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Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

This ETS is a multi-part standard and will consist of the following parts:

Part 1:   "General network design".

Part 2:   "Air Interface (AI)".

Part 3:   "Inter-working", (DE/RES-06001-3).

Part 4:   "Gateways", (DE/RES-06001-4).

Part 5:   "Terminal equipment interface", (DE/RES-06001-5).

Part 6:   "Line connected stations", (DE/RES-06001-6).

Part 7:   "Security".

Part 8:   "Management services", (DE/RES-06001-8).

Part 9:   "Performance objectives", (DE/RES-06001-9).

Part 10:   "Supplementary Services (SS) Stage 1".

Part 11:   "Supplementary Services (SS) Stage 2".

Part 12:   "Supplementary Services (SS) Stage 3".

Part 13:   "SDL Model of the Air Interface".

Part 14:   "PICS Proforma", (DE/RES-06001-14).

Part 15:   "Inter-working - Extended Operations", (DE/RES-06001-15).

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
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1 Scope

This ETS defines the stage 2 specifications of the Supplementary Service Access Priority (SS-AP) for the Trans-European Trunked RAdio (TETRA).

The SS-AP enables a user to have preferential access to the TETRA system in times of radio link congestion. The SS-AP specifies the definition and interrogation of the Access Priority Level (APL) that a Mobile Station (MS) may apply for random access in the uplink direction in the air interface.

Man-Machine Interface (MMI) and Charging principles are outside the scope of this ETS.

Stage 2 describes the functional capabilities of the Supplementary Service introduced in the stage 1 description (see ETS 300 392-10-09 [3]). Stage 2 identifies the functional capabilities for the management of the service in the Switching and Management Infrastructure (SwMI), in the Mobile Station (MS) and in the Line Station (LS). Stage 2 also describes the information flows between these entities and the flows sent over the Inter System Interface (ISI).

> NOTE: The stage 2 description is followed by a stage 3 description, which specifies the encoding rules for the information flows and process behaviour for the different entities in the SwMI, in the MS and in the LS of the service.

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1]   ETS 300 392-2 (1996): "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[2]   ETS 300 171 (1992): "Private Telecommunication Network (PTN); Specification, functional models and information flows; Control aspects of circuit mode basic services; ECMA-BCSD".

[3]   ETS 300 392-10-09: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Part 10-09: Access priority".

3 Definitions and abbreviations

3.1 Definitions

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

authorized user: The user making the SS-AP definition on behalf of served user.

Access Priority Level (APL): A value allocated to each mobile ITSI or GTSI/service type. It is used for messages to determine priority access across the air interface.

served user: The user on whose behalf the **authorized** user makes the SS-PC definition. The served user also requests the SS-AP operation.

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

3.2 Abbreviations

3.2.1 General abbreviations

For the purposes of this ETS, the following general abbreviations apply:

AP	Access Priority
APL	Access Priority Level
FE	Functional Entity
CC	Basic Service Call Control functional entity
CCA	Basic Service Call Control functional entity agent
GTSI	Group TETRA Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
MS	Mobile Station
O&M	Operation and Management
PDU	Packet Data Unit
SDL	Specification and Description Language
SS	Supplementary Service

> NOTE: The abbreviation SS is only used when referring to a specific supplementary service.

SwMI	Switching and Management Infrastructure
TETRA	Trans-European Trunked RAdio

4 Supplementary Service Access Priority (SS-AP) stage 2 specification

4.1 Functional model

4.1.1 Functional model description

The functional model shall comprise the following Functional Entities (FEs):

- FE1: served user's service agent for SS-AP definition and invocation;

- FE2: SS-AP service control entity in system 1;

- FE3: **authorized** user's service agent;

- FE4: SS-AP generic functional entity in system 2;

- CC: basic service Call Control functional entity in SwMI;

- CCA: basic service Call Control functional entity Agent in MS.

> NOTE: The FE, CC and CCA are used as described in ETS 300 171 [2].

The following relationships shall exist between these FEs:

- ra: between FE1 and FE2;

- rb: between FE2 and FE4 in different TETRA systems;

- rc: between FE2 and FE3;

- rd: between FE1 and FE4;

- re: between FE3 and FE4.

Figure 1 shows these FEs and the relationships for the management part. As the priority used for random access mechanism is used in the uplink, but not explicitly sent over the air interface, there are no supplementary service specific relationships for the operational part between FEs.
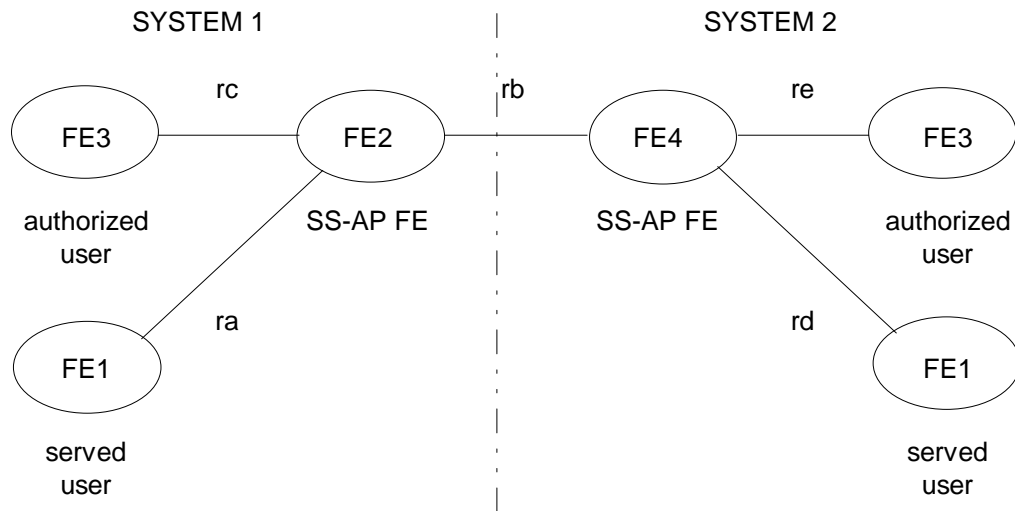
SYSTEM 1 | SYSTEM 2

Figure 1: The relationships and functional entities of the management part of SS-AP

4.1.2   FE descriptions

4.1.2.1   Served user's agent functional entity, FE1

FE1 shall receive SS-AP definitions from the SwMI. FE1 shall save the definitions to the database of the MS and acknowledges them to the SwMI. If for any reason rejection occurs, FE1 shall indicate this to FE2.

> NOTE: Application collocated to FE1 should support local interrogations in the MS/LS about the SS-AP definitions made to the served user or to the groups defined for it.

When the user requests to send a message that is sent with random access mechanism, FE1 shall map the requested access priority to the APL defined for the service.

4.1.2.2   SS-AP control functional entity, FE2

FE2 shall receive the SS-AP definition requests from FE3. FE2 shall verify that the requests are authorized, and the parameters and their values are valid. FE2 shall also locate the served users, shall send the definition requests to them, shall wait for the acknowledgement(s) and shall acknowledge the service request to the authorized user. FE2 shall also save the definitions to the database in SwMI.

FE2 shall also receive SS-AP interrogation requests. FE2 shall verify that the requests are valid and authorized and if so, it shall send the response to the authorized user.

If definition or interrogation requests fail for any reason, FE2 shall send the error/rejection indication to the user that requested the service.

At the reception of a random access message, if an APL is activated in the system, FE2 may verify that the served user has the right to use the APL, and if not, FE2 should send the appropriate definition message to FE1. FE2 can also reject the service request by clearing the call with a basic service information flow.

4.1.2.3   Authorized user's agent functional entity, FE3

At the reception of definition or interrogation request from a service user, FE3 shall send the request to the SwMI. At the reception of the acknowledgement or response from the SwMI, FE3 shall forward it to the service user.

4.1.2.4   Generic functional entity in system 2, FE4

FE4 shall address and route the definition and interrogation requests from the authorized user to the SS-AP control FE in system 1. FE4 shall also send the acknowledgements and responses to the authorized user.

FE4 shall address and route the definition requests to served users from the SS-AP control entity in system 1, and also the acknowledgements from the served user back to the SS-AP FE. FE4 can change the SS-AP values in the definition for the served user located in the system (where FE4 is located).

At the reception of a random access message, if an APL is activated in the system, FE4 may verify that the served user has the right to use the APL, and if not, FE4 should send the appropriate definition message to FE1. FE4 can also reject the service request by clearing the call with a basic service information flow.

4.1.3　　　　Relationship with a basic service

FE1 is collocated with CCA as FE1 shall map the correct APL value (Packet Data Unit (PDU) priority) for the random access process.

4.2　　　　Information flows

4.2.1　　　Definition of information flows

In the tables listing the elements in the information flows, the column headed "Type" indicates if these elements shall be Conditional (C), Optional (O) and Mandatory (M) in the information flow.

4.2.1.1　　　　Definition

Definition shall be used as an Operation and Management (O&M) function to define SS-AP to served user(s). FE3 shall start the definition operation by sending DEFINE1 information flow to FE2. At the reception of this message, FE2 shall acknowledge to FE3 the service request and if the request is found valid, FE2 shall send DEFINE2 information flows to the subscriber(s). The DEFINE2 information flow is sent to one or several FE1s depending on the definition request. The served users may be one or several individual subscribers or members of one or several groups. Each served user shall acknowledge the DEFINE2 request by DEFINE2-ACK. FE2/FE4 shall send the DEFINE2 information flow to FE1(s) addressed by group or individual subscriber address.

FE2 may define the SS-AP to all the subscribers that are in the system where FE2 is located. So, if a subscriber (FE1) moves to another TETRA system, FE2 can define SS-AP to FE1. The definition initiated by FE2 is valid only in that TETRA system. When the subscriber returns to his home system the definition shall not be valid. FE2 shall use the information flow DEFINE2 for this purpose, which is acknowledged by FE1 with DEFINE2-ACK.

FE4 may change the SS-AP value sent via it from FE2, in another system, to FE1 in the same system as FE4 is located.

If FE2 or FE4 notifies that FE1 uses a APL level that is not allowed for the subscriber, FE2 or FE4 can send a definition information flow to FE1.

4.2.1.1.1　　　　DEFINE1 request

DEFINE1 request information flow shall apply to the relationship rb, rc and re. It shall be sent from FE3 to FE2. The flow shall be sent from FE4 to FE2 if FE3 is in another TETRA system.

The information flow shall be used in order to define the SS-AP (APL) for one or more subscribers or groups. FE2 returns to FE3 an acknowledgement to the request.

Different APL values can be defined to different basic service types.

Table 1 lists the elements within the DEFINE1 request information flow.

Table 1: DEFINE1 request

Element	Type
Defining authorized user	M
Defined subscriber/group identity(ies)	M
Basic service type(s)	M
APL for low priority	M
APL for high priority	M

4.2.1.1.2 DEFINE1-ACK

DEFINE1-ACK information flow shall apply to the relationship rb, rc and re. It shall be sent from FE2 to FE3. The flow shall be sent from FE2 to FE4 if FE3 is in another TETRA system.

FE2 (FE4) shall send the DEFINE1-ACK information flow as an acknowledgement to a previously received SS-AP definition request from FE3.

NOTE: If any requests to served users are buffered in the SwMI, the SwMI should acknowledge the definition requests without waiting for the acknowledgement(s) for the buffered request.

Table 2 lists the elements within the DEFINE1-ACK information flow.

Table 2: DEFINE1-ACK

Element	Type
Defining authorized user	M
Defined subscriber/group identity(ies)	M
Result for definition	M
APL for low priority	C (note)
APL for high priority	C (note)
NOTE: The field shall only be given if the SwMI changed the priority.	

4.2.1.1.3 DEFINE2 request

DEFINE2 request information flow shall apply to the relationship ra, rb and rd. It shall be sent from FE2 to FE1. The flow shall be sent from FE2 to FE4 if FE1 is in another TETRA system.

The information flow shall be used in order to define the SS-AP for one or several subscribers or groups. If the definition is made to a group, SwMI shall send this information flow to all group members. The receiver shall acknowledge the service request. As an operator option, if the SwMI is not able to reach some of the FE1s when it makes the definition, the SwMI may buffer the definition request(s) and send them to FE1s when it finds that suitable.

Different APL values can be defined to different basic service types.

Table 3 lists the elements within the DEFINE2 request information flow.

Table 3: DEFINE2 request

Element	Type
Receiving served user	M
Defined subscriber/group identity(ies)	M
Basic service type(s)	M
APL for low priority	M
APL for high priority	M

4.2.1.1.4 DEFINE2-ACK

DEFINE2-ACK information flow shall apply to the relationship ra, rb and rd. It shall be sent from FE1 to FE2. The flow shall be sent from FE4 to FE2 if the FE1s is in another TETRA system.

FE1 shall return the DEFINE2-ACK information flow as an acknowledgement to a previously received SS-AP definition request.

The served user should accept the definition.

Table 4 lists the elements within the DEFINE2-ACK information flow.

Table 4: DEFINE2-ACK

Element	Type
Acknowledging served user	M
Defined subscriber/group identity(ies)	M
Result for definition	M

4.2.1.2 Activation

The SwMI may activate a certain APL level by broadcasting the APL to MSs, as described in ETS 300 392-2 [1]. The activation of an APL shall replace a previously received activation of an APL in the MS.

4.2.1.3 Interrogation

Interrogation shall be used as an O&M function to interrogate the SS-AP definitions made to subscriber and group identities. FE3 shall start the interrogation operation by sending INTERROGATE request information flow to FE2. At the reception of this message, FE2 sends INTERROGATE-ACK information flow as a response to FE3.

Application collocated to FE1 should also support interrogations of the SS-AP definitions made to the MS/LS unit. Application should answer these interrogations locally, and the interrogation shall not be sent to FE1, FE2 nor FE4.

4.2.1.3.1 INTERROGATE request

INTERROGATE request information flow shall apply to the relationship rb, rc and re. It shall be sent from FE3 to FE2. The flow shall be sent from FE4 to FE2 if FE3 is in another TETRA system.

INTERROGATE-ACK shall be received as response to INTERROGATE request.

Table 5 list the elements within the INTERROGATE request information flow.

Table 5: INTERROGATE request

Element	Type
Interrogating authorized user	M
Interrogated subscriber/group identity(ies)	M

4.2.1.3.2 INTERROGATE-ACK

INTERROGATE-ACK information flow shall apply to the relationship rb, rc and re. It shall be sent from FE2 to FE3. The flow shall be sent from FE4 to FE2 if FE3 is in another TETRA system.

FE2 shall send this information flow in order to give a response to a previously interrogated SS-AP definition.

Different APL values can be defined to different basic service types.

Table 6 list the elements within the INTERROGATE-ACK information flow.

Table 6: INTERROGATE-ACK

Element	Type
Interrogating authorized user	M
Interrogated subscriber/group identity(ies)	M
Basic service type(s)	M
APL for low priority	M
APL for high priority	M

4.2.1.4   Invocation and operation

The "Access priority" that comes from application is mapped to "PDU priority" as defined for the subscriber or group. Or, if the "Access priority" value is not set by the application, a default AP value shall be used. The PDU priority shall be used as APL for random access protocol.

When the MS receives the activation of a minimum APL, the reception invokes the comparison of APLs to decide whether a message can be sent in the uplink with random access or not, as described in ETS 300 392-2 [1].

4.2.1.5   Information flows between different TETRA systems

The general principles and mechanism for sending supplementary service information flows between different TETRA systems shall apply for SS-AP.

4.2.2   Relationship of SS-AP information flows to other information flows

The SS-AP information flows may be sent with FACILITY PDU or any basic call information flow that is able to include SS-FACILITY element.

4.3.3   Information flow sequences

Signalling procedures shall be provided in support of the information flow sequences specified in figures 4 to 6. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies etc.

In figures 4 to 6, SS-AP information flows are represented by solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that the two information flows occur together. Within the column representing an SS-AP FE, the numbers refer to FE actions listed in subclause 4.4.

No timers are used in figures 4 to 6.

> NOTE: The information flow sequences are examples and they may not cover all possible variations of the service.

4.3.3.1 Definition

Figure 2 shows the information flow sequence for normal operation of SS-AP definition when all parties are in the home system. In case of SS-AP definition for a group, steps 202, 101, 102 and 203 shall be carried out for every group member.
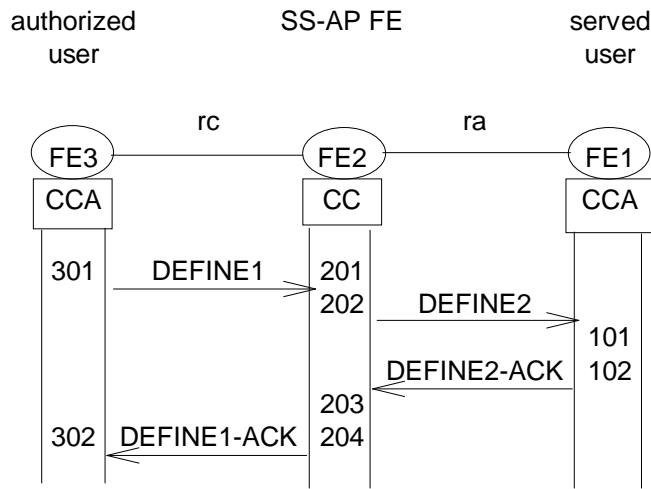
Figure 2: Successful definition of SS-AP

4.3.3.2 Definition when user is in a visited system

Figure 3 shows the information flow sequence for normal operation of SS-AP definition when the authorized user has migrated into the visited system (system 2) and the served user is in the home system (system 1). If the served user has migrated into another TETRA system, the DEFINE2 and DEFINE2-ACK information flows shall appear over the relationships rd and rb.
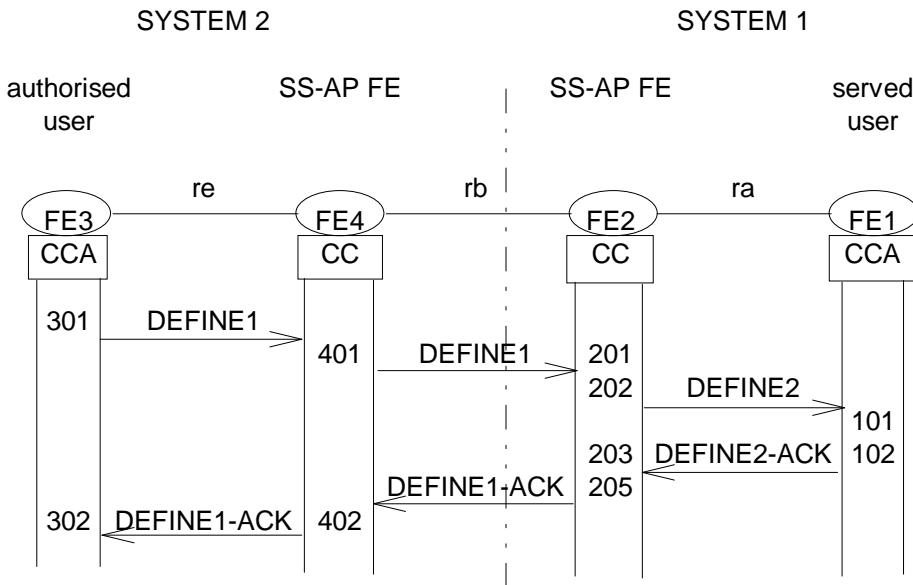
Figure 3: Successful definition of SS-AP when authorized user is in a visited system

4.3.3.3 Interrogation

Figure 4 shows the information flow sequence for normal operation of SS-AP interrogation when the authorized user is in the home system. If an authorized user requests the interrogation in another TETRA system, the same information flow shall appear between FE3 and FE4 over the re relationship, but it shall also appear between FE2 and FE4 in the relationship rb.
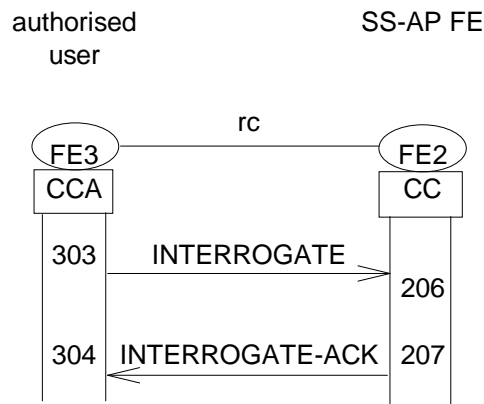

Figure 4: Interrogation of SS-AP

4.4 FE actions

4.4.1 FE actions of FE1

101 At the reception of SS-AP definition from FE2, FE1 shall save the definition to the database of the MS, if FE1 doesn't find any reason for rejection.

102 FE1 shall acknowledge the definition request positively, if it finds the request valid. If not, it shall return a negative acknowledgement.

4.4.2 FE actions of FE2

201 At the reception of SS-AP definition from FE3, FE2 shall verify that the definition request is authorized, its parameters valid and their values in allowed range.

202 FE2 shall locate the MS subscriber, or MS subscribers, and shall send them the definition requests. FE2 may buffer the definition data, if some of the FE1s are not reachable for the moment.

   NOTE: If the served user has migrated to another TETRA system, the step 205 is also required in order to deliver the DEFINE2 information flow to FE1.

203 FE2 shall receive the acknowledgement(s) from the FE1(s).

   NOTE: If SS-AP definition is made for a group, the actions 202 and 203 are carried for each group member.

204 FE2 shall acknowledge the definition request to FE3 positively, if the service was successfully carried out. If the service request failed for any reason, FE2 shall return a negative acknowledgement to FE3.

   NOTE: If the request to (some) FE1s is buffered in the SwMI, it should not delay the acknowledgement to FE3.

205 FE2 shall add the routing address of FE4 to the definition acknowledgement information.

206 At the reception of SS-AP interrogation from FE3, FE2 shall verify that the request is authorized, its parameters valid and their values in allowed range.

207   If the request was valid and authorized, FE2 shall fetch the interrogation data and return the
       response to FE3. If the request is not valid or not authorized an error indication shall be sent to FE3.

4.4.3   FE actions of FE3

301   At the reception of SS-AP definition request from user, FE3 may perform local checks for suitability.
       FE3 may bar the request based on these checks, but if the request is not barred, FE3 shall send it
       to FE2. If the request is barred locally, FE3 shall indicate the error to the user.

302   At the reception of the acknowledgement, FE3 shall display it to the user.

303   At the reception of SS-AP interrogation request from user, FE3 may perform local checks for
       suitability. FE3 may bar the request based on these checks, but if the request is not barred, FE3
       shall send it to FE2. If the request is barred locally, FE3 shall indicate the error to the user.

302   At the reception of the response, FE3 shall display it to the user.

4.4.4   FE actions of FE4

401   FE4 shall add the routing address of FE2 to the SS-AP information flow.

402   FE4 shall locate the FE3 and shall send the information flow to it.

       NOTE: FE3 may be replaced by FE1 in this action in order to reach the FE1 that has migrated
                  into another system.

4.5   Allocation of FEs to physical equipment

Table 7 defines the allocation of FEs to physical equipment.

Table 7: Allocation of FEs to physical equipment

FE	SwMI	LS	MS
FE1	-	-	+
FE2	+	-	-
FE3	-	+	+
FE4	+	-	-
Key:	+ = applicable; - = not applicable.		

4.6   Inter-working considerations

In order to support the SS-AP to extend to several TETRA systems over the ISI, FE2 and FE4 related to
SS-AP shall be able to perform the general supplementary service related sending and reception tasks of
call unrelated data.

History

Document history		
August 1996	Public Enquiry	PE 111: 1996-08-05 to 1996-11-29