description: Private_call_SETUP primitives provide a confirmed information flow to establish a private call over the ISI between a calling party an one or several called parties. The following table lists the service elements within the private_call_SETUP information flow.

**Table 2: Contents of private_call_SETUP**

| Service element | Request | Confirm |
|---|---|---|
| callingAddress | M | - |
| set of calledAddress | M | - |
| setupPriority | O | - |
| dispatcherAuthorization | O | - |
| setupTimeout | O | - |
| retentionPriority | O | - |
| hook | O | - |
| requestedSecurity | O | - |
| requestedSpeechService | O | - |
| requestedSynchro | - | M |
| usedSecurity | - | O |
| usedSpeechService | - | O |
| NOTE: serviceAction is setup, routeing is known by the ANF, actualDestinationSwMI and actualCallMasterSwMI are handled by the ANF, messageTrunking is assumed. | | |

#### 6.2.2.4. Private_call_INTRUSION

Related PDU: ISI_SETUP, ISI_CONNECT

Direction: From originating ANF_ISIIC

Short description: Private_call_INTRUSION primitives provide a confirmed information flow to intrude into an on-going private call in another SwMI. The calling party of that private call shall be known to address that private call. The following table lists the service elements within the private_call_INTRUSION information flow.

**Table 3: Contents of private_call_INTRUSION**

| Service element | Request | Confirm |
|---|---|---|
| callingAddress | M | - |
| callingAddress of the call to be intruded | M | - |
| setupPriority | O | - |
| setupTimeout | O | - |
| retentionPriority | O | - |
| hook | O | - |
| requestedSecurity | O | - |
| requestedSpeechService | O | - |
| requestedSynchro | - | M |
| usedSecurity | - | O |
| usedSpeechService | - | O |
| NOTE: serviceAction is intrusion, routeing is known by ANF, actualDestinationSwMI and actualMasterSwMI are negociated by the ANF, directDiallingInRequested, messageTrunking is assumed. | | |

#### 6.2.2.5. Private_call_PROCEED

Related PDU: ISI_PROCEED

Direction: From destination ANF_ISIIC

Short description: Private_call_PROCEED primitives provide a SwMI-to-SwMI unconfirmed information flow that may be used as a first reply to a private_call_SETUP. The following table indicates that no service element is carried in the private_call_PROCEED information flow.

**Table 4: Contents of private_call_PROCEED**

| Service element | Request | - |
|---|---|---|
| - | - | - |

#### 6.2.2.6. Private_call_ALERT

Related PDU: ISI_ALERT

Direction: From destination ANF_ISIIC

Short description: Private_call_ALERT primitives provide an unconfirmed information flow that shall be used when the called party has been rung if requested in the hook service element of private_call_SETUP_request. The following table lists the service elements within the private_call_ALERT information flow.

**Table 5: Contents of private_call_ALERT**

| Service element | Request | - |
|---|---|---|
| callQueued | O | - |
| proposedSecurity | O | - |
| proposedSpeechService | O | - |

#### 6.2.2.7. Private_call_COMPLETE

Related PDU: ISI_CONNECT_ACK

Direction: From originating ANF_ISIIC

Short description: Private_call_COMPLETE primitives provide an unconfirmed information flow that shall be used to synchronise the end of the private call establishment between all involved SwMIs if the synchronization was requested in private_call_SETUP_confirm. The following table lists the service elements within the private_call_COMPLETE information flow.

**Table 6: Contents of private_call_COMPLETE**

| Service element | Request | - |
|---|---|---|
| usedSynchro | M | - |
| usedSecurity | O | - |

#### 6.2.2.8. Private_call_USER_INFORMATION

These primitives deal with activation and speech transfer.

#### 6.2.2.9. Private_call_MAINTENANCE

Related PDU: ISI_MAINTENANCE

Direction: From any ANF_ISIIC

Short description: Private_call_MAINTENANCE primitives provide a confirmed information flow that shall be used between the call establishment and the call release in order to support call related security. As an alternative to in-band signalling, push-to-talk management, talking party identification and activations of the call may be supported as unconfirmed information flows. The following table lists the service elements within the private_call_MAINTENANCE information flow.

**Table 7: Contents of private_call_MAINTENANCE**

| Service element | Request | Confirm |
|---|---|---|
| updateSecurity | O.1 | - |
| ptt | O.1 | - |
| tpi | O.1 | - |
| activation | O.1 | - |
| suspend | O.1 | - |
| resume | O.1 | - |
| ackResult | - | M |
| NOTE: O.1: one of these parameters shall be used | | |

#### 6.2.2.10. Private_call_REMOTE_CLEARING

Related PDU: ISI_SETUP, ISI_DISCONNECT

Direction: From originating ANF_ISIIC

Short description: Private_call_REMOTE_CLEARING primitives provide a confirmed information flow to remotely clear a private call. The following table lists the service elements within the private_call_REMOTE_CLEARING information flow.

**Table 8: Contents of private_call_REMOTE_CLEARING**

| Service element | Request | Confirm |
|---|---|---|
| callingAddress | M | - |
| callingAddress of the call to clear | M | - |
| disconnectAction | - | M |
| cause | - | M |
| NOTE: serviceAction is release | | |

#### 6.2.2.11. Private_call_DISCONNECT

Related PDU: ISI_DISCONNECT, ISI_RELEASE.

Direction: From any ANF_ISIIC.

Short description: Private_call_DISCONNECT primitives provide a confirmed information flow to release a private call. The following table lists the service elements within the private_call_DISCONNECT information flow.

**Table 9: Contents of private_call_DISCONNECT**

| Service element | Request | Confirm |
|---|---|---|
| cause | O | - |
| NOTE: disconnectAction is release | | |

#### 6.2.2.12. Private_call_TRANSFER

Related PDU: ISI_DISCONNECT, ISI_RELEASE, ISI_MAINTENANCE.

Direction: From a destination ANF_ISIIC.

Short description: Private_call_TRANSFER primitives provide a confirmed or an unconfirmed information flow that shall be used to transfer a called party of a destination SwMI to a host party in a different SwMI. If that transferred called party is the last called party of the call in the destination SwMI, then the ISI circuit shall be released. The following table lists the service elements within the private_call_TRANSFER information flow.

**Table 10: Contents of private_call_TRANSFER**

| Service element | Request | Confirm |
|---|---|---|
| disconnectAction | M | - |
| cause | O | - |
| transferFromAddress | O | - |
| transferToAddress | M | - |
| visitedSwMI | O | - |
| NOTE: disconnectAction is either release or withdrawalFromCall | | |

### 6.2.3. ANF for group calls

#### 6.2.3.1. Purpose

ANF_ISIGC is an additional network feature that enables a group call to be set up over a coverage involving more than one SwMI. It relies on a bearer service to allocate ressources from several SwMIs to be linked together over the ISI for the purpose of a group call.

#### 6.2.3.2. ANF_ISIGC primitives

The primitives provided by ANF_ISIGC shall support the following procedures:

- call establishment;
- complete establishment synchronisation;
- call maintenance;
- call disconnection.

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.2.3.3. Group_call_SETUP

Related PDU: ISI_SETUP, ISI_CONNECT.

Direction: From originating ANF_ISIGC

Short description: Group_SETUP primitives provide a confirmed information flow that shall be used to establish a group call over the ISI between a calling party and a group. The following table lists the service elements within the group_call_SETUP information flow.

**Table 11: Contents of group_call_SETUP**

| Service element | Request | Confirm |
|---|---|---|
| called | M | - |
| callingAddress | M | - |
| calledGroup | M | - |
| coverageId | M | - |
| set of involvedSwMI | O | - |
| masterSwMI | O | - |
| setupPriority | O | - |
| dispatcherAuthorization | O | - |
| setupTimeout | O | - |
| retentionPriority | O | - |
| hook | O | - |
| requestedSecurity | O | - |
| requestedSpeechService | O | - |
| requestedSynchro | - | M |
| usedSecurity | - | O |
| usedSpeechService | - | O |
| | | |
| NOTE: serviceAction is setup, routeing and trunking is known by ANF, actualDestinationSwMI and actualMasterSwMI are handled by the ANF. | | |

#### 6.2.3.4. Group_call_COMPLETE

Related PDU: ISI_CONNECT_ACK.

Direction: From originating ANF_ISIGC

Short description: Group_call_COMPLETE primitives provide an unconfirmed information flow that shall be used to synchronize the end of the group call establishment between all involved SwMIs. The following table lists the service elements within the group_call_COMPLETE information flow.

**Table 12: Contents of group_call_COMPLETE**

| Service element | Request | - |
|---|---|---|
| usedSynchro | M | - |
| usedSecurity | O | - |
| participationGroup | O | - |
| NOTE: | | |

#### 6.2.3.5. Group_call_USER_INFORMATION

These primitives deal with activation management and speech transfer.

#### 6.2.3.6. Group_call_MAINTENANCE

Related PDU: ISI_MAINTENANCE.

Direction: From any ANF_ISIGC.

Short description: Group_MAINTENANCE primitives provide confirmed flows that shall be used between the call establishment and the call release in order to support call related security. As an alternative to in-band signalling, push-to-talk management, talking party identification and activations of the call may be supported as unconfirmed information flows. The following table lists the service elements within the group_call_MAINTENANCE information flow.

**Table 13: Contents of group_call_MAINTENANCE**

| Service element | Request | Confirm |
|---|---|---|
| updateSecurity | O.1 | - |
| ptt | O.1 | - |
| tpi | O.1 | - |
| activation | O.1 | - |
| suspend | O.1 | - |
| resume | O.1 | - |
| ackResult | - | O |
| NOTE: O.1: one of these parameters shall be used | | |

#### 6.2.3.7. Group_call_DISCONNECT

Related PDU: ISI_DISCONNECT, ISI_RELEASE.

Direction: From any ANF_ISIGC.

Short description: Group_call_DISCONNECT primitives provide a confirmed information flow that shall be sent to release the call. The following table lists the service elements within the group_call_DISCONNECT information flow.

**Table 14: Contents of group_call_DISCONNECT**

| Service element | Request | Confirm |
|---|---|---|
| disconnectAction | M | - |
| cause | O | - |
| NOTE: disconnectAction is either release or withdrawalFromCall | | |

### 6.3. Connection related network features

#### 6.3.1. Scope

The ANF related to network resources shall be invoked before any subscriber request to participate in a call using those network resources. These ANF rely directly on the bearer services.

#### 6.3.2. ANF for multisite open channel

#### 6.3.2.1.Purpose

ANF_ISIMOCH is an additional network feature which enables network resources from several SwMIs to be connected together for the duration of an MOCH.

#### 6.3.2.2. ANF_ISIMOCH primitives

The primitives provided by ANF_ISIMOCH shall support the following procedures:

- MOCH establishment;
- complete MOCH establishment synchronisation;
- MOCH maintenance;
- MOCH disconnection;

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.3.2.3. Moch_SETUP

Related PDU: ISI_SETUP, ISI_CONNECT.

Direction: From originating ANF_ISIMOCH.

Short description: Moch_SETUP primitives shall provide confirmed information flows to establish a MOCH coverage over the ISI for a set of groups. The following table lists the service elements within the Moch_SETUP information flow.

**Table 15: Contents of Moch_SETUP**

| Service element | Request | Confirm |
|---|---|---|
| mochIdentifier | M | - |
| coverageId | O | - |
| set of involvedSwMI | M | - |
| masterSwMI | O | - |
| establishment group | O | - |
| set of participation groups | O | - |
| setupPriority | M | - |
| dispatcherAuthorization | O | - |
| setupTimeout | O | - |
| retentionPriority | O | - |
| requestedSecurity | O | - |
| requestedSpeechService | O | - |
| requestedSynchro | - | M |
| usedSecurity | - | O |
| usedSpeechService | - | O |
| | | |

NOTE: serviceAction is setup, routeing and trunking is known by ANF, hook is not relevant, actualDestinationSwMI and actualMasterSwMI are handled by the ANF.

#### 6.3.2.4. Moch_COMPLETE

Related PDU: ISI_CONNECT_ACK.

Direction: From originating ANF_ISIMOCH.

Short description: moch_COMPLETE primitives provide an unconfirmed information flow to synchronize the end of the moch coverage establishment between all involved SwMIs. The following table lists the service elements within the moch_COMPLETE information flow.

**Table 16: Contents of moch_COMPLETE**

| Service element | Request | - |
|---|---|---|
| usedSynchro | M | - |
| usedSecurity | O | - |
| participationGroup | O | - |

#### 6.3.2.5. Moch_USER_INFORMATION

These primitives deal with activation management and speech transfer.

#### 6.3.2.6. Moch_MAINTENANCE

Related PDU: ISI_MAINTENANCE.

Direction: From any ANF_ISIMOCH.

Short description: Moch_MAINTENANCE primitives provide a confirmed information flow that shall be used between the call establishment and the call release in order to support call related security. As an alternative to in-band signalling, push-to-talk management, talking party identification and activations of the call may be supported as unconfirmed information flows. The following table lists the service elements within the moch_MAINTENANCE information flow.

**Table 17: Contents of moch_MAINTENANCE**

| Service element | Request | Confirm |
|---|---|---|
| updateSecurity | O.1 | - |
| ptt | O.1 | - |
| tpi | O.1 | - |
| activation | O.1 | - |
| suspend | O.1 | - |
| resume | O.1 | - |
| ackResult | - | O |
| NOTE: O.1: one of these parameters shall be used | | |

#### 6.3.2.7. Moch_DISCONNECT

Related PDU: ISI_DISCONNECT, ISI_RELEASE

Direction: From any ANF_ISIMOCH

Short description: Moch_DISCONNECT primitives provide a confirmed information flow that shall be sent to release the moch. The following table lists the service elements within the moch_DISCONNECT information flow.

**Table 18: Contents of moch_DISCONNECT**

| Service element | Request | Confirm |
|---|---|---|
| disconnectAction | M | - |
| cause | O | - |
| NOTE: disconnectAction is release | | |

### 6.3.3. ANF for broadcast call

ANF_ISIBC is an additional network feature that shall behave the same as ANF_ISIMOCH for the purpose of a broadcast call.

### 6.3.4. ANF for coverage

#### 6.3.4.1.Purpose

ANF_ISICOV is an additional network feature which enables resources from several SwMIs to be connected together over the ISI for the purpose of a group, prior to any use for the purpose of a communication.

This ANF enables a voice virtual path to be established between SwMI.

#### 6.3.4.2. ANF_ISICOV primitives

The primitives provided by ANF_ISICOV shall support the following procedures:

- coverage establishment;
- complete coverage establishment synchronisation;
- coverage disconnection;

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.3.4.3. Coverage_SETUP

Related PDU: ISI_SETUP, ISI_CONNECT.

Direction: From originating ANF_ISICOV.

Short description: Coverage_SETUP primitives provide a confirmed information flow that shall be used to make a connection over the ISI between pre-allocate resources for a group. The following table lists the service elements within the coverage_SETUP information flow.

**Table 19: Contents of coverage_SETUP**

| Service element | Request | Confirm |
|---|---|---|
| Group | M | - |
| coverageId | M | - |
| set of involvedSwMI | O | - |
| masterSwMI | O | - |
| setupPriority | M | - |
| setupTimeout | O | - |
| retentionPriority | O | - |
| trunking | O | - |
| requestedSecurity | O | - |
| requestedSpeechService | O | - |
| requestedSynchro | - | M |
| actualMasterSwMI | - | O |
| usedSecurity | - | O |
| usedSpeechService | - | O |
| NOTE: serviceAction is setup, routeing is known by ANF, actualDestinationSwMI is handled by the ANF,.dispatcher authorization and hook are irrelevant | | |

#### 6.3.4.4. Coverage_COMPLETE

Related PDU: ISI_CONNECT_ACK.

Direction: From originating ANF_ISICOV.

Short description: Coverage_COMPLETE primitives provide an unconfirmed information flow that shall be used to synchronize the end of the coverage establishment between all involved SwMIs. The following table lists the service elements within the coverage_COMPLETE information flow.

**Table 20: Contents of coverage_COMPLETE**

| Service element | Request | - |
|---|---|---|
| usedSynchro | M | - |
| usedSecurity | O | - |

#### 6.3.4.5. Coverage_DISCONNECT

Related PDU: ISI_DISCONNECT, ISI_RELEASE.

Direction: From any ANF_ISICOV.

Short description: Coverage_DISCONNECT primitives provide a confirmed information flow that shall be sent to release the coverage resources. The following table lists the service elements within the coverage_DISCONNECT information flow.

**Table 21: Contents of coverage_DISCONNECT**

| Service element | Request | Confirm |
|---|---|---|
| cause | O | - |
| NOTE: disconnectAction is release | | |

### 6.3.5. ANF for talkgroups

#### 6.3.5.1. Purpose

ANF_ISITKG is an additional network feature which enables a voice circuit from a virtual path to be allocated for the activation of a talkgroup over a coverage area between the involved SwMI.

#### 6.3.5.2. ANF_ISITKG primitive

The primitives provided by ANF_ISITKG shall support the following procedures:

- talkgroup management.

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

#### 6.3.5.3. Talkgroup_MANAGEMENT

Related PDU: ISI_MAINTENANCE

Direction: From any ANF_ISITKG

Short description: Talkgroup_MANAGEMENT primitives provide confirmed and unconfirmed information flows that shall be used for group activation over a coverage and speech transfer.

**Table 22: Contents of talkgroup_MANAGEMENT**

| Service element | Request | Confirm |
|---|---|---|
| coverageId | M | - |
| group | M | - |
| updateSecurity | O.1 | - |
| ptt | O.1 | - |
| tpi | O.1 | - |
| activation | O.1 | - |
| suspend | O.1 | - |
| resume | O.1 | - |
| ackResult | - | O |
| NOTE: O.1: one of these parameters shall be used | | |

## 6.4. Mobility related network features

### 6.4.1. Scope and purpose

ANF_ISIMM is an additional network feature which enables mobility management information to flow over the ISI for the purpose of location and migration services.

The ISI should provide the capability to locate the SwMI where a terminal is registered and should be able to route a call request to it. Mobility features include terminal location management and susbcriber profile information.

The database access network plane of the system may be different a different plane from the call control and speech network plane. Thus SwMI may use a different bearer for the signalling of database queries and updates than for the aspects of call routeing and traffic channel assignements.

As specified in part 10.1 of this specification, the ANF signalling related to mobility, registration and subscription may be supported over a circuit mode bearer, a fast circuit mode or a packet mode bearer.

### 6.4.2. Database query

This procedure shall provide the ability for a visited SwMI to request the registration and location update from a home database of a terminal. It shall allow to retrieve subscription data from the home database. It shall provide the ability for a home SwMI to deregister a terminal in a previously visited SwMI.

This procedure shall provide the ability for a SwMI to request the location information in order to route a call establishment. Using this procedure before routeing a call to another SwMI enable to handle optimized routeing and addressing aspects such as UPT-like services. Thus forward-switching and re-routeing procedures may be limited to the case when the called party is migrating while the call is being established, and the network resources used are minimised.

### 6.4.3. Database update

This ANF shall enable to update the database of a SwMI, whether home database or visited database.

### 6.4.4. ANF_ISIMM primitives

The primitives provided by ANF_ISIMM shall support the following procedures:

- migrated terminal location update;
- terminal location delete;
- terminal location enquiry;
- terminal profile enquiry;
- terminal remote disable.

In the tables listing the service elements in information flows related to the primitives, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

### 6.4.5. ENQUIRY

Related PDU: ISI_ENQUIRY, ISI_ACKNOWLEDGE, ISI_LOCATION_PROFILE

Direction: From visited ANF_ISIMM

Short description: ENQUIRY primitives provide confirmed information flows that shall be used to retrieve location information and profile information from the HLR in the home SwMI of a terminal. The following table lists the service elements within the ENQUIRY information flow.

**Table 23: Contents of ENQUIRY**

| Service element | Request | Confirm |
|---|---|---|
| address | M | M |
| locationScope | O | - |
| keyReference | O | - |
| requested set of enquired service profile | O | - |
| enquiryResult | - | M |
| visitedSwMI | - | O |
| set of enquired service profile | - | O |

### 6.4.6. PROFILE

Related PDU: ISI_ACKNOWLEDGE, ISI_LOCATION_PROFILE

Direction: From home ANF_ISIMM

Short description: PROFILE primitives provide confirmed information flows that shall be used to asynchronously provide profile information from the HLR in the home SwMI of a terminal. The following table lists the service elements within the PROFILE information flow.

**Table 24: Contents of PROFILE**

| Service element | Request | Confirm |
|---|---|---|
| address | M | - |
| enquiryResult | M | - |
| visitedSwMI | O | - |
| set of enquired service profile | O | - |

### 6.4.7. LOCATION_UPDATE

Related PDU: ISI_LOCATION_UPDATE_DEMAND, ISI_ACKNOWLEDGE, ISI_LOCATION_UPDATE_PROFILE.

Direction: From visited ANF_ISIMM.

Short description: LOCATION_UPDATE primitives provide confirmed information flows that shall be used upon registration of a terminal in a visited SwMI, between that SwMI and the home SwMI of the terminal. The following table lists the service elements within the LOCATION_UPDATE information flow.

**Table 25: Contents of LOCATION_UPDATE**

| Service element | Request | Confirm |
|---|---|---|
| address | M | M |
| serialNumber | M | M |
| visitedSwMI | M | - |
| expectedTerminalState | M | - |
| registrationResult | - | M |
| terminalType | - | M |
| stateBitmap | - | M |
| udtType | - | M |
| number of migration | - | M |
| number of full registration | - | M |
| home SwMI | - | M |
| viisted SwMI | - | M |
| forward address on no reply | - | M |
| unconditional forward address | - | M |
| nominal operational group | - | M |

### 6.4.8. LOCATION_DELETE

Related PDU: ISI_LOCATION_DELETE, ISI_ACKNOWLEDGE.

Direction: From home ANF_ISIMM.

Short description: LOCATION_DELETE primitives provide a confirmed information flow that shall be used between the home SwMI and a previous visited SwMI of a terminal in order to remove the profile information and location of the terminal from the previous visited SwMI. The following table lists the service elements within the LOCATION_DELETE information flow.

**Table 26: Contents of LOCATION_DELETE**

| Service element | Request | Confirm |
|---|---|---|
| address | M | - |
| serialNumber | M | - |
| number of migration | M | - |

### 6.4.9. DISABLE

Related PDU: ISI_DISABLE, ISI_ACKNOWLEDGE.

Direction: From home ANF_ISIMM.

Short description: DISABLE primitives is a confirmed information flow that shall be used to remotely disable a terminal. The following table lists the service elements within the DISABLE information flow.

**Table 27: Contents of DISABLE**

| Service element | Request | Confirm |
|---|---|---|
| address | M | M |
| serialNumber | M | M |
| expectedDisablingType | O | - |
| actualDisableType | - | O |

## 6.5. Generic network feature

This ANF is left for further studies.

### 6.6. User information network feature

The user information related network feature is not an independent ANF, as it shall be related to the user information primitives of the call control ANF.

The user information connections over ISI shall support TETRAPOL encoded clear or encrypted speech items.

The Call master RSW in the master SwMI is assumed to handle the following tasks:

- activation and deactivation management;
- push-to-talk arbitration and speech transfer;
- talking party identification;
- key reference update.

## 7. ISI service data units

### 7.1. ISI SDU module

The following sub-clauses provide the abstract syntax of the services handled by the ISI network features. The productions are separated between security service data units, call control service data units and mobility management service data units. The root constructions are SECsdu, CCsdu and MMsdu.

**Tetrapol-ISI-Sdu** {ccitt (0) identified-organization (3) etsi (0) tetrapol isi-sdu(1)}.

DEFINITIONS EXPLICIT TAGS =

BEGIN

EXPORTS SECsdu, CCsdu, Mmsdu, Genericsdu, UserInfosdu;
-- Granularity of information elements

**WORD**::= [APPLICATION 1]IMPLICIT INTEGER (0..65536);
-- ENUMERATED -- octet boundary is assumed;
-- OCTET STRING
-- OCTET
**QUARTET**::= [APPLICATION 2] IMPLICIT INTEGER (0..15);
-- BIT STRING -- octet boundary is assumed;
-- BOOLEAN
-- BIT
**Counter256:**:= INTEGER (0..255) -- modulo 256;
--

**InvokeReference**::= OCTET;

**Timer**::= DURATION {
t12 (12)
};

### 7.2. Security SDU

-- begin of SECsdu

```
EncryptionType::= ENUMERATED
                        {
                        unknown (0),
                        clearSpeech (1),
                        networkEncryption (2),
                        endToEndEncryption (3),
                        isiEncryption (4)
                        };

KeyReference::= OCTET;

Security::= SEQUENCE {
                encryptionType          EncryptionType,
                groupPartitioning       BOOLEAN OPTIONAL,
                keyList                 [0] IMPLICIT SEQUENCE OF{
                                            address Address,
                                            keyOfCall OCTET STRING
                                            } OPTIONAL,
                challenge               [1] IMPLICIT OCTET STRING OPTIONAL,
                result                  [2] IMPLICIT OCTET STRING OPTIONAL,
                KeyReferenceSynchro     [3] IMPLICIT OCTET STRING OPTIONAL,
                currentKeyReference     [4] IMPLICIT KeyReference OPTIONAL,
                expiredKeyReference     [5] IMPLICIT KeyReference OPTIONAL,
                setKeyModifier          [6] IMPLICIT OCTET STRING OPTIONAL,
                useKeyModifier          [7] IMPLICIT OCTET STRING OPTIONAL,
                other                   [8] IMPLICIT OCTET STRING OPTIONAL
                };

SECsdu::= SEQUENCE{
                connectionId            ConnectionIdentifier,
                invokeReference         InvokeReference,
                codop CHOICE {
                        data            [1] IMPLICIT --$ implement size < -- OCTET STRING;
                        parameters      [2] IMPLICIT Security,
                        ackResult       [3] IMPLICIT AckResult -- confirmed transfer of previous SDU
                        }
        };
-- end of SECsdu
```

### 7.3. Call control SDU

**--** begin of extract from Addressing-Data-Elements in PSS1 Generic functional protocol [5]

```
PISNPartyNumber::= CHOICE {
    unknownPartyNumber      [0] IMPLICIT NumberDigits,
        -- the numbering plan is the default numbering plan of the network.
        -- It is recommended that this value is used.
    publicPartyNumber       [1] IMPLICIT PublicPartyNumber,
        -- the numbering plan is according to Recs. E.163 and E.164.
    dataPartyNumber         [3] IMPLICIT NumberDigits,
        -- not used, value reserved.
    telexPartyNumber        [4] IMPLICIT NumberDigits,
        -- not used, value reserved.
    privatePartyNumber      [5] IMPLICIT PrivatePartyNumber,
    nationalStandardPartyNumber [8] IMPLICIT NumberDigits};
        -- not used, value reserved.

PublicPartyNumber::= SEQUENCE {
    publicTypeOfNumber      PublicTypeOfNumber,
    publicNumberDigits      NumberDigits};
```

```
PrivatePartyNumber::= SEQUENCE {
        privateTypeOfNumber     PrivateTypeOfNumber,
        privateNumberDigits     NumberDigits};

NumberDigits::= QUARTET STRING (SIZE(1..20)); -- adapted

PublicTypeOfNumber::= ENUMERATED {
        unknown (0),
                -- if used number digits carry prefix indicating type of number
                -- according to national recommendations
        internationalNumber (1),
        nationalNumber (2),
        networkSpecificNumber (3),
                -- not used, value reserved.
        subscriberNumber (4),
        abbreviatedNumber (6)};
                -- valid only for called party number at the outgoing access,
                -- network substitutes appropriate number

PrivateTypeOfNumber::= ENUMERATED {
        unknown (0),
        level2RegionalNumber (1),
        level1RegionalNumber (2),
        pISNSpecificNumber (3),
        localNumber (4),
        abbreviatedNumber (6)};

-- end of extract from Addressing-Data-Elements in PSS1 Generic functional protocol [5]

-- begin of CCsdu

Cause::= ENUMERATED {
                        successfull (0),
                        inconsistentData (1),
                        reserved2 (2),
                        noAnswerTimeout (3),
                        reserved4 (4),
                        reserved5 (5),
                        voiceTransmissionAborted (6),
                        reserved7 (7),
                        hookOnWhileSetup (8),
                        voiceTransmissionDisturbance (9),
                        reserved10 (10),
                        remoteCallClearing (11),
                        maxNumberVoiceCall (12),
                        barredService (13),
                        serviceNotSupportedbySwMI(14),
                        intrusionOnWrongAddress (15),
                        reserved16 (16),
                        reserved17 (17),
                        reserved21 (21),
                        reserved22 (22),
                        reserved23 (23),
                        reserved24 (24),
                        voiceInactivity (26),
                        unreachableParty (41),
                        calledPartyBusy (42),
                        reserved43 (43),
                        callingPartyNotRegistered (44),
                        reserved45 (45),
                        inconsistentAddress (46),
                        reserved47 (47),
```

withdrawal (48),
preemption (49),
reserved50 (50),
noReply (51),
reserved52 (52),
failedTransfer (53)
reserved54 (54),
hopCreditLimit (61),
failedRouteing (62),
routeingLoop (63),
tooManyHopsForQoS (64),
reserved81 (81),
reserved82 (82),
reserved83 (83),
intrusionOnUnreachableTerminal (84),
intrusionOnCallNotEstablished (85),
unreachableTerminalAttribute (86),
noMorePartyInCall (87),
forwardingChainMax (88),
unknownCalledParty (89),
doubleTransfer (90),
nonCharacterizedTerminal (91),
transferProceeding (92),
listAddressNotExpandable (93),
twoSimultaneousIntrusions (94),
reserved101 (101),
reserved102 (102),
reserved103 (103),
reserved104 (104),
reserved105 (105),
reserved121 (121)
reserved122 (122),
reserved123 (123),
reserved141 (141),
groupAlreadyActive (142),
unknownGroupCommunication (143),
outOfCoverage (144),
reserved145 (145),
partialCoverage (146),
reserved147 (147),
intrusionOnNonSetupGroupCommunication (148),
reserved149 (149),
emergencyCallRelease (150),
wrongEstablishmentOg (151),
inconsistentGroupCommunication (152),
intrusionWithinCoverage (153),
expiredKeyReference (161),
externalPartyNoReply (181),
externalPartyBusy (182),
gatewayAddressInconsistent (183),
externalAddressInconsistent (184),
externalServiceBarredtoCallingParty (185),
externalServiceBarredtoCalledParty (186),
externalEquipmentUnreachable (187),
isdnUnreachable (188)
};

**CallId**::= WORD;

**ConnectionIdentifier:**:= --$ implement size < 5 --OCTET STRING;

**Cell**::= ConnectionIdentifier;

```
RSW::= ConnectionIdentifier;

GRW:= RSW;

CC::= OCTET;
NC::= QUARTET;
BN::= QUARTET STRING(3);

SAP::= CHOICE {
        [1] IMPLICIT GRW,
        [2] IMPLICIT GLR
        };

SwMI::= SEQUENCE {
        countryCode         CC,
        networkCode     NC,
        baseNetwork     [0] IMPLICIT BN OPTIONAL,
        isiGSW          [1] IMPLICIT RSW OPTIONAL,
        pisnNumber      [2] IMPLICIT PISNPartyNumber OPTIONAL
        };

Address::= SEQUENCE
            {
            CHOICE
                {
                shortAddress        [1] IMPLICIT QUARTET STRING(SIZE(9)),
                functionalAddress   [4] IMPLICIT --$ implement size < -- OCTET STRING
                longAddress         [5] IMPLICIT OCTET STRING(6)
                escapeCode          [7] IMPLICIT --$ implement size < -- OCTET STRING
                }
            subaddress          [3] IMPLICIT -- interconnectAccess
                                        --$ implement size < -- OCTET STRING OPTIONAL
            countryCode             [8] IMPLICIT CC OPTIONAL, -- may be implicit if
                longAddress
            networkCode         [9] IMPLICIT NC OPTIONAL, -- may be implicit if longAddress
            baseNetwork         [10] IMPLICIT BN OPTIONAL -- is usually implicit
            };

Group::= SEQUENCE{
            CHOICE{
                federalGroup        [0] IMPLICIT INTEGER(0..4096),          -- 12 bits
                networkGroup        [1] IMPLICIT OCTET STRING(SIZE(6))      -- 48 bits
                group               [2] IMPLICIT INTEGER(0..4096),          -- 12 bits
                allGroups           [2] IMPLICIT NULL
                }
            countryCode             [8] IMPLICIT CC OPTIONAL,
            networkCode         [9] IMPLICIT NC OPTIONAL,
            baseNetwork         [10] IMPLICIT BN OPTIONAL
            };

CallPriority::= ENUMERATED { -- relative priority of calls for a user
            unknown (0),
            routine (2),
            urgent (4),
            flash (6),
            broadcast (8),
            emergency (12)
            };

SetupPriority::= CallPriority; -- priority of allocating a bearer connection, i.e. virtual resource reservation
                        -- default value is routine for quasi-transmission trunked establishment
```

```
UserPriority:= BIT STRING(4) { -- user rank, delta to SetupPriority or to ActivationPriority
                    minUserPriority (0),
                    mediumUserPriority (1),
                    upperUserPriority(2)
                    }

RetentionPriority:= ENUMERATED {
                              -- maximum retention priority for bearer connection,
                              -- i.e. retention priority for depth zero of the associated coverage
                         unknown (0),
                         vulnerable (1),
                         normal (2),
                         resistant (3)
                         };

TrunkingPriority::= OCTET; -- SwMI priority allocated at establishment for quasi-transmission trunking
                              -- used in association with ActivationPriority for actual seizing a physical
                                    resource for a bearer connection


Hook:= ENUMERATED {
                         automaticHookOffWithoutTone (0);
                         automaticHookOffWithTone (1);
                         ring (2),
                         reserved (3)
                         };

Routeing::= SEQUENCE{
                    originatingSwmi              SwMI;
                    callMaster                   SwMI;
                    destinationSwmi              SwMI;
                    routeingHopCredit            Counter256;
                    forwardSwitchingForbidden    [0] IMPLICIT NULL OPTIONAL
                    };


EndEstablishmentSynchro:= ENUMERATED {
                    none (0),
                    totalCoverage (1);
                    partialCoverage (2);
                    allCalledPartyConnected (3);
                    oneCalledPartyConnected (4);
                    allCalledPartyAlerted (5);
                    };

SpeechService:= ENUMERATED {
                    pcmAlaw (0),
                    tetrapol (1),
                    tetra (2)
                    gsmFullRate (3)
                    };

QuasiTransmissionTrunking::= SEQUENCE{
                    deactivationHangTime    DURATION, -- hang time after end of transmission
                    trunkingPriority        TrunkingPriority
                    };

MessageTrunking::= NULL;
                         -- deactivation hangTime=maxCallDuration, i.e. no deactivation until call
                              release
                         -- maximum TrunkingPriority: a resource allocated for MessageTrunking can
```

```
                    -- not be preempted for a QuasiTransmissionTrunking usage.

Trunking::= CHOICE{
                    [0] IMPLICIT MessageTrunking,
                    [1] IMPLICIT QuasiTransmissionTrunking
                    };

CallQueued::= NULL;

Cad::= ENUMERATED {
            unknownCad (0),
            incomingCallToBeAuthorizedByDispatcher (1),
            outgoingCallAuthorizedByDispatcher(2),
            directDiallingInRequested (3)
            };

ServiceAction::= ENUMERATED {
                    unknown                     (0), -- reserved
                    setup                       (1), -- Half duplex call/moch setup with ISISetup
                                                Coverage bearer setup with ISISetup
                                                 -- End of setup coverage/moch with ISIDisconnect
                    release                     (2), -- Call release with ISIDisconnect
                                                 -- Coverage/moch release with ISISetup
                                                 -- Remote call clearing with ISISetup
                    intrusion                   (3), -- intrusion into a private call
                    lateEntryIncludeCall        (4), -- participation, SwMI insertion in call/coverage
                    withdrawalFromCall          (5), -- SwMI withdrawal from on-going call
                    withdrawalFromCoverage      (6), -- SwMI withdrawal from Coverage bearer
                    priorityMode                (7), -- used for scanning on R6 interface only
                    sequentialMode              (8), -- used for scanning on R6 interface only
                    resume                      (9), -- used for scanning on R6 interface only
                    suspend                     (10), -- used for scanning on R6 interface only
                    reset                       (11), -- access gate bearer reset on R6 interface only
                    ambience                    (12), -- ambience listening for individual call only
                    isiFallbackSenderInitiative (13),
                    isiFallbackRecipientInitiative (14)
                    };

-------------------------------------------------------------------------------------------------------------------------------
-- TETRAPOL service types

-- Private communications

PrivateCall::= SEQUENCE {
                    callingAddress      Address,
                    calledAddresses     SET OF Address
                    };

IndividualCall::= PrivateCall;          -- 1 calledAddress

MultipartyCall::= PrivateCall;          -- up to 4 calledAddresses

-- Group communications

Coverage::= SEQUENCE { -- defined from OMC
                    identifier          WORD, -- global reference allocated by initiating SwMI
                    trunkingDepth       [0] IMPLICIT OCTET OPTIONAL,-- according to trunkingScheme
                    masterSwMI          [1] IMPLICIT SwMI OPTIONAL,
                    participantSwMI     [2] IMPLICIT SEQUENCE OF SwMI OPTIONAL
                    };

GroupCommunication::= SEQUENCE {
```

```
                coverage            Coverage,
                participationGroup      [1] IMPLICIT SET OF Group OPTIONAL
                };

-- multisite open open class of services

Moch::= SEQUENCE{
                GroupCommunication,
                        -- coverage identifier is known by user
                        -- up to 10 participationGroup, provided at establishment
                establishmentGroup Group
                        -- group of users who can establish the moch over the coverage
                };
BroadcastMoch::= Moch; -- broadcast SetupPriority and specific air interface service to users

Merging::= Moch; -- selected according to its coverage with air interface service for a set of talkgroups

-- group call class of services

Talkgroup::= GroupCommunication,
                -- group over a coverage known by network
                -- 1 participationGroup, known by user

GroupCall::= SEQUENCE {
                callingAddress      Address -- user who requests to establish the group call
                calledGroup         Talkgroup,
                };

-- Broadcast call class of services

BroadcastCall::= CHOICE{
                        [0] IMPLICIT BroadcastMoch,
                        [1] IMPLICIT NULL
                        };

-- Emergency call class of services

Ech::= SEQUENCE {
                moch        Moch, -- emergency SetupPriority and specific air interface service to
                        users
                sosAddress  [0] IMPLICIT Address OPTIONAL
                };

EmergencyCall::= CHOICE{
                        [0] IMPLICIT Ech,
                        [1] IMPLICIT NULL
                        };

-- Terminal scanning service

GroupComms::= CHOICE{
                Moch,
                BroadcastCall,
                Merging,
                Talkgroup,
                GroupCall
                };

Scan::= SEQUENCE OF GroupComms;

--
```

```
ServiceType:= CHOICE {
                    [0] IMPLICIT PrivateCall,
                    [1] IMPLICIT Moch,
                    [2] IMPLICIT EmergencyCall      -- Not used on ISI
                    [3] IMPLICIT BroadcastCall,
                    [4] IMPLICIT Talkgroup,
                    [5] IMPLICIT GroupCall,
                    [6] IMPLICIT Scan               -- Not used on ISI
                    [7] IMPLICIT Merging            -- Not used on ISI
                    [8] IMPLICIT Coverage
                    };

-------------------------------------------------------------------------------------------------------------------------------
-- TETRAPOL call control SDU

ISISetup::= SEQUENCE {
                    serviceType                 ServiceType,
                    serviceAction               [9] IMPLICIT ServiceAction DEFAULT setup;
                    setupPriority               [10] IMPLICIT SetupPriority DEFAULT routine;
                    requestingUserPriority      [11] IMPLICIT UserPriority DEFAULT
                                                minUserPriority;
                    dispatcherAuthorization     [12] IMPLICIT Cad DEFAULT unknownCad;
                    setupTimeout                [13] IMPLICIT DURATION DEFAULT t12;
                    retentionPriority           [14] IMPLICIT RetentionPriority DEFAULT normal;
                    requestedSpeechService      [15] IMPLICIT SpeechService DEFAULT tetrapol;
                    hook                        [16] IMPLICIT Hook DEFAULT ring;
                    routeing                    [17] IMPLICIT Routeing OPTIONAL;
                    trunkingScheme              [18] IMPLICIT Trunking OPTIONAL;
                    requestedSecurity           [19] IMPLICIT Security OPTIONAL;
                    };

ISIProceeding::= NULL; -- destinationSwMI-to-originatingSwMI message

ISIAlerting::= SEQUENCE {
callQueued                                      [1] IMPLICIT CallQueued OPTIONAL;
                    proposedSecurity            [2] IMPLICIT Security OPTIONAL;
                    proposedSpeechService       [3] IMPLICIT SpeechService OPTIONAL;
                    };

ISIConnect::= SEQUENCE {
                    requestedSynchro            EndEstablishmentSynchro,
                    callId                      [1] IMPLICIT CallId OPTIONAL
                                                -- mandatory callId upon groupCall setup
                                                -- if callingAddress is not a member of calledGroup
                    actualDestinationSwMI       [2] IMPLICIT SwMI OPTIONAL,
                    actualMasterSwMI            [3] IMPLICIT SwMI OPTIONAL,
                    usedSecurity                [4] IMPLICIT Security OPTIONAL,
                    usedSpeechService           [5] IMPLICIT SpeechService OPTIONAL
                    };

ISIConnectAck::= SEQUENCE {
        usedSynchro                             EndEstablishmentSynchro,
                    usedSecurity                [1] IMPLICIT Security OPTIONAL
                    participationGroup          [2] IMPLICIT --$ implement size < 11--
                                                SET OF Group OPTIONAL

                    };

ISIDisconnect::= SEQUENCE {
                    disconnectAction            ServiceAction,
                    cause                       [1] IMPLICIT Cause OPTIONAL,
                    transferFromAddress         [2] IMPLICIT Address OPTIONAL,
                    transferfToAddress          [3] IMPLICIT Address OPTIONAL,
```

```
                visitedSwMI                 [4] IMPLICIT SwMI OPTIONAL
                };

ISIRelease::= NULL;

ISIMaintenance::= SEQUENCE {
                updateSecurity              [1] IMPLICIT Security OPTIONAL,
                suspend                     [5] IMPLICIT NULL, -- scanning
                resume                      [6] IMPLICIT NULL, -- scanning
                cause                       [7] IMPLICIT Cause OPTIONAL,
                transferFromAddress         [8] IMPLICIT Address OPTIONAL,
                transferfToAddress          [9] IMPLICIT Address OPTIONAL,
                visitedSwMI                 [10] IMPLICIT SwMI OPTIONAL, -- when
                                            transferred
                ackResult                   [11] IMPLICIT AckResult --confirmed transfer of
                        previous SDU
                };

CCsdu::= SEQUENCE {
                connectionId                ConnectionIdentifier,
                codop CHOICE {
                        isiSetup            [11] IMPLICIT ISISetup,
                        isiProceeding       [12] IMPLICIT ISIProceeding,
                        isiAlerting         [13] IMPLICIT ISIAlerting,
                        isiConnect          [14] IMPLICIT ISIConnect,
                        isiConnectAck       [15] IMPLICIT ISIConnectAck,
                        isiDisconnect       [16] IMPLICIT ISIDisconnect,
                        isiReleased         [17] IMPLICIT ISIRelease,
                        isiMaintenance      [18] IMPLICIT ISIMaintenance
                        }
                };

-- end of CCsdu
```

### 7.4. Mobility management SDU

```
-- begin of MMsdu

TerminalState:= ENUMERATED {
                trafficDisabled (1),
                forwarded (2),
                migrating (16),
                powerSaving (32)
                };

TerminalType:= ENUMERATED {
                reservedType1 (1),
                reservedType2 (2),
                reservedType3 (3),
                fixedRadioTerminal (4),
                mobileRadioTerminal (5),
                lineConnectedTerminal (6),
                reservedType7 (7),
                reservedType8 (8),
                reservedType9 (9),
                fixedRadioPABXaccess (10),
                mobileRadioPABXaccess (11),
                lineConnectedPABXaccess (12),
                reservedType13 (13),
                reservedType14 (14),
                reservedType15 (15),
                fixedRadioAccessGate (16),
```

```
                    mobileRadioAccessGate (17),
                    lineConnectedAccessGate (18)
                    };

UdtType:= ENUMERATED {
                    minitel (1);
                    stutel (2);
                    ndis (4);
                    other (8);
                    unknown (255)
                    };

SerialNumber::=  OCTET STRING(4);


ISILocationUpdateDemand:= SEQUENCE {
                address                 Address;
                serialNumber            SerialNumber;
                visitedSwMI             SwMI;
                expectedTerminalState   TerminalState
                };

RegistrationResult:= ENUMERATED {
            successfullyRegistered (0);
            unknownTerminal(1);
            serialNumberInconsistentWithAddress (2);
            networkNoAccess (3);
            terminalAccessDisabled (5);
            terminalTrafficDisabled (6);
            reserved7 (7);
            outOfOrderTerminal (8);
            vlrSoftwareSaturation (9);
            hlrSoftwareSaturation (10);
            failedAuthentication (11);
            terminalLocalRegistration (12);
            olderRegistration (13);
            networkCongestion (14);
            databaseAccessError (15);
            illegalTerminal (16);
            databaseReadOnly (17);
            vlrSaturation (18);
            authenticationKo (50);
            migrationNotAllowed (80);
            limitedServiceUponMigration (81)
            };

StateBitmap:= BIT STRING;

StateBitMask:= ENUMERATED {
                expectingNetworkGroupDownloading (1);
                expectingLocalGroupDownloading(2);
                homeBnRegistered (16);
                locallyRegistered (256);
                active (512);
                characterized (1024);
                reserved2048 (2048);
                forwarded (4096);
                present (8192);
                reserved1638 (16384);
                accessDisabled (65536);
                trafficDisabled (131072);
                tracked (524288);
```

```
                udtEquipped (1048576);
                reserved2097152 (2097152);
                outOfOrder (8388608)
                };


ISILocationUpdateProfile:= SEQUENCE {
                registrationResult RegistrationResult;
                address Address;
                serialNumber SerialNumber;
                terminalType TerminalType;
                stateBitmap StateBitmap;
                udtType UdtType;
                numberOfMigration Counter256;
                numberOfFullRegistration Counter256;
                homeSwMI [1] IMPLICIT SwMI OPTIONAL;
                visitedSwMI [2] IMPLICIT SwMI OPTIONAL;
                forwardAddressOnNoReply [3] IMPLICIT Address OPTIONAL;
                unconditionnalForwardAddress [4] IMPLICIT Address OPTIONAL;
                nominalOperationalGroup Group
                };

ISILocationDelete:= SEQUENCE {
                address             Address;
                serialNumber        SerialNumber;
                numberOfMigration Counter256
                };

Scope:= ENUMERATED {
                world (0);
                tetrapolDomain (1);
                swmi(2);
                baseNetwork (3)
                };

ISIEnquiry:= SEQUENCE {
                address Address;
                locationScope       [0] IMPLICIT Scope OPTIONAL;
                keyReference        [1] IMPLICIT KeyReference OPTIONAL;
                requestedSetOfServiceProfile [2] IMPLICIT --$ implement size < 200--
                OCTET STRING -- reserved
                };

EnquiryResult:= ENUMERATED {
        knownLocalised (0);
        vlrNotaccessible (1);
        unknownFromHlr (2);
        knownNotLocalised (3);
        unknownFromVlr (5);
        knownLocalisedFromVlrButCellInaccessible (19);
        remoteAuthenticationFailed (20);
        encryptionFailure (23);
        keyReferenceUnknown (24);
        randomUnavailable (25)
        };

BasicProfile:= SEQUENCE {
                numberOfMigration           Counter256;
                numberOfFullRegistration    Counter256;
                terminalType                [1] IMPLICIT TerminalType;
                stateBitmap                 [2] IMPLICIT StateBitmap;
                udtType                     [3] IMPLICIT UdtType OPTIONAL;
```

```
                forwardAddressOnNoReply      [4] IMPLICIT Address OPTIONAL;
                unconditionnalForwardAddress [5] IMPLICIT Address OPTIONAL;
                validityOfKey                [6] IMPLICIT BOOLEAN OPTIONAL;
                keyOfCall                    [7] IMPLICIT --$ implement size < --
                                             OCTET STRING OPTIONAL
                };

DefaultProfile:= BasicProfile;

Profile:= CHOICE{
        [0] IMPLICIT BasicProfile;
        [1] IMPLICIT --$ implement size < --  OCTET STRING -- reserved
        } DEFAULT DefaultProfile;

ISILocationProfile:= SEQUENCE {
                address Address;
                enquiryResult EnquiryResult;
                visitedSwMI                  [0] IMPLICIT SwMI OPTIONAL;
                forwardAddress               [1] IMPLICIT Address OPTIONAL;
                setOfEnquiredServiceProfile  [2] IMPLICIT --$ implement size < 200 --
                                             SET OF Profile OPTIONAL
                };

DisablingType:= ENUMERATED {
                enabled(0);
                trafficDisable(1);
                accessDisable(2)
                };

ISIDisable:= SEQUENCE {
                address                      Address;
                serialNumber                 SerialNumber;
                expectedDisablingType        [0] IMPLICIT DisablingType OPTIONAL;
                actualDisableType            [1] IMPLICIT DisablingType OPTIONAL
                };


AckResult:= ENUMERATED {
                confirmedOperation (0);      -- acknowledgement of a successfull SDU transfer
                flushInvokeReference (1);    -- flush all buffered SDU with same invokeReference
                invokeReferenceFlushed (2);
                invokeReferenceNotFound (3);
                duplicatedRequest (4)
                };

ISIAcknowledge:= AckResult;-- used over an unreliable bearer service

MMsdu::= SEQUENCE {
                endConnectionId              ConnectionIdentifier;
                invokeReference              InvokeReference;
                codop CHOICE {
                        isiLocUpdateDemand   [31] IMPLICIT ISILocationUpdateDemand;
                                             -- from visited to home SwMI at migration
                        isiLocUpdateProfile  [32] IMPLICIT ISILocationUpdateProfile;
                                             -- from home to visited SwMI at migration
                        isiLocDelete         [33] IMPLICIT ISILocationDelete;
                                             -- from home to previous visited SwMI
                                             -- to home SwMI upon hlr recovery
                        isiEnquiry           [34] IMPLICIT ISIEnquiry;
                                             -- location request before routeing
                                             -- service profile interrogation
                        isiLocProfile        [35] IMPLICIT ISILocationProfile;
```

```
                                        -- from home SwMI as a location indication
                                        -- from home SwMI as a service profile delivery
                    isiDisable          [36] IMPLICIT ISIDisable;
                                        -- terminal disable order
                    isiAcknowledgment   [37] IMPLICIT ISIAcknowledge
                }
            };
-- end of MMsdu
--
--
--
```

### 7.5. Generic service information SDU

```
Genericsdu:= SEQUENCE {
                connectionId ConnectionIdentifier;
                --$ implement size < -- OCTET STRING
                };
```

### 7.6. User information SDU

```
ConnectionReference:= OCTET STRING(4);-- access reference in cell of SwMI;
                                      -- or access reference in RSW of SwMI;
                                      -- is related to the unidirectional voice path in SwMI;
                                      -- either from cell to call master RSW or;
                                      -- from call master RSW to cell;
                                      -- is not semantically a ConnectionIdentifier;
                                      -- could have same value as ConnectionIdentifier over ISI;


CallReference:= OCTET STRING(2);      -- allocated for each call;
                                      -- to be related to ConnectionIdentifier and COV;

ActivationPriority:= CallPriority; -- priority for seizing physical resource for a bearer connection
                        -- is provided upon activation demand; is a delta to the
                        -- TrunkingPriority that was provided at establishment

TransmitPriority:= ENUMERATED {
                    low (0);
                    standard (1);
                    dispatcher (2);
                    transit (4)
                    };

PrivateActivation:= NULL;

GroupActivation:= ENUMERATED{
                    moch(0); -- access rights according to participation groups of moch;
                    internalToGroup (1), -- group-member call to group, talkgroup;
                    oneWay (2), -- for broadcastCall;
                    externalToGroup (3) -- non-group-member call to group;
                    };

ActivationMode:= SEQUENCE{
                    hook  Hook,
                    type  CHOICE{
                          PrivateActivation, -- if serviceType is privateCall;
                          GroupActivation;
                          }
                    };

DataItem::= CHOICE {
```

```
        talkingPartyIdentification      [1] IMPLICIT Address,
        security                        [2] IMPLICIT Security,
        userData                        [0] IMPLICIT BIT STRING(66)
                                        -- transparent data
        };
```

**StartSpeechItem:=** OCTET STRING(15);

**SpeechItem:=** OCTET STRING(15);

**DummyItem:=** OCTET STRING(15); -- voice stuffing

```
Item:= SEQUENCE {
        group       Group ,
        priority    TransmitPriority;
        userItem    CHOICE {
                        [1] IMPLICIT DataItem;
                        [2] IMPLICIT StartSpeechItem;
                        [3] IMPLICIT SpeechItem;
                        [4] IMPLICIT DummyItem;
                        }
        };

ActivationDemand:= SEQUENCE { -- activation request to call master;
        group               Group,      -- request to associate (group, reference);
        reference           CallReference,  -- with endConnectionReference;
        keyReference        KeyReference;
        userPriority        UserPriority;
        activationPriority  ActivationPriority DEFAULT routine;
        activationMode      ActivationMode;
        };
```

```
Activation:= SEQUENCE { -- active group indication from call master;
                group               Group ,             -- indicates association of (group, reference);
                reference           CallReference,      -- with endConnection;
                keyReference        KeyReference;
                activationCounter   Counter256;
                userPriority        UserPriority;
                activationPriority  ActivationPriority;
                activationMode      ActivationMode;
                };

Active:= Group; -- active group without on-going ptt on endConnection,indication to call master

Inactive:= Cause; -- indicates end of association of (group, reference) with endConnection.

SynchroActive:= SEQUENCE {
                group               Group,
                localConnection     ConnectionReference -- between cell and call master;
                };

SynchroInactive:=  localConnection ConnectionReference; -- between cell and call master;

UserInfosdu::= SEQUENCE {
                endConnection ConnectionReference, -- cell or  call master access reference;
                codop CHOICE {
                        isiActivationDemand  [0] IMPLICIT ActivationDemand;
                        isiActivation        [1] IMPLICIT Activation;
                        isiActive            [2] IMPLICIT Active;
                        isiUserInfo          [3] IMPLICIT Item;
                        isiSynchroActive     [4] IMPLICIT SynchroActive;
                        isiInactive          [5] IMPLICIT Inactive;
                        isiSynchroInactive   [6] IMPLICIT SynchroInactive;
                        }
                }

END         -- of Tetrapol-ISI-Sdu
```

# 8. Reliability of ISI services

## 8.1. Confirmed and unconfirmed transfers of ISI SDU

### 8.1.1. Confirmed transfer procedure

A confirmed operation requires that the sender ANF and the receiver ANF coordinate the reliable transfer of information elements over the ISI.

Upon sending an SDU whose transfer is to be confirmed, the sender ANF shall set an ISI timer, depending on the SDU.

Upon receipt of a SDU whose transfer is to be confirmed, the receiving ANF shall transfer back the appropriate SDU within a time transmit window, as monitored by the ISI timer in the sender ANF, thus confirming that the initial SDU has been successfully transmitted over the ISI.

Upon transferring back the appropriate SDU, the receiving ANF acknowledges that it has successfully parsed all necessary information element in the received SDU, that it has detected no protocol sequencing error and that it has taken responsibility for handling the SDU within its SwMI.

Upon receipt of the appropriate back SDU, the sender ANF shall reset the ISI timer.

Note that the back SDU may require itself a confirmed transfer.

Upon ISI timer expire, the sending ANF shall consider that the transfer has failed. The sending ANF may then retry once the confirmed transfer, depending on the SDU.

### 8.1.2. Unconfirmed transfer procedure

An unconfirmed operation requires no coordination upon sending information elements. A failure of the transfer procedure requires no explicit extra action from the sending ANF.

### 8.1.3. Confirmed and unconfirmed ISI SDU

The ISI service control procedures shall handle either confirmed or unconfirmed SDU transfers.

- ISIProceeding, ISIAlerting, ISIConnectAcknowledge and ISIRelease are unconfirmed SDU.
- ISISetup requires a transfer confirmation with ISIProceeding, ISIAlerting, ISIConnect or ISIDisconnect.
- ISIConnect requires a transfer confirmation with ISIConnectAcknowledge.
- ISIDisconnect requires a transfer confirmation with ISIRelease.
- ISIMaintenance may be confirmed with ISIMaintenance ackResult information element.

The ISI mobility management procedures shall handle either confirmed or unconfirmed SDU transfers.

- ISIAcknowledgment is an unconfirmed SDU.
- ISILocationUpdateDemand requires a transfer confirmation with ISILocationUpdateProfile or ISIAcknowledgment.
- ISILocationEnquiry requires a transfer confirmation with ISILocationProfile or ISIAcknowledgment.
- ISIDisable or ISILocationDelete require a transfer confirmation wih ISIAcknowlegment.
- ISILocationUpdateProfile and ISILocationProfile may be confirm with ISIAcknowlegment.

The ISI security management procedures shall handle confirmed SDU transfers.

- ISISecurity requires a transfer confirmation with ISIAcknowlegment.

### 8.1.4. SDU flush indication

Over an unreliable bearer service, ISIAcknowledge may indicate that the transfer of the previous SDU that are identified with the same invokeReference are no more valid and can be removed from the internal SwMI queue. The invokeReference value shall be deallocated.

ISIDisconnect or ISIRelease may indicate that the transfer of the previous call related SDU with the same identifier is no more valid and can be removed from the internal SwMI queue. The identifier value shall be deallocated upon sending or receiving ISIRelease.

## 8.2. Timers

### 8.2.1. T11 timer waiting for a call setup response

Timer T11 operates in any call control ANF in an originating SwMI (GRW). Its purpose is to protect against the absence of a response to an ISISetup. T11 is not needed if PSS1 T303 operates.

T11 set: ANF sending of an ISISetup to initiate a call establishment.

T11 reset: ANF receipt of a consequent SDU to complete or abort the call establishment.

T11 expiry: ANF sending of the ISISetup a second time or clearing of the related call setup request in the local SwMI.

Possible T11 expiry causes:

- Unreliable transfer of ISISetup, ISIProceeding, ISIAlerting, ISIConnect or ISIDisconnect by the bearer service;
- Setup request queued too long in the destination SwMI;

- Lack of resources in the destination SwMI;
- Failure in the destination SwMI;

### 8.2.2. T12 timer waiting for a call connect

Timer T12 operates in any call control ANF in an originating SwMI (GRW). Its purpose is to limit the call establishment duration. Timer T12 shall be longer than timer T11. T12 is not needed if PSS1 T303, T310 and T301 operate.

T12 set: ANF sending of an ISISetup to initiate a call establishment.

T12 reset: ANF receipt of an ISIConnect or ISIDisconnect.

T12 expiry: ANF sending of an ISIDisconnect.

Possible T12 expiry causes:

- Unreliable transfer of ISIConnect or ISIDisconnect by the bearer service;
- Establishment completion too long in the destination SwMI;
- Failure in the destination SwMI.

### 8.2.3. T13 timer waiting for a call connect response

Timer T13 operates in any call control ANF in a destination SwMI (GRW). Its purpose is to protect against the absence of a response to the ISIConnect to complete the call establisment. T13 is not needed if PSS1 T313 operates.

T13 set: ANF sending of an ISIConnect.

T13 reset: ANF receipt of an ISIConnectAcknowledge or an ISIDisconnect.

T13 expiry: ANF sending an ISIDisconnect.

Possible T13 expiry causes:

- Unreliable transfer of ISIConnect, ISIConnectAcknowledge or ISIDisconnect by the bearer service;
- Connect request queued too long in the originating SwMI;
- Lack of resources in the originating SwMI;
- Failure in the originating SwMI.

### 8.2.4. T14 timer waiting for a call disconnection response

Timer T14 operates in any call control ANF in a requesting SwMI (GRW). Its purpose is to protect against the absence of a response to the ISIDisconnect. T14 is not needed if PSS1 T305 and T308 operate.

T14 set: ANF sending of a ISIDisconnect to disconnect a call.

T14 reset: ANF receipt of a ISIRelease to acknowledge the disconnection.

T14 expiry: ANF clearing the call locally.

Possible T14 expiry cause:

- Unreliable transfer of ISIDisconnect or ISIRelease by the bearer service;
- Failure in the responding SwMI.

### 8.2.5. T15 timer waiting for an acknowledgment of a maintenance request

Timer T15 operates in any call related ANF at a requesting SwMI (GRW) side. Its purpose is to protect against the absence of a response to a confirmed maintenance request.

T15 set: ANF sending of a request.

T15 reset: ANF receipt of a consequent SDU.

T15 expiry: ANF rejecting the related request.

Possible T15 expiry causes:

- Unreliable transfer of the SDU with the related identifier by the bearer service;
- Failure in the other SwMI.

### 8.2.6. T21 timer waiting for a location update response

Timer T21 operates in the ANF_ISIMM in the visited SwMI (GLR) during a location update demand to the home SwMI (GLR-HLR). Its purpose is to protect against the absence of a response to the ISILocationUpdateDemand. Timer T21 shall have a value not less than the Air Interface timer T702.

T21 set: ANF sending of an ISILocationUpdateDemand.

T21 reset: ANF receipt of an ISILocationUpdateProfile or an ISIAcknowledge.

T21 expiry: ANF rejecting the related request.

Possible T21 expiry causes:

- Unreliable transfer of ISILocationUpdateDemand, ISIAcknowledge or ISILocationUpdateProfile by the bearer service;
- Request queued too long in the home SwMI;
- Failure in the home SwMI.

### 8.2.7. T22 timer waiting for a location enquiry response

Timer T22 operates in the ANF_ISIMM at a requesting SwMI (GLR) side during a location enquiry to the home SwMI (GLR-HLR) side. Its purpose is to protect against the absence of a response to the ISILocationEnquiry. Timer T22 shall have a value not less than the Air Interface timer T712

T22 set: ANF sending of an ISILocationEnquiry.

T22 reset: ANF receipt of an ISILocationProfile.

T22 expiry: ANF rejecting the related request.

Possible T22 expiry causes:

- Unreliable transfer of the ISILocationEnquiry, ISIAcknowledge or ISILocationProfile by the bearer service;
- Failure in the home SwMI.

### 8.2.8. T23 timer waiting for an acknowledgement of a request

Timer T23 operates in the ANF_ISIMM at a requesting SwMI (GLR) side. Its purpose is to protect against the absence of a response to a request. Timer T23 shall have a value not less than timers T21 and T22.

T23 set: ANF sending of a request.

T23 reset: ANF receipt of a consequent SDU or an ISIAcknowledge.

T23 expiry: ANF rejecting the related request.

Possible T23 expiry causes:

- Unreliable transfer of all SDU with the related invokeReference by the bearer service;
- Failure in the other SwMI.

## 9. ISI procedures

The operational semantics of the inter-system services is specified in Annex B of this specification as an SDL dynamic model of the additional network features that enables to implement the inter-system procedures with a finite state automaton.

ISDN-like canonical message sequences apply.

A typical call related sequence is as follows:

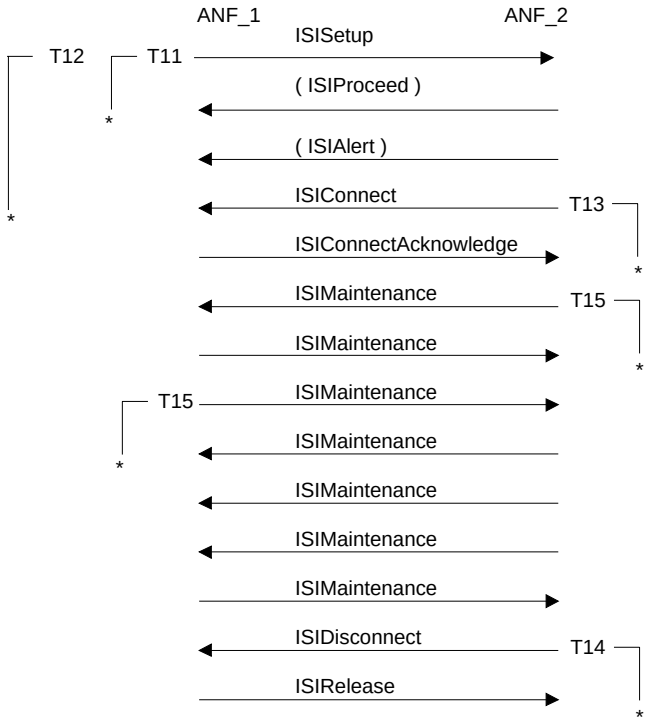


**Figure 6: Typical ISI call related message sequence**

A typical mobility related sequence is as follows:

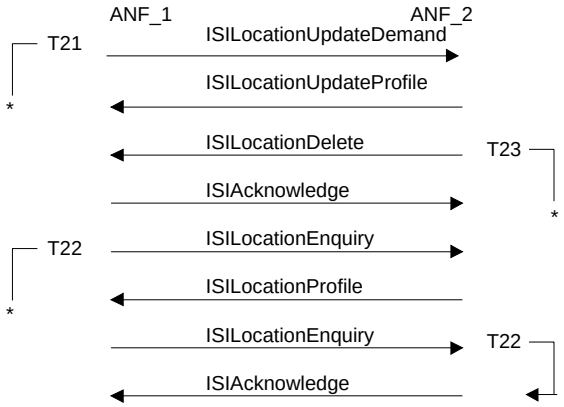


**Figure 7: Typical ISI mobility related message sequence**

Flows received out of any correct message sequence, or out of a correct timer window, or with an incorrect invokeIdentifier or an incorrect identifier shall be ignored.

# 10. Circuit-mode bearer services for ISI procedures

## 10.1. Scope

This clause applies for a circuit mode bearer service supporting TETRAPOL encoded speech or unrestricted user information, in a network scenario with circuit mode user information connections and circuit mode signalling connections, over the inter-system interface at R9 reference point.

Note that this bearer is relevant for the resources of the core network of a SwMI as seen from the ISI. A range of radio access bearers may be associated to this network bearer, providing different trunking schemes on the radio resources, e.g. radio resources may use a quasi-transmission scheme while the network resource use a message trunking scheme on a circuit mode bearer.

The signalling procedures and protocol for circuit-switched call control between private integrated services network (PISN) exchanges (PINX) for the support of circuit mode basic bearer services apply as defined in the Private Signaling System Number 1 (PSS1) [4] [5].

Note: PSS1 is the private signalling system number 1 for the purpose of the signalling at the ISDN Q reference point and is also referred-to as QSIG.

In this clause, a GSW is a gateway circuit mode switching entity of a SwMI and is considered as a private integrated services network exchange (PINX) to the ISI backbone, that is embodied by a private integrated services network (PISN). Databases access are routed through the GSW.

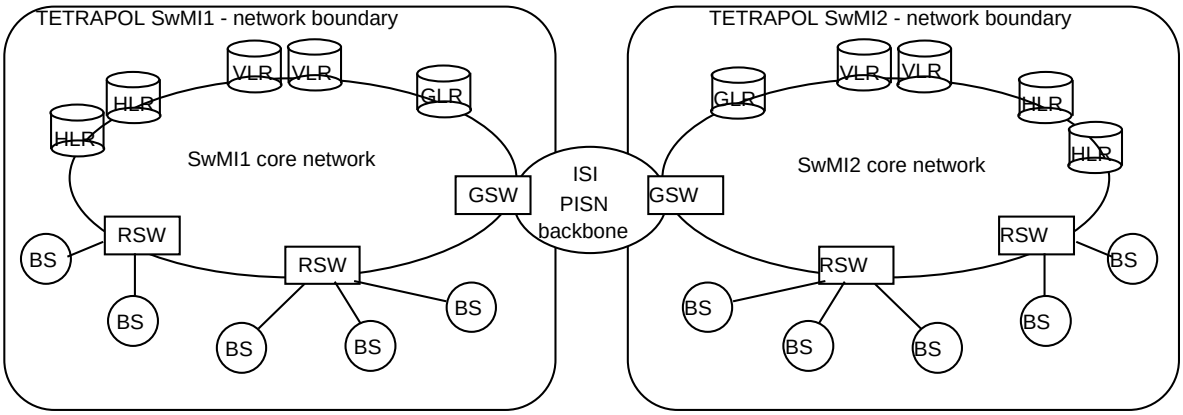


**Figure 8: Example circuit mode configuration in support of ISI services**

## 10.2. Circuit mode network service

### 10.2.1. ISI service data unit encapsulation

#### 10.2.1.1. Scope

A circuit shall provide information transfer of signalling or user information, using a bandwidth allocated on physical pathes at the bearer invocation during call establishment and available for the duration of the bearer invocation, i.e. for the duration of the call supported by the bearer.

User-information transferred in the circuit, that features the bandwidth allocated for the exclusive use of one bearer invocation for one communication, shall support circuit switching and time-multiplexing access to the physical path between bearer connections. The circuit mode network service provides a reliable transfer service for ISI SDU.

The ISI SDU shall use the signalling procedures for the generic functional protocol of the PSS1 protocol stack [4] [5], for the purpose of transferring ISI service information flows while establishing, maintaining and releasing an associated circuit over R9 interface.

The ISI service data units shall be transferred using the TETRAPOL remote operation defined hereafter, which in turn shall be coded in a PSS1 facility information element in accordance with the PSS1 generic feature for the support of supplementary services in ETS 300 239 [5].

An Interpretation APDU may be included in the PSS1 facility information element, in which case its value shall be “rejecAnyUnrecognisedInvokePdu”.

#### 10.2.1.2. Tetrapol ISI operation

Thés clause specifies how the service data units required for fulfilling the ISI service requirements are mapped to the OSI presentation layer via a specific remote operation for the purpose of being transported in PISN messages.

The remote operation defined hereafter in Abstract Syntax Notation number 1 (ASN.1) [7] [8] shall apply for the PISN messages in support of the ISI services.

**Tetrapol-ISI-Operation** {ccitt (0) identified-organization (3) etsi (0) tetrapol isi-encoding-operation(0)}

```
DEFINITIONS EXPLICIT TAGS::=
BEGIN
IMPORTS   OPERATION, ERROR FROM Remote-Operations-Notation
          {joint-iso-ccitt (2) remote-operations (4) notation (0) };
          Extension FROM Manufacturer-specific-service-extension-definition
          {iso (1) standard (0) pss1-generic-procedures (11582) msi-definition (0)};

TetrapolIsiMessage::= OPERATION
-- Tetrapol ISI service data unit encoded in IsiArgument;
ARGUMENT      IsiArgument;
RESULT        IsiResult;
ERRORS        {destEntityNotSupported, invalidDestEntity, invalidSDU, invalidInfoElement,
incompleteSDU, requestNotSupported, unspecified}.

IsiArgument::=SEQUENCE    {
      sourceEntity       [0] IMPLICIT AnfSubEntity;
      destinationEntity  [1] IMPLICIT AnfSubEntity;
      sdu                [2] IMPLICIT OCTET STRING;
      extension          CHOICE {
                         [3] IMPLICIT Extension;
                         [4] IMPLICIT SEQUENCE OF Extension;
```

```
                    } OPTIONAL;
    }

IsiResult    CHOICE {
    NULL,
    IsiArgument;
    [1] IMPLICIT Extension;
    [2] IMPLICIT SEQUENCE OF Extension;
    }

destEntityNotSupported ERROR PARAMETER AnfSubEntity    ::= 1

invalidDestEntity ERROR PARAMETER AnfSubEntity         ::= 2

invalidSDU ERROR PARAMETER OCTET STRING                ::= 3

invalidInfoElementERROR PARAMETER OCTET STRING         ::= 4

incompleteSDU ERROR PARAMETER OCTET STRING             ::= 6

unspecifiedERROR PARAMETER Extension                   ::= 0

AnfSubEntity                                           ::= ENUMERATED { anfIsiic (2),
anfIsigc (3), reservedsd (4), anfIsimm (5), anfIsiss (6), anfIsimoch (7), anfIsitkg (8), anfIsicov (9)}


tetrapolIsisMessageISI-message                         ::= 1

END -- of Tetrapol-ISI-Operation
```

The Tetrapol-ISI-Operation shall be used to convey all ISI service data units in the facility information element of PSS1 protocol data units, as processed in the additional network features.

#### 10.2.1.3. Generic transport of information

Over the ISI between TETRAPOL systems at R9 reference point, the argument of the ISI Message operation is tagged as [2] IMPLICIT OCTET STRING to allow for the generic transport of information.

The generic information shall be:

- either rejected when not supported or not recognised, according to the procedure for “rejecAnyUnrecognisedInvokePdu”;
- or ignored, if the call setup can proceed without them.

#### 10.2.1.4. Facility information element

The Tetrapol-ISI-Operation shall be coded in the Facility information element in accordance with QSIG generic features [5].

When conveying the invoke APDU of the Tetrapol-ISI-Operation, the destinationEntity data element of the NFE shall contain value endPINX.

When conveying the invoke APDU of the Tetrapol-ISI-Operation, the Interpretation APDU shall either be omitted or be included with value rejectAnyUnrecognisedInvokePdu.

#### 10.2.1.5. Overall SDU encapsulation

The ISI SDU is inserted in a PSS1 protocol data unit at network layer, as illustrated in the following table and fully specified in PSS1 circuit mode bearer services specifications (ETS 300 172 [4] and ETS 300 239 [5].

**Table 28: PSS1 protocol data unit contents**

| information element | Length |
|---|---|
| Protocol discriminator | 1 |
| Call reference | 3 |
| Message type | 1 |
| PSS1 basic call information elements | variable |
| Facility IE identifier | 1 |
| Length of IE contents | 2 |
| Network facility extension | constant |
| Interpretation APDU | constant |
| Invoke APDU header | constant |
| InvokeID | 1 |
| OperationValue | constant |
| SourceEntity | 3 |
| DestinationEntity | 3 |
| SDU | variable |

NOTE: The protocol discriminator is ITU-T Q.931;the basic call information elements depend on the message type; the OperationValue shall be set to TETRAPOL-ISI-Operation

The maximum SDU length is network-dependent and is below SDUMaxLengthOverPSS1 octets, as defined in Annex E.

### 10.2.2. Remote operation timer

The following timer apply:

Timer T0 operates in any SwMI. Its purpose is to protect against the absence of a response to the Tetrapol-ISI-Operation invoke APDU. Timer T0 shall have a value not less than 15s.

T0 set: ANF sending of a Tetrapol-ISI-Operation.

T0 reset: ANF receipt of a ISIresult or Error or a consequent PDU.

T0 expiry: ANF either repeat the remote operation again or clear the call.

Possible expiry cause:

- Failure in the other SwMI.

### 10.2.3. ISI information flows and relationship to PSS1 flows

The ISI procedures use certains aspects of the QSIG basic call procedures [4] and the QSIG generic procedures for the support of supplementary services [5]. As the ISI additional network features supplement the PISN flows, the ISI procedures are clocked with some PISN flows according to QSIG procedures.

The relationship between ISI information flows and PISN flows are listed in this clause.

ISISetup shall flow over QSIG_SETUP and be the first ISI call control protocol data unit for a call.

ISIDisconnect shall flow over QSIG_DISCONNECT or QSIG_RELEASE and be the last ISI call control protocol data unit.

Other ISI call control protocol data units may flow on any PISN message, as long as the canonical PSS1 message sequences are respected, i.e. the order of the message occurrence for a call shall be ISISetup,

ISIProceeding, ISIAlerting, ISIConnect, ISIConnectAcknowledge, ISIMaintenance; ISIDisconnect, ISIRelease may be sent whenever after an ISI_setup.

When the mobility management procedures use QSIG services, they shall be supported whenever needed by the appropriate QSIG basic call service and QSIG generic features as selected by the QSIG coordination function. Recommended PISN flows include QSIG_SETUP, QSIG_FACILITY, QSIG_CONNECT and QSIG_RELEASE for mobility management.

### 10.2.4. ISI circuit procedures for user information

#### 10.2.4.1. User information transfer over the ISI circuit

- TETRAPOL encoded speech item SDU stream.

The information transfer protocol uses a specific header before the speech item in order to build a user information service data unit, as defined in the TETRAPOL circuit mode control protocol. This protocol applies to TETRAPOL encoded clear speech or TETRAPOL encoded encrypted speech.

- PCM A-law speech item SDU stream.

The information transfer coding and protocol shall conform to PCM A-law as defined in ITU-T G.711/G.714. This protocol applies to clear speech.

Sub-multiplexing is for further study.

#### 10.2.4.2. Static description of the ISI connection element

The following table defines the static description of this connection element used over the ISI in terms of the values of its attributes as listed in ITU-T Recommendation I.140.

**Table 29: Basic definition of ISI connection element attributes**

| Attribute category | Attribute name | Attribute value |
|---|---|---|
| Information transfer attributes | 1. Information transfer mode:<br>2. Information transfer rate:<br>3. Information transfer capability:<br>4. Structure:<br>5. Establishment of connection:<br>6. Symmetry:<br>7. Connection configuration: | circuit<br>64 kbit/s<br>no restriction (see note)<br>8 kHz integrity<br>demand<br>bi-directional symmetric<br>point-to-point |
| Access attributes | 8. Channel:<br>9. Connection control protocol:<br>10. Information transfer coding/ protocol | B for user information,<br>D for signalling<br>“QSIG” for D-channel<br>see above |
| General attributes | 11. Network performance<br>12. Network interworking<br>13. Operations and management aspects | for further study<br>for further study<br>for further study |
| NOTE: | According to the definition of the attribute information transfer capability of a connection element in ITU-T Rec. I.140, the value of this attribute for the ANF-ISIIC connection element should be “null”. Since this value means that there is no restriction to the types of information which may pass through the connection element, the term “no restriction” has been preferred. | |

**Table 30: optional definition of ISI connection element attributes**

| Attribute category | Attribute name | Attribute value |
|---|---|---|
| Information transfer attributes | 1. Information transfer mode:<br>2. Information transfer rate:<br>3. Information transfer capability:<br>4. Structure:<br>5. Establishment of connection:<br>6. Symmetry:<br>7. Connection configuration: | circuit<br>4 x 16 kbit/s<br>no restriction (see note)<br>frame sequence integrity<br>on-demand<br>bi-directional symmetric<br>point-to-point |
| Access attributes | 8. Channel:<br>9. Connection control protocol:<br>10. Information transfer coding/protocol | 16 kbit/s channels for user information,<br>D for signalling<br>“QSIG” for D-channel<br>see above |
| General attributes | 11. Network performance<br>12. Network interworking<br>13. Operations and management aspects | for further study<br>for further study<br>for further study |
| NOTE: | According to the definition of the attribute information transfer capability of a connection element in ITU-T Rec. I.140, the value of this attribute for the ANF-ISIIC connection element should be “null”. Since this value means that there is no restriction to the types of information which may pass through the connection element, the term “no restriction” has been preferred. | |

### 10.3. Circuit establishment and release

The PSS1 establishment and release procedures of a circuit apply over ISI [4].

### 10.4. Addressing

#### 10.4.1. Addressing in ISI service data units

TETRAPOL addressing plan shall be used in ISI service data units, except SwMI service access point that may be identified in the PISN numbering plan.

#### 10.4.2. SwMI addressing in PSS1 protocol data units

QSIG protocol data units shall use the PISN addressing.

One of the following alternatives shall be pre-arranged by the system managers:

- When the default numbering plan of the PISN is used, i.e. unknownPartyNumber in the PINX numbering plan, the called party number of the QSIG basic call message may contain the country code, network code of the destination SwMI and may contain a base network number of the destination service access point in the destination SwMI, as defined in the TETRAPOL addressing plan.

- When the default numbering plan of the PISN is used, i.e. unknownPartyNumber, the called party number of the QSIG basic call message may contain an address from the TETRAPOL addressing plan.

- A PISN address from a private numbering plan may be provided in the QSIG called party number.

#### 10.4.3. Circuit identification over the ISI

The circuit identification over the ISI is indicated by the PSS1 channel identifier.

### 10.5. Requirement on the intervening network

The gateway RSW (GSW) of a SwMI that provide end-point PINX access to a PISN (private integrated service network) shall be identified as such and shall implement the appropriate gateway filtering features.

## 11. Fast circuit-mode bearer services for ISI procedures

### 11.1. Scope

This clause applies for a fast circuit mode bearer service, supporting TETRAPOL encoded speech or unrestricted data, in a network scenario for signalling and user information connections over the inter-system interface at R9 reference point, whereby bandwidth reservation occurs independently and before the end-to-end connection establishment.

Note that this bearer is relevant for the resources of the core network of a SwMI as seen from the ISI. A range of radio access bearers may be associated to this network bearer, providing different trunking schemes on the radio resources, e.g. radio resources may use a quasi-transmission scheme while the network resource use a different quasi-transmission trunking scheme on a fast circuit mode bearer.

### 11.2. Fast circuit mode network service

Fast circuit mode services shall provide information transfer, using a pool of pre-established bandwidth (i.e. reserved channel connection chains) on physical pathes, that are dynamically allocated to a bearer per call activation. The pool of pre-established bandwidth builds a virtual path that is referred-to as a coverage. This coverage may be trunked between several bearer invocations for different communications.

User-information using the pre-established bandwidth shall support circuit switching and time-multiplexing access to the physical path.

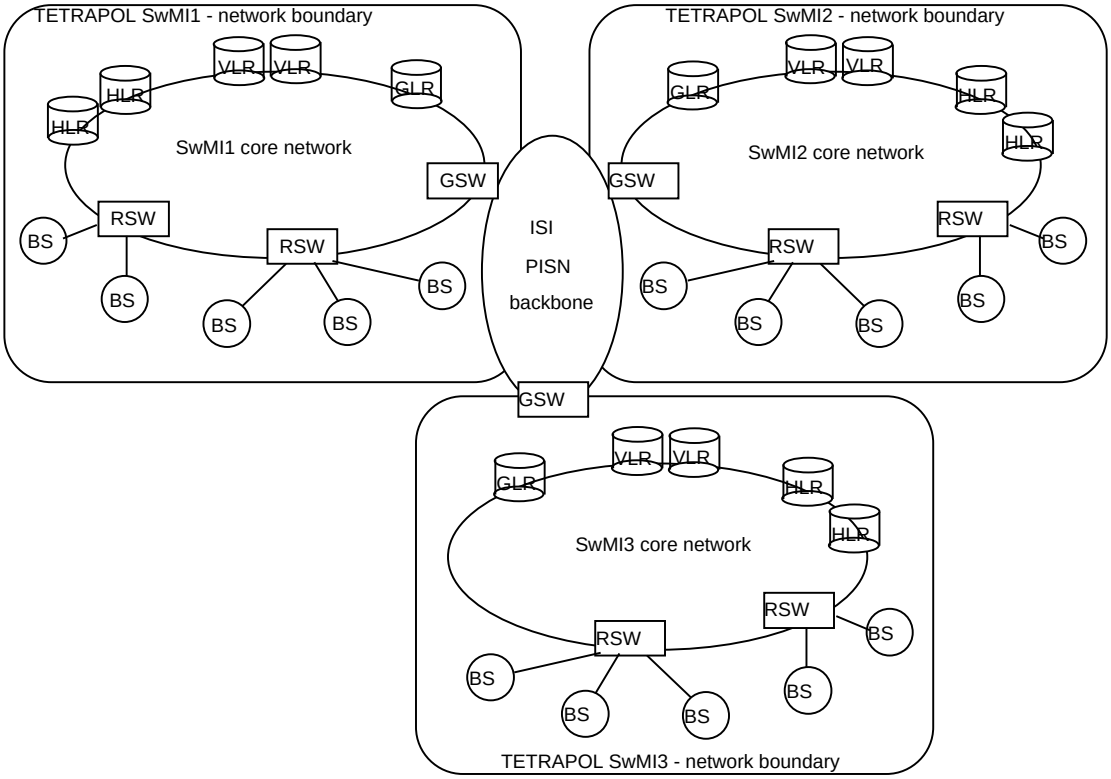


**Figure 9: Example circuit mode configuration in support of ISI services**

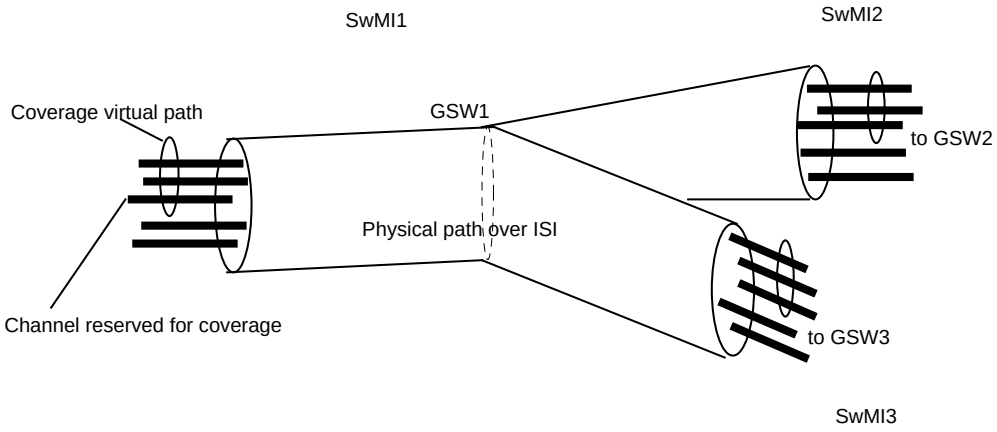


**Figure 10: Example fast circuit coverage with reserved bandwidth over the ISI**

### 11.3. Circuits establishment for bandwidth reservation and release

The same procedures apply for each bandwidth pre-establishment on as for a circuit mode bearer establishment, apart that the bandwidth is not a priori allocated to a bearer invocation. A pre-established circuit bandwidth shall be allocated on-demand to a bearer invocation for the duration of a call activation. All bandwidth from a virtual path may be shared between several bearer invocations and the fast circuit bearer service shall handle the concurrent bandwidth allocation requests to a same virtual path.

The bandwidth capacity reserved for a virtual path shall be defined before the establishment procedure for a virtual path, as pre-agreed between all involved system managers.

### 11.4. Addressing

The same addressing requirements as with circuit-mode bearer services apply.

A pool of pre-established bandwidth on a physical path is identified with the coverage identifier related to the pool, as defined in the services specification (TETRAPOL PAS Part 1) and in all relevant interface protocols, including also the ISI protocol defined hereafter.

### 11.5. Requirement on the intervening network

The same requirements as with circuit-mode bearer services apply.

## 12. Packet-mode bearer services for ISI procedures

### 12.1. Scope

This clause applies for a packet mode bearer service in a network scenario with packet mode signalling connections over the inter-system interface at R9 reference point.

ISI mobility may uses this bearer service to access HLR and VLR databases through a gateway database access point (GLR) of a SwMI. Uses of a packet-mode bearer for other signalling purposes is not further specified in this version of the specification.

### 12.2. Connection oriented network service

The packet mode network service provides a reliable transfer service for ISI SDU, as supported by the X.25 packet layer protocol (ISO 8208).

ISI SDU signalling information shall use packet-switching services over the physical path. Each ISI SDU shall be inserted as a user data in an X.25 packet at network layer.

**Table 31: X.25 packet contents**

| information element | Length |
|---|---|
| X.25 layer 3 protocol control information | 3-4 |
| Protocol discriminator | 1 |
| SDU | variable |

NOTE: The ISI protocol discriminator shall be set to a value not redundant with other protocols

In this clause, a node refers either to an HLR or a VLR or a Gateway database access (GLR) of a SwMI. The ISI backbone provides access to home location registers (HLR) and visitor location register (VLR) through a gateway location register (GLR).

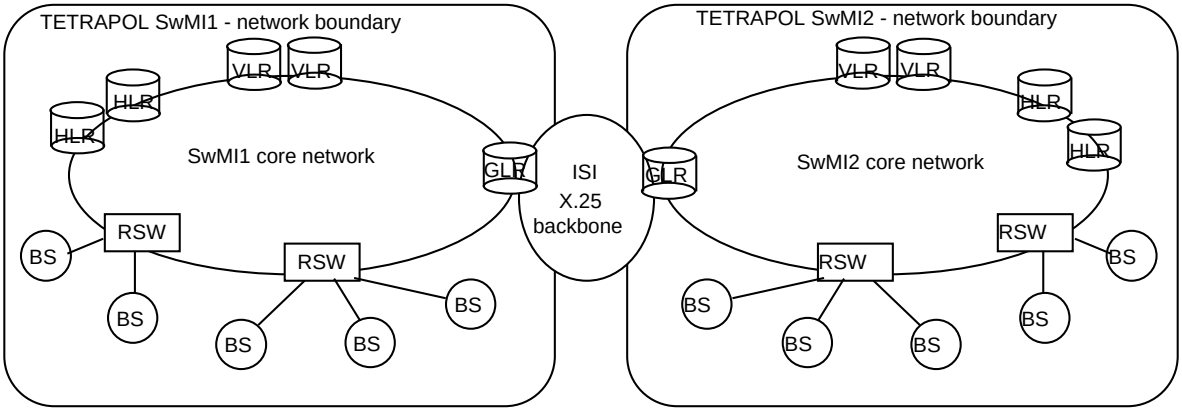

**Figure 11: Example packet mode configuration in support of ISI services**

Service access points shall be identified using X.121 addresses.

### 12.3. Virtual circuit and virtual call establishment and release

Permanent virtual circuits shall be considered and define the routeing capabilities of a SwMI towards other trusted SwMIs, as configured from the OMC. Permanent virtual circuits require no procedure for establishment and release, during normal ISI operation.

Virtual call management shall be handled as defined in the appropriate network layer procedures.

### 12.4. Addressing

#### 12.4.1. Database addressing

The database addressing plan is SwMI-specific and shall be known only by the relevant ANF_ISIMM in the GLR. Each GLR shall be provided with a service access point address over the ISI.

#### 12.4.2. SwMI addressing

With a packet mode bearer service, there is no relationship between the call control plane and the database plane, so that SwMI addressing is not needed for mobility management purposes.

#### 12.4.3. Virtual circuit addressing

The virtual circuit addressing shall be indicated in the network protocol control header.

### 12.5. Requirement on the intervening network

The intervening network shall be based on X.25 permanent virtual circuits, allowing the exchange of signalling information over the ISI.

The virtual circuits may be multi-hop and may traverse a number of packet switching nodes. However over the ISI, all packet shall traverse one X.25 gateway node before accessing the core network of a SwMI.

## 13. Transfer syntax over ISI

### 13.1. Scope

A transfer syntax over the ISI defines the binary format of the flows over the interface.

The ISI service data units shall be coded and transferred over the interface according to one of the following concrete transfer syntax's, in compliance with the abstract syntax specified in the above clause. Extra static semantic rules are indicated where needed.

NOTE: The purpose of translating an abstract syntax specification into a concrete syntax specification is to define the transfer syntax, namely the octet string buffers that are actually transferred by the bearer services for the support of the specification. There exist tools that use the ASN.1 abstract syntax specification defined above to ease the implementation of a transfer syntax of the ISI SDU according to some encoding rules. A transfer syntax over the ISI is the result of applying appropriate encoding rules to the ISI SDU. This clause indicates which encoding rules are applicable over the ISI.

When a circuit mode bearer service is used without segmentation at network layer, the length of ISI service data units shall be less than SDUMaxLengthOverISI, as defined in Annex E. When a packet mode is used, the maximum length of an ISI service data unit shall be less than 1600 octets.

Alternative transfer syntax's are described for speech item SDU and signalling SDU.

### 13.2. BER transfer syntax for signalling SDU

The basic encoding rules (BER) for TETRAPOL SDU at R9 interface shall comply with ITU-T Recommendation X.209 [8].

### 13.3. Packed transfer syntax for signalling and speech item SDU

This specification provides an optional capability for an ISI transfer syntax, using specific packed encoding rules, as described in annex C.

### 13.4. Speech item payload contents

Speech item SDU contain signalling information, such as connectionReference or transmit priority, associated with a speech item payload.

The purpose is to transfer speech item payloads between participants of a communications, using the appropriate payload encoding, as negotiated at establishment phase with SpeechService information element in other SDU.

One of the following speech item payload encoding shall be used over the ISI at R9 reference point:

- TETRAPOL encoded speech item SDU (default alternative).

The information transfer protocol uses a specific header before the speech item in order to build a user information service data unit, as defined in the TETRAPOL circuit mode control protocol. This protocol applies to TETRAPOL encoded clear speech or TETRAPOL encoded encrypted speech.

- PCM A-law speech item SDU.

The information transfer protocol shall conform to PCM A-law as defined in ITU-T G.711/G.714. This protocol applies to clear speech only.

## 14. Interworking with other PMR systems

### 14.1. Scope

This clause specifies some requirements upon an interworking unit (IWU) for the purpose of communications between a TETRAPOL system and another PMR system.

It is convenient, for the purpose of the interworking with other systems, to define several functional groupings related to the inter-systems interface, as shown on the following figure.

First a TETRAPOL switching and management infrastructure (SwMI) comprises a core network connecting several radio switches (RSW). In this system, the mobility of the subscribers is embodied by three functional entities: HLR, VLR and GLR. A subscriber of this TETRAPOL system is called a home subscriber. A subscriber of another system, but registered in this system, is called a migrated subscriber. The home location register (HLR) is a distributed database function that contains a master copy of the home subscriber profile and indicates the address of the database (VLR) or the address of the other system actually in charge of the of this home subscriber. The gateway location register (GLR) is a distributed database function that contains temporary information on the profiles of migrated subscribers and indicate the address of the database (VLR) actually in charge of those subscribers of this system. The GLR is the concentration point for all requests related to non-home subscribers. A visitor location register (VLR) is a distributed database handling location information for any terminals registered in cells controlled by a set of RSW, i.e. per base network in the SwMI.

Second, a TETRAPOL gateway switch (GSW) intermediates between the voice and signalling core network and the other systems. The GSW shall implement the ISI network features, including also ISI encryption capabilities, a function for translation of the addressing plan, and routeing information to be able to connect other systems. The ISI service data units shall flow through the GSW and the GSW shall control the bearer connections over the ISI.

Third, the TETRAPOL GSW may include an interworking unit (IWU). It is in charge of the actual gateway function in the GSW, using the appropriate transfer syntax of the ISI SDU for the purpose of connection to other PMR systems. This may include signalling protocol conversion, voice protocol conversion, voice transcoding, multiplexing and rate adaptation aspects.

Fourth, other systems are connected to the same backbone network as the GSW.

This is depicted in the figure, where R9 and R11 reference points are shown between the TETRAPOL GSW and the ISI backbone network.

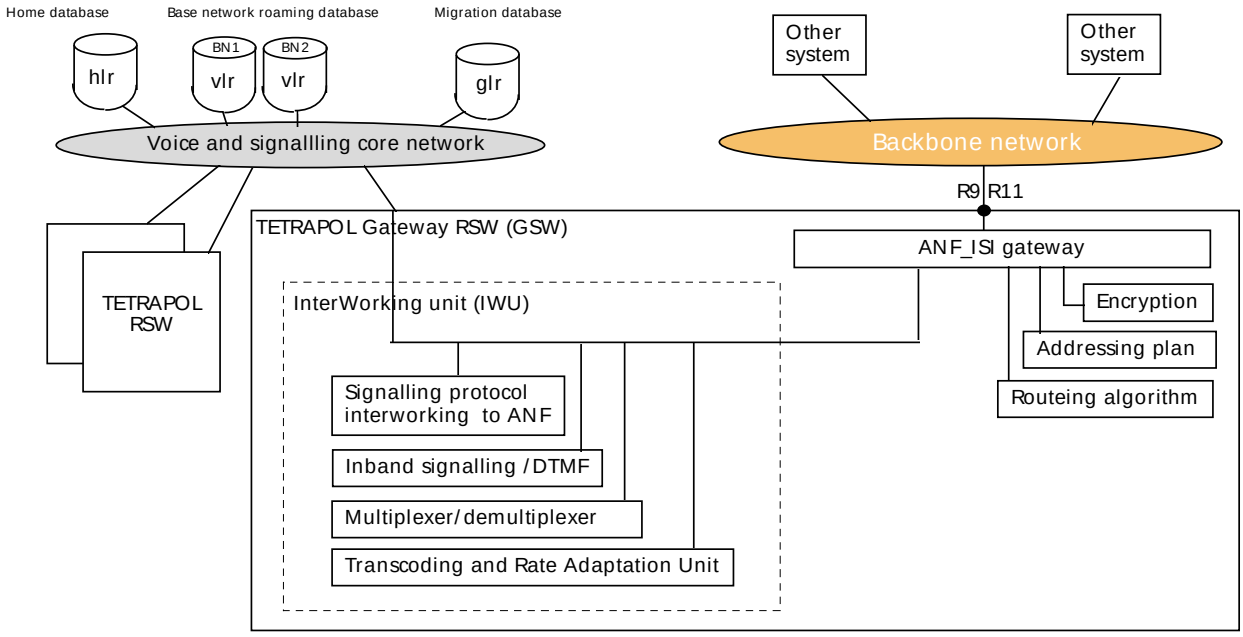


**Figure 12: TETRAPOL InterWorking Unit between heterogeneous systems**

- Signalling requirements include the protocol interworking function if the other systems do not fully support all TETRAPOL ISI network features.
- User information may require to had or remove signalling in stolen frames.
- A common multiplexing scheme in the ISI bearer is assumed to be pre-arranged between manufacturers.
- A transcoding and rate adaptation unit (TRAU) may be required depending on the speech service negotiation over the ISI.

The following figure indicates an overview of possible connections over the ISI and the range of IWU that are specified in this clause.

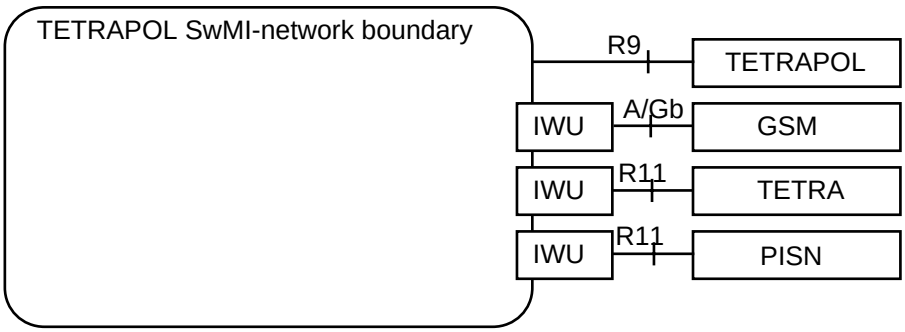


**Figure 13: Interworking with other PMR systems**

### 14.2. Manufacturer specific information over ISI to a PISN system

The PSS1 manufacturer specific information facility may be used alongside with TETRAPOL ISI operation in order to convey specific information to other private integrated services network (PISN) systems at TETRAPOL R11 reference point.

The PSS1 manufacturer specific information or the TETRAPOL ISI operation shall be:

- either rejected, according to the remote operation procedure for "rejecAnyUnrecognisedInvokePdu";
- or ignored, if the call setup can proceed without them;
- or interpreted according to pre-agreed interworking procedures with the other system.

### 14.3. Interworking with GSM phase 2+ systems

#### 14.3.1. Scope

IWU interworking requirements between TETRAPOL and GSM phase 2+ systems at TETRAPOL R11 reference point shall allow to convey service data units in order to interwork with the GSM mobile application part (GSM MAP) procedures.

The application of the ISDN user part of CCITT SS7 protocol stack at the interface for connecting mobile networks to fixed networks [11] may be used between the TETRAPOL GRW and the GSM MSC, supporting 64kbit/s unrestricted data bearer service for PCM A law speech transmission and ISDN telephony teleservice , calling line identification presentation and subaddressing supplementary services. Alternatively, the GRW may be considered as a PINX and may access the GSM MSC through an ISDN DSS1 interface via a transit public network or a PSS1 interface via a transit private network.

Either the GRW translates beetween ISI SDU and MAP SDU, or the ISI-specific SDU are conveyed as a specific MAP operation over the SS7 network, depending on the location of the interworking function. Concepts described in ITU-T Q.1400 may be used up to the GRW. These concepts enable, with minor modifications, the ISI protocol specified in clause §7 to be supported via an SS7 protocol stack. Q.1400 specifies the use of OSI concepts via SS7 for the development of signalling and operations and management protocols. The ISI protocol can be carried via an SS7 protocol stack consisting of TCAP, SCCP and MTP (see ITU-T Q.700 series) with minor adaptations.

#### 14.3.2. Common services

The GSM individual call, the GSM phase 2+ group call and broadcast call services shall be mapped onto TETRAPOL individual call, group call and broadcast call services with the appropriate addressing plan.

Mapping half-duplex GSM 2+ voice group call services on TETRAPOL services is for further study.

The mapping between GSM international mobile subscriber identity (IMSI), International mobile group identity (IMGI) and the TETRAPOL addressing plan shall be configured by pre-arrangement between system managers.

#### 14.3.3. Interworking requirements at TETRAPOL R11 reference point over GSM-A interface

For further study when TETRAPOL R11 reference point is coincident with GSM A-interface.

On the user plane at R11 reference point, PCM A-law unencrypted voice, as defined in ITU-T G711, may be transmitted at R11 reference point.

#### 14.3.4. Interworking requirements at TETRAPOL R11 reference point over GSM-Gb interface

For further study when TETRAPOL R11 reference point is coincident with GSM Gb-interface.

Mapping GSM GPRS services on TETRAPOL ISI services is for further study.

Voice shall be transmitted as unrestricted data at Gb interface.

### 14.3.5. GSM-specific transfer syntax

GSM MAP or GPRS specific coding requirements are for further studies.

## 14.4. Interworking with TETRA systems

### 14.4.1. Scope

This clause specifies the interworking requirements necessary to ensure the mappings between TETRAPOL voice services and TETRA services that can be supported over TETRAPOL R11 reference point. These requirements apply to the interworking unit (IWU) between a TETRAPOL SwMI and a TETRA SwMI over the inter-system interface.

### 14.4.2. Common services

The IWU shall enable a TETRA SwMI to support TETRAPOL individual call and group call procedures as seen at TETRAPOL R11 reference point. The IWU shall support the services and procedures specified in [10], including individual call and group call, providing the mapping between peer network features (ANF) over the ISI.

Forward-switching in the TETRA domain shall be the preferred routeing procedure requested over R11 reference point to a TETRA SwMI. Both forward switching procedure and re-routing procedure may be handled in the TETRAPOL domain.

### 14.4.3. Interworking requirements at TETRAPOL R11 reference point

#### 14.4.3.1. Interworking requirements at the signalling plane

##### 14.4.3.1.1. General requirements

As the procedures for TETRAPOL intersystem interface contain those for TETRA individual call, group call and mobility, and as TETRAPOL ISI SDU may convey all relevant information elements in the TETRAPOL domain, it is assumed a TETRAPOL IWU may emulate a TETRA SwMI with regards to the ISI flows that are relevant to the common services.

The interworking between a TETRAPOL system and a TETRA system requires a PSS1 circuit mode bearer service in order to support ISI SDU.

In order to assure network interoperability, semantic and syntactic requirements shall be added to the TETRA transfer syntax defined in [10], e.g. the actual TETRAPOL usage of the information elements in the octet strings transferred from the TETRA system in TETRAPOL ISI message operation shall be detailed.

##### 14.4.3.1.2. IWU procedures

Upon receipt of a PSS1 setup request, the TETRAPOL IWU shall be invoked if no TETRAPOL-ISI-Operation is conveyed in the PSS1 message.

Should a TETRA-ISI-Operation be provided for an individual call setup request, then the IWU shall extract the called party address and request the location of the called party.

Should a TETRA-ISI-Operation be provided for a group call setup request, then the IWU shall extract the called group and link the group with a coverage and a TETRAPOL group in the TETRAPOL SwMI, in order to request a group activation, as pre-arranged in the IWU. Different service mappings may be considered, as pre-agreed between system managers.

Should no mapping be defined for a messages, an information element or a field within an information element, the element shall be either ignored or replaced locally.

Further call processing applies at both sides of the IWU as described in [10] and in this specification.

#### 14.4.3.2. Interworking requirements at the user plane

The information transfer flow over the ISI at R11 reference point shall be either pre-arranged or negotiated.

Source coding negotiation is described in draft prETS 300 392-3 and applies for the following cases:

- PCM A law, requiring transcoding in all SwMIs (default alternative), as defined in TETRAPOL PAS Part 11
- TETRAPOL voice coding, requiring transcoding in the TETRA SwMI, in accordance with TETRAPOL PAS Part 7
- TETRA voice coding, requiring transcoding in the TETRAPOL SwMI, in accordance with ETS 300 395

Channel coding and multiplexing shall be pre-arranged as one of the following alternatives:

- PCM 64kbit/s unrestricted information transfer per call (default alternative), as defined in TETRAPOL PAS Part 11 and in ETS
- one of the sub-multiplexing as defined in draft prETS 300 392-3

### 14.4.4. TETRA-specific transfer syntax

The TETRA service data units that are relevant to the interworking procedures at TETRAPOL R11 reference points shall support the services listed in TETRAPOL PAS Part 10.1 Annex A.

NOTE: Draft pr ETS 300 392-3 supports a specific transfer syntax for the ISI SDU. This transfer syntax is the same as on the TETRA V+D Air Interface network layer CMCE protocol. The encoding rules for TETRA type 1, type 2 and type 3 information element is described in ETS 300 392-2 (march 1996) § 14.7 PDU descriptions. Thus the UMTS rule requiring independence between the core network functionalities and the radio access network functionalities is not followed in this case.

TETRA-ISI-Operation shall be considered as a restriction of TETRAPOL-ISI-Operation, supporting a subset of the ISI-ANF for call-related aspects.

The basis for inter-working shall be based on the following associations:

- TETRAPOL ANF_ISIIC and TETRA ANF_ISIIC shall be considered as peer entities.
- TETRAPOL ANF_ISIGC, TETRAPOL ANF_ISITKG, TETRAPOL ANF_ISICOV, TETRAPOL ANF_ISIMOCH, TETRAPOL ANF_ISIBC, TETRAPOL ANF_ISIIC may be related to TETRA ANF_ISIGC depending on the service mapping.
- TETRAPOL ANF_ISIMM supports all the features of TETRA ANF_ISIMM that are relevant to a cooperation of autonomous systems.
- TETRAPOL ANF_ISISEC has no TETRA direct peer entity.

The information elements shall be encoded using the rule defined in [10]. The values of the information elements selected for TETRAPOL are listed in Annex F. The procedures defined in [10] apply over TETRAPOL R11 reference point.

Type-2 elements should be considered as mandatory elements, i.e. they should be present whether they are significant or not. Thus type-1 and type-2 elements should make a constant-lengthed block of information elements.

The values of the information elements that are relevant over R11 reference point are listed in Annex F.

## 15. Protocol implementation conformance statements

### 15.1. Identification of the implementation

This part shall be completed according to the guide-lines presented in ISO/IEC 9646.

### 15.2. Identification of the protocol

This PICS applies to the following standard:

[0] PAS 0001-10-3 « TETRAPOL intersystem interface; Protocol design »

### 15.3. Statement of conformance

The implementation shall conform to all ISI network features (ANF) and shall support all ISI service data units (SDU) defined in PAS 0001-10-3 [0].

In addition, the implementation shall conform to at least one of the following statements relative to a transfer syntax for signalling SDU over the interface:

- The implementation conforms to the BER transfer syntax defined in ITU-T X.209 [8].
- The implementation conforms to the packet transfer syntax defined in Annex C [0].

In addition, the implementation may conform to one of the following statements relative to a transfer syntax for signalling SDU over the interface.

- The implementation conforms to the transfer syntax defined in draft pr ETS 300 392-3
- The implementation conforms to the transfer syntax defined in ETS 300 044

In addition, the implementation shall conform to at least one of the following statements relative to a transfer syntax for speech item SDU over the interface:

- The implementation supports TETRAPOL encoded speech items SDU as defined in TETRAPOL PAS 0001-7.
- The implementation supports support PCM A-law encoded speech items SDU as defined in ITU-T G.711.

Conformance to other encoded speech items SDU shall be indicated.

In addition, the implementation shall conform to at least one of the following statements relative to a bearer:

- The implementation conforms to the PICS defined in PSS1 circuit mode bearer services ETS 300 172 [4] and generic features ETS 300 239 [5]. In addition, it is mandatory to support the Tetrapol-ISI-Operation and all related circuit mode procedures as specified in PAS 0001-10 [0].

- The implementation conforms to the PICS defined in PSS1 circuit mode bearer services ETS 300 172 [4] and generic features ETS 300 239 [5]. In addition, it is mandatory to support the Tetrapol-ISI-Operation and all related fast circuit mode procedures as specified in PAS 0001-10 [0].

- The implementation shall conform to the packet mode bearer services for the transfer of ISI service data units as defined in PAS 0001-10 [0] and in ITU-T X.25 and ITU-T X.215.

## Annex A (informative) Figures and tables

For further editorial update

## Annex B (restricted) SDL model of the ISI network features

This annex contains an informative SDL description of the ISI protocol at R9 reference point, in ITU-T Z.100 PR or GR format.

# Annex C Specific packed transfer syntax for SDU

The normative requirements on a transfer syntax supporting specific packed encoding rules of the ISI apply to signalling SDU and speech item SDU.at TETRAPOL R9 reference point. This transfer syntax is one of the possible concrete operational syntax's for the SDU abstract syntax.

## C.1 ISI protocol discriminator

The object identifier for the ISI protocol shall be set to {ccitt (0) identified-organization (3) etsi (0) tetrapol(protocolDiscriminator) isi-encoding-operation(0)}.

A one-octet protocol discriminator shall be allocated for the ISI protocol over packet mode bearers at R9 reference point.

The value of the ISI protocol discriminator should be $FE_{16}$.

## C.2 TETRAPOL Service data unit coding

This clause lists the contents of the service data units sent over the ISI.

### C.2.1 TETRAPOL ISISECData SDU

ISISECData SDU is an unconfirmed security flow through a connection identified with ConnectionIdentifier and shall transport security data relevant to ISI security.

An InvokeReference may be allocated by the sending side in order to relate this SDU with another SDU, thus enabling a confirmation. $00_{16}$ is a reserved value for non-significant InvokeReference.

The encoding of the TETRAPOL ISISECData SDU at R9 reference point shall be as defined in the following table.

**Table 32: TETRAPOL ISISECData SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $100000_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| Data | - | M | |

### C.2.2 TETRAPOL ISISECParameters SDU

ISISECParameters SDU is a confirmed security flow through a connection identified with ConnectionIdentifier and shall transport security parameters relevant to the security of both the migrated terminals and the inter-system services, i.e. for a call related or call unrelated flows between different SwMI.

An InvokeReference shall be allocated by the sending side in order to relate this SDU with the AckResult SDU that acknowledges receipt of the SDU.

The encoding of the TETRAPOL ISISECParamaters SDU at R9 reference point shall be as defined in the following table.

**Table 33: TETRAPOL ISISECParameters SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $100001_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| Security | - | M | |

### C.2.3 TETRAPOL ISISECAckResult SDU

ISISECAckResult SDU is an unconfirmed security flow through a connection identified with ConnectionIdentifier and shall transport an acknowledgment of receipt and processing of a previous security SDU, identified with its InvokeReference.

ISISECAckResult SDU is a confirmed security flow through a connection identified with ConnectionIdentifier, over an unreliable bearer, and shall transport a request to flush all queued security SDU in the SwMI that are related to the InvokeReference.

The encoding of the TETRAPOL ISISECAckResult SDU at R9 reference point shall be as defined in the following table.

**Table 34: TETRAPOL ISISECAckResult SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $100010_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| AckResult | 1 | M | |

### C.2.4 TETRAPOL ISICCSetup SDU

ISISetup SDU is a confirmed service control flow through a connection identified with ConnectionIdentifier and shall invoke a service establishment between SwMI over the ISI. This flow may be associated with a bearer invocation for connection management.

The encoding of the TETRAPOL ISISetup SDU at R9 reference point shall be as defined in the following table.

**Table 35: TETRAPOL ISISetup SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000000_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| ServiceTypeTLV | 1 | M | |
| ServiceAction | 1 | M | |
| SetupPriorityTLV | | O | |
| requesting UserPriorityTLV | | O | |
| CadTLV | | O | |
| SetupTimeoutTLV | | O | |
| RetentionPriorityTLV | | O | |
| HookTLV | | O | |
| RouteingTLV | | O | |
| TrunkingTLV | | O | |
| requested SecurityTLV | | O | |
| requested SpeechServiceTLV | | O | |

### C.2.5 TETRAPOL ISICCProceeding SDU

ISIProceeding SDU is an unconfirmed service control flow through a connection identified with ConnectionIdentifier and shall indicate the received ISISetup is being processed.

The encoding of the TETRAPOL ISIProceeding SDU at R9 reference point shall be as defined in the following table.

**Table 36: TETRAPOL ISIProceeding SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000001_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | $00_{16}$ |

### C.2.6 TETRAPOL ISICCAlerting SDU

ISIAlerting SDU is an unconfirmed service control flow through a connection identified with ConnectionIdentifier and shall indicate that one called party has been alerted

The encoding of the TETRAPOL ISIAlerting SDU at R9 reference point shall be as defined in the following table.

**Table 37: TETRAPOL ISIAlerting SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000010_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| CallQueuedTLV | | O | |
| proposed SecurityTLV | | O | |
| proposed SpeechServiceTLV | | O | |

### C.2.7 TETRAPOL ISICCConnect SDU

ISIConnect SDU is a confirmed service control flow through a connection identified with ConnectionIdentifier and shall indicate that the service is established in the destination SwMI.

$00_{16}$ is a reserved value for a non-significant Called.

The encoding of the TETRAPOL ISIConnect SDU at R9 reference point shall be as defined in the following table.

**Table 38: TETRAPOL ISIConnect SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000011_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| CallId | 1 | M | |
| used EndEtablishmentSynchro | 1 | M | |
| actual destination SwMITLV | | O | |
| actual master SwMITLV | | O | |
| used SecurityTLV | | O | |
| used SpeechServiceTLV | | O | |

### C.2.8 TETRAPOL ISICCConnectAck SDU

ISIConnectAck SDU is an unconfirmed service control flow through a connection identified with ConnectionIdentifier and shall acknowledge receipt of ISIConnect in the originating SwMI.

The encoding of the TETRAPOL ISIConnectAck SDU at R9 reference point shall be as defined in the following table.

**Table 39: TETRAPOL ISIConnectAck SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000100_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| used EndEstablishmentSynchro | 1 | M | |
| used SecurityTLV | | O | |
| used SpeechServiceTLV | | O | |

### C.2.9 TETRAPOL ISICCDisconnect SDU

ISIDisconnect SDU is a confirmed service control flow through a connection identified with ConnectionIdentifier and shall request the end of the service invocation.

The encoding of the TETRAPOL ISIDisconnect SDU at R9 reference point shall be as defined in the following table.

**Table 40: TETRAPOL ISIDisconnect SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000110_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| disconnect ServiceAction | 1 | M | |
| Cause | 1 | M | |
| TransferFrom AddressTLV | | O | |
| TransferTo AddressTLV | | O | |
| visited SwMITLV | | O | |

### C.2.10 TETRAPOL ISICCRelease SDU

ISIRelease SDU is an unconfirmed service control flow through a connection identified with ConnectionIdentifier and shall acknowledge ISIDisconnection.

The encoding of the TETRAPOL ISIRelease SDU at R9 reference point shall be as defined in the following table.

**Table 41: TETRAPOL ISIRelease SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $000111_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | $00_2$ |

### C.2.11 TETRAPOL ISICCMaintenance SDU

ISIMaintenance SDU is an unconfirmed service control flow through a connection identified with ConnectionIdentifier and shall be used between service establishment and service release.

The encoding of the TETRAPOL ISIMaintenance SDU at R9 reference point shall be as defined in the following table.

**Table 42: TETRAPOL ISIMaintenance SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $001000_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| SecurityTLV | | O | |
| SuspendTLV | | O | |
| ResumeTLV | | O | |
| CauseTLV | | O | |
| TransferFrom AddressTLV | | O | |
| TransferTo AdressTLV | | O | |
| visited SwMITLV | | O | |
| AckResultTLV | | O | |

### C.2.12 TETRAPOL ISIGeneric SDU

ISIGeneric SDU is an unconfirmed supplementary service control flow through a connection identified with ConnectionIdentifier.

The encoding of the TETRAPOL ISIGeneric SDU at R9 reference point shall be as defined in the following table.

**Table 43: TETRAPOL ISIGeneric SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $01_2$ |
| SDUCodop | 6 bits | M | $001001_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| Facility octet string | - | M | |

### C.2.13 TETRAPOL ISILocUpdateDemand SDU

ISILocUpdate SDU is a confirmed mobility control flow from a visited SwMI to the home SwMI of a migrated terminal through a connection identified with ConnectionIdentifier for the purpose of updating the location information of the terminal.

The encoding of the TETRAPOL ISILocUpdateDemand SDU at R9 reference point shall be as defined in the following table.

**Table 44: TETRAPOL ISILocUpdateDemand SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000000_2$ |
| ConnectionIdentifier | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| LongAddress | 6 | M | |
| SerialNumber | 4 | M | |
| expected TerminalState | 1 | M | |
| visited SwMITLV | | M | |

### C.2.14 TETRAPOL ISILocUpdateProfile SDU

ISILocUpdateProfile SDU is a confirmed mobility control flow from a home SwMI to the visited SwMI of a migrated terminal through a connection identified with ConnectionIdentifier for the purpose of updating the profile information of the terminal in the visited SwMI upon a locationUpdate.

The encoding of the TETRAPOL ISILocUpdateProfile SDU at R9 reference point shall be as defined in the following table.

**Table 45: TETRAPOL ISILocUpdateProfile SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000001_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| RegistrationResult | 1 | M | |
| Address | 6 | M | |
| SerialNumber | 4 | M | |
| TerminalType | 1 | M | |
| StateBitmap | 2 | M | |
| UdtType | 1 | M | |
| numberOfMigration | 1 | M | |
| numberOfFullMigration | 1 | M | |
| nominal Group | 2 | M | |
| home SwMITLV | | O | |
| visited SwMITLV | | O | |
| CFNR AddressTLV | | O | |
| CFU AddressTLV | | O | |

### C.2.15 TETRAPOL ISILocDelete SDU

ISILocDelete SDU is a confirmed mobility control flow from a home SwMI to the previously visited SwMI of a migrated terminal through a connection identified with ConnectionIdentifier for the purpose of deleting the temporary information regarding this terminal in that SwMI.

The encoding of the TETRAPOL ISILocDelete SDU at R9 reference point shall be as defined in the following table.

**Table 46: TETRAPOL ISI SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000010_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | $0C_{16}$ |
| InvokeReference | 1 | M | |
| Address | 6 | M | |
| SerialNumber | 4 | M | |
| numberOfMigration | 1 | M | |

### C.2.16 TETRAPOL ISIEnquiry SDU

ISIEnquiry SDU is a confirmed mobility control flow from an originating SwMI to the home SwMI of a called terminal for the purpose of retrieving its actual location or some profile information.

The encoding of the TETRAPOL ISIEnquiry SDU at R9 reference point shall be as defined in the following table.

**Table 47: TETRAPOL ISIEnquiry SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000011_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| Address | 6 | M | |
| ScopeTLV | | O | |
| KeyReferenceTLV | | O | |
| requested ProfileTLV | | O | May be repeated |

### C.2.17 TETRAPOL ISILocProfile SDU

ISILocProfile SDU is a confirmed mobility control flow from an originating SwMI to the home SwMI of a called terminal for the purpose of providing its actual location and some profile information.

The encoding of the TETRAPOL ISILocProfile SDU at R9 reference point shall be as defined in the following table.

**Table 48: TETRAPOL ISILocProfile SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000100_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | |
| InvokeReference | 1 | M | |
| Address | 6 | M | |
| EnquiryResult | 1 | M | |
| visited SwMITLV | | O | |
| forward AddressTLV | | O | |
| ProfileTLV | | O | may be repeated |

### C.2.18 TETRAPOL ISIDisable SDU

ISIDisable SDU is a confirmed mobility control flow from an originating SwMI to the home SwMI of a called terminal for the purpose of remotely requesting the disabling of a terminal in a visited SwMI from the home SwMI. Security Sdu may be provided in association with ISIDisable SDU.

The encoding of the TETRAPOL ISIDisable SDU at R9 reference point shall be as defined in table 32.

**Table 49: TETRAPOL ISIDisable SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000110_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | $0C_{16}$ |
| InvokeReference | 1 | M | |
| Address | 6 | M | |
| SerialNumber | 4 | M | |
| DisablingType | 1 | M | |

### C.2.19 TETRAPOL ISIAcknowledgment SDU

ISIAcknowledgment SDU is an unconfirmed mobility flow through a connection identified with ConnectionIdentifier and shall transport an acknowledgment of receipt and processing of a previous mobility SDU, identified with its InvokeReference.

ISIAcknowledgment SDU is a confirmed mobility flow through a connection identified with ConnectionIdentifier, over an unreliable bearer, and shall transport a request to flush all queued mobility SDU in the SwMI that are related to the InvokeReference.

The encoding of the TETRAPOL ISIAcknowledgment SDU at R9 reference point shall be as defined in the following table.

**Table 50: TETRAPOL ISIAcknowledgment SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $11_2$ |
| SDUCodop | 6 bits | M | $000111_2$ |
| ConnectionId | 4 | M | |
| Length | 1 | M | $02_{16}$ |
| InvokeReference | 1 | M | |
| AckResult | 1 | M | |

### C.2.20 TETRAPOL ISIActivationDemand SDU

ISIActivationDemand SDU is an confirmed speech flow from a cell to a call master through a connection identified with ConnectionReference. ISIActivationDemand requests, from the cell to the callMaster, the activation of the communication identified with CallReference on behalf of a terminal in the cell referenced with ConnectionReference in its SwMI. This SDU shall be continually transferred until receipt of an SDU stating that the communication is active.

The encoding of the TETRAPOL ISIActivationDemand SDU at R9 reference point shall be as defined in the following table.

**Table 51: TETRAPOL ISIActivationDemand SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $000010_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| Reserved | 4 bits | M | |
| CallReference | 16 bits | M | |
| Reserved | 16 bits | | |
| KeyReference | 8 bits | M | |
| UserPriority | 4 bits | M | |
| ActivationPriority | 4 bits | M | |
| Reserved | 4 bits | M | |
| ActivationMode | 4 bits | M | |
| Filler | 64- bits | M | |

### C.2.21 TETRAPOL ISIActivation SDU

ISIActivation SDU is an unconfirmed speech flow from a callMaster to a cell through a connection identified with ConnectionReference. It indicates that the communication is activated or active, and provides its parameters.

The encoding of the TETRAPOL ISIActivation SDU at R9 reference point shall be as defined in the following table.

**Table 52: TETRAPOL ISIActivation SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $000100_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| reserved | 4 bits | M | |
| CallReference | 16 bits | M | |
| Reserved | 16 bits | | |
| KeyReference | 8 bits | M | |
| Counter256 | 8 bits | M | |
| UserPriority | 4 bits | M | |
| ActivationPriority | 4 bits | M | |
| Reserved | 4 bits | M | |
| ActivationMode | 4 bits | M | |
| Filler | 56 bits | M | |

### C.2.22 TETRAPOL ISIActive SDU

ISIActive SDU is an unconfirmed speech flow from a cell and a callMaster through a connection identified with ConnectionReference. It indicates that a communication is active with no on-going user information transmission.

The encoding of the TETRAPOL ISIActive SDU at R9 reference point shall be as defined in the following table.

**Table 53: TETRAPOL ISIActive SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $000101_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| reserved | 4 bits | M | |
| Filler | 120 bits | M | |

### C.2.23 TETRAPOL ISIUserInfoData SDU

ISIUserInfoData SDU is an unconfirmed speech flow through a connection identified with ConnectionReference as a request for transmit permission over the coverage of the communication and for the purpose of transmitting a 66 bit transparent data item, from a participant terminal to the other participant terminals in the active communication.

The encoding of the TETRAPOL ISIUserInfoData SDU at R9 reference point shall be as defined in the following table.

**Table 54: TETRAPOL ISIUserInfoData SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $001011_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| TransmitPriority | 4 bits | M | |
| Filler | 54 bits | M | |
| DataItem | 66 bits | M | |

### C.2.24 TETRAPOL ISIUserInfoStartSpeech SDU

ISIUserInfoStartSpeech SDU is an unconfirmed speech flow from a cell to a callMaster through a connection identified with ConnectionReference as a request for transmit permission over the coverage of the communication and for the purpose of starting speech item transmission. Upon selecting the talking party, the callMaster shall send the relevant ISIUserInfoSpeech SDU.

The encoding of the TETRAPOL ISIUserInfoStartSpeech SDU at R9 reference point shall be as defined in the following table.

**Table 55: TETRAPOL ISIUserInfoStartSpeech SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $001000_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| TransmitPriority | 4 bits | M | |
| StartSpeech item | 64 bits | M | |
| Filler | 56 bits | M | |

### C.2.25 TETRAPOL ISIUserInfoSpeech SDU

ISIUserInfoSpeech SDU is an unconfirmed speech flow through a connection identified with ConnectionReference as a request for transmit permission over the coverage of the communication and for the purpose of a 120 bit speech item transmission.

The encoding of the TETRAPOL ISI SDU at R9 reference point shall be as defined in the following table.

**Table 56: TETRAPOL ISIUserInfoSpeech SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $001001_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| TransmitPriority | 4 bits | M | |
| TETRAPOL vocoded Speech item | 120 bits | M | |

### C.2.26 TETRAPOL ISIUserInfoDummy SDU

ISIUserInfoDummy SDU is an unconfirmed speech flow through a connection identified with ConnectionReference as a request for transmit permission over the coverage of the communication and for the purpose of inserting a dummy speech item in the transmission flow, while neither a speech item nor a data item is available for transmission, i.e. when a speech item or a data item has been lost over an unreliable bearer, e.g. the radio interface.

The encoding of the TETRAPOL ISIUserInfoDummy SDU at R9 reference point shall be as defined in the following table.

**Table 57: TETRAPOL ISIUserInfoDummy SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $001010_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| TransmitPriority | 4 bits | M | |
| Speech | 64 bits | M | |
| Filler | 56 bits | M | |

### C.2.27 TETRAPOL ISISynchroActive SDU

ISISynchroActive SDU is an unconfirmed speech flow through a connection identified with ConnectionReference and may replace any other missing flow while the communication is active, for the purpose of synchronization in the SwMI.

The encoding of the TETRAPOL ISIsynchroActive SDU at R9 reference point shall be as defined in the following table.

**Table 58: TETRAPOL ISISynchroActive SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $10_2$ |
| SDUCodop | 6 bits | M | $000001_2$ |
| ConnectionReference | 32 bits | M | |
| Group | 12 bits | M | |
| reserved | 4 bits | M | |
| Local ConnectionReference | 32 bits | M | |
| Filler | 88 bits | M | |

### C.2.28 TETRAPOL ISIInactive SDU

ISIInactive SDU is an unconfirmed speech flow from a cell to a callMaster or from the callMaster to a cell through a connection identified with ConnectionReference in order to indicate that the communication is inactivated or inactive.

The encoding of the TETRAPOL ISIInactive SDU at R9 reference point shall be as defined in the following table.

**Table 59: TETRAPOL ISIInactive SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $000000_2$ |
| ConnectionReference | 32 bits | M | |
| Cause | 8 bits | M | |
| Filler | 128 bits | M | |

### C.2.29 TETRAPOL ISISynchroInactive SDU

ISISynchronInactive SDU is an unconfirmed speech flow through a connection identified with ConnectionReference and may replace any other missing flow while the communication is inactive, for the purpose of synchronization in the SwMI.

The encoding of the TETRAPOL ISISynchronInactive SDU at R9 reference point shall be as defined in the following table.

**Table 60: TETRAPOL ISISynchroInactive SDU**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| SDUtype | 2 bits | M | $00_2$ |
| SDUCodop | 6 bits | M | $000001_2$ |
| ConnectionReference | 32 bits | M | |
| Filler | 16 bits | M | |
| Local ConnectionReference | 32 bits | M | |
| Filler | 88 bits | M | |

## C.3 TLV coding

This clause specifies the coding of the information elements from the service data units sent over the ISI.

### C.3.1 TLV format

The encoding of a TLV element shall be as defined in the example pattern in the following table.

**Table 61: TLV encoding pattern**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEType | 1 | M | |
| IELength | 1 | M | |
| IEValue | IELength | M | |

The encoding of a TV element shall be as defined in the example pattern in the following table.

**Table 62: TV encoding pattern**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEType | 1 | M | |
| IEValue | IELength | M | |

The optional TLV structures may appear in any order at the end of an SDU.

The TV structures may appear in any order at the end of an SDU.

### C.3.2 SecurityTLV

The SecurityTLV provides call related information, such as the encryption type of the call or whether the call is partitioned by groups or key of calls, and non call related information, such as key related flows and authentication flows.

The encoding of the security information element shall be as defined in the following table. The interpretation of the following fields shall be provided in the TETRAPOL security specification: challenge, result, keyReferenceSynchro, setKeyModifier, useKeyModifier. Other security fields may be conveyed with the other field.

**Table 63: SecurityTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| EncrytionType | 1 | M | |
| groupPartitionning | 1 | M | |
| numberOfAddress | 1 | M | |
| Address | 6 | C | numberOfAddress |
| KeyOfCall | - | C | numberOFAddress |
| ChallengeTV | - | O | |
| ResultTV | - | O | |
| KeyReferenceSynchroTV | - | O | |
| currentKeyReferenceTV | 1 | O | |
| expiredKeyReferenceTV | 1 | O | |
| setKeyModifierTV | - | O | |
| usedKeyModifierTV | - | O | |
| otherTLV | - | O | |

### C.3.3 SwMITLV

The SwMI information element identifies a switching and management infrastructure or an access point of a SwMI. CountryCode, network code and BN identify the base network of the service access point. PISNnumber is an optional field that identify the QSIG address of the SwMI service access point.

**Table 64: SwMITLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| countryCode/networkCode/BN | 3 | M | |
| serviceAccessPoint | 1 | M | |
| pisnNumber | - | O | |

### C.3.4 AddressTLV

The address information element shall be from the TETRAPOL RFSI addressing plan.

**Table 65: AddressTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| CodedNatureOfAddress | 1 | M | |
| Address | - | M | |
| SubaddressLength | 1 | M | |
| Subaddress | - | O | |

### C.3.5 GroupTLV

The Group address information element identifies a TETRAPOL group.

**Table 66: Group TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| GroupAddress | - | M | |

### C.3.6 RouteingTLV

The routeing information element indicates routeing information over the ISI network, including end-SwMI, maximum number of transit nodes and whether forward-switching is allowed. In case forward switching is not allowed, then rerouteing applies.

**Table 67: TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| originatingSwMITLV | | M | |
| callMasterSwMITLV | | M | |
| destinationSwMITLV | | M | |
| routeingHopCredit | 1 | M | |
| forwardSwitchingForbidden | 1 | O | |

### C.3.7 TrunkingTV

The trunking information element describes the quasi-transmission trunking scheme, as indicated in the following table.

**Table 68: TrunkingTV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| DeactivationHangTime | 1 | M | |
| TrunkingPriority | 1 | M | |

### C.3.8 PrivateCallTLV

The Private Call information element characterizes the private call with its calling party and indicates up to 4 called parties.

**Table 69: PrivateCallTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| callingAddress | 6 | M | |
| calledAddress | 6 | M | may be repeated |

### C.3.9 GroupCommunicationTLV

The group communication information element is described as follows:

**Table 70: Group Communication TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| Coverage | 4 | M | |
| participationGroup | 1 | M | |

### C.3.10 COVTLV

The COV information element is described in the following table:

**Table 71: COVTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| countryCode/networkCode/BN | 6 | M | |
| identifier | 2 | M | |
| trunkingDepth | 1 | M | |

### C.3.11 CoverageTLV

The coverage information element is described as follows:

**Table 72: CoverageTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| COV | 10 | M | |
| SwMI | | M | may be repeated |

### C.3.12 MochTLV

The multisite open channel information element is described in the following table:

**Table 73: MochTLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| Coverage | - | M | |
| establishmentGroup | 2 | M | |
| participationGroupTLV | - | M | may be repeated |

### C.3.13 EchTLV

The emergency open channel information element is described in the following table:

**Table 74: Ech TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| MochTLV | - | M | |
| address | 5 | M | |

### C.3.14 BroadcastMochTLV

The information element for broadcast moch is described in the table for MochTLV.

### C.3.15 TalkgroupTLV

The information element for talkgroup is described in the following table

**Table 75: talkgroup TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| Coverage | - | M | |
| Group | 2 | M | |

### C.3.16 GroupCallTLV

The information element for group call is described in the following table:

**Table 76: GroupCall TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| calledGroup | 2 | M | |
| callingAddress | 5 | M | |

### C.3.17 ScanTLV

The information element for scanning is described in the following table:

**Table 77: Scan TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| GroupCommunication | - | M | Sequence of |

### C.3.18 ServiceTypeTLV

The information element for service type is either privateCall, Moch, EmergencyCall, BroadcastCall, talkgroup, groupCall, Scan, merging or coverage.

### C.3.19 BasicProfileTLV

The information element for the basic profile of a subscriber is described in the following table

**Table 78: Basic profile TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| numberOfMigration | 1 | M | |
| numberOfFullRegistration | 1 | M | |
| terminalType | 1 | M | |
| stateBitmap | 1 | M | |
| udtType | 1 | O | |
| forwardAddressOnNoReply | 5 | O | |
| unconditionnalForwardAddress | 5 | O | |
| validityOfKey | 1 | O | |
| keyOfCall | - | O | |

### C.3.20 ProfileTLV

The information element for the profile is either a basic profile or an octet string.

### C.3.21 ActivationModeTLV

The information element for the activation mode is described in the following table.

**Table 79: ActivationMode TLV**

| Information element | Length | C/O/M | Remark |
|---|---|---|---|
| IEtype | 1 | M | $00_{16}$ |
| IElength | 1 | M | |
| hook | 1 | M | |
| type | - | M | |

### C.3.22 DataItemTLV

The information element for data item is either an address, a security information element or a bit string.

## C.4 Information Element coding

### C.4.1 General coding requirements

The values of the information elements are described in the ASN.1 abstract syntax for the ISI protocol.

### C.4.2 EncryptionType values

The purpose of the element shall be to indicate the type of encryption for a call.

**Table 80: information element values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| unknown | 1 | $00_{16}$ | |
| clearSpeech | | $01_{16}$ | |
| networkEncryption | | $02_{16}$ | |
| endToEndEncryption | | $03_{16}$ | |
| isiEncryption | | $04_{16}$ | |

### C.4.3 Cause values

The purpose of the element shall be to inform of a cause indication.

**Table 81: Cause values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| successfull | 1 | $00_{10}$ | |
| inconsistentData | | $01_{10}$ | |
| reserved2 | | $02_{10}$ | |
| noAnswerTimeout | | $03_{10}$ | |
| reserved4 | | $04_{10}$ | |
| reserved5 | | $05_{10}$ | |
| voiceTransmissionAborted | | $06_{10}$ | |
| reserved7 | | $07_{10}$ | |
| hookOnWhileSetup | | $08_{10}$ | |
| voiceTransmissionDisturbance | | $09_{10}$ | |
| reserved10 | | $10_{10}$ | |
| remoteCallClearing | | $11_{10}$ | |
| maxNumberVoiceCall | | $12_{10}$ | |
| barredService | | $13_{10}$ | |
| serviceNotSupportedbySwMI | | $14_{10}$ | |
| intrusionOnWrongAddress | | $15_{10}$ | |
| reserved16 | | $16_{10}$ | |
| reserved17 | | $17_{10}$ | |
| reserved21 | | $21_{10}$ | |
| reserved22 | | $22_{10}$ | |
| reserved23 | | $23_{10}$ | |
| reserved24 | | $24_{10}$ | |
| voiceInactivity | | $26_{10}$ | |
| unreachableParty | | $41_{10}$ | |
| calledPartyBusy | | $42_{10}$ | |
| reserved43 | | $43_{10}$ | |
| callingPartyNotRegistered | | $44_{10}$ | |
| reserved45 | | $45_{10}$ | |
| inconsistentAddress | | $46_{10}$ | |
| reserved47 | | $47_{10}$ | |
| withdrawal | | $48_{10}$ | |
| preemption | | $49_{10}$ | |
| reserved50 | | $50_{10}$ | |
| noReply51 | | $51_{10}$ | |
| reserved52 | | $52_{10}$ | |
| failedTransfer | | $53_{10}$ | |
| reserved54 | | $54_{10}$ | |
| hopCreditLimit | | $61_{10}$ | |
| failedRouteing | | $62_{10}$ | |
| routeingLoop | | $63_{10}$ | |
| tooManyHopsForQoS | | $64_{10}$ | |
| reserved81 | | $81_{10}$ | |
| reserved82 | | $82_{10}$ | |
| reserved83 | | $83_{10}$ | |
| intrusionOnUnreachableTerminal | | $84_{10}$ | |
| intrusionOnCallNotEstablished | | $85_{10}$ | |
| unreachableTerminalAttribute | | $86_{10}$ | |
| noMorePartyInCall | | $87_{10}$ | |
| forwardingChainMax | | $88_{10}$ | |
| unknownCalledParty | | $89_{10}$ | |
| doubleTransfer | | $90_{10}$ | |
| nonCharacterizedTerminal | | $91_{10}$ | |

| | | | |
|---|---|---|---|
| transferProceeding | | $92_{10}$ | |
| listAddressNotExpandable | | $93_{10}$ | |
| twoSimultaneousIntrusions | | $94_{10}$ | |
| reserved101 | | $101_{10}$ | |
| reserved102 | | $102_{0}$ | |
| reserved103 | | $103_{10}$ | |
| reserved104 | | $104_{10}$ | |
| reserved105 | | $105_{10}$ | |
| reserved121 | | $121_{10}$ | |
| reserved122 | | $122_{10}$ | |
| reserved123 | | $123_{10}$ | |
| reserved141 | | $141_{10}$ | |
| groupAlreadyActive | | $142_{10}$ | |
| unknownGroupCommunication | | $143_{10}$ | |
| outOfCoverage | | $144_{10}$ | |
| reserved145 | | $145_{10}$ | |
| partialCoverage | | $146_{10}$ | |
| reserved147 | | $147_{10}$ | |
| intrusionOnNonSetupGroupCommunication | | $148_{10}$ | |
| reserved149 | | $149_{10}$ | |
| emergencyCallRelease | | $150_{10}$ | |
| wrongEstablishmentOg | | $151_{10}$ | |
| inconsistentGroupCommunication | | $152_{10}$ | |
| intrusionWithinCoverage | | $153_{10}$ | |
| expiredKeyReference | | $161_{10}$ | |
| externalPartyNoReply | | $181_{10}$ | |
| externalPartyBusy | | $182_{10}$ | |
| gatewayAddressInconsistent | | $183_{10}$ | |
| externalAddressInconsistent | | $184_{10}$ | |
| externalServiceBarredtoCallingPart y | | $185_{10}$ | |
| externalServiceBarredtoCalledParty | | $186_{10}$ | |
| externalEquipmentUnreachable | | $187_{10}$ | |
| isdnUnreachable | | $188_{10}$ | |

### C.4.4 CallPriority values

The purpose of the element shall be to inform of the priority of a call.

**Table 82: Call priority values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| unknown | 1 | $00_{10}$ | |
| routine | | $02_{10}$ | |
| urgent | | $04_{10}$ | |
| flash | | $06_{10}$ | |
| broadcast | | $08_{10}$ | |
| emergency | | $12_{10}$ | |

### C.4.5 SetupPriority values

SetupPriority shall be coded as a call priority.

### C.4.6 UserPriority values

The purpose of the element shall be to inform of the user priority attached to a terminal.

**Table 83: User priority values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| minUserPriority | 1 | $00_{10}$ | |
| mediumUserPriority | | $00_{10}$ | |
| upperUserPrority | | $00_{10}$ | |

### C.4.7 RetentionPriority values

The purpose of the element shall be to inform of the retention priority of resources allocated by the SwMI.

**Table 84: Retention priority values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| unknown | 1 | $00_{10}$ | |
| vulnerable | | $01_{10}$ | |
| normal | | $02_{10}$ | |
| resistant | | $03_{10}$ | |

### C.4.8 Hook values

The purpose of the element shall be to inform of the hook method.

**Table 85: Hook values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| automaticHookOffWithoutTone | 1 | $00_{10}$ | |
| automaticHookOffWithTone | | $00_{10}$ | |
| ring | | $00_{10}$ | |
| reserved | | $00_{10}$ | |

### C.4.9 End Establishment Synchro values

The purpose of the element shall be to indicate when the call establishment ends.

**Table 86: End Establishment Synchro values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| none | | $00_{10}$ | |
| totalCoverage | | $01_{10}$ | |
| partialCoverage | | $02_{10}$ | |
| allCalledPartyConnected | | $03_{10}$ | |
| oneCalledPartyConnected | | $04_{10}$ | |
| allCalledPartyAlerted | | $05_{10}$ | |

### C.4.10 Speech Service values

The purpose of the element shall be to inform which speech service is associated with the speech flow.

**Table 87: Speech Service values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| pcmALaw | 1 | $00_{10}$ | |
| tetrapol | | $01_{10}$ | |
| tetra | | $02_{10}$ | |
| gsmFullRate | | $03_{10}$ | |

### C.4.11 Cad values

The cad information element is related to the call authorized by dispatcher supplementary service.

**Table 88: Cad values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| unknownCad | 1 | $00_{10}$ | |
| incomingCallToBeAuthorizedByDispatcher | | $01_{10}$ | |
| outgoingCallAuthorizedByDispatcher | | $02_{10}$ | |
| directDiallingInRequested | | $03_{10}$ | |

### C.4.12 Service Action values

The purpose of the element shall be to modify the purpose of the message related to a service type.

**Table 89: information element values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| unknown | 1 | $00_{10}$ | |
| setup | | $01_{10}$ | |
| release | | $02_{10}$ | |
| intrusion | | $03_{10}$ | |
| lateEntryIncludeCall | | $04_{10}$ | |
| withdrawalFromCall | | $05_{10}$ | |
| withdrawalFromCoverage | | $06_{10}$ | |
| priorityMode | | $07_{10}$ | |
| sequentialMode | | $08_{10}$ | |
| resume | | $09_{10}$ | |
| suspend | | $10_{10}$ | |
| reset | | $11_{10}$ | |
| ambience | | $12_{10}$ | |
| isiFallBackSenderInitiative | | $13_{10}$ | |
| isiFallBackRecipientInitiative | | $14_{10}$ | |

### C.4.13 Terminal State values

The purpose of the element shall be to inform of the state of a terminal.

**Table 90: Terminal State values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| trafficDisabled | 1 | $00_{10}$ | |
| forwarded | | $02_{10}$ | |
| migrating | | $16_{10}$ | |
| powerSaving | | $32_{10}$ | |

### C.4.14 TerminalType values

The purpose of the element shall be to inform of the type of terminal.

**Table 91: information element values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| reservedType1 | 1 | $01_{10}$ | |
| reservedType2 | | $02_{10}$ | |
| reservedType3 | | $03_{10}$ | |
| fixedRadioTerminal | | $04_{10}$ | |
| mobileRadioTerminal | | $05_{10}$ | |
| lineConnectedTerminal | | $06_{10}$ | |
| reservedType7 | | $07_{10}$ | |
| reservedType8 | | $08_{10}$ | |
| reservedType9 | | $09_{10}$ | |
| fixedRadioPABXaccess | | $10_{10}$ | |
| mobileRadioPABXaccess | | $11_{10}$ | |
| lineConnectedPABXaccess | | $12_{10}$ | |
| reservedType13 | | $13_{10}$ | |
| reservedType14 | | $14_{10}$ | |
| reservedType15 | | $15_{10}$ | |
| fixedRadioAccessGate | | $16_{10}$ | |
| mobileRadioAccessGate | | $17_{10}$ | |
| lineConnectedAccessGate | | $18_{10}$ | |

### C.4.15 UdtType values

The purpose of the element shall be to inform of the type of user data terminal attached to a terminal.

**Table 92: information element values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| minitel | 1 | $01_{10}$ | |
| stutel | | $02_{10}$ | |
| ndis | | $04_{10}$ | |
| other | | $08_{10}$ | |
| unknown | | $255_{10}$ | |

### C.4.16 RegistrationResult values

The purpose of the element shall be to inform of the result of a terminal registration.

**Table 93: RegistrationResult values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| successfullyRegistered | 1 | $00_{10}$ | |
| unknownTerminal | | $01_{10}$ | |
| serialNumberInconsistentWithAddress | | $02_{10}$ | |
| networkNoAccess | | $03_{10}$ | |
| terminalAccessDisabled | | $05_{10}$ | |
| terminalTrafficDisabled | | $06_{10}$ | |
| reserved7 | | $07_{10}$ | |
| outOfOrderTerminal | | $08_{10}$ | |
| vlrSoftwareSaturation | | $09_{10}$ | |
| hlrSoftwareSaturation | | $10_{10}$ | |
| failedAuthentication | | $11_{10}$ | |
| terminalLocalRegistration | | $12_{10}$ | |
| olderRegistration | | $13_{10}$ | |
| networkCongestion | | $14_{10}$ | |
| databaseAccessError | | $15_{10}$ | |
| illegalTerminal | | $16_{10}$ | |
| databaseReadOnly | | $17_{10}$ | |
| vlrSaturation | | $18_{10}$ | |
| authenticationKo | | $50_{10}$ | |
| migrationNotAllowed | | $80_{10}$ | |
| limitedServiceUponMigration | | $81_{10}$ | |

### C.4.17 StateBitMask values

The purpose of the element shall be to show how to set the StateBitMap; refer to the ASN.1 description.

### C;4.18 Scope values

The purpose of the element shall be to indicate the scope of the search.

**Table 94: Scope values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| world | 1 | $00_{10}$ | |
| tetrapolDomain | | $01_{10}$ | |
| swmi | | $02_{10}$ | |
| baseNetwork | | $03_{10}$ | |

### C.4.19 EnquiryResult values

The purpose of the element shall be to inform of the result of a database enquiry.

**Table 95: Enquiry result values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| knownLocalised | 1 | $00_{10}$ | |
| vlrNotaccessible | | $01_{10}$ | |
| unknownFromHlr | | $02_{10}$ | |
| knownNotLocated | | $03_{10}$ | |
| unknownFromVlr | | $05_{10}$ | |
| knownLocatedFromVLRButCellInaccessible | | $19_{10}$ | |
| remoteAuthenticationFailed | | $20_{10}$ | |
| encryptionFailure | | $23_{10}$ | |
| keyReferenceUnknown | | $24_{10}$ | |
| randomUnavailable | | $25_{10}$ | |

### C.4.20 DisablingType values

This information element is related to the enable/disable supplementary service.

**Table 96: DisablingType values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| enabled | | $00_{10}$ | |
| trafficDisable | | $01_{10}$ | |
| accessDisable | | $02_{10}$ | |

### C.4.21 AckResult values

The purpose of the element shall be to provide acknowledgment values.

**Table 97: AckResult values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| confirmedOperation | 1 | $00_{10}$ | |
| flushInvokeReference | | $01_{10}$ | |
| invokeReferenceFlushed | | $02_{10}$ | |
| invokeReferenceNotFound | | $03_{10}$ | |
| duplicatedRequest | | $04_{10}$ | |

### C.4.22 ActivationPriority values

The purpose of the element shall be to indicate the activation priority for an on-going communication and its values shall be the same as the call priority values.

### C.4.22 TransmitPriority values

The purpose of the element shall be to indicate the transmission priority upon a push-to-talk request

**Table 98: TransmissionPriority values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| low | 1 | $00_{10}$ | |
| standard | | $00_{10}$ | |
| dispatcher | | $00_{10}$ | |
| transit | | $00_{10}$ | |

### C.4.23 GroupActivation values

The purpose of the element shall be to indicate the type of activation.

**Table 99: GroupActivation values**

| Information element | Length | Value | Remark |
|---|---|---|---|
| moch | | $00_{10}$ | |
| internalToGroup | | $01_{10}$ | |
| oneWay | | $02_{10}$ | |
| externalToGroup | | $03_{10}$ | |

# Annex D (informative) Transcoder and rate adaptation unit

This annex provides informative specifications on a transcoder and rate adaptation unit (TRAU) in a TETRAPOL gateway RSW (GSW) to accommodate speech items and in-band signalling from other PMR systems over the ISI at TETRAPOL R11 reference point.

## Annex E (normative) Segmentation over PSS1 circuit mode bearer

SDUMaxLengthOverPSS1::= 230 octets when no segmentation is applied over PSS1 ciruit mode bearer.

*Mandatory requirements for supporting segmentation over a PSS1 circuit mode bearer, if ISISetup SDU were larger than SDUMaxLengthOverPSS1, are for further studies.*

# Annex F (normative) Values of TETRA information elements at TETRAPOL R11 reference point

## F.1 Interworking mappings for basic services

This annex specifies the IWU mappings necessary to ensure that the TETRA voice services can be provided over the TETRAPOL inter-system interface at R11 reference point. From the TETRA SwMI side, this annex assumes inter-working as specified in [10].

The scope of this section is to describe the handling of the content of the Information Elements where"content" is understood to be the value of the parameter fields of the Information Elements. For the transport of these Information Elements over the ISI, refer to the PISN circuit-mode bearer service and remote operation defined above in this specification.

refer to GSM 09.02.

## F.2 Message mappings

There shall be a one-to-one mapping at the IWU between TETRAPOL SDU and TETRA SDU. SDU related to unsupported procedures shall be ignored.

## F.3 Information element mappings

### F.3.1Coverage identifier and area selection

TETRAPOL coverage identifier and TETRA area selection have the same meaning and their common values over the ISI shall be pre-agreed by the system managers.

### F.3.2 TETRAPOL services and basic service information

The TETRA basic service information shall be set according to the following indications:

The circuit mode type shall be set for speech transmission; other values shall make the call be rejected at the TETRAPOL side, as TETRAPOL R11 reference point is not the reference point of the network interface for data services in the TETRAPOL reference model.

The encryption flag shall be set according to manufacturer pre-arrangements, default assumption is clear mode over the ISI, assuming each SwMI is free to provide network encryption per default.

When the communication type is point-to-point, TETRAPOL individual call procedures apply with TETRA individual call procedures.

When the communication type is point-to-multipoint, either TETRAPOL group call, moch, talkgroup procedures apply, according to operator arrangements; default assumption is TETRAPOL group call.

When the communication type is point-to-multipoint acknowledged, TETRAPOL multiparty call or group call apply, according to operator arrangements. Default assumption is TETRAPOL multiparty call with pre-arranged called parties per TETRA group identifiers.

When the communication type is set to broadcast, TETRAPOL broadcast call procedures apply.

The number of slots per frame shall be pre-arranged between manufacturers, default assumption is one slot.

### F.3.3 Call identifier

The TETRA call identifier may be mapped to another one in the TETRAPOL SwMI when received by the TETRAPOL IWU. When it is allocated by the TETRAPOL SwMI, it shall be specific to each ISI link.

### F.3.4 Call master and call ownership over ISI

The TETRA call ownership is not relevant over the ISI, as the SwMI may decide to disconnect the call, whether a call owner is register in the SwMI or not. This field shall be ignored when received by the TETRAPOL SwMI and shall be set to call owner whatever the communication type when it is set by the TETRAPOL SwMI.

Default assumption for group call is that a TETRA user shall not be a member of a TETRAPOL group, unless pre-arranged by the OMC. Thus upon a group call request from a TETRA system, the TETRA calling party is assumed to be external to the TETRAPOL called group.

### F.3.5 Addressing

TETRA subscriber identity (TSI) shall be sent as called party address over the ISI to the TETRA SwMI, including a country code, network code and subscriber identity.

The TETRA identities shall be handled in the TETRAPOL addressing plan as defined in PAS Part 10.1.

The TETRA SwMI may also address a TETRAPOL subscriber with an ITSI allocated to the ISI gateway and an external number in the TETRAPOL RFSI addressing plan.

### F.3.6 Call has been forwarded switched

When received, this information element may be ignored by the TETRAPOL SwMI, as the routeing in the TETRA is handled by the other SwMI at R11 reference point.

### F.3.7 Call priority

Call priority have the same meaning in TETRAPOL and TETRA. The mapping between these priority shall be a manufacturer arrangement. The TETRA call priority shall be either a Setup priority or an Activation priority in the TETRAPOL SwMI.

### F.3.8 Call status

When received by the TETRAPOL SwMI, the call status may be ignored.

### F.3.9 Call queued

When received by the TETRAPOL SwMI, this information element may be ignored, until a TETRAPOL timer expires.

### F.3.10 Continue

When received by the TETRAPOL SwMI, this information element may be ignored.

### F.3.11 Call time-out

When received by the TETRAPOL SwMI, this information element may be ignored. When set by the TETRAPOL SwMI, the call time-out shall be set to the nearest T6xx value configured in the TETRAPOL SwMI.

### F.3.12 Call time-out, setup phase

When received by the TETRAPOL SwMI, this information element may be ignored. It shall be set as follows by the TETRAPOL SwMI:

- For private call, the call time-out at setup phase shall be the nearest value to TETRAPOL timer T712, as defined in the TETRAPOL Air Interface.
- For group communications, the time-out shall be considered as a predefined value (000).

### F.3.13 Call master and controlling SwMI

The TETRAPOL SwMI may request to be the controlling SwMI, i.e.the TETRAPOL call master, whenever it is the originating SwMI.

### F.3.14 Disconnect cause

The mapping of the TETRA causes to the TETRAPOL causes is defined hereafter. The reversed mapping shall be arranged between manufacturers.

| | |
|---|---|
| TETRA 00000 2 Cause not defined or unknown | TETRAPOL noError (0) |
| TETRA 00001 2 User requested disconnect | TETRAPOL hookOnWileSetup (8) |
| TETRA 00010 2 Called party busy | TETRAPOL calledPartyBusy (42) |
| TETRA 00011 2 Called party not reachable | TETRAPOL unreachableTerminal (41) |
| TETRA 00100 2 Called party does not support encryption | TETRAPOL reserved |
| TETRA 00101 2 Congestion in infrastructure | TETRAPOL reserved |
| TETRA 00110 2 Not allowed traffic case | TETRAPOL reserved |
| TETRA 00111 2 Incompatible traffic case | TETRAPOL reserved |
| TETRA 01000 2 Requested service not available | TETRAPOLserviceNotSupportedbySwMI(14 ) |
| TETRA 01001 2 Pre-emptive use of resource | TETRAPOL preemption (49) |
| TETRA 01010 2 Invalid call identifier | TETRAPOL reserved |
| TETRA 01011 2 Call rejected by the called party | TETRAPOL noReply (51) |
| TETRA 01100 2 No idle CC entity | TETRAPOL maxNumberVoiceCall (12) |
| TETRA 01101 2 Expiry of timer | TETRAPOL reserved |
| TETRA 01110 2 SwMI requested disconnection | TETRAPOL remoteCalClearing (11) |
| TETRA 01111 2 Acknowledged service not completed | TETRAPOL reserved |

### F.3.15 DTMF

When received by the TETRAPOL SwMI, this information element may be ignored and the call shall proceed.

### F.3.16 External subscriber number

When received by the TETRAPOL SwMI, the SwMI shall assume it is an ISDN number.

### F.3.17 Encryption control

When received by the TETRAPOL SwMI, this information element may be ignored.

### F.3.18 Facility

Support of TETRA supplementary services is for further studies.

### F.3.19 Hook method selection

TETRAPOL private calls assume a hook-off signalling is used.

The TETRA hook method selection is similar to the TETRAPOL hook over the ISI and the TETRAPOL activation mode over the Air Interface for group communications.

### F.3.20 Incoming call authorised by SS-CAD

This information element may be ignored when received. Local TETRAPOL rules for incoming CAD may supersede the request.

### F.3.21 Incoming call barring status

This information element shall be ignored when received.

### F.3.22 Length indicator

The TETRA length indicator profile the length of the TETRA user defined data-4 to be ignored.

### F.3.23 New call identifier

This information element shall not be used over the ISI.

### F.3.24 Minimum speech acceptable

To be defined in draft pr ETS 300 392-3

### F.3.25 Modify

This information element shall not be used over the ISI.

### F.3.26 N x 8 kbit/s link with visited SwMI

This information element is to be defined in draft pr ETS 300 392-3

### F.3.27 Notification indicator

When received by the TETRAPOL SwMI, this information element may be ignored.

### F.3.27 SwMI MNI

When received by a TETRAPOL SwMI, it shall be used to identify the originating SwMI and may be used as an hash code parameter for selecting a visitor location register in the TETRAPOL SwMI.

The MNI of a TETRAPOL SwMI shall include the country code, network code and regional network identifier as defined over the TETRAPOL Air Interface.

It is assumed that each SwMI, whether TETRAPOL one or TETRA one, known whether the other SwMI MNI belongs to the TETRAPOL or TETRA domain.

### F.3.28 SwMI PISN number

One or several PISN number shall be allocated to each SwMI.

### F.3.29 Pdu type

Pdu types shall be used as defined.

### F.3.30 Poll request

When received by the TETRAPOL SwMI, the TETRAPOL call shall be a multiparty call in the TETRAPOL SwMI.

### F.3.31 Poll response

Shall not be used over the ISI

### F.3.32 Poll response addresses

As an answer to a poll request, the TETRAPOL SwMI may provide the completed list of connected TETRAPOL subscribers in a multiparty call.

### F.3.33 Poll response number

As an answer to a poll request, the TETRAPOL SwMI may provide the number of connected TETRAPOL subscribers in a multiparty call.

### F.3.34 Poll response percentage

An answer to a poll request, the TETRAPOL SwMI may provide a number.

### F.3.35 Pre-coded status

Status shall not be supported over the ISI

### F.3.36 Proprietary

When received by the TETRAPOL SwMI, this information element may be ignored.

### F.3.37 Request to transmit/send

When received by the TETRAPOL SwMI, this information element shall trigger the appropriate signalling in the SwMI.

### F.3.38 Reset call time-out timer

When received by the TETRAPOL SwMI, this information element may be ignored.

### F.3.39 Restoring party

This information element shall not be supported over R11 interface.

### F.3.40 Security level used at the air interface

To be defined in draft prETS 300 392-3

### F.3.41 Short data type identifier

Not supported over the ISI

### F.3.42 Simplex/duplex selection

This information element shall be set according to the SwMI capabilities, otherwise the call setup shall be rejected.

### F.3.43 Speech service

The purpose of the speech service element shall be to change between TETRA standard speech and non-TETRA speech.

The 3-bit requested speech service information element may be set to PCM A law, TETRAPOL encoded speech or TETRA encoded speech. In case draft prETS 300 392-3 has not allocated values to the 3-bit speech service information element, then the following values may be arranged over the TETRAPOL R11 reference point:

**Table 100: Speech service element contents over the ISI at R11 reference point**

| Information element | Length | Value | Remark |
|---|---|---|---|
| Speech service | 3 | 111<br>011<br>001<br>000 | PCM A law speech<br>TETRAPOL full rate encoded speech<br>7,2 kbit/s unprotected data (note 1)<br>TETRA encoded speech |

NOTE 1: This service shall carry a non-TETRA encoded speech, as defined in ETS 300 392-2 § 14.8.40 (March 1996).

NOTE 2: The lower-weight bit may indicate a non-TETRA encoded speech

Requested speech service may be one among a combination of some of the allowed speech service, in which case the requested bits of the speech service shall be set to 1.

The speech service actually accepted shall be one of the requested speech service or a pre-agreed one.

### F.3.44 PTT management

Transmission grant, transmission request permission and tx demand priority shall be related to the equivalent TETRAPOL signalling.

### F.3.45 Talking party identity and transmitting party

The TETRAPOL talking party identity shall be related to the TETRA transmitting party type identifier, transitting party extension, transmitting party SSI

### F.3.46 Type 3 element identifier

This type of information elements shall be handled appropriately by the TETRAPOL SwMI.

### F.3.47 User defined data-

This information element shall not be supported over the ISI.

## History

| Document history | | |
|---|---|---|
| **Date** | **Status** | **Comment** |
| 30/04/96 | Version 0.0.1 | TETRAPOL ISI at R9 reference point |
| 16/12/97 | Version 0.0.8 | Edition |
| 30/03/97 | Version 0.0.9 | Interworking at TETRAPOL R11 reference point updated according to draft prETS 300 392-3 (March 97) and to Special Mobile Group (SMG), Universal Mobile Telecommunications System (UMTS); Network principles (UMTS 23.05) v 0.6.0 |
| 25/06/97 | Version 0.1.0 | Version for released |
| 30/01/98 | Version 1.0.0 | TETRAPOL Forum approval |
| 14/06/00 | Version 1.0.1 | Update of TTI field |