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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) ETSI Project of the European Telecommunications Standards Institute (ETSI), and is now submitted for the One-step Approval Procedure 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: "Interworking at the Inter-System Interface (ISI)";
- Part 4: "Gateways basic operation";
- Part 5: "Peripheral Equipment Interface (PEI)";
- Part 6: "Line connected Station (LS)";
- Part 7: "Security";
- Part 8: "Network management services";
- Part 9: "General requirements for supplementary services";
- Part 10: "Supplementary services stage 1";**
- Part 11: "Supplementary services stage 2";
- Part 12: "Supplementary services stage 3";
- Part 13: "SDL model of the Air Interface (AI)";
- Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

<b>Proposed transposition dates</b>	
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 ETS specifies the supplementary services Call Forwarding Unconditional (CFU), Call Forwarding Busy (CFB), Call Forwarding on No Reply (CFNRy) and Call Forwarding on Not Reachable (CFNRc) which are applicable to various basic services supported by TETRA SwMIs. Basic services are specified in ETS 300 392-2 [4].

SS-CFU, SS-CFB, SS-CFNRy and SS-CFNRc are supplementary services which apply during call establishment providing a forwarding of an incoming call to an other destination than the original destination defined by the calling user under different conditions (busy, no reply or not reachable) or under no condition (unconditional).

Supplementary services specifications are produced in three stages, according to the method described in ITU-T Recommendation I.210 [2]. The present document contains the stage 1 specifications of SS-CFU, SS-CFB, SS-CFNRy and SS-CFNRc. The stage 1 descriptions specify the supplementary services as seen by users of networks.

This draft ETS is applicable to circuit mode TETRA V+D tele-services and bearer services. This draft ETS is also applicable to TETRA Short Data Service (SDS).

Man Machine Interfaces and charging principles are outside the scope of this draft ETS.

Selective Call Forwarding is outside the scope of this ETS.

NOTE 1: Selective Call Forwarding may be considered for further improvements of TETRA SS-CF at a later stage.

This second edition of this ETS was presented as a delta document to the first edition of ECMA-173 [1]. This second edition has been redrafted based on the latest published text of ECMA-173 [1] as a self contained document so as to be more readable. Additions to ECMA-173 [1] have been made to take into account particular TETRA specifics such as group calls and to include user requirements and situations not addressed in ECMA-173 [1].

NOTE 2: Contrary to ECMA-173 [1], this ETS does not specify SS-CD (Call Deflection) which is not presently supported by TETRA.

NOTE 3: Contrary to ECMA-173 [1], this draft ETS distinguishes between No Reply and Not Reachable because of the radio nature of the TETRA links.

This Standard specifies also the Forwarding Counter (FC), which is applicable to various basic services supported by TETRA Networks. Basic services are specified in ETS 300 392-2 [4].

FC counts the number of forwarding that a call has been forwarded and allows to limit the number of forwarding that a call request may encounter during call establishment, e.g. to protect the network against indefinite looping. There is no user involved in the provision or operation of forwarding counter.

## 2 Normative references

This draft ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. 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] ECMA-173 (1997): "Private Integrated Services Network (PISN) - Specification, Functional Model and Information Flows - Call Diversion Supplementary Services (CFSD)".

[2] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".

- [3] ITU-T Recommendation Z.100 (1993): "CCITT Specification and description language (SDL)".
- [4] ETS 300 392-2 (1995): "Terrestrial European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [5] CCITT Recommendation Q.9 (1988): "Vocabulary of switching and signalling terms".

### 3 Definitions, symbols and abbreviations

#### 3.1 Definitions

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

**Additional network feature:** additional network feature (ANF) is a capability, over and above that of a basic service, provided by a SwMI, but not directly to a SwMI user.

**Authorized user:** user who is responsible for the definition, activation and deactivation of the service. The authorized user may also interrogate the service.

**Affected user:** user who is subject to the operation.

**Busy:** TETRA destination is considered to be busy if either a "network determined user busy" or a "user determined user busy" condition exists.

**Call, basic call:** call or basic call is an instance of the use of a basic service.

**Connected number:** number of the user that answers (User C).

**Forwarded-to number:** forwarded-to number is the number to which a call is forwarded.

**Forwarded-to user:** forwarded-to user is the user to which a call is forwarded.

**Forwarding:** forwarding is the redirection of a call, on behalf of a called user and prior to connect, to a number different from the number of that called user.

**Forwarding cause:** forwarding cause contains the reason for the forwarding: CFU, CFB, CFNRy, CFNRc.

**Forwarding counter:** counter for the number of forwarding involved in a call or signalling connection during the establishment phase.

**Forwarding number:** forwarding number is the number of the served user.

**Forwarding user:** user for which the call forwarding is invoked; it may be the called user first and then any of the successive forwarded-to users (see also last forwarding user).

**Forward switching:** network routing algorithm which performs the forwarding by joining together the first connection from User A's node to User B's node and a second, new connection from User B's node to User C's node.

**Last forwarding user:** last forwarding user is the served user from the point of view of the forwarded-to user for a particular stage of call forwarding. In the case of a call subject to a single stage of call forwarding, User B is the last forwarding user from the point of view of User C. In the case of a call subject to multiple stages of call forwarding, user B1 is the last forwarding user from the point of view of user B2, user B2 is the last forwarding user from the point of view of user B3, etc. The served user for the final stage of call forwarding is the last forwarding user from the point of view of User C.

**Line Station (LS):** physical grouping that contains all the fixed equipment that is used to obtain TETRA services through a line.

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

**Original called number:** original called number is the number of User B (in case of multiple call forwarding user B1).

**Original called user:** original called user is the first served user of a call which is subject to one or more stages of call forwarding, i.e. User B or B1.

**Partial re-routeing:** network routeing algorithm which performs the call forwarding by replacing a particular part of the connection from User A's node to User B's node by another connection from User A's node to User C's node.

**Signalling connection:** connection used to exchange information between peer supplementary service protocol control entities independently of a basic call.

**Supplementary service:** any service provided by a network in addition to its basic service or services (defined in CCITT Recommendation Q.9 [5]). A supplementary service modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a customer as a stand alone service. It must be offered together with or in association with a basic telecommunication service (except from ITU-T Recommendation I.210 [2]).

**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.

**SwMI number:** SwMI number is a number belonging to a SwMI numbering plan.

**Re-routeing:** network routeing algorithm which performs the call forwarding by replacing the connection from User A's node to User B's node by another connection from User A's node to User C's node.

**Served user:** served user is the user of a particular SwMI number who is requesting that calls to his number be forwarded. This user may also be referred to as the forwarding user or the called user.

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

**Served user:** user for whom the supplementary service is invoked.

**User:** entity using the services of a telecommunications network via an externally accessible service access point. Unless otherwise noted, the word user is to be understood as individual or group.

NOTE 1: A user may be a person or an application process.

**User application:** application process which acts as a user (see definition of user just above).

**User A:** user A is the calling user of a call which is subject to call forwarding.

**User B:** user B is the served (forwarding) user of a call which is subject to call forwarding.

**User B1, user B2, user B3, etc.:** these are the served (forwarding) users of a call which are subject to multiple stages of forwarding. B1 is the first served user, B2 is the second served user, B3 is the third served user, etc.

NOTE 2: B2 is also the forwarded-to user with respect to the first stage of call forwarding, B3 is also the forwarded-to user with respect to the second stage of call forwarding, etc.

**User C:** user C is the forwarded-to user with respect to the final stage of call forwarding.

### 3.2 Symbols

For the purposes of this ETS, there are no additional symbols excepted the symbols used in the SDL representation (ITU-T Recommendation Z.100 [3]).

### 3.3 Abbreviations

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

ANF	Additional Network Feature
CD	Call Deflection
FC	Forwarding Counter
GTSI	Group TETRA Subscriber Identity
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
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
TE	Terminal Equipment
TETRA	Terrestrial European Trunked Radio
V+D	Voice Plus Data

#### 3.3.1 Supplementary service abbreviations

BIC	Barring of Incoming Calls
BOC	Barring of Outgoing Calls
CAD	Call Authorized by Dispatcher
CCBS	Call Completion to Busy Subscriber (TETRA)
CCNR	Call Completion on No Reply (TETRA)
CF	Call Forwarding
CFB	Call Forwarding on Busy
CFNR	Call Forwarding on No Reply (generic for both CFNRy and CFNRc)
CFNRc	Call Forwarding on Not Reachable
CFNRy	Call Forwarding on No Reply
CFU	Call Forwarding Unconditional
CLIP	Calling Line Identification Presentation
CLIR	Calling/Connected Line Identification Restriction
COLP	COnnected Line Identification Presentation
COLR	COnnected Line Identification Restriction
CR	Call Report
CW	Call Waiting
DL	Discreet Listening
IC	Include Call
PPC	Pre-emptive Priority Call
SNA	Short Number Addressing

## 4 SS-CF Generic Specification

This generic specification regroups all elements common to the four Call Forwarding procedures (CFU, CFB, CFNRy and CFNRc). Each call forwarding procedure has then its own dedicated part. SS-CFU for SDS is described in another specific part.

FC shall be invoked in conjunction with a call forwarding request when it is desired to limit the number of forwarding that the call can encounter. The maximum number of forwarding that the call can encounter is network dependent, in the range 1 to 31.

## 4.1 Description

### 4.1.1 General description

SS-CF enables a served user to have the network redirect, to either another ITSI or to another GTSI, calls which are addressed to the served user's ITSI/GTSI/External Number. SS-CF may operate on all calls or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CF.

SS-CF is provided on a per ITSI/GTSI/External Number basis.

The maximum number of forwarding for a single call is a network implementation option. When counting the number of forwarding, all types of forwarding shall be included.

NOTE 1: Not seen to the user, the mechanism of the Forwarding Counter allows to count the number of forwarding of the call resource and of the signaling connection.

NOTE 2: The mechanism of the Transit Counter is separate but similar to the Forwarding Counter mechanism.

Call forwarding of an individual call may be either to an ITSI or to a GTSI; individual and group calls may be forwarded to either an ITSI or a GTSI (i.e. the Communication Type as defined in ETS 300 392-2 [4] subclause 14.8.2 may change due to forwarding). In the case of the set-up of a group call, the invocation of SS-CF by an individual member of the group has no effect on the group call set-up and the group call shall not be forwarded to a non member of the group.

NOTE 3: As a result of call forwarding, the original TETRA call may be forwarded to an external number.

### 4.1.2 Applicability

SS-CF is applicable to all basic TETRA V+D circuit mode services as defined in subclause 11.3.4 of ETS 300 392-2 [4] (speech and data).

FC is applicable to all basic services defined in ETS 300 392-2 [4].

## 4.2 Procedures

### 4.2.1 Provision/Withdrawal

Provision and withdrawal of SS-CF shall be by pre-arrangement with the service provider. SS-CF subscription shall be on a per ITSI/GTSI/External Number basis. For each ITSI/GTSI/External Number, the supplementary service may be subscribed to collectively for all basic services subscribed to at that ITSI/GTSI/External Number or for only some of the basic services subscribed to at that ITSI/GTSI/External Number.

The subscription options and values offered by the originating SwMI are an implementation matter. A stage 3 standard shall support the options and values specified in table 1. A SwMI may offer less options and values than those specified in table 1.

Subscription options apply separately to each basic service subscribed to on each ITSI/GTSI/External Number. For each subscription option only one value is to be selected. Different subscription options may be applied to different services for the same ITSI/GTSI/External Number, e.g. SS-CF for Voice may have different subscription option than SS-CF for Data for the same ITSI/GTSI/External Number. Subscription options for one call forwarding supplementary service may be different from corresponding subscription options for another call forwarding supplementary services for the same ITSI/GTSI/External Number.

Any forwarded-to user shall be able to deactivate selectively call forwarding for which that user is a forwarded-to user; this deactivation shall be possible only for the services and the call forwarding procedures that affect the forwarded-to user.

Contrary to ECMA-173 [1], in the case of TETRA, the served user does not obtain an indication that SS-CF is currently activated when placing an outgoing call and this is not a subscription option.

Contrary to ECMA-173 [1], the served user/forwarding user does not receive notification that a call has been forwarded; this applies also to all the intermediate served users/forwarding users.

**Table 1: Subscription options**

<b>Subscription Options</b>	<b>Value</b>
Permanent activation	- Yes - No
Calling user receives notification that call has been forwarded	-Yes without forwarded-to ITSI/GTSI/External Number (note)
Served user releases his ITSI/GTSI/External Number to forwarded-to user	- No - Yes
NOTE: For TETRA, not actually a subscription option.	

FC shall be generally available for all calls that involve multiple call forwarding.

NOTE: "Local" as well as "remote" needs to be counted; local calls are within a SwMI; local calls may encounter call forwarding and need to be accounted for as well.

**4.2.2 Normal procedures**

**4.2.2.1 Activation/deactivation/definition/registration/interrogation**

**4.2.2.1.1 Activation/deactivation**

Within the TETRA network environment, the activation upon definition shall be used.

SS-CF may be either permanently activated or activated/deactivated under user control. If activation/deactivation is under user control, the SwMI may provide for activation/deactivation by any authorized user (served user or not).

In the case of SS-CF involving a served user being a served group, SS-CF may be permanently activated for that group GTSI or may be activated/deactivated by an authorized user member or not of the group. A member of a group shall not be able to activate/deactivate SS-CF for the group he is member of unless he is an authorized user.

In case there is only one authorized user, it shall be the served user; in other cases, the other authorized users are different from the served user and the served user may have limited authorized user capability. Any authorized user may activate and/or deactivate SS-CF for the served user.

NOTE 1: Criteria for attributions of authorized user status shall be implementation dependent (e.g. dispatchers may be authorized).

Any authorized user shall be able to activate SS-CF separately for each basic service for which SS-CF is subscribed to and thereby request a different forwarded-to ITSI/GTSI/External Number for each basic service for which SS-CF is subscribed to; any authorized user shall also be able to activate SS-CF for all basic services for which SS-CF is subscribed to (in which case a single ITSI/GTSI/External Number shall be used as forwarded-to number for all basic services).

Any authorized user may activate SS-CF at the served user such that the activating (e.g. authorized user) user becomes the forwarded-to user. The served user (and only the served user) shall be able to enable and to disable authorized user activation/deactivation. The intended forwarded-to user who is also authorized user shall be able to activate SS-CF regardless of whether SS-CF is already active or not. The served user may disable an authorized user activation at any time.

Any forwarded-to user shall be able to become an authorized user for the deactivation of SS-CF for the basic services and the forwarding procedures for which this user is defined as a forwarded-to user. The served user shall not be able to disable that deactivation capability by the forwarded-to user. The authorized forwarded-to user may deactivate SS-CF at the served user. This shall not be dependent on whether the served user has enabled authorized user activation. The forwarded-to user may be defined as a temporary authorized user; the forwarded-to user shall lose this authorized user capability as soon as SS-CF is deactivated in this way, and shall not regain the capability if SS-CF is activated again to a different forwarded-to user.

The forwarded-to user, at the same time as deactivating SS-CF as described above, may be able to activate SS-CF from the served user to another forwarded-to user (i.e. change the destination of SS-CF). The forwarded-to user shall lose this authorized user capability as soon as SS-CF is reactivated in this way. The new forwarded-to user shall gain this authorized user capability.

When an activation/deactivation procedure is performed successfully by an authorized user, the served user and the activating/deactivating authorized user shall be notified. The notification to the served user shall include the ITSI/GTSI/External Number of the forwarded-to user and the basic services.

NOTE 2: The authorized user gets the same notification as part of the activation procedure.

It shall be possible, that the served user activates SS-CF and the authorized user deactivates SS-CF and vice versa.

It shall be possible, that the authorized user who deactivates SS-CF be different from the authorized user who activated SS-CF and vice-versa.

NOTE 3: The use of a password facility for authorized user activation as an implementation option is not excluded.

#### **4.2.2.1.2 Enable/Disable**

The served user (and only the served user) shall be able to enable/disable any authorized user activation when the authorized user is different from the served user.

The served user shall be able to enable/disable any authorized user deactivation if the authorized user is not the forwarded-to user for that SS-CF procedure and for those basic services.

To activate SS-CF, the authorized user shall:

- 1) define the forwarded-to user ITSI/GTSI/External Number;
- 2) indicate the circuit mode for which it applies (i.e. if SS-CF applies to speech calls and/or to data calls); this corresponds in fact to the definition procedure defined in sub clause 14.3.1.5 of ETS 300 392-1 [3].

NOTE 4: Verification that the forwarded-to user ITSI/GTSI/External Number exists and that the specified basic service is subscribed to at that ITSI/GTSI/External Number may be carried out before accepting the SS-CF activation request. This verification is outside the scope of this ETS.

The service provider shall return notification of acceptance of the request. Notification of acceptance shall include the ITSI/GTSI/External Number of the forwarded-to user to whom the SS-CF is active.

In the absence of any of the parameters in the activation procedure (e.g. the forwarded-to ITSI/GTSI/External Number), default parameters already known to the SwMI may be used. In the absence of basic service information provided by the user, the activation will be valid for all basic services.

It shall be possible to deactivate SS-CF by means of an explicit request for deactivation. An explicit request for deactivation shall be treated as follows:

- if deactivation of SS-CF for an individual basic service is requested, it shall be accepted only if SS-CF is already activated for that basic service;
- if deactivation of SS-CF collectively for all basic services is requested, it shall result in the discarding of any forwarded-to ITSI/GTSI/External Numbers for individual basic services and any forwarded-to ITSI/GTSI/External Number collectively for all basic services.

It shall be possible to deactivate SS-CF by activating SS-CF to a different forwarded-to ITSI/GTSI/External Number. A request for activation of SS-CF when SS-CF is already activated shall be treated as follows:

- if activation of SS-CF for an individual basic service is requested, it shall be accepted only if SS-CF is not already activated collectively for all basic services and, if SS-CF is already activated for that individual basic service, shall result in the overwriting of the existing forwarded-to ITSI/GTSI/External Number;
- if activation of SS-CF collectively for all basic services is requested, it shall result in the discarding of any existing forwarded-to ITSI/GTSI/External Numbers for each basic service and the overwriting of any existing forwarded-to ITSI/GTSI/External Number collectively for all basic services.

Contrary to ECMA-173 [1], in the case where a first call forwarding request to a first functional entity fails, it shall not be possible to request a second call forwarding against a second functional entity.

FC shall be invoked in conjunction with a call forwarding request. When invoked, the forwarding counter shall be set to an initial value and then incremented each time that the call forwarding request is accepted. The initial value shall be zero unless any knowledge available about the history of the call (e.g. route taken, inter-working, diversions) is used to choose a higher initial value.

FC shall terminate when the call request reaches its destination, is released, or leaves the TETRA Network.

#### **4.2.2.1.3 Registration**

Registration of information is performed by subscription and/or on activation of SS-CF. There are no separate registration procedures.

#### **4.2.2.1.4 Interrogation**

The SwMI may provide interrogation to the served user and to any authorized user; the forwarded-to user may be defined as a temporary authorized user.

In the case of SS-CF involving a served user being a served group, SS-CF interrogation may be operated by any authorized user either inside or outside the group. A member of a served group shall not be able to interrogate SS-CF for the group he is member of unless he is an authorized user.

If interrogation is provided, a SwMI shall support interrogation on a per ITSI/GTSI/External Number basis for all basic services and/or for a user specified basic service. The SwMI response to an interrogation request shall provide the following information to the user:

- activated or deactivated state of the supplementary service;
- if activated:
  - forwarded-to ITSI/GTSI/External Number;
  - whether activated for all basic services or an individual basic service and the identity of the individual basic service.

As additional information, the interrogation may provide information to the served user, whether activation by an authorized user has been enabled.



Where interrogation is for all basic services for which SS-CF is subscribed to and SS-CF has been activated separately for more than one basic service, the above information shall be repeated for each activation (e.g. twice, once for speech and once for data).

If interrogation by a user different from the served user is provided, it shall be possible from the following users:

- any authorized user may interrogate SS-CF conditions on the served user. Authorization shall be implementation dependent (e.g. dispatchers may be authorized);
- the forwarded-to user may interrogate SS-CF at the served user (but only for those options for which he is the forwarded-to user).

The authorized user interrogation request and response shall include the information as specified for the served user interrogation and additionally the ITSI/GTSI/External Number of the served user.

#### 4.2.2.2 Invocation and operation

All incoming calls indicating a basic service for which SS-CF is active shall be forwarded without being presented to the served user (excepted for SS-CFNRY).

Once the call forwarding has been initiated, the original called user B shall not be able to participate in that forwarded call regardless of the fact that the original condition, which lead to the initiation of forwarding, disappeared (e.g. user B busy becomes non busy for SS-CFB, user B Not Reachable becomes Reachable for SS-CFNRc).

- The following figure 1 clarifies the SS-CF procedures. Assume that A calls B<sub>1</sub>, who forwards the call to B<sub>2</sub>, ..., B<sub>m</sub>, ..., B<sub>x</sub>. The final receiver of the call is C.

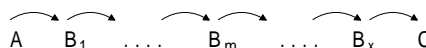


Figure 1: SS-CF operation

##### 4.2.2.2.1 Forwarded-to user C notification

The forwarded-to user shall receive an indication that the call has been forwarded with the appropriate forwarding cause. According to the served user's subscription option, the forwarded-to user may receive:

- the original served user's ITSI/GTSI/External Number;
- the cause for the original forwarding;
- the last forwarding number B<sub>x</sub>;
- the cause for the last forwarding.

The forwarding cause shall indicate which call forwarding supplementary invocation lead to the forwarding (CFU, CFB, CFNRY, CFNRc).

##### 4.2.2.2.2 Calling user A notification

The calling user shall receive a notification that the call has been forwarded.

For single forwarding, a notification shall be sent to the calling user indicating that call has been forwarded.

For multiple forwarding, notifications shall be sent to the calling user depending on the subscription options of the served users as follows:

- a notification shall be sent to User A as a result of the forwarding at user B1. Forwarding at successive served users B2, B3, etc. each shall also result in a notification to User A, but only if both:
  - the alerting state has been reached at the served user; and
  - none of the served users has the "No" option (in the case of interworking).

The ITSI/GTSI/External Number of User C shall be sent to User A, but only if SS-COLR is not invoked by User C.

NOTE 1: Each user B1, B2, ..., Bn-1, Bn are first forwarded-to users who become successively served users with their own subscription options.

NOTE 2: This does not apply to either direct signaling operation or to group call.

NOTE 3: User A MS/LS may receive an D-ALERT with one origin (user B alerting) followed by a D-CONNECT from a different source (C).

### 4.2.3 Exceptional procedures

#### 4.2.3.1 Activation/Deactivation

SS-CF for all basic services and SS-CF for particular basic services cannot be activated simultaneously.

If the SwMI cannot accept an activation request, the activating (authorized/served) user shall receive a notification that SS-CF activation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;
- authorized user not enabled for activation of SS-CF;
- insufficient information;
- forwarded-to ITSI/GTSI/External Number is a special service code;
- forwarded-to ITSI/GTSI/External Number is the served user's ITSI/GTSI/External Number;
- forwarded-to ITSI/GTSI/External Number is an invalid ITSI/GTSI/External Number;
- basic service to which relevance is requested is not subscribed to;
- incorrect served user's ITSI/GTSI/External Number;
- conflicting situation with other supplementary services (e.g. SS-BOC).

If the SwMI cannot accept a deactivation request, the deactivating (authorized/served) user shall receive a notification that SS-CF deactivation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;
- insufficient information;
- service not activated;
- incorrect served user's ITSI/GTSI/External Number.

If the network deactivates SS-CF without the served user having requested deactivation (e.g. when an exceptional condition occurs), the served user will receive notification along with the cause.

The notification of an unsuccessful activation/deactivation request shall be sent to the activating/deactivating (authorized/served) user only.

#### 4.2.3.2 Interrogation

If the SwMI cannot accept an interrogation request, the interrogating user shall receive a notification that SS-CF interrogation was unsuccessful. Possible causes for rejection are e.g.:

- service or option not subscribed to;
- insufficient information;
- basic service to which relevance is requested is not subscribed to.

#### 4.2.3.3 Invocation and operation

SS-CF shall not be invoked on a call to the served user if the call uses a basic service for which SS-CF has not been activated.

In cases where a calling user normally receives, as part of notification, the ITSI/GTSI/External Number of the forwarded-to user, the last forwarding user or the original called user and this ITSI/GTSI/External Number is unavailable (e.g. due to number presentation restriction, or inter-working), the user who would have been given the number shall receive an indication of the reason why no number is given.

Within a SwMI the total number of all forwarding for each call shall be limited. The maximum number of such forwarding for each call shall be an implementation option. When counting the number of forwarding, all types of forwarding shall be included. If the limit is reached and an attempt is made to forward the call an additional time, the calling user shall receive call clearing with an appropriate new disconnect cause.

NOTE 1: While ECMA Forwarding Counter mechanism allows for values from 1 to 31, for TETRA limit of 5 seems to be reasonable for proper performance.

If the forwarded call cannot be completed to any of the forwarded-to destination, then the SwMI shall clear the call and to the calling user shall be sent an indication that the call cannot be completed.

The forwarding may be overridden for specific calls, e.g. calls from the forwarded-to user to the forwarding user. The conditions for this shall be implementation specific.

If the forwarding counter exceeds a TETRA Network specific limit (which takes any value in the range 1 to 31) before the call reaches its destination or leaves the TETRA Network, the call shall be aborted.

NOTE 2: Other actions that the TETRA Network may take are outside the scope of this Standard.

#### 4.3 Interactions with other supplementary services and ANFs

##### 4.3.1 Calling Line Identification Presentation (SS-CLIP)

No interaction.

NOTE: Forwarded-to users, who have subscribed to SS-CLIP shall receive the calling user's number unless SS-CLIR applies and the forwarded-to user has no override capability.

##### 4.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction.

NOTE: If the served user, or any served user in the case of multiple forwarding, subscribes to the option that the calling user is notified, but without the forwarded-to user number, then the calling user will not be provided with SS-COLP, unless the calling user has an override capability.

##### 4.3.3 Calling/Connected Line Identification Restriction (SS-CLIR/SS-COLR)

When forwarding occurs, the number of a calling user which has invoked SS-CLIR, shall not be presented to the forwarding user or the forwarded-to user, unless the forwarding user or forwarded-to user has the service profile to override this restriction.

A forwarded-to user which has invoked SS-COLR shall not have its number presented to the calling user as part of a notification of forwarding, unless the calling user has an override service profile. A forwarded-to user which is provided with SS-COLR temporary mode shall not have its identity revealed to the calling user as part of a notification of call forwarding until the forwarded-to user has responded and it is known that restriction is not to be invoked, unless the calling user has an override service profile.

NOTE: The forwarded-to user's number can still be released on answer, after confirmation, or using the default.

In each of the above situations, a calling user that subscribes to SS-COLP and who has override capability shall not be able to receive the forwarded-to user's number as part of the forwarding notification information, but can invoke SS-COLP with override in order to receive the connected line identity when the call is answered.

#### **4.3.4 Call Completion to Busy Subscriber (SS-CCBS)**

If the call to User B is forwarded to User C by SS-CF and User C is busy, then a SS-CCBS request from User A shall be applied to the forwarded-to User C.

If User B activates SS-CF whilst the SS-CCBS recall (corresponding to user A SS-CCBS request) has not yet been accepted by User A, then the SS-CCBS request shall either continue to be applied to User B or be canceled.

If a user invokes SS-CCBS whilst SS-CF is activated, or a user invokes SS-CCBS and subsequently activates SS-CF, SS-CCBS Recall shall still be given to that user.

NOTE: SS-CCBS Recall is not an actual call and is not subject to call forwarding.

#### **4.3.5 Call Completion on No Reply (SS-CCNRy)**

Same as for SS-CCBS.

#### **4.3.6 Call report**

If the call to user B is forwarded to user C, then a SS-CR invocation from user A shall be applied to the forwarded-to user C.

#### **4.3.7 Talking party identification**

SS-CF shall not have any interaction with talking party identification.

#### **4.3.8 List search call**

SS-CF shall not have any interaction with list search call.

#### **4.3.9 Short number addressing**

SS-SNA shall not have any interaction with SS-CF.

NOTE 1: For each of SS-CF management procedures, the authorized user may indicate for which user the procedure applies in indicating the address of the served user using SS-SNA short number in the corresponding SS PDU.

NOTE 2: The use of SS-SNA in management procedures of SS-CF does not allow overriding of other interactions between SS-CF and other supplementary services, e.g. SS-BIC or SS-BOC.

#### **4.3.10 Area selection**

The call may be forwarded as long as the forwarded-to party is within the selected area.

#### **4.3.11 Access priority**

Priority service is restricted to A-B connections. There shall be no interaction between SS-CF and Access Priority.

#### **4.3.12 Call waiting**

If the served user has activated both SS-CF and SS-CW, then SS-CF shall take precedence over SS-CW and the served user shall not receive an indication that a call is waiting.

#### **4.3.13 Call hold**

SS-CF shall not have any interaction with call hold.

#### **4.3.14 Late entry**

SS-CF shall not have any interaction with late entry.

#### **4.3.15 Transfer of control**

SS-CF shall not have any interaction with transfer of control.

#### **4.3.16 Priority call**

SS-CF shall not have any interaction with priority call.

#### **4.3.17 Pre-emptive Priority Call**

There is no interaction between SS-PPC and either SS-CFU, SS-CFNRY or SS-CFNRC; the interaction between SS-PPC and SS-CFB is specified in clause 7.3.3.

#### **4.3.18 Include call**

SS-CF shall not have any interaction with include call.

#### **4.3.19 Advice of charge**

SS-CF shall not have any interaction with advice of charge.

#### **4.3.20 Barring of outgoing calls**

When SS-CF has been activated against user B prior to the activation of Barring of Outgoing Calls (BOC), the calls are forwarded regardless of the limitations of the version of BOC that has been activated; i.e. in this case there exists no interaction between the two services. In that case, SS-BOC fails.

When SS-CF has been activated after SS-BOC, calls can only be forwarded to destinations which are within the limitations of the SS-BOC that has been activated as follow:

- ITSIs/(external)numbers allowed to call according SS-BOC are allowed as forwarded-to numbers for the served user;
- ITSIs/numbers not allowed to call according to SS-BOC are not allowed as forwarded-to ITSIs/(external) numbers for the served user. If barring of all outgoing calls is activated, the activation of call forwarding shall be rejected. The user requesting that activation shall be informed of that incompatibility between services.

#### **4.3.21 Barring of incoming calls**

If an SS-BIC condition is encountered during the setup procedure, the call shall be cleared.

When SS-BIC is active on the initially called user (the served/forwarding user) and the calling user identity is part of the SS-BIC active list, no call forwarding services are allowed on that served user.

If SS-BIC is activated for user B (the SS-CF served user), the activation of SS-CF for the same basic service for that served user B is rejected with reject cause provided to the activating SS-CF user (incompatible supplementary services).

Calls forwarded to a user having SS-BIC when migrating to a different SwMI will be denied like any other call to that user.

If SS-CF is activated for a served user B, activation of SS-BIC for that same user B is not permitted. The SS-BIC activating user shall be informed of that incompatibility.

#### 4.3.22 Ambiance listening

SS-CF shall not have any interaction with ambiance listening.

#### 4.3.23 Dynamic group number assignment

SS-CF shall not have any interaction with dynamic group number assignment.

#### 4.3.24 Interaction with ANF Mobility

Within a SwMI or between different SwMIs, the number of call forwarding connections should be limited. The maximum number of call forwarding connections should be limited to a value between 1 and 5. This is to prevent infinite looping.

NOTE: In the case of forward switching, the mechanism of the ECMA Transit Counter will also be implemented.

The different cases of mobility of the served user and of the forwarded-to user listed in the table 2 below shall be supported. Those cases correspond to different cases of ANF-ISI-IC and Call Forwarding interactions; those different cases shall not result in long transmission delays to the user (trombone) and shall not result in long switching delays. This table does not reflect "local forwarding" within a SwMI.

It is assumed that the user is not migrating during call set-up.

In the case where the served user has activated SS-CF and that SS-CF is invoked when the served user is outside served user home SwMI, any invocation of SS-CF shall be reported to served user home SwMI. The actual timing of the reporting (immediate, periodic, by batch) is outside the scope of this ETS.

In the case where the served user wishes to modify its profile while he is visiting a SwMI different from his home SwMI, the authorization to modify the served user profile shall be given by the served user home SwMI to the served user visited SwMI.

**Table 2: Mobility cases**

Case	Calling User SwMI	Called User Home SwMI	Called User SwMI	Forwarded-to User Home SwMI	Forwarded-to User SwMI
1	A	A	A	#A (note 2)	#A
2	A	B	*(note 1)	#A	A
3	A	B	B	B	B
4	A	B	A	B	#B
5	A	B	C(#A, #B)	#B ( C )	C
6	A	*	*	#B ( C )	C
NOTE 1:	* indicates don't care				
NOTE 2:	# indicates different from				

#### 4.4 Inter-working considerations

Inter-working with other networks is optional. When inter-working with another network, the implementation specific limit of the total number of known forwarding for each call shall still apply.

NOTE: Some networks may not report the number of call forwarding; the number of call forwarding within a SwMI may also be not known.

Where a remote user is on a different network, notifications to the remote user, if applicable, shall be sent to the remote user's network for delivery to the remote user. Numbers included in this information shall be provided as required for the other network.

In the case of a call from the public network to TETRA network, if the TETRA network detects forwarding back to a destination in the public network, the TETRA network may request that forwarding is performed by the public network.

The gateway SwMI may activate, deactivate and interrogate SS-CFU in the public ISDN on behalf of a TETRA SwMI user.

If a forwarded call meets an inter-working situation, then an inter-working indication should be sent to the calling party. FC may apply to calls entering the TETRA Network from another network or to calls going to another network.

### 5 SS-CF overall SDL

Figure 2 contains the dynamic description of SS-CF using the Specification and Description Language (SDL) defined in ITU-T Recommendation Z.100 [3]. The SDL process represents the behavior of the network in providing SS-CF in the case of Individual Call only.

Output signals to the left represent primitives to the calling user. Output signals to the right represent primitives to the served user or to the forwarded-to user. Input signals from the right represent internal stimuli.

In the original ECMA-173 [1] diagram, the diversion has been replaced by forwarding; the main ECMA options which are not kept in TETRA are shown with a comment "Not\_a\_TETRA\_option". These options are kept for the case of possible inter-working.

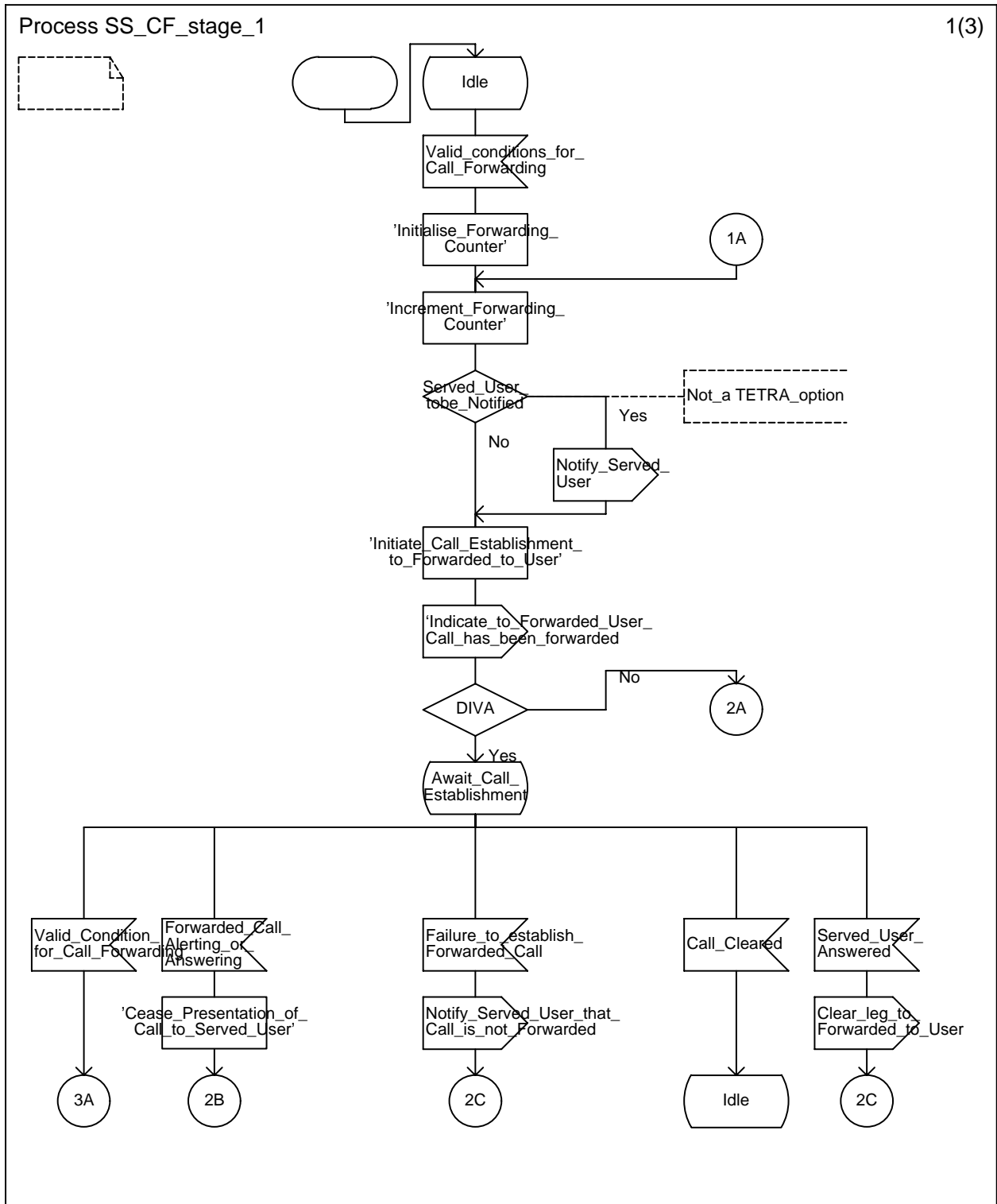


Figure 2: SS-CF, Overall SDL (sheet 1 of 3)



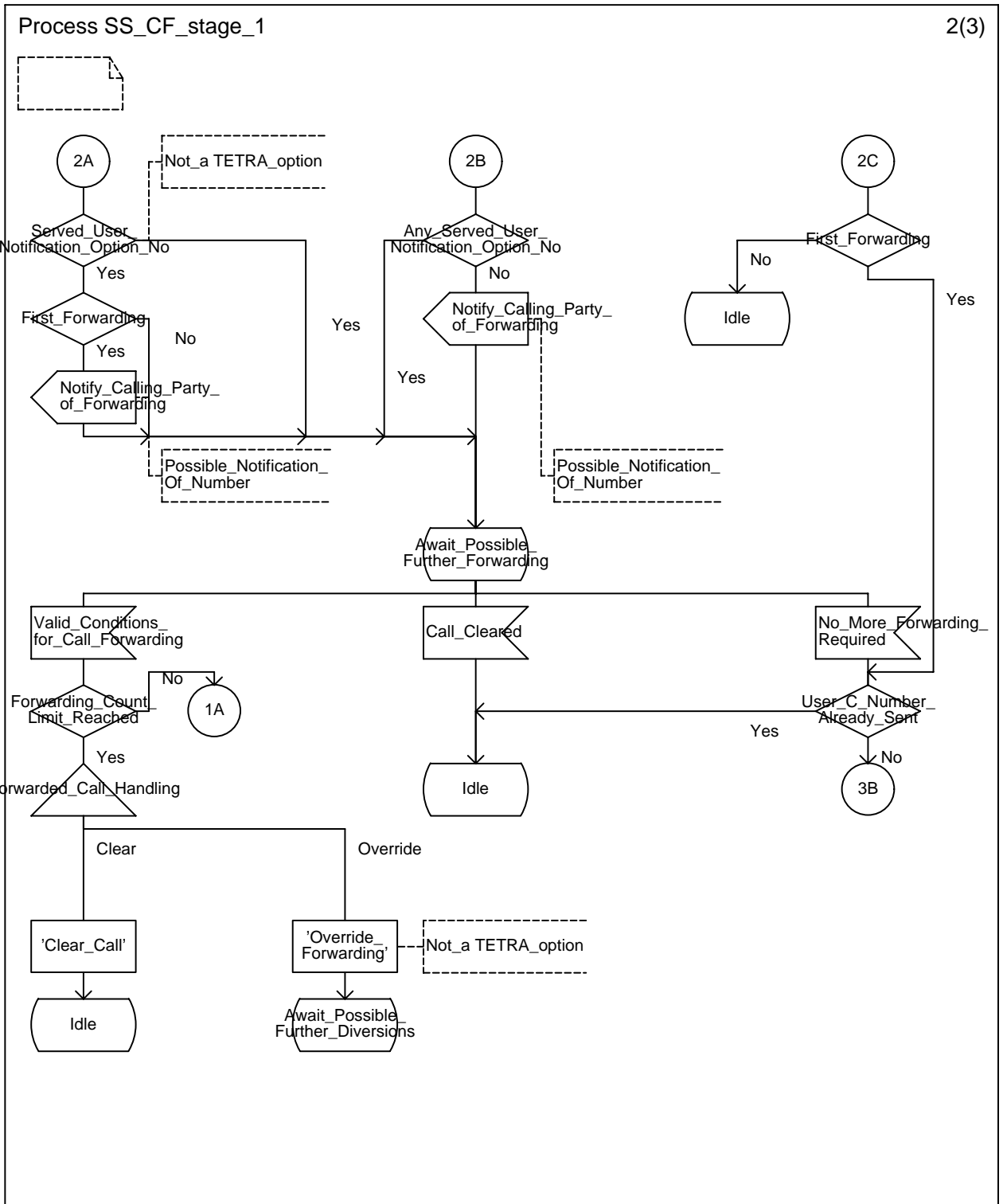


Figure 2: SS-CF, Overall SDL (sheet 2 of 3)

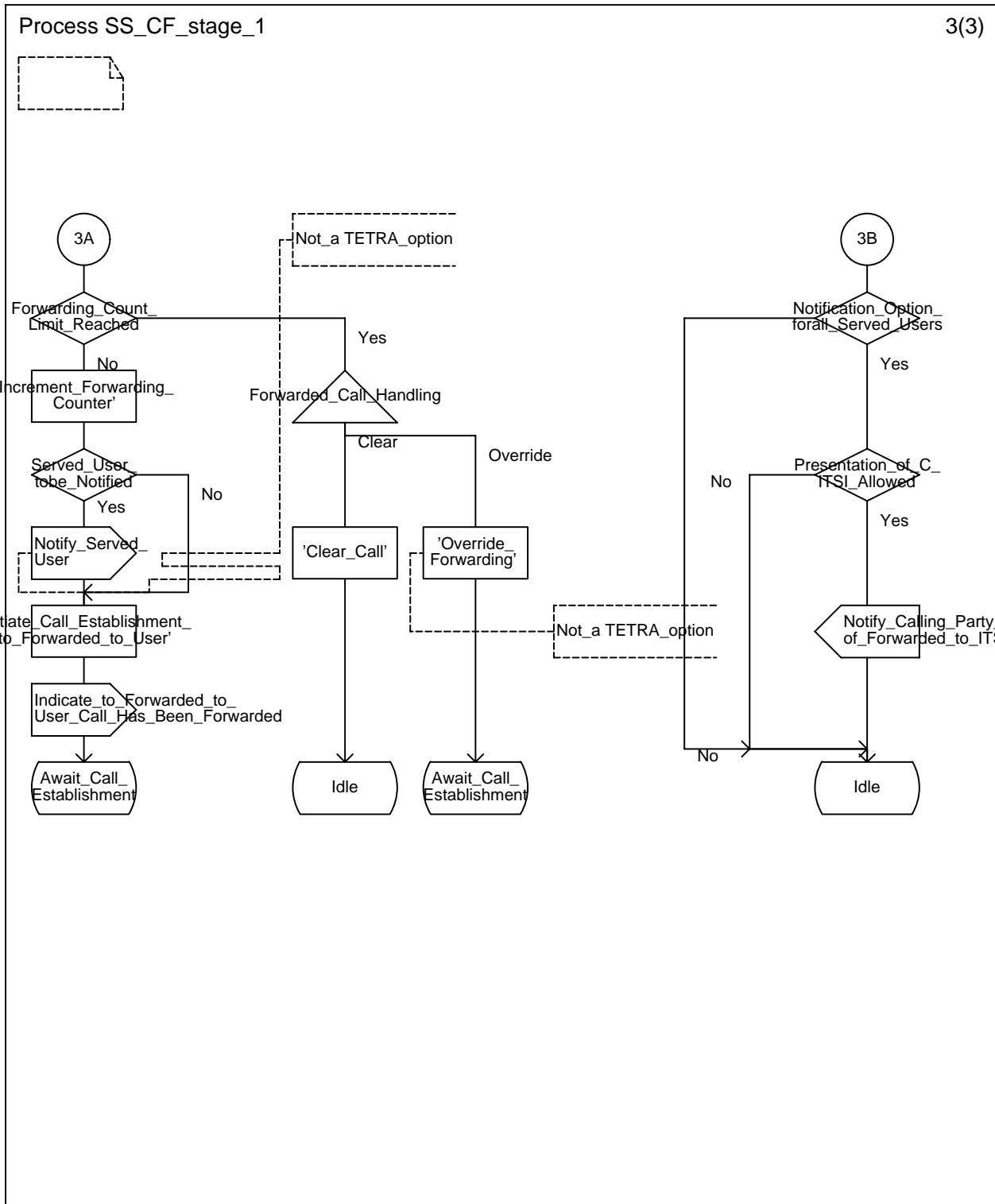


Figure 2: SS-CF, Overall SDL (sheet 3 of 3)

Figure 3 contains the dynamic description of FC using the Specification and Description Language (SDL) defined in ITU-T Recommendation Z.100 [3]. The SDL process represents the behaviour of the TETRA Network in providing FC. Input symbols from the left and output symbols to the left represent internal stimuli.

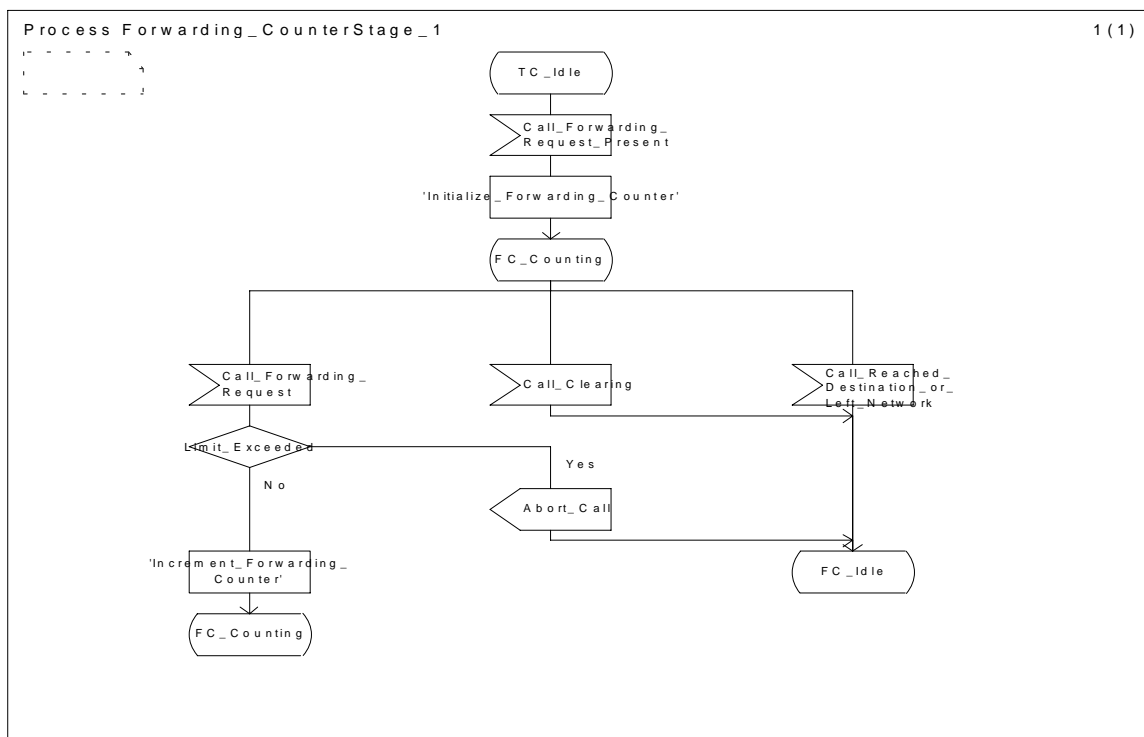


Figure 3: FC, overall SDL

## 6 SS-CFU Specific Specification

The generic SS-CF clauses 4 and 5 above apply. SS-CFU specification below gives the particular requirements for SS-CFU different from the generic requirements common to all call forwarding supplementary services.

### 6.1 Description

#### 6.1.1 Applicability

SS-CFU is also applicable to TETRA SDS.

### 6.2 Interaction with other supplementary services and ANFs

#### 6.2.1 Call Waiting SS-CW

SS-CW shall not have any interaction with SS-CFU, i.e.:

- if SS-CFU has been activated for the called user:, then SS-CFU shall take precedence over SS-CW, even if the called user is busy;
- SS-CFU may be activated for the SS-CW served user while a call is waiting but the waiting call shall then not be forwarded;
- the diverted-to user may invoke SS-CW for the diverted call if he is busy and SS-CW is available to him.

#### 6.2.2 Call Forwarding Busy (SS-CFB)

The invocation of SS-CFU shall take precedence over SS-CFB. If SS-CFU is active, activation of SS-CFB FOR THE SAME SERVICE is rejected. The served user shall be informed of this supplementary service incompatibility.

If SS-CFB is active, activation of SS-CFU shall be accepted. SS-CFB shall be idle during the activation period of SS-CFU. If SS-CFU is deactivated, SS-CFB becomes active again.

If SS-CFB is activated for one particular basic service, activation of SS-CFU for all basic services will be accepted. SS-CFB shall be idle during the activation period of SS-CFU.

### **6.2.3 Call Forwarding No Reply (SS-CFNR<sub>y</sub>)**

The invocation of SS-CFU shall take precedence over SS-CFNR<sub>y</sub>.

### **6.2.4 Call Forwarding not Reachable (SS-CFNR<sub>c</sub>)**

The invocation of SS-CFU shall take precedence over SS-CFNR<sub>c</sub>.

### **6.2.5 Pre-emptive Priority Call**

The Call Forwarding Unconditional service takes priority over the PPC service.

The priority level of calls is preserved during the forwarding process, and the forwarded-to user may be pre-empted.

### **6.2.6 Call authorized by dispatcher**

SS-CFU shall not have any interaction with call authorized by dispatcher.

NOTE 1: Call forwarding shall not be subject to SS-CAD. It is assumed that the interception by the dispatcher has occurred prior to the call being forwarded to the forwarded-to number.

NOTE 2: One could distinguish between CAD calling and CAD called.

### **6.2.7 Discreet listening**

If the served user has activated SS-CFU and the monitoring user has invoked the SS-DL on that served user, then SS-DL shall take precedence over SS-CFU and the calling user shall be connected to the served user if an appropriate call is in progress. The forwarded-to user shall not be listened to.

NOTE: SS-DL monitoring does not result in a call set-up.

## **7 SS-CFB Specific Specification**

The generic SS-CF clauses 4 and 5 above apply. SS-CFB specification below gives the particular requirements for SS-CFB different from the generic requirements common to all call forwarding supplementary services.

### **7.1 Description**

#### **7.1.1 General description**

SS-CFB enables a served user to redirect incoming calls to another ITSI/GTSI/External Number if they meet a busy condition at the served user.

NOTE: The conditions that lead to the declaration of a group as being busy are outside the scope of this draft ETS.

#### **7.1.2 Applicability**

SS-CFB is not applicable to SDS.

## **7.2 Procedures**

### **7.2.1 Provision/withdrawal**

### **7.2.2 Normal procedures**

#### **7.2.2.1 Activation/deactivation**

SS-CFB may be either permanently activated or activated/deactivated under user control.

## **7.3 Interaction with other supplementary services and ANFs**

### **7.3.1 Call Completion to Busy Subscriber (SS-CCBS)**

If the call to User B is forwarded to User C by SS-CFB and User C is busy, then a SS-CCBS request from User A shall be applied to the forwarded-to User C and not to the originally called User B.

NOTE 1: If User B activates SS-CFB and whilst the SS-CCBS recall (corresponding to user A SS-CCBS invocation on user B) has not yet been accepted by User A, then the SS-CCBS request shall continue to be applied to User B.

NOTE 2: If a user invokes SS-CCBS whilst SS-CFB is activated, or a user invokes SS-CCBS and subsequently activates SS-CFB, this shall not affect the provision of the SS-CCBS recall to that user.

NOTE 3: The SS-CCBS recall is not an actual call.

### **7.3.2 Call Completion on No Reply (SS-CCNR)**

If the call to User B is forwarded to User C by SS-CFB and User C does not answer, then a SS-CCNR request from User A shall be applied to the forwarded-to User C.

NOTE 1: If User B activates SS-CFB and whilst the SS-CCNR recall corresponding to user A SS-CCNR invocation on user B has not yet been accepted by User A, then the SS-CCNR request shall continue to be applied to User B.

NOTE 2: If a user invokes SS-CCNR whilst SS-CFB is activated, or a user invokes SS-CCNR and subsequently activates SS-CFB, this shall not affect the provision of the SS-CCNR recall to that user.

NOTE 3: The SS-CCNR recall is not an actual call.

### **7.3.3 Pre-emptive priority call**

SS-PPC shall take precedence over SS-CFB.

If the incoming call is of higher priority than one or more calls at user B, a call of the lowest priority will be pre-empted and the incoming call will be established, i.e. the Call Forwarding service will not be invoked.

If the incoming call is of equal or lower priority than the established calls, the Call Forwarding service will be invoked.

If the called subscriber is non pre-emptable, the Call Forwarding service will be invoked regardless of the priority levels of incoming call and established calls.

The priority level of calls is preserved during the forwarding process, and the forwarded-to user may be pre-empted.

NOTE: In the TETRA network environment, no alternate party defined by ECMA-173 [1] is used.

#### **7.3.4 Call Forwarding Unconditional (SS-CFU)**

Subclause 6.1.2 shall apply.

#### **7.3.5 Call Forwarding No Reply (SS-CFNRy)**

No interaction. (User B is either busy or in no reply state but not both at the same time).

#### **7.3.6 Call Forwarding Not Reachable (SS-CFNRc)**

No interaction. (User B is either busy or in not reachable state but not both at the same time).

#### **7.3.7 Call waiting**

Call waiting shall not have any interaction with SS-CFB, i.e.:

- if an individual new call is addressed to the served user while SS-CFB has been activated for that user and that call can be supported by his terminal equipment:
  - if the network knows that that user is busy and cannot offer him that new call because of some limit in the number of additional calls offered or of call waiting (see e.g. subclause 4.2.3.2.1.1), the network will invoke SS-CFB for that new call (and not offer it to the served user);
  - if the network can offer it to that user, that user will then be able to invoke SS-CW or e.g. to clear the call in indicating that he is busy (see note 1 in subclause 4.2.3.2.2.1). The network will then invoke SS-CFB for that call;
  - the network will also invoke SS-CFB for that call after the served user has invoked SS-CW for it when that user clears it later in indicating that he is busy (see subclause 4.2.3.2.2.1).
- SS-CFB may be activated for the SS-CW served user while a call is waiting but the waiting call shall then not be forwarded unless the served user clears that waiting call in indicating that he is busy (see subclause 4.2.3.2.2.1);
- the diverted-to user may invoke SS-CW for the diverted call if he is busy and SS-CW is available to him.

If the served user has activated both SS-CFB and SS-CW, then SS-CFB shall take precedence over SS-CW and the served user shall not receive an indication that a call is waiting.

#### **7.3.8 Discreet listening**

If the served user for SS-CFB is also the monitored user for SS-DL, if the SS-CFB served user has activated SS-CFB and if the calling user has invoked SS-DL then SS-DL shall take precedence over SS-CFB and the calling user shall be connected (in a discreet listening mode) to the served user if an appropriate call is in progress.

If the served user has invoked the SS-DL and the called party has activated SS-CFB, then SS-DL shall take precedence over SS-CFB and the served user shall be connected to the called user (in a discrete listening mode) if an appropriate call is in progress.

### **8 SS-CFNRy Specific Specification**

The generic SS-CF clauses 4 and 5 above apply. SS-CFNRy specification below gives the particular requirements for SS-CFNRy different from the generic requirements common to all call forwarding supplementary services.

Contrary to ECMA-173 [1], distinction is needed in the TETRA environment between no reply and not reachable. The distinction between the two services is that in the case of SS-CFNRY, the calling user obtains an ALERT signal while in the case of SS-CFNRC, the calling user does not obtain any signal. This clause covers the case of No Reply. SS-CFNRC is covered in clause 9 of this draft ETS.

## **8.1 Description**

### **8.1.1 General description**

SS-CFNRY enables a served user to redirect incoming calls to another ITSI/GTSI/External Number if the connection is not established within a predefined time of alerting.

### **8.1.2 Applicability**

SS-CFNRY is not applicable to SDS. SS-CFNRY is not applicable to calls established with direct signaling. SS-CFNRY is not applicable to group calls.

## **8.2 Procedures**

### **8.2.1 Provision/Withdrawal**

Void.

### **8.2.2 Normal procedures**

#### **8.2.2.1 Activation/Deactivation**

SS-CFNRY may be either permanently activated or activated/deactivated under user control.

#### **8.2.2.2 Invocation and operation**

All incoming calls indicating a basic service for which SS-CFNRY is active shall be forwarded if the served user does not reply within a specified time interval. This no reply condition time interval shall have a value from 5 to 60 seconds in steps of 5 seconds. This timer value shall be such that it is less than the disconnect timer. The no reply condition is defined as the user is being alerted but does not reply. The no reply is a user situation (e.g. user absent, user ignoring the call...).

NOTE: The no reply condition is not due to a call presented with an incompatible basic service in which case a disconnect would occur with the proper basic service incompatible cause.

When forwarding occurs, the network shall clear the call to the served user on acceptance of the call forwarding request.

### **8.2.3 Exceptional procedures**

#### **8.2.3.1 Activation/Deactivation**

If the SwMI cannot accept an activation/deactivation request, the activating user shall receive a notification that SS-CFNRY activation was unsuccessful.

If the network deactivates SS-CFNRY without the served user having requested deactivation (e.g. when an exceptional condition occurs), the served user will receive notification along with the cause when that served user replies again to calls.

In case of activation/deactivation by an authorized user different from the served user, the notification of an unsuccessful activation/deactivation request shall be sent to the served user.

### **8.3 Interaction with other supplementary services and ANFs**

#### **8.3.1 Call Completion to Busy Subscriber (SS-CCBS)**

If User B activates SS-CFNRy and whilst the SS-CCBS recall (corresponding to user A SS-CCBS request) has not yet been accepted by User A, then the SS-CCBS request shall continue to be applied to User B.

NOTE 1: In such a case, the call resulting from successful completion of SS-CCBS can be subject to SS-CFNRy if not answered.

If a user invokes SS-CCBS whilst SS-CFNRy is activated, or a user invokes SS-CCBS and subsequently activates SS-CFNR, this shall not affect the provision of the SS-CCBS recall to that user.

NOTE 2: SS-CCBS Recall is not an actual call.

#### **8.3.2 Call Completion on No Reply (SS-CCNR)**

If the call to User B is forwarded to User C by SS-CFNRy and User C does not answer, then a SS-CCNR request from User A shall be applied to either User B or User C.

If User B activates SS-CFNRy and whilst the SS-CCNR recall (corresponding to a user A SS-CCNR request) has not yet been accepted by User A, then the SS-CCNR request shall continue to be applied to User B.

If a user invokes SS-CCNR whilst SS-CFNRy is activated, or a user invokes SS-CCNR and subsequently activates SS-CFNR, this shall not affect the provision of the SS-CCNR recall to that user.

#### **8.3.3 Call Forwarding Unconditional (SS-CFU)**

The invocation of SS-CFU shall take precedence over SS-CFNRy.

#### **8.3.4 Call Forwarding Busy (SS-CFB)**

No interaction. If a served/forwarding user is busy, he cannot be in a "no reply" condition.

#### **8.3.5 Call Forwarding Not Reachable (SS-CFNRc)**

No interaction. If a served user is in a not reachable condition, he cannot be in a no reply condition.

#### **8.3.6 Call authorized by dispatcher**

SS-CFNRy shall not have any interaction with call authorized by dispatcher.

#### **8.3.7 Call waiting**

SS-CW shall not have any interaction with SS-CFNRy, i.e.:

- if SS-CFNRy has been activated for the SS-CW served user and that user has invoked SS-CW for an individual call, SS-CFNRy shall be invoked if the call forwarding no reply timer expires before:
  - the served user has accepted or cleared the waiting call; or
  - SS-CW timer T2 has expired.
- the diverted-to user may invoke SS-CW for the diverted call if he is busy and SS-CW is available to him.

If the served user has activated both SS-CFNRy and SS-CW, then SS-CFNRy shall take precedence over SS-CW and the served user shall not receive an indication that a call is waiting.



### 8.3.8 Pre-emptive priority call

If the calling user has invoked SS-Pre-emptive Priority Call (PPC) and the served user has activated SS-CFNR, then the call shall be forwarded in accordance with SS-CFNR.

## 9 SS-CFNRc Specific Specification

The generic SS-CF clauses 4 and 5 above apply. SS-CFB specification below gives the particular requirements for SS-CFB different from the generic requirements common to all call forwarding supplementary services.

### 9.1 Description

#### 9.1.1 General description

SS-CFNRc permits a called user to have the network send all incoming calls, or just those associated with a specific basic service, addressed to the called user ITSI, but which is not reachable, to another forwarded-to user ITSI/GTSI/External Number.

The distinction between the two services (SS-CFNRy and SS-CFNRc) is that in the case of SS-CFNRy, the calling user obtains an ALERT signal while in the case of SS-CFNRc, the calling user does not obtain any signal.

The ability of the served user to originate calls is principally unaffected, but practically it is affected if the user is de-registered, if there is radio congestion or if the user for example is being out of radio coverage. If this service is activated, a call is forwarded only if the user is not reachable.

SS-CFNRc is provided on a per TETRA ITSI number basis.

NOTE 1: A Line Station may also be found as Not Reachable, e.g. power-off.

NOTE 2: A Group may never be found Not Reachable.

#### 9.1.2 Applicability

SS-CFNRc is not applicable to SDS and to group calls.

### 9.2 Procedures

#### 9.2.1 Provision/withdrawal

Void.

#### 9.2.2 Normal procedures

##### 9.2.2.1 Activation/deactivation/registration/interrogation

SS-CFNRc may be either permanently activated or activated/deactivated under user control.

NOTE: Obviously, the served user must be reachable at the time the served user activates, deactivates or interrogates the service.

##### 9.2.2.2 Invocation and operation

Void.

### **9.2.3 Exceptional procedures**

#### **9.2.3.1 Activation/Deactivation**

If the SwMI cannot accept an activation/deactivation request, the activating user shall receive a notification that SS-CFNRC activation was unsuccessful. In the case where the activating user was the served user B who is found to be in a not reachable condition, that notification will have to occur once the user is back in a "reachable" condition.

If the network deactivates SS-CFNRY without the served user having requested deactivation (e.g. when an exceptional condition occurs), the served user will receive notification along with the cause.

In case of activation/deactivation by an authorized user different from the served user, the notification of an unsuccessful activation/deactivation request shall be sent to the served user only once the served user replies again to calls.

### **9.3 Interactions with other supplementary services and ANFs**

#### **9.3.1 Interactions with other supplementary services**

All interactions with other supplementary services are identical to interactions between SS-CFNRY and other supplementary services; subclauses 8.3.1, 8.3.2, 8.3.3, 8.3.4, 8.3.6, and 8.3.8 shall apply replacing CFNRY by CFNRC and "no reply" by "not reachable"; subclause 8.3.5 shall not apply.

#### **9.3.2 Interaction with Call Waiting (SS-CW)**

SS-CW shall not have any interaction with SS-CFNRC, i.e.:

- when the SS-CW served user is not reachable, SS-CW shall not be invoked because the called user is not busy, therefore, SS-CFNRC will be invoked if activated for that user;
- the diverted-to user may invoke SS-CW for the diverted call if he is busy and SS-CW is available to him.

#### **9.3.3 Interaction with ANF Mobility**

The mobile station being not reachable, its mobility cannot be tracked as long as it is not reachable; the home SwMI will keep the served user status as "Not Reachable" as long as the served user MS does not appear as reachable; a SwMI which receives a call for the served user ITSI will check with the home SwMI of that served user to determine that this user is still not reachable at which time this SwMI will invoke SS-CFNRC. When the mobile station becomes reachable again, it will register in a given SwMI, the home SwMI will be notified but at that time, SS-CFNRC will not be invoked because the user has become reachable again.

### **9.4 Inter-working considerations**

If a forwarded call meets an inter-working situation, then an inter-working indication should be sent to the calling party.

NOTE: The "Not Reachable" condition may not be understood by all networks, e.g. ISDN; the "Not Reachable" condition may in the case of inter-working be translated into a "no Reply" condition.

## **10 SS-CFU for SDS Specification**

### **10.1 Description**

#### **10.1.1 General description**

SS-CFU for SDS permits a called user to have the network send unconditionally all incoming SDS user-data messages (regardless of their length), addressed to the called user ITSI to another forwarded-to user ITSI/GTSI.

NOTE 1: The terminology CFU is not totally adequate since in the case of SDS, there is no call per se; SS-CFU for SDS will mean in what follows SDS user-data forwarding unconditional.

NOTE 2: The extension of SS-CFU for SDS to external forwarded-to users is outside the scope of this ETS.

The ability of the served user to send user-data messages is unaffected.

SS-CFU for SDS is provided on a per TETRA ITSI/GTSI basis.

The maximum number of forwarding for a single user-data message is a network implementation option.

NOTE 3: Not seen to the user, the mechanism of the Forwarding Counter allows to count the number of forwarding of the signaling connection used for SS-CFU for SDS.

NOTE 4: SS-CFU for SDS is not specified in ECMA-173 [1].

SS-CFU for SDS may forward user-data either to an ITSI or to a GTSI.

### **10.1.2 Applicability**

SS-CFU for SDS is applicable only to SDS and to Call Forwarding Unconditional. It can apply to either individual or group receiving user-data messages. It may not apply to other call forwarding procedures e.g. SS-CFB, SS-CFNRY and SS-CFNRC.

## **10.2 Procedures**

### **10.2.1 Provision/withdrawal**

Void.

### **10.2.2 Normal procedures**

#### **10.2.2.1 Activation/deactivation/registration/interrogation**

SS-CFU for SDS may be either permanently activated or activated/deactivated under user control.

Within TETRA network, the activation upon definition shall be used.

If activation/deactivation is under user control, the SwMI may provide for activation/deactivation by any authorized user (served user or not).

In the case of SS-CFU for SDS involving a served user being a served group, SS-CFU for SDS may be permanently activated for that group GTSI or may be activated/deactivated by an authorized user member or not of the group. A member of a group shall not be able to activate/deactivate SS-CFU for SDS for the group he is member of unless he is an authorized user.

In case there is only one authorized user, it shall be the served user; in other cases, the other authorized users are different from the served user and the served user may have limited authorized user capability. Any authorized user may activate and/or deactivate SS-CFU for SDS for the served user.

NOTE 1: Criteria for attributions of authorized user status shall be implementation dependent.

In the case of SS-CFU for SDS, there is no basic service parameter.

Any authorized user may activate SS-CFU for SDS at the served user such that the activating (e.g. authorized user) user becomes the forwarded-to user. The served user (and only the served user) shall be able to enable and to disable authorized user activation/deactivation. The intended forwarded-to user who is also authorized user shall be able to activate SS-CFU for SDS regardless of whether SS-CFU for SDS is already active or not. The served user may disable an authorized user activation at any time.

Any forwarded-to user shall be able to become an authorized user for the deactivation of SS-CFU for SDS. The served user shall not be able to disable that deactivation capability by the forwarded-to user. The authorized forwarded-to user may deactivate SS-CFU for SDS at the served user. This shall not be dependent on whether the served user has enabled authorized user activation. The forwarded-to user may be defined as a temporary authorized user; the forwarded-to user shall lose this authorized user capability as soon as SS-CFU for SDS is deactivated in this way, and shall not regain the capability if SS-CFU for SDS is activated again to a different forwarded-to user.

The forwarded-to user, at the same time as deactivating SS-CFU for SDS as described above, may be able to activate SS-CFU for SDS from the served user to another forwarded-to user (i.e. change the destination of SS-CFU for SDS). The forwarded-to user shall lose this authorized user capability as soon as SS-CFU for SDS is reactivated in this way. The new forwarded-to user shall gain this authorized user capability.

When an activation/deactivation procedure is performed successfully by an authorized user, the served user and the activating/deactivating authorized user shall be notified. The notification to the served user shall include the ITSI/GTSI of the forwarded-to user.

NOTE 2: The authorized user gets the same notification as part of the activation procedure.

It shall be possible, that the served user activates SS-CFU for SDS and the authorized user deactivates SS-CFU for SDS and vice versa.

It shall be possible, that the authorized user who deactivates SS-CFU for SDS be different from the authorized user who activated SS-CFU for SDS and vice-versa.

NOTE 3: The use of a password facility for authorized user activation as an implementation option is not excluded.

#### **10.2.2.1.1 Enable/Disable**

The served user (and only the served user) shall be able to enable/disable any authorized user activation when the authorized user is different from the served user.

The served user shall be able to enable/disable any authorized user deactivation if the authorized user is not the forwarded-to user for SS-CFU for SDS.

To activate SS-CFU for SDS, the authorized user shall define the forwarded-to user ITSI/GTSI.

NOTE: Verification that the forwarded-to user ITSI/GTSI exists and that the specified SDS is subscribed to at that ITSI/GTSI may be carried out before accepting the SS-CFU for SDS activation request. This verification is outside the scope of this ETS.

The service provider shall return notification of acceptance of the request. Notification of acceptance shall include the ITSI/GTSI of the forwarded-to user to whom the SS-CFU for SDS is active.

In the absence of the parameter in the activation procedure (e.g. the forwarded-to ITSI/GTSI), default parameter already known to the SwMI may be used.

It shall be possible to deactivate SS-CFU for SDS by activating SS-CFU for SDS to a different forwarded-to ITSI/GTSI. A request for activation of SS-CFU for SDS when SS-CFU for SDS is already activated shall be treated as follows:

- if activation of SS-CFU for SDS is requested, it shall be accepted only if SS-CFU for SDS is not already activated and, if SS-CFU for SDS is already activated, shall result in the overwriting of the existing forwarded-to ITSI/GTSI.

#### **10.2.2.1.2 Registration**

Registration of information is performed by subscription and/or on activation of SS-CFU for SDS. There are no separate registration procedures.

### **10.2.2.1.3 Interrogation**

The SwMI may provide interrogation to the served user and to any authorized user; the forwarded-to user may be defined as a temporary authorized user.

In the case of SS-CFU for SDS involving a served user being a served group, SS-CFU for SDS interrogation may be operated by any authorized user either inside or outside the group. A member of a served group shall not be able to interrogate SS-CFU for SDS for the group he is member of unless he is an authorized user.

If interrogation is provided, a SwMI shall support interrogation on a per ITSI/GTSI basis. The SwMI response to an interrogation request shall provide the following information to the user:

- activated or deactivated state of the supplementary service;
- if activated:
  - forwarded-to ITSI/GTSI;

As additional information, the interrogation may provide information to the served user, whether activation by an authorized user has been enabled.

If interrogation by a user different from the served user is provided, it shall be possible from the following users:

- any authorized user may interrogate SS-CFU for SDS conditions on the served user. Authorization shall be implementation dependent;
- the forwarded-to user may interrogate SS-CFU for SDS at the served user.

The authorized user interrogation request and response shall include the information as specified for the served user interrogation and additionally the ITSI/GTSI of the served user.

### **10.2.2.2 Invocation and operation**

Void.

### **10.2.3 Exceptional procedures**

#### **10.2.3.1 Activation/Deactivation**

If the SwMI cannot accept an activation/deactivation request, the activating/deactivating user shall receive a notification that SS-CFU for SDS activation/deactivation was unsuccessful.

If the network deactivates SS-CFU for SDS without the served user having requested deactivation (e.g. when an exceptional condition occurs), the served user will receive notification along with the cause of deactivation.

In case of activation/deactivation by an authorized user different from the served user, the notification of an unsuccessful activation/deactivation request shall also be sent to the served user.

### **10.3 Interactions with other supplementary services and ANFs**

#### **10.3.1 Interactions with other supplementary services**

There are no interactions with other supplementary services which are not defined for SDS.

#### **10.3.2 Interaction with ANF Mobility**

The considerations specified for SS-CFU shall apply excepted that only the signaling connection shall be concerned and not the call forwarding part.

#### 10.4 Inter-working considerations

Inter-working of SS-CFU for SDS with non TETRA network is outside the scope of this ETS.

## **Annex A (Informative): Bibliography**

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ITU-T Recommendation I.252.2 (1992): "Call Forwarding Busy".
- ITU-T Recommendation I.252.3 (1992): "Call Forwarding No Reply".
- ITU-T Recommendation I.252.4 (1992): "Call Forwarding Unconditional".
- ETS 300 392-3-2 (1998): "Terrestrial European Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2: Additional Network Functions Individual Call (ANF-ISIIC)".

## History

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