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SERIES Q: SWITCHING AND SIGNALLING

Intelligent Network

UPT stage 2 for Service Set 1 on IN CS-1 – Procedures for universal personal telecommunication: Functional modelling and information flows

ITU-T Recommendation Q.1541

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ITU-T RECOMMENDATION Q.1541

UPT STAGE 2 FOR SERVICE SET 1 ON IN CS-1 – PROCEDURES FOR UNIVERSAL PERSONAL TELECOMMUNICATION: FUNCTIONAL MODELLING AND INFORMATION FLOWS

Summary

This Recommendation defines the stage 2 description of the UPT procedures for the support of Service Set 1 on Capability Set 1 (IN CS-1). It supersedes Recommendation Q.76 in terms of stage 2; the corresponding stage 3 description can be found in Recommendation Q.1551 (based on CS-1).

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation Q.1541

UPT STAGE 2 FOR SERVICE SET 1 ON IN CS-1 – PROCEDURES FOR UNIVERSAL PERSONAL TELECOMMUNICATION: FUNCTIONAL MODELLING AND INFORMATION FLOWS

(Geneva, 1998)

1   Scope

This Recommendation defines an Intelligent Network "Capability Set 1" (IN CS-1) compliant stage 2 description of Universal Personal Telecommunication (UPT). It does not in any way provide an implementation or technology-dependent description. It identifies the functional capabilities and information flows needed to support the service for UPT Service Set 1 on IN CS-1, the initial phase of UPT introduction, as defined in Recommendations F.850 [1] and F.851 [2]. Recommendation F.851 [2] categorizes the functionality into **essential** and **optional**. Not all the features of Recommendation F.851 [2] can be supported by existing networks. This Recommendation includes only those service features achievable with current ITU-T signalling Recommendations. Networks not supporting existing ITU-T signalling Recommendations may be unable to provide all the features in this Recommendation.

All UPT procedures described in this Recommendation are associated with a call, as required by IN CS-1 capabilities, and are invoked by interruption of call processing.

Only the relationships related to IN service execution are addressed in this Recommendation.

This Recommendation does not address the relationship between UPT service and basic call. This relationship is as prescribed for IN CS-1 services and is described in Recommendation Q.1214 [3]. It should be noted that the definitions of CCAF and CCF are based on corresponding Q.71 [6] ISDN definitions but are modified for use in IN. In particular, the enhanced basic call state model of the IN defines standard Detection Points (DPs) at which IN service feature logic instances can be invoked. These DPs correspond to the Q.71 "hooks" where an ISDN supplementary service interfaces to the Q.71 basic call model. Call modelling and the SSF/CCF functional entity are described in detail in clauses 3/Q.1214 and 4/Q.1214 [3]. In CS-1, the SSF/CCF functional entity is treated as indivisible, i.e. the interface between CCF and SSF is not a matter for CS-1 standardization.

The procedures, functional entities and information flows described in this Recommendation relate to service provision across multiple networks, to the level of Intelligent Network CS-1 capabilities, by allowing access to the UPT user's home service provider's database from the originating network across a network boundary. It is assumed throughout this Recommendation that the UPT user is a visitor on the originating network and no UPT service profile transfer is provided from the UPT user's home database to the originating network database. All interactions with SDFh are controlled by the SCF in the originating network, in conformance with CS-1 guidelines.

NOTE – The format of this Recommendation is not totally consistent with the Q.65 [9] Unified Functional Methodology. The reason for this is that the corresponding stage 3 Q.1551 [8] was completed and published prior to this stage 2 activity. SDLs can be found in Recommendation Q.1551 [8]. FEAs were not considered as a critical problem.

The relationship between this Recommendation and UPT Service Set 1 as defined in Recommendation F.851 [2] is as follows:

–   Service provided – Telephone (i.e. voice-grade connection).

–   Networks involved – All voice networks (e.g. PSTN, ISDN, PLMN).

1.1 Included in this Recommendation (supported by CS-1)

- Features
  - *Essential*

    UPT user identity authentication

    InCall registration

    Outgoing UPT call

    InCall delivery

  - *Optional*

    Remote InCall registration (and deregistration)

    OutCall follow-on

    Global follow-on

    UPT-specific indications

    UPT service profile interrogation

    UPT service profile modification

1.2 Not included in this Recommendation (mainly not supported by CS-1)

- Features
  - *Optional*

    OutCall registration

    Remote OutCall registration

    AllCall registration

    Remote AllCall registration

    Linked registration

    Remote Linked registration

    Multiple Terminal Address registration

    Call Pick-up

    Intended Recipient Identity Presentation

    Access to groups of UPT service profiles

    Variable default Incall registration

    UPT service assistance

    Called party specified secure answering of incoming UPT calls

    UPT service provider authentication

    Numbering – UPT numbering is based on a personal UPT number which uniquely identifies the UPT user

- Charging
  - *Optional*

    Location-related charges based on the caller's location and the current location of the called UPT user (see Note).

- Service profiles

  Personalized UPT service profile to enable UPT user and subscriber control and flexibility in the selection of the UPT user telecommunication services.

- Third-party protection mechanisms
    - *Essential*

        None identified in Recommendation F.851 [2].
    - *Optional*

        Reset of registrations for incoming UPT calls

        Exemption from any UPT usage

        Indications of UPT registrations

        Blocking/deblocking of registrations for incoming UPT calls

        Blocking/deblocking of incoming UPT calls

        Reset of registration for outgoing UPT calls

        Suspension of registration for outgoing UPT calls

        NOTE – The charging information flows in this Recommendation are independent of the method of determination of charges.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1]   ITU-T Recommendation F.850 (1993), *Principles of Universal Personal Telecommunication (UPT).*

[2]   ITU-T Recommendation F.851 (1995), *Universal Personal Telecommunication (UPT) – Service description (Service Set 1).*

[3]   ITU-T Recommendation Q.1214 (1995), *Distributed functional plane for intelligent network CS-1.*

[4]   ITU-T Recommendation Q.1215 (1995), *Physical plane for intelligent network CS-1.*

[5]   ITU-T Recommendation Q.1218 (1995), *Interface Recommendation for intelligent network CS-1.*

[6]   ITU-T Recommendation Q.71 (1993), *ISDN circuit mode switched bearer services.*

[7]   ITU-T Recommendation D.280 (1995), *Principles for charging and billing, accounting and reimbursements for universal personal telecommunication.*

[8]   ITU-T Recommendation Q.1551 (1997), *Application of Intelligent Network Application Protocols (INAP) CS-1 for UPT Service Set 1.*

[9]   CCITT Recommendation Q.65 (1988), *Stage 2 of the method for the characterization of services supported by an ISDN.*

3 Definition of terms

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

3.1 Terms defined in Recommendation F.851 [2]

The following terms are defined in Recommendation F.851 [2]:

– UPT (Universal Personal Telecommunication);

– UPT subscriber;

– UPT user;

– UPT service provider;

– UPT number (UPTN);

– UPT Access Code (UPTAC);

– UPT service profile;

– UPT service profile management;

– Terminal address;

– Network limitations.

3.2 Terms not defined in Recommendation F.851 [2]

The following terminology is used in this Recommendation:

3.2.1 General terms

A CS-1 **UPT environment** consists of one or more bearer networks (PSTN, ISDN, and PLMN) as defined below:

3.2.1.1 UPT network: A bearer network capable of processing UPT calls and procedures. This is a network with IN functionality platform and UPT Service Logic Program (SLP).

3.2.1.2 UPT supporting network: A bearer network capable of recognizing a UPT access code and routing the corresponding UPT call to a UPT network. This network is also able of handling UPT-specific signalling information in order to process the delivery of the incoming UPT calls up to the destination UPT user. In this network neither UPT Service Logic Program on IN platform nor IN functionalities are required. However, it is capable of providing UPT service-specific information on call completion.

3.2.1.3 non-UPT supporting network: A bearer network that treats a UPT call as a regular voice call. A non-UPT supporting network does not recognize UPT access code or UPT number on call origination, and does not pass UPT service-specific information on call completion.

A minimum of one UPT network is required in a UPT environment.

3.2.2 Specific terms

3.2.2.1 home network: The network with which the user's UPT service provider is associated is described as the "home network". The home network contains the database with the service profiles of the associated users.

3.2.2.2 originating network: The "first" network that is a UPT network in the UPT call processing. If the network from which a user originates a UPT service request or outgoing UPT call is only a UPT supporting network (see above), the originating network will be the UPT network to which this UPT supporting network will route the UPT call.

3.2.2.3 terminating network: The called party's current network is the "terminating" network.

3.2.2.4 home SDF: The "home SDF" is the UPT service provider's SDF in the home network, where the UPT user's service profile is stored. It is designated SDFh.

3.2.2.5 originating SDF: The "originating SDF" is the SDF of the UPT service provider associated with the originating network. It is designated SDFo.

3.2.2.6 SDFhA and SDFhB: Where it is necessary to distinguish between SDFs of the A (calling) and B (called) UPT parties, the notations "SDFhA" and "SDFhB" are used.

4   Abbreviations

This Recommendation uses the following abbreviations:

A	Calling User
ACM	Address Complete Message
AD	Adjunct
ANC	Answer Signal, Charge
APPLYCHG	Apply Charging
APPLYCHGRPT	Apply Charging Report
ARI	Assist Request Instruction
B	Called User
BCSM	Basic Call State Model (see Recommendation Q.1214 [3])
CBK	Clear-Back signal
CCAF	Call Control Agent Function
CCF	Call Control Function
CLF	Clear-Forward signal
CLI	Calling Line Identification
COLL-UI	Collected User Information
CS-1	Capability Set 1
CT	Command Type
CTR	Connect To Resource
DISCFWDCONN	Disconnect Forward Connection
DP	Detection Point (in BCSM)
EDP	Event Detection Point (in BCSM)
EDP-N	Event Detection Point – Notification (in BCSM)
EDP-R	Event Detection Point – Request (in BCSM)
ETC	Establish Temporary Connection
EVREPBCSM	Event Report BCSM
FE	Functional Entity
FURNCHGINFO	Furnish Charging Information
IAM	Initial Address Message
IF	Information Flow
IN	Intelligent Network

INITIALDP	Initial Detection Point
IP	Intelligent Peripheral
ISDN	Integrated Services Digital Network
NAP	Network Access Point
P&C	Prompt and Collect user information
PE	Physical Entity
PIN	Personal Identification Number
PLAYANN	Play Announcement
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
PUI	Personal User Identity
resp./conf.	response confirmation
req./ind.	request indication
REQREPBCSM	Request Report BCSM Event
SCF	Service Control Function
SCP	Service Control Point
SDF	Service Data Function
SDFh	Home Service Data Function
SDFo	Originating Service Data Function
SDP	Service Data Point
SIB	Service Independent Building Block
SMF	Service Management Function
SN	Service Node
SPIN	Special PIN
SRF	Specialized Resource Function
SRFRPT	Specialized Resource Function Report
SSB	Subscriber-Busy Signal
SSCP	Service Switching and Control Point
SSF	Service Switching Function
SSP	Service Switching Point
SS1	Service Set 1
TDP	Trigger Detection Point (in BCSM)
TDP-N	Trigger Detection Point – Notification (in BCSM)
TDP-R	Trigger Detection Point – Request (in BCSM)
UPT	Universal Personal Telecommunication
UPTAC	UPT Access Code
UPTN	UPT Number

5 Description of UPT

UPT introduces the concept of UPT number. In fixed telecommunication networks, a user or subscriber is associated with the network access point of the terminal, the point of attachment of the terminal. In certain mobile telecommunication networks, a user or subscriber is associated with the specific terminal in use.

In the UPT environment, the fixed association between terminal and user identification is removed. In order to offer users the capability of establishing and receiving calls on any terminal and at any location, the identification of UPT users is treated separately from the addressing of terminals and network access points. UPT user identification is achieved by use of a UPT number. The UPT user is therefore personally associated with his or her own UPT number, which is used as the basis for making and receiving calls. The UPT number is diallable on a global basis and is routable from any fixed or mobile terminal, across multiple networks irrespective of geographical location, limited only by the terminal and network capabilities and any restrictions imposed by the network operator. The UPT user may be assigned one or more UPT numbers.

UPT also allows the UPT user to participate in a user-defined set of subscribed services, from amongst which the user defines personal requirements, to form a UPT service profile.

6 Functional architecture for UPT Service Set 1

6.1 Functional architecture

The Functional Entities (FEs) and Information Flows (IFs) defined for Intelligent Network Refined Capability Set 1 (IN CS-1) are the basis in this Recommendation for the modelling of UPT, and are described in Recommendation Q.1214 [3]. The functional architecture is that of clause 3/Q.1214 [3]. A functional architecture is shown in Figure 6-1. Modelling of entities and information flows which relate to the service provider's service management are not explicitly shown. Modelling of the assist and hand-off procedures (see 5.2.12.5/Q.1214 and 5.2.12.6/Q.1214 [3]) is not included, as implementation of UPT service will require no change to the information flows and actions described there.
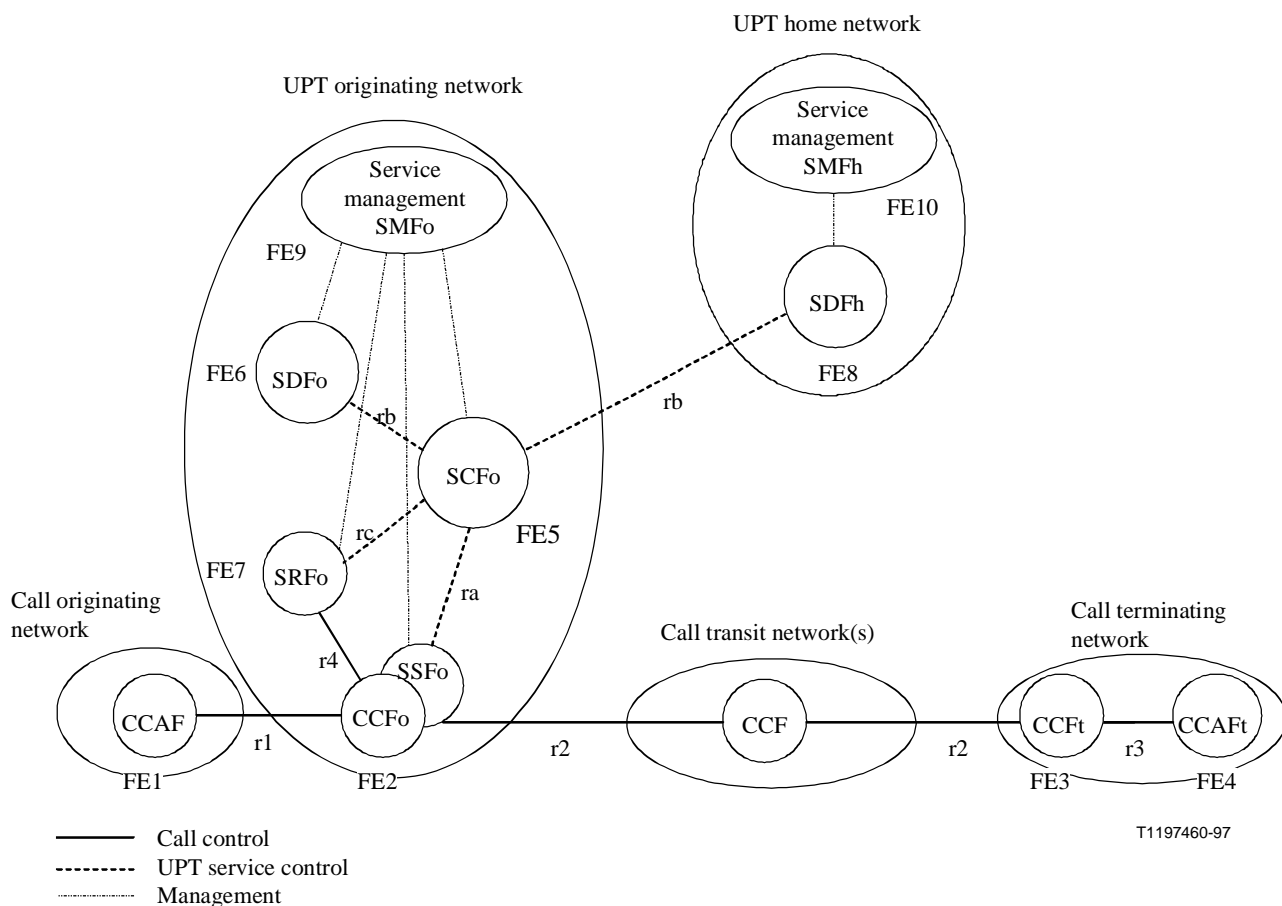
Figure 6-1/Q.1541 – Service Set 1 UPT functional architecture

6.2 Description of the functional entities

In Figure 6-1, the Functional Entities (FEs) have the following meanings:

FE1   CCAF from which the UPT request is coming;

FE2   originating CCF; associated with SSF;

FE3   terminating CCF;

FE4   terminating CCAF;

FE5   SCFo (SCF in the originating network);

FE6   SDFo;

FE7   SRFo;

FE8   SDFh (SDF in the home network);

FE9   SMFo;

FE10   SMFh;

where the terms are as follows:

CCAF   Call Control Agent Function;

CCF   Call Control Function;

SCF   Service Control Function;

SDF   Service Data Function;

SMF   Service Management Function;

SRF   Specialized Resource Function;

SSF   Service Switching Function.

Taking into account the limitations of IN CS-1, the functional architecture for UPT Service Set 1, described in Figure 6-1, presents the following characteristics:

- the interconnection of networks takes place between the SCFo and SDFh functional entities, as indicated on the figure. The interface between SCF and SDF is specified in IN CS-1;

- SDFh stores all data related to the UPT user (i.e. the database in UPT Service Set 1 is centralized). There is no transfer of the user's service profile information (it will be in CS-2) and SDFh will be accessed for any query on or update of the UPT user's data;

- SDFh must as a consequence provide access control functions to check whether or not the requests received from remote entities are authorized requests. SDFh checks that a service agreement exists with the service provider of the invoking SCF;

- SDFh performs the authentication of the UPT user (controls the security, counts the number of retries);

- SDFo stores a list of agreements, which indicates the identity of all the service providers whose subscribers are allowed to access UPT service in SDFo's network;

- SDFo stores a list of service limitations resulting from agreements with service providers or network limitations. SDFo may also contain data on local security measures;

- SDFo also stores information related to the management of the UPT service in its network, e.g. charging records which will be used later on for accounting;

- SCFo contains the Service Logic Program.

The UPT originating network is the first UPT network (see 3.2.1) accessed by the call originating network.

Descriptions of the FEs are to be found in 3.3/Q.1214 [3]. For the purposes of this Recommendation, the CCAF is identical with the CCA of Recommendation Q.71 [6]. The CCF is based on the corresponding Q.71 [6] ISDN definition but is modified for use of IN. The enhanced basic call state model of the IN defines standard Detection Points (DPs) at which IN service feature logic instances can be invoked. These DPs correspond to the Q.71 "hooks" where an ISDN supplementary service interfaces to the Q.71 basic call model. For the purposes of this Recommendation, relationships r_1, r_2 and r_3 are outside the scope of the Recommendation and are identical with those defined in Recommendation Q.71 [6]. For the purposes of this Recommendation, relationship r_4 is identical with relationship r_2 of Recommendation Q.71 [6], since it involves the control of a connection between CCF and SRF in order to provide specialized resources such as tones and announcements.

In a single service example, one CCAF originates the call and the other CCAF terminates the call. The functions and relationships involved are not symmetric. This asymmetry is reflected in the different FE designations, FE1 and FE4, assigned to the two CCAFs and in the different relationship designations between CCAFs and CCFs (r_1 and r_3).

The various scenarios for connecting the SCF to the SRF are described in 3.1.3.5/Q.1218 [5]. The information flows across the interface SCF-SRF (relationship r_c) which are involved in UPT service interactions with the UPT user are not affected by the physical realization of the SRF connection. For illustrative purposes, the IFs used in this Recommendation are based on both cases i) and ii) from Recommendation Q.1218 [5] (e.g. see Figure 7-3). SCF-initiated disconnection of SRF is assumed, except following call abandon or disconnect.

Last, one SCF or one SDF in a network does not imply one physical entity. It only indicates the same function from IN and UPT points of view, independent of their implementations (distributed or not).

7 Information flows for UPT Service Set 1

The main body of text of this Recommendation contains descriptions of all the essential and some of the optional features of UPT Service Set 1 for a variety of successful and unsuccessful operations. The UPT procedures defined in Recommendation F.851 [2] and included in this Recommendation fall into four main categories:

– elementary procedures for access, identification and authentication;

– personal mobility procedures;

– UPT call handling procedures;

– UPT service profile management procedures.

The method by which a caller indicates that access to a UPT service procedure is required will depend on the procedure requested and on whether the caller is a UPT user or not. Where a UPT user requires a personal mobility (registration) or service profile management procedure, or wishes to make an outgoing UPT call (not already registered for OutCall in SS1 on CS-1), then identification and authentication of the UPT user will always be required. In this case, some form of access procedure would be used to initiate the interaction with the UPT service.

The UPT user may send information to the UPT service provider in the network either in a prompted exchange of information or in one or in a small number of messages (e.g. by using some form of ancillary device such as a DTMF tone sender). One-way strong authentication methods may require input of several items of information in one message.

It is assumed throughout that the user invokes access to UPT service by setting up a call to a UPT service provider. This is the CS-1 required method of invocation of services provided by an IN. The user is then connected to an SRF which provides the mechanism of interaction between the UPT user and the service provider. Interaction from the user to the UPT service provider is assumed to be by DTMF in-band signalling and from the service provider to the user by the voice announcement facility of the SRF. The wording of the announcements is to show intent only, not specific content.

The order in which the UPT user sends information to the UPT service provider in the network is assumed to be:

a) access procedure (with UPT Access Code) (call set-up with information contained in SETUP req./ind.);

b) identity of UPT user (use of PUI) (interaction with SRF for this and remaining interactions);

c) authentication information (use of PIN);

d) identity of required UPT procedure (e.g. InCall);

e) data for UPT procedure;

f) optional follow-on procedure.

An outline of the sequence in which procedures could be invoked is shown in Figure 7-1.

Figure 7-1/Q.1541 – Outline of sequencing of UPT procedures
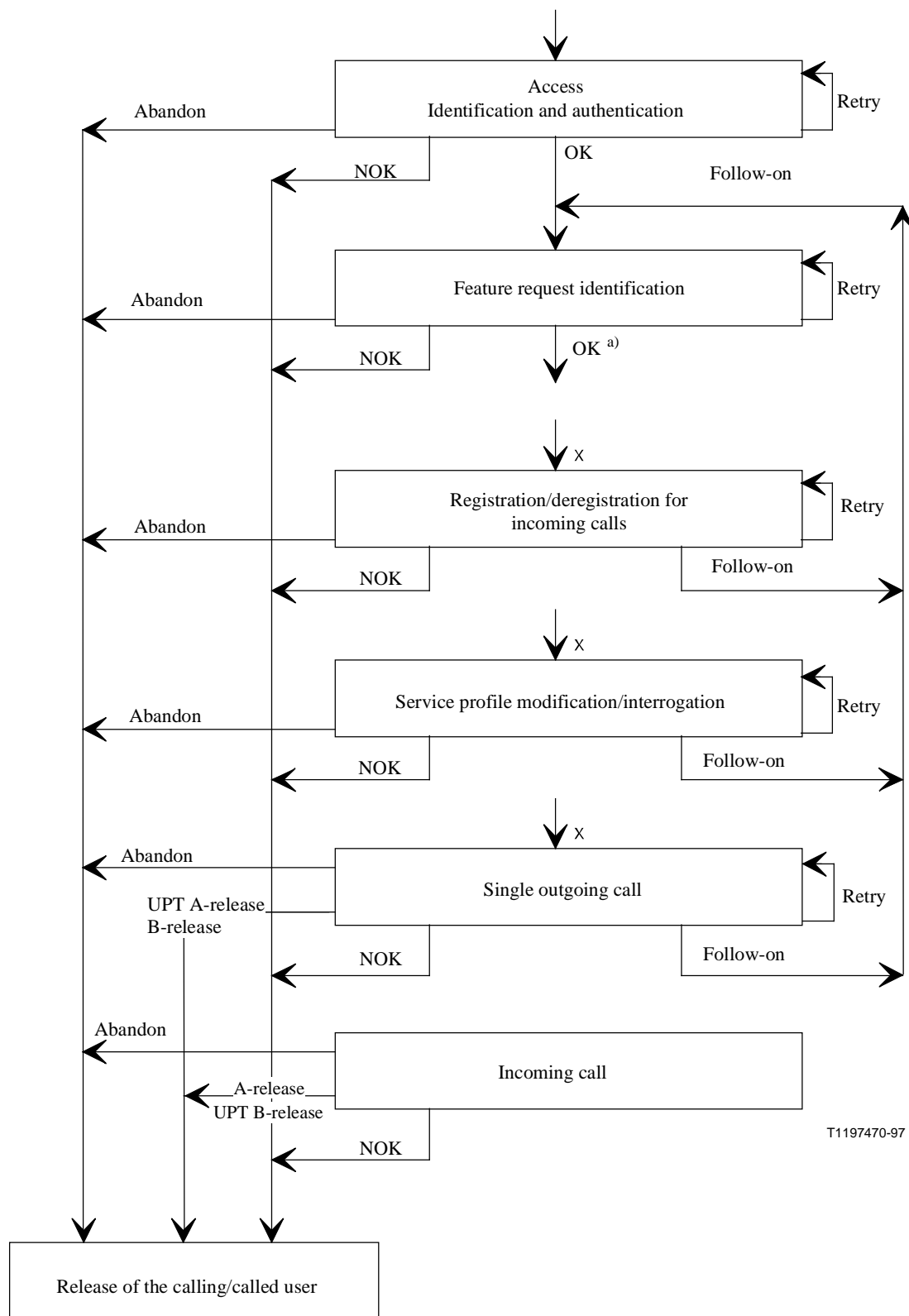
a) Can be followed by any x-marked sequence.

Figure 7-1/Q.1541 – Outline of sequencing of UPT procedures

In the case of an incoming UPT call from any person to a UPT user, no access procedure is required but the UPT number must be identifiable as such. The method by which this will occur is outside the scope of this Recommendation.

NOTE – Recommendation E.168 provides the information on the means by which this may occur.

It is assumed that both home and originating networks may apply limits on the number of retries that a UPT user may make if authentication, for example, is unsuccessful. For the purposes of this Recommendation, it is assumed that the values applying to such limits would be stored in SDFh and that the counter logic would reside in the SDFh.

The Information Flows (IFs) and their contents [Information Elements (IEs)] are based on those developed for the IN architecture, as described in clause 6/Q.1214 [3]. Whether IFs are confirmed or unconfirmed, and of type req./ind. or resp./conf., is described there.

The charging methods which are described in 5.2.2/Q.1214 [3] can apply to UPT service, provided the principles of Recommendation D.280 [7] are followed.

Where the SSF/CCF is required to send and react to both bearer/non-IN call control (see Recommendation Q.71 [6]) and IN call control IFs, the sequencing of the two classes of IF bears no relationship to each other, except that synchronization of the termination of sequences is assumed. For example, it has been assumed that the SSF/CCF will wait until all resources are released and the call is terminated before sending a Call Information Report to the SCF.

7.1 UPT elementary procedures and common sequences

7.1.1 Access, identification and authentication

For simplicity, it is assumed that the identity of the UPT user's service provider can be deduced from the UPT number. It is further assumed that, if there is a service agreement between the originating network service provider and the UPT user's service provider, then and only then does the originating SCF contain information identifying SDFh. Other methods are possible.

7.1.1.1 Outline description

The following is a high-level description of the network actions required when a UPT user requests access to UPT service and undertakes identification and authentication:

1) access code input by UPT user (UPTAC);

2) recognition of access code, suspension of call processing in CCF, connection of SRF (Establish Temporary Connection);

3) prompt and response for user identification (PUI);

4) prompt and response for user authentication (input authentication code).

   NOTE – If the authentication is a one-way strong authentication (automatic authentication with a device), steps 3) and 4) above are replaced by a single flow.

5) UPT user's service provider undertakes authentication check and sends result. The SDFh controls the security and counts the number of retries;

6) decision:
   – if successful, continue to feature identification;
   – if unsuccessful and more attempts allowed, advise user of failure and restart at step 3) if one-way strong authentication, at step 4) if weak authentication;
   – if unsuccessful and no more attempts allowed, advise user and release call.

The initial access code will contain information that enables SSF/CCF to trigger on a statically armed detection point (TDP-R). Call processing will then be suspended at the detection point.

7.1.1.2   Information flows

Most UPT procedures start with a user request followed by an identification and an authentication. The organization of these sequences is given in the following block diagram (see Figure 7-2; also, see Figures 7-3 to 7-5).

The procedure includes the possibility for the user to make several attempts (retries).

Prompts are given to the user after each attempt according to the result of the procedure and allowed service options.

The logical outputs of the procedure are:

1)   OK: proceed to next procedure;

2)   NOK: the user is released by the network after a prompt:

   –   when the last permitted attempt has failed;

   –   when a given number of rejected requests is reached (e.g. protection against misuse through a transaction-based counter in SCF);

3)   the user abandons the request (in any state).

NOTE – The procedures to change PIN code or to unblock the PIN (after the limit of attempts is reached) are not described in this Recommendation.
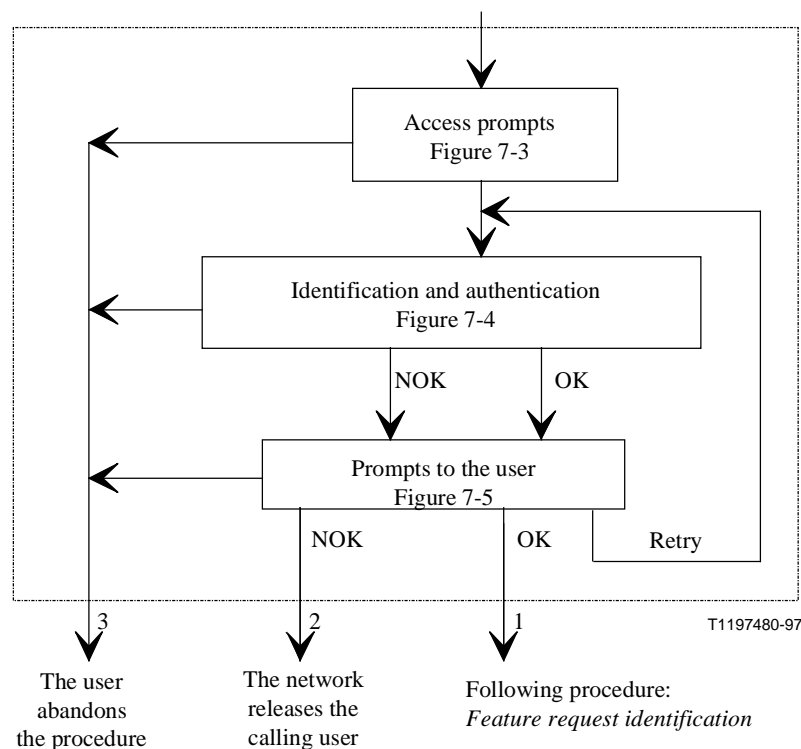

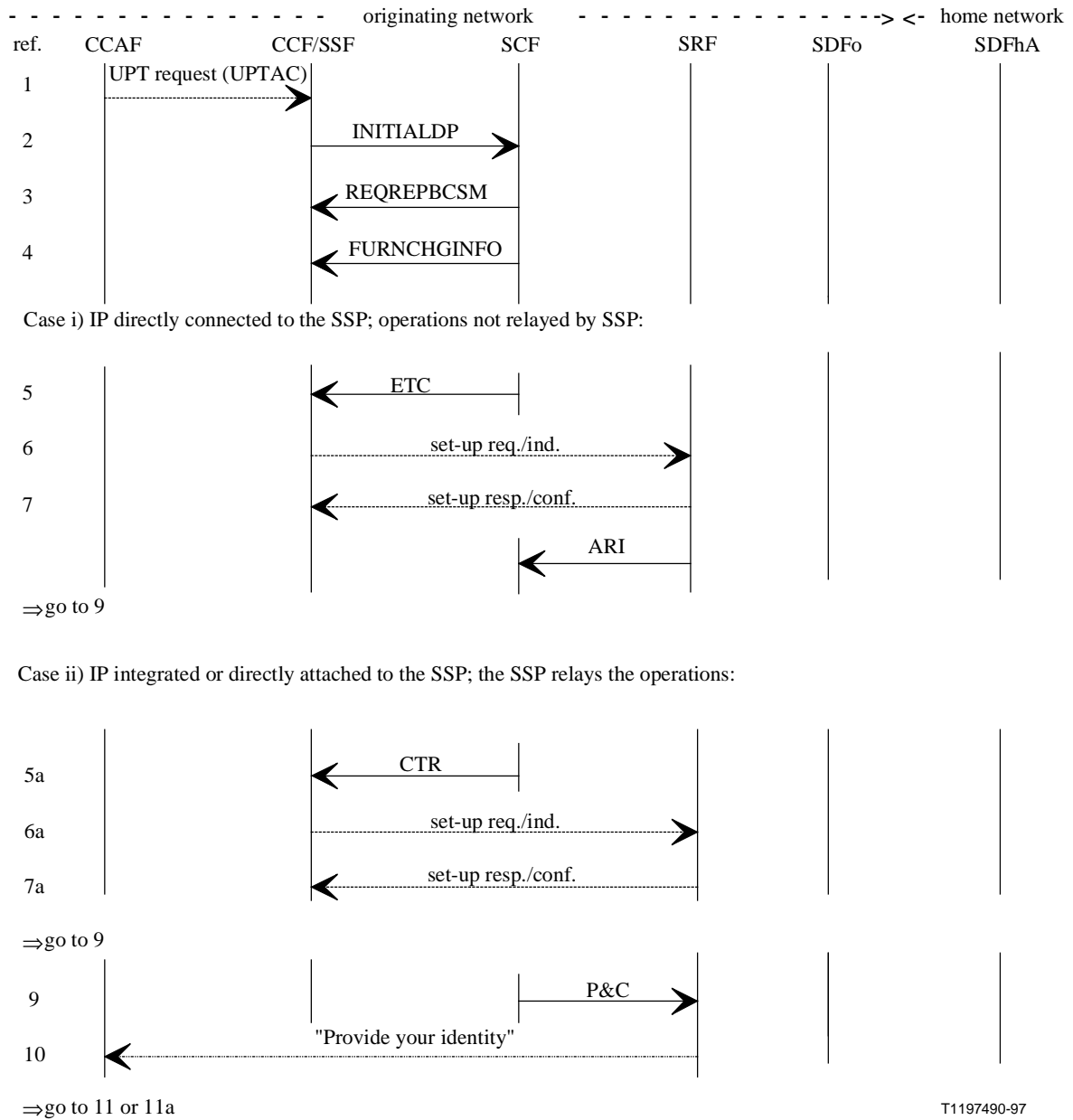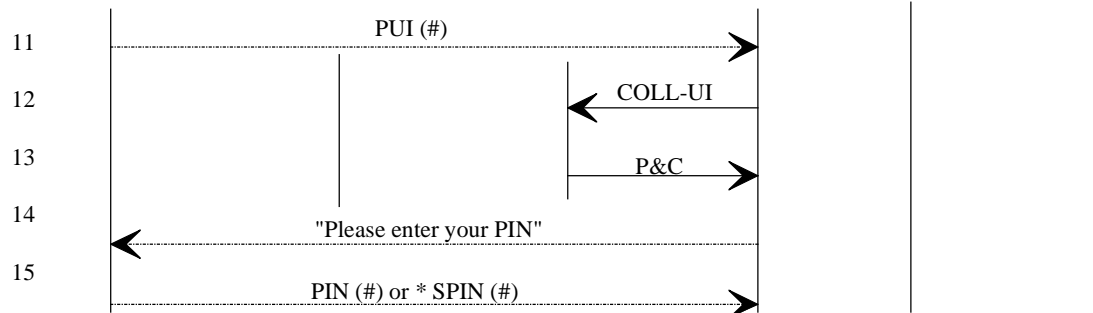**Figure 7-2/Q.1541 – Access, identification and authentication**

Figure 7-3/Q.1541 – Access and prompts
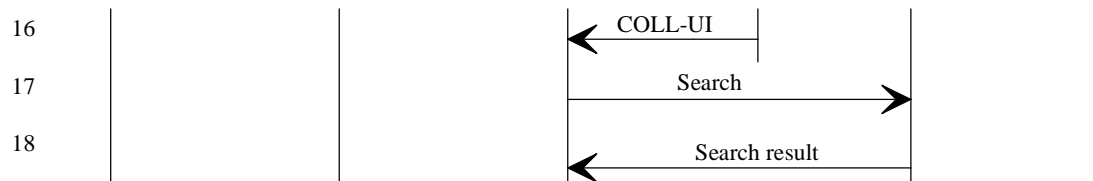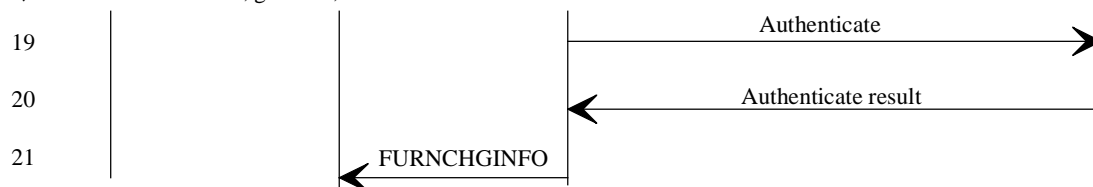
⇒If authentication is successful, go to 31, else:

⇒Authentication has failed. If another attempt may take place, go to 41.

⇒If last permitted attempt fails or if the local maximum number of
rejected requests is reached, go to 51.

⇒If authentication is not possible (failed local check), go to 61.

Figure 7-4/Q.1541 – Identification and authentication
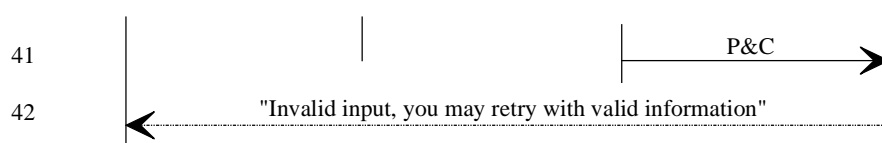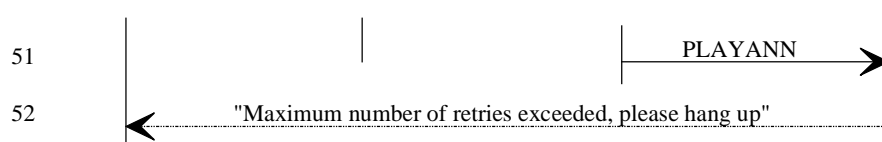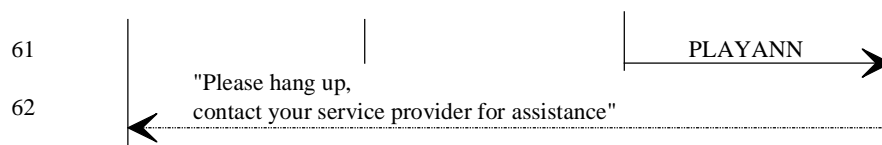
Figure 7-5/Q.1541 – Prompts to the user
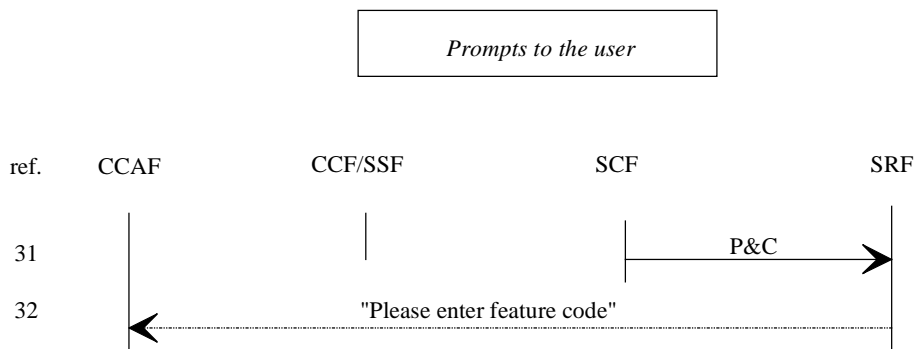
Notes on access, identification and authentication

IF ref.:

1, 2   The UPT request contains information (UPTAC) that enables CCF/SSF to trigger "Initial Detection Point".

3   REQREPBCSM contains the list of events and their monitoring mode (may be useless if the DPs are statically armed).

4   The FURNCHGINFO operation is sent to instruct SSF to create a call record for the following user request.

5-8	The SSF is ordered to connect an SRF using the ETC operation.
	The ARI operation is used (SCF-SRF operations not relayed by SSF).
5a-7a	The SSF is ordered to connect an SRF using CTR.
	In this case the SCF-SRF operations are relayed by the SSF.
9, 10	P&C enables the SRF to prompt the user.
11	In manual procedure the user sends the PUI Number.
	To avoid to wait for end of dialling recognition by a time-out, the user may use a star (*) to speed up the procedure and then dial the PIN in the same sequence.
	After the PIN, a square (#) may be dialled to terminate the sequence.
12	"Collected Info" to SCF contains information received from the user.
13-15	If the user does not dial the (#) and waits, he/she is prompted to send the PIN.
	The PIN request is systematic.
11a	In automatic procedure the subscription device sends all authentication information in one string.
	The star (*) is used as a separator. At the head of the sequence, the (*) enables the SCF and the SDFhA to recognize an automatic authentication sequence.
	AC is the authentication code (result of calculation by the device), Ns a sequence number (incremented each time) and CT identifies the algorithm to be used.
16	The complete string of information is received in the SCF, a format check is applied.
	NOTE – A local black-listing of users misusing the service may exist. However, this has no impact on the Information Flows and is not reflected in the diagrams.
17, 18	The SDFo query provides a local check, e.g. to check if there exists particular agreements between the local service provider and the user's home provider (Agreement check).
	SDFh address and service-specific data: e.g. maximum global counter value may also be retrieved with this local check.
19, 20	The received information is sent to SDFh in one string for authentication.
	SDFh monitors and keeps a count of the number of attempts.
	SDFh sends the result of authentication back to SCF.
21	The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.
	NOTE – According to the phase of authentication: 1st, 2nd, ... last attempt exchanges 11, 11a or 14 to 21 can be repeated.
31, 32	The SRF is ordered to inform the user that authentication is successful and that feature identification may now take place.
41, 42	The SRF is ordered to inform the user that another attempt is allowed (no reason is given).
51, 52	The SRF prompts the user that the maximum number of rejected requests is reached (the count of the number of attempts is done in the SCF). The user is asked to hang up.
61, 62	The user is asked to hang up. No further attempt is allowed, but the line is not blocked.
	The user may contact the local/home provider for assistance.

7.1.2 UPT release sequences

We describe in this subclause only the sequences that are initiated by the UPT user or the network. They normally take place at the end of every UPT user procedure or call.

The following situations may be encountered:

- release initiated by the user hanging up spontaneously in any state, or during/consequent to the reception of an announcement. The release may also be initiated by the originating network;

- forced release initiated by the IN-node, either immediately or after a prompt (possibly associated with a time-out), e.g. when, following an invitation to terminate, the user does not hang up.

Thus, the release procedure has the following inputs:

1) the UPT user abandons a procedure in any state or the user hangs up during or after a prompt;

2) the UPT user is released by the IN-node.

The following UPT user/network release sequences are described:

a)   *A-party initiated release* – at any time in all procedures, by the calling user;

b)   *B-party initiated release* – only for call handling procedures, at any time after answer for call;

c)   *Network-initiated release* – at end of outgoing procedure or on error or failure, e.g. after authentication rejection, and after reset procedure.

When SRF is connected, release implies disconnection of SRF by CCF, in a similar way to Figure 7-6.

7.1.2.1 Information flow diagrams

7.1.2.1.1 UPT A-party initiated release

See Figure 7-6.
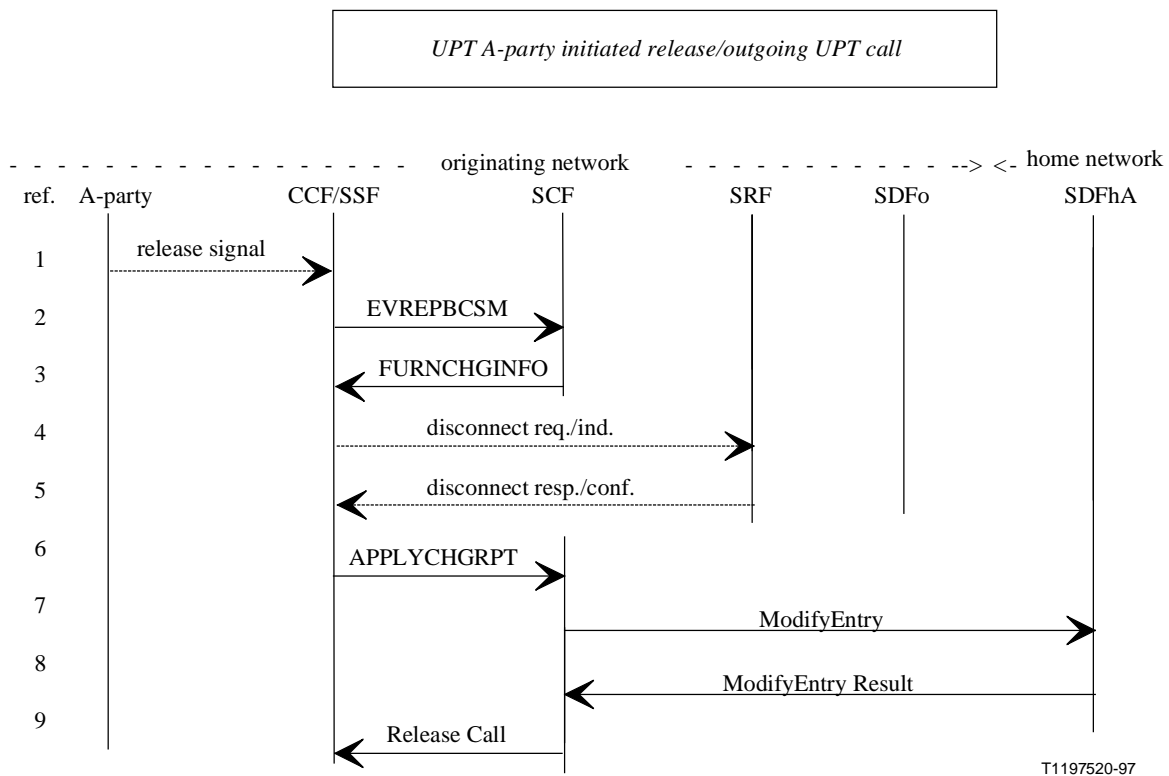
Figure 7-6/Q.1541 – UPT A-party initiated release

Notes on UPT A-party initiated release

IF ref.:

1, 2   A release signal is received from the network and sent to the SCF.

4, 5   When an SRF is connected, e.g. abandon during a prompt, SRF disconnection is initiated by the CCF.

      This sequence is network configuration dependent.

6-8   When an "ApplyCharging" has been issued, the record is returned to the SCF in an "ApplyChargingReport". The record is sent to the SDFhA.

      Other SDFs may also receive a record for e.g. split charging.

9   When an outgoing connection exists, the "Release Call" operation may be used. This sequence is network configuration dependent.

7.1.2.1.2   Non-UPT A-party initiated release

See Figure 7-7.
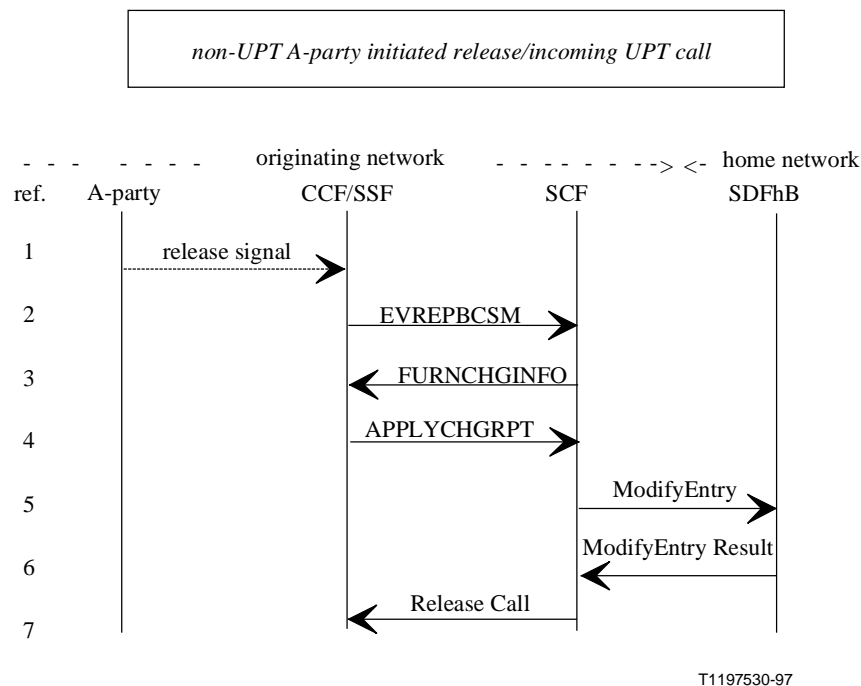
Figure 7-7/Q.1541 – Non-UPT A-party initiated release

Notes on non-UPT A-party initiated release

IF ref.:

1, 2   A release signal is received from the network and sent to the SCF.

4-6   When an "ApplyCharging" has been issued, the record is returned to the SCF in an "ApplyChargingReport". The record is sent to the SDFhB.

Other SDFs may also receive a record for, e.g., split charging.

7   When an outgoing connection exists, the "Release Call" operation may be used. This sequence is network configuration dependent.

7.1.2.1.3   UPT B-party initiated release

See Figure 7-8.
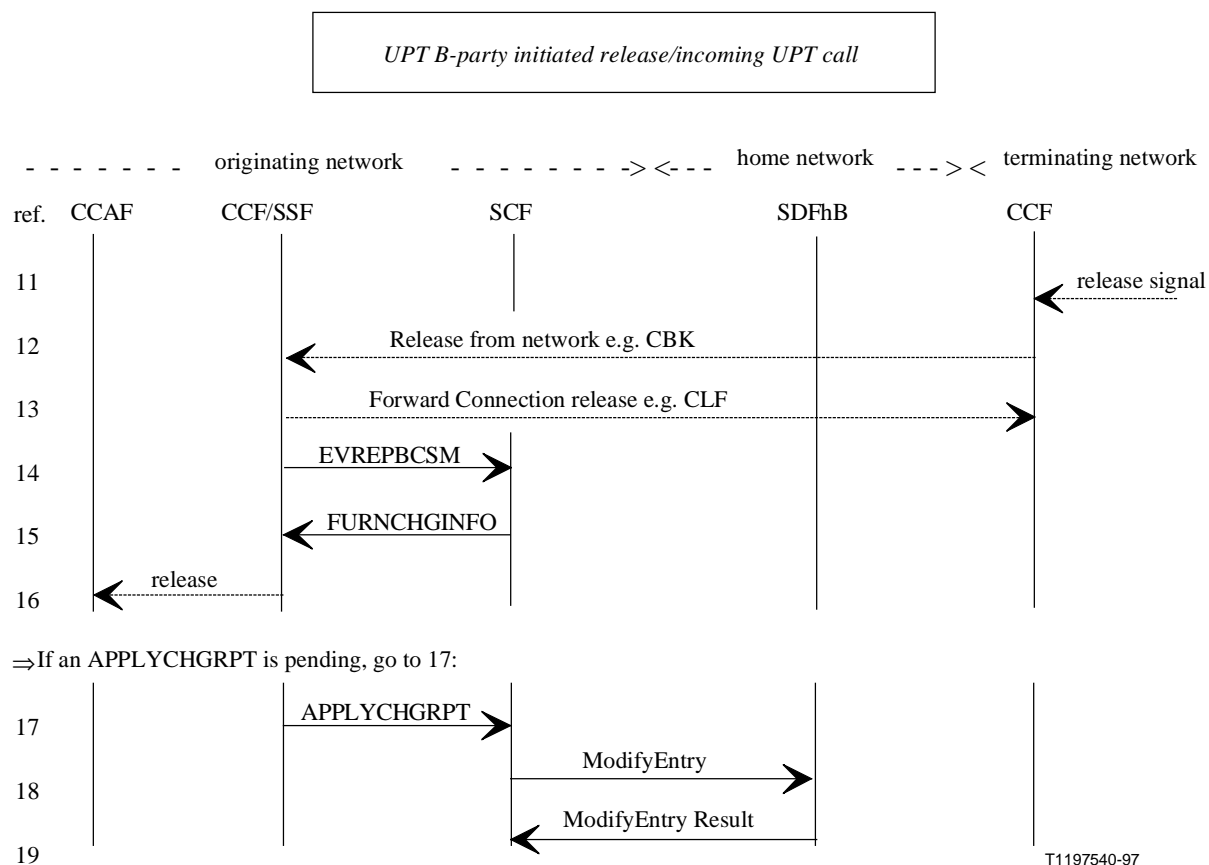
Figure 7-8/Q.1541 – UPT B-party initiated release

Notes on UPT B-party initiated release

IF ref.:

11-16   The UPT called party ends the conversation. SSF initiates an immediate disconnection sequence of the forward circuit. The disconnection sequence is network dependent.

SSF reports to SCF.

17-19   Since an "ApplyCharging" has been issued, the record is returned to the SCF and transferred to the SDFh of the called UPT user. Another record may also be sent to the originating network.

7.1.2.1.4   Non-UPT B-party initiated release

See Figure 7-9.

```
                    ┌──────────────────────────────────────────┐
                    │  non-UPT B-party initiated release/incoming UPT call  │
                    └──────────────────────────────────────────┘
```
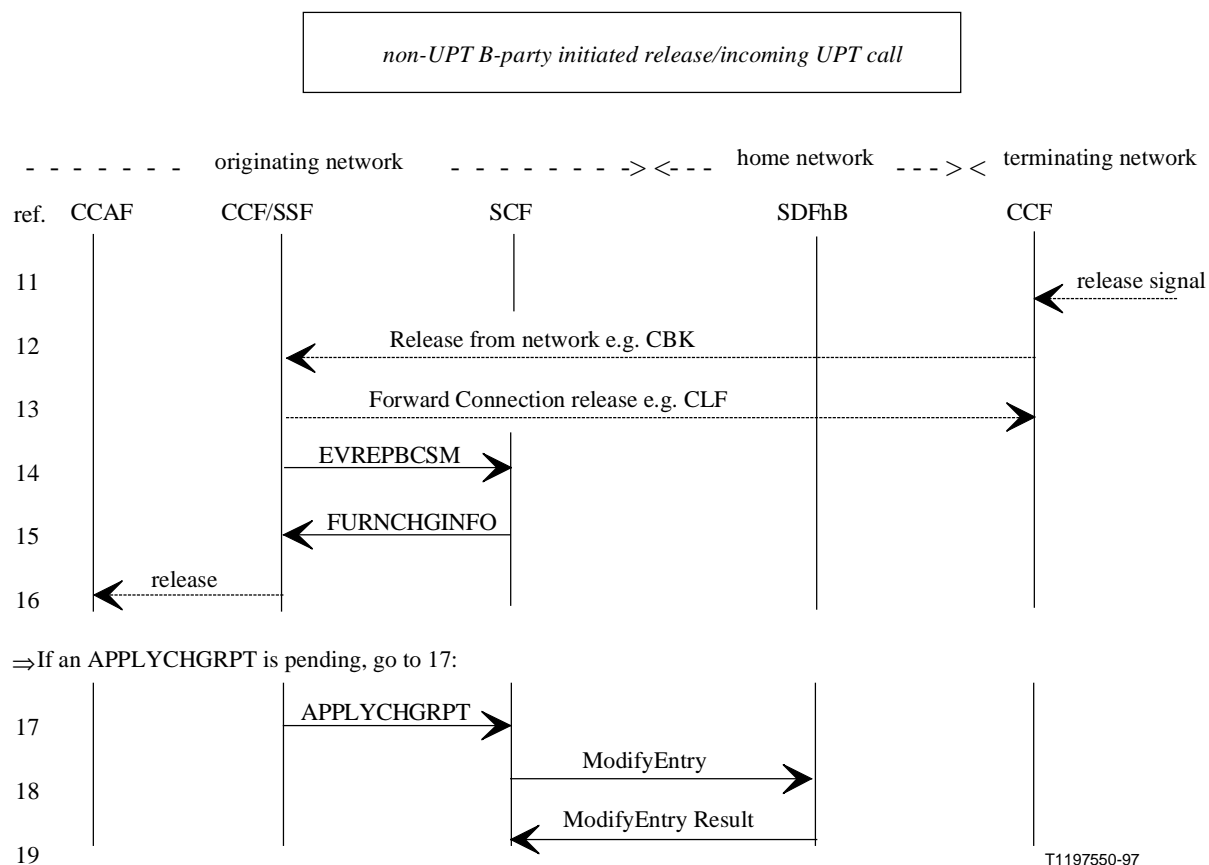
Figure 7-9/Q.1541 – Non-UPT B-party initiated release

Notes on non-UPT B-party initiated release

IF ref.:

11-16   The called party ends the conversation. SSF initiates an immediate disconnection sequence of the forward circuit. The disconnection sequence is network dependent.

SSF reports to SCF.

17-19   Since an "ApplyCharging" has been issued, the record is returned to the SCF and transferred to the SDFh of the calling UPT user. Another record may also be sent to the originating network.

7.1.2.1.5   Network-initiated release

See Figure 7-10.

Figure 7-10/Q.1541 – Network-initiated release

Notes on network-initiated release

IF ref.:

Option 1

21a   When a prompt is sent to the user e.g. after follow-on, network-initiated disconnection may be triggered either after a time-out or a given number of prompt repetitions.
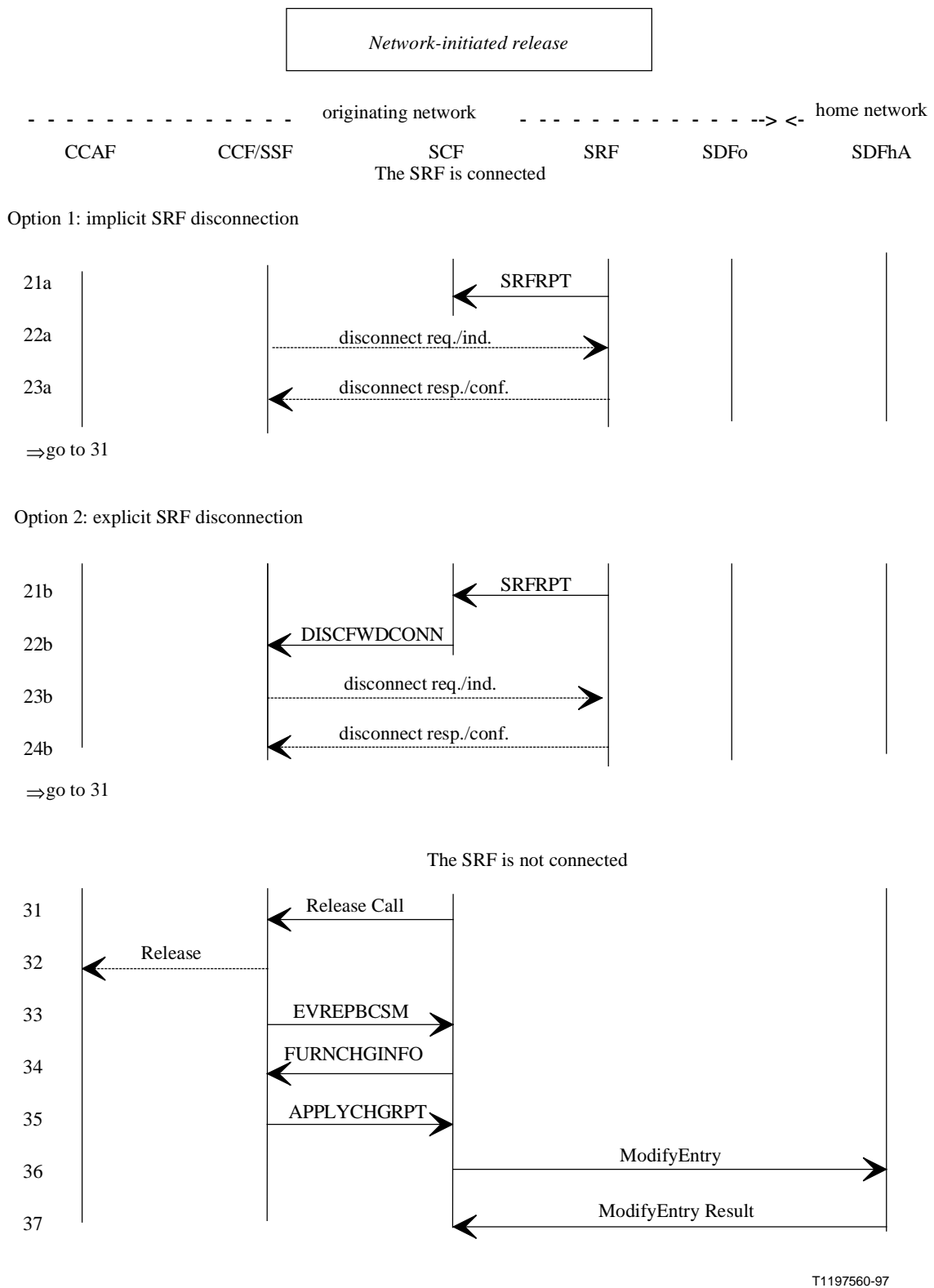
In this case an "SRF Report" is sent to SCF to indicate that call disconnection may start.

22a, 23a The disconnection of the SRF is initiated by the SRF itself (this sequence is network configuration dependent).

Option 2

21b   See 21a.

22b, 24b SCF orders the disconnection of the SRF (this sequence is network configuration dependent).

31, 32   This release sequence takes place when the SRF is not connected or when no prompt is given to the user. "Release Call" initiates the forced release of the user and the release of associated connections in the calling network.

NOTE – The release sequence of any possible outgoing connection is not shown.

35-37   See 5-7 (in non-UPT A-party initiated release).

In Figures 7-6 to 7-8, the release sequences apply to the case of ISDN access. For PSTN, simple sequences will apply.

It is assumed that the appropriate detection points for detecting call abandon (DP 10) and disconnect (DP 9) will always be appropriately armed as EDP-N for detecting A-party release, so the case of unarmed DPs has not been shown. For detecting B-party disconnect for follow-on outgoing UPT calls, DP 9 will also be armed as EDP-R with Leg ID information element specified as B-party.

For B-party initiated disconnection, depending on the signalling protocols in use between CCFs, the originating CCF will need to recognize Release, Clearback and Suspend (network-initiated) messages. The O_Disconnect information flow could be used instead of Event Report BCSM to pass the Release Cause information element to the SCF, if required. This has not been shown here, and Event Report BCSM req./ind. is used to report detection of DP 9, O_Disconnect.

The sequence for release of the SRF (if connected) following call abandon is assumed to be controlled by the SSF/CCF (see 3.1.3.5.3/Q.1218 [5]). The SSF/CCF sends RELEASE req./ind. to the SRF to release it without waiting for the disconnect request (Disconnect Forward Connection) from the SCF. The SCF is advised of call termination by sending Event Report BCSM to SCF. Once the SCF is thus advised that dialogue with the SSF is terminated, it will await any outstanding Call Information Report before returning to the idle state.

The procedures for call release are based on the corresponding procedures in Recommendation Q.1218 [5]. In particular, for call abandon before answer, 3.1.1.4/Q.1218 [5] requires that all CCF resources have been de-allocated before sending notification (Event Report BCSM req./ind.) to the SCF. When the first party disconnects after answer, the Event Report BCSM req. ind. is sent first and thus precedes de-allocation of CCF resources. This is required for implementing follow-on in outgoing UPT calls.

In the case of network-initiated disconnection, if the SRF is connected it must first be disconnected (by Disconnect Forward Connection req. ind. for SCF-initiated release). Otherwise the Release Call req./ind. will be ignored by the SSF, as described in 3.1.1.5.4/Q.1218 [5].

7.1.3 Feature identification (including global follow-on)

Feature identification follows after successful identification and authentication. It is followed by specific personal mobility, call handling or service profile management procedures. It is assumed that a limit will be applied to the number of unsuccessful attempts to identify a procedure that a user may make. No limit is applied to successful attempts.

7.1.3.1 Outline description

The following is a high-level description of the network actions for the UPT user to input feature identification:

1)   feature identification (prompt/response) – reply "feature code";

2)   query originating SDF to determine if service agreement for that procedure exists with home service provider;

3)   query home SDF to determine if UPT user has subscribed to this procedure;

4)   decision:

–   if successful, go to procedure requested;

–   if unsuccessful, retry or release.

7.1.3.2 Information flow diagrams

This sequence takes place:

–   after a successful authentication;

–   as a follow-on after any other procedure.

The organization of this sequence is given in the following block diagram (see Figure 7-11; also see Figures 7-12 and 7-13):

When the request is denied, the user could be allowed to request another feature (retry = follow-on).

The logical outputs of the procedure are:

1)   OK: proceed to next procedure;

2)   NOK: the user is released by the network, after a prompt (see Note);

3)   the user abandons the request (in any state).

NOTE – To prevent the service/network from being misused, e.g. abnormal number of retries after a request rejection, the network may release the user.

This function is carried out in the SCF.

Authentication

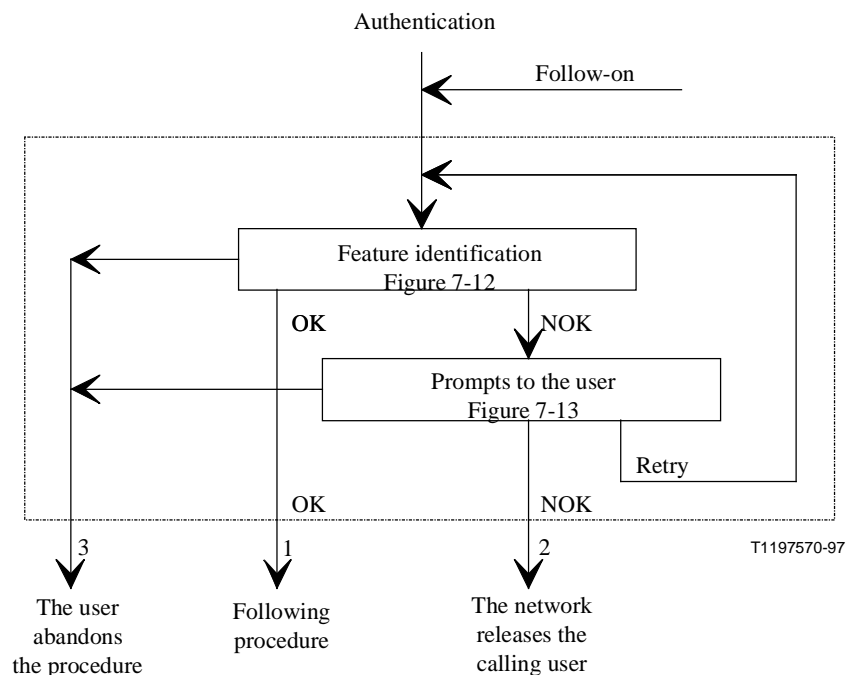

Figure 7-11/Q.1541 – Feature request identification
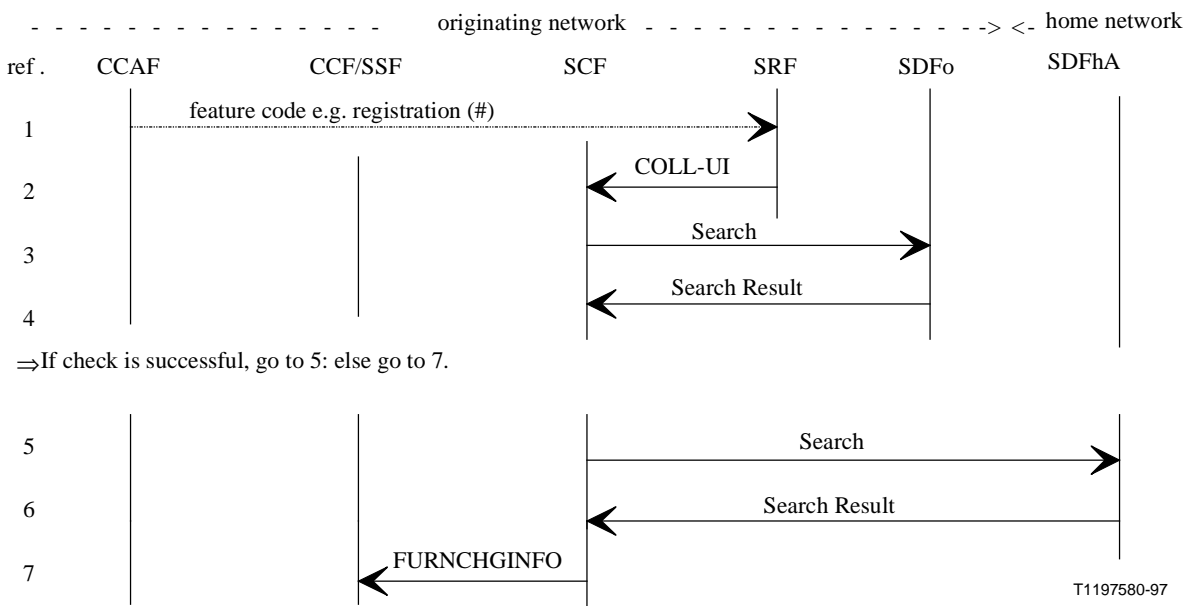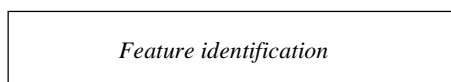
⇒If check is successful go to the required procedure.
⇒If the maximum number of rejected requests is reached, go to 21;.
⇒else, go to 11.

Figure 7-12/Q.1541 – Feature identification

Figure 7-13/Q.1541 – Prompts to the user

Notes on feature request identification

IF ref.:

1, 2   The user indicates the requested feature code.

   The SRF sends the received code to the SCF. The feature request may be made in several steps.

   A flag may be input at the end of the request. This would allow immediate input of the following information.

3, 4   The SDFo query is intended to locally check e.g. if there exists particular agreements between the local service provider and the user's home provider for that feature request (agreement check; may include follow-on allowance).

5, 6   The SDFh query is intended to check e.g. if the user has subscribed to the requested feature, if the request is consistent with user state (profile check which may also contain a credit indicator).

   In the follow-on this check could be used between two subcalls to verify if the user is allowed to continue, e.g. credit check.

   According to feature request and to inter-operator agreements, some of these checks might be superfluous.

   When the request is not accepted another attempt could be allowed: exchanges 1-6 could be repeated after a prompt (see 11, 12).

7   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record or to create a new record after a follow-on.

11, 12 The SRF prompts the user that the request cannot be handled. The user is asked to terminate or to request another procedure.

> NOTE – The prompt given to the user may vary depending on the requested feature and/or nature of the rejection.

21, 22 The SRF prompts the user that the maximum number of rejected requests is reached (the count of the number of attempts is done in the SCF). The user is asked to hang up.

7.2 Procedures for personal mobility

7.2.1 Registration

"Registration" is a generic name used in this Recommendation to describe InCall registration, in which the UPT user registers a terminal address to which incoming UPT calls are to be presented.

Local and remote registration are supported by the user inputting the terminal address required. Remote registration is registration on a terminal other than the one being used for the registration procedure. Unless the remote terminal address is in a UPT network, it will not be possible to check the validity of the specified address.

For UPT Service Set 1, InCall registration on the current terminal is classified as **essential** procedure and remote registration is **optional** (both are included in the description below).

7.2.1.1 Outline description

The following is a high-level description of the network actions required when a UPT user invokes an Incall registration procedure. Access, identification and authentication have already been completed and the registration procedure required has been identified:

1) input new location and echo to user;

2) input other optional parameters;

3) query originating SDF to verify that UPT user is allowed by originating network to register on the terminal address specified;

4) query home SDF to verify that UPT user is allowed by home network to register on the terminal address specified;

5) update and confirmation of location data in SDFh;

6) decision:

   – if successful, advise user of success and request new procedure;

   – if unsuccessful, retry or release.

7.2.1.2 Information flow diagrams

Prerequisite sequences: Access, identification and authentication;

Feature request identification.

The organization of the registration sequence is given in the following block diagram (see Figure 7-14; also see Figures 7-15 to 7-17).

Of course, charging is a national or operator matter. FURNCHGINFO depends on the place of charging in the procedure and on the existence of charging (registration could be free).

As an option, the procedure includes the possibility for the user to impose limitations/restrictions to the registration.

Prompts are given to the user according to allowed service options.

The logical outputs of the procedure are:

1)   OK: the user is allowed to request another feature (follow-on);

2)   NOK: the user is released by the network after a prompt; to prevent the service/network from being misused e.g. abnormal number of retries after a request rejection, the network may release the user. This function is carried out in the SCF;
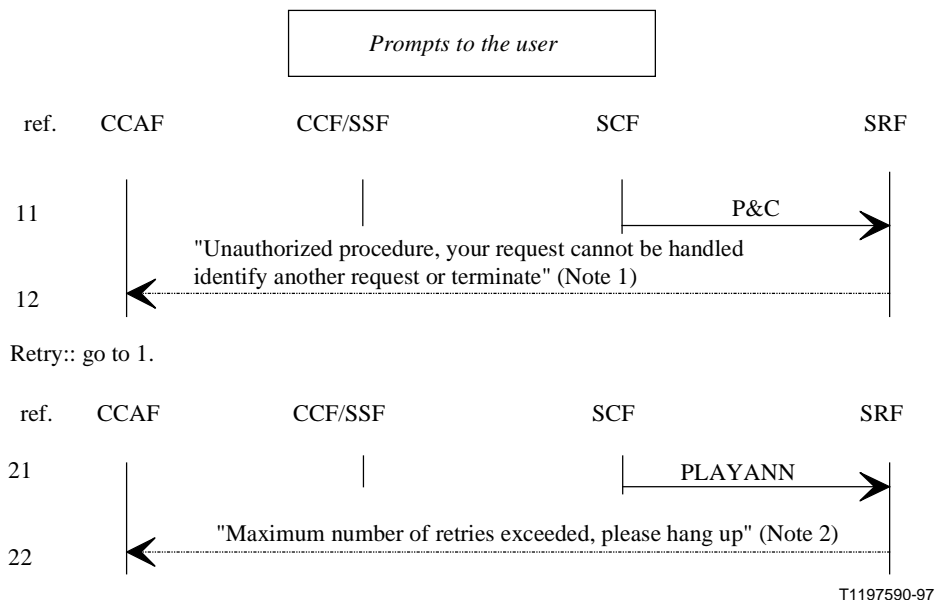
3)   the user abandons the request (in any state).
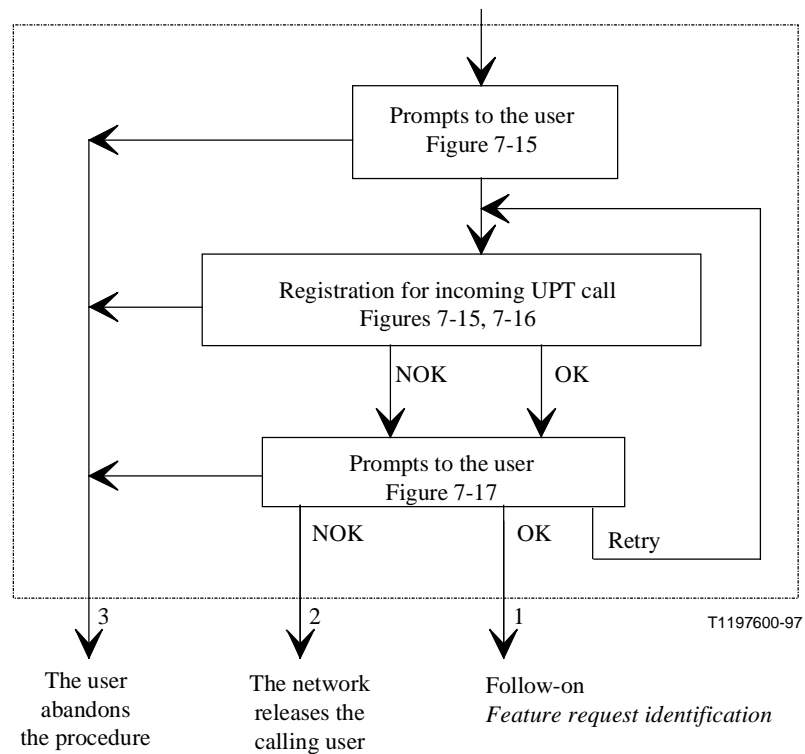
Figure 7-14/Q.1541 – Registration for incoming UPT call

Figure 7-15/Q.1541 – **Prompts and registration for incoming UPT call**

Prompts and registration for incoming UPT call

originating network   home network

ref.   CCAF   CCF/SSF   SCF   SRF   SDFo   SDFhA
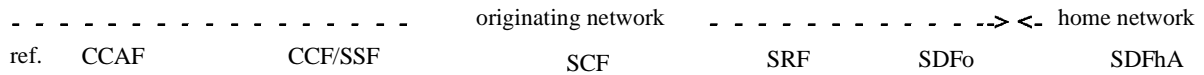
a) In a network with automatic Calling Line Identification:

1   P&C

2   "You are at terminal aaaa. Do you want to register at that terminal? Enter YYY to confirm, NNN to cancel or ESC to make another request"

3   "user acknowledgement"

4   COLL-UI
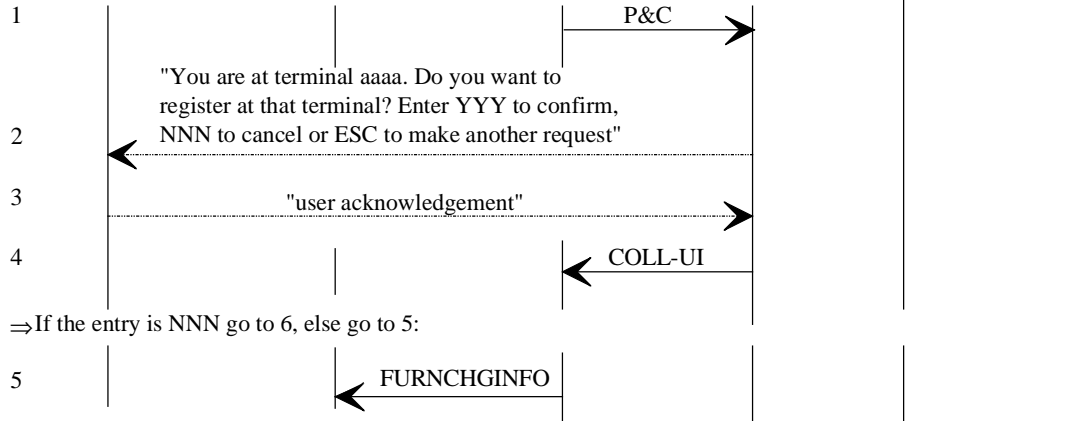
⇒If the entry is NNN go to 6, else go to 5:

5   FURNCHGINFO

⇒If the entry is YYY go to 15, if the entry is ESC, go to 61.
⇒If the maximum number of cancelled attempts is reached, go to 91.

b) In a network with no Calling Line Identification:

6   P&C

7   "Please enter terminal number"

8   Terminal number (#)

9   COLL-UI

10   P&C

11   "You want to register at terminal aaaa? Enter YYY to confirm, NNN to cancel and make another try or ESC to make another request"

12   "user acknowledgement"

12   COLL-UI

14   FURNCHGINFO
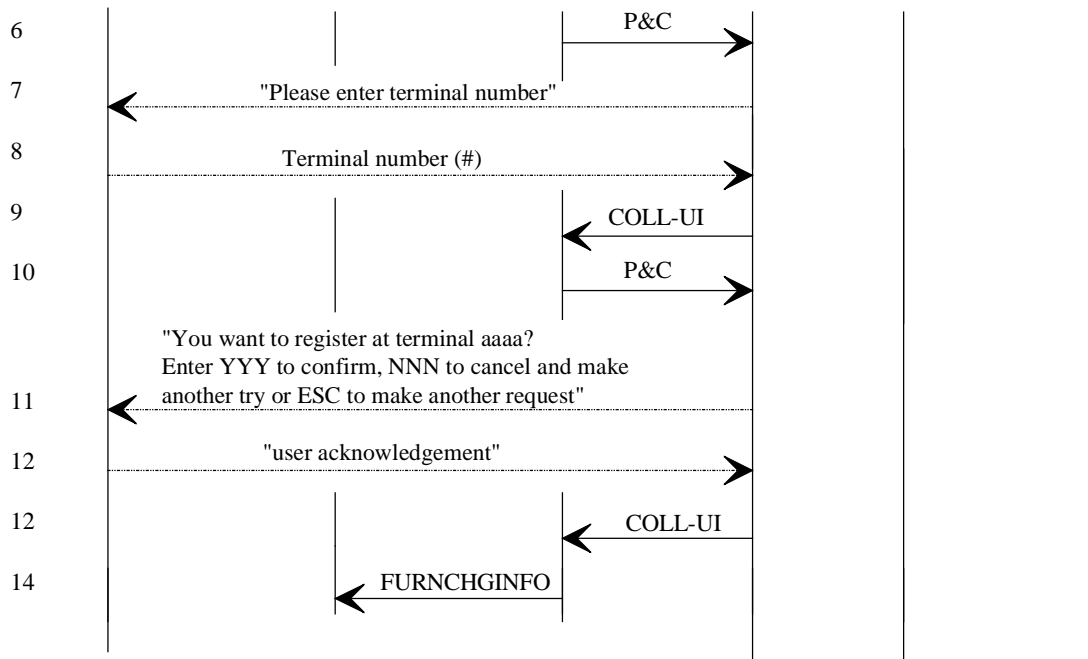
⇒If the entry is YYY, go to 15.
⇒If the entry is NNN, go to 71.
⇒If the entry is ESC, go to 61.
⇒If the maximum number of cancelled attempts is reached, go to 91.

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Registration for incoming UPT call (continued)

ref.	CCAF	CCF/SSF	SCF	SRF	SDFo	SDFhA

originating network - - - - - - - - - - - - --> <- home network

15 — Search (SCF → SRF)

16 — Search Result (SRF → SCF)

⇒If check is successful, go to 21, else go to 17:

17 — FURNCHGINFO (SCF → CCF/SSF)

⇒If the maximum number of rejected attempts is reached, go to 91;
⇒else a new manual registration attempt is allowed go to 51.

Registration limitation sequence:

21 — P&C (SCF → SRF)

22 — "Please enter registration limitation sequence" (→ CCAF)

23 — * C * XXXX (#) (CCAF → SRF)

24 — COLL-UI (SRF → SCF)

25 — P&C (SCF → SRF)

26 — "Enter YYY to confirm, NNN to cancel and make another try, or ESC to make another request" (→ CCAF)

27 — "User acknowledgement" (CCAF → SRF)

28 — COLL-UI (SRF → SCF)
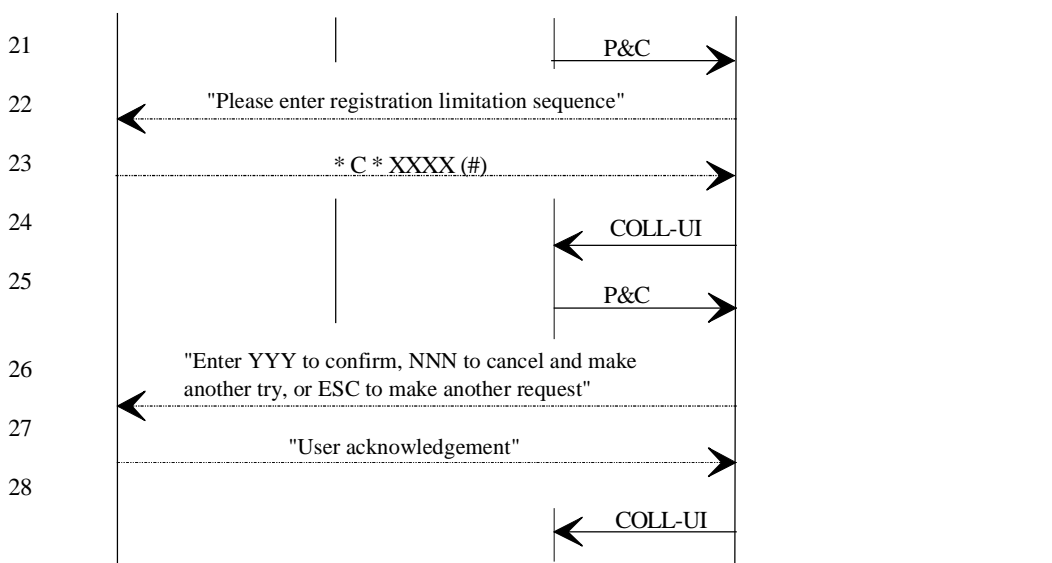
⇒If the entry is YYY, go to 29.
⇒If the entry is NNN, go to 81.
⇒If the entry is ESC, go to 61.
⇒If the maximum number of rejected attempts is reached, go to 91.

29 — PLAYANN (SCF → SRF)

31 — "Your request is being processed, please wait" (→ CCAF)

32 — Search (SCF → SDFhA)

33 — Search Result (SDFhA → SCF)

34 — ModifyEntry (SCF → SDFhA)

35 — ModifyEntry Result (SDFhA → SCF)

36 — FURNCHGINFO (SCF → CCF/SSF)
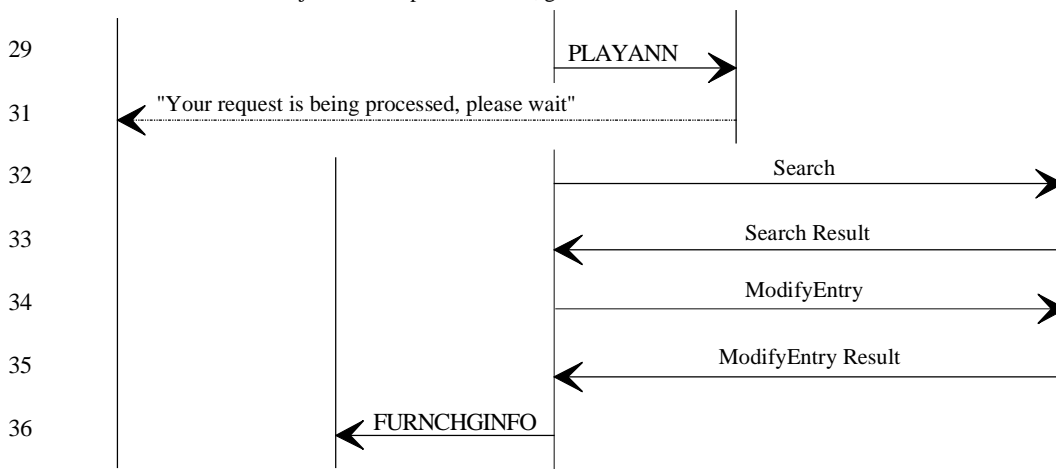
⇒If registration is successful, go to 41.
⇒If the maximum number of rejected attempts is reached, go to 91;
⇒else, go to 101.

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Figure 7-16/Q.1541 – Registration for incoming UPT call *(continued)*

Figure 7-17/Q.1541 – Prompts to the user

CCAF   CCF/SSF   SCF   SRF

41   P&C

42   "You are now registered at terminal aaaa
       you may identify another request or terminate"

Logical output 1: ⇒go to another procedure;
Logical output 2/3: ⇒go to *UPT A-party initiated release.*

51   P&C

52   "Unauthorized registration number,
       retry with valid information"

Retry: go to 8

61   P&C

62   "Your request is cancelled (after ESC),
       identify another request or terminate"

Logical output 1: ⇒go to another procedure;
Logical output 2/3: ⇒go to *UPT A-party initiated release.*

71   P&C

72   "Your request is cancelled, retry with valid information"

Retry: go to 8

81   P&C

82   "Your request is cancelled, retry with valid information"

Retry: go to 23

91   PLAYANN

92   "Maximum number of retries exceeded, please hang up"

Logical output 2/3: ⇒go to *UPT A-party initiated release.*

101   P&C

102   "Invalid input, retry with valid information"

Retry: go to 23   T1197630-97

NOTE – After any prompt the user may abandon (logical output 3) or not react within a given time (logical output 2).

Figure 7-17/Q.1541 – Prompts to the user

Notes on registration for incoming UPT calls

IF ref.:

1-5   When CLI is available in the network, the user must first confirm whether registration will be at that terminal or not. If "yes", or in case of Escape, the "FurnishChargingInformation" is sent to instruct SSF to update the record. If "no" the procedure is the same as when no CLI is provided.

6-9   The user is prompted to enter a terminal number. This can be given in different ways, depending on network capabilities: for example, a subscriber number in national or E.164 for international number.

            Usually a country code and a subscriber number are required (only the country code of the home country or of the visited country are allowed).

            A flag (#) may be used to indicate end of terminal identity.

10-13   The given terminal number is echoed and the user is requested to confirm (or reject). The SRF sends the response to the SCF.

            According to user input, terminal identification may be repeated or abandoned.

14   The "FurnishChargingInformation" is sent to instruct SSF to update the record.

15-16   The SDFo is queried to check if any restrictions apply to the use of the given terminal number.

            If the registration is denied a negative reply is sent to the SCF.

17   See 14.

21-22   The user is offered to enter a sequence of information to limit/restrict the registration.

23-28   The sequence contains a code (C) which indicates the nature of the limitation, e.g. period of time, date, default limitation stored in the service profile or no limitation. The necessary parameters are given in a following block (XXXX). A separator * is dialled between the two blocks.

            The sequence is echoed to the user for confirmation.

            According to the user input, the limitation sequence may be repeated [sequence (71, 72 and 23-28) or abandoned (ESC)].

            NOTE – The originating network makes only a format check on the received sequence.

29-35   The SDFhA is queried to check if the given terminal number does not violate any restriction and is updated with the new location. If the registration is denied, a negative reply is sent to the SCF. A waiting prompt is given to the user.

36   See 14.

41-42   When registration is completed successfully, the user may want another UPT feature. For this purpose the user may identify another feature request (follow-on).

51-52   The SRF prompts the user that registration was rejected; another valid terminal identity could be input again.

61-62   When the user cancels the request, another feature request may be input (follow-on).

71-72   After a negative acknowledgement, the SRF prompts the user that terminal number could be input again.

81-82   After a negative acknowledgement, the SRF prompts the user that limitation sequence could be input again.

91-92   The SRF prompts the user that the maximum number of rejected requests is reached. The count of the number of attempts is done in the SCF. The user is asked to hang up.

101-102   The SRF prompts the user that registration was rejected, another valid terminal identity could be input again.

7.2.2   Deregistration

"Deregistration" is a generic name used in this Recommendation to describe InCall deregistration, in which the UPT user deregisters either by registering for a new address (the new address replaces the previous one) or by a specific deregistration procedure (described hereafter).

Local and remote deregistration are supported by the user inputting the terminal address required. Remote deregistration is deregistration on a terminal other than the one being used for the deregistration procedure. Unless the remote terminal address is in an UPT network, it will not be possible to check the validity of the specified address.

For UPT Service Set 1, InCall deregistration on the current terminal is classified as **essential** procedure and remote deregistration is **optional** (both are included in the description below).

7.2.2.1   Outline description

A high-level description of deregistration is:
1)   retrieve default address from SDFh;
2)   update location address in SDFh to restore default value of address;
3)   decision:
   –   if successful, advise user of success and request new procedure;
   –   if unsuccessful, retry or release.

7.2.2.2   Information flow diagrams

Prerequisite sequences: Access, identification and authentication;

                               Feature request identification.

The organization of the deregistration sequence is given in the following block diagram (see Figure 7-18; also, see Figures 7-19 to 7-21):

Prompts are given to the user according to allowed service options.

The logical outputs of the procedure are:
1)   OK: the user is allowed to request another feature (follow-on);
2)   NOK: the user is released by the network after a prompt; to prevent the service/network from being misused e.g. abnormal number of retries after a request rejection, the network may release the user. This function is carried out in the SCF;
3)   the user abandons the request (in any state).

Figure 7-18/Q.1541 – Deregistration for incoming UPT call

Figure 7-19/Q.1541 – Prompts and deregistration for incoming UPT call

Deregistration for incoming UPT call (continued)

⇒If deregistration is successful, go to 21.
⇒If the maximum number of rejected attempts is reached, go to 51;
⇒else, go to 41.

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Figure 7-20/Q.1541 – Deregistration for incoming UPT call *(continued)*
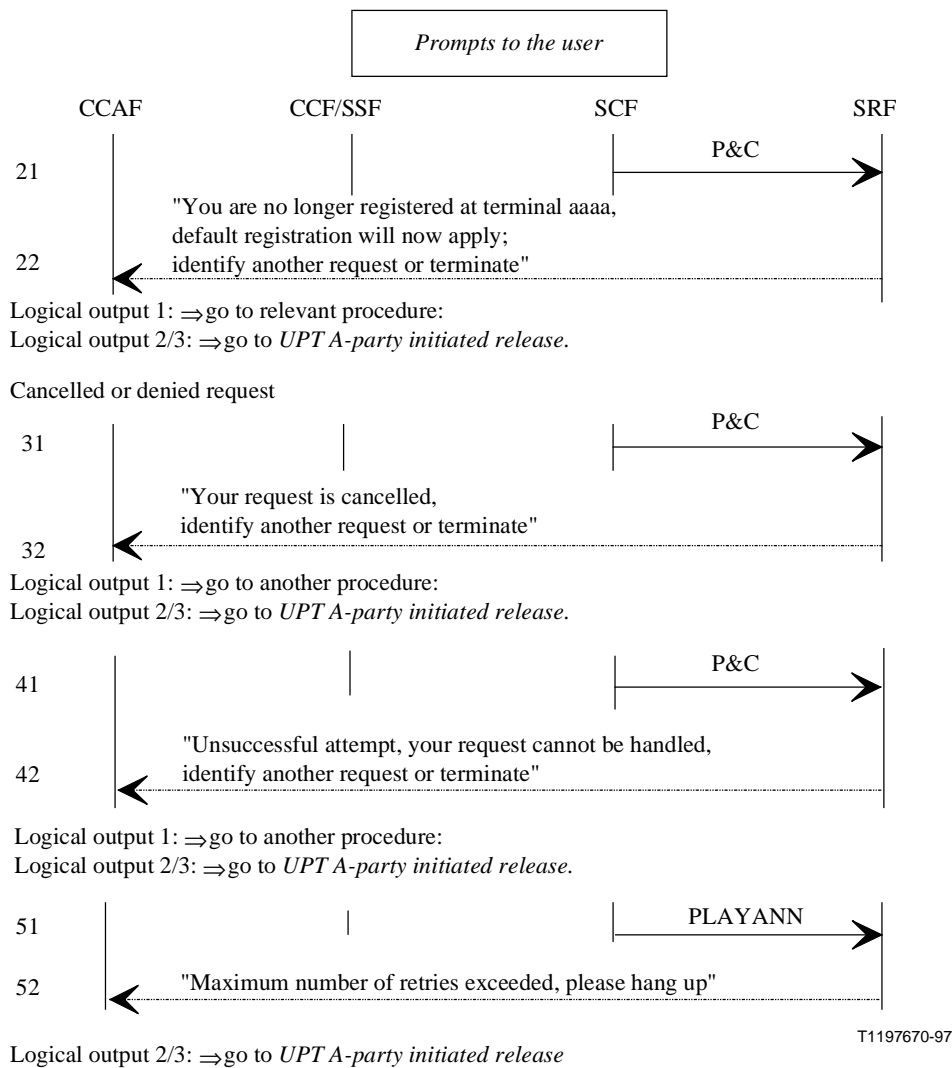
Figure 7-21/Q.1541 – Prompts to the user

NOTE – After any prompt the user may abandon (logical output 3) or not react within a given time (logical output 2).

Notes on deregistration for incoming UPT call

IF ref.:

1, 2   The data retrieval may be necessary to obtain the current registration of the user (to prompt the user accurately).

3-6   The user is prompted to confirm or cancel deregistration. User acknowledgement is received in the SCF.

7   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.

8-11   When the user validates the deregistration, the SDFhA is updated.

A waiting prompt is given to the user.

12   See 7.

17-18   The service profile is updated by the SCF according to the deregistration request.

21, 22   SRF is ordered to give the user a positive acknowledgement. When deregistration is completed successfully, the user may want another UPT service (e.g. an outgoing UPT call). For this purpose the user may make a new feature request.

31, 32   When deregistration is not confirmed by the user, the user is requested to hang up or to make another feature request.

41, 42   When deregistration is not accepted by the home network for any reason, e.g. no prior registration (if this has not been checked during *Feature request identification*), the user is requested to hang up or to make another feature request.

51, 52   The SRF prompts the user that the maximum number of rejected requests is reached. The count of the number of attempts is done in the SCF. The user is asked to hang up.

7.3   UPT call handling procedures

7.3.1   Outgoing UPT call

This Recommendation considers only the case of outgoing UPT call as described in 5.3.1/F.851 [2]. It does not cover the case of outgoing UPT calls subsequent to OutCall registration (see 5.2.3/F.851 [2]).

Outgoing UPT calls from a UPT user may be single calls, in which the procedure terminates at the end of the call, or may allow follow-on. The follow-on request may be for another call ("OutCall follow-on") or for another UPT procedure ("global follow-on"). Outcall follow-on will be offered to the UPT user after the B-party disconnects at the end of a conversation, or following call set-up failure due to route congestion, B-party busy or B-party no answer. For UPT Service Set 1, single outgoing UPT call is classified as **essential** and OutCall and global follow-on are **optional**.

There are some difficulties in implementing these requirements within the constraints of normal call release procedures. If follow-on calls are to be implemented, the handling of normal network release sequences must be modified. The requirement is that resources in the forward direction are fully released when the B-party clears after conversation or if call set-up fails, but that resources in the backward direction (originating exchange to A-party) are not released until the A-party clears.

It is assumed that the SCF can recognize UPT numbers. The user is prompted to input the destination number, which may be a UPT number; if so, it is translated by the SCF (involving queries to the originating and home SDFs). The SRF is disconnected and processing is restarted using the Connect operation which contains the destination number (even if it were the dialled number). If follow-on is enabled, various Detection Points will be armed (as EDP-R) to suspend processing when any follow-on event is detected. In CS-1 terms, a control relationship then exists between the SCF and SSF and the original transaction still exists.

7.3.1.1   Outline description

The following is a high-level description of the actions required for the network to set up an outgoing UPT call. The user has requested outgoing UPT call and the SRF is still connected:

1)   prompt user to input destination number and Collect destination number;

2)   authorize destination number (optional, interaction with SDFhA);

3)   if number is a UPT number, translate it to the called UPT user's current InCall location;

4)   Disconnect SRF;

5)   arm A-disconnect and B-disconnect trigger (DP 9) (twice) and triggers to detect call set-up failure (DPs 4, 5, 6); also arm DP 8 to detect mid-call feature activation (if required) and activate application timer on "B-party no answer" (if required);

6)   "Furnish Charging Information" operation (or other charging operation);

7)   "Call Information Request" operation (if transfer of call data to SDF at end of call);

8)   connect to destination number using "Connect" operation.

7.3.1.2 Information flow diagrams

This is a call from a UPT user, possibly roaming, i.e. not registered in the network from where he/she is calling. The called number may be any number. Of course, charging is a national or operator matter.

See Figures 7-22 to 7-27.

NOTE – The information flows related to supplementary services (Call Forwarding, ...) are not to be used for the time being, since these supplementary services are not clearly defined yet.

Prerequisite sequences: Access, identification and authentication;

                                 Feature request identification.

Prompts are given to the user according to allowed service options.

The logical outputs of the procedure are:

1)   the user is allowed to request another feature (follow-on);

2)   the user is released by the network after a prompt;

3)   the user abandons the request before call set-up or hangs up during call set-up or conversation or while being prompted after call attempt.
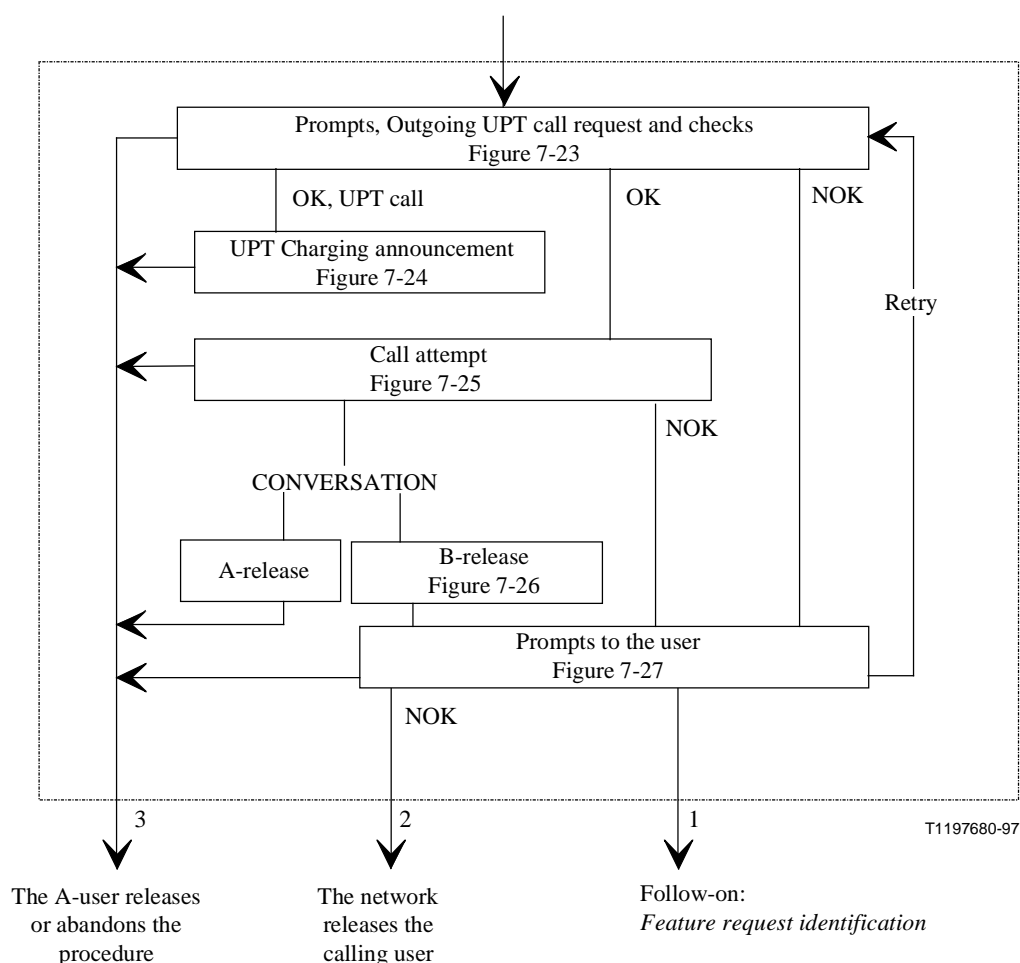
Figure 7-22/Q.1541 – Outgoing UPT call

Figure 7-23/Q.1541 – Prompts, Outgoing UPT call request and checks

```
                  ┌─────────────────────────────────────────────┐
                  │   UPT charging announcement to the user     │
                  └─────────────────────────────────────────────┘

    ref.      CCAF        CCF/SSF          SCF            SRF

     21                                          PLAYANN
                                                ──────────────►

     22                   "UPT charging is applicable"
                    ◄─────────────────────────────────────────

     23                                          SRFRPT
                                                ◄──────────────

     24                          disconnect req./ind.
                            ◄─────────────────────────────────

     25                          disconnect resp./conf.
                            ─────────────────────────────────►
                                                         T1197700-97
```

⇒If the user hangs up, go to the *UPT A-party initiated release;*
⇒else go to 31.
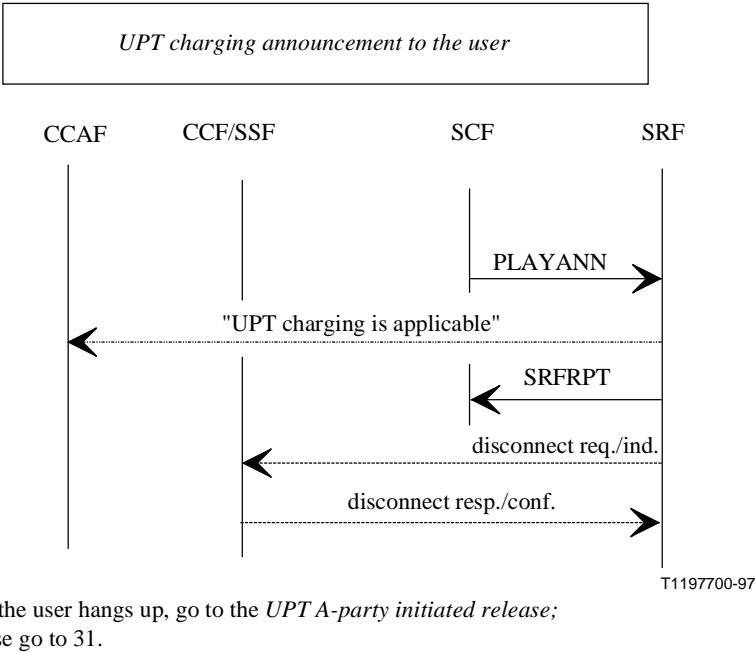
Figure 7-24/Q.1541 – UPT charging announcement

Call attempt

ref.	CCAF	CCF/SSF	SCF	SRF

31 — REQREPBCSM (SCF → CCF/SSF)

32 — FURNCHGINFO (SCF → CCF/SSF)

33 — APPLYCHG (SCF → CCF/SSF)

34 — Connect (SCF → CCF/SSF)

B-party network

35 — Forward call set-up message e.g.: IAM (CCF/SSF → B-party network)

36 — Message(s) from network e.g.: SSB, ACM, ANC (B-party network → CCF/SSF)

⇒On busy, congestion, or no answer, go to 37.
⇒When call set-up is successful:
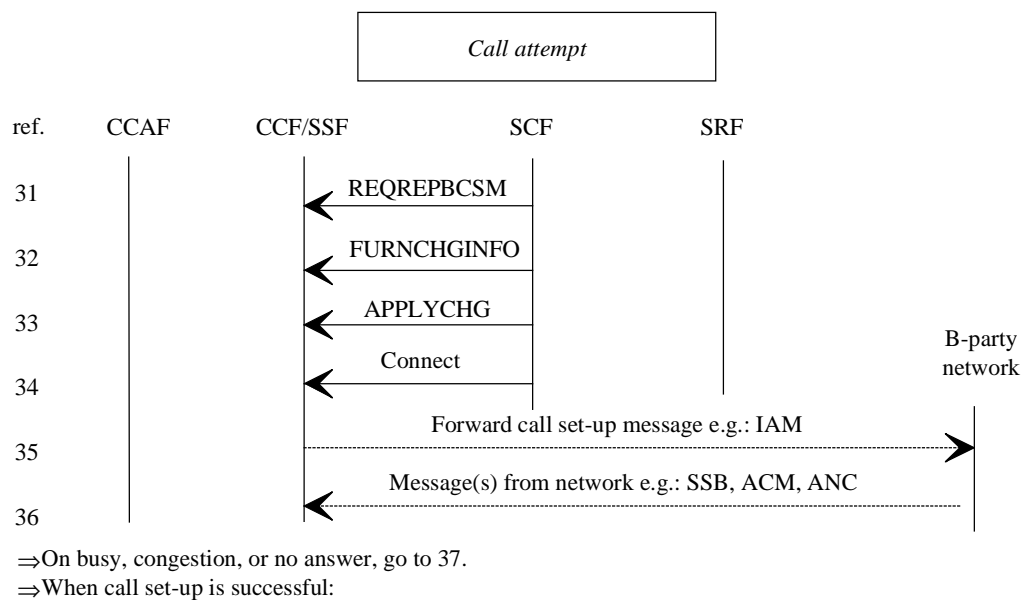
CONVERSATION

The called user hangs up first: go to 51.
The calling user hangs up first: go to the *UPT A-party initiated release*

37 — EVREPBCSM (CCF/SSF → SCF)

⇒On busy or no answer, go to 38: else go to 40.

SDFhB

38 — Search (SCF → SDFhB)

39 — Search Result (SDFhB → SCF)

⇒If call forwarding is activated, a redirected call attempt is made: go to 31, else go to 40.

40 — ETC (SCF → CCF/SSF)

41 — setup req./ind. (CCF/SSF → SRF)

42 — setup resp./conf. (SRF → CCF/SSF)

43 — ARI (SRF → SCF)

⇒go to 91
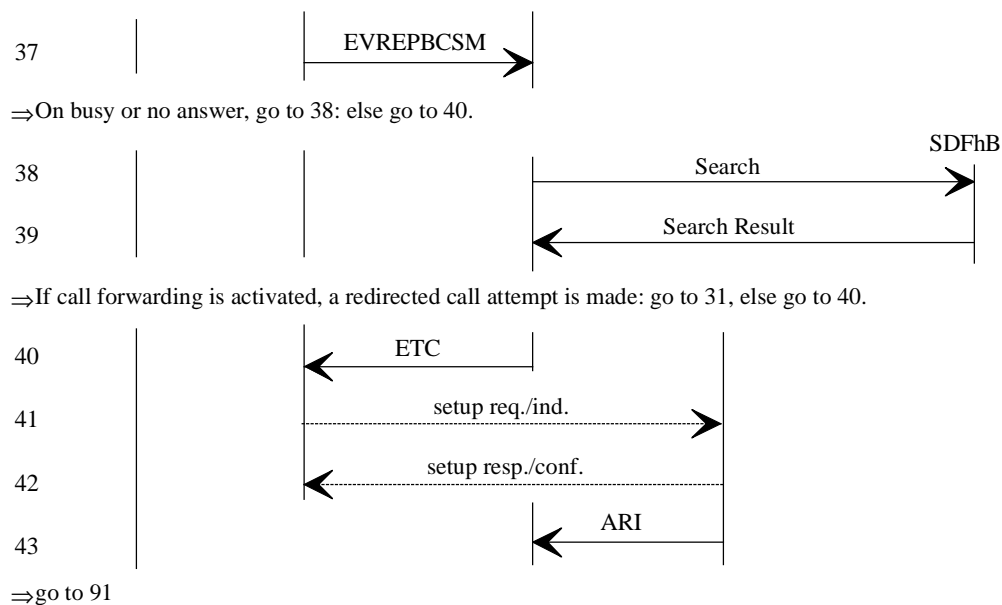
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Figure 7-25/Q.1541 – Call attempt

Figure 7-26/Q.1541 – Non-UPT B-party release with follow-on
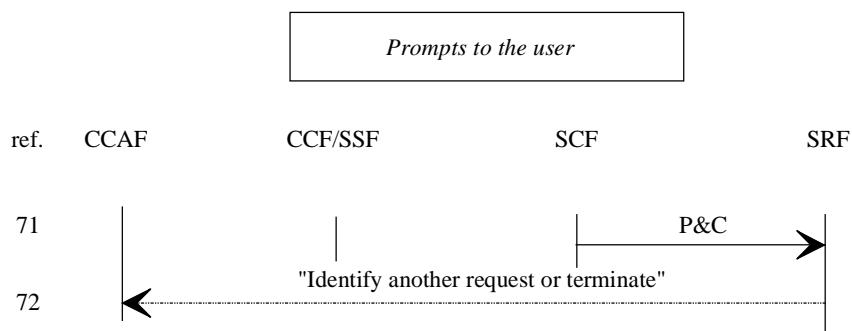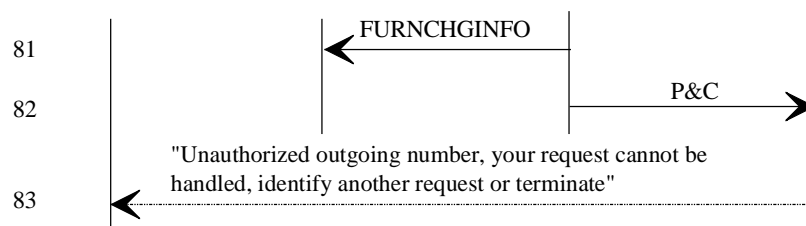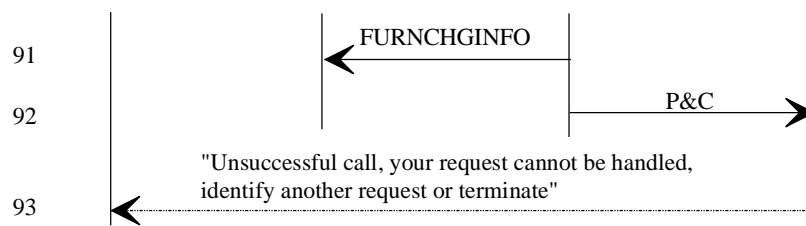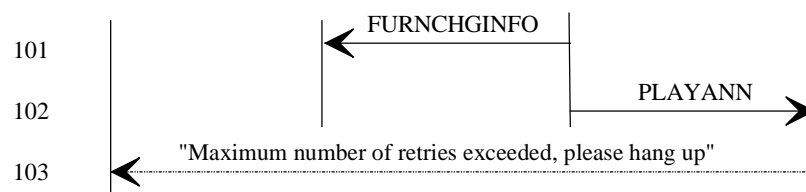
Figure 7-27/Q.1541 – **Prompts to the user**

Notes on Outgoing UPT call

IF ref.:

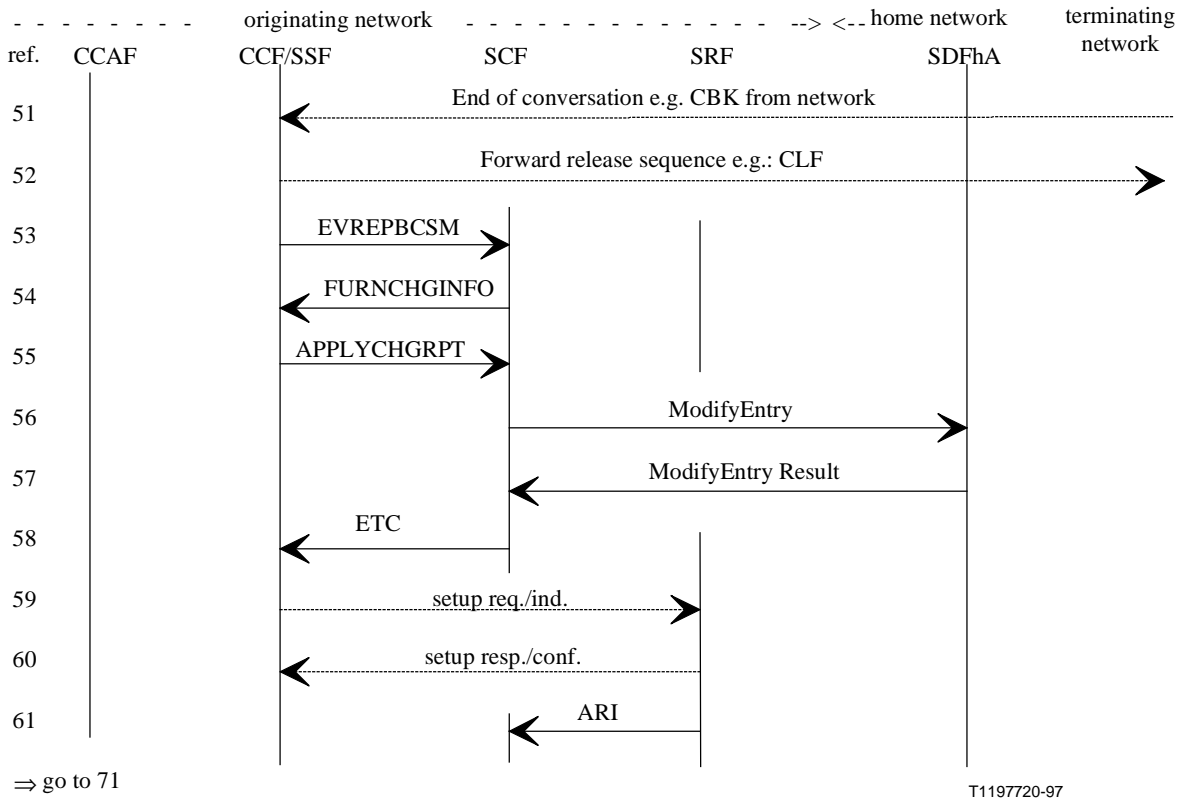**Assumption**: the SCF recognizes UPT numbers and controls call set-up.

1-4   The B-number can be given in different ways, depending on networks. At most, the international significant number is required.

The dialled number can be any number, also a UPT number. The digits are echoed (the user can abandon the procedure by hanging up).

A flag (#) may be dialled to indicate the end of the destination number.

The SRF sends the number sequence to the SCF.

The B-number is analysed in the SCF.

5-6   The SDFhA is queried to check if particular restrictions apply to the dialled number.

7-8   SDFo is queried to check if there exists particular agreements between the local service provider and the called user's home provider for establishing outgoing UPT calls.

9-10   The SDFhB query is made to retrieve the location of the called user and the charging reference point.

Particular restrictions may also be checked in SDFhB when necessary.

11-13   SSF is ordered to release the SRF.

21-22   The user is informed that particular charging conditions may apply.

The user is thus given the opportunity to abandon the call.

23-25   When the announcement is played, disconnection of the SRF takes place (SRF-initiated disconnection).

31   The SSF is required to suspend processing at given detection points (such as CBK after a successful call or on busy, congestion and no answer).

32   The "FurnishChargingInformation" operation is sent to instruct SSF to create a call record for the following call attempt.

33   "ApplyCharging" could also be sent (this operation is not necessary if an earlier request is pending).

34   The SSF is required to set up the call.

35-36   SSFo routes the call accordingly and receives backward signalling.

If the B-party number is a (recognized) UPT number or not a UPT number, then the call is "normally" routed to the terminating CCAF.

If the B-party number is a UPT number but not recognized, then the call is routed to the (UPT) B-party home network and, before alerting to the terminating CCAF, triggering occurs in order to retrieve the CCAF location and further routing (similar to flows 7, 8 ...).

37   When the call is unsuccessful, the SCF is informed. The no answer event is generated by an application timer in the SSF.

38-39   If a busy or no answer indication is received and if the called party is a UPT user, a request is made to the B-user's home database to check whether the call forwarding service is activated.

If call forwarding is activated, the redirection address is retrieved and a new call attempt is made.

40-43   When the call set-up is unsuccessful or when the request is denied, it may be necessary to reconnect the SRF.

Several SRF connection scenarios are possible.

51-53	The called party ends the conversation. SSF initiates an immediate disconnection sequence of the forward circuit. The disconnection sequence is network dependent.

51-53   The called party ends the conversation. SSF initiates an immediate disconnection sequence of the forward circuit. The disconnection sequence is network dependent.

SSF reports to SCF.

54   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.

NOTE – For the purpose of the follow-on, the creation of a new record is done when the user places a new request.

55-57   Since an "ApplyCharging" has been issued, the record is returned to the SCF.

The record is sent to the SDFhA and, in case of UPT user to UPT user call, to the SDFhB.

58-61   To offer the follow-on, the SCF orders the SSF to reconnect an SRF.

Several SRF connection scenarios are possible.

71-72   SRF is ordered to prompt the calling user, which is given the opportunity to place another service request.

81   See 54.

82-83   The calling user is informed that the dialled B-number is not authorized and is requested to hang up or to make another feature request.

91   See 54.

92-93   The calling user is informed that the call is unsuccessful and is requested to hang up or to make another feature request.

101   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.

102-103 The SRF prompts the user that the maximum number of denied call attempts is reached. The count is done in the SCF.

The user is asked to hang up.

7.3.2   Incoming UPT call

Any person can make a call to a UPT user. The case of a UPT user calling a UPT user is covered in 7.3.1, Outgoing UPT calls. This subclause deals only with a non-UPT user calling a UPT user. For simplicity, only the case where the caller's local exchange has SSF capabilities is shown here.

7.3.2.1   Outline description

The following is a high-level outline of the network actions required for an incoming UPT call:

1)   detect UPT number dialled by number prefix;

2)   query/response for translation (to SDFh);

3)   play advice of charging announcement to caller (optional);

4)   initiate charging (may be required for both parties if split charging);

5)   "Call Information Request" operation (optional);

6)   "Connect" operation to restart call processing with translated number;

7)   call data update to SDFh at the end of the call (if requested).

7.3.2.2   Information flow diagrams

This procedure deals only with calls generated by non-UPT users.

The UPT network may be either the originating network or the called user's home network or another network. Figures 7-28 to 7-30 describe the case of a dialled B-party number that is a recognized UPT

number. If this dialled number is UPT but not recognized as UPT, then the call will be routed to the (UPT) B-party home network, from where Figures 7-28 to 7-30 apply (replacing originating network by UPT B-party home network).

NOTE – The information flows related to supplementary services (Call Forwarding, ...) are not to be used for the time being, since these supplementary services are not clearly defined yet.
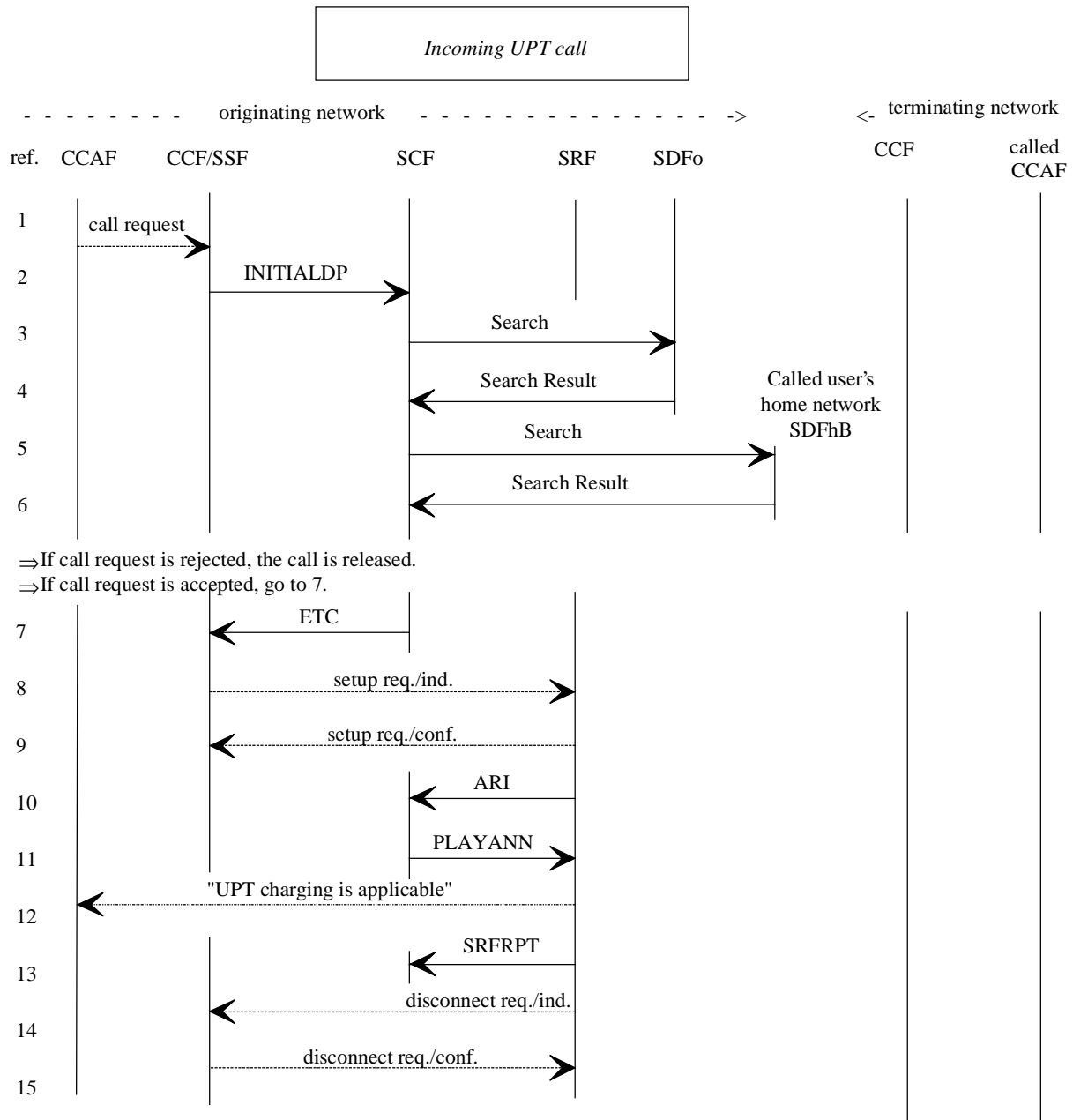
Figure 7-28/Q.1541 – Incoming UPT call

The diagram shows a message sequence chart titled "Incoming UPT call (continued)".

Column headers: ref. | CCAF | CCF/SSF | SCF | SRF | SDFo | CCF | Called CCAF

- - - - - - - - originating network - - - - - - - - -> | < - - terminating network

16 FURNCHGINFO (SCF → CCF/SSF)

17 Apply Charging (SCF → CCF/SSF)

18 REQREPBCSM (SCF → CCF/SSF)

19 Send Charging Information (SCF → CCF/SSF)

20 Connect (SCF → CCF/SSF)

21 Forward call set-up message e.g. IAM (CCF/SSF → CCF)

22 Alerting (CCF → Called CCAF)

23 (Answer) / Message(s) from network e.g. SSB, ACM, ANC, ...

⇒ On busy, congestion or no answer go to 51.
⇒ When call set-up is successful:

CONVERSATION

The calling user hangs up first: go to 41
The called user hangs up first: go to *UPT B-party initiated release*

41 release (CCAF → CCF/SSF)

42 Forward connection release: e.g. CLF (CCF/SSF → CCF)

43 release (CCF/SSF → CCAF)

⇒ If an APPLYCHGRPT is pending, go to 45.

Called user's home network SDFhB

45 APPLYCHGRPT (CCF/SSF → SCF)

46 ModifyEntry (SCF → SDFhB)

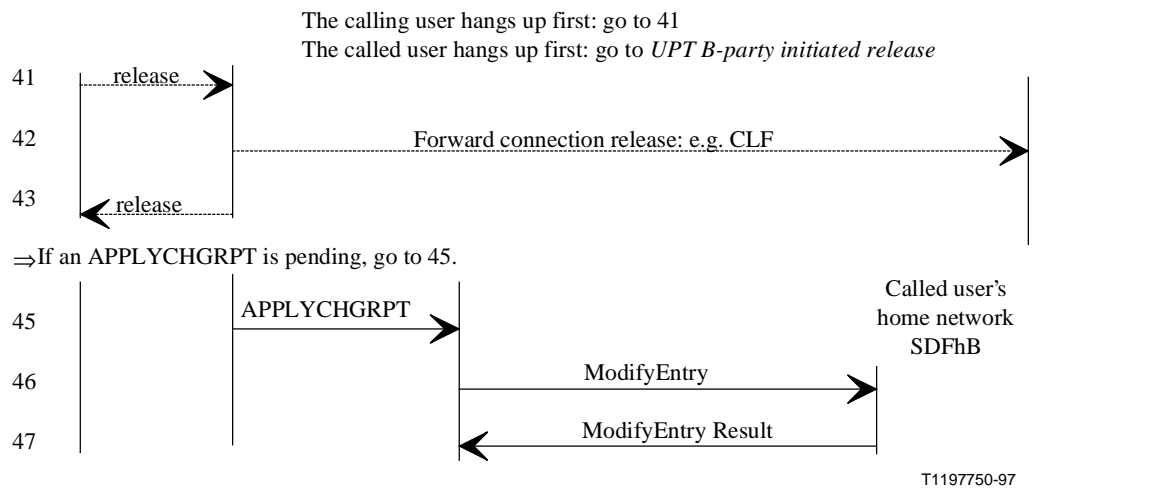47 ModifyEntry Result (SDFhB → SCF)

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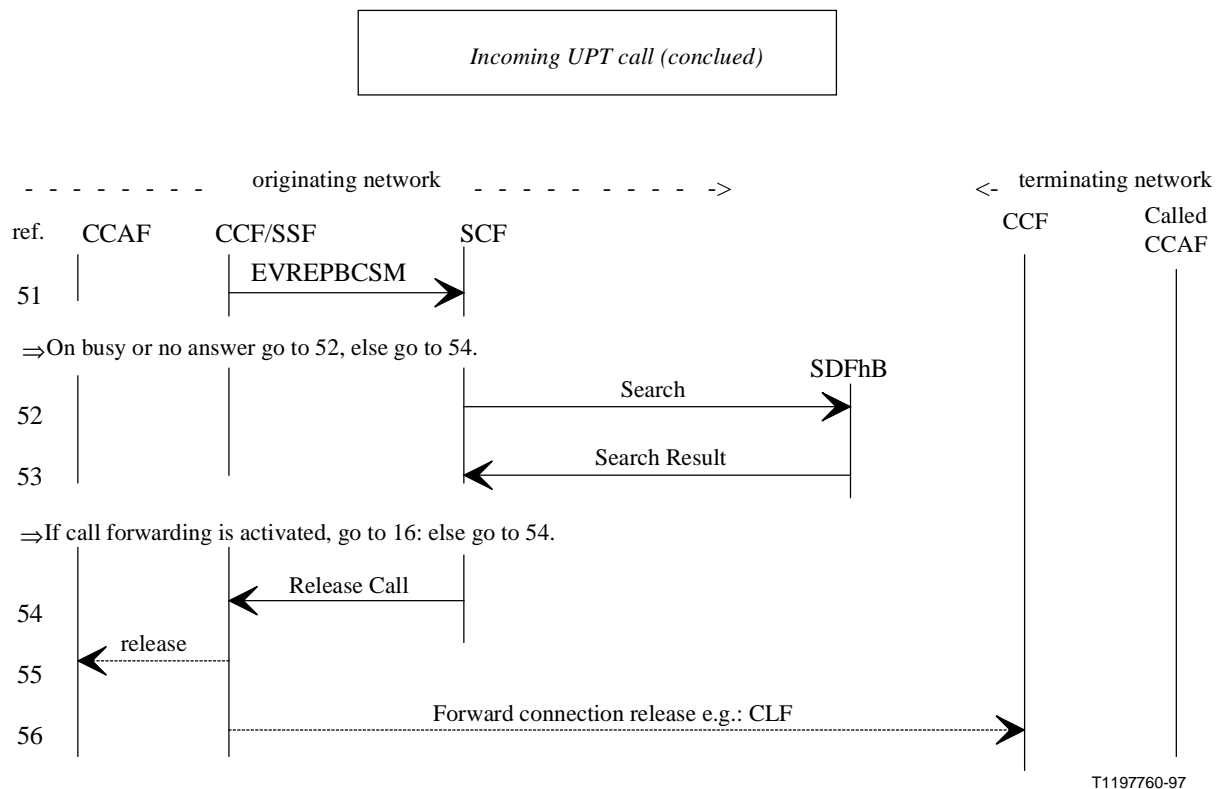**Figure 7-29/Q.1541 – Incoming UPT call** *(continued)*

Figure 7-30/Q.1541 – Incoming UPT call *(concluded)*

Notes on Incoming UPT call

IF ref.:

1-2   A received UPT number sequence triggers "Initial Detection Point".

3-4   The SDFo is queried to check if there exists particular agreements between the local service provider and the called user's home provider for establishing incoming UPT calls.

5-6   The SDFhB query is made to retrieve the location of the called user and the charging reference point.

        Particular restrictions may also be checked in SDFhB when necessary.

7-12   After a connection to SRF, the calling user is informed on particular charging conditions that may apply.

13   SRF reports when the announcement is played through.

14-15   Disconnection is initiated from SRF.

        Several SRF connection scenarios are possible.

16   The "FurnishChargingInformation" operation is sent to instruct SSF to create a call record for the following call event.

        NOTE – FurnishChargingInformation is used if call record is generated at SSF.

        "Apply Charging" may be used if the call record is generated at SCF.

17   "Apply Charging" may be necessary also to send charging information back to the SCF.

18   SCF orders SSF to suspend call processing at given detection points (CBK, CLF).

19	"SendChargingInformation" may be necessary also to send metering pulses to the calling line.
20	SCF orders SSF to set up the call.
21-22	In the destination network, a call attempt is made towards the user.
23	The result is received in the controlling SSF.
	If the called user answers, this is received in SSF and sent backwards.
41	The call is terminated by the A-party.
42-43	The forward and backward connections are released and an appropriate signal is sent backwards.
45-47	When an "APPLYCHGRPT" is pending, the record generated in the SSF/CCF is returned to the SCF and transferred to the SDFhB.
	Another record may also be sent to the originating network.
51	When the call is unsuccessful, the SCF is informed.
52-53	If a busy or no answer indication is received, a request is made to the B-user's home database to check whether the call forwarding service is activated.
	If call forwarding is activated, the redirection address is retrieved and a new call attempt is made.
54-56	In the case of a rejected or unsuccessful call attempt, SSF releases the connections in both directions with an appropriate signalling sequence (Network dependent).
	(In the case of a rejected call attempt, SCF orders the release.)

7.4 Procedures for UPT service profile management

Service profile interrogation allows a UPT user to examine information stored in his service profile. An example of information which the user might wish to view would be the current InCall registration address.

The UPT user may also be able to modify service profile information, for example, default parameters. Values such as the current location are set by registration procedures.

Service profile interrogation and modification are both **optional** features of UPT Service Set 1.

7.4.1 Service profile modification

7.4.1.1 Outline description

The following is a high-level outline description of the actions required for a UPT user to modify values in the service profile:

1) input code for data whose values are to be changed;
2) user is prompted to input new information or cancel code;
3) new information is echoed to user, who can confirm or reject the echoed information;
4) values are changed in the home service profile;
5) decision:
   – if successful, advice user of success and request new procedure;
   – if unsuccessful, retry or release.

7.4.1.2 Information flow diagrams

Prerequisite sequences: Access, identification and authentication;

                                      Feature request identification.

The organization of the service profile modification sequence is given in the following block diagram: (see Figure 7-31; see also Figures 7-32 and 7-33).

Prompts are given to the user according to allowed service options.

The logical outputs of the procedure are:

1)   OK: the user is allowed to request another feature (follow-on);

2)   NOK: the user is released by the network after a prompt; to prevent the service/network from being misused e.g. abnormal number of retries after a request rejection, the network may release the user;

3)   the user abandons the request (in any state).
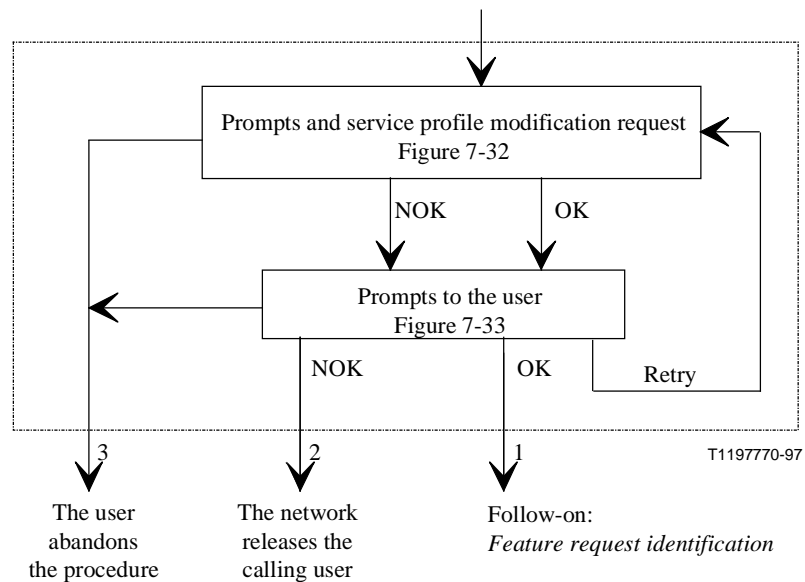
This function is carried out in the SCF.

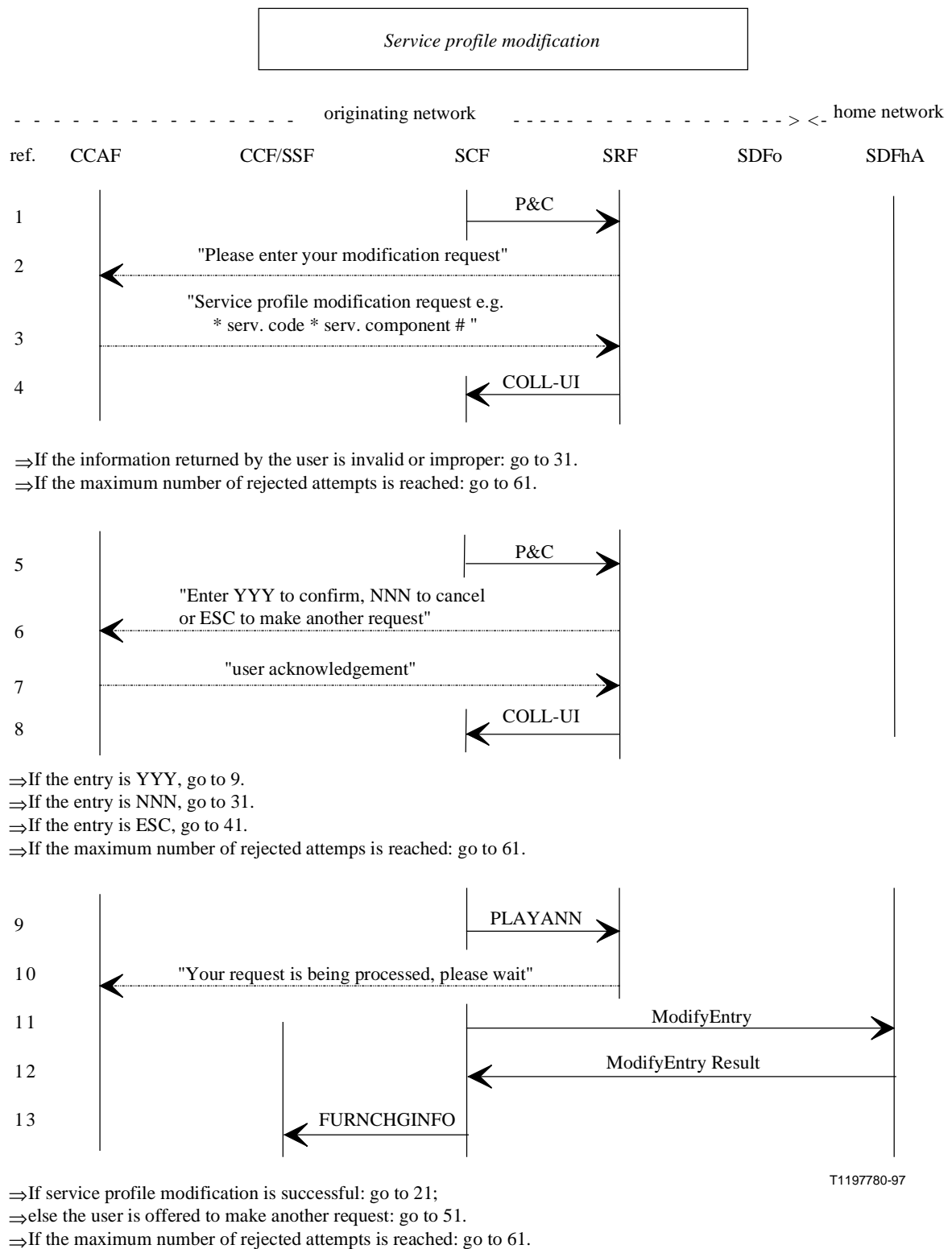**Figure 7-31/Q.1541 – Service profile modification**

ref.	CCAF	CCF/SSF	SCF	SRF	SDFo	SDFhA

Figure containing the following message flow:

Service profile modification

originating network ----- home network

1   P&C (SCF → SRF)

2   "Please enter your modification request" (SRF → CCAF)

3   "Service profile modification request e.g. * serv. code * serv. component # " (CCAF → SRF)

4   COLL-UI (SRF → SCF)

⇒If the information returned by the user is invalid or improper: go to 31.
⇒If the maximum number of rejected attempts is reached: go to 61.

5   P&C (SCF → SRF)

6   "Enter YYY to confirm, NNN to cancel or ESC to make another request" (SRF → CCAF)

7   "user acknowledgement" (CCAF → SRF)

8   COLL-UI (SRF → SCF)

⇒If the entry is YYY, go to 9.
⇒If the entry is NNN, go to 31.
⇒If the entry is ESC, go to 41.
⇒If the maximum number of rejected attemps is reached: go to 61.

9   PLAYANN (SCF → SRF)

10   "Your request is being processed, please wait" (SRF → CCAF)

11   ModifyEntry (SCF → SDFhA)

12   ModifyEntry Result (SDFhA → SCF)

13   FURNCHGINFO (SCF → CCF/SSF)

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⇒If service profile modification is successful: go to 21;
⇒else the user is offered to make another request: go to 51.
⇒If the maximum number of rejected attempts is reached: go to 61.

Figure 7-32/Q.1541 – Service profile modification request
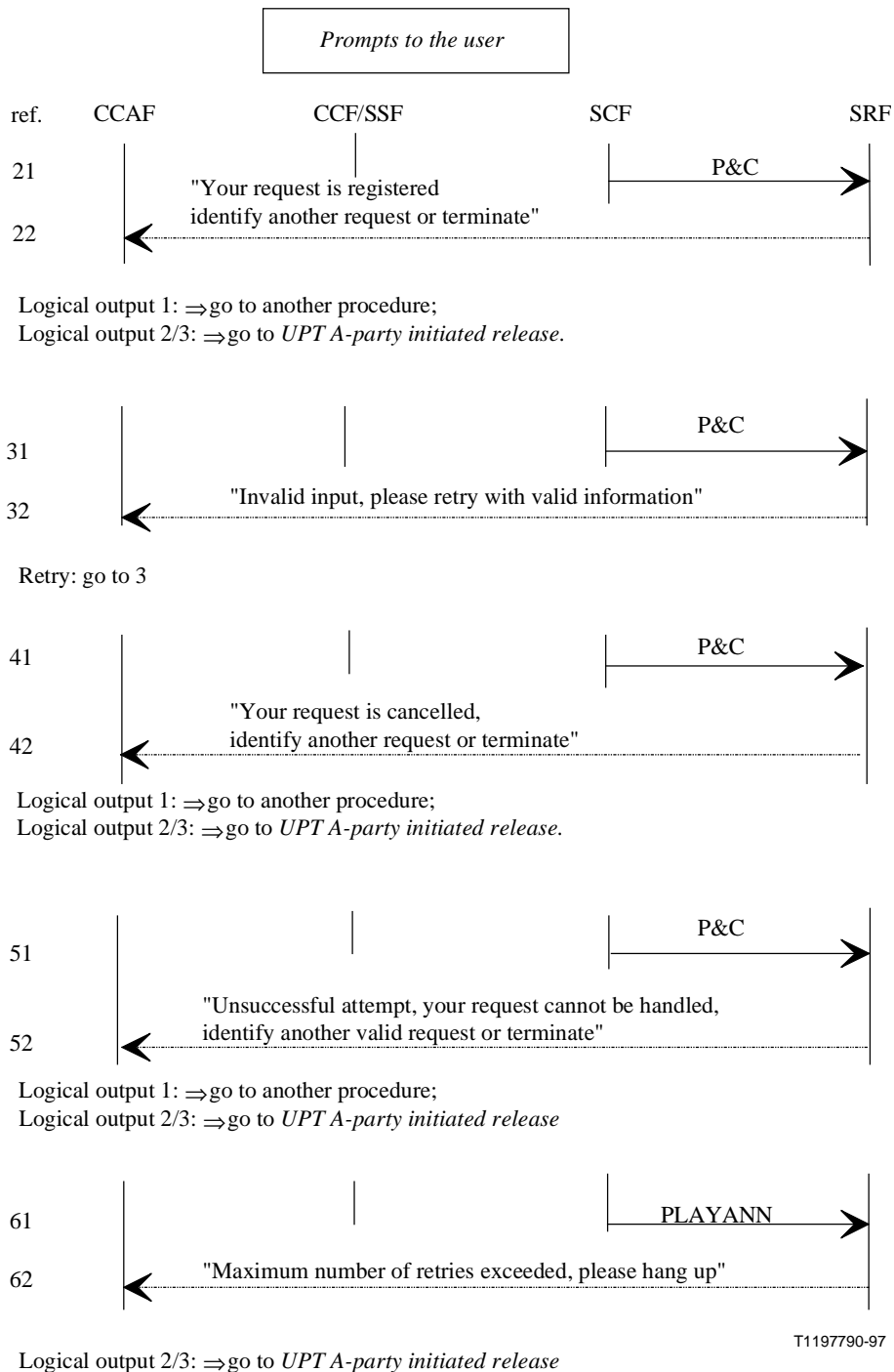
Figure 7-33/Q.1541 – Prompts to the user

Notes on service profile modification

IF ref.:

1-3   The user is prompted to enter the request which conforms to a specified structure.

4-6   The SRF is ordered to ask the user to confirm the request.

7, 8   The user acknowledgement is required, received and sent to the SCF.

9-12   After user confirmation, the service profile is updated in the home network.

13   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.

21, 22   Following a successful request, the SRF is ordered to give the user a positive acknowledgement to the user who may require another UPT service (e.g. an outgoing UPT call).

      For this purpose the user will make a new feature request.

31, 32   When the user cancels the entry (NNN entry), he/she is invited to make another try.

41, 42   When the request is cancelled by the user (Escape code), he/she is requested to hang up or to make another feature request.

51, 52   When the request is denied, the user is offered to make another valid request or to terminate.

61, 62   The SRF prompts the user that the maximum number of rejected requests is reached. The count of the number of attempts is done in the SCF.

      The user is asked to hang up.

7.4.2 Service profile interrogation

7.4.2.1 Outline description

The following is a high-level outline of the network actions required for a UPT user to ascertain the current values stored in the service profile. Access, identification and authentication have been successfully undertaken, and the service profile interrogation procedure has been requested:

1)   input code for data whose values are required;

2)   the values are retrieved from the home SDF and played back to the user (voice announcement):

    –   if successful, advice user of success and request new procedure;

    –   if unsuccessful, retry or release.

7.4.2.2 Information flow diagrams

Prerequisite sequences: Access, identification and authentication;

                       Feature request identification.

The organization of the service profile interrogation sequence is given in the following block diagram (see Figure 7-34; see also Figures 7-35 and 7-36).

Prompts are given to the user according to allowed service options.

The logical outputs of the procedure are:

1)   OK: the user is allowed to request another feature (follow-on);

2)   NOK: the user is released by the network after a prompt; to prevent the service/network from being misused, e.g. abnormal number of retries after a request rejection, the network may release the user;

3)   the user abandons the request (in any state).
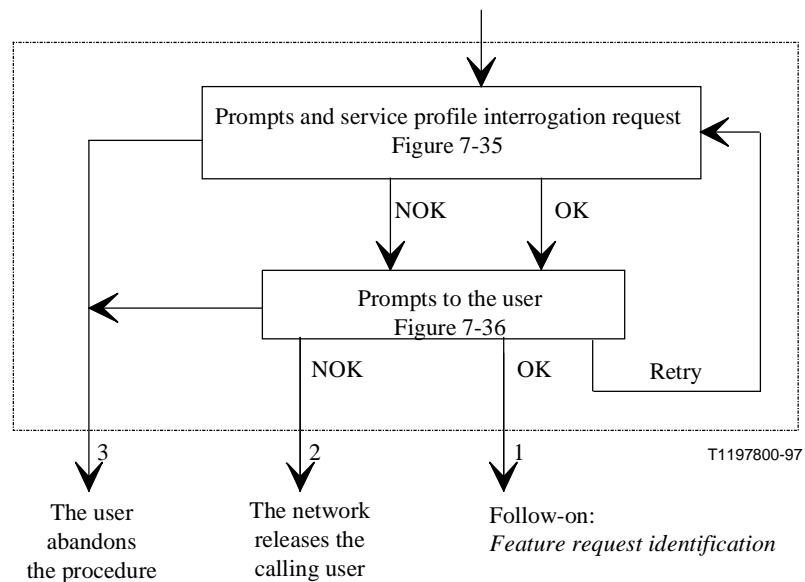
This function is carried out in the SCF.

Figure 7-34/Q.1541 – Service profile interrogation

⇒If the information returned by the user is invalid or improper, go to 31.
⇒If the maximum number of rejected attempts is reached, go to 61.

⇒If service profile interrogation is successful, go to 21;
⇒else the user is offered to make another request; go to 51.
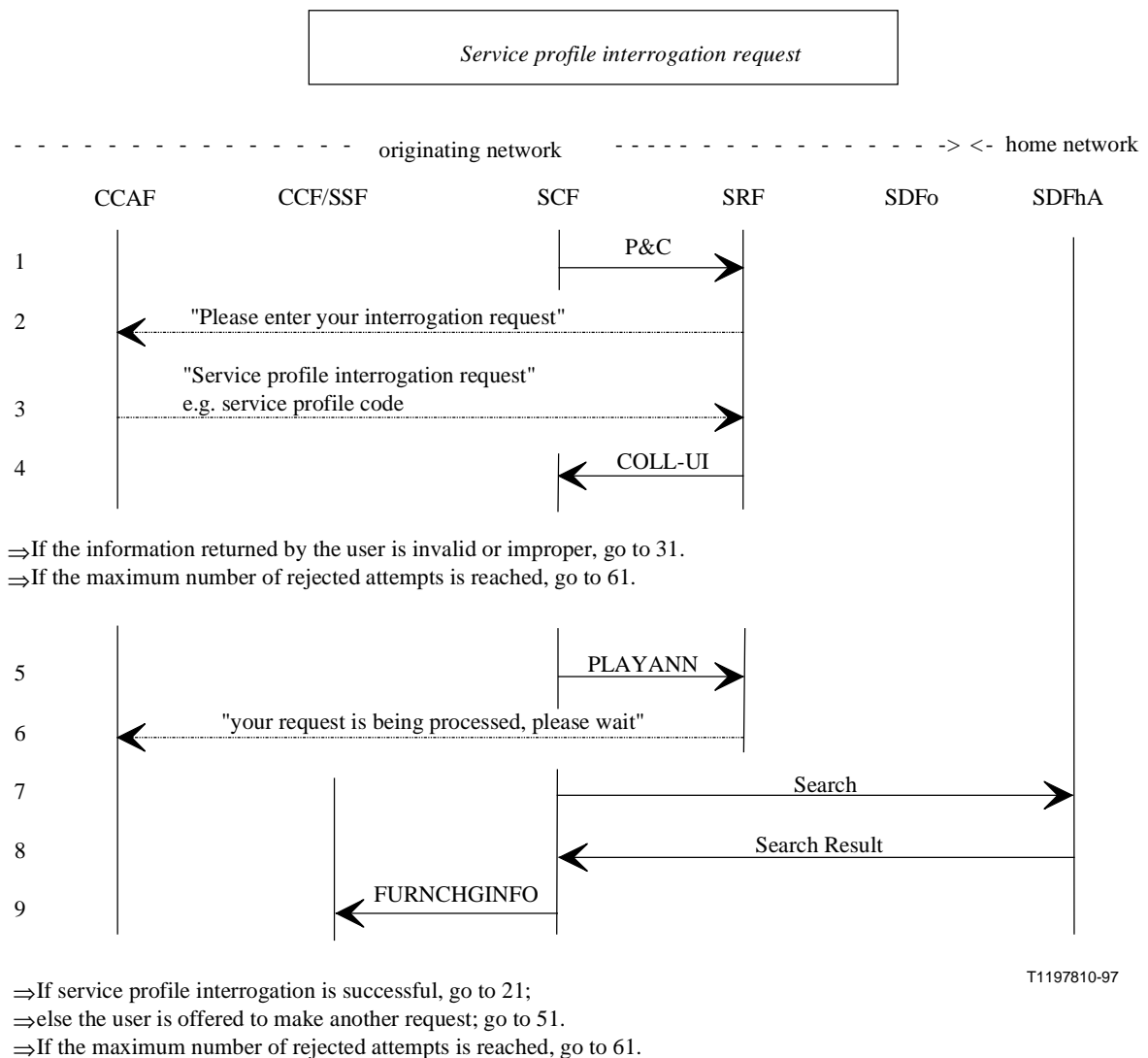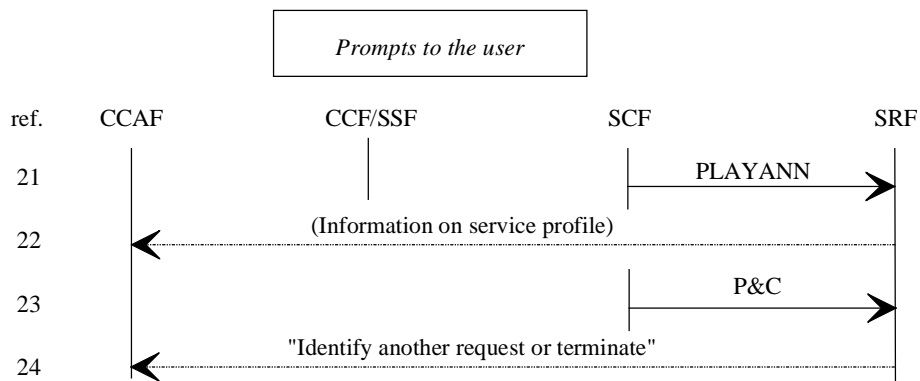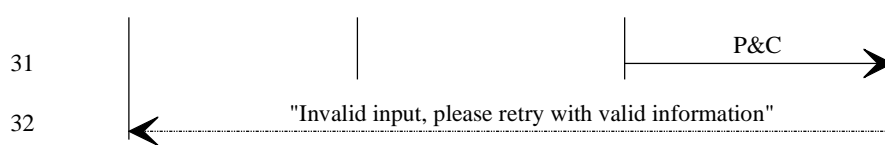⇒If the maximum number of rejected attempts is reached, go to 61.

Figure 7-35/Q.1541 – Service profile interrogation request
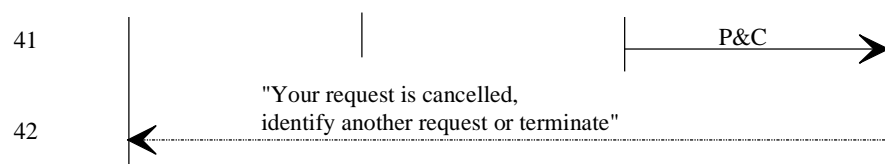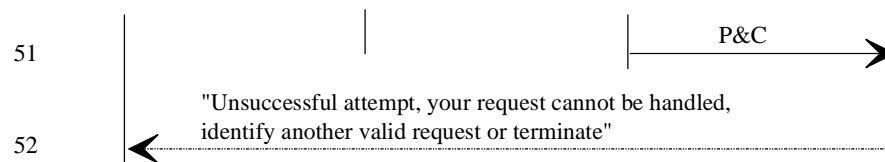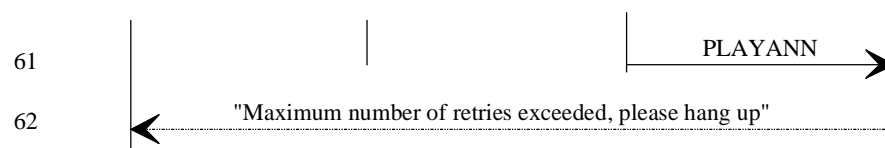
Figure 7-36/Q.1541 – Prompts to the user

Notes on service profile interrogation

IF ref.:

1-3   The user is prompted to enter the request which conforms to a specified structure.

5-6   The SRF is ordered to ask the user to confirm the request.

7-8   The Service Profile is queried in the Home network.

9   The "FurnishChargingInformation" operation is sent to instruct SSF to update the record.

21, 24 Following a successful request, the SRF is ordered to give the user a positive acknowledgement to the user who may require another UPT service (e.g. an outgoing UPT call).

        For this purpose the user will make a new feature request.

31, 32 When the user cancels the entry (NNN entry), he/she is invited to make another try.

41, 42 When the request is cancelled by the user (Escape code), he/she is requested to hang up or to make another feature request.

51, 52 When the request is denied, the user is offered to make another valid request or to terminate.

61, 62 The SRF prompts the user that the maximum number of rejected requests is reached. The count of the number of attempts is done in the SCF.

        The user is asked to hang up.

8   Mapping of functional entities to physical entities

As the functional model for UPT is based on the IN functional model for CS-1, the mapping between functional entities FEs and physical entities PEs for UPT is also based on the related mapping for IN. The only difference is the distinction between the originating and the home database.

The PE used for the mapping are the same as those described in Recommendation Q.1215 [4] and are the following:

–   *Service Switching Point (SSP)* – The SSP provides switching functionality and, if it is a local exchange, provides the user with access to the network. The SSP allows access to IN capabilities after a request for IN service has been detected. It communicates with other PEs such as an SCP. Functionally, the SSP contains a Call Control Function (CCF), a Service Switching Function (SSF), and, if the SSP is a local exchange, a Call Control Agent Function (CCAF). A Service Control Function (SCF), a Specialized Resource Function (SRF) and a Service Data Function (SDF) may be optionally contained in the SSP.

–   *Network Access Point (NAP)* – This PE contains only the CCAF and CCF FEs. The NAP cannot communicate with an SCF but has the capability to recognize a call requesting an IN service and to route it to an SSP.

–   *Service Control Point (SCP)* – The SCP contains Service Logic Programs (SLPs) and data used to provide services from an IN. SCP and SSP are connected by a signalling network. An SCP contains a Service Control Function (SCF) and a Service Data Function (SDF).

–   *Adjunct (AD)* – This PE contains the same functionality as an SCP but is directly connected to the SSP by a high-speed interface.

–   *Intelligent Peripheral (IP)* – The IP provides resources (i.e. customised announcement, voice recognition, DTMF digits collection) for user interaction with the network. Functionally, an IP contains a Specialized Resource Function (SRF).

–   *Service Node (SN)* – The SN controls services provided by an IN and communicates directly with one or more SSPs. Functionally, the SN contains an SCF, SDF and SRF.

–   *Service Switching and Control Point (SSCP)* – This is a combined SCP and SSP in a single node. Functionally it contains an SCF, SDF, CCAF, CCF and SSF. An SSCP may optionally contain an SRF.

–   *Service Data Point (SDP)* – The SDP contains the customer and network data which is accessed during the execution of a service. Functionally, the SDP contains an SDF.

Table 1 below is an extension of the typical scenarios of FE to PE mapping contained in Recommendation Q.1215 [4] in order to be aligned with the UPT functional model (see Figure 6-1).

Table 1/Q.1541 – Typical scenarios of FE to PE mapping for UPT

PEs / FEs	SCF	CCF/SSF	SDF originating	SRF	SDF home
SCP	C	–	C	–	C
SN	C	–	C	C	C
AD	C	–	C	–	C
SSP	O	C	O	O	O
IP	–	–	–	C	–
SDP	–	–	C	–	C
SSCP	C	C	C	O	C
NAP	–	C (CCF only)	–	–	–
C Core					
O Optional					
– Not allowed					
For definitions, see Recommendation Q.1215 [4].					
NOTE – SCF, CCF/SSF, SDF (originating) and SRF must all be contained within the originating network; SDF (home) may be contained within a network other than the originating network, and will be associated with an SCF in that other network. Where SCF is shown in the table, only one of SDF (originating) or SDF (home) can be associated with it.					

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