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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", (DE/RES-06001-7).

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

Part 9: DE/RES-06001-9, work item stopped.

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

Part 11: "Supplementary Services (SS) Stage 2", (DE/RES-06001-11).

Part 12: "Supplementary Services (SS) Stage 3", (DE/RES-06001-12).

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

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

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

This European Telecommunication Standard (ETS) defines the stage 2 specifications of the Supplementary Service Pre-emptive Priority Call (SS-PPC) for the Trans-European Trunked Radio (TETRA).

SS-PPC enables a user to have preferential access to the network resources in a TETRA system in times of congestion including pre-emption of calls. SS-PPC is applicable for pre-emptive priorities including the emergency priority. SS-PPC includes the capability to pre-empt resources needed for higher priority calls and the capability to pre-empt users from ongoing calls in order to move them to higher priority calls. SS-PPC specifies the definition, activation, deactivation and interrogation for the usage of pre-emptive call priorities in the TETRA system. The Switching and Management Infrastructure (SwMI) applies the SS-PPC priorities when it allocates the resources for calls. The SS-PPC operations are defined for the SwMI, for the Mobile Station (MS) and for the Line Station (LS).

SS-PPC is defined to subscribers of one TETRA system, but the subscribers may be located in several TETRA systems and the information flows may be delivered over the Inter-System Interface (ISI). SS-PPC also is invoked for calls within one TETRA system or for calls that extend over ISI to several TETRA systems.

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 stage 1 description. Stage 2 identifies the functional capabilities for the management and operation of the service in the SwMI, in the MS and in the LS. Stage 2 describes also the information flows exchanged between these entities and the flows sent over the ISI.

NOTE: The stage 2 description is followed by the 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.

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 300 392-12-16: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D), Part 12: Supplementary services stage 3; Part 12-16: Pre-emptive priority call".

3 Definitions and abbreviations

3.1 Definitions

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

authorized user: A user who is authorized to define, activate, deactivate and interrogate the SS-PPC.

basic service: In this ETS, basic service is either a circuit mode speech or a circuit mode data service (call), see ETS 300 392-2 [1] clause 11.

emergency priority: Highest pre-emptive priority.

Functional Entity (FE): FE performs the SS-PPC specific tasks in the MS, in the LS or in the SwMI.

NOTE: In stage 2 specification the FE functionality is not restricted to SS sub-entity within layer 3.

home system: A TETRA system of which the Mobile Network Identity (MNI) is equal to the MNI of the authorized user.

management functions: The management functions for SS-PPC are definition, activation, deactivation and interrogation.

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

SS-PPC call: The service (call) to which the defined SS-PPC priority is applied.

SS-PPC invocation: The sending of priority request to infrastructure. The SS-PPC invocation is done with the service invocation request.

SS-PPC operation: The usage of an SS-PPC priority for and in a basic service set-up. The operation of SS-PPC may include the SS-PPC pre-emption.

SS-PPC pre-emption: The exclusion of one or more parties from an ongoing service due an SS-PPC operation for another service. The pre-emption is carried out due to the lack of resources or due to the need to join a called party to a higher priority pre-emptive call. The users may be warned of the impending pre-emption or indicated, if any party is pre-empted from the ongoing call.

SS-PPC priority: Any pre-emptive priority invoked and operated for an SS-PPC call.

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.

user A: Calling party, the party that invokes SS-PPC.

user B: Called party in a call in which SS-PPC is operated.

user C: Pre-empted party, a party that is involved in a call which is pre-empted due to SS-PPC. There shall be one, two or more pre-empted parties in a pre-empted call.

visited system: A TETRA system of which the MNI is equal to the MNI of the authorized user.

3.2 Abbreviations

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

CC	Call Control functional entity
CCA	Call Control functional entity Agent
CMCE	Circuit Mode Control Entity
FE	Functional Entity
ISI	Inter-System Interface
LS	Line Station
MNI	Mobile Network Identity
MS	Mobile Station
PDU	Protocol Data Unit
SS-PC	Supplementary service Priority Call
SS-PPC	Supplementary service Pre-emptive Priority Call
SwMI	Switching and Management Infrastructure
TETRA	Trans-European Trunked RAdio

4 SS-PPC stage 2 specification

4.1 Functional model

The functional model describes the functional characteristics of the Functional Entities (FEs) involved in the management and operation of SS-PPC.

The functional model shall comprise the following FEs:

FE1 user A's (calling party's) FE for SS-PPC in MS/LS;
FE2 SS-PPC FE in SwMI;
FE3 authorized user's FE for SS-PPC in MS/LS;
FE4 SS-PPC generic FE in SwMI;
FE5 user B's (called party's) FE for SS-PPC in MS/LS;
FE6 user C's (pre-empted party) for SS-PPC in MS/LS;
CC Call Control FE in SwMI;
CCA call control agent FE in MS/LS.

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 FE2 and FE5;
re between FE1 and FE4;
rf between FE3 and FE4;
rg between FE2s in different systems;
rh between FE2 and FE6.

Figure 1 shows these FEs and the possible relationships for the management part and figure 2 for the operational part.

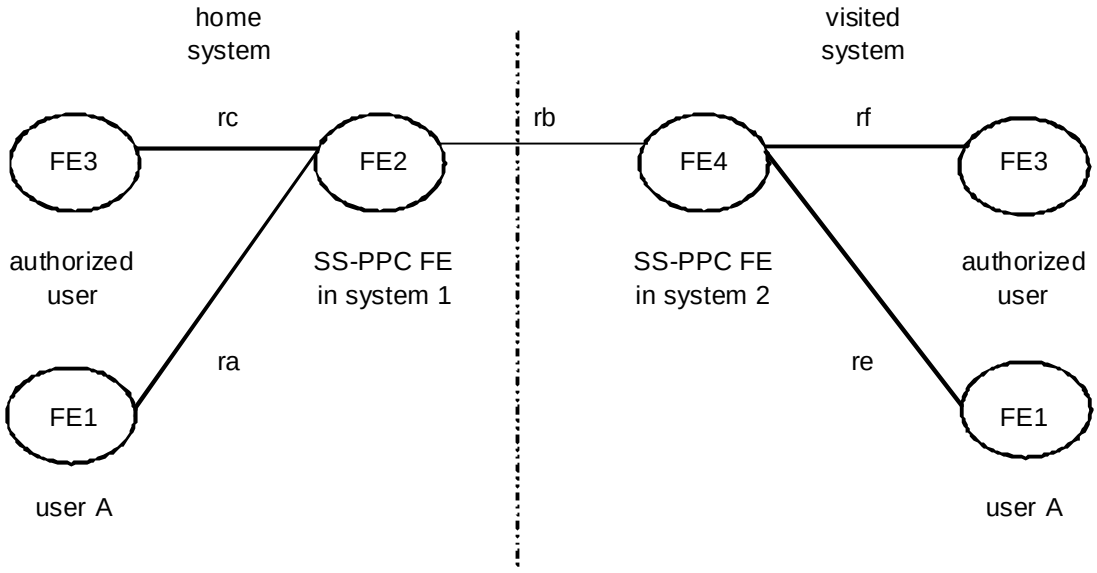


Figure 1: The relations and the FEs of the management part of SS-PPC.

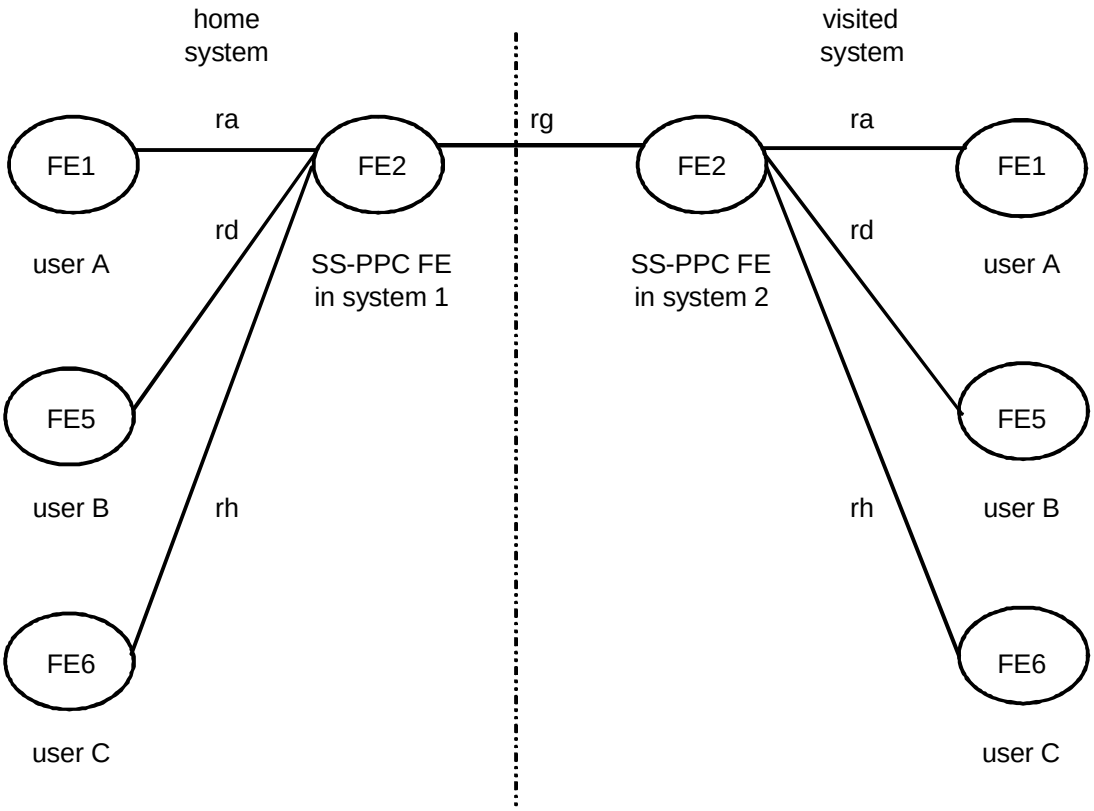


Figure 2: The relations and FEs of the operational part of SS-PPC

4.1.1 Functional model description

4.1.1.1 User A's FE, FE1

The functional tasks of FE1 shall be the following:

- as an option, upon reception of the SS-PPC definition, FE1 shall save the subscriber and group specific priority definitions. FE1 shall also acknowledge the definition request to FE2, if the acknowledgement was requested;

- upon reception of the SS-PPC interrogation requests from user, FE1 shall send them to FE2. When the system sends the response or the acknowledgement for a requested service, FE1 shall inform it to the user;

- upon reception of the SS-PPC invocations from user with a call set-up, FE1 shall verify that the priority is allowed and replace it with an allowed priority, if needed. However, the emergency priority shall not be replaced by another priority value. FE1 shall send the SS-PPC invocation to the SwMI with the call set-up;

- At the reception of an indication of a pre-empted party (parties) during a call, FE1 shall indicate the disconnection of the party to the user.

4.1.1.2 SS-PPC FE in the home system and in the visited system, FE2

The functional tasks for definition, activation, deactivation and interrogation of FE2 shall be the following:

- at the reception of the SS-PPC definition, activation and deactivation request from FE3, FE2 shall verify the request, save valid requests to the SwMI and acknowledge the request to FE3;

- if FE3 requested downloading to FE1(s) with definition, activation and deactivation, FE2 shall send the requests to the concerned FE1s and may receive their acknowledgements;

- at the reception of the SS-PPC interrogation request from FE3 or FE1, FE2 in the home system shall verify the request and send the response to the requesting party (FE1/FE3).

The functional tasks for operation of FE2 shall be the following:

- when FE2 receives a service invocation request with the SS-PPC invocation, FE2 shall verify the received priority and change it, if needed;

- FE2 in visited system should not change the SS-PPC priority of an SS-PPC call;

  NOTE: Each TETRA system is able to determine the priority value used for resource allocation within that system. So, the SS-PPC calls extending to several TETRA systems may use different priority levels for resource allocation in each TETRA system.

- when a service invocation is requested with the emergency priority, FE2 shall invoke the service with the emergency priority;

- FE2 shall determine, if the pre-emption is needed to gain resources or parties to the invoked SS-PPC call. If the pre-emption is needed, FE2 may send the impending pre-emption indication, but FE2 shall send the pre-emption indication to FE6;

- if a party is pre-empted in order to move him to the SS-PPC call, the SS-PPC call set-up indication may be sent directly to the called party without a separate impending pre-emption and/or pre-emption indication;

- FE2 may indicate to the members of a group call the fact, that a pre-empted party (parties) is disconnected from the call;

- FE2 shall send the confirmation or rejection of the invoked SS-PPC call and/or the SS-PPC priority to the calling party;

- FE2 shall send the SS-PPC call set-up indication and the SS-PPC operation indications to the called parties.

4.1.1.3 Authorized user's FE, FE3

The functional tasks of FE3 shall be the following:

- upon reception of the SS-PPC definition, activation, deactivation and interrogation requests from a user, FE3 shall send them to FE2;

- upon reception of the SS-PPC definition, activation, deactivation and interrogation responses from FE2, FE3 shall inform them to the user.

4.1.1.4 SS-PPC FE in the visited system, FE4

The functional tasks of FE4 shall be the following:

- upon reception of the SS-PPC definition, activation, deactivation and interrogation requests from FE3 or FE1 in one TETRA system, FE4 shall route them to FE2 in another TETRA system;

- upon reception of the SS-PPC definition, activation, deactivation and interrogation responses from FE2 in the home system, FE4 shall route them to FE3 or FE1 in another TETRA system.

4.1.1.5 User B's (called party) FE, FE5

The functional tasks of FE5 shall be the following:

- upon reception of an incoming service invocation with the SS-PPC operation, FE5 shall indicate the participation to the established call and the SS-PPC priority to the user;

- FE5 shall compare the SS-PPC priority of the first call and the SS-PPC priority of the second call and FE5 shall join to the service with higher priority;

- upon reception of an indication of a pre-empted party (parties) during a call, FE5 shall indicate the disconnection of the party to the user.

4.1.1.6 Pre-empted party's FE, FE6

The functional tasks of FE6 shall be the following:

- upon reception of an impending pre-emption indication, FE6 shall indicate the forthcoming pre-emption to the user;

- upon reception of a pre-emption indication, FE6 shall indicate the pre-emption to the user.

4.1.2 Relationship with a service

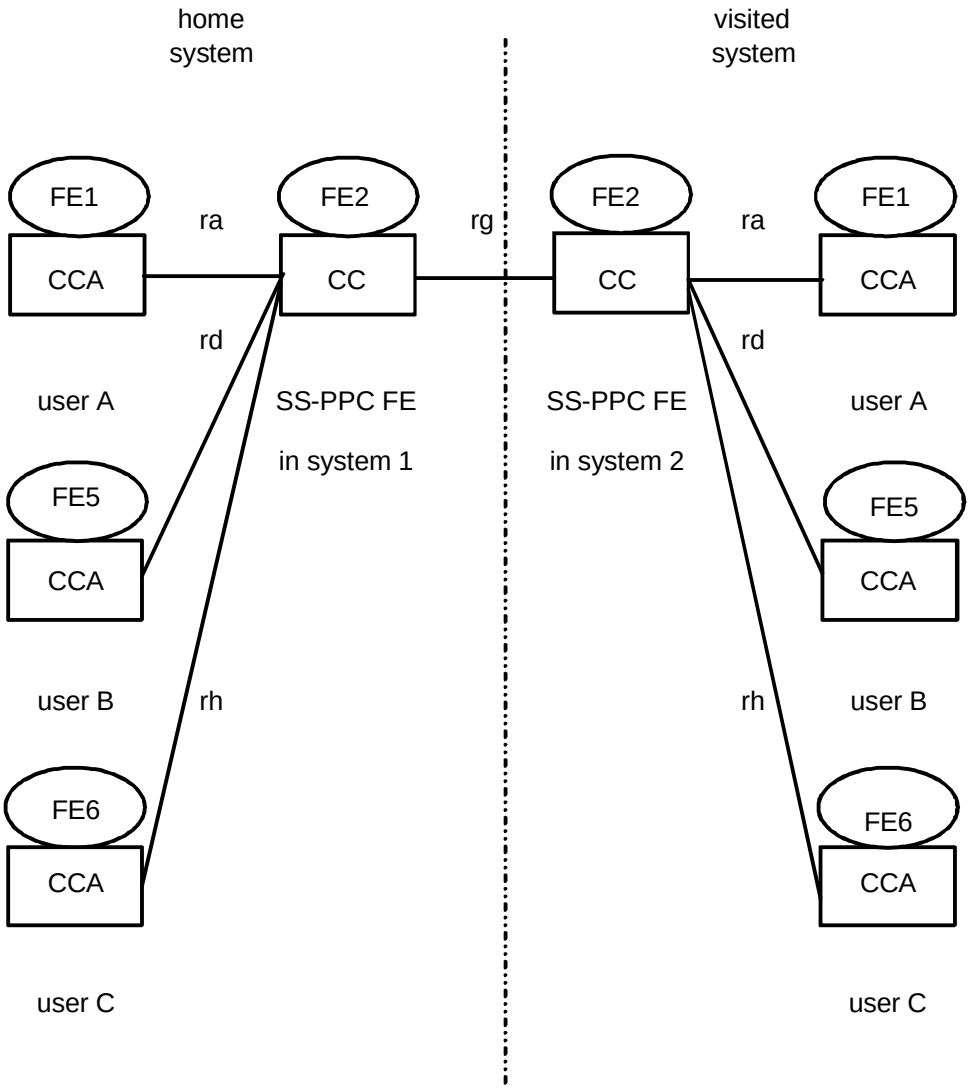
In the case of SS-PPC invocation, FE1 shall be collocated with CCA at a service invocation.

In the case of SS-PPC operation, FE2 shall be collocated with CC.

In the case of SS-PPC operation, FE5 shall be collocated with CCA.

In the case of service SS-PPC pre-emption, FE6 shall be collocated with CCA.

Figure 3 shows the different relationships that may exist between FEs and CC/CCA.



NOTE: The routes defined between FEs are applicable also for the CCs/CCAs to which the FEs are collocated.

Figure 3: The relationships between the service and SS-PPC FEs.

4.2 Information flows

4.2.1 Definition of information flows

In the tables listing the service elements in information flows, the column header "Type" indicates which of the service elements are Mandatory (M), Conditional (C) or Optional (O). If type is conditional, the conditions are stated.

The listed service elements shall specify whether the information of each element is included in the flow.

NOTE: It is possible that there is not a one-to-one mapping between a service element and Protocol Data Units (PDUs) or primitive elements described in ETS 300 392-12-16 [2].

4.2.1.1 Definition

An authorized user shall be able to define SS-PPC to be saved in a TETRA system. The SS-PPC definition shall specify the usage of pre-emptive priorities applied for services and the subscriber identities on which behalf the definition is made. SS-PPC shall be definable for circuit mode services and SS-PPC defines the pre-emptive priority values for these services including the emergency value. SS-PPC shall be used only if SS-PPC is defined.

The SS-PPC definition shall be made to a single individual subscriber or to a range or set of individual subscribers. The definition shall also be made to one group or to a range or list of groups. The priority value defined for a group shall be applicable to all group calls made by the group members to the group. If the SS-PPC definition is made to a subscriber, the definition shall apply for the individual calls that the subscriber makes.

The priority values shall be defined separately to different services or a common value shall be defined to these services. All the priority values, that are defined by SS-PPC, shall be pre-emptive. The highest definable priority value shall be considered as emergency value.

The defined priority value shall indicate the highest value that the MS/LS is allowed to use. However, the SS-PPC definition shall not restrict to usage of emergency priority. The value may indicate that no priority shall be used.

The authorized user, that is making the definition, shall indicate, if the definition should be sent to user A(s) subscriber unit(s). If the definition is made to a group number, the definition shall be sent to the members of the group, if sending of definitions to the MS/LS unit(s) was requested. If the definition is sent to the user A's subscriber unit, an acknowledgement may be requested from it. The sending of the SS-PPC definition to user A is on optional feature for FE2; FE1 should recognize the information flow.

The SS-PPC activation/deactivation shall be used in one of the following two ways in TETRA systems. It shall be an operation option which of ways shall be used.

1) SS-PPC shall be activated with the definition. the SwMI uses the SS-PPC priorities as defined, if SS-PPC is defined. The SS-PPC definition shall be deactivated by defining a priority value that indicates that no priority is used.

2) SS-PPC shall be applicable when defined and activation/deactivation shall be used separately from definition to temporarily activate and deactivate certain priority levels for subscribers and groups. The activation temporarily activates certain values and these temporary definitions shall be applied until they are deactivated. After the deactivation, the defined values, that were used before activation, shall be used. The activation/deactivation shall be made to the SwMI only, so that the SwMI assigns these priorities on calls invoked with SS-PPC. If SS-PPC is not defined, a call to which the SS-PPC value is requested should be changed to high priority call.

A new definition shall override an older definition.

NOTE: It is possible that some networks prefer a different process for handling the definitions.

4.2.1.1.1 DEFINE

DEFINE information flow shall be used to define SS-PPC.

The information flow is for the relationship rc and from FE3 to FE2. The flow shall also be applied for the relationship rf and rb and sent from FE3 to FE2 via FE4, if FE3 is in another TETRA system. DEFINE information flow is described in table 1.

The service elements Service type and SS-PPC priority value may be repeated in order to define different priority values to different services.

The service element Indication of disconnected parties is an optional indication applied during group calls to indicate that one or more parties have been pre-empted from the call.

Table 1: The service elements within DEFINE information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Service type	M	note
SS-PPC priority value	M	note
Delivered to MS/LS unit(s)	M	
Acknowledgement from unit(s)	M	
NOTE: A wild card value may be used.		

4.2.1.1.2 DEFINE-ACK

DEFINE-ACK information flow shall be used to acknowledge a previously sent definition request.

The information flow shall be for the relationship rc and from FE2 to FE3. The flow shall also be applied for the relationship rf and rb and from FE2 to FE3 via FE4, if FE3 is in another TETRA system. FE2 shall send an acknowledgement for each requested TETRA identity. That shall be done in one or several information flows. DEFINE-ACK information flow is described in table 2.

Table 2: The service elements within DEFINE-ACK information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Result	M	

4.2.1.1.3 DEFINE-USER

DEFINE-USER information flow shall be used to define the call priority value(s) for one TETRA identity or for a range or list of TETRA identities to a user A(s). The usage of this information flow shall be optional to FE1.

The information flow shall be for the relationship ra and from FE2 to FE1. The flow shall be applied for the relationship rb and re and from FE2 to FE1 via FE4, if FE1 is in another TETRA system. DEFINE-USER information flow is described in table 3.

The elements Service type and SS-PPC priority value shall be repeated in order to define different priority values to different services, if needed.

There shall be no separate activation/deactivation for the user A. If the SS-PPC definition is sent for user A, the sent definition shall be considered as activated.

Table 3: The service elements within DEFINE-USER information flow

Service element	Type	Remarks
User A	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Service type	M	
SS-PPC priority value	M	
Acknowledgement requested	M	Requested for the definition

4.2.1.1.4 DEFINE-USER-ACK

DEFINE-USER-ACK information flow shall be used to acknowledge the previously received DEFINE-USER, if acknowledgement was requested.

The information flow shall be applied for the relationship ra and from FE1 to FE2. The flow shall be applied for the relationship re and rb and from FE1 to FE2 via FE4, if FE1 is in another TETRA system. DEFINE-USER information flow is described in table 4.

Table 4: The service elements within DEFINE-USER-ACK information flow

Service element	Type	Remarks
User A	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Result	M	

4.2.1.2 Activation/deactivation

A separate activation shall be optionally used to temporarily activate certain SS-PPC values within the SwMI to be used instead of the defined SS-PPC values. The deactivation removes the temporary activation and after deactivation the SS-PPC definitions, that were valid before the activation, shall be used.

4.2.1.2.1 ACTIVATE

ACTIVATE information flow shall be used to activate SS-PPC.

The information flow is for the relationship rc and from FE3 to FE2. The flow shall also be applied for the relationship rf and rb and sent from FE3 to FE2 via FE4, if FE3 is in another TETRA system. ACTIVATE information flow is described in table 5.

The service elements Service type and SS-PPC priority value shall be repeated in order to activate different priority values to different services, if needed.

Table 5: The service elements within ACTIVATE information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Activated	M	
Service type	M	note
SS-PPC priority value	M	note
NOTE: A wild card value may be used.		

4.2.1.2.2 ACTIVATE-ACK

ACTIVATE-ACK information flow shall be used to acknowledge a previously sent activation request.

The information flow shall be for the relationship rc and from FE2 to FE3. The flow shall also be applied for the relationship rf and rb and from FE2 to FE3 via FE4, if FE3 is in another TETRA network. FE2 shall send an acknowledgement for each requested TETRA identity. That shall be done in one or several information flows. ACTIVATE-ACK information flow is described in table 6.

Table 6: The service elements within ACTIVATE-ACK information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Result	M	

4.2.1.2.3 DEACTIVATE

DEACTIVATE information flow shall be used to deactivate SS-PPC.

The information flow is for the relationship rc and from FE3 to FE2. The flow shall also be applied for the relationship rf and rb and sent from FE3 to FE2 via FE4, if FE3 is in another TETRA system. DEACTIVATE information flow is described in table 7.

The service elements Service type and SS-PPC priority value shall be repeated in order to deactivate different priority values to different services, if needed.

Table 7: The service elements within DEACTIVATE information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Deactivated	M	
Service type	M	note
SS-PPC priority value	M	note
NOTE: A wild card value may be used.		

4.2.1.2.4 DEACTIVATE-ACK

DEACTIVATE-ACK information flow shall be used to acknowledge a previously sent deactivation request.

The information flow shall be for the relationship rc and from FE2 to FE3. The flow shall also be applied for the relationship rf and rb and from FE2 to FE3 via FE4, if FE3 is in another TETRA network. FE2 shall send an acknowledgement for each requested TETRA identity. That shall be done in one or several information flows. DEACTIVATE-ACK information flow is described in table 8.

Table 8: The service elements within DEACTIVATE-ACK information flow

Service element	Type	Remarks
Authorized user	M	
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Result	M	

4.2.1.3 Interrogation

An authorized user shall be able to interrogate the SS-PPC definitions made to the system. The user A shall also be able to interrogate his own priorities. The interrogation shall be made to a single individual subscriber or to a range or a set of subscriber numbers. One interrogated subscriber number shall be an individual subscriber number or a group number.

4.2.1.3.1 INTERROGATE

INTERROGATE information flow shall be used to interrogate the defined SS-PPC priority value(s) for one TETRA identity or for a range or list of TETRA identities. The interrogating party shall be either an authorized user or a user A. User A is only authorized to interrogate its own SS-PPC definitions or definitions made to a group, that user A is a member of.

The information flow shall be applied for the relationship ra or rc and from FE1 or FE3 to FE2. The flow shall be used for the relationship rf/re and rb, and from FE1 or FE3 to FE2 via FE4, if FE1 or FE3 is in another TETRA system.

Table 9 lists the elements in the INTERROGATE information flow.

Table 9: The service elements within INTERROGATE information flow

Service element	Type	Remarks
Interrogating user	M	Authorized user/User A
Interrogated subscriber number(s)	M	Group or individual subscriber number(s)

4.2.1.3.2 INTERROGATE-ACK

INTERROGATE-ACK information flow shall be used to give a response for an SS-PPC interrogation. The response includes all defined call priority value(s) and the service types, if priorities are separately defined for those.

The information flow shall be applied for the relationship ra or rc and from FE2 to FE1 or to FE3. The flow shall be used for the relationship rb and rf/re, and from FE2 to FE1 or FE3 via FE4, if FE1 or FE3 is in another TETRA system.

The elements Service type and SS-PPC priority value shall be repeated in order to indicate different defined priority values to different services, if needed.

Table 10 lists the elements in the INTERROGATE-ACK information flow.

Table 10: The service elements within INTERROGATE-ACK information flow

Service element	Type	Remarks
Interrogating user	M	Authorized user/User A
Defined subscriber number(s)	M	Group or individual subscriber number(s)
Result for interrogation		Successful/Error indication
Activated/deactivated	C	note 1
Service type	C	note 2
SS-PPC priority value	C	note 2
Delivered to MS/LS units	M	
NOTE 1: The parameter shall be included only if separate activation/deactivation is supported in the system. NOTE 2: A wild card value may be used.		

4.2.1.4 Operation and invocation

The SS-PPC priority shall be invoked and operated for circuit mode switched services.

SS-PPC shall be invoked and operated in one of the following ways:

- if the calling party invokes SS-PPC with emergency priority, the SwMI (FE2) shall establish the service with the emergency priority;

- if the calling party invokes SS-PPC with a non-emergency pre-emptive priority, FE2 verifies and approves the priority and operates SS-PPC by using the pre-emptive value for the service.

FE2 shall indicate the applied priority to user A and user B(s).

FE2 should use the priority level requested by FE1, However, FE2 can change the requested call priority, if:

- the requested priority was not authorized;

- if the call extends to several TETRA systems, FE2 of each system shall be able to select the applied call priority in that system;

- as network option, if FE1 did not request any priority, FE2 may select the applied priority value;

- as operator option, FE2 may always change the requested priority, e.g. in special circumstances where some user groups are favoured for resource allocation.

If a calling party requests a service with emergency priority, FE2 shall not change the priority value.

4.2.1.4.1 Pre-emption

When an SS-PPC call is invoked, FE2 may pre-empt any resources for the SS-PPC call. FE2 shall pre-empt members engaged to other calls to join them to pre-emptive calls, if needed.

If a party is pre-empted from an individual call, FE2 shall disconnect the call. If a party is pre-empted from a group call, FE2 shall disconnect the pre-empted party from the call, but the group call shall continue.

However, optionally FE2 can pre-empt resources from a call without disconnecting it.

Services applying emergency priority should not be pre-empted.

The pre-emption shall take place in one of the two ways:

- the pre-empted party or parties are first given an impending pre-emption indication and pre-empted 0-10 seconds after that; or,

- the pre-empted party or parties are pre-empted immediately, and given a disconnection cause indicating pre-emption.

The impending pre-emption indication is an optional feature for the SwMI.

NOTE: The method to determine the time between the sending of impending pre-emption indication and the pre-emption is outside the scope of this ETS.

At the reception of the confirmation of service invocation, FE1 shall indicate the applied priority level to the user.

FE2 shall pre-empt a called party (FE5) from an ongoing call by sending him an SS-PPC call invocation with a higher SS-PPC value than the one of the ongoing call. If the ongoing call is not an SS-PPC call, FE5 shall join the invoked call. If the ongoing call is an SS-PPC call, FE5 shall compare the priorities and join the invoked call, if it has a higher SS-PPC priority. Optionally, the party may be sent a pre-emption indication before the SS-PPC call set-up indication.

If a one or more parties are pre-empted from an ongoing call so that the ongoing call shall continue, the parties of the ongoing call may be sent an information flow indicating the disconnection of the pre-empted party.

If there are multiple established calls, FE2 shall use the Call Retention Value (CRV) to determine which call the SS-PPC call should pre-empt.

NOTE: The network can use a different process to determine the priority for the allocation of resources.

4.2.1.4.2 Exceptional situations

It is possible, that FE2 cannot allocate resources for the SS-PPC call. FE2 shall either put the requested service in a queue or reject the service request. In case of group call, FE2 may also set-up the call partially and complete the set-up when the needed resources are available.

It is also possible, that FE2 cannot join all parties to the requested service, if one or more parties are engaged in calls with higher priority. FE2 may indicate to calling party all other group members, that all members have not joined the call.

4.2.1.4.3 PRIORITY1

Calling party shall use PRIORITY1 to request the pre-emptive priority for a call at call invocation.

The information flow shall be applied for the relationship ra and from FE1 to FE2. The flow shall be applied for the relationship re and rb and from FE1 to FE2 via FE4, if FE1 is in another TETRA system. PRIORITY1 information flow is described in table 11.

Table 11: The service elements within PRIORITY1 information flow

Service element	Type	Remarks
Calling party	M	
Called subscriber number	M	Group or individual subscriber number(s)
Requested pre-emptive priority	M	

4.2.1.4.4 PRIORITY2

The SwMI shall use PRIORITY2 to indicate the priority level of the invoked call. The information flow shall be sent to the calling and called parties.

The information flow shall be applied for the relationship ra and rd, and from FE2 to FE1 and to FE5. The flow shall also be applied for the relationship rh and from FE2 to FE2 (in different TETRA systems) if the SS-PPC operation extends to several TETRA system. PRIORITY2 information flow is described in table 12.

Invoked call priority in PRIORITY2 can have different values in different TETRA systems as each TETRA system can determine the value of the call priority applied in that system.

Table 12: The service elements within PRIORITY2 information flow

Service element	Type	Remarks
Receiving party	M	User A, User B
Called subscriber number	M	Group or individual subscriber number(s)
Call identifier	M	
Invoked call priority	M	Pre-emptive priority value

4.2.1.4.5 IMPENDING-PRE-EMPTION

The SwMI shall use IMPENDING-PRE-EMPTION to indicate the impending pre-emption. The information flow shall be sent to the pre-empted parties.

The information flow shall be applied for the relationship rh from FE2 to FE6. The flow shall also be applied for the relationship rh and from FE2 to FE2 (in different TETRA systems) if the SS-PPC operation extends to several TETRA systems. IMPENDING-PRE-EMPTION information flow is described in table 13.

Table 13: The service elements within IMPENDING-PRE-EMPTION information flow

Service element	Type	Remarks
Receiving party	M	User C, User B
Reference to the ongoing call	M	
Impending pre-emption indication	M	
Remaining time to pre-emption	O	

4.2.1.4.6 PRE-EMPTION

FE2 shall send PRE-EMPTION to indicate the pre-emption and the termination of the call. The information flow shall be sent to the pre-empted parties.

The information flow shall be applied for the relationship rh from FE2 to FE6. The flow shall also be applied for the relationship rh and from FE2 to FE2 (in different TETRA systems) if the SS-PPC operation extends to several TETRA systems. PRE-EMPTION information flow is described in table 14.

FE2 can replace Disconnection indication by queue indication, if FE6 is pre-empted from the call due to lack of resources.

Table 14: The service elements within PRE-EMPTION information flow

Service element	Type	Remarks
Receiving party	M	User C, User B
Reference to the ongoing call	M	
Pre-emption indication	M	
Disconnection indication	M	note
NOTE: Disconnection indication can be replaced by queue indication.		

4.2.1.4.7 SUBSCRIBER-PRE-EMPTED

Optionally, if a party is pre-empted from a call, FE2 shall send SUBSCRIBER- PRE-EMPTED indication to other participants of the call to indicate the disconnection of the pre-empted party from the ongoing call. If the indication is sent, it shall be sent to some or all participants of the call.

SUBSCRIBER-PRE-EMPTED indication shall be applied for the relationships ra and rd, and from FE2 to FE1 and to FE5. The flow shall be applied for the relationship rh and between two FE2s located in different TETRA systems, if participants of the call (FE1, FE5(s)) are located in different TETRA systems.

SUBSCRIBER-PRE-EMPTED information flow is described in table 15.

Table 15: The service elements within SUBSCRIBER- PRE-EMPTED information flow

Service element	Type	Remarks
Receiving party	M	Group, Individual subscriber
Pre-empted party number	C	note
One or more pre-empted parties	C	note
NOTE: The information flow included either the pre-empted party subscriber number, or the information that one or more parties have been pre-empted from the call without giving the pre-empted party(ies) subscriber identity(ies).		

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 apply for SS-PPC.

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

The SS-PPC information flows for definition, activation, deactivation and interrogation between all entities should be sent with U/D-FACILITY PDU or any Circuit Mode Control Entity (CMCE) service PDU that is able to include SS-FACILITY element.

The pre-emptive priority shall be included in any circuit mode service information flow that contains the parameter "Call Priority" as defined in ETS 300 392-2 [1] clause 14. In a group call, the polling to find out if a subscriber is present in the call shall be done with D/U-INFO.

4.3 Information flow sequences

Signalling procedures shall be provided in support of the information flow sequences shown below. 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 the figures, the SS-PPC 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 a column representing an SS-PPC FE, the numbers refer to FE actions listed in subclauses 4.3.2 and 4.3.7.

The information flow sequences for the SS-PPC call in this sub clause describe the SS-PPC specific behaviour for the basic services. These sequences complement the basic service behaviour described in ETS 300 392-2 [1] clauses 11 and 14.

No timers are used in the figures.

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

4.3.1 Definition of SS-PPC when definition is sent to user A

Figure 4 shows the information flow sequence for normal operation of the SS-PPC definition when the definition is also sent to user A and when all parties are in one TETRA system.

The DEFINE-USER/DEFINE-USER-ACK information flows are optional. If sent, in case of SS-PPC definition for a group, the information flow DEFINE-USER/DEFINE-USER-ACK should appear for every member of the group.

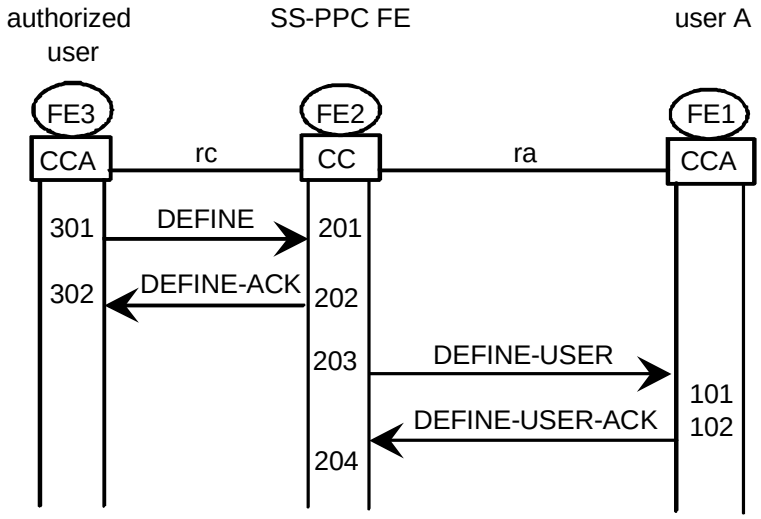


Figure 4: Successful definition of SS-PPC

4.3.1.1 Definition when authorized user is in visited system

Figure 5 shows the information flow sequence for normal operation of the SS-PPC definition when the definition is also sent to user A. The authorized user is in visited system and user A is in the home system.

The DEFINE-USER/DEFINE-USER-ACK information flows are optional. If sent, in case of SS-PPC definition for a group, the information flow DEFINE-USER/DEFINE-USER-ACK should appear for every member of the group.

After the SS-PPC definition has been concluded, the home system of the defined subscriber identity may send the SS-PPC definitions applying the Mobility management functions to other TETRA systems (the visited system, if any user A is located in the visited system). If this is done, the visited system should use the SS-PPC definitions for determining the priority for calls, if invoked for the defined subscriber identity. However, this is outside the scope of this ETS.

NOTE: FE4 in the visited system should not keep any SS-PPC definitions as part of the generic function tasks when delivering the SS-PPC definitions from the visited system to the home system on authorized user's behalf (even if the authorized user is located in the visited system when he makes the definition, activation or deactivation).

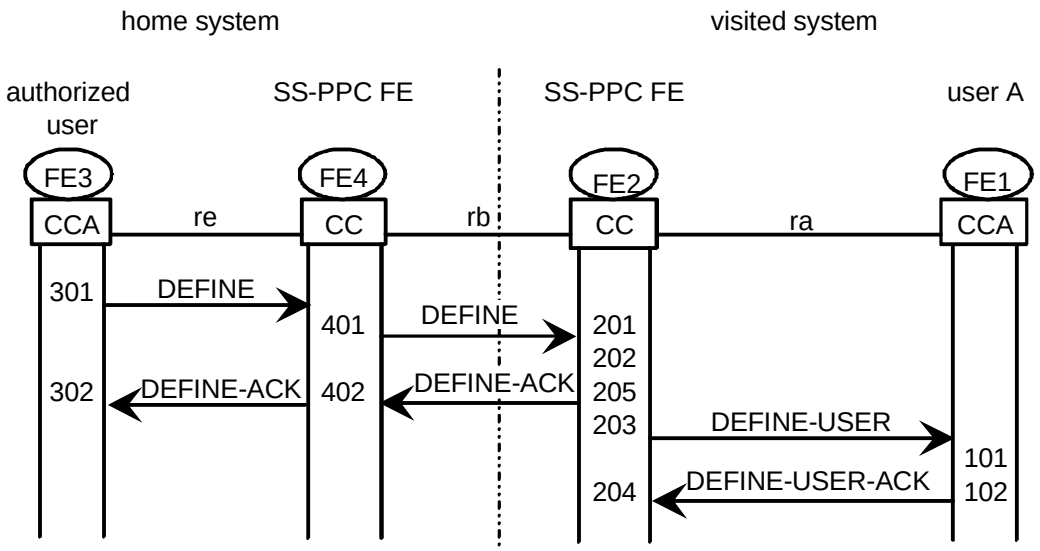


Figure 5: Successful definition of SS-PPC when authorized user is in visited system

4.3.1.2 Definition when user A is in visited system

Figure 6 shows the information flow sequence for definition of SS-PPC when the definition is also sent to user A. User A is in the visited system and authorized user is in the home system.

The DEFINE-USER/DEFINE-USER-ACK information flows are optional. If sent, in case of SS-PPC definition for a group, the information flow DEFINE-USER/DEFINE-USER-ACK should appear for every member of the group.

After the SS-PPC definition has been concluded, the home system of the defined subscriber identity may send the SS-PPC definitions applying the Mobility management functions to other Tetra systems (the visited system, if any user A is located in the visited system). If this is done, the visited system shall use the SS-PPC definitions for determining the priority for calls, if invoked for the defined subscriber identity. However, this is outside the scope of this ETS.

NOTE : FE4 in the visited system should not keep any SS-PPC definitions as part of the generic function tasks when delivering an SS-PPC definition from the home system to user A, when user A is located in the visited system. If the SS-PPC definitions are updated on FE1's behalf to the visited system, the visited system should use the definitions to determine the priorities when SS-PPC is operated for services.

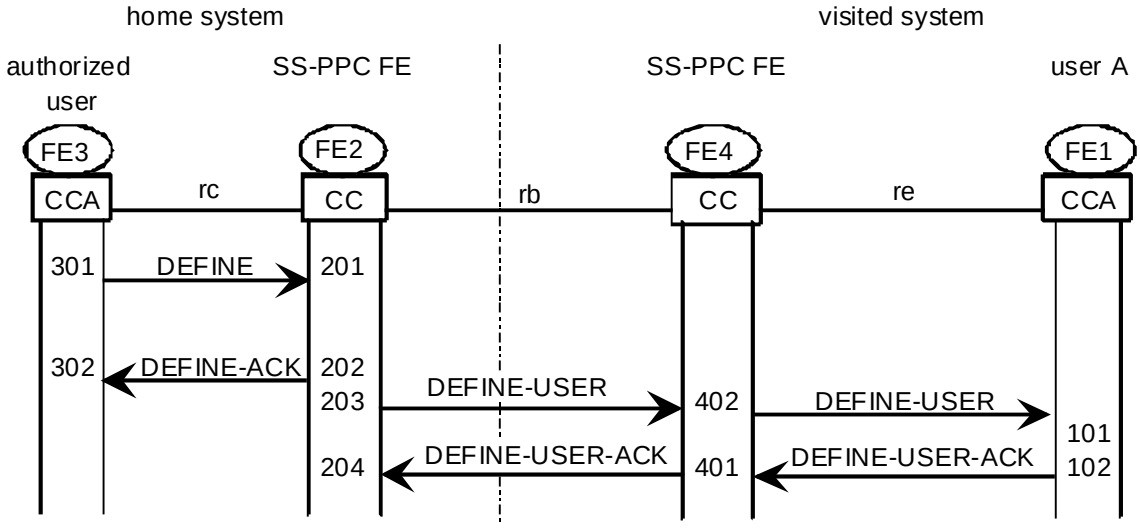


Figure 6: Successful definition of SS-PPC when user B is in visited system

4.3.1.3 Interrogation

Figure 7 shows the information flow sequence for normal operation of the SS-PPC interrogation when authorized user is in home system. If the 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.

FE3 may be replaced by FE1.

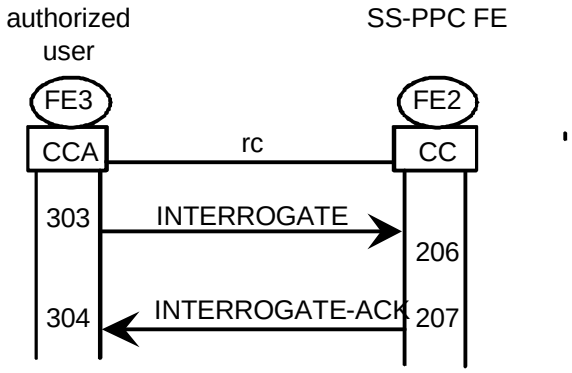


Figure 7: Interrogation of SS-PPC

4.3.1.4 Activation

Figure 8 shows the information flow sequence for normal operation of the SS-PPC activation when authorized user is in home system. If the authorized user requests the activation in another TETRA system, the same information flow shall appear also between FE2 and FE4 in the relationship rb.

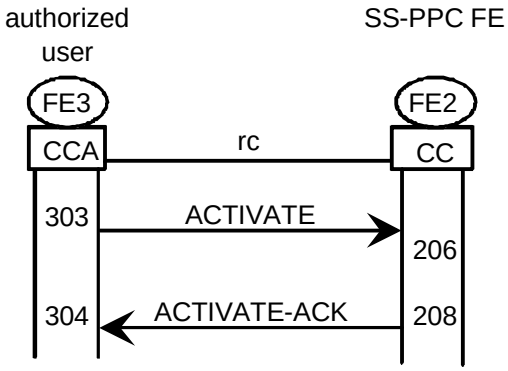


Figure 8: Activation of SS-PPC

4.3.1.5 Deactivation

As activation, see subclause 4.2.4.4. However, the ACTIVATE and ACTIVATE-ACK information flows shall be replaced by DEACTIVATE and DEACTIVATE-ACK respectively.

4.3.2 FE actions

4.3.2.1 FE actions of FE1

101 Upon reception of an SS-PPC definition from FE2, FE1 optionally saves the definition to the database of the MS/LS, if FE1 doesn't find any reason for rejection.

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

4.3.2.2 FE actions of FE2

201 Upon reception of an SS-PPC definition from FE3, FE2 should verify that the definition request is authorized, its parameters are valid and their values are in allowed range.
202 FE2 should acknowledge the definition request to FE3 positively, if the service request was accepted by FE2. If the service request failed for any reason, FE2 should return a negative acknowledgement to FE3.
203 As an operation option, FE2 may locate the LS- or MS-subscriber(s) and send them the definition request. FE2 may save the definition data and send it later, if FE1 is not reachable for the moment.

NOTE 1: If the user A has migrated to another TETRA system, the step 205 is also made in order to deliver the DEFINE-USER information flow to FE1.

204 FE2 receives the acknowledgement(s) from the FE1(s) to DEFINE-USER request(s), if acknowledgement to the definition was requested.

NOTE 2: If the SS-PPC definition is made for a group, the actions 203 and 204 should be carried for each group member, if downloading to group members were requested.

205 FE2 should add the routing address of FE4 to the SS-PPC information flow.
206 Upon reception of the SS-PPC interrogation, activation or deactivation from FE3, FE2 should verify that the request is authorized, its parameters valid and their values in the allowed range.
207 If the interrogation request is valid and authorized, FE2 should fetch the interrogation data and return the response to FE3. If the request is not valid or not authorized FE2 should send an error indication to FE3.
208 If the activation or deactivation request is valid and authorized, FE2 acknowledge the activation or deactivation, respectively, to FE3. If the request is not valid or not authorized FE2 should send an error indication to FE3.

4.3.2.3 FE actions of FE3

301 Upon reception of an SS-PPC 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 Upon reception of the definition acknowledgement, FE3 shall indicate it to the user.
303 Upon reception of an SS-PPC interrogation, activation or deactivation 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 sends it to FE2. If the request is barred locally, FE3 shall indicate the error to the user.
304 Upon reception of the response or the acknowledgement, FE3 shall indicate it to the user.

4.3.2.4 FE actions of FE4

401 FE4 should add the routing address of FE2 to the SS-PPC information flow.
402 FE4 should locate the FE3/FE1 and send the information to it.

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

4.3.3 Operation of SS-PPC with pre-emption due to lack of resources

4.3.3.1 Operation of SS-PPC for individual call with pre-emption

Figure 9 shows the information flow sequence for the SS-PPC operation applied in an individual call within one TETRA system. User A invokes an individual call (on/off hook signalling) with the SS-PPC priority to user B. The SS-PPC call causes the pre-emption of an ongoing individual call taking place between the user Cs. Optionally, FE2 may send the impending pre-emption indication to user Cs, and shall send the pre-emption indication with the D-RELEASE information flow to user Cs. FE2 indicates the SS-PPC priority value to user A and user B in D-CONNECT and D-SETUP information flows, respectively.

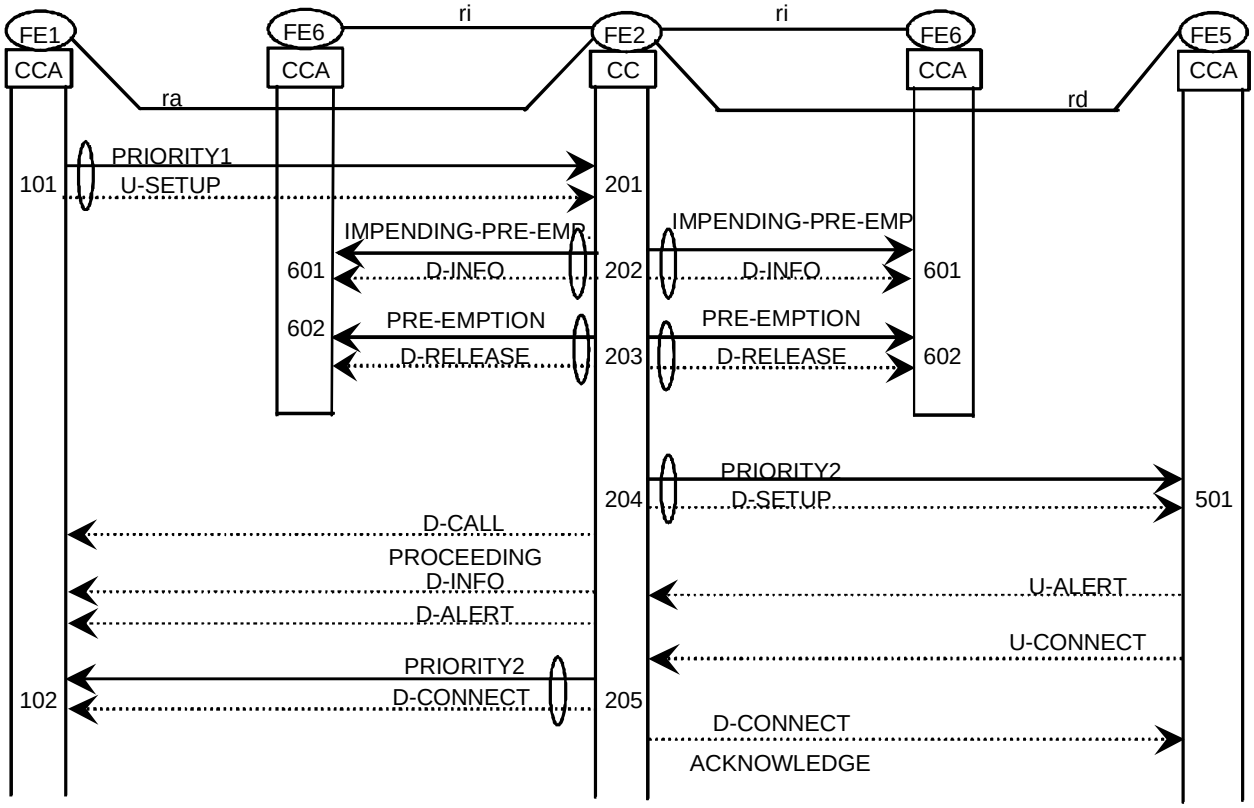
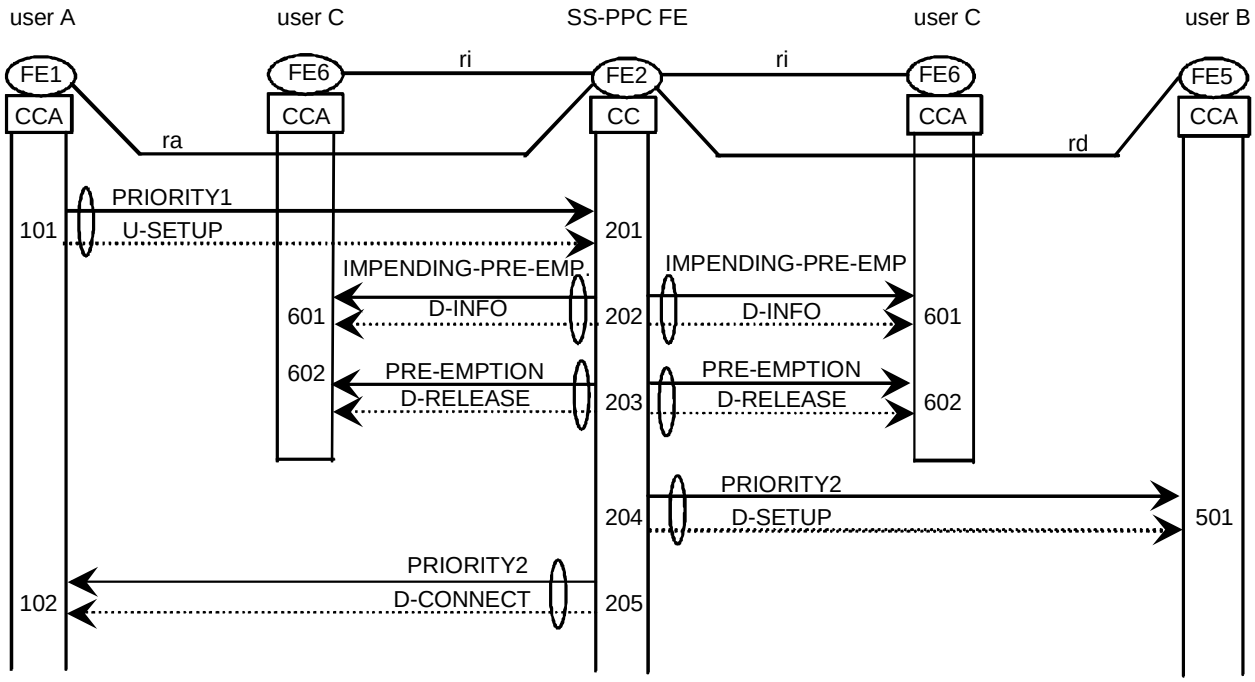


Figure 9: Operation of SS-PPC for an individual call within one TETRA system

4.3.3.2 Operation of SS-PPC for a group call with a pre-emption

Figure 9 shows the information flow sequence for the SS-PPC operation applied in a group call within one TETRA system. User A invokes a group call with the SS-PPC priority. User B is a member of the group. The SS-PPC call causes the pre-emption of an ongoing individual call taking place between the user Cs. Optionally, FE2 may send the impending pre-emption indication to user Cs, and shall send the pre-emption indication with the D-RELEASE information flow to user Cs. FE2 indicates the SS-PPC priority value to user A and user B(s) in D-CONNECT and D-SETUP information flows, respectively.



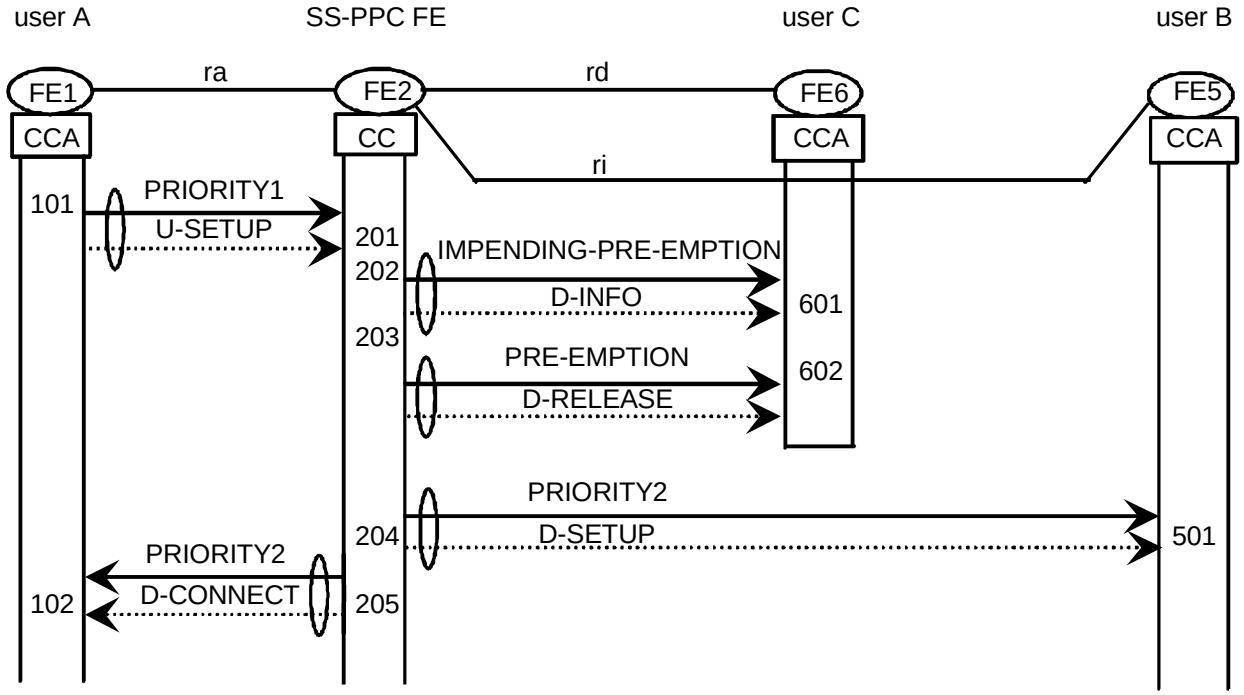
NOTE: Only one user B is shown in the figure.

Figure 10: Operation of SS-PPC for a group call within one TETRA system

4.3.3.2.1 Operation of SS-PPC with a pre-empted party participating a group call

Figure 11 shows the information flow sequence for the SS-PPC operation applied in a call. User A invokes a group call with the SS-PPC priority. User B is member of the group. The invoked SS-PPC call causes the pre-emption of resources used by user C. User C participates another group call.

User A invokes SS-PPC by requesting a pre-emptive priority value with a service invocation. Optionally, FE2 may send the impending pre-emption indication to user Cs, and shall send the pre-emption indication with the D-RELEASE information flow to user Cs. FE2 indicates the SS-PPC priority value to user A and user B(s) in D-CONNECT and D-SETUP information flows, respectively.

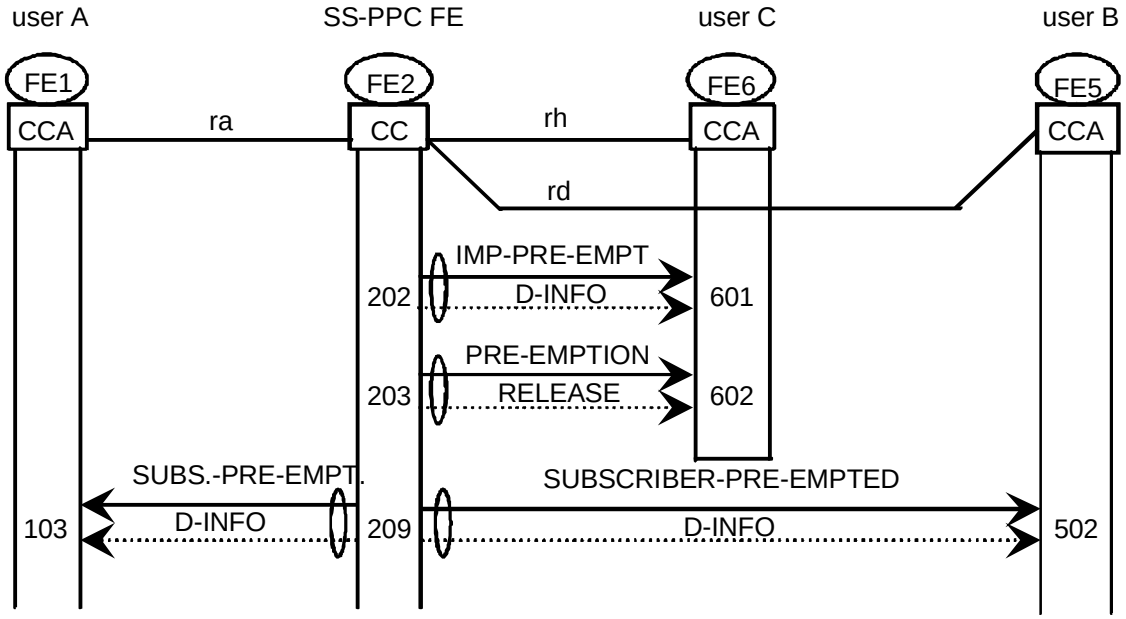


NOTE: Only one user B is shown in the figure.

Figure 11: Operation of SS-PPC for a call within one TETRA system

4.3.3.3 Operation of SS-PPC with a pre-empted party in a group call

Figure 12 shows the information flow sequence for the SS-PPC pre-emption. User A, user B and user C participate a group call when an SS-PPC call is invoked. The invoked SS-PPC call causes the pre-emption of user C. Optionally, FE2 may send the impending pre-emption indication to user C, and shall send the pre-emption indication with the D-RELEASE information flow to user C. The other parties of the ongoing group call (FE1, FE5s) are informed of the pre-emption. All parties are within one TETRA system.



NOTE: Only one user B is shown in the figure.

Figure 12: Operation of SS-PPC with a pre-empted party in a group call

4.3.4 Operation of SS-PPC with a called party that is pre-empted from an ongoing call

4.3.4.1 SS-PPC call is an individual call

A called party, that is engaged in a call, shall be pre-empted to an individual SS-PPC call by sending him the SS-PPC call set-up. When the called party receives the set-up, it shall indicate the SS-PPC set-up and priority to the user. If the user accepts the call, the MS/LS shall move to the indicated traffic channel and complete the call set-up as indicated in ETS 300 392-2 [1] clause 14. If the called party rejects the SS-PPC call, the previous call shall continue, FE2 shall terminate and clear the SS-PPC call set-up.

If the previous call was an individual call and if the called party accepts the SS-PPC call, FE2 shall release the previous call, including the other party of the individual call.

If the previous call was a group call, FE2 may send the SUBSCRIBER-PRE-EMPTED indication to the previous call in order to indicate that the party has left the call.

Optionally, FE2 may send the impending pre-emption indication to the called party before the SS-PPC call set-up.

4.3.4.2 SS-PPC call is a group call

A called party, that is engaged in a call, shall be pre-empted to an SS-PPC group call by sending him the SS-PPC call set-up. When the called party receives the set-up, it shall indicate the SS-PPC set-up and priority to the user.

If the previous call is an individual call and if the user moves to the SS-PPC call, the MS/LS shall move to the indicated traffic channel and complete the call set-up locally in the MS/LS as indicated in ETS 300 392-2 [1] clause 14. The called party shall disconnect the previous call by sending a disconnection indication to FE2. FE2 responds to the disconnection by sending a release indication. The disconnection of the previous call should take place after joining the SS-PPC call in the traffic channel of the SS-PPC call in order to ascertain, that the called party does not move to the control channel and does not join another call.

If the previous call was a group call, FE2 may send the SUBSCRIBER-PRE-EMPTED indication to the previous call in order to indicate that the party has left the call. Before sending the SUBSCRIBER-PRE-EMPTED indication, FE2 may poll the called subscriber in the previous call to find out, if he has left from the call.

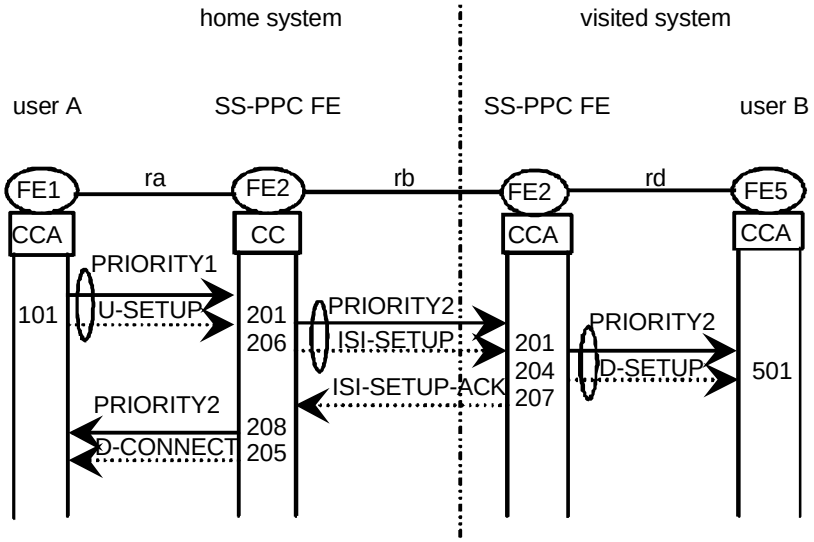
If the called party does not join the SS-PPC call, he shall continue to participate the previous call, but FE2 shall complete the SS-PPC call set-up.

4.3.5 Operation for SS-PPC call initiated over ISI

Figure 13 shows the information flow sequence for the SS-PPC operation in a call initiated over the ISI. The functionality is shown for group call in figure 13. However, the SS-PPC priority may be used for individual calls extending over ISI.

User A in the visited system requests the priority and FE2 in the home system verifies the priority for the call and indicates the priority to user B(s) in the home system and to FE2 in the visited system. FE2 may change the priority applied for the call in system.

FE2 indicates the priority to user A. FE2 also indicates the priority to user B. In case of group call, there are several user B(s), however, only one user B is shown in the figure.



NOTE: The SS-PPC call may cause pre-emption in the home system or in the visited system or in both systems.

Figure 13: Operation of SS-PPC for group call initiated over ISI

4.3.6 Subscriber pre-empted in a group call that extends over ISI

Figure 14 shows the information flow sequence for pre-emption of a subscriber in a group call that extends over ISI.

FE2 pre-empts FE6 which is participating a group call. FE2 indicates to the other parties of the call (FE1, FE5s) that a subscriber has been pre-empted. FE5 is located in the visited system.

NOTE 1: Only one FE5 is shown in the scenario.

NOTE 2: The sending of the impending pre-emption indication is optional.

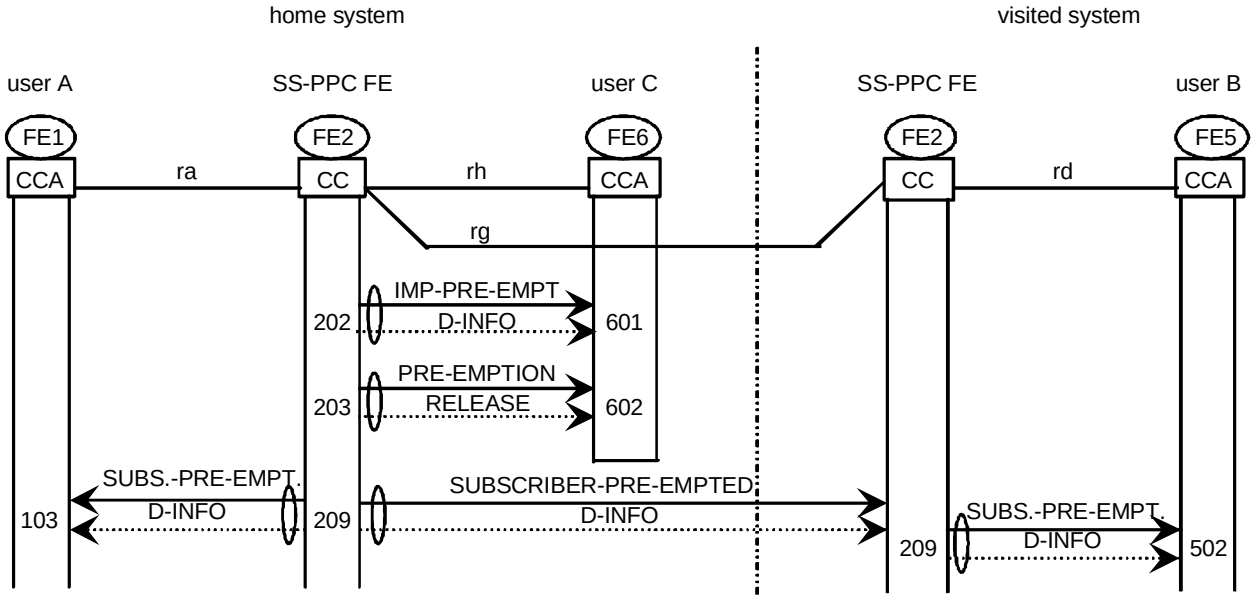


Figure 14: Subscriber pre-empted in a group call that extends over ISI.

4.3.7 FE actions

4.3.7.1 FE actions of FE1

101 Upon reception of an SS-PPC invocation (requested priority level) with a service request, FE1 shall send the request to FE2. If the SS-PPC has been saved to the MS/LS unit, FE1 shall verify that the requested priority level is allowed for the service and if the level is not allowed, replace it with an allowed level.
102 Upon reception of the service invocation confirmation, FE1 shall indicate the call priority to the user.
103 Upon reception of an indication that subscriber has been pre-empted, FE1 should indicate that to the user.

4.3.7.2 FE actions of FE2

201 Upon reception of the service request including an SS-PPC invocation, FE2 shall verify and/or assign the call priority that will be applied for the service.

NOTE: Normally, the calling party invokes SS-PPC with the service invocation and FE2 only verifies that the requested value is valid.

202 FE2 shall send the impending pre-emption indication, if used, to the pre-empted parties, if the pre-emption is needed.
203 FE2 shall send the pre-emption indication with service information flow to pre-empted parties.
204 Upon reception of the service invocation, FE2 shall indicate the applied priority level to the called parties.
205 Upon reception of the service invocation, FE2 shall confirm the SS-PPC invocation and indicate the applied priority level to the calling party.
206 If the service extends over ISI, FE2 shall send the SS-PPC invocation with the service request to FE2 in other TETRA system.
207 As part of the service operation over ISI, FE2 shall send the confirmation of the invoked service.
208 As part of the service operation over ISI, FE2 shall receive the confirmation of the invoked service.
209 FE2 may send the indication of a pre-empted party to the participants of the call (from which the party has been pre-empted).

4.3.7.3 FE actions of FE5

501 Upon reception of the service invocation, FE5 and CCA shall receive the call priority value and shall move to the invoked call. If the called party is engaged in an ongoing call, FE2 shall compare the SS-PPC priorities of the calls, and shall join the invoked call, if it has a higher SS-PPC priority. FE5 shall indicate the call priority to the user.
502 Upon reception of an indication that subscriber has been pre-empted, FE1 should indicate that to the user.

4.3.7.4 FE actions of FE6

601 Upon reception of the impending pre-emption indication, FE6 shall indicate it to the user. The impending pre-emption indication should be indicated to the user.
602 Upon reception of the pre-emption indication, FE6 shall indicate it to the user and act upon the received service request.

4.4 Allocation of FEs to physical equipment

The allocation of FEs to physical equipment is described in table 9.

Table 16: Allocation of FEs to physical equipment

FE/PE	SwMI	LS	MS
FE1	-	+	+
FE2	+	-	-
FE3	-	+	+
FE4	+	-	-
FE5	-	+	+
FE6	-	+	+
Key:	+ = applicable - = not applicable		

4.5 Inter-working considerations

SS-PPC should extend to several TETRA networks over ISI, if the networks support SS-PPC. The requirements for the management part for the visited system shall be: deliver and receive SS-PPC definition information over the ISI and transfer the information to user A or authorized user.

The requirements for the operational part of SS-PPC include the capability to support the functions of FE2 in call set-up.

History

Document history			
October 1996	Public Enquiry	PE 116:	1996-10-21 to 1997-02-14