



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.1542

(06/2000)

SERIES Q: SWITCHING AND SIGNALLING

Intelligent Network

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

ITU-T Recommendation Q.1542

(Formerly CCITT Recommendation)

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

| | |
|--|----------------------|
| SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE | Q.1–Q.3 |
| INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING | Q.4–Q.59 |
| FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN | Q.60–Q.99 |
| CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS | Q.100–Q.119 |
| SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5 | Q.120–Q.249 |
| SPECIFICATIONS OF SIGNALLING SYSTEM No. 6 | Q.250–Q.309 |
| SPECIFICATIONS OF SIGNALLING SYSTEM R1 | Q.310–Q.399 |
| SPECIFICATIONS OF SIGNALLING SYSTEM R2 | Q.400–Q.499 |
| DIGITAL EXCHANGES | Q.500–Q.599 |
| INTERWORKING OF SIGNALLING SYSTEMS | Q.600–Q.699 |
| SPECIFICATIONS OF SIGNALLING SYSTEM No. 7 | Q.700–Q.799 |
| Q3 INTERFACE | Q.800–Q.849 |
| DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 | Q.850–Q.999 |
| PUBLIC LAND MOBILE NETWORK | Q.1000–Q.1099 |
| INTERWORKING WITH SATELLITE MOBILE SYSTEMS | Q.1100–Q.1199 |
| INTELLIGENT NETWORK | Q.1200–Q.1699 |
| SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000 | Q.1700–Q.1799 |
| BROADBAND ISDN | Q.2000–Q.2999 |

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.1542

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

Summary

This Recommendation contains ITU-T Q.1542, defining the stage 2 description of the UPT procedures for the support of Service Set 1 (as defined in ITU-T F.851) on Capability Set 2. It follows the approved ITU-T Q.1541, defining the stage 2 description of the UPT procedures for the support of Service Set 1 on Capability Set 1.

Source

ITU-T Recommendation Q.1542 was prepared by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 1 procedure on 15 June 2000.

Keywords

IN, UPT.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSC Resolution 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

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. 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, 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.

© ITU 2001

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from ITU.

CONTENTS

| | Page |
|---|-------------|
| 1 Scope..... | 1 |
| 2 References..... | 2 |
| 3 Definition of terms..... | 3 |
| 3.1 Terms defined in ITU-T F.851 [2]..... | 3 |
| 3.2 Terms not defined in ITU-T F.851 [2]..... | 3 |
| 3.2.1 General terms..... | 3 |
| 3.2.2 Specific terms | 4 |
| 4 Symbols and abbreviations | 4 |
| 5 Description of UPT | 7 |
| 6 Functional architecture for UPT Service Set 1 | 7 |
| 6.1 Functional architecture..... | 7 |
| 6.1.1 Generic functional model | 7 |
| 6.1.2 Descriptions of the functional entities | 9 |
| 6.2 Interconnection scenarios..... | 9 |
| 6.2.1 Use of the relationship SCF-SDF | 10 |
| 6.2.2 Use of the relationship SCF-SCF | 11 |
| 6.2.3 Use of the relationship SDF-SDF | 12 |
| 6.3 User access scenarios | 13 |
| 6.3.1 DTMF user access | 13 |
| 6.3.2 DSS1 user access for ISDN terminals which behave in functional mode | 14 |
| 7 Information flows for UPT Service Set 1 on Capability Set 2..... | 15 |
| 7.1 UPT elementary procedures and common sequences..... | 19 |
| 7.1.1 Access to the UPT environment | 19 |
| 7.1.2 Identification and authentication | 24 |
| 7.1.3 UPT release sequences | 28 |
| 7.1.4 Feature identification (including global follow-on)..... | 29 |
| 7.2 Procedures for personal mobility | 29 |
| 7.2.1 Service profile transfer | 29 |
| 7.2.2 Registration for incoming UPT calls | 32 |
| 7.2.3 Registration for outgoing UPT calls (call related description)..... | 35 |
| 7.2.4 Deregistration for incoming UPT calls..... | 42 |
| 7.2.5 Deregistration for outgoing UPT calls (call related description)..... | 42 |
| 7.2.6 Remote registration for incoming UPT calls (call related description) | 48 |
| 7.2.7 Remote registration for outgoing UPT calls..... | 48 |
| 7.3 UPT call handling procedures..... | 48 |
| 7.3.1 Incoming UPT call (based on one trigger)..... | 48 |

| | Page |
|---|-------------|
| 7.3.2 Incoming UPT call (based on two triggers)..... | 48 |
| 7.3.3 Outgoing UPT call for a non-registered UPT user | 67 |
| 7.3.4 Outgoing UPT call for a registered UPT user..... | 67 |
| 7.3.5 Call Pick-Up | 68 |
| 7.3.6 Called party specified secure answering of incoming UPT calls | 76 |
| 7.3.7 Emergency calls..... | 78 |
| 7.4 Procedures for UPT service profile management | 79 |
| Annex A | 79 |
| A.1 Examples of incoming UPT call with home service transparency (SCF-SCF assist). | 79 |
| A.1.1 General description..... | 79 |
| A.1.2 First option..... | 80 |
| A.1.3 Second option | 80 |
| A.2 Examples of outgoing UPT call with home service transparency (SCF-SCF assist) . | 81 |
| A.2.1 General description..... | 81 |
| A.2.2 First option..... | 82 |
| A.2.3 Second option | 83 |
| Annex B – UPT on mobile networks | 84 |
| B.1 Scenario 1: basic interworking between IN and mobile networks..... | 84 |
| B.2 Access to the UPT environment on mobile terminals | 86 |

ITU-T Recommendation Q.1542

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

1 Scope

This Recommendation defines an Intelligent Network "Capability Set 2" (IN CS-2) 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-2, as defined in ITU-T F.850 [1] and F.851 [2]. ITU-T F.851 [2] categorizes the functionality into essential and optional. 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 that cover the case of UPT capable networks (able to process UPT calls and procedures).

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

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-2 capabilities, by allowing access to the UPT user's home service provider's network/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 it is possible that the UPT service profile transfer is provided from the UPT user's home database to the originating network database. All interactions are in conformance with CS-2 guidelines.

For backward compatibility, the CS-1 compliant descriptions proposed in ITU-T Q.1541 [7] remain applicable in IN CS-2.

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

- *Service provided* – Telephone (i.e. voice-grade connection).
- *Networks involved* – All voice networks (e.g. PSTN, ISDN, PLMN, including IMT-2000).
- *Numbering* – UPT numbering is based on a personal UPT number which uniquely identifies the UPT user.

Included in this Recommendation (supported by CS-2)

- **Features**

- Essential**

- UPT user identity authentication
 - InCall registration
 - Outgoing UPT call
 - InCall delivery

- Optional**

- Remote InCall registration (and deregistration)
 - Outgoing UPT call follow-on
 - Global follow-on
 - UPT-specific indications
 - Outgoing call registration

Remote outgoing UPT call registration
Call Pick-up
Variable default InCall registration
Called party specified secure answering of incoming UPT calls

Not specifically included in this Recommendation (supported by CS-2)

- **Features**

- Optional**

- AllCall registration
 - Remote AllCall registration
 - Linked registration
 - Remote Linked registration
 - UPT service profile interrogation
 - UPT service profile modification
 - Multiple Terminal Address registration
 - Intended Recipient Identity Presentation
 - Access to groups of UPT service profiles
 - UPT service assistance

Not included in this Recommendation (mainly not supported by CS-2)

- **Features**

- Optional**

- UPT service provider authentication

- **Third-party protection mechanisms**

- Essential**

- None identified in ITU-T 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

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 F.850 (1993), *Principles of Universal Personal Telecommunication (UPT)*.
- [2] ITU-T F.851 (1995), *Universal Personal Telecommunication (UPT) – Service description (service set 1)*.
- [3] ITU-T Q.1224 (1997), *Distributed functional plane for intelligent network Capability Set 2*.
- [4] ITU-T Q.1228 (1997), *Interface Recommendation for intelligent network Capability Set 2*.

- [5] ITU-T Q.71 (1993), *ISDN circuit mode switched bearer services*.
- [6] ITU-T D.280 (1995), *Principles for charging and billing, accounting and reimbursements for universal personal telecommunication*.
- [7] ITU-T Q.1541 (1998), *UPT stage 2 for Service Set 1 on IN CS-1 – Procedures for universal personal telecommunication: Functional modelling and information flows*.
- [8] ITU-T Q.1214 (1995), *Distributed functional plane for intelligent network CS-1*.
- [9] ITU-T E.168 (1999), *Application of E.164 numbering plan for UPT*.

3 Definition of terms

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

3.1 Terms defined in ITU-T F.851 [2]

Network limitations

Terminal address

UPT (Universal Personal Telecommunication)

UPT access code (UPTAC)

UPT number (UPTN)

UPT service profile

UPT service profile management

UPT service provider

UPT subscriber

UPT user

3.2 Terms not defined in ITU-T F.851 [2]

This Recommendation defines the following terms:

3.2.1 General terms

3.2.1.1 UPT Capable Network: a bearer network capable of processing UPT calls and procedures. This is a network equipped with the IN Functional Platform, the UPT Service Logic, and the UPT user's data. The network may or may not house the UPT user's home network.

3.2.1.2 UPT Assisting Network: a bearer network capable of recognizing a UPT Access Code or a UPT Number (based on the E.168 Numbering Plan [9]) and requesting assistance of a UPT Capable Network (in CS-2 with the SCF-SCF interface). This is a network equipped with the IN Functional Platform but not the complete the UPT Service Logic.

NOTE – In CS-3 and further, some additional assistance could be used.

3.2.1.3 UPT Supporting Network: a bearer network capable of recognizing a UPT Access Code or a UPT Number (based on the E.168 Numbering Plan [9]) and routing the corresponding UPT call to a UPT or UPT-Assisting Network with which there is interworking and business agreement. This network is not equipped with the IN Functional Platform. However, it is capable of providing UPT specific information on call completion.

3.2.1.4 Non-UPT Supporting Network: a bearer network that treats a UPT call as a regular voice call. This network treats the UPT Access Code or the UPT Number on call origination not as a UPT specific code/number, but rather as an E.164 number.

3.2.1.5 UPT Environment: a CS-2 UPT Environment consists of one or more bearer networks, PSTN, ISDN, and PLMN, as defined above. A minimum of one UPT Capable Network is required to be present in a UPT Environment. A UPT user can have access to his subscribed UPT service while roaming within a UPT Environment that includes the UPT user's home network.

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 UPT service request/call is originated is only UPT Supporting Network (see above), the originating network will be the UPT Network to which this UPT Supporting Network will route/redirect this UPT request/call.

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

3.2.2.4 Future and previous visited networks: the future visited network is the remote network where a UPT user will be registered when having processed remote registration. The previous visited network is the network where a UPT user will no longer be registered after remote registration.

3.2.2.5 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.

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

3.2.2.7 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 Symbols and abbreviations

This Recommendation uses the following abbreviations:

| | |
|-------------|-----------------------------------|
| A | Calling User |
| ACM | Address Complete Message |
| ACTREC&AUT | Association Received & Authorized |
| AD | Adjunct |
| ANC | ANswer signal, Charge |
| AOC-E | Advice Of Charge – End |
| APPLYCHG | Apply Charging |
| APPLYCHGRPT | Apply Charging Report |
| ARI | Assist Request Instruction |
| B | Called User |
| BCSM | Basic Call State Model |
| BCUSM | Basic Call Unrelated State Model |
| BSS | Base Station Sub-system |
| 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 |
| CUSF | Call Unrelated Service Function |
| DISCFWDCONN | Disconnect Forward Connection |
| DLE | Destination Local Exchange |
| DP | Detection Point (in BCSM) |
| DTMF | Dual Tone Multi-Frequency |
| 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 |
| GMSC | Gateway MSC |
| HLR | Home Location Register |
| IAM | Initial Address Message |
| IF | Information Flow |
| IMT-2000 | International Mobile Telecommunications-2000 |
| IN | Intelligent Network |
| INITIALDP | Initial Detection Point |
| IP | Intelligent Peripheral |
| ISDN | Integrated Services Digital Network |
| LE | Local Exchange |
| MSC | Mobile services Switching Centre |
| MSRN | Mobile Station Roaming Number |
| NAP | Network Access Point |
| NOK | Not OK |
| OLE | Originating Local Exchange |
| P&C | Prompt and Collect user information |
| PE | Physical Entity |
| PIM | Personal Identity Module |
| PIN | Personal Identification Number |

| | |
|-------------|--|
| PLAYANN | Play Announcement |
| PLMN | Public Land Mobile Network |
| PSTN | Public Switched Telephone Network |
| PUI | Personal User Identity |
| r.c. | response confirm |
| r.i. | request indication |
| REQREPBCSM | Request Report BCSM Event |
| REQREPBCUSM | Request Report BCUSM Event |
| SCF | Service Control Function |
| SCFo | Originating Service Control Function |
| SCP | Service Control Point |
| SCUAF | Service Call Unrelated Agent Function |
| 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 |
| SS1 | Service Set 1 |
| SSB | Subscriber-Busy Signal |
| SSCP | Service Switching and Control Point |
| SSF | Service Switching Function |
| SSP | Service Switching Point |
| TDP | Trigger Detection Point (in BCSM) |
| TDP-N | Trigger Detection Point-Notification (in BCSM) |
| TDP-R | Trigger Detection Point-Request (in BCSM) |
| UIM | User Identity Module |
| UPT | Universal Personal Telecommunication |
| UPTAC | UPT Access Code |
| UPTN | UPT Number |
| VLR | Visited Location Register |
| VMSC | Visited MSC |

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 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

6.1.1 Generic functional model

Proposed below is the generic functional model for UPT Service Set 1 on CS-2. See Figure 6-1.

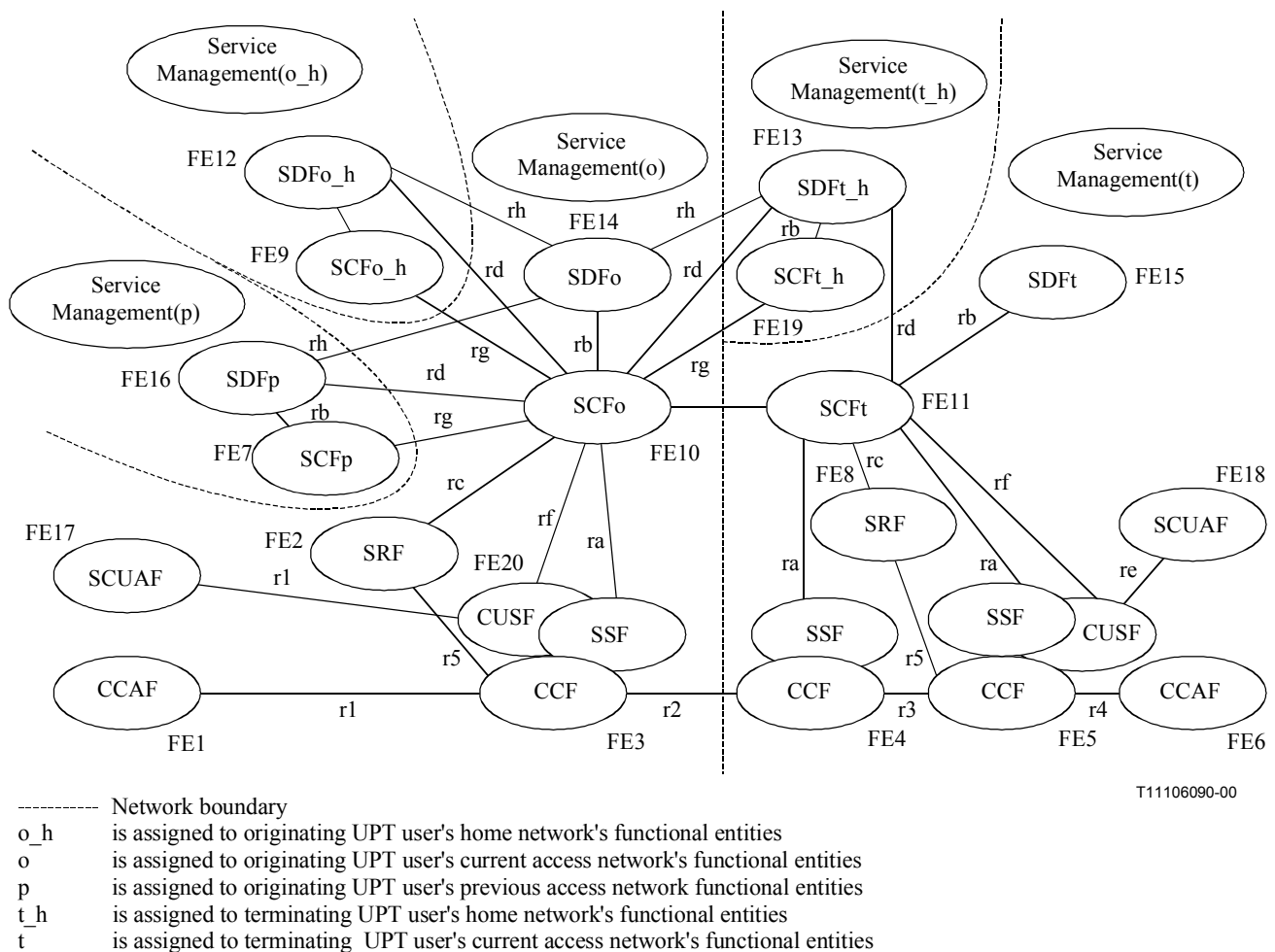


Figure 6-1/Q.1542 – Generic functional model for UPT

NOTE – The service management interfaces are not described above but it implies the normal interfaces.

Taking into account the limitations of IN CS-2, 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/SDFo and SCFh/SDFh functional entities. The interface between SCF/SDF and SCF/SDF is specified in IN CS-1/CS-2;
- SDFh stores all data related to the UPT user but part (or all) of the service profile can be copied in a visited SDF;
- SCFh/SDFh must as a consequence provide access control functions to check whether or not the requests received from remote entities are authorized requests or not;
- SCFh/SDFh performs the authentication of the UPT user if authentication data are not stored in the visited network, or else SCFo/SDFo performs the authentication;
- 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 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;
- SCF processes the UPT Service Logic;

- SDFo also stores service profile (or a part of it).

6.1.2 Descriptions of the functional entities

In Figure 6-1 the functional entities (FEs) have the following meanings:

| | | | | | |
|-----|-----------------|------|--------|------|--------|
| FE1 | CCAFo | FE8 | SRFt | FE15 | SDFt |
| FE2 | SRFo | FE9 | SCFo_h | FE16 | SDFo_p |
| FE3 | CCFo/SSFo | FE10 | SCFo | FE17 | SCUAFo |
| FE4 | Transit CCF/SSF | FE11 | SCFt | FE18 | SCUAFt |
| FE5 | CCFt/SSFt | FE12 | SDFo_h | FE19 | SCFt_h |
| FE6 | CCAFt | FE13 | SDFt_h | FE20 | CUSFo |
| FE7 | SCFp | FE14 | SDFo | FE21 | SDFo_f |

The corresponding relationships are presented in Figure 6-1.

Descriptions of the FEs are to be found in ITU-T Q.1224 [3]. The enhanced basic call state model of the IN defines standard detection points (DPs) at which IN service feature logic instances can be invoked. For the purposes of this Recommendation, relationships r_1 , r_2 , r_3 and r_4 are outside the scope of the Recommendation and are identical with those defined in ITU-T Q.71 [5]. For the purposes of this Recommendation, relationship r_5 is identical with relationship r_2 of ITU-T Q.71 [5], since it involves the control of a connection between CCF and SRF in order to provide specialized resources such as tones and announcements.

For the purposes of this Recommendation, it is assumed that home SDF will be able to check that a service agreement exists with the service provider of the invoking SCF.

The various scenarios for connecting the SCF to the SRF are described in ITU-T Q.1228 [4]. 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 only on the case when the IP is directly attached to the SSP that is interacting with the SCP, but the SCP's operations to the IP are sent directly to the IP without SSP relaying being involved. Relaying is permitted if required, however. The IP must indicate to the SCP that it is ready to receive operations. SCF-initiated disconnection of SRF is assumed, except following call abandon or disconnect. No examples of SRF-initiated disconnection are shown further.

6.2 Interconnection scenarios

A global interconnection scenario can be used for UPT. Indeed, each UPT procedure may combine the three functional CS-2 relationships (SCF-SDF, SCF-SCF and SDF-SDF), depending on its needs (e.g. data retrieval, supplementary services, data transfer). This global scenario is proposed in Figure 6-2.

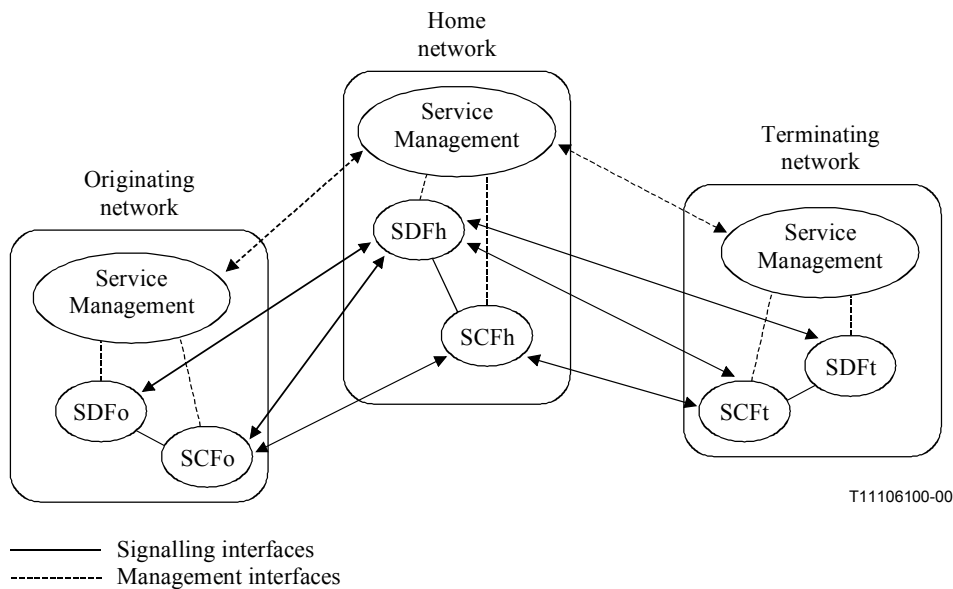


Figure 6-2/Q.1542 – Global scenario for interconnection

In Figure 6-2 are gathered the different interfaces that can be used between two UPT capable networks for all the procedures. In addition, the home network is related to the called party in the case of an incoming UPT call and to the calling party in case of an outgoing UPT call. In the case of a UPT to UPT call, two home networks may be involved.

6.2.1 Use of the relationship SCF-SDF

This interface is the only one considered in CS-1. Its main characteristics are shown below. The functional architecture is as follows.

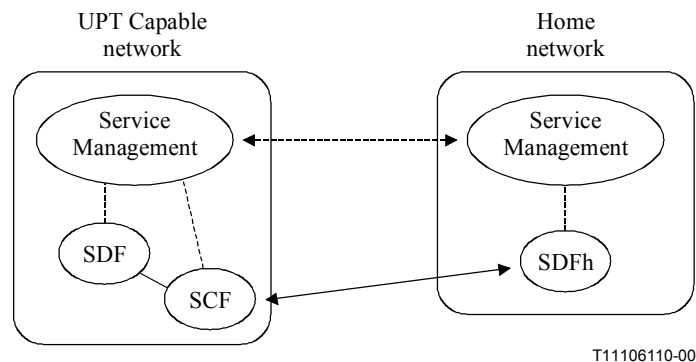


Figure 6-3/Q.1542 – SCF-SDF relationship

In the above architecture, no UPT-specific functions are attributed to the terminating network. The functional interface considered here is the SCF-SDF interface. This interface is used to perform user authentication operations, to retrieve, update, etc., the user service profile information stored in the home network.

SCF in the UPT Capable Network (e.g. in the originating or the terminating network) is in charge of the service control. It houses service logic for UPT, including call control logic, supplementary services logic, interaction (with SDFh) logic.

SDFh stores subscriber and user profiles. It performs classic data storage and management functions, e.g. access control over the SCF-SDF link (authentication of the originating network) or authentication of the UPT users. Consequently, SDFh is required to be more than a simple data repository.

Lastly, SDF in the UPT Capable Network stores information on the agreements with the other operators and service providers, and call records created by the SCF. This SDF could also store some part of the service profile (with security restrictions) since there is the possibility to do some transfer of data. Data would be transferred from the SDFh thanks to the (UPT Capable Network) SCF, after a SCF request. Of course, it would be possible not to transfer the whole requested data: this would depend on agreements between operators, service providers and on the status of these data and would be decided by the SDFh.

Some conclusions of such an architecture are:

- there is no transparency on the location of data; indeed, the queries on a UPT user's service profile must explicitly be addressed to the SDFh entity which stores it;
- the approach to service control and to data management is a centralized one: SCF in the capable network is the only control point for a UPT call and SDFh is the only entity holding the whole UPT user's profiles;
- in this case, service control is always assumed by SCF in the capable network while user profile management is always performed by SDFh;
- the SDF in the involved UPT Capable Network could be used for more than only the storage of agreements and call records;
- the UPT Capable Network can be on the originating side (e.g. during an outgoing or incoming UPT call) and also on the terminating side (e.g. if some service logic or supplementary services are processed on the terminating side during an incoming UPT call).

6.2.2 Use of the relationship SCF-SCF

The following architecture is derived from the standard architecture by assembling the IN architecture for the originating, home and terminating networks (see Figure 6-4). It corresponds to one of the interconnection scenarios agreed for CS-2. Note that the terminating SCFt may be involved only for some specific procedures (e.g. secure answering of intended recipient identity presentation).

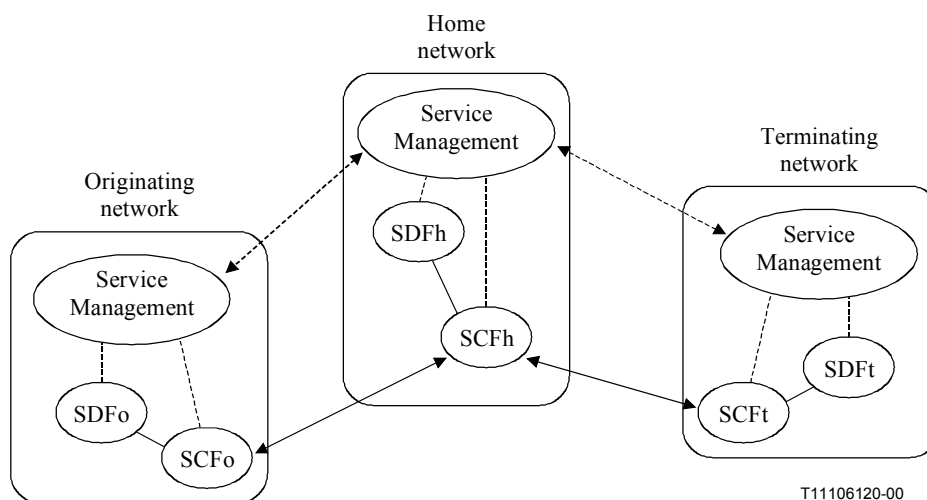


Figure 6-4/Q.1542 – SCF-SCF relationship

In this architecture, the functional interface used for internetwork connection is the SCF-SCF one. This interface is used for relationships between the originating and the home network (supplementary services control).

SDFo stores information on agreements and call records (as in the SCF-SDF scenario). SDFo could also store some part of the service profile since there is the possibility to do some data transfer between networks. Data would be transferred from the SDFh to the SDFo thanks to the SCFh and the SCFo, after an SCFo request. Of course, it would be possible not to transfer the whole requested data: this would depend on agreements between operators, service providers and on the status of these data and would be decided by the home network.

SCFo houses service logic for UPT: call control logic, supplementary services logic, logic for accessing to the profiles (through SCFh), logic for providing multipoint services (through interaction with each other), logic for interacting with the users, etc.

SCFh performs access control over the SCFo-SCFh link (for example in the case of copies being required by other networks) and authenticates the UPT users. However, SCFh may play the part of an assisting SCF for the SCFo during UPT call related procedures; indeed, SCFh will have the possibility to work with SCFo (at the service logic level) in order to offer to the UPT user some part of the service that SCFo could not offer on its own.

NOTE – Examples are provided in Annex A.

SDFh still stores the service profiles.

Some conclusions of such an architecture are:

- this scenario allows distribution of service logic over several entities. During a call, SCFo is activated first and may invoke for assistance some service logic contained in SCFh. While allowing a richer service logic, it opens up the possibility of complex service interaction scenarios between the service logic programs running on different SCF (originating, home, terminating);
- in this scenario, service control is assumed by both SCFo and SCFh while data management is always performed by SDFh;
- there is no distributed data; SDFh is responsible for locating the data requested by the SCF entities.

6.2.3 Use of the relationship SDF-SDF

The following architecture is derived from the standard architecture by assembling the IN architecture for the originating and home networks (see Figure 6-5).

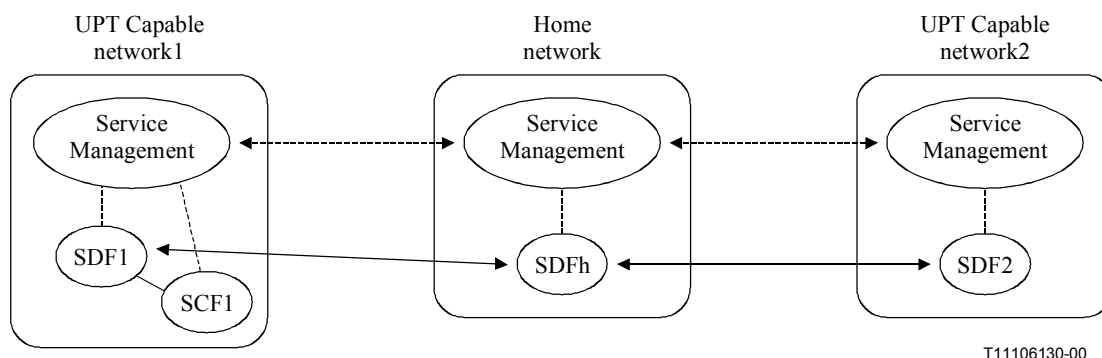


Figure 6-5/Q.1542 – SDF-SDF relationship

In this architecture, the functional interface used for internetwork connection is the SDF-SDF one. This interface is used for relations between the involved capable networks and the home network (call control, service logic related operations) and for relations with the home network (user authentication operations, retrieval, updating, etc., of the service profiles information).

SCF1 houses service logic for UPT: call control logic, supplementary services logic, logic for accessing the profiles (through their local SDF), logic for interacting with the users, etc.

SDF1 stores information on agreements and call records (as in the SCF-SDF scenario). They provide transparent access to the user profiles (distributed database with location transparency). Data would be transferred from the SDFh to the SDF1 directly, after an SDF1 request. Of course, it would be possible not to transfer the whole requested data: this would depend on agreements between operators, service providers and on the status of these data and would be decided by the SDFh.

SDFh permanently stores the service profiles (but SDF1 may store temporary copies under its control), manages any shadow copy stored in SDF1 and performs access control over the SDF-SDF link (authentication of the originating network). Also, SDFh can perform other data transfer as a consequence of the SDFo request, in particular the removal of update copied data in other SDF (SDF2 in the figure).

Some conclusions of such an architecture are:

- this scenario allows distribution of data management functionalities and location transparency for data manipulation operations. SDF1 is responsible for locating the data requested by the SCF1; the service logic is completely decoupled from the data;
- this approach allows data to be duplicated on several SDF, if necessary. The SDF cooperate to keep track of the data and maintain copies up to date; the SDF entities are required to be more than simple data repositories since they must be able to perform access control (on the SDF-SDF links) and provide location and replication transparencies;
- in this case, service control is assumed by SCF1 while data management is performed by SDFh and SDF1;
- the UPT Capable Network can be on the originating side and also on the terminating side.

6.3 User access scenarios

6.3.1 DTMF user access

The following architecture is derived from the standard architecture by assembling the IN architecture for the user and the network (see Figure 6-6).

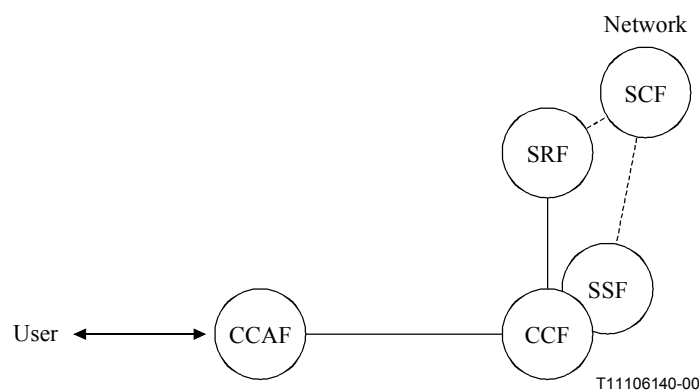


Figure 6-6/Q.1542 – DTMF user access

In this architecture, the functional interface used for interaction between the user and the network is CCAF-CCF/SSF. CCAF establishes the B-channel path between user and network and CCF establishes the in-channel path between CCAF and SRF.

SRF sends speech guidance to the user according to indication from SCF and receives information (authentication information, information to modify/retrieve own service profile, etc.) using DTMF from the user. SRF analyses this information and sends the results to SCF.

Some conclusions of such an architecture are:

- in this scenario, the B-channel path must be established for non-signalling interaction between user and network;
- this scenario allows interaction for user and network using only DTMF through the B-channel path;
- in this scenario, information from user through the in-channel path is converted to signalling by SRF.

6.3.2 DSS1 user access for ISDN terminals which behave in functional mode

Functional procedure is a one-shot request type procedure.

6.3.2.1 Call related user-network interaction

The following architecture is derived from the standard architecture by assembling the IN architecture for the user and the network (see Figure 6-7).

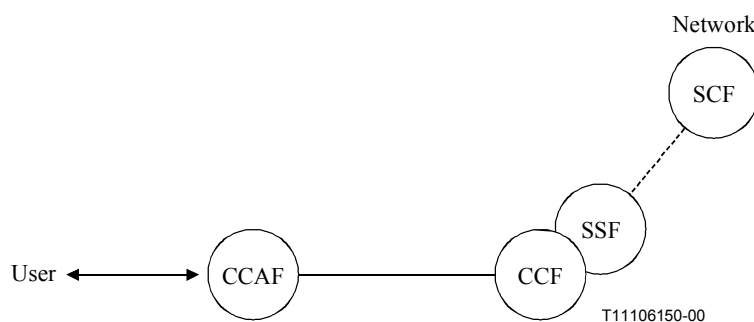


Figure 6-7/Q.1542 – DSS1 user access – Functional mode – Call related

In this architecture, the functional interface used for interaction between the user and the network is CCAF-CCF/SSF. This scenario is valid for ISDN environments.

CCAF establishes the B-channel path between user and network. After the B-channel path is established, CCAF sends information (authentication information, information to modify/retrieve user's service profile etc.) to CCF/SSF using D-channel signals.

Some conclusions of such an architecture are:

- this scenario allows interaction for user and network using D-channel signals in the case of the originating call or terminating call;
- in this scenario, the B-channel path must be established for non signalling interaction between user and network;
- in this scenario, information is transferred between SCF and user through CCF/SSF.

6.3.2.2 Call unrelated user-network interaction

The following architecture is derived from the standard architecture by assembling the IN architecture for the user and the network (see Figure 6-8).

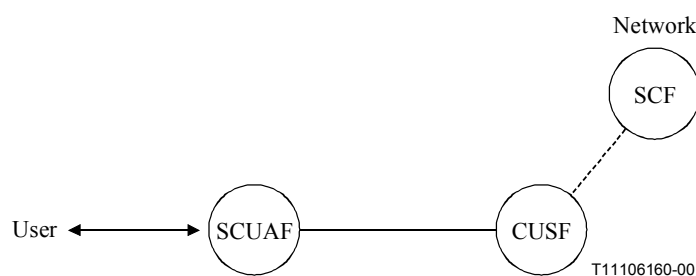


Figure 6-8/Q.1542 – DSS1 user access – functional mode – call unrelated

In this architecture, the functional interface used for interaction between the user and the network is SCUAF-CUSF. This scenario is valid for ISDN environments.

SCUAF invokes functions to modify or retrieve own service profile not establishing a B-channel path between user and network. It is activated by network function (e.g. challenge/response authentication).

CUSF sends/receives information (authentication information, information to modify/retrieve user's service profile...) using D-channel signals to/from terminal. It sends this information to SCF.

Some conclusions of such an architecture are:

- in this scenario, the B-channel path must not be established for non-signalling interaction between user and network;
- this scenario allows interaction for user and network in the case of an unrelated call;
- in this scenario, information is transferred between SCF and user by way of CUSF;
- this can be used only for registration and service profile management.

7 Information flows for UPT Service Set 1 on Capability Set 2

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 ITU-T 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.

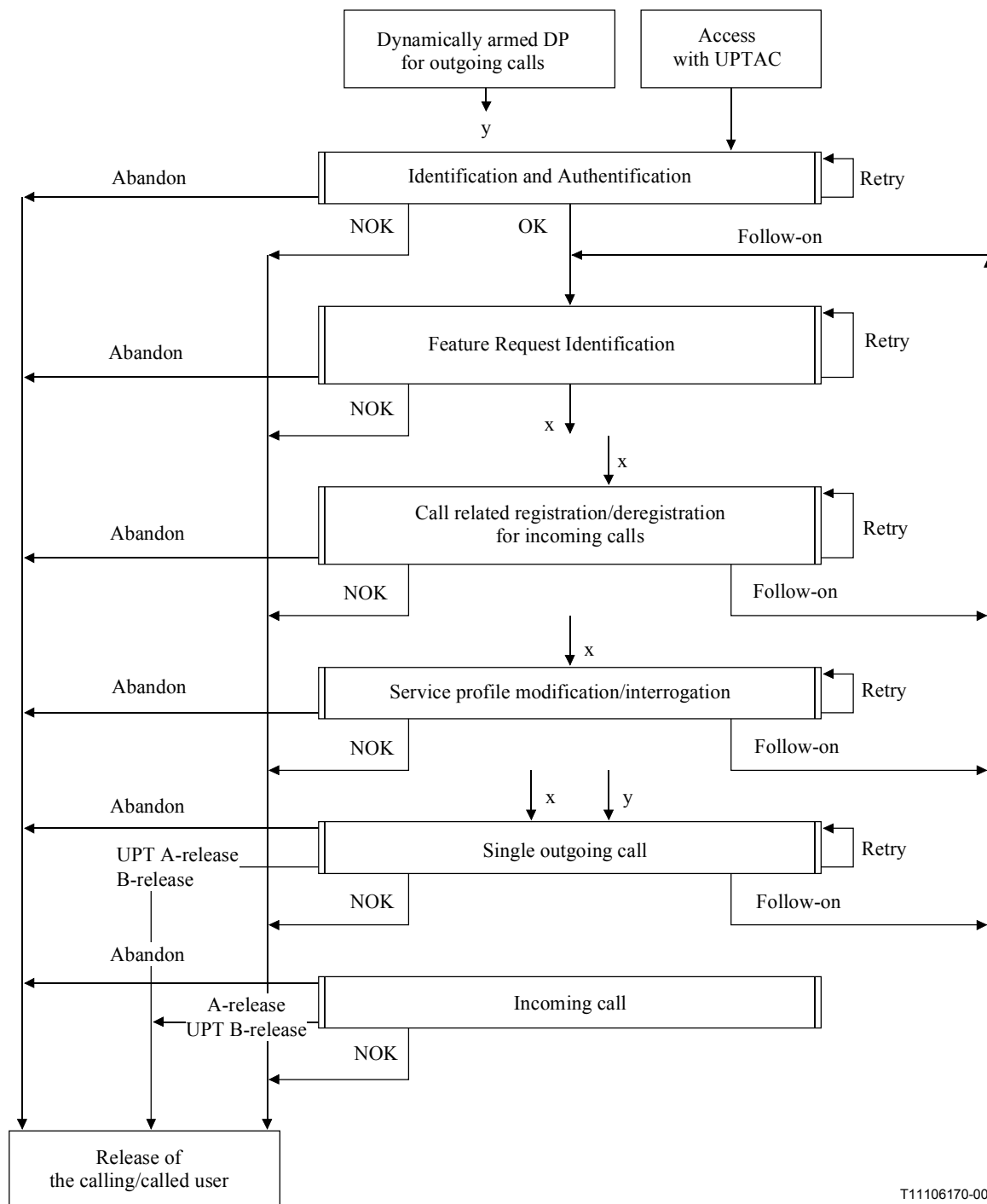
The method by which a caller indicates that access to a UPT service procedure is required will depend on the procedure requested and on whether the caller is a UPT user or not. Where a UPT user requires a personal mobility (registration) or service profile management procedure, or wishes to make an outgoing UPT call, 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 a small number of messages (e.g. by using some form of ancillary device such as a DTMF tone sender).

On DTMF accesses, the user is 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 mainly by DTMF in-band signalling and from the service provider to the user by the voice announcement facility of the SRF. In this Recommendation, the wording of the announcements is to show intent only, not specific content.

On DSS1 accesses, the use of an SRF is not necessary; the initial user interaction is performed by the DSS1 terminal and the required service feature can be automatically detected and processed.

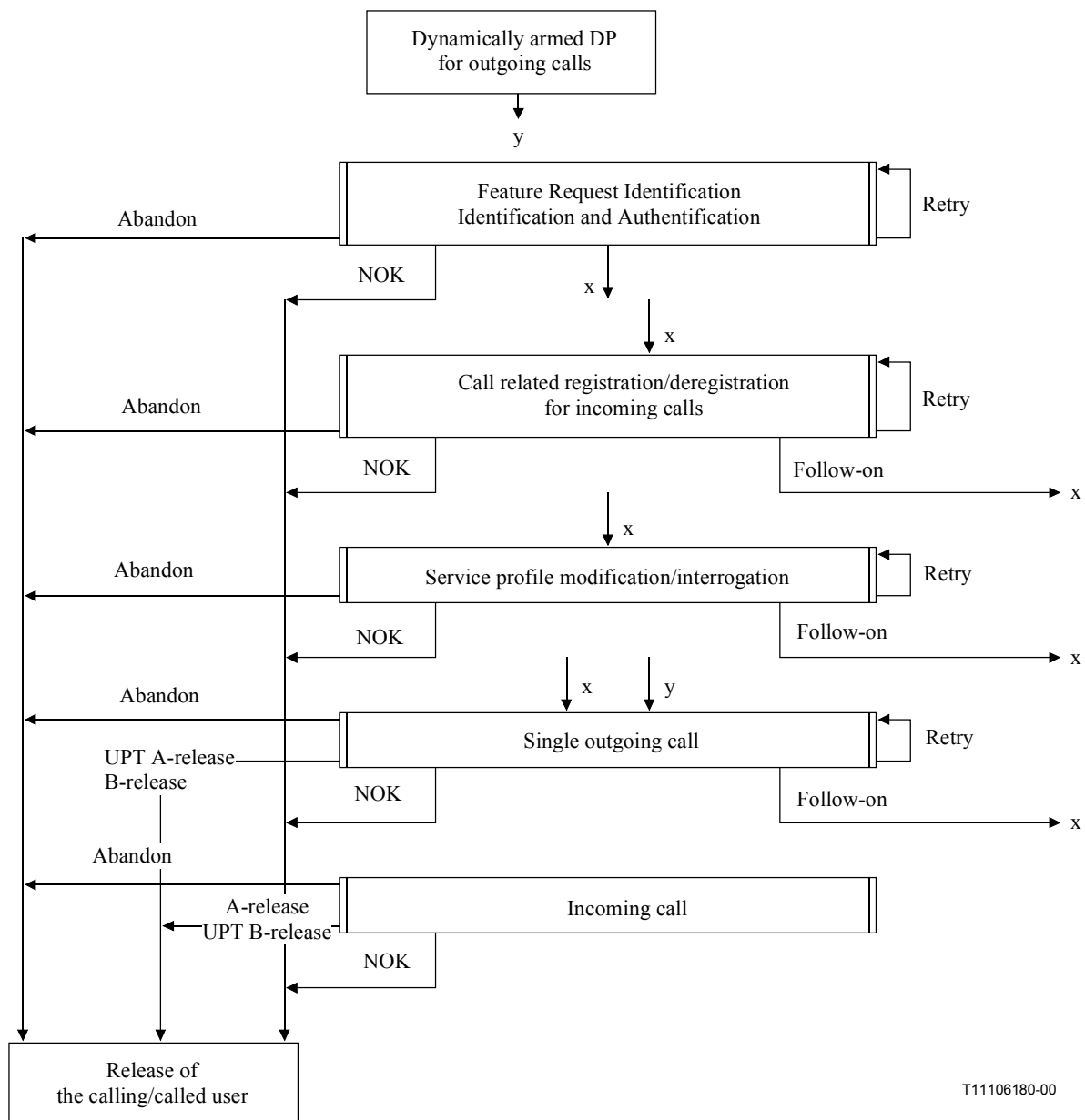
The order in which the UPT user sends information to the UPT service provider in the network is shown in Figure 7-1.



T11106170-00

Figure 7-1/Q.1542 – State machine model for UPT procedures, DTMF access (sheet 1 of 2)

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.



T11106180-00

Figure 7-1/Q.1542 – State machine model for UPT procedures, DSS1 access (sheet 2 of 2)

NOTE – ITU-T E.168 [9] 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 the service profile and that the counter logic would reside in the function responsible for processing authentication.

The Information Flows (IFs) and their contents (Information Elements, IEs) are based on those developed for the IN architecture, as described in ITU-T Q.1224 [3]. Whether IFs are confirmed or unconfirmed, and of type req. ind. or resp. conf., is described in ITU-T Q.1224.

The charging methods which are described in 5.2.2/Q.1214 [8] can apply to UPT service provided the principles of ITU-T D.280 [6] are followed.

Where the SSF/CCF is required to send and react to both bearer/non-IN call control (see ITU-T Q.71 [5]) 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 to the UPT environment

As described later, for SS1 on CS-2, several ways to access the UPT service are possible. According to the procedures described in this Recommendation, the following ways can be proposed:

- a CS-1 access procedure with the UPTAC, as in 7.1.1/Q.1541 [7];
- the same as for SS1 on CS-1 with authentication data sent at the same time as the UPTAC;
- a call related access procedure with automatic detection (see also outgoing UPT call for a UPT user from the line where the user registered);
- a call unrelated access procedure;
- normal DSS1 access (not described hereafter).

Three of these possibilities are included in the outline of sequencing of main UPT procedures and are summarized hereafter.

7.1.1.1 SS1 on CS-1 with authentication data sent with the UPTAC

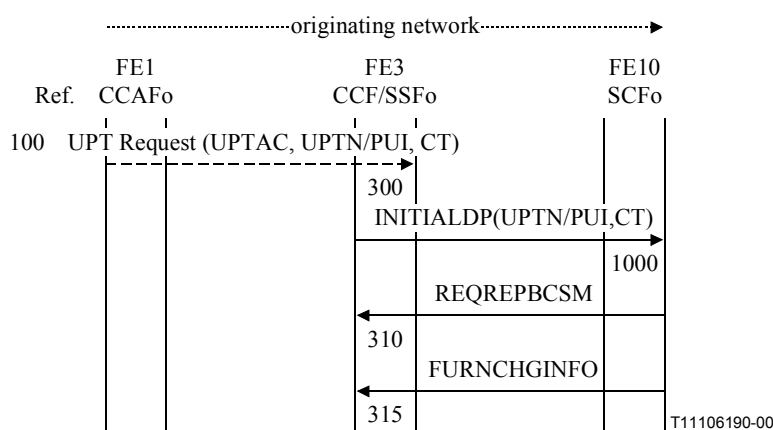


Figure 7-2/Q.1542 – SS1 on CS-1 access with authentication data in parallel

NOTE – CT is Command Type, it identifies the algorithm to be used for authentication.

Feature Entity Actions

Functional Entity – FE1 (CCAFo)

FEA: 100

- pass UPT call SETUP request to CCF/SSF;
SETUP may contain Facility IE for UPT OutCall invocation and Facility IE contains originating UPTN/PUI.

Functional Entity – FE3 (CCF/SSFo)

FEA: 300

- receive SETUP req. ind. with UPTN;
- on detection of armed TDP-R, formulate and send Initial DP req. ind. to SCFo;
- send Analyzed_Info req. ind. or Initial DP req. ind. to SCFo;
- suspend call processing and wait instruction(s) from SCFo.

FEA: 310

- receive Request Report BCSM Event req. ind. from SCFo;
- arm Detection Points as EDP-N to report user abandon (before answer – DP 10) and user disconnect (after answer – DP 9).

FEA: 315

- receive Furnish Charging Information req. ind. from SCFo;
- initiate off-line charging according to specified rules (this is only an example. Other charging methods can be used).

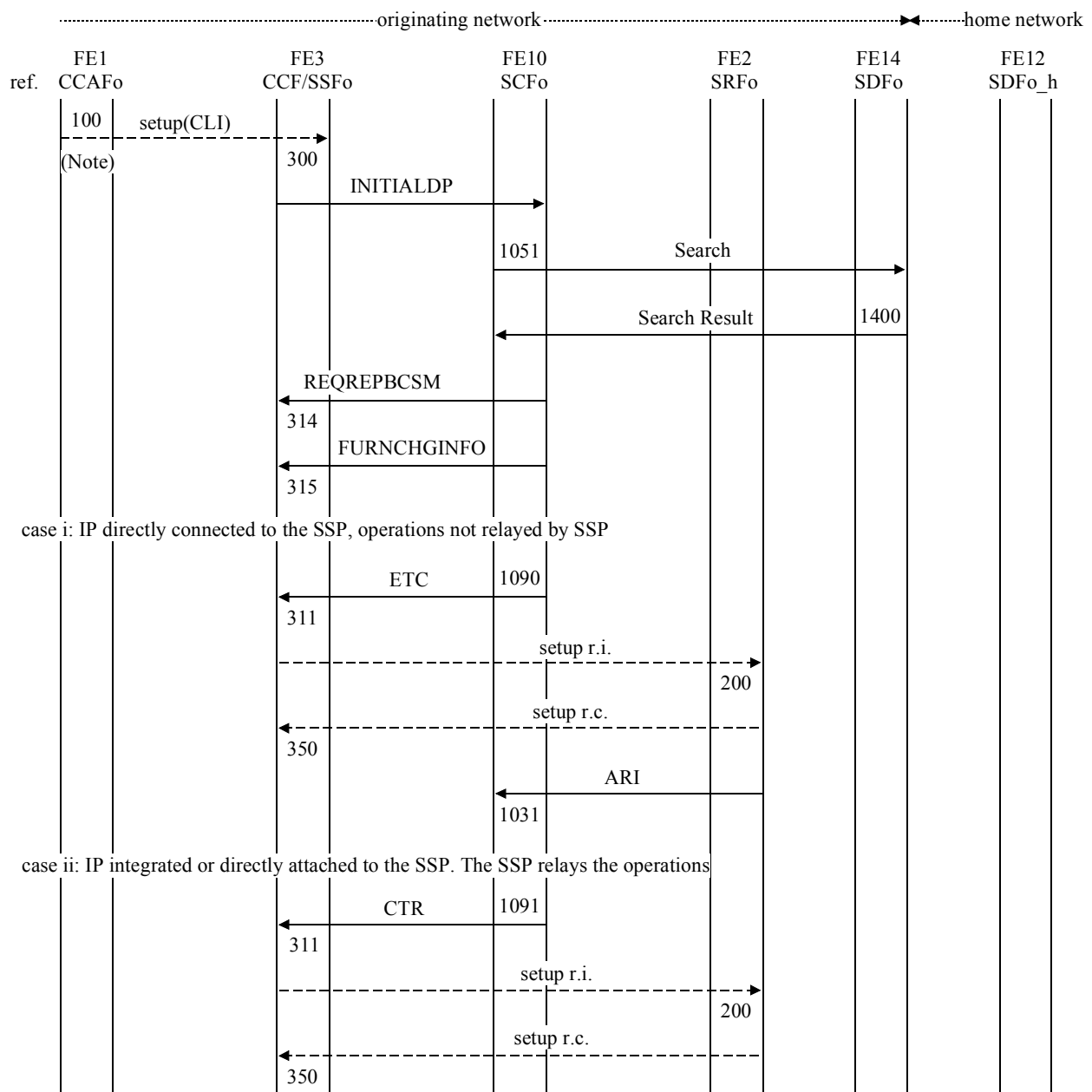
Functional Entity – FE10 (SCFo)

FEA: 1000

- receive and react to Initial DP req. ind. from SSF/CCF;
- formulate and send Request Report BCSM Event req. ind. to SSF/CCF to arm Detection Points as EDP-N for abandon (DP 10) and disconnect (DP 9), if the latter is required. REQREPBSCM contains the list of events and their monitoring mode (may be useless if the DPs are statically armed).

7.1.1.2 Access to UPT for outgoing UPT call by a registered UPT user

In this case, solution a) described further in 7.2.3 is used: the line at which the user is registered is temporarily marked. See Figure 7-3.



T11106200-00

NOTE – The line is marked, which enables the SSF to immediately trigger the SCF for outgoing UPT call when registered. For simplification, we consider here that the optional Registrator Identifier was given at registration and that it is the PUI. If not, the SCF should ask the UPT user to provide his PUI (e.g. to be able to charge the user!).

Figure 7-3/Q.1542 – Access and prompts [solution a)]

Feature Entity Actions

Functional Entity – FE1 (CCAFo)

FEA: 100

- pass UPT call SETUP request to CCF/SSF;
SETUP may contain Facility IE for UPT OutCall invocation. In this type of access (registered UPT user), Facility IE does not contain originating UPTN/PUI since it is not provided by the UPT user but retrieved by the network.

Functional Entity – FE2 (SRFo)

FEA: 200

- receive and react to SETUP req. ind. from SSF/CCF;
- on successful establishment of connection:
 - formulate and send SETUP resp. conf. to SSF/CCF;
 - formulate and send Assist Request Instructions to SCF to indicate readiness to send messages.

Functional Entity – FE3 (CCF/SSFo)

FEA: 300

- receive SETUP req. ind., with CLI only (the UPTN or PUI is not provided);
- on detection of armed TDP-R, formulate and send Initial DP req. ind. to SCFo;
- send Analyzed_Info req. ind. or Initial DP req. ind. to SCFo;
- suspend call processing and wait instruction(s) from SCFo.

FEA: 311

- receive and react to Establish Temporary Connection req. ind. from SCFo;
- formulate and send SETUP req. ind. to SRFo to establish a connection to it.

FEA: 314

- receive Request Report BCSM Event req. ind. from SCFo;
- arm Detection Points as EDP-N to report user abandon (before answer – DP 10) and user disconnect (after answer – DP 9).

FEA: 315

- receive Furnish Charging Information req. ind. from SCFo;
- initiate off-line charging according to specified rules (this is an example only. Other charging methods can be used).

FEA: 350

- receive and react to SETUP resp. conf. from SRFo;
- establish a relationship between the leg between the calling party and the SSF/CCF, and the leg between the SSF/CCF and the SRFo;
- through-connect calling party to SRFo.

Functional Entity – FE10 (SCFo)

FEA: 1031

- receive and react to Assist Request Instructions from SRFo req. ind. from SRFo;
- formulate and send Play Announcement req. ind. to SRFo to play announcement of UPT charges. Advice of end of announcement required.

FEA: 1051

- receive and react to Initial DP req. ind. from SSF/CCFo;
- formulate and send Search (including the CLI) to the SDFo in order to get back the PUI/UPTN of the calling UPT user;
- formulate and send Request Report BCSM Event req. ind. to SSF/CCF to arm Detection Points for disconnect (DP 9), user abandon (DP 10), route select failure (DP 4), B busy (DP 5) and B no answer timeout (DP 6). If follow-on is allowed, most DPs are armed as

EDP-R, or else as EDP-N. REQREPBCSM contains the list of events and their monitoring mode (may be useless if the DPs are statically armed);

- formulate and send Furnish Charging Information req. ind. to SSF/CCF to establish charge record for the call. The charging method shown is an example only. Other charging methods can be used.

FEA: 1090

- formulate and send Establish Temporary Connection req. ind. to SSF/CCFo to instruct it to connect to SRFo to play announcement to calling party.

FEA: 1091

- formulate and send CTR to SSF/CCFo to instruct it to connect to SRFo to play announcement to calling party.

Functional Entity – FE14 (SDFo)

FEA: 1400

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

7.1.1.3 Call unrelated access

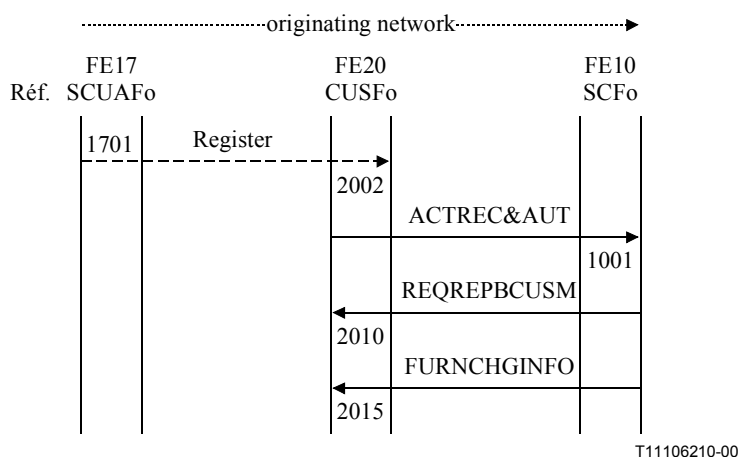


Figure 7-4/Q.1542 – Call unrelated

Feature Entity Actions

Functional Entity – FE10 (SCFo)

FEA: 1001

- receive and react to Association Received & Authorized from CUSFo;
- formulate and send Request Report BCUSM Event req. ind. to CUSFo to arm Detection Points as EDP-N for abandon (before answer DP 10) and disconnect (DP 9), if the latter is required. REQREPBCUSM contains the list of events and their monitoring mode (may be useless if the DPs are statically armed).

Functional Entity – FE17 (SCUAFo)

FEA: 1701

- send the UPT procedure request to the CUSFo (for example incall registration).

Functional Entity – FE20 (CUSFo)

FEA: 2002

- receive the procedure request (e.g. Incall registration) from SCUAFo and pass it to the SCFo (Association Received & Authorized to the SCFo in order to request a call unrelated dialogue).

FEA: 2010

- receive Request Report BCUSM Event req. ind. from SCF;
- arm Detection Points as EDP-N to report user abandon (before answer – DP 10) and user disconnect (after answer – DP 9).

FEA: 2015

- receive Furnish Charging Information req. ind. from SCF;
- initiate off-line charging according to specified rules (This is only an example. Other charging methods can be used).

7.1.2 Identification and authentication

In the description proposed for SS1 on CS-1, only weak authentication was proposed (see 7.1.1/Q.1541 [7]). Based on CS-2, it is possible to provide strong authentication, for which additional descriptions are presented below.

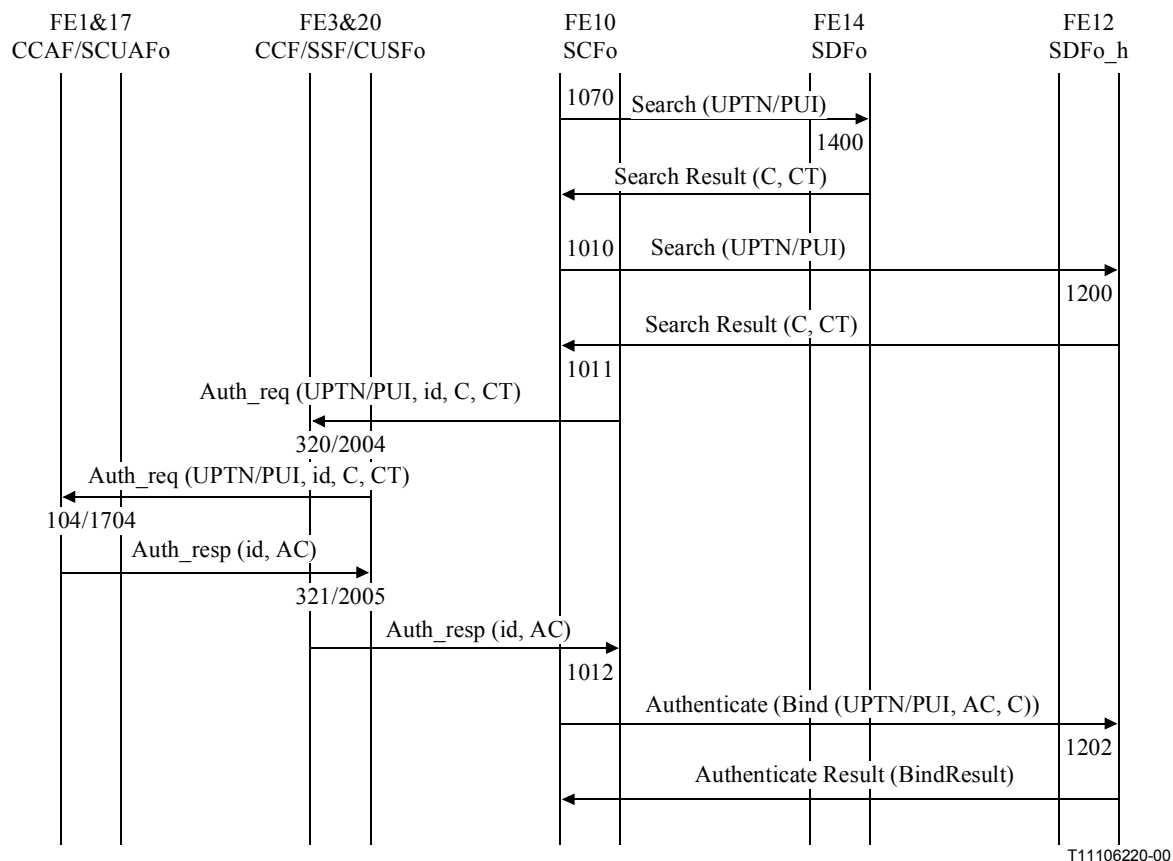
We consider here the way to perform two-pass strong authentication procedure with a smart card, with SCF-SDF interface. The descriptions below are independent from the access (call related or call unrelated).

7.1.2.1 Identification and two-pass strong authentication, data not stored in SDFo

(It is assumed that this procedure was preceded by Card Holder Verification thanks to a local PIN, in the case where the UPT user has a smart card.)

We assume that the SCFo has received the PUI/UPTN of the user from the access.

In this description, the home network (SDFh) generates the challenge C for security reasons. But with strong agreements between the originating and home networks, the challenge could be generated by SCFo as well. See Figure 7-5.



NOTE 1 – CT is Command Type, it identifies the algorithm for authentication when necessary.
 NOTE 2 – When a single channel is established between CCF and CCAF, the Call ID is not needed.
 NOTE 3 – About ID: the Call Reference or Call ID is defined as identifying a specific instance of a relationship between an SCF and an SSF. At the physical plane, it is mapped onto a TCAP transaction identity.

Figure 7-5/Q.1542 – Identification and two-pass strong authentication

In the figure, SDFh compares AC (calculated by the smart card) and AC' (calculated by itself) and gives this result to SCFo.

Another assumption could be that the SCFo makes the check itself. In this case, the SDFh has to send back AC', and the above last two flows are not needed (Authenticate).

Feature Entity Actions

Functional Entity – FE1 (CCAFo)

FEA: 104

- on receipt of the request from the network (here for authentication data), send this request to the user;
- on receipt of the user's response, send the information to the network (here for authentication).

Functional Entity – FE3 (CCF/SSFo)

FEA: 320

- on receipt of the authentication data from the SCFo, send these data to the CCAFo.

FEA: 321

- on receipt of the authentication result from the CCAFo, send this result to the SCFo for authentication.

Functional Entity – FE10 (SCFo)

FEA: 1010

- upon receipt of the result to the check for specific agreement with the UPT user's service provider, and because the UPT user authentication data are not stored in the SDFo, request the authentication data (challenge C, CT) from the SDFo_h.

FEA: 1011

- upon receipt of the authentication data provided by the SDFo_h, send authentication data towards the user.

FEA: 1012

- upon receipt of the authentication result calculated by the user side, send this result to the SDFo_h for authentication.

FEA: 1070

- check from the SDFo the agreements with the UPT user's service provider. Check also if the UPT user is already registered in the SDFo.

Functional Entity – FE12 (SDFo_h)

FEA: 1200

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

FEA: 1202

- calculate its result AC', compare to the result received from user through the SCFo and send the authentication result back (successful or not).

Functional Entity – FE14 (SDFo)

FEA: 1400

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

Functional Entity – FE17 (SCUAFo)

FEA: 1704

- on receipt of the request from the network (here for authentication data), send this request to the user;
- on receipt of the user's response, send the information to the network (here for authentication).

Functional Entity – FE20 (CUSFo)

FEA: 2004

- on receipt of the authentication data from the SCFo, send these data to the SCUAFo.

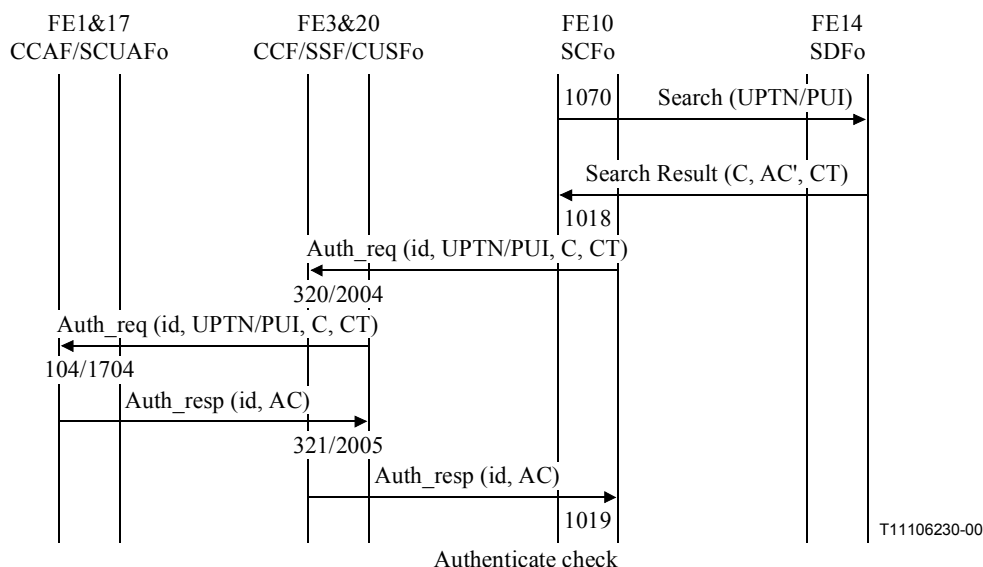
FEA: 2005

- on receipt of the user's authentication result from the SCUAFo, send this result to the SCFo.

7.1.2.2 Identification and two-pass strong authentication, data previously stored in SDFo

(It is assumed that this procedure was preceded by Card Holder Verification thanks to a local PIN, in the case where the UPT user has a smart card.)

It is assumed that service profile transfer is available in this configuration since authentication data are stored from home to originating SDF. See Figure 7-6.



NOTE 1 – When a single channel is established between CCF and CCAF, the Call ID is not needed.

NOTE 2 – About ID: the Call Reference or Call ID is defined as identifying a specific instance of a relationship between an SCF and an SSF. At the physical plane, it is mapped onto a TCAP transaction identity.

Figure 7-6/Q.1542 – Identification and two-pass strong authentication, data previously stored

Above, SCFo compares AC (calculated by the smart card) and AC' (previously stored in the SDFo).

Feature Entity Actions

Functional Entity – FE1 (CCAFo)

FEA: 104

- on receipt of the request from the network (here for authentication data), send this request to the user;
- on receipt of the user's response, send the information to the network (here for authentication).

Functional Entity – FE3 (CCF/SSFo)

FEA: 320

- on receipt of the authentication data from the SCFo, send these data to the CCAFo.

FEA: 321

- on receipt of the authentication result from the CCAFo, send this result to the SCFo for authentication.

Functional Entity – FE10 (SCFo)

FEA: 1018

- upon receipt of the (previously stored) authentication data provided by the SDFo, send authentication data towards the user.

FEA: 1019

- upon receipt of the authentication result calculated by the user side, process authentication (comparison of the pre-stored result and the user side's result).

FEA: 1070

- check from the SDFo the agreements with the UPT user's service provider. Check also if the UPT user is already registered in the SDFo.

Functional Entity – FE14 (SDFo)**FEA: 1400**

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

Functional Entity – FE17 (SCUAFo)**FEA: 1704**

- on receipt of the request from the network (here for authentication data), send this request to the user;
- on receipt of the user's response, send the information to the network (here for authentication).

Functional Entity – FE20 (CUSFo)**FEA: 2004**

- on receipt of the authentication data from the SCFo, send these data to the SCUAFo.

FEA: 2005

- on receipt of the user's authentication result from the SCUAFo, send this result to the SCFo.

7.1.2.3 Downloading of authentication data

The SCFo downloads authentication data from the SDFh into the SDFo in order to be able to perform authentication locally. One or more sets of authentication data can be translated: one set is more real time transfer, e.g. for the access to a new network, several sets are considered for a later use and transferred when the access to a newly visited network was successful.

The mechanisms for data transfer are described hereafter in 7.2.1.

7.1.3 UPT release sequences

The release sequences are initiated by the UPT user, the non-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 possible:

- a) *UPT A-party initiated release* – At any time in all procedures, by the calling UPT user;
- b) *UPT B-party initiated release* – Only for call handling procedures, at any time after answer for call;
- c) *non UPT A-party initiated release* – At any time in all procedures, by the calling (non UPT) user;
- d) *non UPT B-party initiated release* – Only for call handling procedures, at any time after answer for call;
- e) *network-initiated release* – At end of outgoing procedure or on error or failure, e.g. after authentication rejection and after reset procedure.

See 7.1.2/Q.1541 [7], for information flows.

7.1.4 Feature identification (including global follow-on)

See 7.1.3/Q.1541 [7], for DTMF procedures. No call unrelated identification is needed on DTMF.

For DSS1 procedures, feature identification is gathered with the access procedures.

7.2 Procedures for personal mobility

7.2.1 Service profile transfer

Table 1/Q.1542 – Service profile transfer

| UPT procedure | Service profile transfer necessity (Note 1) |
|--|--|
| 1) Personal mobility procedures <ul style="list-style-type: none"> • InCall registration/deregistration • remote InCall registration/deregistration • OutCall registration/deregistration • remote OutCall registration/deregistration • AllCall registration/deregistration • remote AllCall registration/deregistration • Linked registration/deregistration • remote Linked registration/deregistration | (Note 2) necessary necessary (Note 3) necessary necessary (Note 3) necessary necessary (Note 3) necessary necessary (Note 3) |
| 2) Outgoing UPT call procedures <ul style="list-style-type: none"> • Single Outgoing UPT call • Outgoing UPT call after OutCall registration • OutCall follow-on • Outgoing UPT call after OutCall follow-on | optional unnecessary optional unnecessary (Note 4) |
| 3) Incoming UPT call procedures <ul style="list-style-type: none"> • Single incoming UPT call • Incoming UPT call with intended recipient identity presentation • Incoming UPT call with secure answering • Call Pick Up | unnecessary unnecessary unnecessary unnecessary |

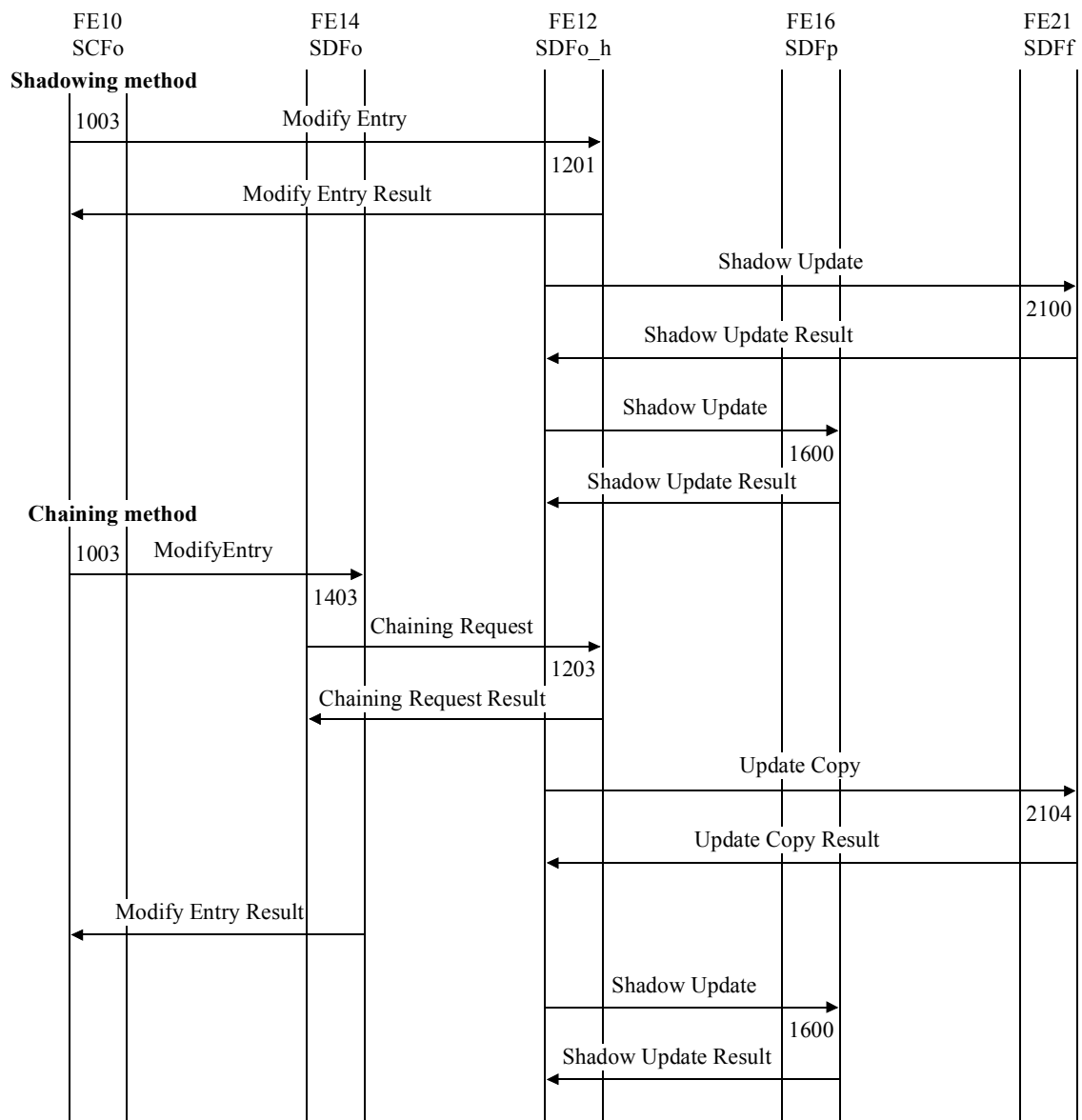
Table 1/Q.1542 – Service profile transfer (*concluded*)

| UPT procedure | Service profile transfer necessity (Note 1) |
|--|--|
| 4) UPT service profile management procedures <ul style="list-style-type: none">• Profile interrogation• Profile modification | unnecessary unnecessary |
| 5) Other procedures <ul style="list-style-type: none">• Global follow-on• Procedure after global follow-on• Service assistance | unnecessary same as for the requested procedure same as for the assisted procedure |
| NOTE 1 – The service profile transfer is unnecessary if it has already been done. NOTE 2 – The copied service profile in the network where the user is registered should be deleted when deregistration procedure is performed. The copied service profile in the network where the user is registered should be deleted when registration to another network is performed, causing the previous registration to be overridden. NOTE 3 – In remote registration/deregistration procedures, the service profile must not be copied/deleted in the network where the remote registration/deregistration procedures are invoked but rather copied/deleted in the network where the user is registered. NOTE 4 – The necessity of the service profile transfer should be decided when the OutCall follow-on procedure is performed. | |

Two mechanisms may be used: one based on shadowing (the SCFo addresses the home SDFh which then transfers the request to the SDFo), one based on chaining (the SCFo addresses its SDFo, the SDFo requests data from the SDFh).

In any case, because nothing can prove that the service profile has been deleted, the use of the service profile transfer facility shall be based on agreements and on the trust between the involved networks.

These mechanisms are presented in Figure 7-7, in the most generic case: service profile transfer is processed from the originating network, between the previous and the future visited networks. If the user is registering in the originating network, then the latter is the future visited network.



T11106240-00

Figure 7-7/Q.1542 – Service profile transfer – Shadowing and chaining

Feature Entity Actions

Functional Entity – FE10 (SCFo)

FEA: 1003

- send ModifyEntry req. to SDFo_h (shadowing method) or SDFo (chaining method) in order to start the service profile transfer procedure.

Functional Entity – FE12 (SDFo_h)

FEA: 1201

- receive and react to ModifyEntry req. from SCFo;
- SDFo_h is updated;
- formulate and send ModifyEntry Result resp. conf. to SCFo.

FEA: 1203

- receive ChainingRequest from SCFo. It is updated, the Result is sent back to the SCFo;

- update, if needed, SDFf (UpdateCopy) and SDFp (shadowUpdate).

Functional Entity – FE14 (SDFo)

FEA: 1403

- receive and react to ModifyEntry req. from SCFo;
- formulate and send ChainingRequest to the SDFo_h;
- formulate and send ModifyEntry Result resp. conf. to SCFo.

Functional Entity – FE16 (SDFo_p)

FEA: 1600

- receive and react to ShadowUpdate req. ind from the SDFo_h;
- modify/Delete data;
- formulate and send ShadowUpdate Result to SDFo_h.

Functional Entity – FE21 (SDFo_f)

FEA: 2100

- receive and react to ShadowUpdate req. ind from the SDFo_h;
- update/modify data;
- formulate and send ShadowUpdate Result to SDFo_h.

FEA: 2104

- receive and react to UpdateCopy Result from the SDFo_h;
- update/modify data;
- receive and react to UpdateCopy Result to the SDFo_h.

7.2.2 Registration for incoming UPT calls

7.2.2.1 Call related procedure

See 7.2.1/Q.1541 [7], for descriptions.

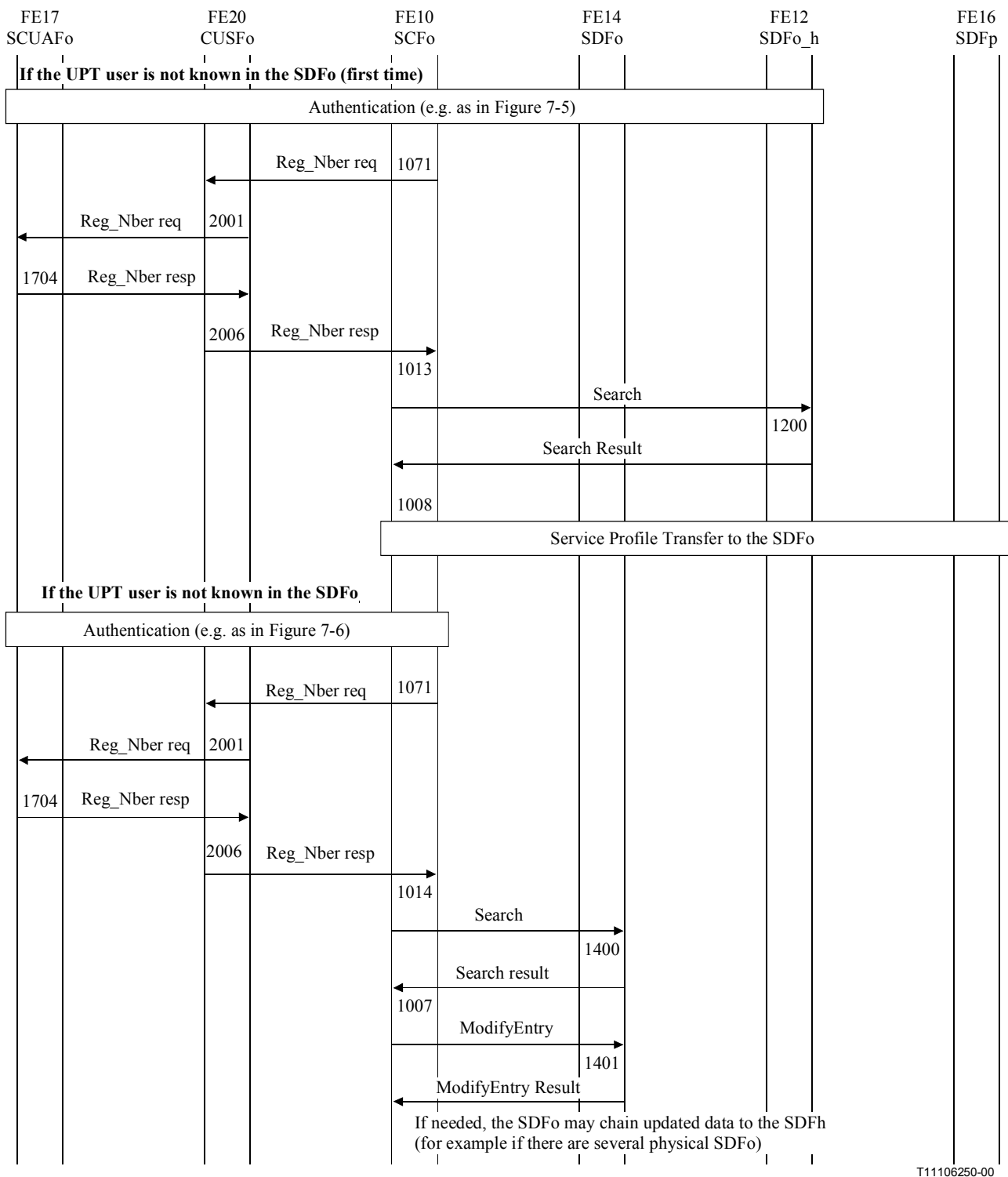
7.2.2.2 Call unrelated procedure (only for DSS1 accesses), with service profile transfer

We describe a way to perform registration without call establishing, i.e. without the need of a call between CCAF/SCUAfo and CCF/SSF/CUSFo. The description is based on "Functional Terminal" procedure.

Service profile transfer may previously happen (e.g. when registering for outgoing UPT call) or during this InCall registration procedure. In this example, it is assumed that InCall registration procedure is performed by call unrelated user interaction.

The service profile in the SDFh is updated with the new location in the visited network: it can be a routing address in the visited network (e.g. the address of the SSF to which the terminal used for registration is attached, when the incoming UPT call is processed with two triggers (as described in 7.3.2); or the terminal address when no trigger is needed on the terminating side for incoming UPT calls) or SDFo address (authentication is processed if not previously done).

If needed, the SDFo is updated with the terminal number used for location registration when this terminal address was not previously stored and service profile not available in the visited network. See Figure 7-8.



T11106250-00

Figure 7-8/Q.1542 – UPT InCall Registration – Call unrelated

Feature Entity Actions

Functional Entity – FE10 (SCFo)

FEA: 1007

- upon receipt of the Search Result from SDFo, update the SDFo with the terminal address(es) provided by the UPT user.

FEA: 1008

- upon receipt of the Search Result from SDFo_h, start the service profile transfer procedure.

FEA: 1013

- upon receipt of the UPT user, formulate and send Search req. ind. to SDFo_h to verify in the service profile the UPT user's permission to register on the specified network access.

FEA: 1014

- upon receipt of the UPT user, formulate and send Search req. ind. to SDFo to verify in the service profile the UPT user's permission to register on the specified network access.

FEA: 1071

- send a request to know if the UPT user wants to register on additional terminal (for multiple terminal registration feature only).

Functional Entity – FE12 (SDFo_h)

FEA: 1200

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

Functional Entity – FE14 (SDFo)

FEA: 1400

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

FEA: 1401

- receive and react to ModifyEntry req. from SCFo;
- SDFo is updated.

Functional Entity – FE17 (SCUAFo)

FEA: 1704

- on receipt of the request from the network (here for additional terminal address), send this request to the user;
- on receipt of the user's response, send the information to the network.

Functional Entity – FE20 (CUSFo)

FEA: 2001

- on receipt of the request of the SCFo for multiple terminal registration feature, send the request to the SCUAFo.

FEA: 2006

- on receipt of the user's response, send the data to the SCFo.

7.2.3 Registration for outgoing UPT calls (call related description)

The processing of outgoing UPT call registration is very similar to the incoming UPT call registration one. The main differences depend on the way the calling UPT user will access the UPT service when doing an outgoing UPT call from a line where the user registered.

The three possible solutions for outgoing UPT calls by a UPT user from a line where the user registered are recalled below:

- a) the line at which the user is registered is temporarily marked: detection is automatic;
- b) the UPT user dials a specific access code to indicate the outgoing UPT call request given previous completion of outgoing UPT call registration procedure;
- c) the UPT user dials the UPT access code (UPTAC) and the network understands that the outgoing UPT call procedure is being activated given the previous completion of outgoing UPT call registration.

These three solutions are from the visited network responsibilities.

In addition, two network scenarios might be considered for registration:

- 1) the line at which the user is registered is connected to the UPT serving node/exchange;
- 2) the line at which the user is registered and connected to is not an IN node or is an IN node with no UPT service facility.

See Table 2.

Table 2/Q.1542

| | Scenario 1 | Scenario 2 |
|-----------------------------------|---|---|
| a) Line temporarily marked | <ul style="list-style-type: none"> – Off line network procedures to mark the line (temporary UPT Registration Active). – Use of the CS-2 Origination_Attempt DP. – DP temporary arming/disarming may be either done by: <ul style="list-style-type: none"> • SCF with CS-2 operation Manage Trigger Data. • SMF using the existing administrative procedures for static DP arming (pseudo real-time). Not standardized. | Not supported by CS-2 because the SSF is not in the LE here. |
| b) Specific access code | <ul style="list-style-type: none"> – the IN node handles the request as a part of the UPT service (no impact on the BCSM). – definition of a new access code. | <ul style="list-style-type: none"> – no other impact on the local exchange than a conventional routing issue. – the IN node handles the request as a part of the UPT service (no impact on the BCSM). – definition of a new access code. |
| c) UPTAC | <ul style="list-style-type: none"> – as in 1) b). – CLI must be available in SDFo. | <ul style="list-style-type: none"> – as in 1) b). – CLI must be available in SDFo. |

Only scenario a) is described further in this Recommendation, because it is the most friendly scenario for the user.

Information flows (UPT user not yet registered in the local SDFo)

For registration of incoming UPT calls, it is possible to have call related and call unrelated procedures. Only the call related one is described hereafter, the call unrelated one is similar to the call unrelated Incall registration described in 7.2.2.2.

Prerequisite sequences:

- Access, identification and authentication;
- Feature request identification.

The organization of the registration sequence is given in the block diagram in Figure 7-9.

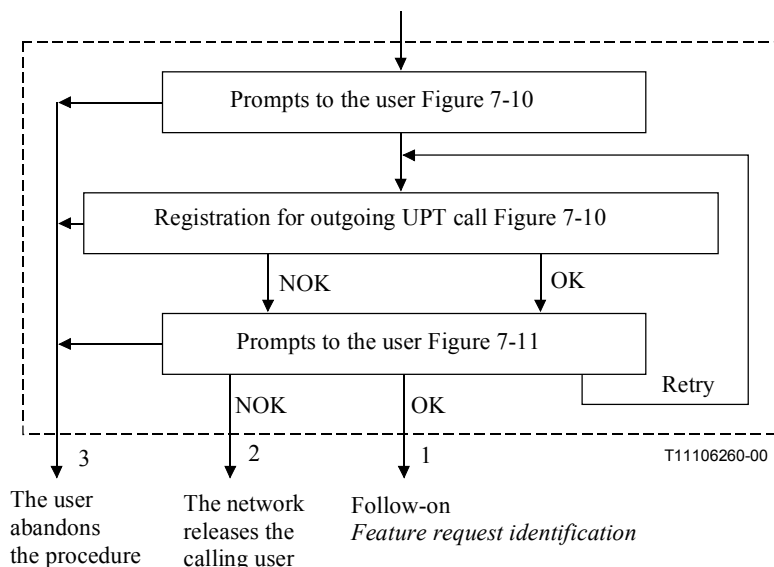


Figure 7-9/Q.1542 – Registration for outgoing UPT calls

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

See Figure 7-10.

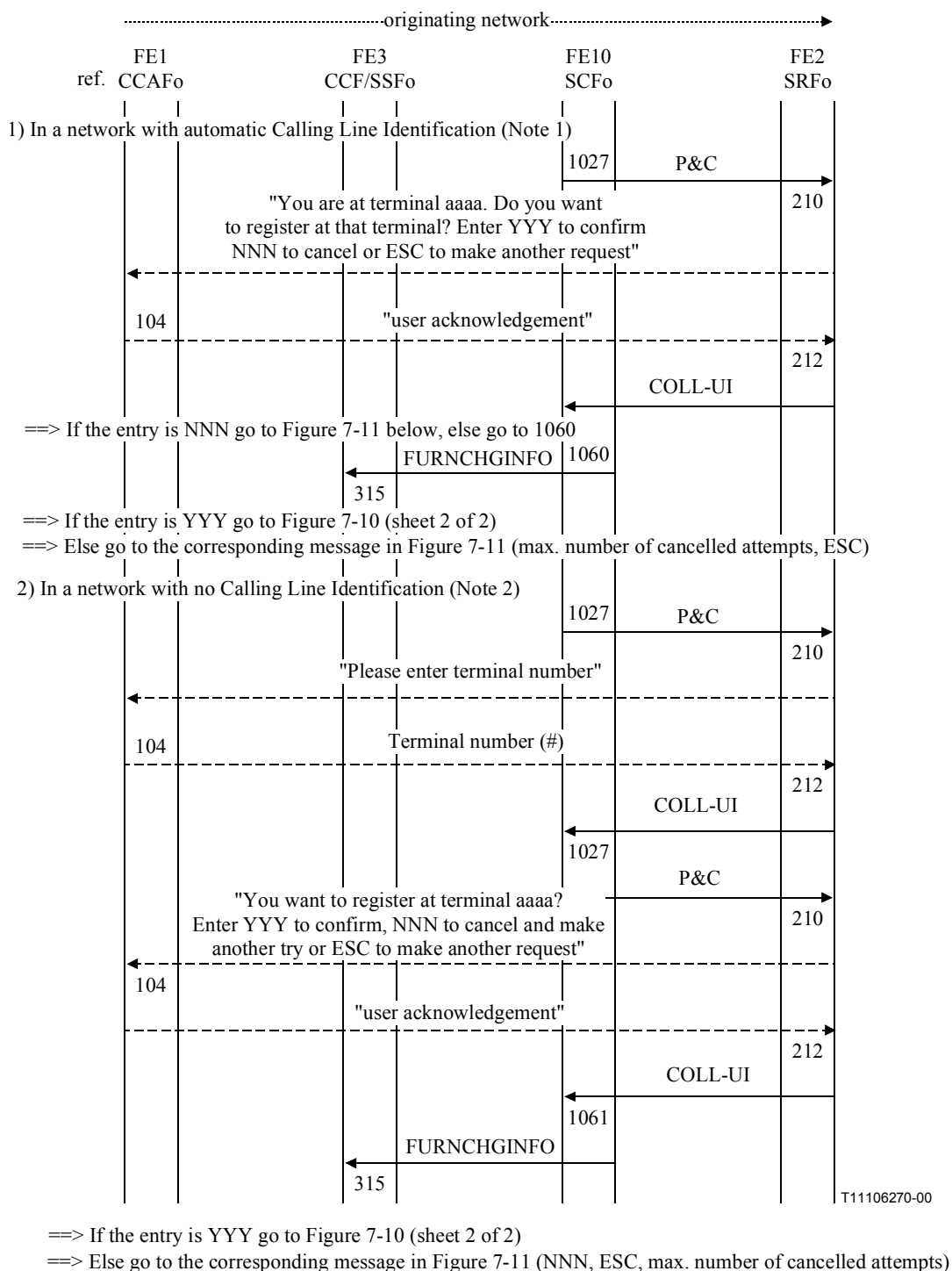


Figure 7-10/Q.1542 – Prompts and registration for outgoing UPT calls (sheet 1 of 2)

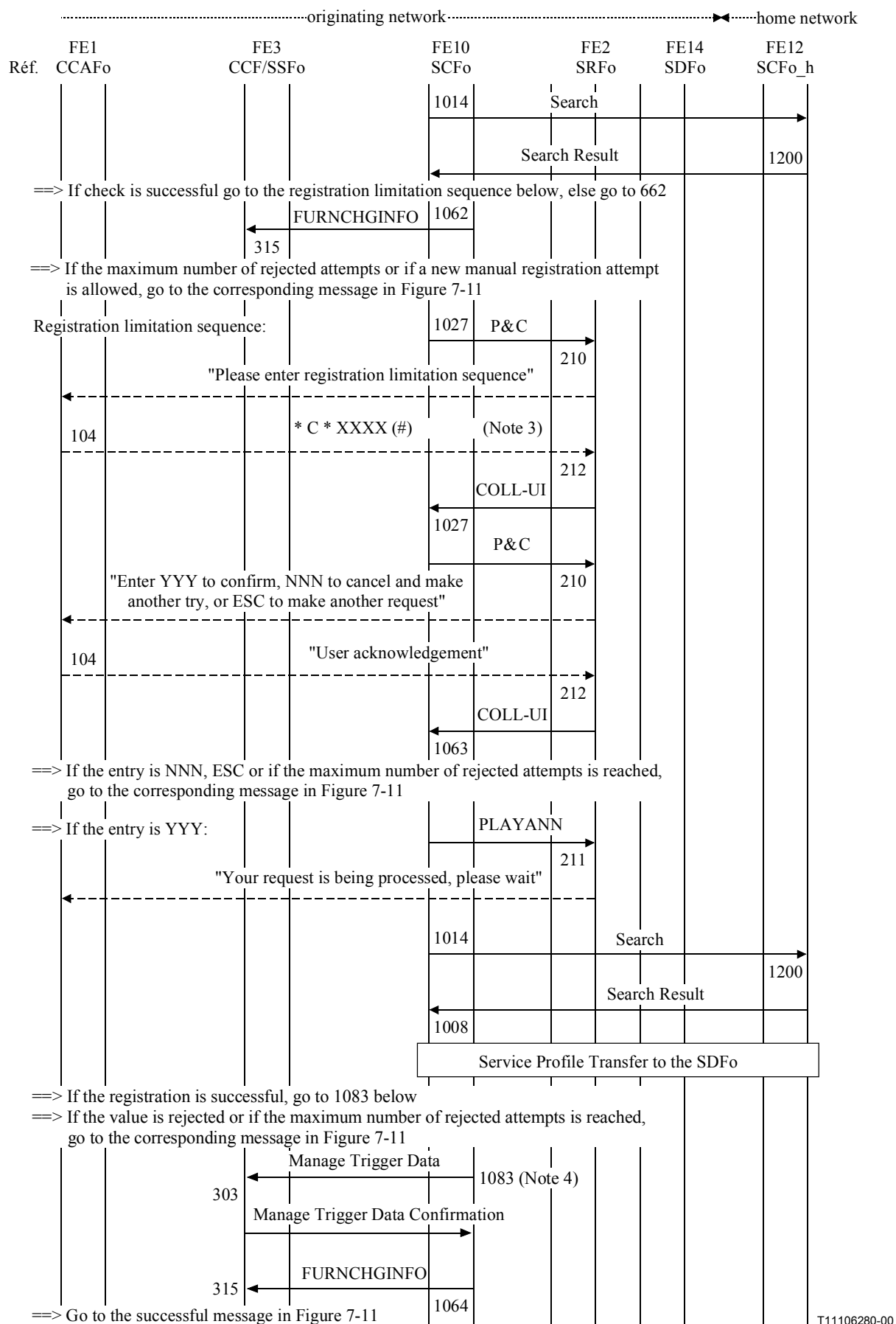


Figure 7-10/Q.1542 – Prompts and registration for outgoing UPT calls (sheet 2 of 2)

Notes to Figure 7-10

NOTE 1 – 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.

NOTE 2 – The user is prompted to enter 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.

NOTE 3 – 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.

NOTE 4 – The SCF requests the SSF/CCF to change the value of activation/deactivation control field to active value (see ITU-T Q.1224 [3]). It sends the callID, the Trigger Data Identifier.

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 104

- on receipt of the request from the SR Fo, send this request to the user;
- on receipt of the user's response, send the information to the SR Fo.

Functional Entity – FE2 (SR Fo)

FEA: 210

- receive and react to Prompt and Collect User Information req. ind. from SC Fo;
- play announcement requested by SC Fo.

FEA: 211

- receive and react to Play Announcement req. ind. from SC Fo;
- play announcement requested by SC Fo;
- at end of announcement, send SR Report resp. conf. to SC Fo.

FEA: 212

- collect information from the user;
- on successful receipt of information, or on error condition, formulate and send Collected User Information resp. conf. to SC Fo.

Functional Entity – FE3 (CCF/SSFo)

FEA: 303

- upon receipt of the SC Fo request, change to active the value of the activation control field and sends the confirmation back.

FEA: 315

- receive Furnish Charging Information req. ind. from SCF;
- initiate off-line charging according to specified rules (this is an example only. Other charging methods can be used).

Functional Entity – FE10 (SC Fo)

FEA: 1008

- upon receipt of the Search Result from SDFo_h, start the service profile transfer procedure.

FEA: 1014

- upon receipt of the UPT user, formulate and send Search req. ind. to SDFo to verify in the service profile the UPT user's permission to register on the specified network access.

FEA: 1027

- formulate and send Prompt and Collect User Information req. ind. to prompt user to input codes for acknowledgement of input values (correct data) or cancel (incorrect data).

FEA: 1060

- on receipt of collected user information from the SRF, react according to the user answer:
 - if the answer is Yes or Esc, send FurnishCharging Information req. to the SSFo and pursue the process: registration or deregistration on the current terminal or another user request;
 - if the answer is No, ask the SRF to send a message to the UPT user in order to know the requested terminal for registration/deregistration.

FEA: 1061

- on receipt of collected user information from the SRF, react according to the user answer:
 - if the answer is Yes or Esc, send FurnishCharging Information req. to the SSFo and pursue the process: registration or deregistration on the current terminal or another user request;
 - if the answer is No, ask to the SRF to send a message to the UPT user in order to indicate that the request is cancelled.

FEA: 1062

- react on receipt of the result for restrictions applying to the requested terminal number. If no restriction applies, request a limitation sequence from the user through the SRF; if a restriction applies, the procedure is stopped or another attempt is allowed (if the maximum number of rejected attempts is not reached).

FEA: 1063

- on receipt of user information on user's confirmation on limitation sequence, process location registration (data updating if the user confirmed), or cancel the user request (if the answer is not confirmed).

FEA: 1064

- after confirmation of the trigger data activation confirmation from the SSFo, send FurnishCharging Information req. to the SSFo.

FEA: 1083

- react to service profile updating and transfer;
- if successful, order SSFo to activate Trigger Data. Else, ask to SRFo to Play Announcement to the user in order to stop the procedure and propose a new attempt.

Functional Entity – FE12 (SDFo_h)**FEA: 1200**

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

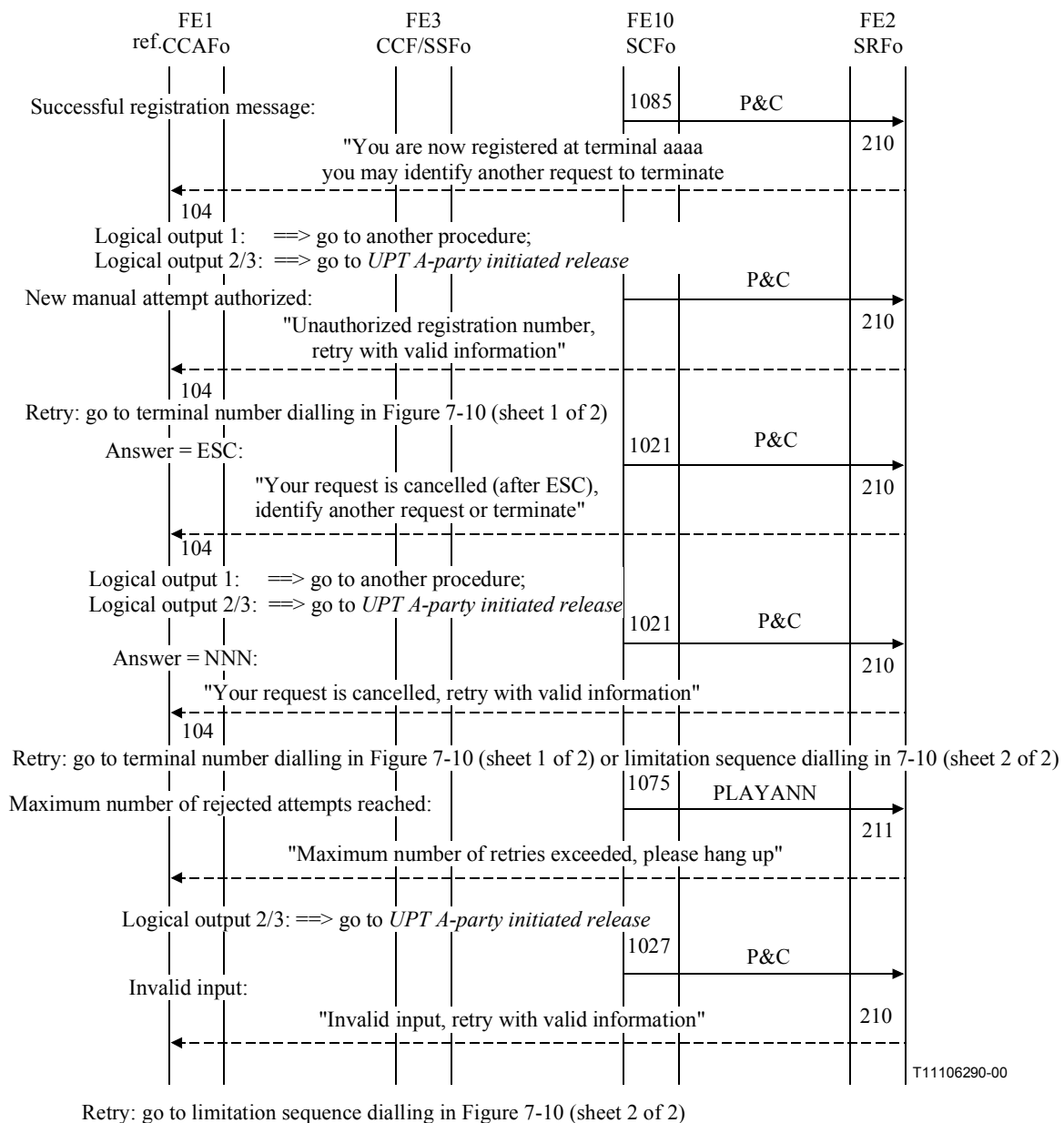


Figure 7-11/Q.1542 – Prompts to the user

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 104

- on receipt of the request from the SR Fo, send this request to the user;
- on receipt of the user's response, send the information to the SR Fo.

Functional Entity – FE2 (SR Fo)

FEA: 210

- receive and react to Prompt and Collect User Information req. ind. from SC Fo;
- play announcement requested by SC Fo.

FEA: 211

- receive and react to Play Announcement req. ind. from SC Fo;

- play announcement requested by SCFo;
- at end of announcement, send SR Report resp. conf. to SCFo.

Functional Entity – FE10 (SCFo)

FEA: 1021

- formulate and send Prompt and Collect User Information to instruct SRF to prompt the UPT user for authentication information.

FEA: 1027

- formulate and send Prompt and Collect User Information req. ind. to prompt user to input codes for acknowledgement of input values (correct data) or cancel (incorrect data).

FEA: 1075

- formulate and send Play Announcement req. ind. to SRF to play "failure" announcement with request to UPT user to hang up;
- advice of end of announcement required.

FEA: 1085

- formulate and send Prompt and Collect User Information req. ind. to SRF to play "success" announcement and prompt UPT user to input new request or terminate call.

7.2.4 Deregistration for incoming UPT calls

See 7.2.2/Q.1541 [7]. As for registration for incoming UPT calls, a similar call unrelated description could be adapted.

7.2.5 Deregistration for outgoing UPT calls (call related description)

We describe hereafter a call related procedure description, taking into account the impact of scenario a), identified in 7.2.3. However, as for registration for incoming UPT calls, a similar call unrelated description could be adapted.

Prerequisite sequences:

- access, identification and authentication;
- feature request identification.

The organization of the deregistration sequence is given in Figure 7-12.

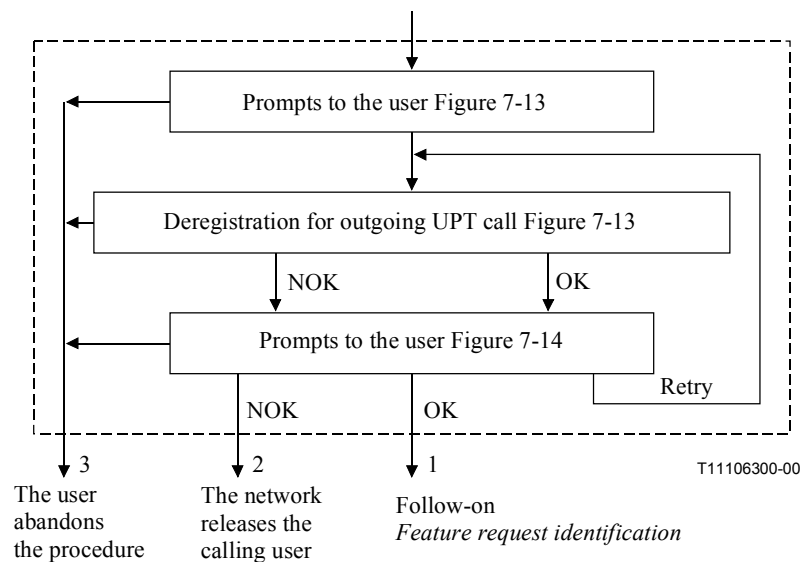


Figure 7-12/Q.1542 – Deregistration for outgoing UPT calls

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).

See Figure 7-13.

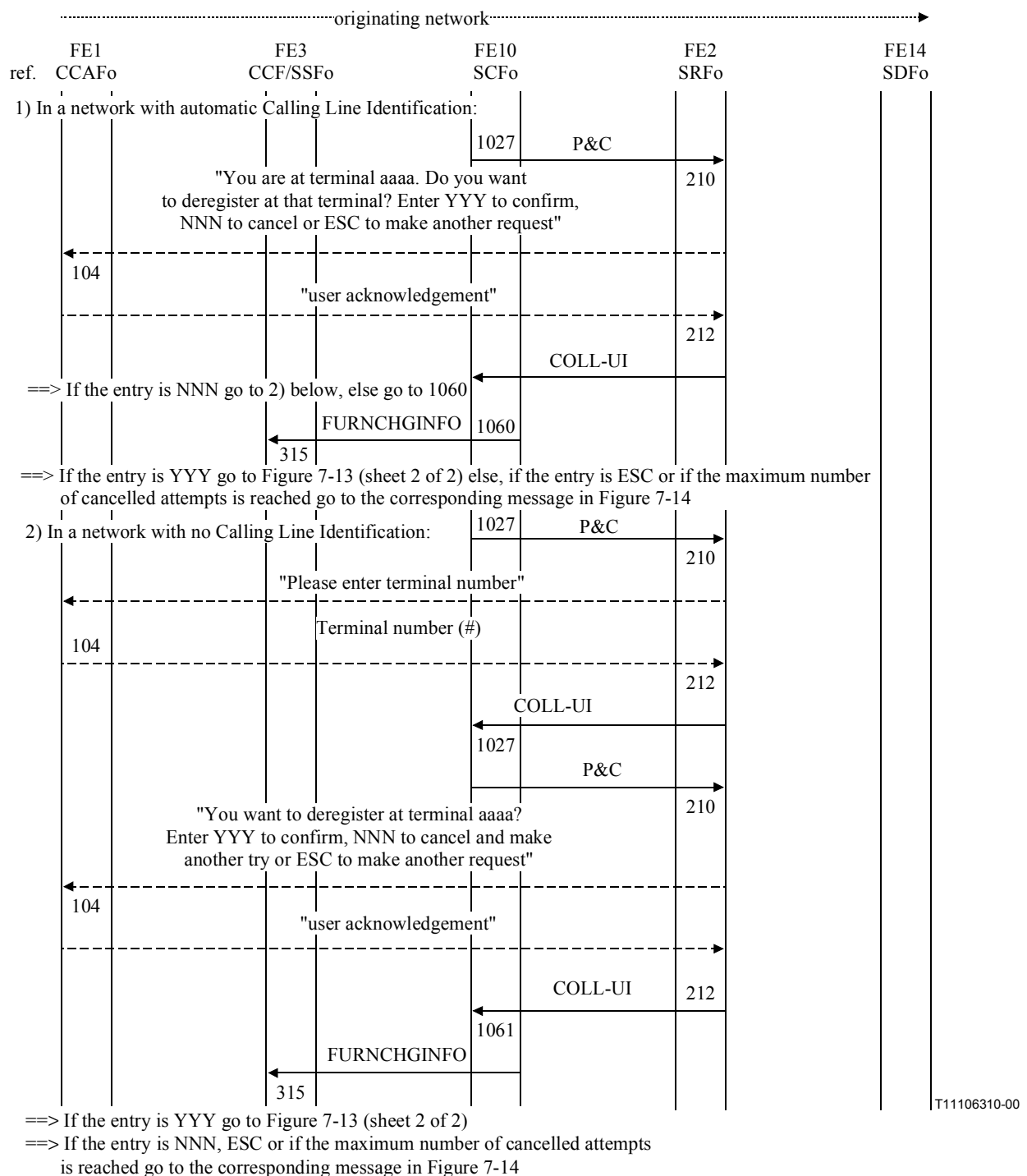
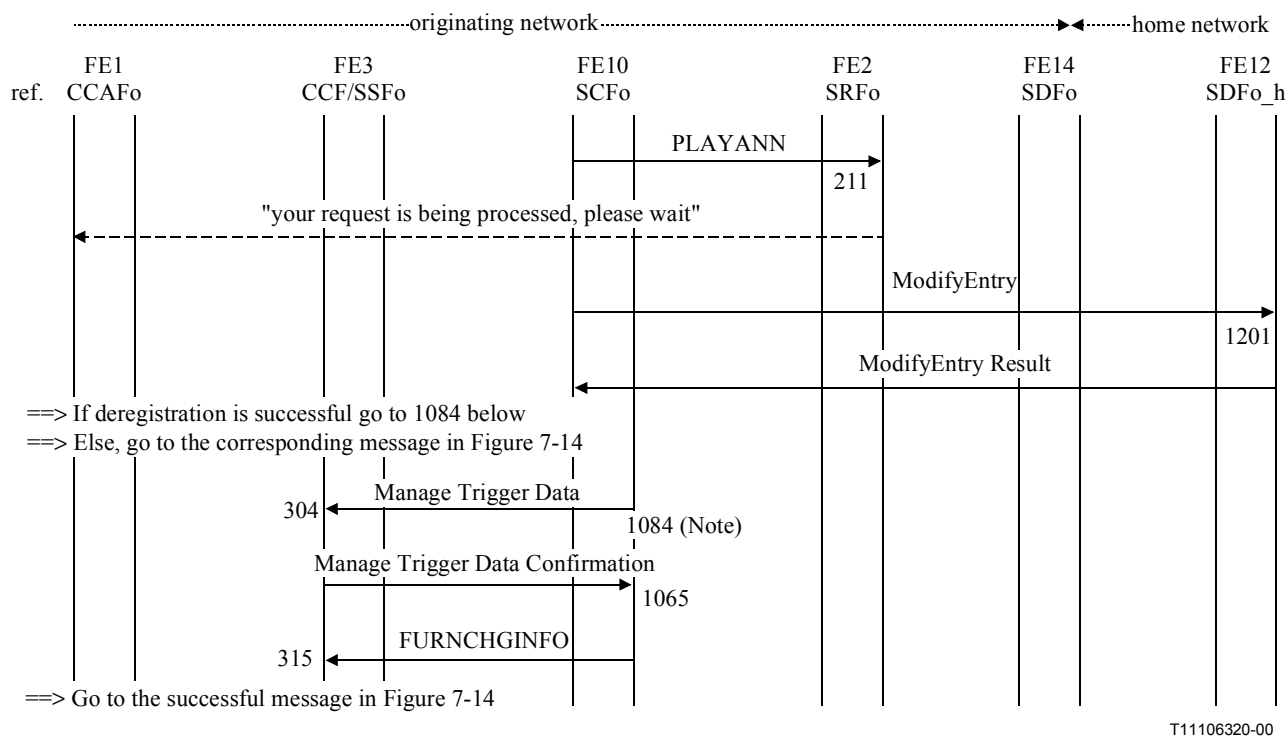


Figure 7-13/Q.1542 – Prompts and deregistration for outgoing UPT calls (sheet 1 of 2)



NOTE – The SCF requests the SSF/CCF to change the value of activation/deactivation control field to deactivate value. If the trigger data has the Registrator Identifier field, the value of this field is set to NULL (see ITU-T Q.1224 [3]).

Figure 7-13/Q.1542 – Prompts and deregistration for outgoing UPT calls (sheet 2 of 2)

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 104

- on receipt of the request from the SRFo, send this request to the user;
- on receipt of the user's response, send the information to the SRFo.

Functional Entity – FE2 (SRFo)

FEA: 210

- receive and react to Prompt and Collect User Information req. ind. from SCFo;
- play announcement requested by SCFo.

FEA: 211

- receive and react to Play Announcement req. ind. from SCFo;
- play announcement requested by SCFo;
- at end of announcement, send SR Report resp. conf. to SCFo.

FEA: 212

- collect information from the user;
- on successful receipt of information, or on error condition, formulate and send Collected User Information resp. conf. to SCFo.

Functional Entity – FE3 (CCF/SSFo)

FEA: 304

- upon receipt of the SCFo request, change to inactive the value of the activation control field and send the confirmation back.

FEA: 315

- receive Furnish Charging Information req. ind. from SCF;
- initiate off-line charging according to specified rules (this is an example only. Other charging methods can be used).

Functional Entity – FE10 (SCFo)

FEA: 1027

- formulate and send Prompt and Collect User Information req. ind. to prompt user to input codes for acknowledgement of input values (correct data) or cancel (incorrect data).

FEA: 1060

- on receipt of collected user information from the SRF, react according to the user answer:
 - if the answer is Yes or Esc, send FurnishCharging Information req. to the SSFo and pursue the process: registration or deregistration on the current terminal or another user request;
 - if the answer is No, ask the SRF to send a message to the UPT user in order to know the requested terminal for registration/deregistration.

FEA: 1061

- on receipt of collected user information from the SRF, react according to the user answer:
 - if the answer is Yes or Esc, send FurnishCharging Information req. to the SSFo and pursue the process: registration or deregistration on the current terminal or another user request;
 - if the answer is No, ask the SRF to send a message to the UPT user in order to indicate that the request is cancelled.

FEA: 1065

- after confirmation of the trigger data deactivation confirmation from the SSFo, send FurnishCharging Information req. to the SSFo.

FEA: 1084

- react to ModifyEntry Result from SDFo_h for user deregistration;
- if successful, order SSFo to deactivate Trigger Data. Else, ask SRFo to Play Announcement to the user in order to stop the procedure and propose a new attempt.

Functional Entity – FE12 (SDFo_h)

FEA: 1201

- receive and react to ModifyEntry req. from SCFo;
- SDFo_h is updated;
- formulate and send ModifyEntry Result resp conf to SCFo.

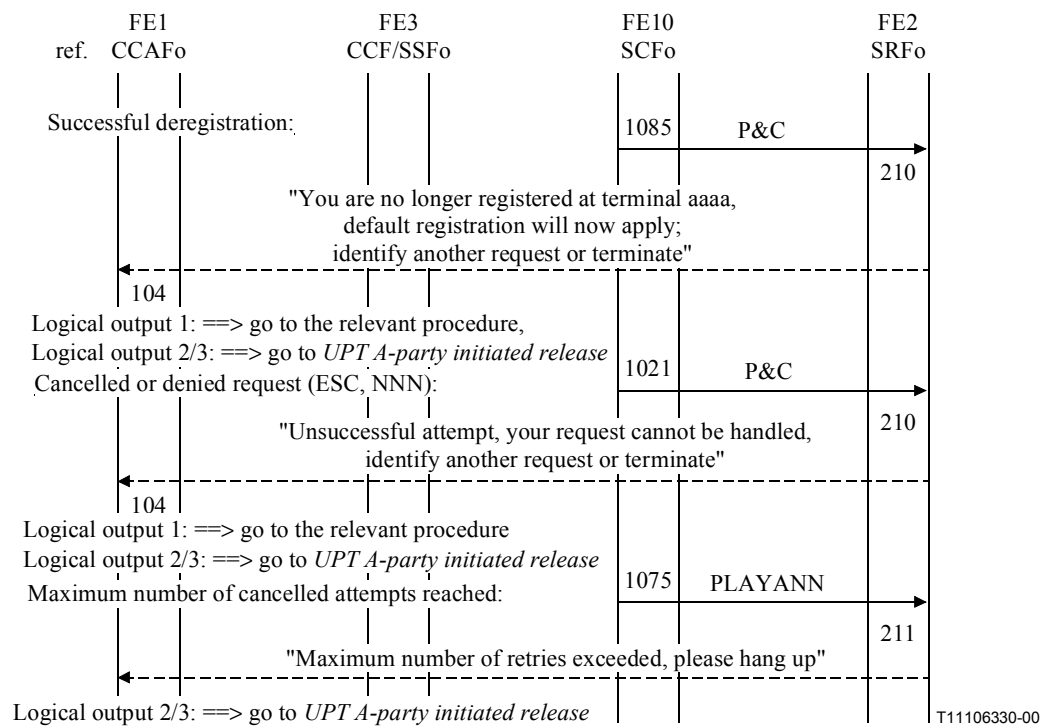


Figure 7-14/Q.1542 – Prompts to the user

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 104

- on receipt of the request from the SRFo, send this request to the user;
- on receipt of the user's response, send the information to the SRFo.

Functional Entity – FE2 (SRFo)

FEA: 210

- receive and react to Prompt and Collect User Information req. ind. from SCFo;
- play announcement requested by SCFo.

FEA: 211

- receive and react to Play Announcement req. ind. from SCFo;
- play announcement requested by SCFo;
- at end of announcement, send SR Report resp. conf. to SCFo.

Functional Entity – FE10 (SCFo)

FEA: 1021

- formulate and send Prompt and Collect User Information to instruct SRF to prompt the UPT user for authentication information.

FEA: 1075

- formulate and send Play Announcement req. ind. to SRF to play "failure" announcement with request to UPT user to hang up;
- advice of end of announcement required.

FEA: 1085

- formulate and send Prompt and Collect User Information req. ind. to SRF to play "success" announcement and prompt UPT user to input new request or terminate call.

7.2.6 Remote registration for incoming UPT calls (call related description)

The procedure is initiated from the so-called originating network.

Prerequisite sequences:

- access, identification and authentication;
- feature request identification.

For this procedure, the description is the same as for registration for incoming UPT calls with the following differences:

- the service profile is transferred to the future visited network (in the SDFf) and not in the originating network (however future visited and originating could be the same);
- the registered terminal is not the one used by the UPT user for registering.

7.2.7 Remote registration for outgoing UPT calls

The procedure is initiated from the so-called originating network. *The procedure is possible only inside the same network (the one to which the SCFo belongs) in IN CS-2.* Indeed, the SCF that arms the DP is the controlling SCF, i.e. the terminal where the UPT user wants to remotely register must be in the same network as the one from where he is running the procedure.

For this procedure, the description is the same as for registration for outgoing UPT calls with the following differences:

- the service profile is transferred to the future visited network (in the SDFf) that is the originating network as explained above;
- the registered terminal is not the one used by the UPT user for registering.

NOTE – With remote registration for outgoing UPT calls, between the registration procedure and the time when the UPT user reaches the terminal to be used, the risk exists that a third party uses this terminal. Then, the calls processed by this third party would be charged on the UPT user account.

Secure procedures are left to the operators' choices. One could for example use delayed activation for registration.

7.3 UPT call handling procedures

7.3.1 Incoming UPT call (based on one trigger)

This kind of procedure is not considered in this Recommendation. See 7.3.2/Q.1541 [7].

7.3.2 Incoming UPT call (based on two triggers)

7.3.2.1 Outline description

See Figure 7-15.

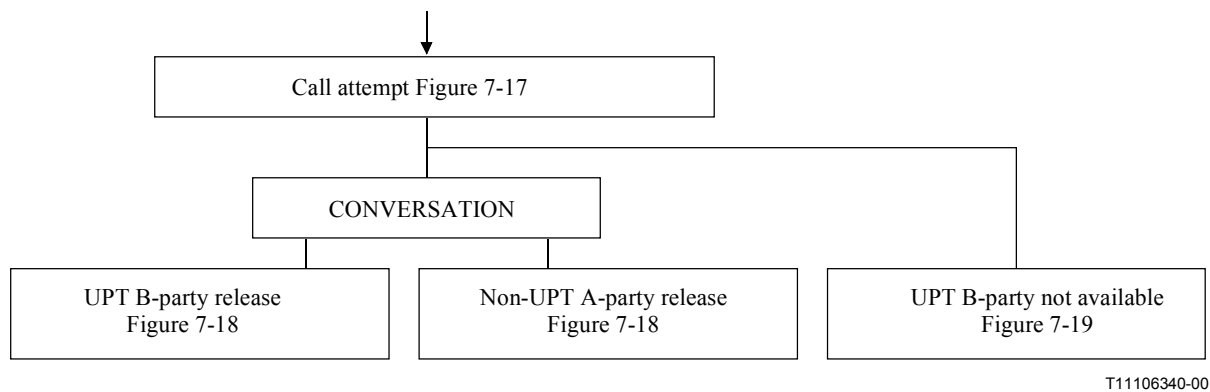


Figure 7-15/Q.1542 – Incoming UPT call

7.3.2.2 If single terminal registration previously occurred

When considering the way operators/networks are involved in an incoming UPT call, the most concerned by authentication and service profile check is the terminating network since the user is roaming in the terminating network. Consequently, a possible high level view is described below:

- SCFo is first triggered on the originating side (SSFo) in order to get a routing address; then it can release its dialogue or not. Indeed, some services could be provided as part of call origination based on the service profile accessed by SCFo, e.g. as Call Forwarding Unconditional;
- when the call arrives on the terminating side, the SCFt is triggered on the terminating side (SSFt) in order to check the service profile and be ready to offer "terminating" services if needed (Hold, Call Waiting, etc.). The SCFt does not release the dialogue.

Figure 7-16 presents a general description of the incoming UPT call:

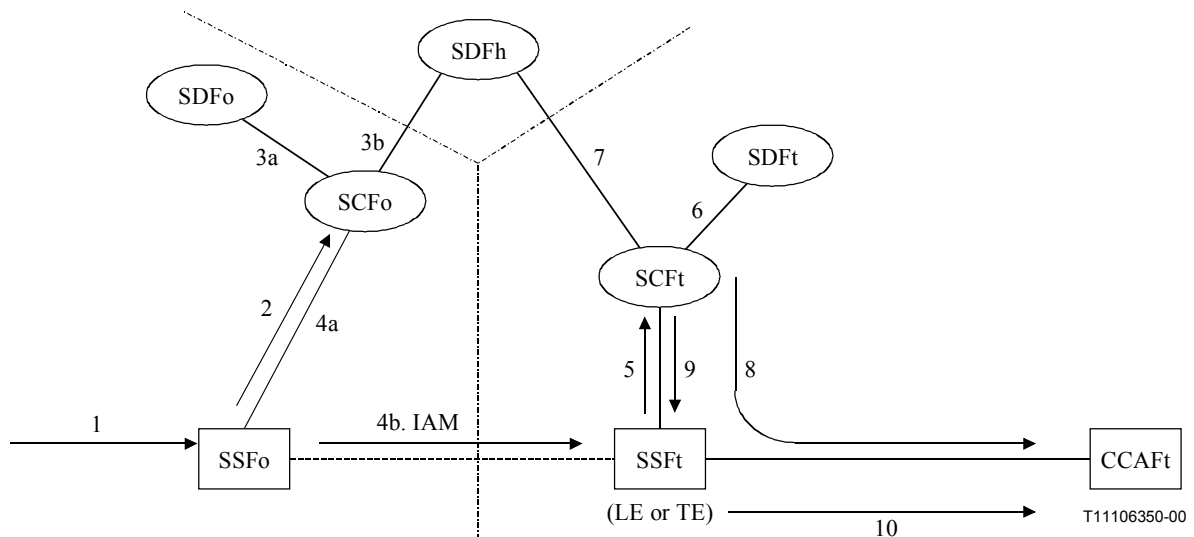


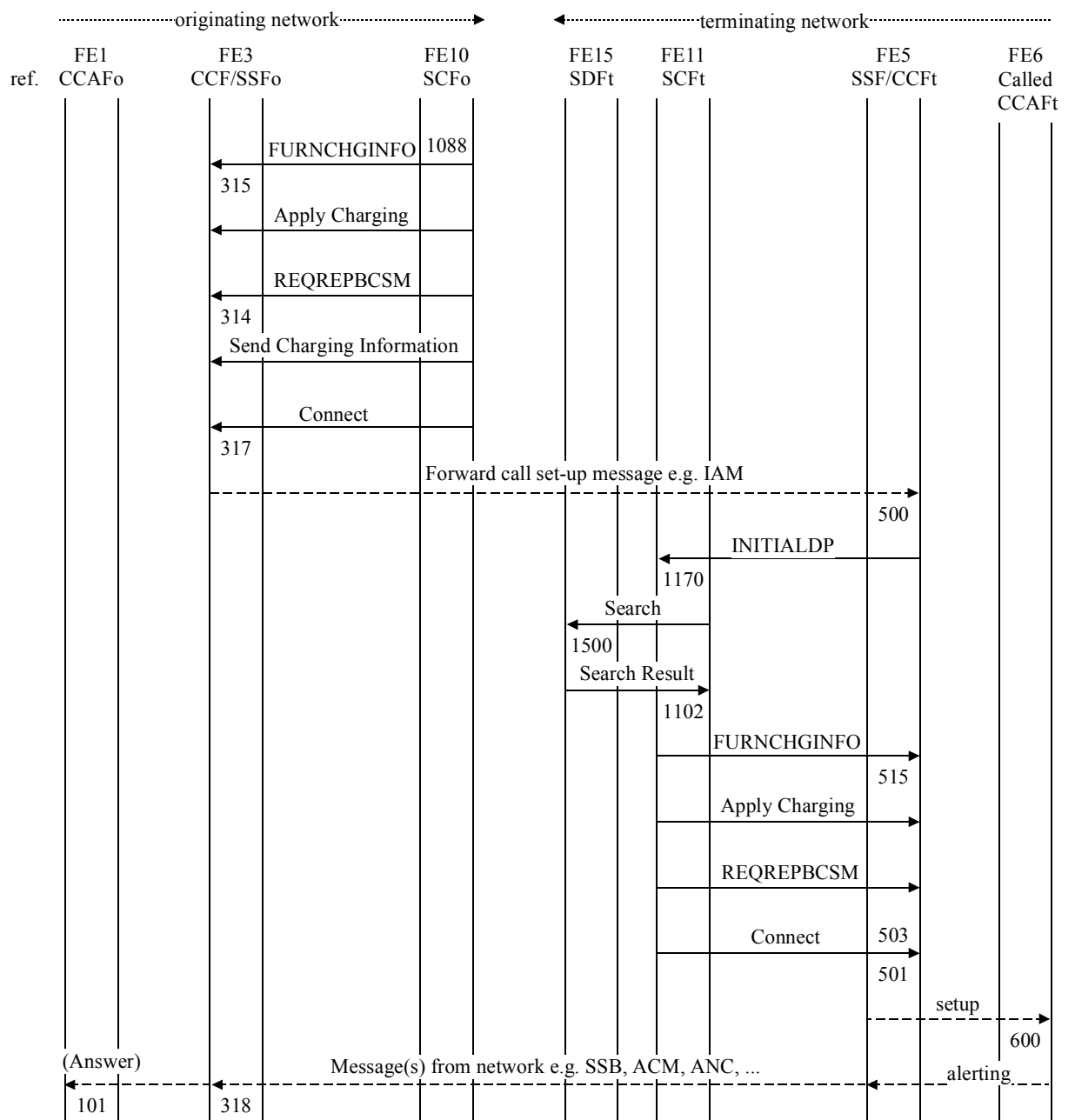
Figure 7-16/Q.1542 – General description of incoming UPT call with two triggers

The numbers correspond to:

- 1) setup to the SSFo;
- 2) the SSFo triggers the SCFo based on the called party number, the UPTN;

- 3) after having checked the agreements in the SDFo, the SCFo retrieves some routing information from the SDFh in the home network;
- 4) with this information, the call is routed to the terminating network and the SSFt;
- 5) the SSFt triggers the SCFt;
- 6) as an optional step, the SCFt retrieves some precise information on the location of the called UPT user. This depends on the terminating network operator and the data stored in the SDFh at registration;
- 7) the SCFt checks the service profile in the SDFt if the service profile was copied at registration, or in the SDFh. This could be done again later as well, for example only if authentication (secure answering) is performed or because of a new event (e.g. Call Waiting);
- 8) if secure answering has to be performed (from the terminating side), the SCFt performs the procedure through call related (or unrelated entities, under study);
- 9) the SCFt orders the SSFt to route the call towards the precise location;
- 10) the call is routed.

Releasing the connection from the SCFo may cause some non-optimization in call routing, in the case of Call Forwarding for example. See Figure 7-17.



==> On busy, congestion or no answer go to Figure 7-19, depending where the feature has to be processed (originating or terminating side)

==> When call set-up is successful:

CONVERSATION

The calling user hangs up first: go to 102 in Figure 7-18 (sheet 2 of 2)

The called user hangs up first: go to 612 in Figure 7-18 (sheet 1 of 2)

T11106370-00

Figure 7-17/Q.1542 – Incoming UPT call with two triggers – call attempt (sheet 2 of 2)

Note on Incoming UPT call

The impact of this alternative description on Incall registration is that the visited SDF is updated with the terminal address used for registration, and the SDFh is updated with a routing address provided by the visited network (e.g. visited SSF or CUSF address).

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 100

- pass UPT call SETUP request to CCF/SSF.

FEA: 101

- the calling party is advised of the answer of the UPT called party.

Functional Entity – FE2 (SR Fo)

FEA: 200

- receive and react to SETUP req. ind. from SSF/CCF;
- on successful establishment of connection:
 - formulate and send SETUP resp. conf. to SSF/CCF;
 - formulate and send Assist Request Instructions to SCF to indicate that ready to send messages.

FEA: 201

- receive and react to RELEASE req. ind. from SSF/CCFo;
- disconnect resources;
- formulate and send RELEASE resp. conf. to SSF/CCFo.

FEA: 211

- receive and react to Play Announcement req. ind. from SCFo;
- play announcement requested by SCFo;
- at end of announcement, send SR Report resp. conf. to SCFo.

Functional Entity – FE3 (CCF/SSFo)

FEA: 300

- receive SETUP req. ind. with UPTN;
- on detection of armed TDP-R, formulate and send Initial DP req. ind. to SCFo;
- send Analysed_Info req. ind. or Initial DP req. ind. to SCFo;
- suspend call processing and wait instruction(s) from SCFo.

FEA: 311

- receive and react to Establish Temporary Connection req. ind. from SCFo;
- formulate and send SETUP req. ind. to SRFo to establish a connection to it.

FEA: 312

- receive and react to Disconnect Forward Connection req. ind. from SCFo;
- formulate and send RELEASE req. ind. to SRFo.

FEA: 314

- receive Request Report BCSM Event req. ind. from SCF;
- arm Detection Points as EDP-R or EDP-N to report route select failure (DP 4), B busy (DP 5), B no answer timeout (DP 6) or user disconnect (DP 9);
if follow-on call is allowed, the DPs will be armed as EDP-R, else as EDP-N.

FEA: 315

- receive Furnish Charging Information req. ind. from SCF;
- initiate off-line charging according to specified rules. (This is an example only, other charging methods can be used.)

FEA: 317

- receive RequestReportBCSM from SCFo to suspend call processing at given detection points;
- receive charging related message from SCFo: FurnishChargingInformation to create a new call record, SendChargingInformation if metering pulses are to be sent;
- receive ApplyCharging from SCFo, in order to send charging report back;
- receive Connect req. ind. from SCFo and continue call processing with received routing information;
- restart basic call set-up, using destination routing address supplied by SCFo.

FEA: 318

- receive the answer of the UPT called party;
- indicate the answer of the called party to the CCAFo.

FEA: 350

- receive and react to SETUP resp. conf. from SRFo;
- establish a relationship between the leg between the calling party and the SSF/CCFo, and the leg between the SSF/CCF and the SRFo;
- through-connect calling party to SRFo.

FEA: 352

- receive and react to RELEASE resp. conf. from SRFo. The SRFo is being released in the middle of a procedure and the call is not yet being terminated;
- confirm disconnection, sending disconnect response confirm.

Functional Entity – FE5 (CCF/SSFt)**FEA: 500**

- receive IAM with UPTN and routing address;
- on detection of armed TDP-R, formulate and send Initial DP req. ind. to SCFo;
- suspend call processing and await instruction(s) from SCFo.

FEA: 501

- receive RequestReportBCSM from SCFt to suspend call processing at given detection points;
- receive charging related message from SCFt: FurnishChargingInformation to create a new call record, SendChargingInformation if metering pulses are to be sent;
- receive ApplyCharging from SCFt, in order to send charging report back;
- receive Connect req. ind. from SCFt and continue call processing with received routing information;
- restart basic call set-up, using destination routing address supplied by SCFt.

FEA: 503

- receive REQREPBCSM from SCFt;
- arm DPs as EDP-R to report called party busy or called party no answer.

FEA: 515

- receive Furnish Charging Information req. ind. from SCFt;
- initiate off-line charging according to specified rules (This is an example only, other charging methods can be used.)

Functional Entity – FE6 (CCAFt)**FEA: 600**

- receive the setup request from the CCF/SSFt;
- send the Alerting to the network.

Functional Entity – FE10 (SCFo)**FEA: 1031**

- receive and react to Assist Request Instructions from SRFo req. ind. from SRFo;
- formulate and send Play Announcement req. ind. to SRFo to play announcement of UPT charges. Advice of end of announcement required.

FEA: 1032

- receive and react to SR Report resp. conf. from SRFo;
- formulate and send Disconnect Forward Connection req. ind. to SSF/CCFo to initiate disconnection of SRFo;
- formulate and send Furnish Charging Information req. ind. to SSF/CCFo to establish charge record for the call;
- formulate and send Call Information Request req. ind. to SSF/CCFo to report call event information to SCFo (if required);
- formulate and send Connect req. ind. to SSF/CCFo to restart basic call set-up, using destination routing address supplied.

The charging method shown is an example only. Other charging methods can be used. If split charging is required, two charging records, for A- and B-parties, may be required.

FEA: 1055

- receive and react to Search Result resp. conf. from SDFo on permission to check the agreements with the UPT user's service provider;
- if allowed, formulate and send Search req. ind. to SDFt_h to verify the UPT user's permission to register on the specified network access, and to retrieve the list of destination routing address(es) registered;
- if not allowed (permission denied), the call is released.

FEA: 1070

- check from the SDFo the agreements with the UPT user's service provider. Check also if the UPT user is already registered in the SDFo.

FEA: 1088

- react to the result of the check of the user service profile. If the call is authorized:
 - formulate and send Request Report BCSM Event req. ind. to SSF/CCFo to arm Detection Points for B clear (DP 9), route select failure (DP 4), B busy (DP 5) and B no answer timeout (DP 6). If follow-on is allowed, arm as EDP-R, else as EDP-N. Only the case of EDP-R is considered here;

- formulate and send Furnish Charging Information req. ind. to SSF/CCFo to establish charge record for the call. The charging method shown is an example only. Other charging methods can be used;
- formulate and send Connect req. ind. to SSF/CCFo to restart basic call set-up, using destination routing address supplied.

FEA: 1090

- formulate and send Establish Temporary Connection req. ind. to SSF/CCF to instruct it to connect to SRF to play announcement to calling party.

Functional Entity – FE11 (SCFt)

FEA: 1102

- react to the result of the check of the user service profile. If the call is authorized:
 - formulate and send Request Report BCSM Event req. ind. to SSF/CCFt to arm Detection Points for B clear (DP 9), route select failure (DP 4), B busy (DP 5) and B no answer timeout (DP 6). If follow-on is allowed, arm as EDP-R, else as EDP-N;
 - formulate and send Furnish Charging Information req. ind. to SSF/CCFt to establish charge record for the call. The charging method shown is an example only. Other charging methods can be used;
 - formulate and send Connect req. ind. to SSF/CCFt to restart basic call set-up, using destination routing address.

FEA: 1170

- on reception of an InitialDP from the SSFt, check from the SDFt the agreements with the UPT user's service provider. Check also if the UPT user is already registered in the SDFt and retrieves the list of destination routing address(es) registered;
- if not allowed (permission denied), the call is released.

Functional Entity – FE13 (SDFt_h)

FEA: 1300

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

Functional Entity – FE14 (SDFo)

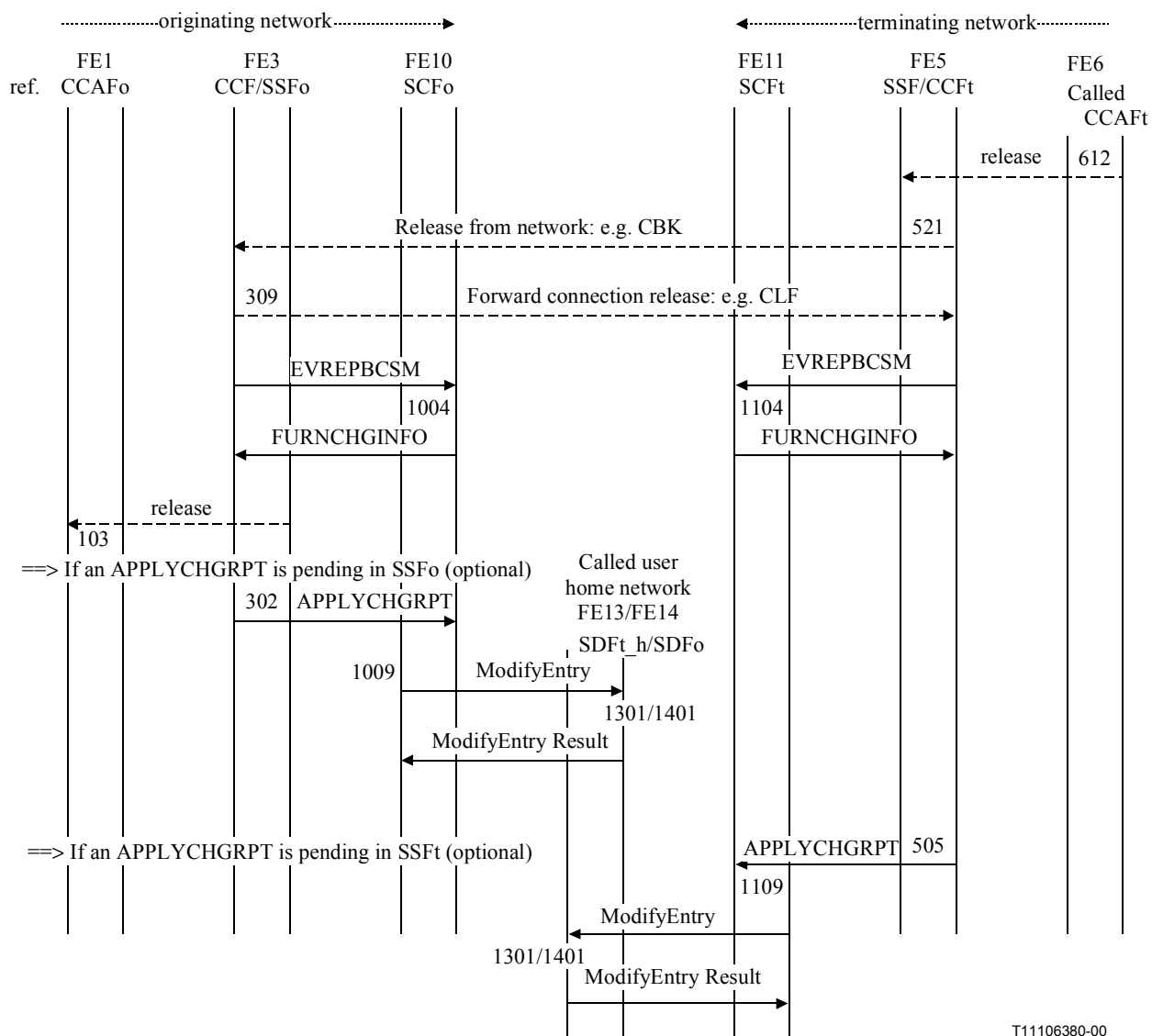
FEA: 1400

- receive and react to Search req. ind. from SCFo;
- extract data requested;
- formulate and send Search Result resp. conf. to SCFo.

Functional Entity – FE15 (SDFt)

FEA: 1500

- receive and react to Search from SCFt on service profile;
- extract data requested;
- formulate and send Search Result to SCFt.



**Figure 7-18/Q.1542 – Incoming UPT call with two triggers –
UPT B-party initiated release (sheet 1 of 2)**

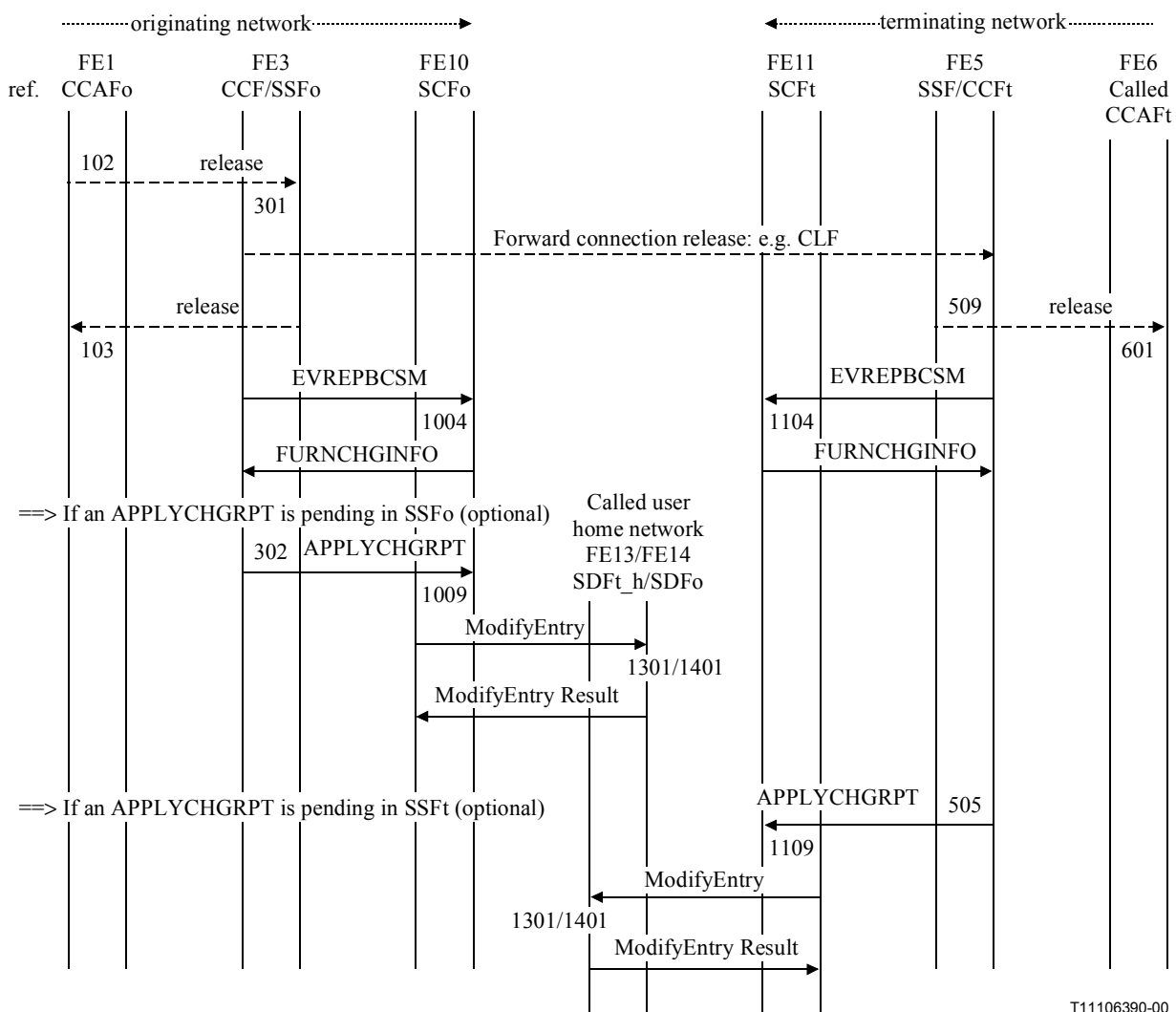


Figure 7-18/Q.1542 – Incoming UPT call with two triggers – non UPT A-party initiated release (sheet 2 of 2)

Feature Entity Actions

Functional Entity – FE1 (CCAFo)

FEA: 102

- the calling party hangs up. The CCAFo releases the call related link to the network.

FEA: 103

- release the call related link on the user side after reception of the release message from the network.

Functional Entity – FE3 (CCF/SSFo)

FEA: 301

- disconnect on the network side;
- stop charging, if applicable;
- formulate and send RELEASE req. ind. to CCAFo to release resources;
- send an EVREPBCSM to the SCFo.

FEA: 302

- the record is returned to the SCFo in an ApplyChargingReport.

Functional Entity – FE5 (CCF/SSFt)**FEA: 505**

- the record is returned to the SCFt in an ApplyChargingReport.

FEA: 509

- receive disconnect on the network side;
- stop charging, if applicable;
- formulate and send Release req. ind. to CCAFt to release resources;
- send an EVREPBCSM to the SCFt.

FEA: 521

- disconnect on the network side;
- stop charging, if applicable;
- formulate and send RELEASE req. ind. to CCAFt to release resources;
- send an EVREPBCSM to the SCFt.

Functional Entity – FE6 (CCAFt)**FEA: 601**

- upon receipt of the release message from the SSF, release the connection on the user side.

FEA: 602

- the called UPT party hangs up. The CCAFt releases the call related link to the network.

Functional Entity – FE10 (SCFo)**FEA: 1004**

- upon receipt of the EVREPBCSM, request from the SSFo charging information.

FEA: 1009

- upon receipt of the ApplyCharging report from the SSF, send charging information to the home SDF of the UPT user.

Functional Entity – FE11 (SCFt)**FEA: 1104**

- upon receipt of the EVREPBCSM, request from the SSFt charging information.

FEA: 1109

- upon receipt of the ApplyCharging report from the SSFt, send charging information to the SDFt_h or SDFo.

Functional Entity – FE13 (SDFt_h)**FEA: 1301**

- receive and react to ModifyEntry req. ind. from SCFo;
- UPT user's home network SDF, SDFt_h, is updated.

Functional Entity – FE14 (SDFo)

FEA: 1401

- receive and react to ModifyEntry req. from SCFo;
- SDFo is updated.

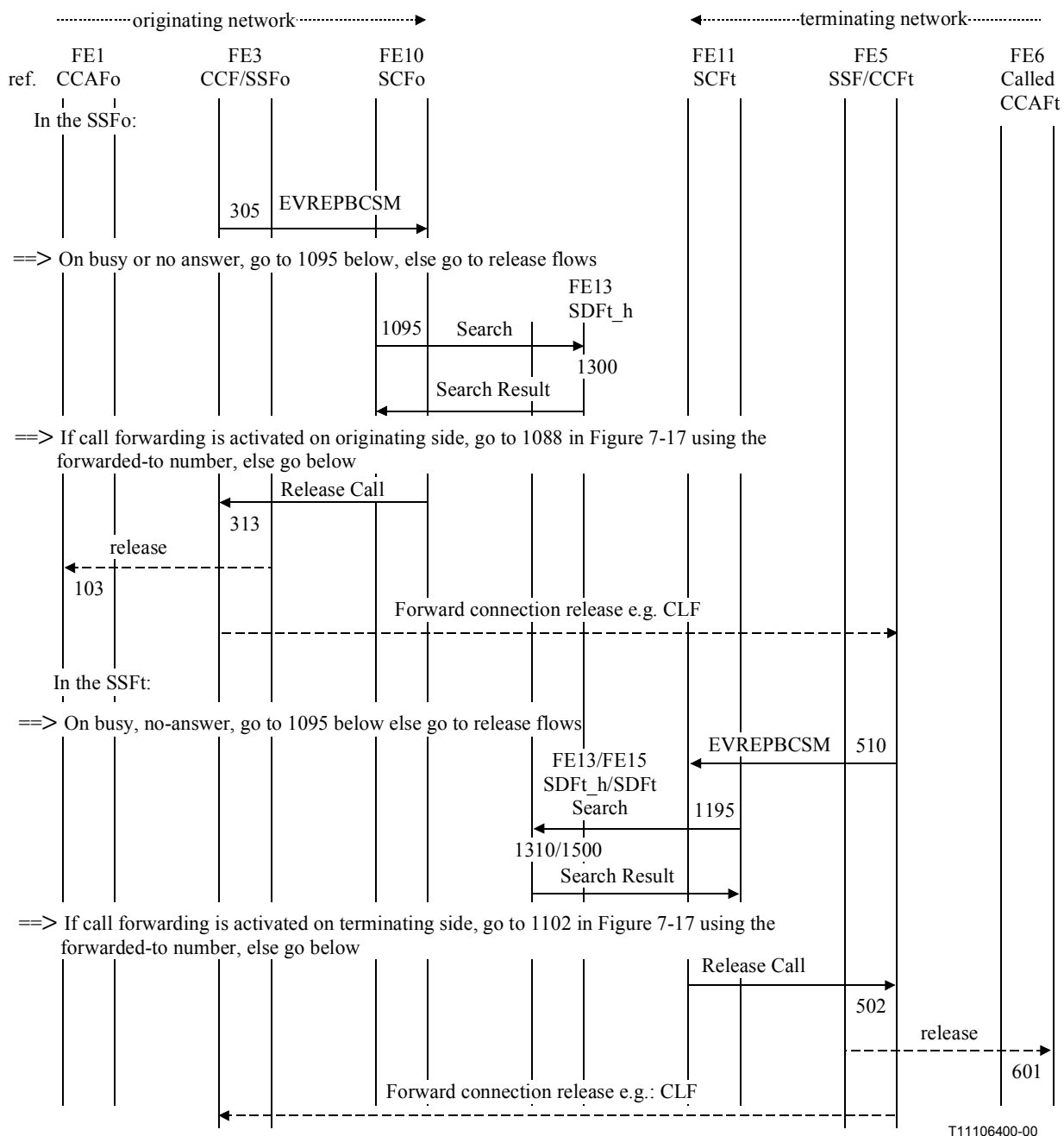


Figure 7-19/Q.1542 – Incoming UPT call with two triggers – UPT B-party not available

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 103

- release the call related link on the user side after reception of the release message from the network.

Functional Entity – FE3 (CCF/SSFo)

FEA: 305

- upon receipt of the status received from access (busy, no answer), send an EVREPBCSM to the SCFo.

FEA: 313

- receive and react to Release Call req. ind. from SCFo;
- continue clearing call as per ITU-T Q.71 [5]. The call is released on the CCAFo and network sides;
- at end of clear down, formulate and send Call Information Report req. ind. to SCFo, if required.

Functional Entity – FE5 (CCF/SSFt)

FEA: 502

- receive and react to Release Call req. ind. from SCFt;
- continue clearing call as per ITU-T Q.71 [5]. The call is released on the CCAFt and network sides;
- at end of clear down, formulate and send Call Information Report req. ind. to SCFt, if required.

FEA: 510

- upon receipt of the status received from access (busy, no answer), send an EVREPBCSM to SCFt.

Functional Entity – FE6 (CCAFt)

FEA: 601

- upon receipt of the release message from the SSF, release the connection on the user side.

Functional Entity – FE10 (SCFo)

FEA: 1095

- upon receipt of an EventReportBCSM from the SSFo, query the SDFt_h (or the SDFo if the service profile was transferred) in order to check that call forwarding is activated and to retrieve the call forwarding address to be used.

Functional Entity – FE11 (SCFt)

FEA: 1195

- upon receipt of an EventReportBCSM from the SSFt, query the SDFt_h (or the SDFt if the service profile was transferred) in order to check that call forwarding is activated and to retrieve the call forwarding address to be used.

Functional Entity – FE13 (SDFt_h)

FEA: 1300

- receive and react to Search from SCFo on service profile;
- extract data requested;
- formulate and send Search Result to SCFo.

FEA: 1310

- receive and react to Search from SCFt on service profile;
- extract data requested;

- formulate and send Search Result to SCFt.

Functional Entity – FE15 (SDFt)

FEA: 1500 = 1310

7.3.2.3 If multiple terminal address registration and sequential alerting

Multiple terminal address registration feature enables an incoming UPT call to be alerted on multiple terminals. In case of sequential alerting, the detection of busy, no reply, or not reachable events (for wireless terminals only) will cause the subsequent alerting.

Information Flows

The procedure starts as for a normal incoming UPT call, as in Figure 7-17 (sheet 2 of 2). The difference is from the IF 501, when setup is sent to the first terminal identified in the terminal address registered list, see Figure 7-20.

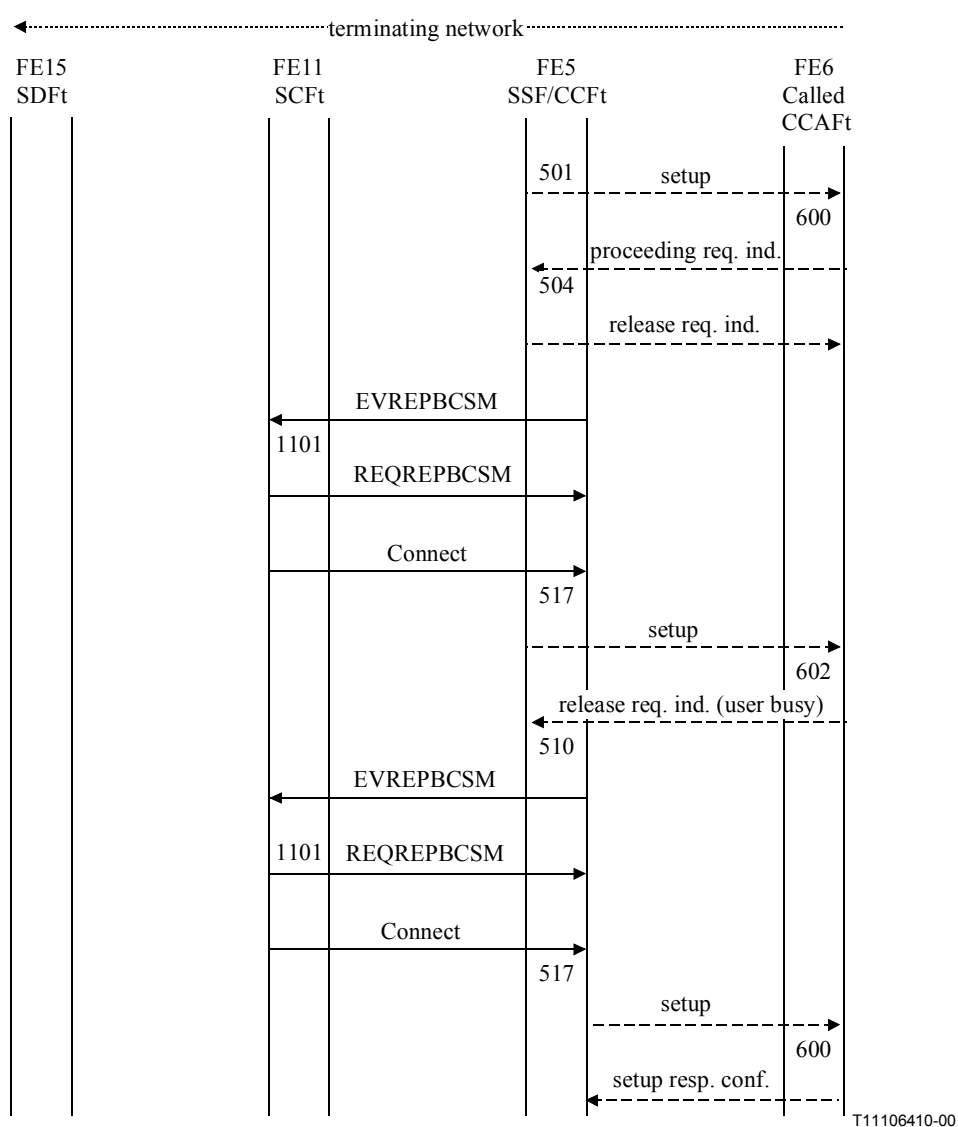


Figure 7-20/Q.1542 – Sequential alerting

Feature Entity Actions

Functional Entity – FE5 (CCF/SSFt)

FEA: 501

- receive RequestReportBCSM from SCF to suspend call processing at given detection points;
- receive charging related message from SCFt: FurnishChargingInformation to create a new call record, SendChargingInformation if metering pulses are to be sent;
- receive ApplyCharging from SCFt, in order to send charging report back;
- receive Connect req. ind. from SCFt and continue call processing with received routing information;
- start basic call set-up, using destination routing address supplied by SCFt.

FEA: 504

- start NoAnswer timer;
- detect that NoAnswer timer is expired;
- formulate and send Release req. ind. to CCfT to release the call.

FEA: 510

- detect that the UPT party is busy;
- formulate and send EVREPBCSM to SCFt to report detection of EDP-R.

FEA: 517

- receive RequestReportBCSM from SCFt to suspend call processing at given detection points;
- receive Connect req. ind. from SCFt and continue call processing with received routing information;
- restart basic call set-up, using destination routing address supplied by SCFt.

Functional Entity – FE6 (CCAFt)

FEA: 600

- receive the setup request from the CCF/SSFt;
- send the Alerting to the network.

FEA: 602

- receive the setup request from the CCF/SSFt;
- send the busy cause to the network.

Functional Entity – FE11 (SCFt)

FEA: 1101

- SCFt reacts to EVREPBCSM received from SSF/CCFt;
- formulate and send Request Report BCSM Event to arm DP as EDP-R to report called party busy or called party no answer, if a subsequent destination address still exists;
- formulate and send Connect req. ind. to SSF/CCFt to restart basic call set-up, using destination routing address supplied.

7.3.2.4 If multiple terminal address registration and simultaneous alerting

Description

The following hypotheses are considered:

- 1) the call will be routed to the first responding terminal;
- 2) incoming UPT call is based on two triggers (originating and terminating networks);
- 3) the SCFt is coordinating the multiple alerting on the terminating side;
- 4) the first available terminal is named CCAFt1.

Multiple terminal address registration feature enables an incoming UPT call to be alerted on multiple terminals. In case of simultaneous alerting, the detection of busy, no reply, or not reachable (for wireless terminals only) event will cause the subsequent alerting.

Information Flows

The procedure starts as for a normal incoming UPT call, as in Figure 7-17 (sheet 2 of 2). The difference is from the IF 1500, see Figure 7-21.

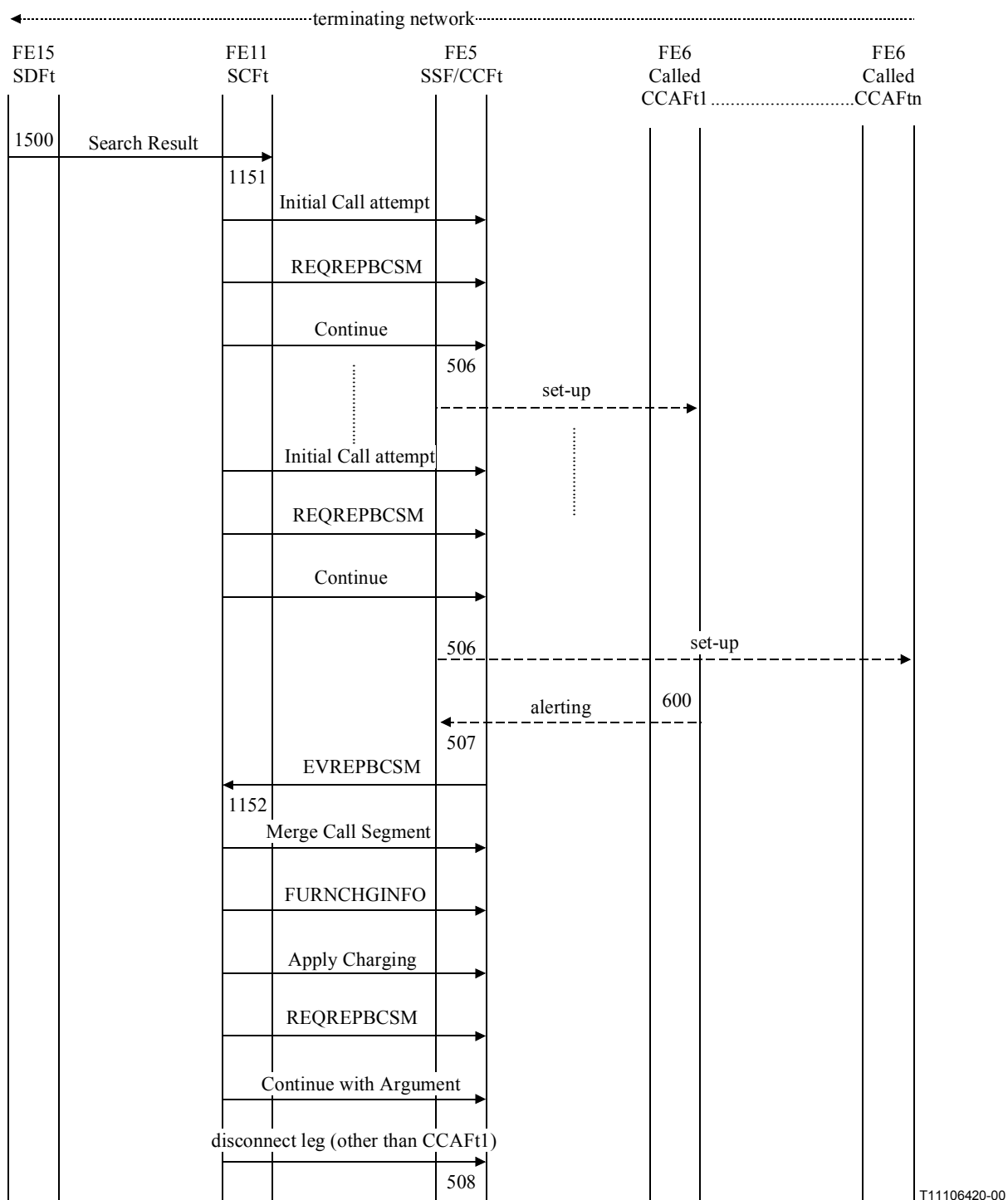


Figure 7-21/Q.1542 – Simultaneous alerting

Feature Entity Actions

Functional Entity – FE5 (CCF/SSFt)

FEA: 506

- receive Initial Call Attempt from SCFt in order to create a leg to a CCAft for a given call segment;
- receive RequestReportBCSM to suspend call processing at given detection points;

- receive Continue and start basic call set-up, using destination routing address supplied by SCFt.

FEA: 507

- receive alerting from the access and alert SCFt that CCAft1 is available for call.

FEA: 508

- receive RequestReportBCSM to suspend call processing at given detection points;
- receive charging related message from SCFt: FurnishChargingInformation to create a new call record, SendChargingInformation if metering pulses are to be sent;
- receive ApplyCharging from SCFt, in order to send charging report back;
- receive Continue with Argument from SCFt and continue call processing with received routing information;
- upon receipt of the disconnect Leg message, release the connections to CCAft other than CCAft1.

Functional Entity – FE6 (CCAft)

FEA: 600

- receive the setup request from the CCF/SSFt;
- send the Alerting to the network.

Functional Entity – FE11 (SCFt)

FEA: 1151

- react to the result of the check of the user service profile. If the call is authorized, executes the following items towards all CCAft identified registered for incoming UPT call:
 - formulate and send Initiate Call Attempt to create a leg to a given CCAft;
 - formulate and send Request Report BCSM Event req. ind. to SSF/CCFt to arm Detection Points for B clear (DP 9), route select failure (DP 4), B busy (DP 5) and B no answer timeout (DP 6). If follow-on is allowed, arm as EDP-R, else as EDP-N;
 - formulate and send Continue to SSF/CCFt to start basic call set-up, using destination routing address.

FEA: 1152

- upon receipt of the EVREPBCSM from CCF/SSFt:
 - formulate and send RequestReportBCSM to arm Detection Points for B disconnection;
 - formulate and send Furnish Charging Information req. ind. to SSF/CCFt to establish charge record for the call. The charging method shown is an example only. Other charging methods can be used;
 - formulate and send Continue with Argument to continue call processing to CCAft1;
 - formulate and send disconnect Leg to SSFt in order to release the connections to all CCAft for which call segments had been created, except CCAft1.

Functional Entity – FE15 (SDFt)

FEA: 1500

- receive and react to Search from SCFt on service profile;
- extract data requested;
- formulate and send Search Result to SCFt.

7.3.3 Outgoing UPT call for a non-registered UPT user

See 7.3.1/Q.1541 [7].

7.3.4 Outgoing UPT call for a registered UPT user

When the UPT user previously registered for outgoing UPT calls, the line was temporarily marked. This means that any call from this terminal will be charged to the registered UPT user.

The description of an outgoing UPT call for a registered UPT user will be similar to the outgoing UPT call of a non-registered UPT user but **without** authentication.

Secure procedures are left to the operators' choices. One could, for example, use delayed activation for registration.

7.3.4.1 Outline description

The following is a high-level description of the actions required for the network to set up an outgoing UPT call when registration previously occurred.

We do not describe the optional (weak at least) authentication that could be added (optional feature).

- 1) access to the service;
- 2) prompt user to input destination number and Collect destination number;
- 3) authorize destination number (optional, interaction with SDFhA);
- 4) if number is a UPT number, translate it to the called UPT user's current InCall location;
- 5) disconnect SRF;
- 6) 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);
- 7) "Furnish Charging Information" operation (or other charging operation);
- 8) "Call Information Request" operation (if transfer of call data to SDF at end of call);
- 9) connect to destination number using "Connect" operation.

7.3.4.2 Information flow diagrams

This is a call from a UPT user possibly roaming but 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 Figure 7-22.

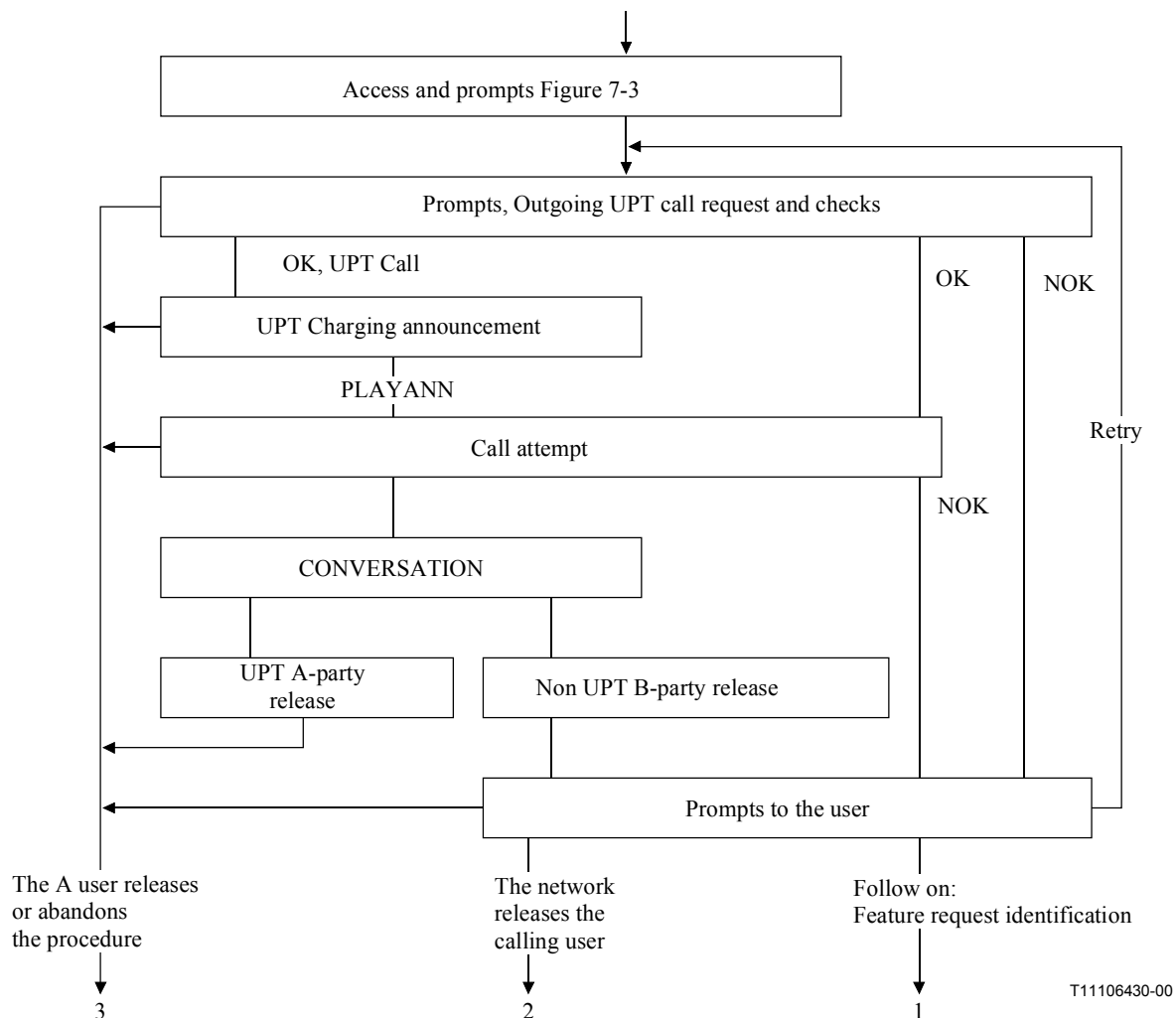


Figure 7-22/Q.1542 – Outgoing UPT call when registered

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.

Once the PUI/UPTN has been retrieved by the SCFo through the access to the UPT environment (see 7.1.1.2), the information flows are the same as in 7.3.1/Q.1541 [7].

7.3.5 Call Pick-Up

Call Pick-up allows a UPT user to be alerted on a terminal specified by himself/herself during the registration procedure, and to answer the call on any other terminal. For instance, the user could be alerted on a paging device, and pick up the call at any telephone set. As far as the network aspects are concerned, the difficulty is that the location of physical resources used for alerting may be very different from the location of physical resources used for answering.

7.3.5.1 Scenarios

Several scenarios can be envisaged for implementing the feature Call Pick-up. Three of them are listed below:

- 1) the call is always routed through a fixed point in the network. The UPT user could answer the call by dialling a dedicated number. The network will set up a connection between the terminal used for answering and the fixed point, and relate this connection to the one already present (i.e. the one from the calling user to the fixed point);
- 2) during the alerting phase, the called UPT user will be informed of a number to dial in order to complete the call. This number will essentially be a routing address towards the SSP at which the originating part of the call was interrupted. Once the call from the called UPT user towards the SSP arrives at the SSP, the two legs will be connected;
- 3) the UPT user indicates to the network that (s)he wants to answer the incoming UPT call (e.g. by pressing a standardized button, or dialling a standardized service code). The network will recognize this request and automatically find out the originating location of the call (i.e. the SSP). Finally the total call can be established.

In all cases above, it seems appropriate that the called UPT user has to be identified (and authenticated according to ITU-T F.851 [2]), because the call is picked up from a terminal different from the ringing terminal.

7.3.5.1.1 Constraints

From the IN CS-2 point of view, a number of constraints exist to support Pick-up. They are as follows:

- assuming that the called UPT user is the same user which will pick up the call, this feature can be provided if the first call to the UPT user is an IN call (which is the case). So for this first call, the interrogating SSF should support Call Party Handling capabilities;
- the called UPT user should pick up the call at the new terminal by dialling a specific access code. This access code should trigger the same previous SSF. The access code should also enable the SCF to retrieve the context of the previous waiting call;
- to enable this requirement, the alerting telephone and the picked up terminal should be connected to the same local exchange or the picked up call should trigger the same interrogating SSF. In each case, the format of access code dialled by the user is not the same. For the first case, we can use a generic access code + the alerting address but in the second case we need to be specific to be able to route the call to the interrogating SSF.

NOTE – For the above reason (trigger the same SSF), it may be difficult to provide call Pick-up if alerting is on a terminal from another network (e.g. pager).

7.3.5.1.2 Comparison of the scenarios

From a user point of view, scenarios 1 and 3 above are nearly as attractive, whereas option 2 is least preferable, because in this case the user has to dial more digits for answering an incoming UPT call (and restrictions are likely if the SSP is abroad).

From a network point of view, e.g. in terms of optimized routing, scenarios 2 and 3 are favourable. Also, having a single point for routing all UPT calls (scenario 1) is not very acceptable for implementation of a service that implies many call routings.

Hence, considering both user and network perspectives, scenario 3 seems to be the best choice. In addition, from a network perspective, this scenario is the most general one, since it does not restrict its implementation.

Therefore, in this Recommendation, scenario 3 is elaborated in more detail.

7.3.5.2 User procedures

In order to describe a configuration for which call pick-up will have the possibility to succeed, we consider hereafter that an incoming UPT call is processed based on two triggers (originating and terminating sides, see 7.3.2). As a consequence, call pick-up is described among two networks, considering that the alerted terminal and the terminal used by the called party belong to the same network and are connected to the same SSFt. A high-level description is proposed below, see Figure 7-23.

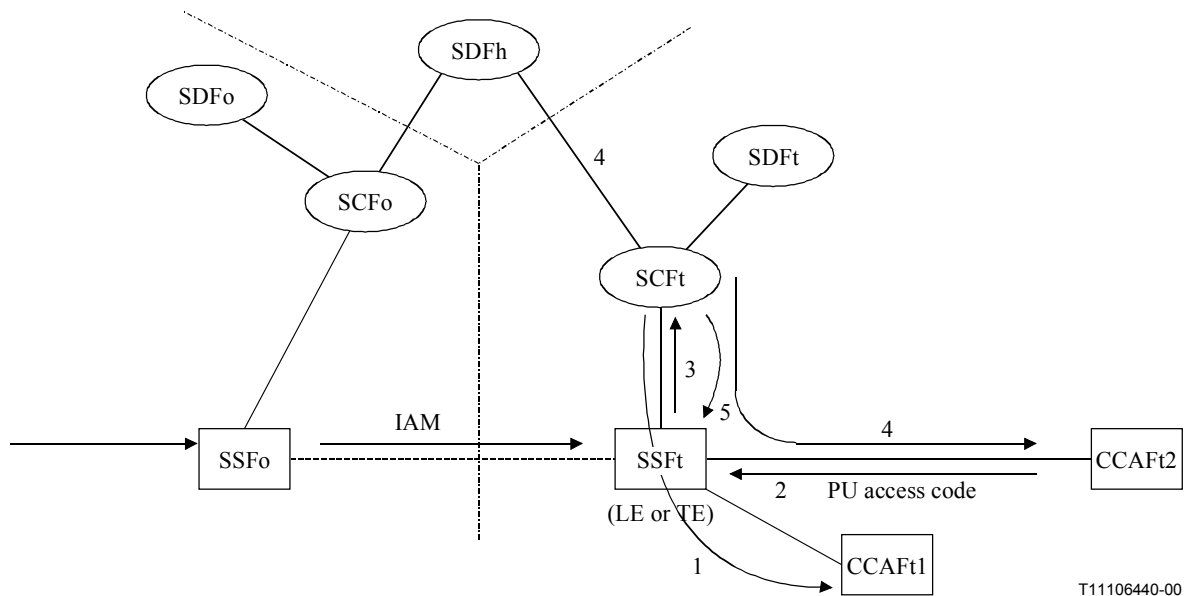


Figure 7-23/Q.1542 – Call pick-up scheme

Comments

Before 1), the incoming UPT call is processed towards the CCAFT1, with a second trigger on SSFt:

- 1) the SCFt orders the SSFt to setup the call to the CCAFT1, the terminal is alerted;
- 2) aware of alerting, the user picks up the terminal in CCAFT2, dialling the Pick-Up access code;
- 3) the SSFt triggers the SCFt;
- 4) SCFt processes identification/authentication of the user (only weak authentication is described here);
- 5) if authentication is successful, the SCFt orders SSFt to release the leg to the CCAFT1 and to connect the legs on the CCAFT2 side and on the originating side.

The first flows and comments are identical to the ones used for the incoming UPT call with double trigger on originating and terminating sides (see 7.3.2). Only new information flows are presented, starting when the terminal is alerted.

7.3.5.3 Information Flows

NOTE – PUPIN is the Pick-Up PIN. It could be different or similar to the "normal" PIN. See Figure 7-24.

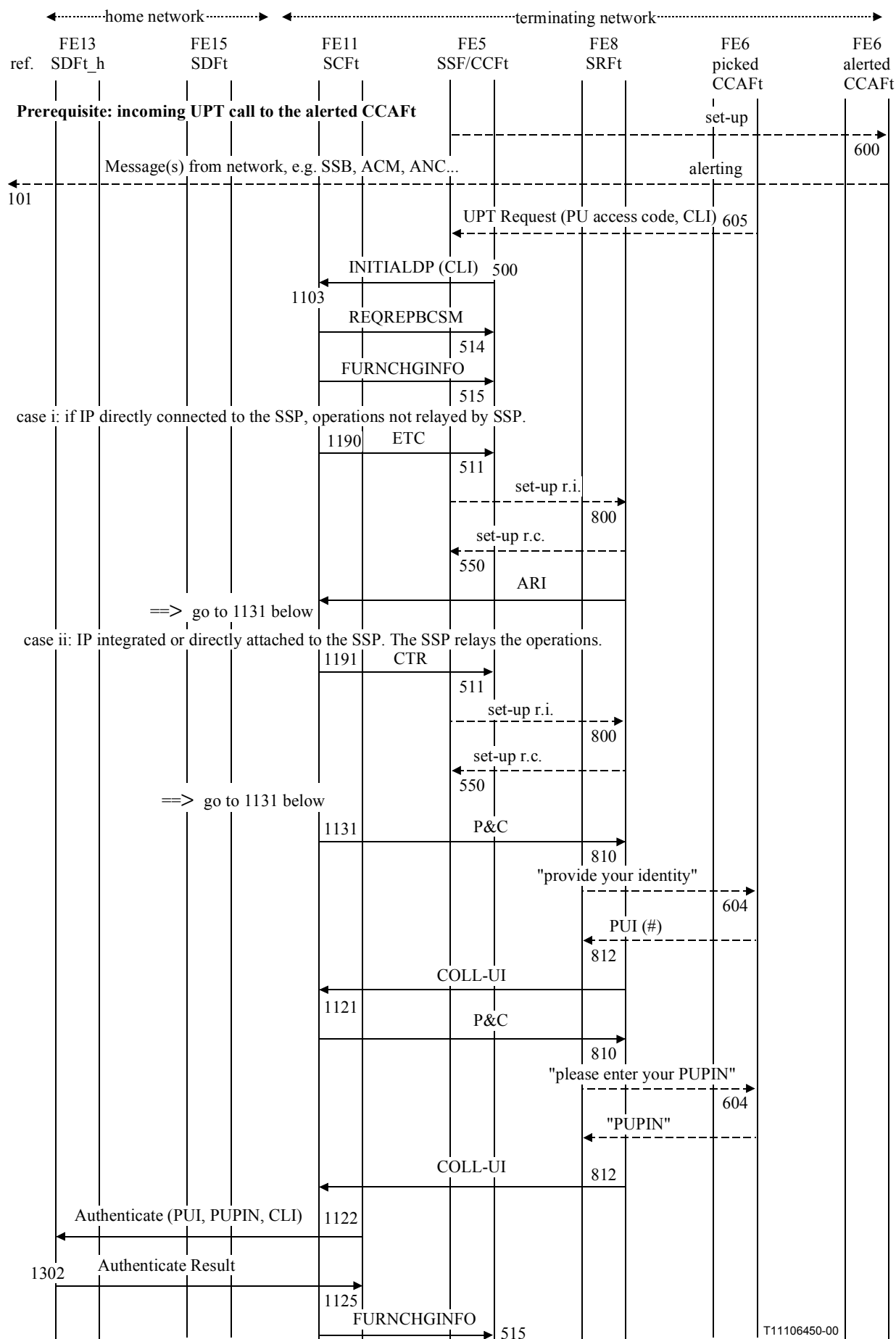


Figure 7-24/Q.1542 – Access and authentication for call pick-up

Feature Entity Actions

Functional Entity – FE1 (CCA Fo)

FEA: 101

- the calling party is advised of the answer of the UPT called party.

Functional Entity – FE5 (CCF/SSFt)

FEA: 500

- receive IAM with UPTN and routing address;
- on detection of armed TDP-R, formulate and send Initial DP req. ind. to SCFt;
- suspend call processing and wait instruction(s) from SCFt.

FEA: 511

- receive and react to Establish Temporary Connection req. ind. from SCFt;
- formulate and send SETUP req. ind. to SRfT to establish a connection to it.

FEA: 514

- receive Request Report BCSM Event req. ind. from SCFt;
- arm Detection Points as EDP-N to report user abandon (before answer – DP 10) and user disconnect (after answer – DP 9).

FEA: 515

- receive Furnish Charging Information req. ind. from SCFt;
- initiate off-line charging according to specified rules. (This is an example only, other charging methods can be used.)

FEA: 550

- receive and react to SETUP resp. conf. from SRfT;
- establish a relationship between the leg between the calling party and the SSF/CCFt, and the leg between the SSF/CCFt and the SRfT;
- through-connect calling party to SRfT.

Functional Entity – FE6 (CCA Ft)

FEA: 600

- receive the setup request from the CCF/SSFt;
- send the Alerting to the network.

FEA: 604

- on receipt of the request from the SRfT (here for authentication code), send this request to the user;
- on receipt of the user's response, send the information to the SRfT.

FEA: 605

- pass UPT call SETUP request to CCF/SSFt;
In this case (Call Pick Up), the SETUP contains at least the PU access code and the CLI.

Functional Entity – FE8 (SRFt)

FEA: 800

- receive and react to SETUP req. ind. from SSF/CCFt;
- on successful establishment of connection:
 - formulate and send SETUP resp. conf. to SSF/CCFt;
 - formulate and send Assist Request Instructions to SCFt to indicate that ready to send messages.

FEA: 810

- receive and react to Prompt and Collect User Information req. ind. from SCFt;
- play announcement requested by SCFt.

FEA: 812

- collect information from the user;
- on successful receipt of information, or on error condition, formulate and send Collected User Information resp. conf. to SCFt.

Functional Entity – FE11 (SCFt)

FEA: 1103

- receive and react to Initial DP req. ind. from SSF/CCFt;
- formulate and send Request Report BCSM Event req. ind. to SSF/CCFt to arm Detection Points as EDP-N for abandon (DP 10) and disconnect (DP 9), if the latter is required. REQREPBSCM contains the list of events and their monitoring mode (may be useless if the DPs are statically armed);
- formulate and send Furnish Charging Information req. ind. to SSF/CCFt to establish charge record for the call. The charging method shown is an example only. Other charging methods can be used.

FEA: 1121

- receive and react to Collected User Information from SRFt;
- formulate and send Prompt and Collect User Information to instruct SRFt to prompt the UPT user for authentication information.

FEA: 1122

- receive and react to Collected User Information resp. conf. from SRFt;
- start authentication of the UPT user;
- formulate and send Search req. ind. to SDFt_h for data.

FEA: 1125

- receive and react to authentication result from SDFt_h:
 - if authentication failed, another attempt may be proposed or the call stopped;
 - if authentication was successful, the SCFt orders SSFt to merge the calling and picked-up segments and to release the alerted one.

FEA: 1131

- receive and react to Assist Request Instructions from SRFt req. ind. from SRFt;
- formulate and send Play Announcement req. ind. to SRFt to play announcement of UPT charges.
Advice of end of announcement required.

FEA: 1190

- formulate and send Establish Temporary Connection req. ind. to SSF/CCFt to instruct it to connect to SRFt to play announcement to calling party.

FEA: 1191

- formulate and send CTR to SSF/CCFt to instruct it to connect to SRFt to play announcement to calling party.

Functional Entity – FE13 (SDFt_h)**FEA: 1302**

- calculate its result AC', compare to the result received from user through the SCFo and send the authentication result back (successful or not).

See Figure 7-25.

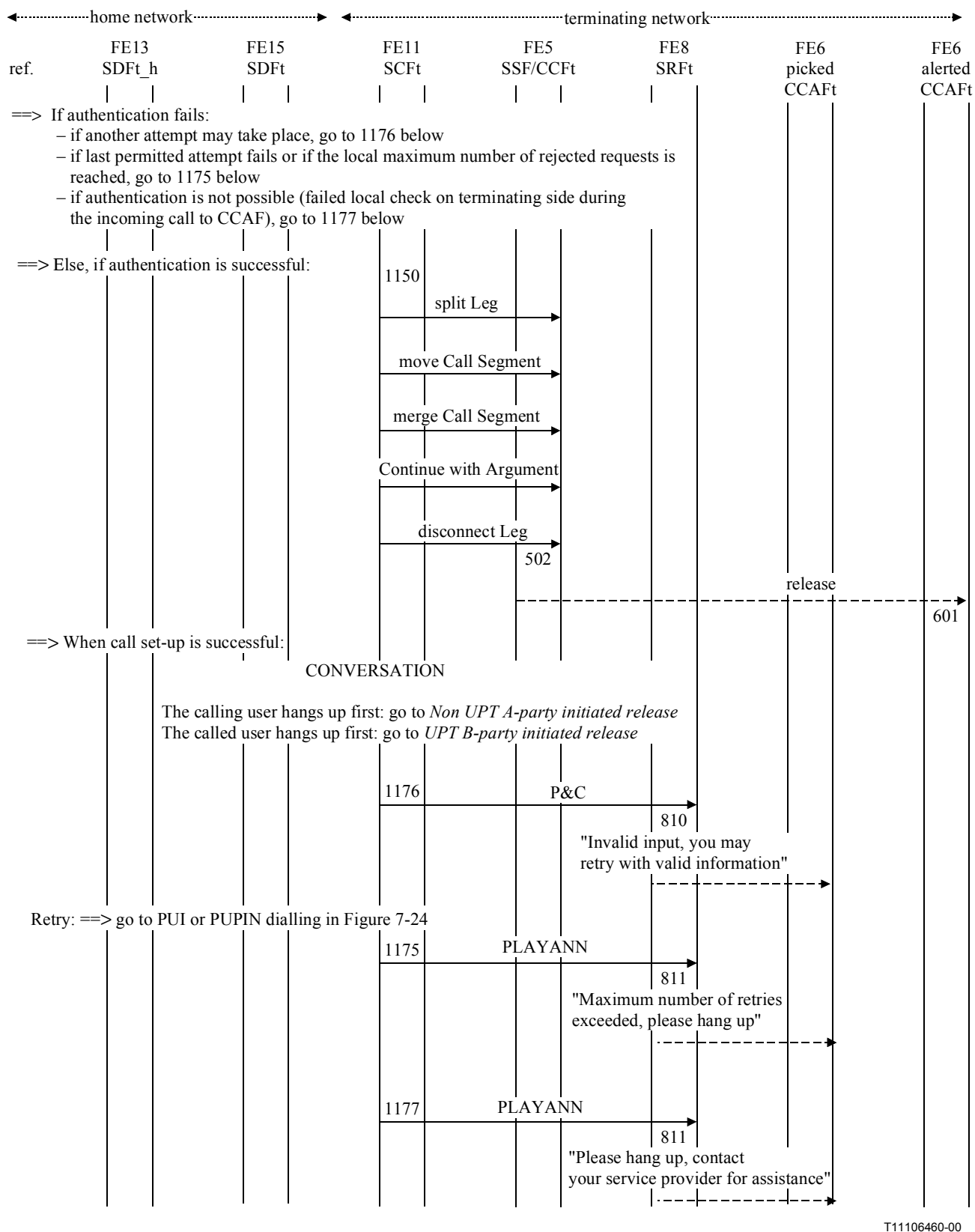


Figure 7-25/Q.1542 – Call pick-up – Call attempt

Feature Entity Actions

Functional Entity – FE5 (CCF/SSFt)

FEA: 502

- upon receipt of the disconnect Leg message from the SCFt, release the connection.

Functional Entity – FE6 (CCAFt)

FEA: 601

- upon receipt of the release message from the SSFt, release the connection on the user side.

Functional Entity – FE8 (SRFt)

FEA: 810

- receive and react to Prompt and Collect User Information req. ind. from SCFt;
- play announcement requested by SCFt.

FEA: 811

- receive and react to Play Announcement req. ind. from SCFt;
- play announcement requested by SCFt;
- at end of announcement, send SR Report resp. conf. to SCFt.

Functional Entity – FE11 (SCFt)

FEA: 1150

- upon receipt of the authentication success message, order the SSFt to split the alerted leg, to move the picked leg to the calling party leg, and to disconnect the alerted leg.

FEA: 1175

- formulate and send Play Announcement req. ind. to SRFt to play "failure" announcement with request to UPT user to hang up.
Advice of end of announcement required.

FEA: 1176

- formulate and send Play Announcement req. ind. to SRFt to play "invalid input" announcement with request to UPT user to hang up;
- formulate and send Play Announcement req. ind. to SRFt to play "hang up" announcement with request to UPT user to hang up.FEA;
- formulate and send Prompt and Collect User Information to SRFt to prompt UPT user to input appropriate registration information.

FEA: 1177

- formulate and send Play Announcement req. ind. to SRFt to play "hang up" announcement;
- formulate and send Prompt and Collect User Information to SRFt to prompt UPT user to input appropriate registration information.

7.3.6 Called party specified secure answering of incoming UPT calls

The way secure answering may be performed depends on how call and connection control is carried out. It is necessary that some form of inter-operator agreement exists to prevent networks from initiating concurrent/parallel authentication procedures.

Particularly in the case of UPT to UPT calls, several IN networks might be involved.

It is generally assumed that the originating network is the "first" IN network with UPT service facility encountered in the progress of the call set-up. It is also assumed that the secure answering request is registered in the called UPT user's service profile.

For this procedure, a number of assumptions can be considered: previous service profile transfer, capability or not of the SCFo to process the procedure, identity of the network controlling the procedure, etc.

7.3.6.1 Outline description

Upon B-answer an authentication procedure is initiated and monitored from the SCFo. The B-user is connected to the SRFo. User input authentication data is collected by the SCFt.

The SCFt then handles the authentication with the B user's home network.

7.3.6.2 Information flows

When no data transfer is made between SDFo and SDFh and when weak authentication is performed by the home network (based on SAPIN, Secure Answering PIN), the following flows are proposed.

NOTE – Authentication could also be strong (not described hereafter).

The information flows are the same as for an incoming UPT call until the Connect sent by SCFt (see incoming UPT call description in 7.3.2). See Figure 7-26.

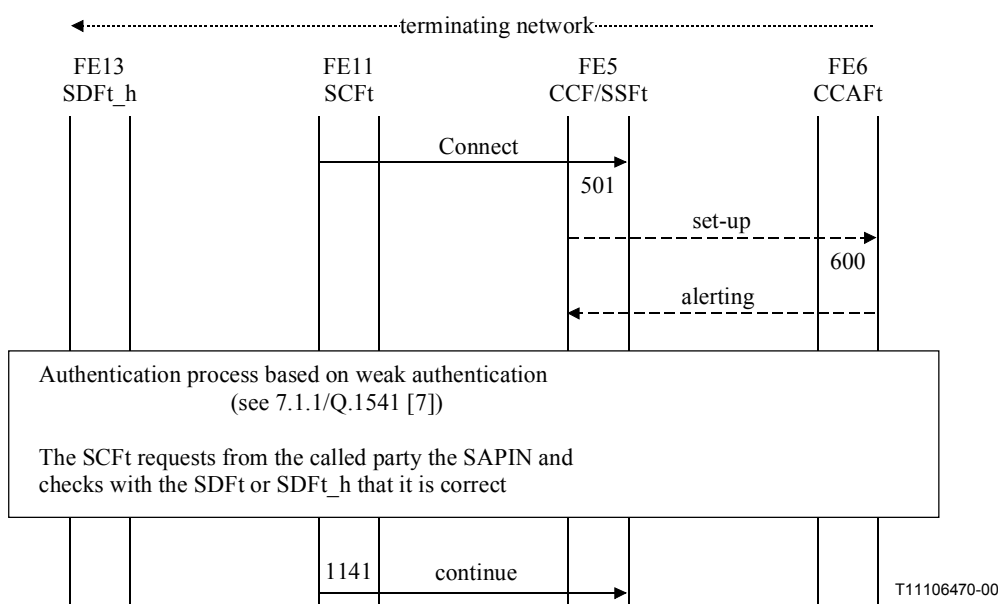


Figure 7-26/Q.1542 – Secure answering for incoming UPT calls

Feature Entity Actions

Functional Entity – FE5 (CCF/SSFt)

FEA: 501

- receive RequestReportBCSM from SCFt to suspend call processing at given detection points;
- receive charging related message from SCFt: FurnishChargingInformation to create a new call record, SendChargingInformation if metering pulses are to be sent;
- receive ApplyCharging from SCFt, in order to send charging report back;

- receive Connect req. ind. from SCFt and continue call processing with received routing information;
- restart basic call set-up, using destination routing address supplied by SCFt.

Functional Entity – FE6 (CCAFt)

FEA: 600

- receive the setup request from the CCF/SSFt;
- send the Alerting to the network.

Functional Entity – FE11 (SCFt)

FEA: 1141

- if authentication for secure answering was successful, the SCFt orders the SSFt to connect the call for conversation.

7.3.6.3 Message to the calling party during authentication

A message could be delivered to the calling party during the authentication, since it can be long and (s)he may not be aware of the procedure occurring. It can be either a text message or a voice message.

Text messages can be delivered using out-channel user information, between the SCF and the calling user. However, it is useless if the calling user's OLE does not support it. Voice messages could be delivered using an SRF to any calling terminal. However, problems may arise due to the language used.

7.3.7 Emergency calls

This clause is dedicated to the treatment of outgoing emergency calls and their interaction with UPT.

Several situations can be considered where interactions are possible:

- the UPT user accesses the UPT service logic before dialling the emergency number;
- a UPT user is registered for outgoing UPT calls on a terminal. An emergency number is dialled.

It is assumed here that the user (either UPT user or non-UPT user) dials the local emergency number, i.e. the emergency number of the network where he is registered.

In situation 1, the UPT user first dials the UPTAC, enters the UPT service environment, then dials the emergency number. See 7.3.3 on "outgoing UPT call for a non-registered UPT user" for details.

The SSFo triggers the UPT SCFo in order to authenticate the UPT user. Since authentication and call routing processes are sequential, it is difficult to speed up the routing of emergency calls.

The UPT service provider is advised to recommend to his users not to access the UPT service environment (by dialling the UPTAC) before dialling an emergency number.

In situation 2, the emergency call can be directly routed without triggering first the UPT service logic if the local CCF/SSF gives priority to emergency numbers. The calling party's identities given to the emergency centre depend on the way the call is processed: if the UPT SCF is not triggered, the UPTN of a calling UPT user will not be provided; if the UPT SCF is triggered, it is possible that the UPT SCF adds the UPTN of a calling UPT user, but the treatment done for that will delay the emergency call establishment (see also 7.3.4 on "outgoing UPT call for a registered UPT user").

It is an operator option to give priority to the emergency number over the outgoing UPT call registration.

7.4 Procedures for UPT service profile management

See 7.4.1/Q.1541 and 7.4.2/Q.1541 [7].

ANNEX A

A.1 Examples of incoming UPT call with home service transparency (SCF-SCF assist)

This clause describes one possible home specific service, optional for UPT SS1:

- Call Forwarding On Busy with specific announcement: during an incoming UPT call, after detection of a busy situation, the calling party is invited with a specific announcement (based on the UPT called party subscription) to choose if he wants to leave a message in the called party voice-mail or be forwarded to another called party (e.g. secretary). Note that all the services the called UPT user has subscribed to are not necessarily implemented in all visited domains.

A.1.1 General description

The visited network offers an IN "CallForwardingOnBusy" different from the switch-based "CallForwardingOnBusy" supplementary service.

Depending on the calling line characteristics and/or on the visited network capabilities, the home SCF provides the visited SCF with the following instructions:

- play specific announcements to the calling user. These announcements depend on the visiting called party: language, name of the called party (voice synthesis), etc.;
- offer different possibilities to the calling user (call forwarded to the mailbox of the visiting called party, to the secretary line, etc.).

When the visited SSF detects a busy condition on the line used by the visiting called party, it triggers the visited SCF (or reports this event to the visited SCF). Then the visited SCF (based on the user profile: homeSpecific attribute or on a mutual network agreement) sends to the home SCF the operation handlingInformationRequest.

Subsequently the following events occur.

- the home SCF requires additional information about the current call in the visited network;
- the visited SCF plays an announcement (indicated in the visiting called party profile) inviting him/her to choose among different options and collect his/her choice: Call Forwarding to Mailbox;
- the visited SCF sends back the required information;
- the home SCF checks the rights of the visiting calling party and tells the visited SCF about the procedure to be run to the visiting called party;
- the visited SCF forwards the call to the mailbox of the visiting called party, that is located in the home network.

The user interaction played in the visited network depends on its capabilities. In the first option below, the SCF accesses an SRF indirectly via the SSF whereas, in the second option, it accesses directly to the SRF. In both cases, the home SCF is not aware of the user interaction scenario.

A.1.2 First option

The visited SCF accesses an SRF indirectly via the SSF, plays the user interaction as requested by the home SCF and returns the result to it. See Figure A.1.

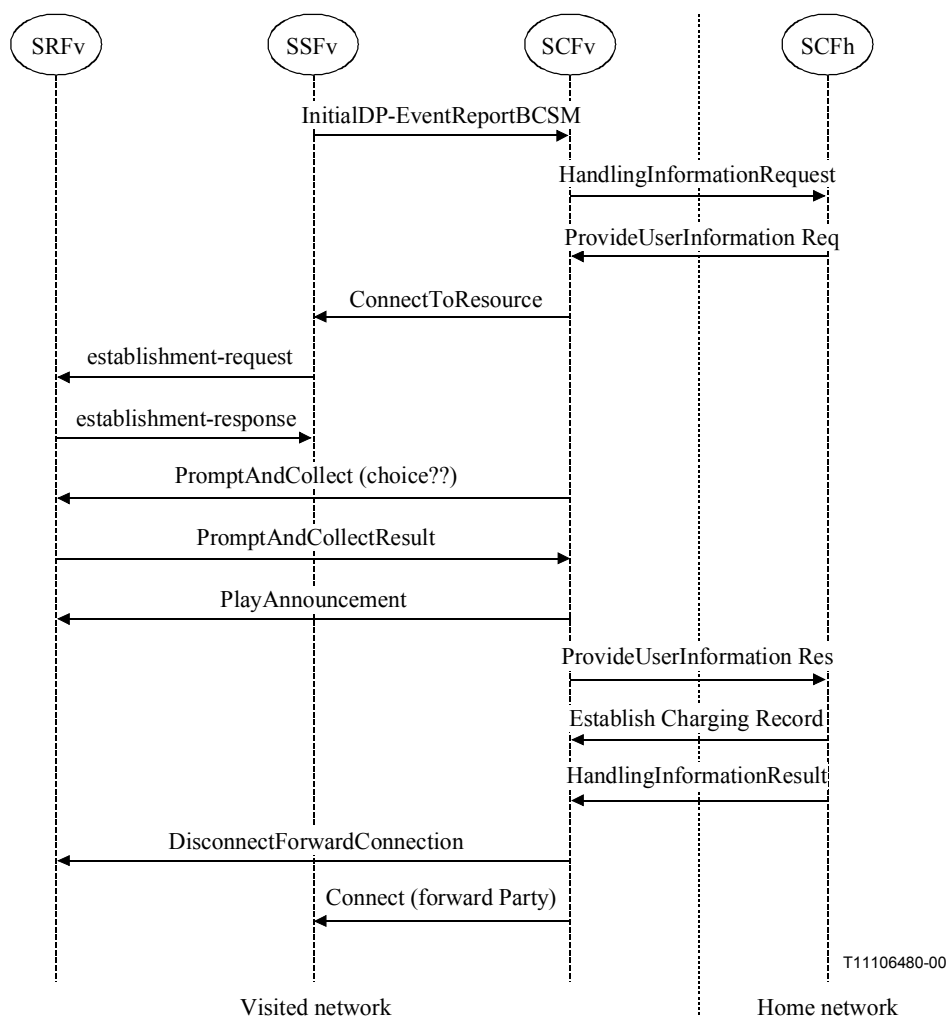


Figure A.1/Q.1542 – Incoming UPT call and CFB (option 1)

A.1.3 Second option

The visited SCF accesses directly to an SRF, plays the user interaction as requested by the home SCF and returns the result.

Then the visited SCF identifies the address of the home SCF with the homeSpecific attribute and sends it the operation handlingInformationRequest.

Later on, the following events occur:

- the home SCF requires additional information from the visiting UPT calling party;
- the visited SCF plays an announcement (indicated by the home SCF) inviting the UPT user to choose among different options and collect his choice: Call Forwarding to Mailbox here;
- the visited SCF sends back the required information;
- the home SCF checks the rights of the visiting UPT calling party (e.g. call barring) and tells the visited SCF about the procedure to be run to the visiting UPT calling user;
- the visited SCF forwards the call to the new called party identified during the User Interaction.

The user interaction played in the visited network depends on its capabilities. Two sequences of operations are possible for the same User Interaction (follow-on call):

- in the first option, the SCF accesses an SRF indirectly via the SSF using the OCCRUI mechanism and performs the User Interaction with the P&C operation;
- in the second option, the SCF accesses directly to the SRF and performs the User Interaction with the script operations.

A.2.2 First option

The SCF accesses an SRF indirectly via the SSF using the OCCRUI mechanism, performs the user interaction with the P&C operation and returns the result. See Figure A.3.

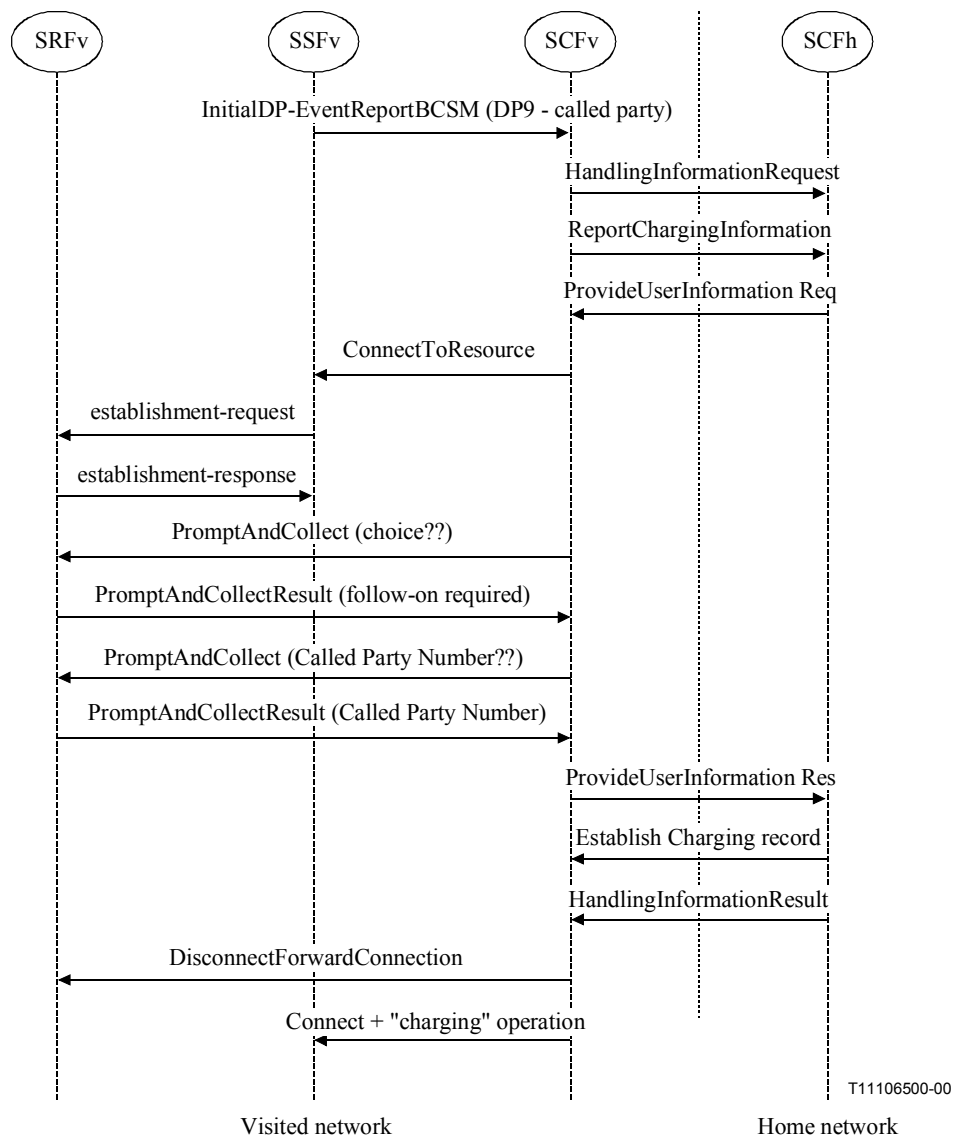


Figure A.3/Q.1542 – Outgoing UPT call, AOC-E and follow-on (option 1)

A.2.3 Second option

The SCF accesses directly to the SRF, performs the user interaction with the script operations and returns the result. See Figure A.4.

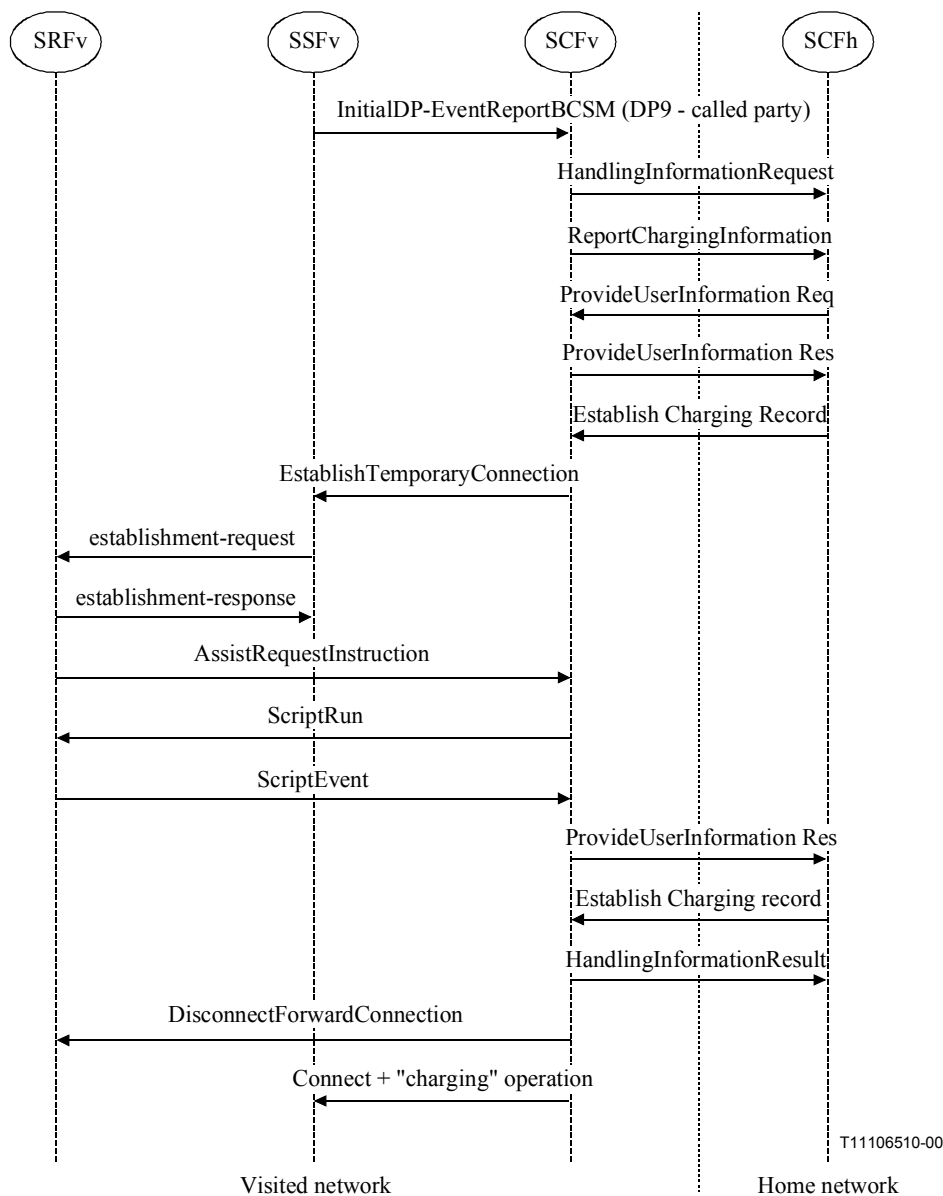


Figure A.4/Q.1542 – Outgoing UPT call, AOC-E and follow-on (option 2)

ANNEX B

UPT on mobile networks

The use of UPT on mobile networks (second generation PLMN or IMT-2000) may be processed thanks to several scenarios. This Recommendation covers only the basic interworking scenario, described below.

B.1 Scenario 1: basic interworking between IN and mobile networks

There is no direct dialogue between UPT SDF/SCF and mobile HLR.

In this scenario there is no change to the operation of mobile networks. The incoming UPT call is detected as a UPT call by the CCF/SSF which invokes the SCF. The SCF requests the number of the terminal at which the UPT user is registered. The mobile subscriber number is obtained after making a query at SDF.

The SSF will route the call as a normal mobile terminated call to the gateway MSC. From this point on, a normal mobile terminated call setup procedure will be carried out within the mobile network.

This can be summarized in Figure B.1.

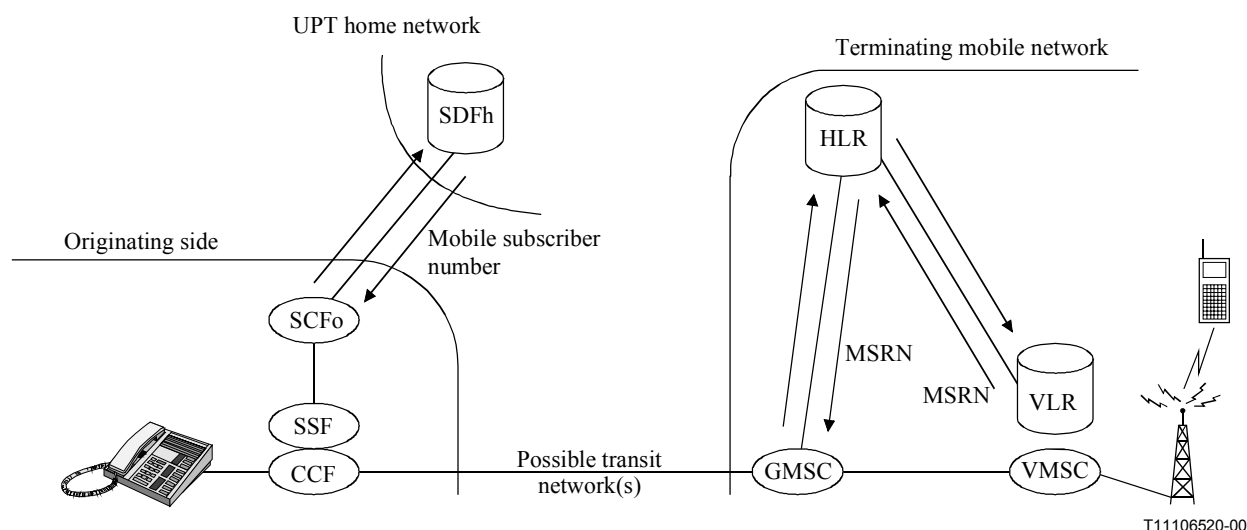


Figure B.1/Q.1542 – Interworking scenario for UPT on mobile networks

The basic drawback of this architecture is that there is no real direct signalling between IN on the originating side ("fixed" side) and the mobile network. Thus, if an IN service (UPT above) needs mobile information or if the mobile network needs an IN service, a call must be established (B-channel).

However, this architecture has the advantage that it can be implemented with few changes in the existing networks.

Some restrictions and requirements are listed below:

- the use of DTMF signalling could be supported in mobile networks, even if a DTMF device is used. But if no DTMF receiver is built in the terminal, then the DTMF signals may not be reliably carried through normal voice service and this will not improve with the use of more efficient speech codecs in the future. Since the UPT device is an improvement from a service point of view, this means that new capabilities would be needed in mobile network handsets in order to recognize and properly deal with DTMF tones. When the UPT device is an IC-card (the PIM), other changes will be needed in order to distinguish whether a call is coming to the mobile user or to the UPT user;
- location updating: when the mobile owner removes his mobile identity module from the mobile terminal, moves and then makes a new location update, the UPT registrations will follow this mobile owner, even if the corresponding location is not the one expected by the UPT user. A solution could be to perform an automatic deregistration each time a mobile identity module with registered UPT users is removed from a mobile terminal;
- charging: the mobile subscriber should not be charged when the UPT subscriber makes a registration. Also, due to an incoming UPT call, the subscriber should not be charged for the roaming leg part of the call;
- service interactions: overlapping between UPT and mobile supplementary services may be avoided only if an indication of UPT call/procedure is provided. Also, the mobile terminal should distinguish whether the call is for a UPT user (e.g. using a specific alerting tone, or voice prompt, or display information).

B.2 Access to the UPT environment on mobile terminals

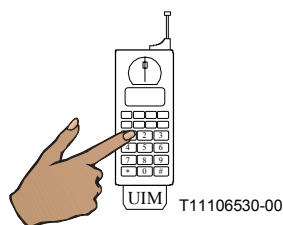
In principle, a UPT user must be able to gain access to UPT from mobile networks without the need of additional devices compared to the devices used in the fixed networks.

A UPT user needs to interact with mobile networks to initiate UPT procedures. Several ways are considered here for the interaction:

- A) mobile terminal's keypad and weak authentication (manual input);
- B1) simple or advanced DTMF device;
- B2) simple or advanced DTMF device, and a DTMF receiver built into the mobile phone;
- C1) use of a PIM (Personal Identity Module): PIM inserted in a DTMF device;
- C2) use of a PIM: the PIM inserted in the mobile terminal's card reader or in a separated card reader (attached to the terminal);
- D) multi-applications IC-card.

NOTE – A mobile identity module is required in the mobile terminal in most cases to activate the terminal.

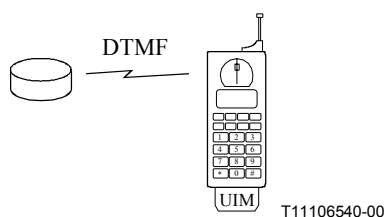
A) Manual input using a mobile terminal – the keypad method



If weak authentication is used, the keypad of the mobile terminals can be used.

Due to different channel coding algorithms some mobile networks cannot guarantee accurately transport in-band DTMF signalling over the air. In this case, the mobile terminal is only able to send message based signalling not in-band DTMF. The messages are then converted at the MSC, using a DTMF sender. This feature may be adequate to support UPT manual PIN procedure.

B) Use of a UPT DTMF access device



Case B1: not built-in DTMF receiver

The DTMF signals will be distorted after decoding in the MSC/BSS. To decrease the risk of false interpretation of the signals in the UPT service logic, the device should send long DTMF signals.

After the call set-up to the UPT service provider, the user uses a DTMF device to authenticate himself. For strong authentication, an advanced DTMF device is needed, and for weak authentication a simple DTMF device is sufficient.

For those mobile networks which are able to accurately transmit in-band DTMF signalling, use of a UPT DTMF access device poses no problem. However, for those mobile networks whose radio transmission is not able to accurately transmit in-band DTMF signalling, accessing the UPT service from a mobile terminal with a UPT DTMF device may be a problem.

Case B2: built-in DTMF receiver

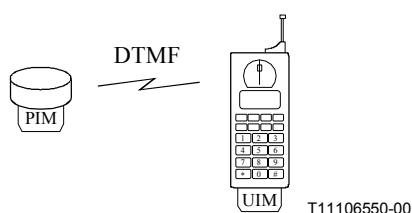
One possible solution is to have a DTMF receiver built into the mobile terminal to convert DTMF signalling to message based mobile terminal signalling; then, at the MSC, the DTMF sender will convert the signalling back to DTMF. This imposes a requirement on mobile terminals. Also the current signalling capacity of the radio interface may not be sufficient to support required digit sending speed.

General comment

In cases A) and B) the interface between UPT user and network uses in-band DTMF signalling. A separate mobile subscription (either the UPT user's or one borrowed from a mobile user) is always required to support in-band DTMF UPT access because a mobile call connection requires a valid mobile subscription and mobile network authentication procedure. A mobile terminal may not be operational without a valid identity module removable or built-in.

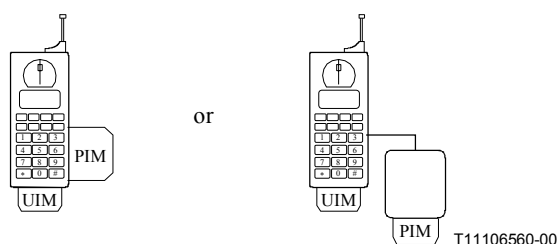
C) Mobile terminal accepting the use of a PIM

Case C1: PIM used in a DTMF device



As in B), only weak and one pass strong authentications are possible. Compared to B), the only advantage is that it simplifies the authentication procedure if the authentication data are contained in the PIM (no dialling is needed to authenticate).

Case C2: PIM used in a card reader (one or more card readers)



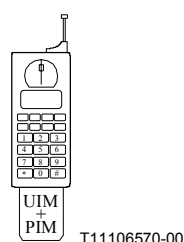
Two sub-cases can be covered: PIM used in an integrated or in a separated card reader. Some mobile networks offer a limited form of user mobility within a mobile environment by use of a removable identity module. This module may be removed from the user's normal terminal and transferred to any other mobile terminal with the same module capability, however it is valid only within the same type of mobile system.

A UPT card reader can be a part of the mobile terminal or connected to the data connector. After the call set-up to the UPT service logic, the UPT service provider controls the PIM via data communication (outband signalling).

In this case, both mobile identity module and UPT PIM are required. A mobile identity module with a bearer service subscription is needed in the mobile terminal for connecting the call. A separate PIM is needed to insert in the separate card reader for UPT purpose.

A function is needed to identify and associate signalling with the corresponding applications (UPT or mobile networks).

D) Multi-applications IC-card



The IC-card could be one single application on a common mobile identity module and UPT UIM. This IC-card would store all mobile and UPT relevant data and perform the required functions. This PIM could accommodate all other network access requirements (ISDN, mobile networks, etc.).

Both UPT module and mobile module are gathered on the same combined IC-card and given by the service provider to his subscriber.

The mobile module is used to establish the connection and the PIM in the same multi-applications card is controlled directly by commands from the UPT service provider in a transparent way. An additional function is needed, to identify and associate signalling with the corresponding applications (UPT or mobile network functions).

If a normal registration is made, the multi-applications card has to be inserted into and left in some mobile terminals to make it possible to make and receive calls.

SERIES OF ITU-T RECOMMENDATIONS

| | |
|-----------------|--|
| Series A | Organization of the work of ITU-T |
| Series B | Means of expression: definitions, symbols, classification |
| Series C | General telecommunication statistics |
| Series D | General tariff principles |
| Series E | Overall network operation, telephone service, service operation and human factors |
| Series F | Non-telephone telecommunication services |
| Series G | Transmission systems and media, digital systems and networks |
| Series H | Audiovisual and multimedia systems |
| Series I | Integrated services digital network |
| Series J | Transmission of television, sound programme and other multimedia signals |
| Series K | Protection against interference |
| Series L | Construction, installation and protection of cables and other elements of outside plant |
| Series M | TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits |
| Series N | Maintenance: international sound programme and television transmission circuits |
| Series O | Specifications of measuring equipment |
| Series P | Telephone transmission quality, telephone installations, local line networks |
| Series Q | Switching and signalling |
| Series R | Telegraph transmission |
| Series S | Telegraph services terminal equipment |
| Series T | Terminals for telematic services |
| Series U | Telegraph switching |
| Series V | Data communication over the telephone network |
| Series X | Data networks and open system communications |
| Series Y | Global information infrastructure and Internet protocol aspects |
| Series Z | Languages and general software aspects for telecommunication systems |