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# Terrestrial Trunked Radio (TETRA);
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# Part 11: Supplementary Services (SS) stage 2;
# Sub-part 9: Access Priority (AP)

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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) Project of the European Telecommunications Standards Institute (ETSI).

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-System Inter-working (ISI)".

Part 4:    "Gateways".

Part 5:    "Peripheral Equipment Interface (PEI)".

Part 6:    "Line connected Station (LS)".

Part 7:    "Security".

Part 9:    "General requirements for Supplementary Services (SS)".

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 (AI)".

Part 14:   "Protocol Implementation Conformance Statement (PICS) proforma specification".

| Transposition dates | |
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| Date of adoption of this ETS: | 9 October 1998 |
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# 1 Scope

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

The SS-AP enables to define specific priorities in an MS for uplink random access messages (at the air interface) for circuit mode or packet mode communications.

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

The stage 2 description identifies the functional entities and the information flows between them to support the supplementary service user functionalities specified in the stage 1 description (see ETS 300 392-10-9 [3]).

> NOTE: The stage 2 description is followed by a stage 3 description, which specifies the SS-AP signalling protocol for the different entities concerned in the SwMIs and in the MS/LS.

Aspects relating to all supplementary services are detailed in ETS 300 392-9 [5].

# 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): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[2]     EN 300 171: "Private Integrated Services Network (PISN); Specification, functional models and information flows; Control aspects of circuit-mode basic services [ISO/IEC 11574 (1994) modified]".

[3]     ETS 300 392-10-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary Services (SS) stage 1; Sub-part 9: Access Priority (AP)".

[4]     prETS 300 392-12-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary Services (SS) stage 3; Sub-part 9: Access Priority (AP)".

[5]     prETS 300 392-9: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of this ETS, in addition to definitions in ETS 300 392-9 [5], the following definitions apply:

**authorized user:** The user who is authorized to make SS-AP definitions and interrogations.

**Access Priority Level (APL):** A specific Protocol Data Unit (PDU) priority level defined for a Mobile Station (MS) by SS-AP for a given primitive access priority and for a given service. The possible services are: circuit mode services (whether invoked as individual calls or as group calls), Short Data Service (SDS), Connection Oriented Network Service (CONS), Specific ConnectionLess Network Service (SCLNS) and supplementary services management.

**served user:** The user who applies a priority access across the air interface.

### 3.2 Abbreviations

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

| | |
|---|---|
| AP | Access Priority |
| APL | Access Priority Level |
| CC | Basic Service Call Control functional entity |
| CCA | Basic Service Call Control functional entity agent |
| CONS | Connection Oriented Network Service |
| FE | Functional Entity |
| LS | Line Station |
| MMI | Man Machine Interface |
| MS | Mobile Station |
| O&M | Operation and Management |
| PDU | Protocol Data Unit |
| SCLNS | Specific ConnectionLess Network Service |
| SDL | Specification and Description Language |
| SDS | Short Data Service |
| SS | Supplementary Service |

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

| | |
|---|---|
| SwMI | Switching and Management Infrastructure |
| TETRA | Terrestrial Trunked RAdio |
| V+D | Voice plus Data |

## 4 Functional model

### 4.1 Functional model description

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

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

- FE2: SS-AP service control entity in SwMIs;

- FE3: authorized user's service agent for SS-AP;

- 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 EN 300 171 [2].

The following relationships shall exist between these FEs:

- ra: between FE1 and FE2 in home SwMI;

- rb: between FE2 in home SwMI and FE2 in visited SwMI;

- rc: between FE2 in home SwMI and FE3;

- rd: between FE1 and FE2 in visited SwMI;

- re: between FE3 and FE2 in visited SwMI.

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.
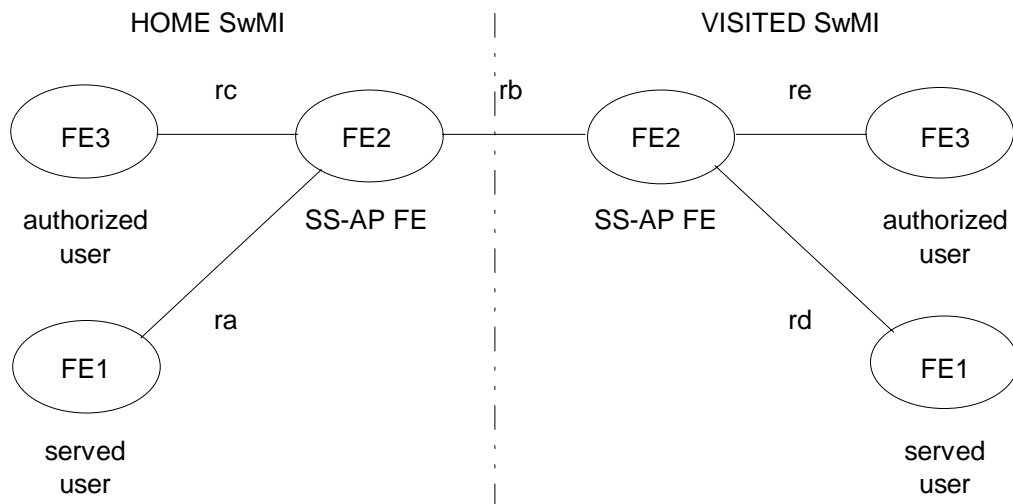
HOME SwMI | VISITED SwMI



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

## 4.2 FE descriptions

### 4.2.1 Served user's agent functional entity, FE1

FE1 shall receive SS-AP definitions from the FE2. FE1 shall save the definitions to the database of the MS and acknowledge them to FE2 if requested by the latter to do so. If for any reason rejection occurs, FE1 shall indicate this to FE2.

When the user application requests to send a message that is sent with random access mechanism, FE1 shall map the user application requested access priority to the APL (PDU priority) defined for the service. Refer to ETS 300 392-2 [1], clauses 11, 14 and 23.

After migration to a visited SwMI, FE1 shall discontinue to use any SS-AP definitions for the home SwMI. FE1 shall assume the default APLs, unless the visited SwMI has sent APL assignments to FE1.

### 4.2.2 SS-AP control functional entity in home SwMI, FE2

FE2 shall receive the SS-AP definition requests from FE3. FE2 shall verify that the requests are authorized and shall acknowledge the service request to the authorized user. FE2 shall also locate the served users, send the assignments to them and wait for the acknowledgement(s) if acknowledgement was requested. FE2 may also save the definitions to the database in SwMI. When the served user is located into a visited SwMI, then the FE2 in the home SwMI may send new profile to FE2 in the visited SwMI.

FE2 shall also receive SS-AP interrogation requests. FE2 shall verify that the requests are 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 a rejection indication to the user that requested the service.

At the reception of a random access message, 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.

### 4.2.3 Authorized user's agent functional entity, FE3

At the reception of definition or interrogation request from a user application, FE3 shall send the request to the FE2. At the reception of the acknowledgement or response from FE2, FE3 shall forward it to the user application.

### 4.2.4        SS-AP control functional entity in visited SwMI, FE2

As part of an MS migration profile due to server user migration or by an authorized user action, the visited SwMI FE2 may receive a SS-AP profile from the home SwMI FE2 to assign the APLs to that MS. The visited SwMI FE2 may then modify the APLs, acknowledge the profile to FE2 in home SwMI and should perform an APL assignment to FE1.

## 4.3        Relationship with basic services

FE1 is collocated with CCA as FE1 shall apply the correct APL value to PDU priority for the random access process for call set-up and call maintenance.

# 5        Information flows

## 5.1        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.

### 5.1.1        Definition and assignment

Definition shall be used as an Operation and Management (O&M) function to define APLs to served user(s). FE3 shall start the definition operation by sending DEFINE information flow to FE2 in the home SwMI of the served user or users. At the reception of this message, the home SwMI FE2 shall acknowledge to FE3 the service request and if the request is found to be valid, FE2 shall send ASSIGN information flows to the MS(s). The ASSIGN information flow is sent to one or several MSs depending on the definition request. Each MS shall acknowledge the ASSIGN with ASSIGN ACK, if acknowledgement is requested in the ASSIGN information flow. FE2 shall send the ASSIGN information flow to MS(s) using either group or individual subscriber addressing.

When an MS has migrated to a visited SwMI, then the home SwMI FE2 may send an SS-AP profile update to the visited SwMI FE2 for assignment to the MS.

As an option, if a FE2 is not able to reach some of the MSs when it makes the definition, the FE2 may buffer the definition request(s) and send them to MSs when it finds that suitable.

Any FE2 may assign APLs to all MSs that are in the SwMI where FE2 is located, but not APLs to MSs in other SwMIs. So, if an MS (FE1) moves to another SwMI it will apply default APL values defined in the air interface protocol until FE2 in that SwMI defines APLs to the MS. The definition initiated by a visited SwMI FE2 is valid only in that TETRA system.

Although the profile exchanged upon migration or later contains absolute values of APLs, it does not imply that those values in different SwMIs had same meaning in the quality of service point of view and the APLs applied in different SwMIs should not be compared directly.

When migrating to a visited SwMI, FE1 shall save any definitions received and accepted in home SwMI.

If a FE2 recognizes that an MS is using an APL that is not allowed for the subscriber, the FE2 may send a definition information flow to the MS.

#### 5.1.1.1        DEFINE

DEFINE information flow applies to the relationship rc and re. It shall be addressed from FE3 to FE2 in home SwMI.

The information flow shall be used in order to define the SS-AP (APL) for one or more MSs. The group identity can be used to address MSs instead of individual identities.

Different APLs can be defined to different basic service types.

Table 1 lists the elements within the DEFINE information flow.

**Table 1: DEFINE**

| Element | Type |
|---|---|
| Defined subscriber/group identity(ies) | M |
| Service type(s) | M |
| APL for low priority | M |
| APL for high priority | M |

### 5.1.1.2 DEFINE ACK

DEFINE ACK information flow applies to the relationship rc and re. It shall be addressed from FE2 in home SwMI to FE3.

FE2 in home SwMI shall send the DEFINE ACK information flow as an acknowledgement to a previously received SS-AP definition request from FE3. The acknowledgement shall confirm that SwMI has started downloading of the accepted definition as indicated in the acknowledgement. FE2 will send multiple DEFINE ACKs when results are different to different defined subscribers.

Table 2 lists the elements within the DEFINE ACK information flow.

**Table 2: DEFINE ACK**

| Element | Type |
|---|---|
| Defined subscriber/group identity(ies) | M |
| Result of 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. | |

### 5.1.1.3 ASSIGN

ASSIGN information flow applies to the relationship ra, and rd. It shall be sent from FE2 to FE1 within a single SwMI.

The information flow shall be used in order to define the SS-AP for a subscriber and/or group(s). If the definition is made to a group members, FE2 shall send this information flow to all group members using individual or group addressing.

Different APLs can be defined for different service types.

Table 3 lists the elements within the ASSIGN information flow.

**Table 3: ASSIGN**

| Element | Type |
|---|---|
| Service type(s) | M |
| APL for low priority | M |
| APL for high priority | M |
| Acknowledgement requested from served user(s) | M |

### 5.1.1.4 ASSIGN ACK

ASSIGN ACK information flow shall apply to the relationship ra and rd. It shall be sent from FE1 to FE2.

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

The served user shall accept the definition if it is valid.

Table 4 lists the elements within the ASSIGN ACK information flow.

**Table 4: ASSIGN ACK**

| Element | Type |
|---|---|
| Assignment result | M |

### 5.1.1.5 PROFILE and PROFILE ACK

PROFILE AND PROFILE ACK information flow applies to the relationship rb. It shall exchange SS-AP information between SwMIs and shall contain the same information as the DEFINE and DEFINE ACK information flows.

### 5.1.2 Interrogation

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

### 5.1.2.1 INTERROGATE

INTERROGATE information flow shall apply to the relationship rb, rc and re. It shall be sent from FE3 to FE2. The flow shall be addressed to FE2 in home SwMI if FE3 is in the visited SwMI.

Table 5 list the elements within the INTERROGATE information flow.

**Table 5: INTERROGATE**

| Element | Type |
|---|---|
| Interrogated subscriber identity(ies) | M |

### 5.1.2.2 INTERROGATE ACK

INTERROGATE ACK information flow shall apply to the relationship rb, rc and re. It shall be sent from FE2 in home SwMI to FE3.

FE2 shall send this information flow in order to give a response to a previously interrogated SS-AP definition. FE2 will send multiple INTERROGATE ACKs when results are different to different interrogated subscribers.

Different APLs can be defined for different basic service types.

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

**Table 6: INTERROGATE ACK**

| Element | Type |
|---|---|
| Interrogated subscriber identity(ies) | M |
| Service type(s) | M |
| APL for low priority | M |
| APL for high priority | M |

### 5.1.3 Invocation and operation

The MS user may invoke SS-AP by selecting an access priority value in service primitive of a network layer service access point as defined e.g. in ETS 300 392-2 [1], clause 11 and subclause 14.5.6.2. The operation of SS-AP is totally incorporated into basic air interface operation at MAC layer, refer to ETS 300 392-2 [1] subclause 23.5.1.

### 5.2 Relationship of SS-AP information flows to other information flows

The SS-AP management information flows shall be sent using call un-related signalling as defined in ETS 300 392-9 [5]. There shall be no SS-AP specific invocation and operation information flows in addition to MAC layer functions as defined in ETS 300 392-2 [1], clause 23.

### 5.3 SS-AP primitives

The SS-AP service primitives at the authorized user MS/LS (FE3) TNSS-SAP shall be:

a)     DEFINE request;

b)     DEFINE indication;

c)     INTERROGATE request;

d)     INTERROGATE indication.

The SS-AP service primitive at the served user MS (FE1) TNSS-SAP shall be:

a)     ASSIGN indication.

Refer to ETS 300 392-12-9 [4], clause 5.

### 5.4 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 information flows used to carry SS-AP 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 6.6.

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

### 5.4.1 Definition

#### 5.4.1.1 Definition when authorized user and served user are in their home SwMI

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 203, 101, 102 and 204 shall be carried out for every group member if acknowledgement is requested in the DEFINE request primitive.
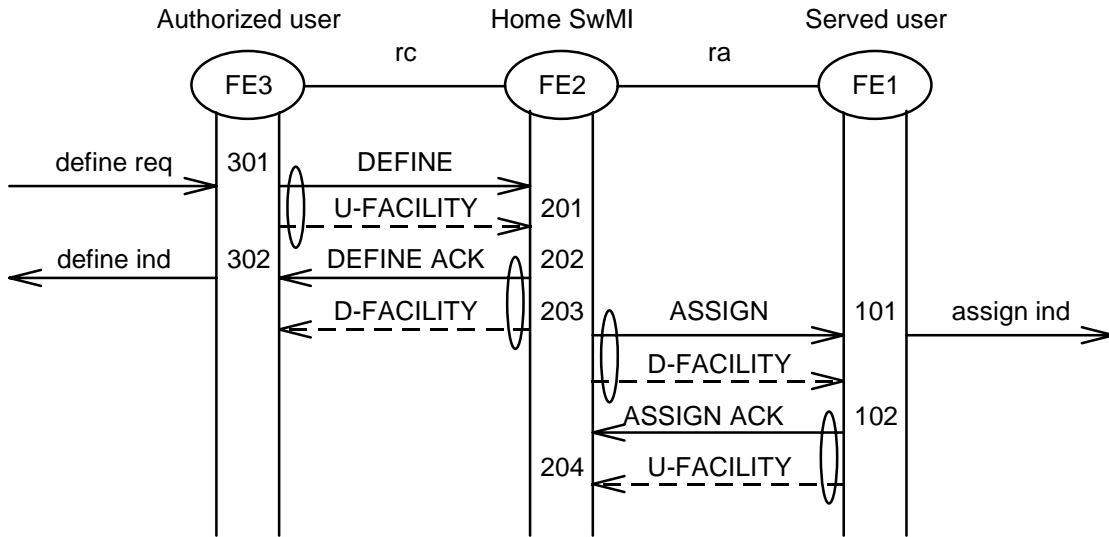
**Figure 2: Successful definition of SS-AP**

#### 5.4.1.2 Definition when authorized user is in visited SwMI

Figure 3 shows the information flow sequence for normal operation of SS-AP definition when the authorized user has migrated to visited SwMI and the served user is in home SwMI.
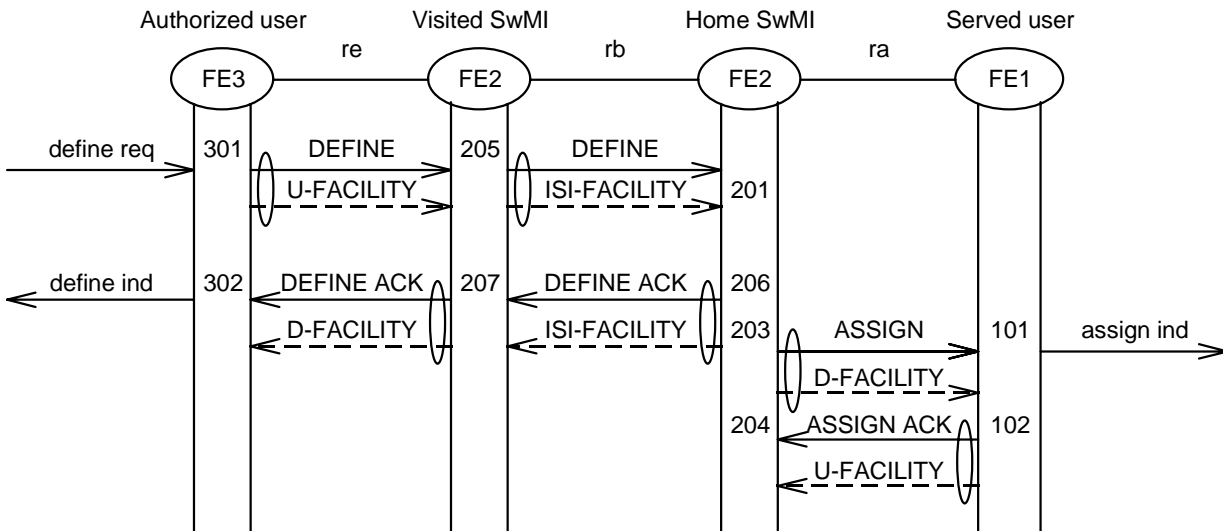
**Figure 3: Successful definition of SS-AP when authorized user is in a visited system**

### 5.4.1.3 Definition when served user is in visited SwMI

Figure 4 shows the information flow sequence for normal operation of SS-AP definition when the served user has migrated to visited SwMI and the authorized user is in home SwMI. If also the authorized user is in a visited SwMI, then scenarios in figures 3 and 4 are combined so that the authorized user communicates with the home SwMI and the home SwMI performs the profile exchange part as if the authorized user were in the home SwMI.
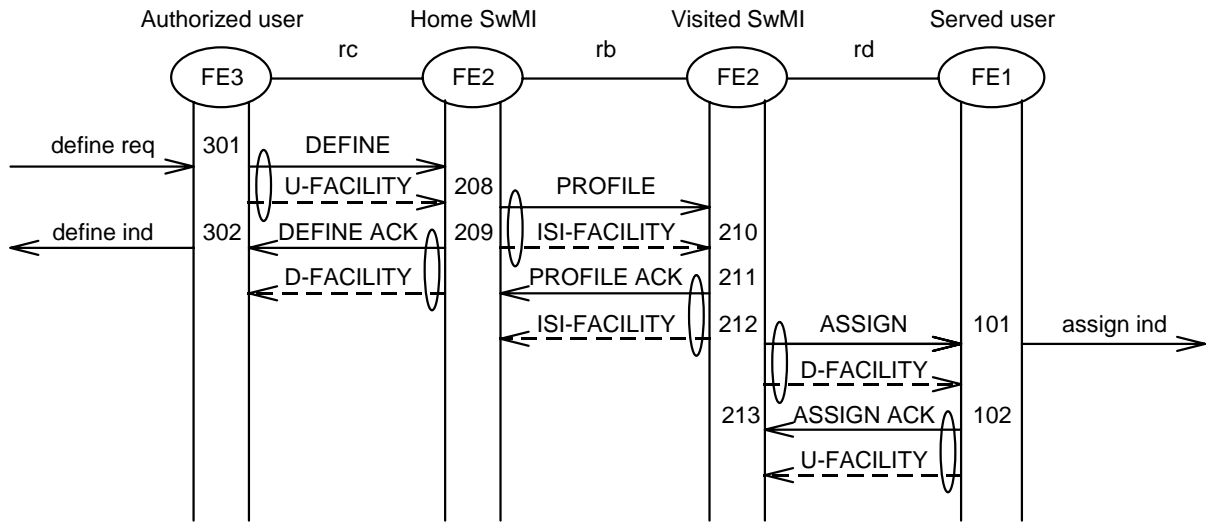
**Figure 4: Successful definition of SS-AP when served user is in a visited system**

### 5.4.2 Interrogation

### 5.4.2.1 Interrogation when authorized user is in the home SwMI

Figure 5 shows the information flow sequence for normal operation of SS-AP interrogation when the authorized user is in home SwMI.
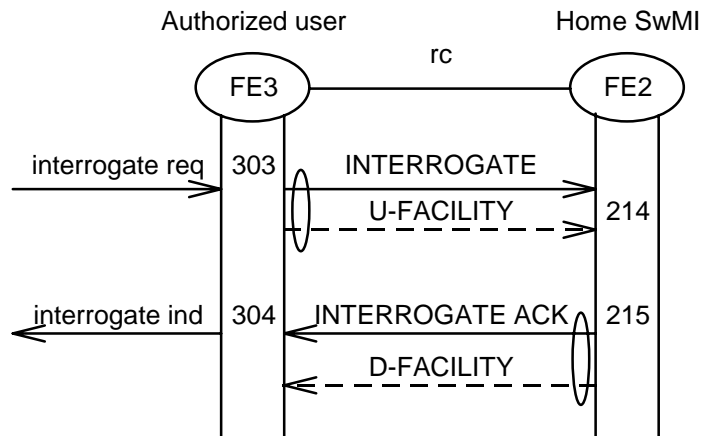
**Figure 5: Interrogation of SS-AP**

#### 5.4.2.2 Interrogation when authorized user is in visited SwMI

Figure 6 shows the information flow sequence for normal operation of SS-AP interrogation when an authorized user requests the interrogation in a visited TETRA system.
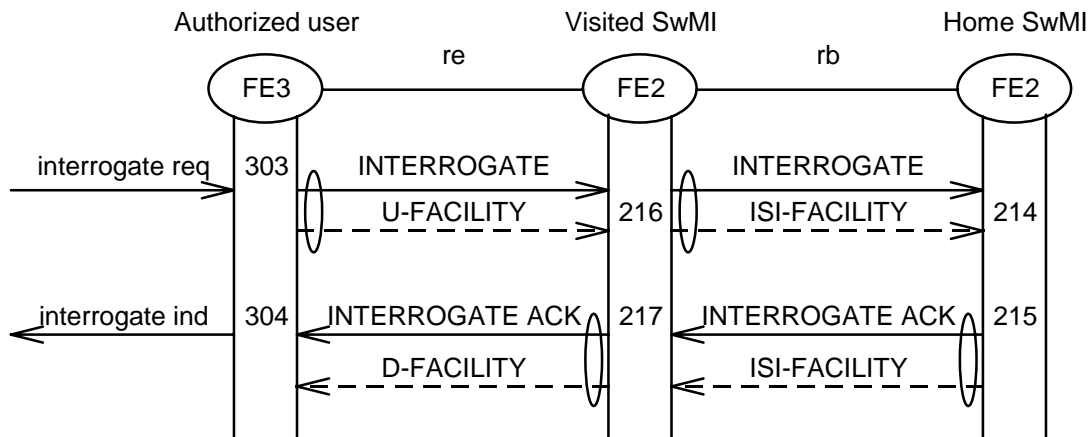


**Figure 6: Interrogation of SS-AP when the authorized user is in visited SwMI**

### 5.4.3 FE actions

#### 5.4.3.1 FE actions of FE1

101 At the reception of SS-AP assignment from FE2, FE1 shall save the definition to the database of the MS unless there is a reason for rejection. FE1 shall indicate the assignment to the user application.

102 If requested to do so by the ASSIGN information flow, FE1 shall acknowledge the definition request positively, if it finds the request valid. If not, it shall return a negative acknowledgement.

#### 5.4.3.2 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 acknowledge the definition request to FE3 positively, if the SwMI accepts the service request. If the service request failed for any reason, FE2 shall return a negative acknowledgement to FE3.

203 FE2 shall locate the MS or MSs, and shall send the assignment. FE2 may buffer the definition data for later sending, if some of the MSs are not reachable for the moment.

204 FE2 receives the acknowledgement(s) from the FE1(s) as requested.

NOTE 1: If SS-AP definition is made for a group, the actions 203 and 204 shall be carried for each group member, if the group members are addressed individually and acknowledgements are requested.

205 The visited SwMI FE2 shall forward the definition addressed to the home SwMI FE2.

206 The home SwMI FE2 shall acknowledge the definition request positively to FE3 in the visited SwMI, if the service request was accepted. If the service request failed for any reason, FE2 shall return a negative acknowledgement.

207 The visited SwMI FE2 shall forward the definition acknowledgement addressed to FE3.

208 At the reception of SS-AP definition from FE3, the home SwMI FE2 shall verify that the definition request is authorized. If the definition is acceptable the home SwMI FE2 may send the definition in a SS-AP profile update to the visited SwMI FE2.

209 The home SwMI FE2 shall acknowledge the definition request to FE3 positively, if FE2 accepted the service request. If the service request failed for any reason, FE2 shall return a negative acknowledgement to FE3.

210 At the reception of SS-AP definition from home SwMI, the visited SwMI FE2 may modify the definition request as appropriate.

211 The visited SwMI FE2 shall acknowledge the definition request to the home SwMI FE2 indicating possible APL modification. If the service request failed for any reason, FE2 shall return a negative acknowledgement.

212 If the visited SwMI FE2 decides to assign new APLs to the FE1(s) in defined MS(s) it shall form assignment message with appropriate priority values and shall send the assignment. The visited SwMI FE2 may buffer the definition data for later sending, if some of the FE1s are not reachable for the moment.

213 FE2 receives the acknowledgement(s) from the FE1(s), if it requested acknowledgement(s).

NOTE 2: If SS-AP definition is made for a group, the actions 212 and 213 shall be carried for each group member, if the group members are addressed individually and acknowledgements are requested.

214 At the reception of SS-AP interrogation from FE3, the home SwMI FE2 shall verify that the request is authorized.

215 If the request was authorized, the home SwMI FE2 shall fetch the interrogation data and return the response to FE3. If the request is not authorized or fails for another reason a rejection indication shall be sent to FE3.

216 The visited SwMI FE2 shall forward the interrogation request addressed to the home SwMI FE2.

217 The visited SwMI FE2 shall forward the interrogation acknowledgement addressed to FE3.

### 5.4.3.3 FE actions of FE3

301 At the reception of SS-AP definition request from user FE3 shall send the definition to FE2 in home SwMI.

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

303 At the reception of SS-AP interrogation request from user FE3 shall send the interrogation to the home SwMI FE2.

304 At the reception of the response, FE3 shall forward it to the user application.

## 6 Allocation of FEs to physical equipment

Table 7 defines the allocation of FEs to physical equipment. Other means of SS-AP management are optional and outside the scope of this ETS.

**Table 7: Allocation of FEs to physical equipment**

| Equipment | SS-AP Management | SS-AP Operation |
|-----------|------------------|-----------------|
| SwMI | FE2(Optional) | FE2(Mandatory) |
| MS | FE3(Optional) | FE1(Mandatory) |
| LS | FE3(Optional) | - |

# 7 Inter-working considerations

In order to support the SS-AP to extend to several TETRA systems over the ISI, home SwMI and visited SwMI shall be able to perform the general supplementary service related sending and reception tasks of call unrelated data, refer to refer ETS 300 392-9 [5].

The migration profile of an individual user may contain SS-AP part as defined in tables 8 and 9, refer to ETS 300 392-9 [5]. A profile update may be exchanged after migration due to a new definition.

Table 8 lists the elements within the PROFILE information flow.

**Table 8: PROFILE**

| Element | Type |
|---|---|
| Defined identity(ies) | M |
| Basic service type(s) | M |
| APL for low priority | M |
| APL for high priority | M |

Table 9 lists the elements within the PROFILE ACK information flow.

**Table 9: PROFILE ACK**

| Element | Type |
|---|---|
| Defined identity(ies) | M |
| Basic service type(s) | O |
| APL for low priority | O |
| APL for high priority | O |

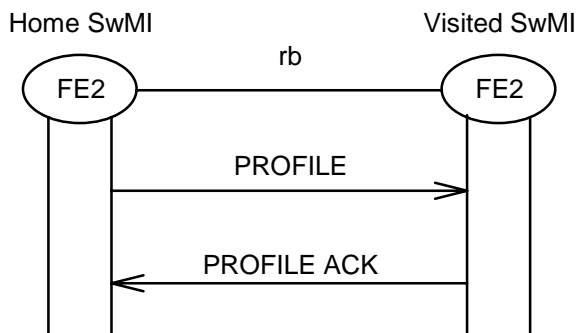Figure 7 shows SS-AP information exchange during migration.



**Figure 7: SS-AP profile exchange between SwMIs**

## History

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