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SERIES Q: SWITCHING AND SIGNALLING

Intelligent Network

Requirements on underlying networks and signalling protocols to support UPT

ITU-T Recommendation Q.1521

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.1521

Requirements on underlying networks and signalling protocols to support UPT

Summary

This Recommendation specifies some requirements on supporting networks and signalling protocols, for the support of UPT Service Set 1, as defined within ITU-T F.851.

Source

ITU-T Recommendation Q.1521 was prepared by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 1 procedure on 15 June 2000.

Keywords

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.

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Requirements on underlying networks and signalling protocols to support UPT

1 Scope

UPT is a personal mobility telecommunications service wherein a subscriber/user can register at a terminal on any connected network and be provided with UPT service at that terminal location. This applies whether the terminal is fixed (wireline) or mobile (wireless), and independent of the type of network serving the terminal, e.g. PSTN, ISDN, PLMN. Further in this Recommendation, PLMN should be understood in a broad sense (including IMT-2000).

This Recommendation is intended to provide the requirements on protocols, PSTN, ISDN, etc. to enable a correct end-to-end support of the UPT service. For the case where support of UPT service for a user spans several service providers or carriers, it is assumed that appropriate business arrangements exist between the multiple providers to effect these requirements (either in a single political environment or not).

This Recommendation specifies the requirements to be applied to underlying networks and protocols in order to have a good implementation of UPT service. It mainly defines the points to be solved to ensure a good feature interaction between the services subscribed by the UPT user and those attached to the owner of the line where the UPT service is invoked.

It addresses the UPT Service Set 1 features, and both CS-1 and CS-2, from a stage 2 perspective.

2 References

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

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

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

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

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

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

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

[7] ITU-T Recommendation F.853 (1998), *Supplementary services in the Universal Personal Telecommunication (UPT) environment*.

[8] ITU-T Recommendation E.164 (1997), *The international public telecommunication numbering plan*.

[9] ITU-T Recommendation E.212 (1998), *The international identification plan for mobile terminals and mobile users*.

[10] ITU-T Recommendation Q.1224 (1997), *Distributed functional plane for intelligent network Capability Set 2*.

[11] ITU-T Recommendation E.168 (1999), *Application of E.164 numbering plan for UPT*.

3 Definition of terms

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

The following terms are defined in ITU-T F.851 [2]:

a) UPT (Universal Personal Telecommunication)

b) UPT subscriber

c) UPT user

d) UPT service provider

e) UPT number (UPTN)

f) UPT access code (UPTAC)

g) UPT service profile

h) UPT service profile management

i) Terminal address

j) Network limitations

3.2 Terms defined in this Recommendation

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) 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 UPT Service Logic.

NOTE – In CS-3, 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) 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 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.

A minimum of one UPT capable network is required in a UPT Environment.

3.2.2 Specific terms

3.2.2.1 home network (HN): Home 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 (ON): The "first" network that is a UPT Network in the UPT call processing. If the network from which a user originates a UPT service request or outgoing UPT call is only UPT Supporting Network, the originating network will be the UPT Network to which this UPT Supporting Network will route the UPT call.

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

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

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

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

4 Abbreviations

This Recommendation uses the following abbreviations:

API	Access Point Identity
CCAF	Call Control Agent Function
CCF	Call Control Function
CLI	Calling Line Identity
CS-1	Capability Set 1
FE	Functional Entity
HLR	Home Location Register
IAM	Initial Address Message
IF	Information Flow
IMT-2000	International Mobile Telecommunications-2000
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LI	Line Identity
OLE	Originating Local Exchange
PBX	Private Branch eXchange
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
PUI	Personal User Identity
SCF	Service Control Function
SCP	Service Control Point

SDF Service Data Function

SDFh Home Service Data Function

SDFo Originating Service Data Function

SDP Service Data Point

SMF Service Management Function

SRF Specialized Resource Function

SS1 Service Set 1

SSF Service Switching Function

SSP Service Switching Point

TDP Trigger Detection Point (in BCSM)

TLE Terminating Local Exchange

UPT Universal Personal Telecommunication

UPTAC UPT Access Code

UPTN UPT Number

VHE Virtual Home Environment

VLR Visited Location Register

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 General requirements

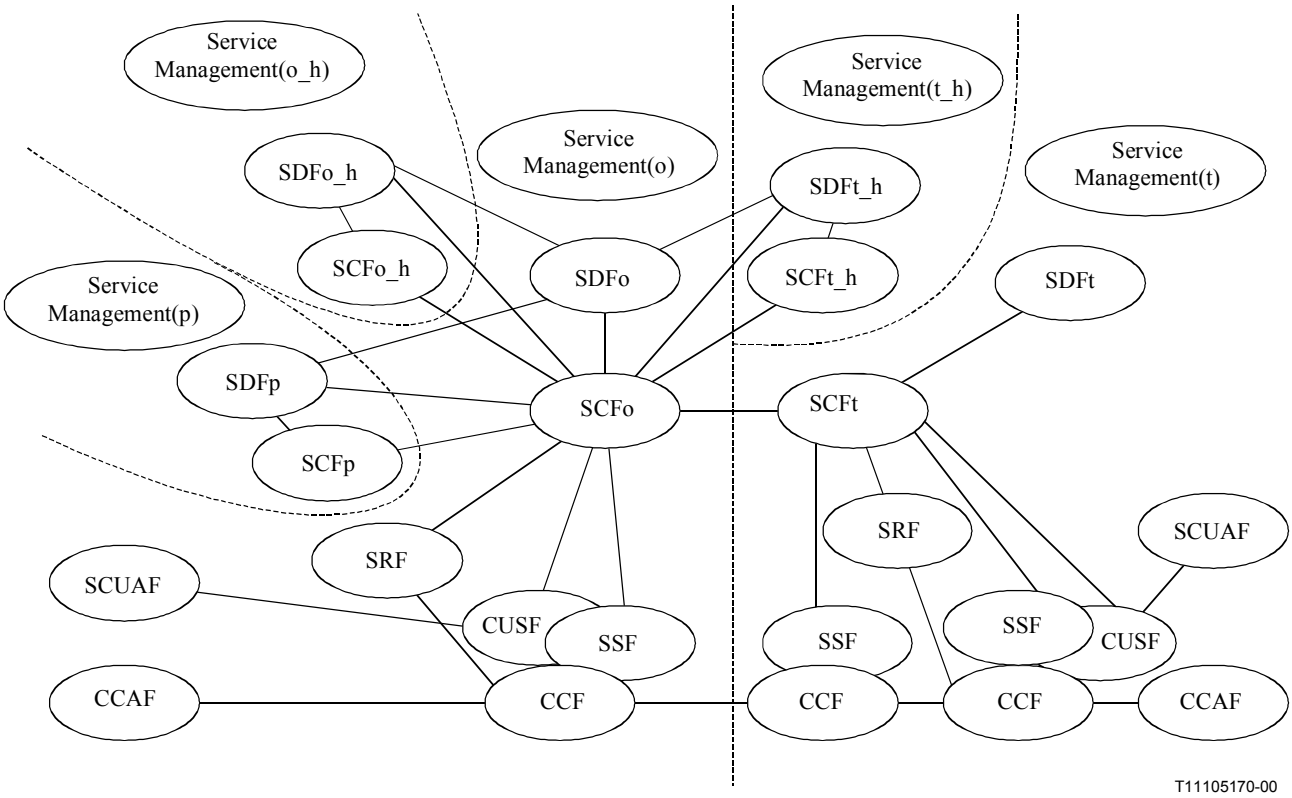
6.1 General principles

When a UPT user is invoking the service on a particular access, his service profile must apply there and replace the features attached to the subscription of the owner of the terminal. This requirement applies to any action of the UPT user as outgoing call, incoming call, registration or service profile management.

This basic requirement implies:

– the handling of a UPT call implies that the involved exchanges have the knowledge of the UPT characteristics of this call.

The general IN CS-1/CS-2 functional architecture for UPT is presented in Figure 1 below. Dotted lines separate the involved networks, bold plain lines indicate interfaces and IN functions used for both CS-1 and CS-2.



---------- network boundary
o_h is assigned to originating UPT user's home network's functional entity.
o is assigned to originating UPT user's current access network's functional entity.
p is assigned to originating UPT user's previous access network.
t_h is assigned to terminating UPT user's home network's functional entity.
t is assigned to terminating UPT user's current access network's functional entity.

Figure 1/Q.1521 – Generic CS-2 functional architecture

Taking into account the limitations of IN CS-1/CS-2, the functional architecture for UPT Service Set 1, described in the above figure, presents the following characteristics:

- the interconnection of networks mainly takes place between the SCFo/SDFo and SCFh/SDFh functional entities, as indicated on the figure. The interfaces between SCF/SDF and SCF/SDF are specified in IN CS-1/2 (SCF-SDF for CS-1 and CS-2; SCF-SCF and SDF-SDF only for CS-2);
- SDFh stores all data related to the UPT user but part (or all of it) of the service profile can be copied in a visited SDF (SDFo, SDFt);
- 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;
- SDFh performs the authentication of the UPT user (if no service profile transfer is used);

- 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;
- SCFo contains the Service Logic Program;
- SDFo also stores service profile (or a part of it).

6.2 Key network functionalities

A set of key network functionalities required to support the UPT service includes:

- *UPT User Registration and Authentication*

  The visited network needs to recognize the UPT access code for invoking the UPT environment. The UPT environment, which may not be the visited network itself, must then recognize the UPT number for identifying the UPT user, prompt the user for a possible personal identifier, and recognize its entry. It may be assumed that all originating UPT service requests are performed by the UPT environment.

- *UPT Service and Address Recognition*

  When completing (incoming) UPT service, requests are received by the visited network from a connecting network entity, the visited network has to recognize any UPT specific treatments that are required and must be able to recognize addresses that are specifically UPT for special treatment. For example, if an incoming call to a visited network is addressed using a UPT number, the connecting network should flag the call as UPT in the signalling information, the local network must be capable of dealing with the UPT address (perhaps by invoking the UPT environment) and must recognize how to route the call, and what UPT user call treatments are to be applied as part of incoming UPT call completion.

- *UPT Address Translation*

  When a UPT address is encountered, the UPT environment must be able to translate the number to a routable network address, or request the translation service from a correspondent network (such as the home UPT network), or transfer the call to such a UPT capable network.

- *UPT User Profile Management (Interrogation and Modification)*

  The visited network needs to be able to interact with the home network to properly register and authenticate the UPT user, to properly deal with service requests, etc., which requires a variable degree of interaction with (interrogation/transfer/update) the home user profile. In addition, the visited network should provide the UPT users with the ability to remotely update their profiles subject to appropriate security control and service provider business agreements.

- *Appropriate Charging and Billing*

  Clearly, the charging algorithm must reflect whatever services are UPT-specific for this user, and the bill rendered must be associated with the UPT user rather than the terminal at which the UPT user is temporarily registered.

- *Security*

  Security mechanisms are needed for protecting the UPT resources from being intercepted or misused, and for preventing fraudulent or unauthorized access to the UPT user profile while the user is registered on a visited network. ITU-T F.851 [2] uses the following examples of UPT misuse:

  1) fraudulent use of a UPT user's resources by unauth3orized parties who manage to take up the identity of the user;
  2) eavesdropping or unauthorized tapping of information exchanged during communication;
  3) eavesdropping or unauthorized tapping of information in the UPT user's service profile;
  4) disclosure of the user's physical location during normal UPT call procedures.

- *Access Signalling*

  In the PSTN network case, it can be assumed that the terminal at which the UPT user is located is capable of DTMF access signalling. In the case of ISDN networks, the access signalling should be assumed to be DSS1 over the D-channel. In either case, there must be appropriate signalling sequences defined to accommodate the requirements for interaction between the UPT user and the visited network.

  For PSTN, a call must have been established for even non-call activity (e.g. for service profile updates), so the access port is effectively busy (a call is a call). But, for DSS1 access, use of the D-channel for non-call associated interactions should be assumed.

- *Network Signalling*

  In both the PSTN and ISDN cases, Signalling System No. 7 is assumed to be available.

  The need exists to distinguish calls associated with the UPT user at this access point (UPT originating calls or incoming UPT calls) from other calls involving this access point so as to be able to treat specific service requests or supplementary services or features appropriately. For example, differentiating between an incoming UPT call versus an incoming ISDN call to correctly apply Call Forwarding Busy. Therefore, it is recommended to:

  – include a UPT indicator in signalling messages (ISDN and SS No. 7) associated with a UPT call;
  – include associated UPT service indicators and parameters (like called UPT number) in signalling messages (ISDN and SS No. 7) where appropriate;
  – associate a UPT identifier in the controlling exchange with active UPT calls in progress (incoming or outgoing) to enable differentiation between the two call types (UPT and non-UPT) for proper feature treatment.

  An important additional consideration is that some service features may be provided remotely, i.e. not directly in the local switching exchange, and such arrangements must be accommodated.

6.3 Network transport of identities

When a UPT user is originating a call from a wireline terminal, the identity of both the calling line number and the calling UPT user, should be passed from the originating to the terminating end of the network. Similarly, when a UPT user receives an incoming call at a wireline terminal, both the identity of the terminating line number and the called UPT user, should be passed across the network(s) from the terminating to the originating end. These may be necessary to support public safety requirements, e.g. emergency calls, and some supplementary services, e.g. CLIP and COLP.

In some cases, the identities will be delivered to an authorized end user, e.g. an emergency centre, and in some cases the information will not be passed beyond the network entities. Note that the transport of line and user identities may be subject to national regulations.

If a wireless terminal is involved, then the terminal address will replace the line number.

As part of the PLMN service, terminal location information will be available, e.g. for emergency centre use.

7 Requirements on UPT networks

This clause contains the interworking requirements for UPT supporting networks based on the capabilities of IN CS-1 and CS-2 standards. It includes the network entities that are engaged during the user-network interaction phase of a UPT procedure in a UPT environment[1], consisting of the originating network, the home network(s), and the terminating network. The UPT supporting networks for this study are PSTN, ISDN and PLMN.

CS-2, as incorporated into the ITU-T IN CS-2 Recommendations, provides enhancements of inter(net)working and inter-process communication capabilities compared to the CS-1 description. The additional capability provides the UPT service provisioning with richer set features and enables the UPT service providers with more efficient implementation. This requirement part addresses the additional UPT features that can be offered, and explores procedures required for their implementation. This clause also addresses requirements for the backward and forward compatibilities of the two CS-1-based and CS-2-based UPT supporting networks for interworking.

The UPT service is meant to be universally available to and accessible by its subscribers/users. Its capabilities may be simplified and broken down into three parts: an originating capability, a terminating capability, and an interworking capability. This part deals with the interworking capability, which enables different UPT service providers' networks to interwork to complete a UPT service call. In the telecommunications industry, competition is gradually becoming the norm and monopoly the exception. The key to a successful and effective provisioning of the UPT service in such a competitive telecommunication marketplace of the near future, and in a universal manner is interconnect agreements, interworking relationships, and interface protocols among the participating networks and/or service operators to provide UPT service[2].

All UPT procedures addressed in this part are associated with a call to be set up across all voice networks (e.g. PSTN, ISDN and PLMN) providing telephony (i.e. voice-grade connection) service. The participating networks may be in one or more of the following states:

- incumbent or new entrant;
- fixed or mobile;
- local, national or international.

A UPT service provider/operator may be responsible for the provision of particular UPT services and their associated database management across one or more of these networks. To support the UPT service in a multi-network environment, each participating network should have the functional capability of relating all call specific information and all routing and charging data to the identity of the UPT service subscriber/user. It should also provide the users the freedom to move between

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[1] As described in ITU-T F.851 [2], the UPT Environment is defined as a telecommunication infrastructure within which the facilities of the UPT service are offered. It consists of combinations of networks and UPT service control facilities, when combined, enable the UPT user to make use of the telecommunication services offered by these networks.

[2] The participating network/service operator is introduced here to define a network/service operator that provides UPT services in coordination and agreement with others within a UPT environment.

terminals across multiple UPT supporting networks as defined in the introduction of this Recommendation.

It is assumed that each UPT supporting network in a multi-network environment provides the required "terminal and user mobility" within itself. It is further required for each UPT supporting network to be capable of communicating with other UPT supporting networks in order to provide global mobility within the UPT environment[3].

7.1 Scope of interworking

7.1.1 CS-1-based

For a UPT user calling a non-UPT user, once the outbound features and authentication of the caller had been processed, the call will be simply an ordinary inter-network call. In processing the UPT procedures of a call, when the caller has roamed, there are two cases that can take place as follows:

- a non-UPT (supporting) originating network can route the call to the calling party's home network where it will be processed using the caller's service profile and then routed to the called party, terminating network, or
- a UPT (supporting) originating network can query the calling party's home network database, obtain necessary data, and handle the call using its own service control function capabilities by routing the call to the called party, terminating network.

This clause deals with the second case when all networks involved for setting up and completing the call are either UPT network or UPT supporting networks. Distinct voice networks are considered in this clause, PSTN, ISDN and PLMN, as specified in the Service Set One, ITU-T F.851 [2]. The requirements for support of the UPT service by each of these networks (individually and independent of the others) are presented in the other clauses of this Recommendation. The interworking requirements are defined to perform procedures required for providing only those UPT features (see ITU-T F.851 [2]) that can be supported based on the INAP CS-1 as listed in the following two categories:

Essential Features

- UPT User Identity Authentication;
- InCall Registration;
- Outgoing UPT Call.

Optional Features

- Remote InCall Registration;
- OutCall Follow-on;
- Global Follow-on;
- UPT-specific indications;
- UPT service Profile Interrogation;
- UPT Service Profile Modification.

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[3] To the UPT user, the UPT environment appears as one global network which provides Personal Mobility. However, when making use of telecommunication services, the UPT user may be limited by the capabilities of the terminals and networks used, or by the regulatory requirements. In clauses to follow, every UPT service feature is studied in the context of the UPT environment and within the scope of the interworking requirements.

7.1.2 CS-2-based

The interworking requirements for this clause (CS-2-based) are defined to perform procedures required for providing those UPT features (see ITU-T F.851 [2]) that cannot be supported by the interworking requirements based on the CS-1 protocols. Tables 1, 2 and 3 below summarize the service features that can be supported by the IN CS-2 standards:

Table 1/Q.1521

Supported UPT Features	CS-1	CS-2
User Identity Authentication	Essential	Essential
InCall Registration	Essential	Essential
Outgoing UPT Calls	Essential	Essential
InCall Delivery	Essential	Essential
Remote InCall Registration	Optional	Optional
Outgoing UPT call follow-on	Optional	Optional
Global follow-on	Optional	Optional
UPT-specific indications	Optional	Optional
UPT service profile interrogation	Optional	Optional
UPT service profile modification	Optional	Optional

Table 2/Q.1521

Supported UPT Features	only CS-2
OutCall Registration	Optional
Remote outgoing UPT Registration	Optional
AllCall Registration	Optional
Remote AllCall Registration	Optional
Linked Registration	Optional
Remote Linked Registration	Optional
Multiple Terminal Address Registration	Optional
Call Pick Up	Optional
Variable Default InCall Registration	Optional
Intended Recipient Identity Presentation	Optional
Access to Groups Service Profiles	Optional
UPT Service Assistance	Optional
Called Party Specified Secured Answering of Incoming UPT Calls	Optional
UPT Service Provider Authentication	Optional

Table 3/Q.1521

Not supported UPT Features	CS-1 & CS-2
UPT service provider authentication	Optional
Reset of registrations for incoming UPT calls	Optional
Exemption of UPT registrations	Optional
Blocking/deblocking of registrations for incoming UPT calls	Optional
Blocking/deblocking of incoming UPT calls	Optional
Reset of registrations for outgoing UPT calls	Optional
Suspension of registration for outgoing UPT calls	Optional

7.2 Functional architecture for interworking

7.2.1 CS-1-based

Figure 2 below presents a functional architecture "reference model" for interworking among three different networks supporting UPT services based on the CS-1 functional architecture. It includes all the Functional Entities (FEs) affected by a UPT user's call. The affected FEs are CCAF, CCF, SSF, SCFo, SDFo, SRF, SDFh and SMF.

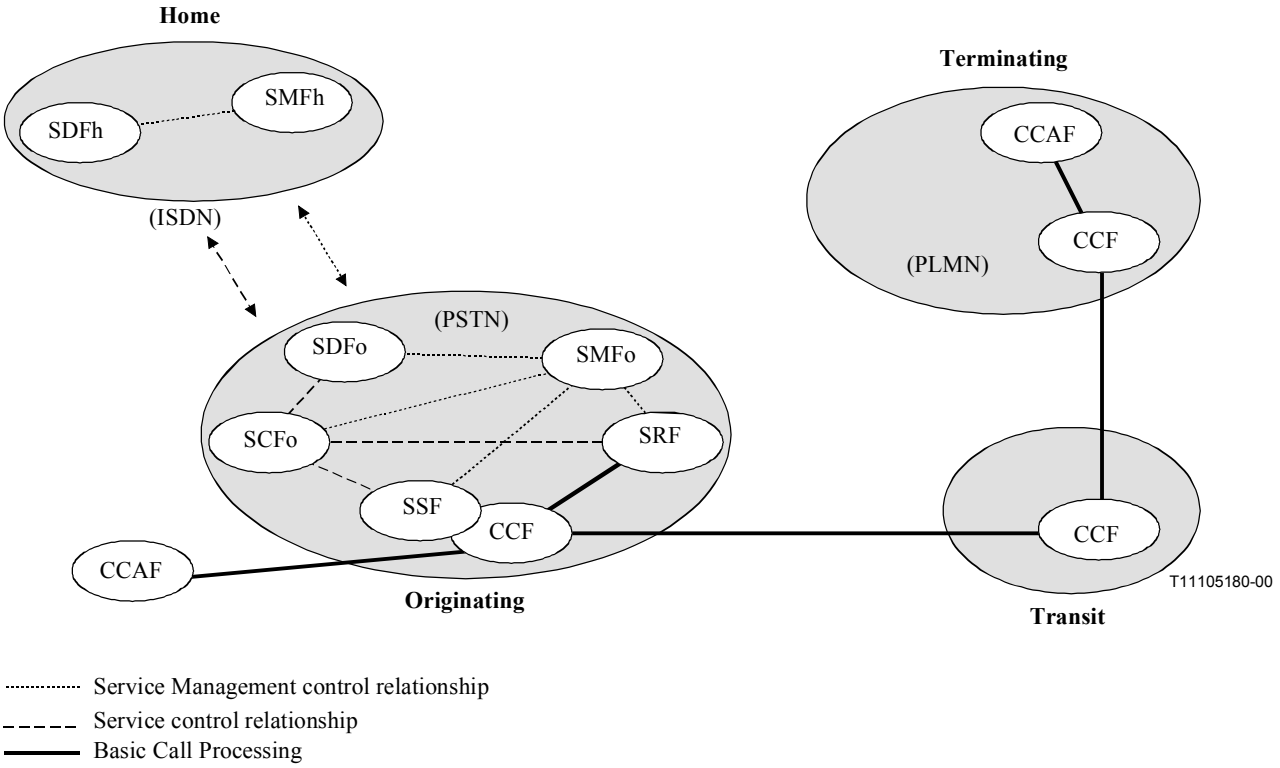

Figure 2/Q.1521 – CS-1 functional architecture of UPT supporting networks

Aside from the non-impacting **transit** network(s), each of the remaining three participating networks in the figure above is designated to have distinct functional characteristics as either ISDN, PSTN or PLMN with distinct geographical designations as either **originating network (ON), terminating network (TN)**, or **home network (HN)**. The geographical designations, however, may rotate as the UPT user roams within the UPT environment, changes subscription from one participating network to another, and/or makes calls to called parties at different terminating networks. The home network

designation of the figure above may be for the calling party's home network, the called party's home network, or both.

As long as we assume that all three functionally different networks are provisioned with the same set of UPT support capabilities, there is no need for differentiating their interworking architectural models. Hence, one model regardless of the geographical designation of the UPT supporting networks would be sufficient. However, if these three networks have their IN components built-in differently, then study of different scenarios would be warranted.

7.2.2 CS-2-based

Figure 3 below presents a functional architecture "reference model" for interworking among three different networks supporting UPT services based on the CS-2 functional architecture. It includes all the Functional Entities (FEs) affected by a UPT user's call and its corresponding procedures. The affected FEs are CCAF, CCF, SSF, SCFo, SDFo, SRF, SCFh, SDFh and SMF. The new required interfaces in CS-2 are SCFo ⇔ SCFh and SDFo ⇔ SDFh; the CS-1 interface SCF ⇔ SDF is still valid.

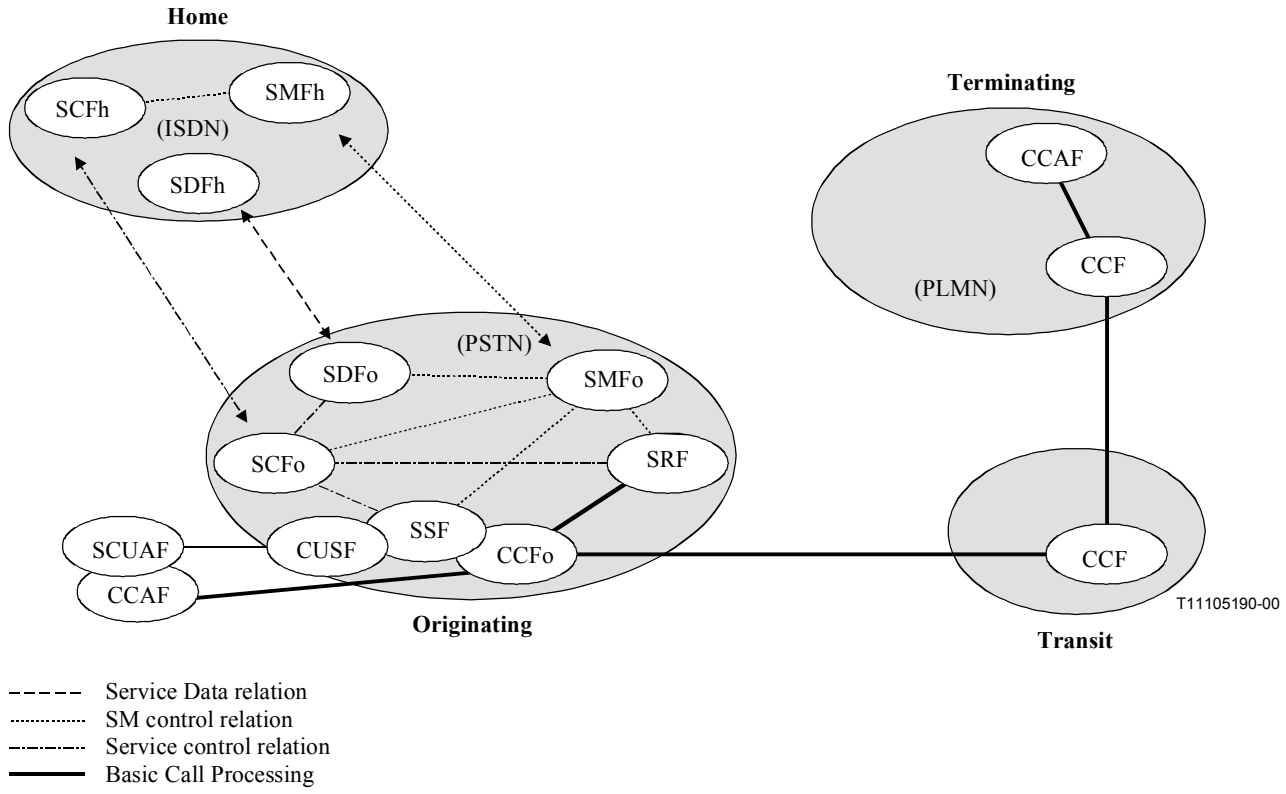

Figure 3/Q.1521 – CS-2 functional architecture of UPT supporting networks

7.3 Interworking – Requirements

7.3.1 CS-1-based

In a UPT environment and for a complete end-to-end UPT call cycle, user-to-terminal-to-network-to-network-to-terminal-to-user, the participating networks should comply with two sets of requirements. They are intra-network and inter-network requirements. The intra-network requirements, which relate to the user-to-terminal-to-network, have already been identified in other clauses of this Recommendation. A summary listing of these requirements, to the extent that they fall within the scope of the interworking study, is given in the Assumptions clause below.

7.3.1.1 Assumptions

It is assumed that a UPT environment fulfils the following intra-network UPT service requirements/objectives on its UPT network or UPT supporting network by offering:

– a minimum of one UPT service provider associated with the originating UPT network;

– a UPT number for uniquely identifying the UPT user, coupled with a personal identifier for security and management purposes;

– a UPT subscription with option to subscribe to multiple users/numbers;

– a personalized UPT service profile associated with each UPT user;

– a charging scheme associated with the UPT number;

– an IN platform on UPT network;

– a set of terminal independent UPT services, i.e. "the terminal, if capable of providing the services requested by the UPT user, will make them available to the UPT user" (see 2.1 e)/F.851 [2]);

– a security mechanism for protecting service subscriber/user's resources from fraudulent use of user identity and personal identifier, eavesdropping or unauthorized tapping during communication, and fraudulent or unauthorized access to user's service profile.

The key functionalities for the three categories of networks (ON: originating, HN: home, and TN: terminating) to support the UPT service with the above listed requirements/objectives for each of the UPT supporting and/or participating networks are as follows:

– ON: UPT service and number recognition;

– ON and HN: support of user registration and authentication;

– HN: UPT number translation into routing number (or route call to the exchange where the number can be translated);

– ON, HN and TN: mobility management if the corresponding network is PLMN;

– ON and HN: user service profile management (interrogation and modification);

– ON, HN and TN: personal billing (based on UPT number).

No further discussion of the aforementioned requirement and functionality classes will be presented in this clause. In other words, it is assumed that all these requirements and functionalities are supported on each participating network of the UPT environment.

7.3.1.2 Requirements

The inter-network requirements set, however, is treated as the new set of requirements for interworking among UPT supporting networks, and will be discussed in this clause in more detail. With respect to the interworking among the UPT supporting networks, the following inter-network requirements/objectives are identified:

1) **Universal access availability**: functional capability of the UPT supporting networks to provide the UPT service accessibility to the users who may use the same UPT number across multiple networks. Furthermore, the UPT Number (UPTN) should not become disabled on global basis, i.e. from any fixed or mobile terminal and across all UPT supporting/participating networks. As the originating network changes, when the user roams within the UPT environment from one network to another, it is absolutely essential for the user to be able to access and use UPT facilities at any terminal across the networks in the same manner.

2) **User interface similarity**: UPT service subscribers/users should be provided with the same user interface across all participating networks. A UPT user, travelling across different network/service operators' jurisdiction areas, expects to dial the same UPT access code/number and perform the same UPT procedures (e.g. InCall registration)[4].

3) **Universal service availability**: the same UPT services available to the users on their home network, may be available to users wishing to make a UPT call from a visited UPT supporting network only limited by the limitations of networks and terminals used (see 1.2 i)/F.851 [2]).

4) **API dependent routing**: the functionality to allow the verification of an Access Point Identity (API) input (i.e. a CLI) from the user and the conversion of the API into a routing address. It should allow association of an API and a service/capability.

5) **Security procedures/Authentication mechanism**: the UPT user may use the service across the networks with a high degree of data security and a minimal risk of losing privacy or receiving erroneous charges due to fraudulent use.

6) **Subscriber information security**: requirements are desirable to provide subscriber information security, a competitive conscious security mechanism for protecting some user information from being accessed by the user's home network's competitors. This is separate from the information that is necessary for interworking (e.g. routing number). Security of subscriber information is a very important factor in UPT, and as such should be kept only in the user's/service subscriber's network and not to be transferable to other networks.

7) **Terminal equipment/Subscription devices**: as the UPT service requires network and terminal independence, the requirements for interworking should also provide for complete user mobility when roaming across the supporting networks. Therefore, a UPT user should be able to register at any terminal for making or receiving calls. The terminal at the originating network should also provide privacy for the third party (the terminal owner).

8) **Performance and reliability**: the signalling traffic involved in UPT services is expected to be extremely high because of activities such as database queries, updates, and registrations/deregistrations. Together with the possible involvement of several networks (originating, home, and terminating), the performance aspects of the UPT supporting network call set up time, reliability, and response time, have to be considered carefully[5].

9) **Information flow/Database functionalities**: functionalities are needed to provide information flow capability to execute network functions related to the following classes:

- access Point;
- personal Identifier;
- inter-network Agreement;
- user Authentication;
- call Control;
- registration;
- service profile management;
- services provisioning;
- charging;
- O&M;

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[4] While this feature is highly desirable, it should not preclude using a different UPT Access Number in a different network in the Service Set 1 phase.

[5] It is desirable to define Grade of Service (GoS) for UPT related to UPT services.

- user interaction.

In a more detailed description of these functionalities, it might be more desirable to define the functionality split among the three categories of participating networks: ON, HN and TN.

10) **Simple billing**: a UPT user making use of its subscribed UPT services across multiple networks may receive bills only from the home network's UPT service provider (one-stop shopping). Furthermore, this requires inter-change of billing/charging information among the participating networks.

11) **Inter-network facility engagement**: disengaging inter-network resources to the maximum extent possible during the UPT user-network interactions without impacting availability and/or quality of the service. This requirement calls for capabilities for routing optimization as well as network equipment data reconfiguration.

12) **Backward compatibility and expandability**: many existing telecommunication service operators are already providing some category of primitive UPT capabilities. Also, the future UPT service is expected to materialize over a period of time via an evolutionary path, with a simplified set of essential and optional features and progress into more advanced features. Therefore, the backward compatibility and expandability of any interworking is required. This requirement should allow participation of UPT supporting networks which may support different levels of compliance with the interworking requirements.

The UPT services/features supported in this UPT environment will consist of the intersection of the sets of services/features supported by the participating networks.

7.3.2 Compatibility requirements between CS-1 and CS-2

When these phase 2 interworking requirements of CS-2-based are deployed in UPT supporting networks, not all phase 1 UPT supporting networks (meeting CS-1-based interworking requirements) will necessarily be upgraded to phase 2 capabilities. Therefore, it will be necessary to ensure interworking compatibility among all phase 1 and phase 2 networks. This includes both forward and backward interworking compatibilities. These interworking requirements are addressed in this clause.

7.3.2.1 Case of the use of the SCF-SCF interface

The main enhancement proposed by this interface is the possibility offered to the SCF to help each other. For example, the SCFh could play the role of an assisting SCF for the SCF of the originating network if the SCFo is not able to offer the whole functionalities related to the service profile of the user. As a consequence, complex service interaction scenarios might be offered (as multipoint services or services offered in a preferred language). The transfer of data (service profile) could be proposed too, from a SDFh to a SDFo, thanks to SCFh and SCFo. Consequently, the main requirements for the SCF and SDF in phase 2 are the following ones:

– the SCF will have the capabilities to exchange information with other SCF. The interconnection protocol will have to be defined;

– related to the former requirement, the SCFh will be responsible for some part of the control of the access to the data of the service provider (all of it or perhaps in an end-to-end phase 2 scenario), which was the role of the only SDFh in phase 1. This responsibility will have to be kept in mind;

– in UPT phase 2, SDFh performs the authentication of a UPT user, data control access, checks related to the service profile (credit limit, subscribed services, etc.) upon request from the SCFo or the SCFh. Due to this addressing by its SCFh, the requirements on the SDFh could be left to the service provider. But when directly addressed by the SCFo, it will have at least the same capabilities as in phase 1.

7.3.2.2 Case of the use of the SDF-SDF interface

This interface enables an easier transfer of data (transfer of service profiles for example) between different networks. Because of this possibility to distribute data, the SDF will have to be more than simple data repositories. They will have to be able to perform access control on the SDF-SDF link, and provide location and replication transparency. In other words, SDF requires new functionalities to perform the stated tasks.

New functions for SDF

The new functions are related to the transfer of data: copy, store, and delete data. These functions will work together with other SDF functions such as data consistency and access control functions.

7.3.2.3 Evolution from SCF-SDF interface

For the time being, the CS-2-based requirements for interworking consist of the coexistence of the three interconnections: SCF-SDF, SCF-SCF and SDF-SDF interfaces.

If we look at the evolution from the phase 1 to the phase 2 UPT interworking requirements, four interconnection scenarios appear, each one having its own requirements. In these scenarios, presented below, we consider that the "Phase 2 UPT Supporting Networks" have to interwork with the "Phase 1 UPT Supporting Networks". There will be a coexistence between heterogeneous networks: networks evolve neither in the same way nor at the same time. Some will be based on CS-1 and others on CS-2. This implies that SCF and SDF in the phase 2 UPT Supporting Networks will have capabilities to cope with the CS-1-based functionalities of the phase 1 UPT Supporting Networks.

7.3.3 Scenario 1

In this case, two phase 1 UPT Supporting Networks are involved. For this scenario no modification is required (see Figure 4).

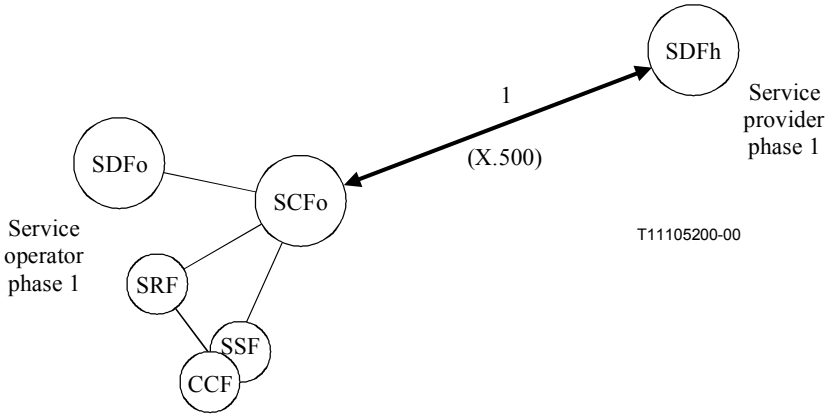

Figure 4/Q.1521 – SCF-SDF relation and UPT phase 1 to UPT phase 1 supporting networks

7.3.4 Scenario 2

In this case, the originating network is a phase 1 network while the home network (service provider) is a phase 2 network. The SCFo will address the home network thanks to the X.500 protocol, having in mind that it is talking to a SDFh (phase 1 configuration). Consequently, the phase 2 home network will give the address of its SDFh to the originating phase 1 networks and, as a consequence, have a phase 2 SDFh having at least the same capabilities of a phase 1 SDFh, that is to say the capability to control the access of a SCFo to the data, the X.500 interface (see Figure 5).

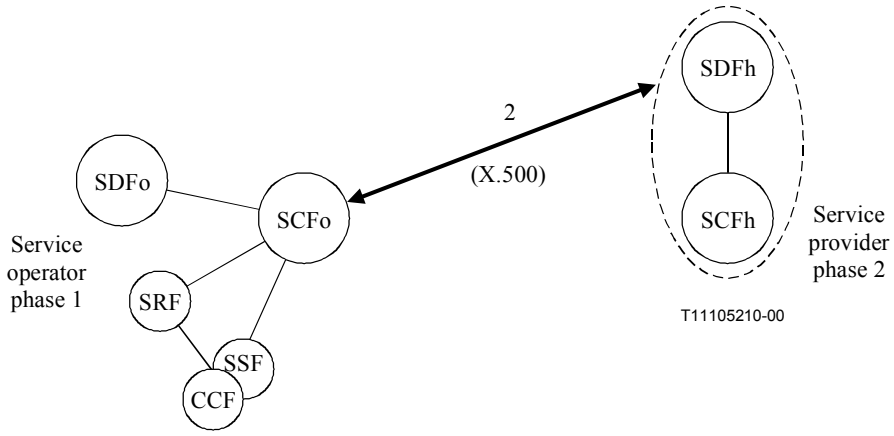

Figure 5/Q.1521 – SCF-SDF relation and UPT phase 1 to UPT phase 2 supporting networks

7.3.5 Scenario 3

In this case, the originating network is a phase 2 network while the home network is a phase 1 network. The SCFo will have to address the home network thanks to the X.500 protocol (since this SDFh is phase 1) (see Figure 6).

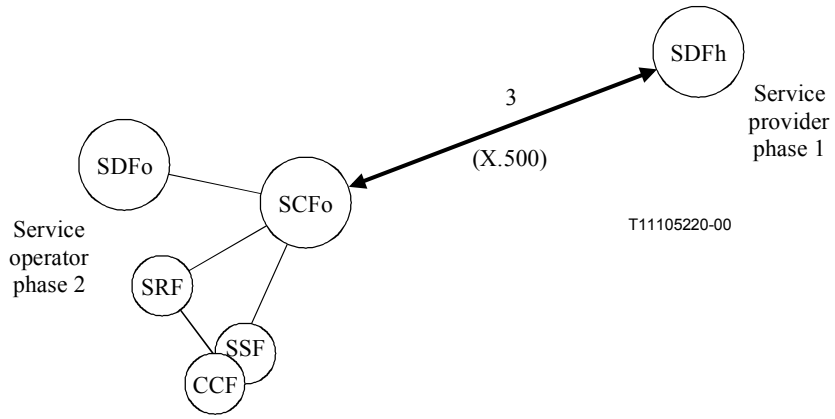

Figure 6/Q.1521 – SCF-SDF relation and UPT phase 2 to UPT phase 1 supporting networks

7.3.6 Scenario 4

In this case, the originating network and the home network are phase 2 networks. The SCFo will address the home SCF thanks to the SCF-SCF protocol, protocol that enables the SCFo to ask the SCFh to assist him or it will address the SDFh with X.500. Besides, the SDF-SDF interface may be used for data transfer (see Figure 7).

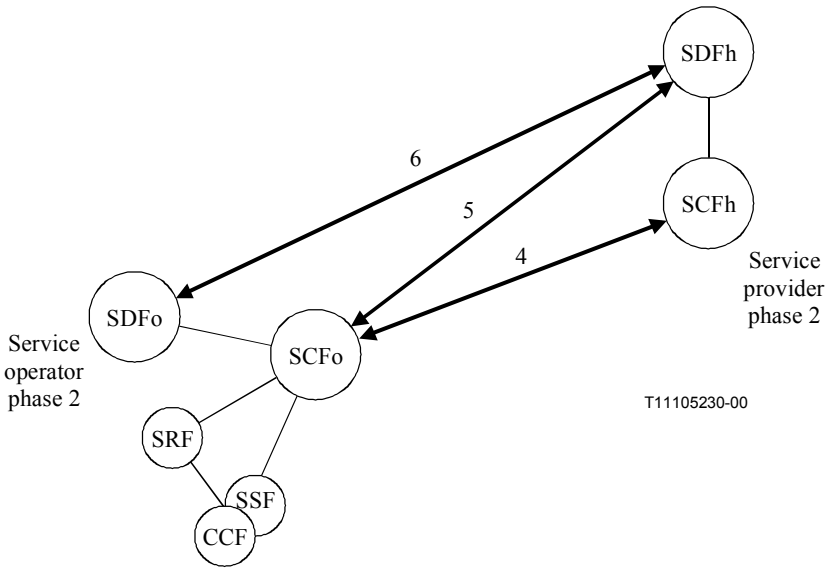

Figure 7/Q.1521 – SCF-SDF relation and UPT phase 2 to UPT phase 2 supporting networks

7.3.6.1 Conclusion

The main requirements for compatibility are summarized below:

- the phase 1 functionalities do not have to change;
- the phase 2 SCFo must have the same capabilities as the phase 1 SCFo to address the phase 1 SDFh directly by X.500 when needed; moreover, they must have supplementary capabilities (related to UPT phase 2) to request assistance from another SCF;
- the phase 2 SCFh must have the capabilities to interrogate their SDFh, to be an assisting SCF for a SCFo; it seems logical that only one interface is used between SCF and SDF: the CS-1 interface, X.500, would be acceptable. However, some functions may be simplified between SCFh and SDFh (inside the same network), for example the access control;
- the phase 2 SDFh must have at least the capabilities of the phase 1 SDFh, because of the possible case of a direct query from a SCFo (which could be a CS-1 or CS-2 SCF). Besides, the use of SDF-SDF must be taken into account.

In order to be able to face all these possible scenarios, the originating network should be able to know which kind of network is the other one, i.e. phase 1 or phase 2. Ideally, this information should be available to the SCFo. It could be stored in the SDFo, with mutual agreement on the data to be stored. However, the maintenance of this information in SDFo is very difficult, which implies that each service provider informs the partners on the evolution of his network. And if there are several equipments in one network, they may be at different levels of upgrade/evolution. Even though the focus of this Recommendation is on CS-1 to CS-2 evolution, the approach will be the same with later phases.

7.3.7 Future requirements

Due to the phased formation of the UPT standards, there will be a great deal of detailed as well as additional UPT interworking requirements to be studied in the future. This clause outlines some thoughts on these future works. These work items may also be divided into two groups:

– standardization work items;

– implementation work items to be left to the network operators or service providers to deal with.

7.3.7.1 Networks inherent capabilities

In this Recommendation, the inherent functional capabilities of the participating networks, PSTN, ISDN, PLMN, etc. did not play a role in supporting the interworking requirements. However, specific functional characteristics of each participating network may facilitate the interworking in some of the cases. Below, two cases of PLMN and ISDN networks are mentioned for examples.

7.3.7.1.1 ISDN network

When an ISDN network becomes the originating network, it provides the ISDN terminal access which provides greater efficiency in usage of network resources. Several UPT procedures such as registration and authentication may be conducted without setting up the B-channels connectivity. These procedures can be conducted via user recognizing registration conditions by an ISDN terminal with display feature. An example of such capability is the use of SCUAFo <==> CUSFo communication. In this case, the improvement is on the User-Network Interface (UNI) side. However, there might be some use of the network capabilities to enhance the interworking aspect.

7.3.7.1.2 PLMN network

In a PLMN network, the terminal mobility is implemented by using Location Registers (e.g. HLR and VLR), the databases that provide the switching system with routing information on the location of the mobile station. Hence, the interconnections among SCP/SDP of an IN capable UPT capable network and the HLR/VLR of a PLMN, HLR/VLR <==> SCP/SDP interface, can facilitate the interworking and flow of information. In such a case, the interface protocol selection will also be for further study in one of the following ways:

– either the INAP protocol on the SCF/SDF side must be enhanced to support the interface to HLR/VLR;

– the protocol on the HLR/VLR side must be enhanced to support the INAP interface to SCF/SDF; or

– both INAP and HLR/VLR protocols will be modified to support such interworking.

7.3.7.2 Competitive conscious model

The SCFo-SCFh and SDFo-SDFh interface represents that the service logic in SCFh and/or the user data in the SDFh can be accessed by their counterparts in the visited (originating) network. This is a direct access, which may invoke security concerns over the competitive nature of the service subscriber's data. One possible answer to this issue might be a competitive conscious functional architecture model and interface requirements. While such measures will facilitate a multiple UPT supporting network environment, it can also provide some control over the security aspect of the UPT users data.

7.3.7.3 Dual home networks model

The geographical designation of the home network addressed in the functional architecture clause of this Recommendation corresponds to the case of a single UPT user. In the case where two UPT users (calling and called) are involved, two home networks (calling and called parties' home networks) should be included in the functional architecture and in the set of requirements.

7.3.7.4 Optimal routing

A study of the optimum route(s) may be warranted. For example, when two UPT users are visiting the same network, and calling each other in the same visited network. In this case, the originating and terminating networks may become one. With the objective of maximizing savings of resources, the optimal routing requirements may substantially reduce the call set up time (and charging rate) and change the routing path. This could be possible thanks to the triggering capability of the same SSF for both UPT to UPT calls, the outgoing call made by the first UPT user becomes the incoming

call to the second UPT user. Also, the same SCF to be in control of service processing for both calls (this implies that the UPTN should not be a national number).

7.3.7.5 Inter-network facility engagement

In the current treatment of an inter-network IN call, inter-network facilities are being engaged during the user-network interaction phase to establish voice paths between a caller in the originating network and an SRF which could be residing in any of the "participating networks". This is a question of Intelligent Peripheral (IP) assist/handoff where caller's language is different from the announcement languages available on the originating network's SRF.

7.3.7.6 Multi-networks agreement

When a UPT user's home network, network A, has interworking agreement with network B, and network B, in turn, has interworking agreement with network C, will network A and network C interwork and will network C provide the UPT user the services/features he/she is subscribed to? One possible scenario to be considered is to have the UPT user registered on network B while maintaining its subscription with network A. In such a case network B plays the role of a surrogate home network.

7.3.7.7 VHE

When VHE is available, whose principles are similar to UPT from the user point of view, it will be a very good way to override some of the supporting network limits.

8 Requirements on the local exchanges

8.1 Originating local exchanges

In order to offer the UPT service, the OLE (Originating LE) in the visited network shall not prevent network access to a UPT user unless the terminal owner has restricted it deliberately. The OLE shall be able to recognize the UPTAC (UPT Access Code) and set a UPT mark for any ongoing UPT activity. This will mainly label an ongoing UPT process at the OLE.

8.2 Terminating local exchanges

In order to offer the UPT service, the TLE (Terminating LE) in the visited network shall not prevent network access to a UPT user unless the terminal owner has restricted it deliberately. On the destination side (e.g. incoming calls), the TLE should be able to distinguish between UPT calls and non-UPT calls in order to deal with the interaction between the access owner-based services and the UPT service (e.g. inhibition of one or the other). Therefore, a UPT indicator with associated service indicators will have to be provided in the network signalling to unambiguously recognize a UPT call.

The principle of these indicators is as follows:

– it is up to the SSF/SCF to properly manage the UPT indicator and the associated service indicators. When a call is destined to a UPT party, the SSF/SCF will set the UPT indicator in the IAM message before routing it towards the called party. If any specific supplementary service is also active for that destination UPT user (e.g. call waiting active), the related service indicator will also be set in the IAM message. Of course, these indicators need not be set for non-UPT terminating calls;

– on the destination side, on receipt of an incoming call, the TLE will first check the state of the UPT indicator. If that state indicates a UPT call, the call will be marked as such in the TLE and the access owner-based supplementary services provided to the access owner will be modified during that UPT call. If an associated service indicator is set, the TLE will directly invoke that active service for the UPT user (e.g. call waiting will be invoked for a

new incoming UPT call at the TLE on detection of a busy condition of the UPT called party).

To support feature interaction with UPT, the main requirement is on the destination local exchanges (which is where supplementary services mostly apply) which should be able to recognize and react to the different indicators.

9 Requirements on the transit exchanges

9.1 National exchanges

No impact on call handling process. There is however a requirement that the TE shall relay all the signalling messages contents transparently from end to end.

9.2 International switching exchanges

No impact on call handling process. There is however a requirement that the exchanges shall relay all the signalling messages contents transparently from end to end.

10 Feature interactions

10.1 UPT feature set

The term features refers to those UPT features that are specified by ITU-T F.851 [2] as Service Set 1 for initial implementation, as well as Supplementary Service features listed in ITU-T F.853 [7]:

- those features associated with the terminal/access location at which the UPT user has registered;
- those features associated with the far-end party which may impact the end that is being analysed;
- and those features associated with the existence of any call in the supporting network environment.

10.1.1 Essential UPT features

1) **UPT user identity authentication**: a feature by which the UPT service provider verifies that the identity of the UPT user is the one claimed. It protects the UPT user and the UPT service provider against unauthorized and fraudulent use. This feature may be used in each UPT procedure.

2) **InCall registration**: a feature that enables the UPT user to register from the current terminal address for incoming calls to be presented to that terminal address. When registered, all incoming calls to the UPT number of the UPT user will be presented to the registered terminal address, for the duration specified by the UPT user (duration may also be specified in terms of number of incoming UPT calls), or until a specified deregistration time. A UPT user's InCall registration will cancel any previous InCall registration of that UPT user's UPT number. Several UPT users may register for incoming calls to the same terminal address simultaneously. The UPT user may also explicitly deregister for incoming calls.

3) **InCall delivery**: a feature by which incoming calls are presented at the terminal address registered previously by InCall registration. This feature is invoked when originating parties or others call the UPT user.

4) **OutCall registration**: a feature that allows the UPT user to register for outgoing calls from the current terminal address to allow outgoing calls to be made from that terminal address. When registered, upon accessing the UPT facilities, all outgoing calls can be made from that

terminal address for the duration specified by the UPT user (duration may also be specified in terms of number of outgoing calls), or until a specified deregistration time. Outgoing UPT calls will be charged to the UPT subscriber. Normally, the UPT user will not have to carry out any further authentication procedures in order to make outgoing calls. However, optionally a simplified authentication procedure may be used. A UPT user may register for outgoing calls at several terminal addresses simultaneously, but at any time only one UPT user/number may be registered for outgoing calls at the same terminal address.

5) **Outgoing UPT call**: a feature by which the UPT user can initiate, from any terminal, an outgoing UPT call attempt. This feature requires the UPT user identity authentication feature for each outgoing UPT call attempt.

   The underlying PSTN/ISDN/PLMN must ensure that any charging associated with this call is correctly associated with the UPT user and not the owner of the access. This may be done in cooperation with the UPT environment.

10.1.2 Optional UPT features

1) **Remote InCall registration**: a feature by which a UPT user registers from any terminal address for incoming calls to be presented to any other specified terminal address.

2) **Remote OutCall registration**: a feature by which a UPT user registers, from any terminal address, for outgoing calls to be made from any other specified terminal address.

3) **OutCall follow-on**: a feature by which the UPT user, when terminating an outgoing UPT call, indicates that another outgoing UPT call is to follow, without the need for further authentication. This implies that the following call is to be automatically associated with the UPT user for charging purposes.

4) **Global follow-on**: a feature by which a UPT user, when terminating a UPT procedure (for which successful authentication has been carried out), indicates before disconnecting completely, a follow-on activity.

5) **AllCall registration**: this feature enables the UPT user to make an InCall registration and an OutCall registration to the same terminal address using a single procedure. The effect of an AllCall registration is as if Incall and OutCall registrations had been carried out separately for the duration specified by the UPT user (duration may also be specified in terms of number of incoming and/or outgoing UPT calls), or until a specified deregistration time. The UPT user may also explicitly deregister AllCall unlike Linked registration, the UPT user can explicitly deregister the InCall registration or OutCall registration separately.

6) **Remote AllCall registration**: this feature enables the UPT user to make a remote InCall registration and a remote OutCall registration to the same terminal address using one single procedure.

7) **Linked registration**: as for the AllCall registration feature, the use of this feature combines the registrations for incoming and outgoing calls for the current terminal address in a single procedure. However, unlike AllCall registration, a Linked registration cannot be overridden in all or in part by:

   – InCall, remote InCall, AllCall or remote AllCall registrations by the same user;

   – OutCall, remote OutCall, AllCall, remote AllCall, Linked or remote Linked registrations by other UPT users.

   The UPT user must explicitly deregister a Linked registration, or override it by another Linked or remote Linked registration.

8) **Remote Linked registration**: a feature by which a Linked registration for one specified terminal address can be carried out from another terminal address.

9) **UPT-specific indications**: a set of UPT-specific user-friendly standard announcements or indications (e.g. for support of specific charging arrangements) is provided.

Such announcements place a requirement on the underlying network to supply them and to be aware of when to play them. As mentioned above, some features including announcements, could be provided remotely and not necessarily in the local switching exchange.

10) **UPT service profile interrogation**: this feature allows the UPT user to interrogate (read only) the current status of the UPT user's own UPT service profile (e.g. for location information, availability of services).

11) **UPT service profile modification**: this feature enables the UPT user to modify (read and write) the UPT user's own UPT service profile (e.g. for change of password, change of default UPT service profile parameters).

12) **Multiple terminal address registration**: this feature enables the UPT user to simultaneously register multiple terminal addresses for incoming and/or outgoing calls.

13) **Call Pick Up**: a feature by which the UPT user answers an incoming UPT call at another terminal access different from the terminal access(es) specified by the InCall registration (for example if the UPT user is alerted on a paging network). Call Pick Up always requires authentication when answering the call.

14) **Variable default InCall registration**: a feature by which the UPT user sets up a default registration matrix of terminal addresses for incoming UPT calls so that incoming UPT calls could be routed and handled differently (directed to a default address or cleared) according to time of day, day of week, calling party's identity, service type, the number dialled, and for "on no answer" and "on busy" conditions. This matrix can be modified by the UPT user. This feature would enable a UPT user with a regular travel routine or schedule to set up a "timetable" matrix.

As mentioned above, this would require the underlying PSTN/ISDN/PLMN to support such variable call treatment although it is the IN/UPT environment that supports this specific variability and supplies the proper routing address to the PSTN/ISDN/PLMN.

15) **Intended recipient identity presentation**: a feature by which the identity of the intended recipient (UPT number or name, etc., specified by the called UPT user) is presented on the alerting terminal.

This feature requires that the underlying network and the terminal equipment support some form of ID display. Note that the called UPT number must be carried from the originating network to the terminating network as a new parameter in the Initial Address Message (IAM).

16) **Access to groups of UPT service profiles**: this feature enables the UPT subscriber (or authorized UPT user) responsible for a group of UPT users, to access, create, interrogate, and modify their UPT service profiles using UPT service profile management procedures.

17) **UPT service assistance**: a feature by which a UPT user can contact a UPT service centre (e.g. an operator) to invoke UPT procedures in case where automatic UPT procedures are unavailable or in cases of difficulty.

18) **Called party specified secure answering of incoming UPT calls**: a feature by which the UPT user specifies that incoming UPT calls cannot be answered unless the answering party first successfully authenticates as the called UPT user.

This is a definite requirement on the underlying network to not simply accept the answering of a call/lifting of a handset as sufficient for call completion. The additional step of authentication, however, may actually be provided by the UPT environment rather than the underlying network. Note that the called UPT number must be carried from the originating

network to the terminating network as a new parameter in the Initial Address Message (IAM).

19) **UPT service provider authentication**: a feature by which the UPT user can verify that the UPT service entity is the one claimed. With some authentication procedures, it will be provided automatically together with the user identity authentication.

10.1.3 UPT Supplementary Services

Following is the list of UPT supplementary services from ITU-T F.853 [7] "Supplementary Services in the UPT Environment". If there are any charges associated with invoking any of these supplementary services, care must be exercised that such charges are correctly associated with the proper invoking agent, i.e. the UPT user.

1) **Call Forwarding on terminal Not Reachable (CFNRc)**: this supplementary service provides the UPT user with the ability to have incoming UPT calls redirected to another number when he/she is registered on a mobile terminal and that terminal is in the state "not reachable" in the mobile network. This feature has PLMN impact only. The Not Reachable cause must be transported through the PSTN/ISDN/PLMN networks till the SSF where the service was triggered.

2) **Selective Call Forwarding on terminal Not Reachable (SCFNRc)**: The ability of the UPT user to have incoming calls from certain callers forwarded to another number when the calls encounter the "not reachable" state at the mobile terminal where the UPT user is registered. The callers may be identified with Calling Line Identities previously registered by the UPT user and/or password entered by the calling party.

3) **Special Market Call Indication (SMCI)**: the ability of a calling party to make a call to a UPT user indicating that the call is important and has a special mark that can be varied and reflect diverse aspects (alarm, business call, etc.). The call recipient may specify using the advanced InCall feature, that all special marked calls are to be treated differently depending on the mark (for example, a business call could not be directed to the UPT user's home phone and alarm calls could be directed to the UPT user's special phone list).

   A service indicator will be set in the IAM message by the OLE on request from the calling party. When an incoming UPT call arrives with this indicator set, the TLE will recognize it and offer the UPT user the required service.

4) **Distinctive Alert**: the ability at a terminal/line to have a special alerting pattern at the termination receiving a UPT call to identify that this call is not a typical call, e.g. a UPT call.

   This is a requirement on both the underlying network and on the terminal equipment to provide for distinctive alerting. The service indicator will be conveyed in the IAM message for a UPT call. When a UPT call arrives with this indicator set, the TLE (if it supports special alerting patterns) will alert the called UPT user with a specific alerting signal. Of course, the setting of this service indicator is to be done by the SSF/SCF node.

5) **Call Forwarding Busy (CFB) subscriber**: the ability of the UPT user to have incoming UPT calls redirected to another number when he/she is registered on a terminal and that terminal is busy with another call.

   This feature requires cooperation between the underlying network (which can detect the line-busy condition) and the UPT environment (which has access to the UPT user profile wherein would be specified the call forwarding addresses). Clearly this only applies when the UPT user has subscribed to Call Forwarding (as indicated in the SS No. 7 signalling messages) and the incoming call is a UPT call (again as indicated by the SS No. 7 signalling message). The actual forwarding of the call is done by the UPT service. This may be done at the terminating exchange if it has sufficient information, or, more likely by the UPT SSF/SCF handling the call after it has been rejected due to a "busy" condition.

6) **Selective Call Forwarding on Busy (SCFB) subscriber**: the ability of the called UPT user to have calls from certain callers forwarded to another number when the call meets busy condition at the termination where it was first offered. The callers may be identified with calling line identities previously registered by the called UPT user and/or password entered by the calling party.

This feature requires cooperation between the underlying network (which can detect the line-busy condition) and the UPT environment (which has access to the UPT user service profile wherein would be specified the call forwarding addresses).

7) **Call Forwarding No Reply (CFNR)**: the ability of the UPT user to have incoming UPT calls redirected to another number when he/she is registered on a terminal and there is no answer on this terminal. See also above requirement for CFB.

8) **Selective Call Forwarding No Reply (SCFNR)**: the ability of the called UPT user to have calls from certain callers forwarded to another number when the call has not been answered at the termination where it was first offered within a time-out (e.g. 20 sec.). The callers may be identified with Calling Line identities previously registered by the called UPT user and/or password entered by the calling party. See also above requirement for SCFB.

9) **Call Deflection (CD)**: the ability of the UPT user to have incoming UPT calls deflected (in real time) to another number.

10) **Incoming Call Screening (ICS)**: the ability of the UPT user to restrict incoming calls. The screening criteria are recorded in a screening list in the UPT service profile and may be: password, area of origin, calling line identities, etc. Incoming Call Barring (ICB) is included in ICS.

This may require cooperation between the underlying network, the UPT user's service provider, and the UPT environment, to recognize the incoming UPT call and to apply the pre-specified screening criteria which will be contained in the called UPT user's service profile.

11) **Outgoing Call Screening (OCS)**: the ability of the calling UPT user to restrict outgoing calls. The screening criteria are recorded in a screening list in the UPT service profile and may be: date, time of day, certain prefixes, etc. Outgoing Call Barring (OCB) is included in OCS.

This is a requirement on the UPT environment which would be invoked for UPT call origination.

12) **Calling Line Identification Presentation (CLIP)** is offered to the called party and provides the calling party's number to the called party.

If the incoming call was originated at the far end as an outgoing UPT call, the originating UPT number will be delivered in place of the calling line even though the calling line number should also be carried in the call setup (ISUP IAM) message. Calling Number Presentation (CNP) is included in CLIP. See 6.2 for feature interactions between CLIP/CLIR subscriptions by the UPT user and/or the access owner.

13) **Calling Line Identification Restriction (CLIR)** is offered to the calling party to restrict presentation of the calling party's identity to the called party. If the incoming call was originated at the far end as an outgoing UPT call, both the calling UPT number and calling line number are restricted from presentation. Calling Number Restriction is included in CLIR.

At the SSF/SCF level the original calling party number (access number) will be replaced by the UPT number to provide the correct calling party identity to the destination end user. On the other hand, the original calling access number should be conveyed either in the generic number as an additional calling party number (option 1) or in the location number (option 2) to keep track of the origin of the call.

If the UPT user has or has not subscribed to the UPT CLIR service, the presentation restricted indicator will be set by the SSF/SCF to the appropriate value based on the subscription option mode of the subscriber.

14) **Connected Line Identification Presentation (COLP)** is offered to the calling party and presents the connected party's number to the calling party. If the connected party number is actually a UPT number, e.g. the call was forwarded at the original destination station to a UPT address, the connected UPT number is presented rather than the line number. Connected User Identity Presentation (CUIP) is included in COLP.

15) **Connected Line Identification Restriction (COLR)** is offered to the called party and restricts the presentation of the connected party's number to the calling party. If the connected party number is actually a UPT number, e.g. the call was forwarded at the original destination station to a UPT address, the connected UPT number (and the line number) is restricted. Connected User Identity Restriction (CUIR) is included in COLR.

16) **Calling Name Identification Presentation (CNIP)**: CNIP is a supplementary service offered to the called UPT party which provides name information associated with the calling party to the called UPT party.

This requirement may fall either on the underlying network or the UPT environment depending on implementation. In either case, the appropriate identity (UPT or access owner) must be carried in the signalling messages.

17) **Calling Name Identification Restriction (CNIR)**: CNIR is a supplementary service offered to the calling UPT party to restrict the presentation of the name information associated with the calling UPT party to the called party.

18) **Call Waiting (CW)** is a supplementary service which permits a UPT user to be notified with an indication that another call for the UPT user is waiting. The user then has the choice of accepting, rejecting, or ignoring the waiting call. Call Waiting is clearly important in the context of busy conditions that may be generated by either a UPT action or a non-UPT (normal call) action at the terminating end of the call.

This is a particular case where a UPT service indicator carried in the SS No. 7 messages can be applied to offer the call waiting service to a called UPT user.

The support of this feature will have major impacts on the SSF/SCF node. If the call waiting has been subscribed to and activated for the called UPT user, the SSF/SCF will set the "call waiting" service indicator along with the UPT indicator in the IAM message. This will inform the TLE that call waiting is applicable for the called UPT party.

If a UPT call waiting indicator has been received so that call waiting is active for the UPT user, any new call arriving at the TLE for the UPT user while the UPT user is engaged, will be put on waiting and appropriately signalled to the station.

When a call arrives for the UPT user while the line access owner is engaged in a normal call, the UPT Call Waiting service shall not apply to this new incoming UPT call. A busy condition will be returned by the TLE to the SSF/SCF to let it take the necessary actions.

19) **Explicit Call Transfer (ECT)**: this enables a UPT user who has two calls, each of which can be incoming or outgoing calls, to connect the other parties in the two calls.

20) **Three-Party Supplementary Service (3PTY)**: this enables a UPT user to establish a three-way conversation, i.e. a simultaneous communication between the UPT user and two other parties.

21) **Conference Calling (CONF)**: this allows a UPT user to communicate simultaneously with multiple parties, who may also communicate among themselves. The UPT user arranges the conference and calls each participant in order to connect them to the conference.

22) **Preset Conference Calling (PCC)**: this allows a UPT user to quickly establish a conference call with a predefined list of conferees that is stored in the network. This simultaneous communication is established in parallel when a user requests a Preset Conference.

23) **Meet-Me Conference (MMC)**: this allows a UPT user to arrange a call between more than two participants. Each participant has to call the conference number in order to be connected to the conference.

24) **Call Hold (HOLD)**: this allows a UPT user to interrupt communications on an existing call for the purpose of making an outgoing call or to answer an incoming call, and then subsequently, if desired, to re-establish the original communication.

25) **Multi-Level Precedence and Pre-emption (MLPP)**: MLPP provides prioritized call handling service. This service has two parts – precedence and pre-emption. Precedence involves assigning a priority level to a call. Pre-emption involves the seizing of resources, which are in use by a call of a lower precedence, by a higher level precedence call in the absence of idle resources. Users in networks that do not support this service will not be affected by this service.

26) **Malicious Call Identification (MCID)**: is offered to the called party being a UPT user. It enables the UPT user to request that the calling party be identified to the network and be registered in the network.

27) **Completion of Calls to Busy Subscriber (CCBS)**: enables a calling UPT user, upon encountering a busy destination, to be notified when the busy destination becomes free and to reinitiate the call. For calls to UPT numbers, some networks may not support CCBS to location independent numbers.

28) **Completion of Calls on No Reply (CCNR)**: enables a calling UPT user, encountering a destination which does not answer the call (no reply), to be notified when the destination becomes free after having terminated an activity and to have the call reinitiated. For calls to UPT numbers, some networks may not support CCNR to location independent numbers.

10.2 Feature interactions between UPT and PSTN/ISDN features

This clause addresses and analyses the specific interactions that take place between UPT features and PSTN/ISDN features that affect the service encountered by the UPT user at any registered terminal as well as the service encountered by the owner of the terminal at which the UPT user has registered.

For example, if there is a call active at the local access (whether UPT or not), an incoming call of any kind will encounter a BUSY condition on PSTN unless the Call Waiting feature has been subscribed to by the access subscriber or perhaps by the UPT user, and for ISDN with two B-channels available for calls, the incoming call may possibly proceed with alerting.

1) **Calling Line Identification Presentation (CLIP)** is offered to the called party (UPT user or line owner) and provides the calling party's (UPT or line) number.

   a) The CLI is presented to the called party if he has subscribed to this service.

   b) The CLIP service presents the number of the calling user, which is either a UPT number (for outgoing UPT calls at the far end) or a line/terminal owner (for non-UPT outgoing UPT calls at the far end).

   Note that both the calling line number and calling UPT number should be transported through the network to allow for public safety needs, e.g. law enforcement.

2) **Calling Line Identification Restriction (CLIR)** is offered to the calling party to restrict presentation of the calling party's number (line or UPT) to the called party.

If the line owner has subscribed to this service, it is not provided on outgoing calls originated by the UPT user at this station. If the UPT user has subscribed to this service, it is not provided on outgoing calls originated by the line owner at this station (see Table 4).

Table 4/Q.1521

Type of outgoing call	Calling party's service	
	NO CLIR	YES CLIR
Outgoing UPT call [Line number should not be delivered]	UPT Number will be delivered if called party has CLIP	UPT Number will not be delivered even if called party has CLIP
Non-outgoing UPT call [UPT number should not be delivered]	Line Number will be delivered if called party has CLIP	Line Number will not be delivered even if called party has CLIP

3) **Connected Line Identification Presentation (COLP)** is offered to the calling party and presents the connected party's line number to the calling party.

If the originating station has subscribed to this service, it is not provided on outgoing calls originated by the UPT user as outgoing UPT calls.

If the connected line is actually a UPT number, e.g. the call was forwarded at the original destination station to a UPT address, the connected UPT number is presented.

The number used to complete this call to its final destination is the number that is displayed at the origination as the Connected Line Number;

- if a call addressed to a UPT user is simply routed through the network to wherever this UPT user is registered currently, then the originally addressed UPT number is the Connected Line Number;
- if a call addressed to a UPT user is forwarded in the network (as specified explicitly by that user) to another UPT user, then the final UPT user's number is the Connected Line Number;
- if a call addressed to a UPT user is forwarded in the network (as specified explicitly by that user) to a non-UPT line number, then the line number is the Connected Line Number.

Only one Connected Line Number is displayed.

Note that both a UPT and a line number (if both exist) for the connected location should be transferred through the network to the originating end.

4) **Connected Line Identification Restriction (COLR)** is offered to the calling party and restricts the connected party's line number to the calling party.

If the connected line owner has subscribed to COLR service, then the connected line number should not be delivered to the originator. If the connected UPT user has subscribed to COLR service, then the connected UPT number will never be delivered to the originator (see Table 5).

Table 5/Q.1521

Type of Connected call	Connected party's service	
	NO COLR	YES COLR
UPT routed call [Connected Line Number should NOT be delivered]	UPT Number will be delivered if calling party has COLP	UPT Number will not be delivered even if calling party has COLP
Line Number routed call [Connected UPT Number should NOT be delivered]	Line Number will be delivered if Calling party has COLP	Line Number will not be delivered even if calling party has COLP

5) **Malicious Call Identification (MCID)** should cause both the calling UPT number and the calling line number to be stored for outgoing UPT calls according to ITU-T F.853 [7].

If a normal incoming call was originated at the far end by a UPT user, the TLE should store both the calling UPT number and the calling line number.

When an incoming UPT call arrives at the TLE, if this service has been subscribed by the line access owner, the service shall be suspended for that call.

6) **Call Forwarding on Busy (CFB)**

IF the line is busy (by the line owner or the UPT user);

AND IF there is an incoming call (to the line owner or UPT user);

AND IF the called party (line owner or UPT user) has subscribed to CFB;

THEN the call is forwarded (by the TLE for the line owner or by the UPT service for UPT user).

As mentioned above, some features including call forwarding, could be provided remotely and not necessarily in the local switching exchange (see Table 6).

Table 6/Q.1521

Type of Incoming call (to the busy line)	Called party subscribed to CFB	Called party not subscribed to CFB
Call incoming to line owner (independent of UPT user)	forward call (by TLE)	calling party receives busy tone
Call incoming to UPT user (independent of line owner)	forward call (by UPT SCP)	calling party receives busy tone

7) **Call Forwarding on No Reply (CFNR), on Not Reachable (CFNRc; applicable to PLMN only) and Call Deflection (CD)**

IF there is an incoming call (to the line owner of the UPT user);

AND IF the called party (line owner or UPT user) has subscribed to CFNR (respectively CFNRc, CD);

THEN the call is forwarded (by the TLE for the line owner or by the UPT service for UPT user).

NOTE – CFU (CF Unconditional) is inherent to UPT (see ITU-T F.853 [7]).

8) **Call Waiting (CW)** is clearly important in the context of busy conditions that may be generated by either a UPT action or a non-UPT (normal call) action.

A) IF the line owner has subscribed to Call Waiting;

AND IF there is an incoming call to the line owner;

AND IF the line is busy (with either the line owner or UPT user);

THEN the Call Waiting signal 1 is given on the line, and the calling party receives audible ringing.

B) IF the UPT user has subscribed to Call Waiting;

AND IF there is an incoming call to the UPT user:

a) IF the line is busy with the UPT user;

THEN the Call Waiting signal 2 is given on the line, and the calling party receives audible ringing.

b) IF the line is busy with the line owner;

THEN NO Call Waiting signal is given on the line, and the calling party receives busy.

There should be a mechanism for distinguishing call waiting notification for an incoming UPT call versus non-UPT call.

When the called party has NOT subscribed to Call Waiting, and the line is busy, then a Call Waiting signal is NOT given on the called line, and the calling party receives busy.

SCENARIO 1: line owner has subscribed to Call Waiting; UPT user has not (see Table 7).

Table 7/Q.1521

	Incoming call for line owner	**Incoming call for UPT user**
Line owner engaged in a call	Call Waiting signal 1 will be given on the line. Calling party receives ringing tone.	Call Waiting signal will not be given on the line. Calling party receives busy tone.
UPT user engaged in a call	Call Waiting signal 1 will be given on the line. Calling party receives ringing tone.	Call Waiting signal will not be given on the line. Calling party receives busy tone.

SCENARIO 2: UPT user has subscribed to Call Waiting; line owner has not (see Table 8).

Table 8/Q.1521

	Incoming call for line owner	**Incoming call for UPT user**
Line owner engaged in a call	Call Waiting signal will not be given on the line. Calling party receives busy tone.	Call Waiting signal will not be given on the line. Calling party receives busy tone.
UPT user engaged in a call	Call Waiting signal will not be given on the line. Calling party receives busy tone.	Call Waiting signal 2 will be given on the line. Calling party receives ringing tone.

SCENARIO 3: both line owner and UPT user have subscribed to Call Waiting (see Table 9).

Table 9/Q.1521

	Incoming call for line owner	Incoming call for UPT user
Line owner engaged in a call	Call Waiting signal 1 will be given on the line. Calling party receives ringing tone.	Call Waiting signal will not be given on the line. Calling party receives busy tone.
UPT user engaged in a call	Call Waiting signal 1 will be given on the line. Calling party receives ringing tone.	Call Waiting signal 2 will be given on the line. Calling party receives ringing tone.

9) **Completion of Calls to Busy Subscriber (CCBS)**

Clearly requires the network to apply the busy definition to the line (whether the UPT user or the access subscriber is involved in the active call).

10) **Conference Calling (CONF) – Preset Conference Calling (PCC), Meet-Me Conference (MMC), Three-Party (3PTY)**

Only the line subscriber who has subscribed to this service may invoke these features. Additional addressees should be allowed as UPT or non-UPT addresses.

11) **Multi-Level Precedence and Pre-emption (MLPP)**

The MLPP supplementary service provides prioritized call handling service. This service has two parts – precedence and pre-emption. Precedence involves assigning a priority level to a call. Pre-emption involves the seizing of resources, which are in use by a call of a lower precedence, by a higher level precedence call in the absence of idle resources. Users in networks that do not support this service will not be affected by this service.

12) **Outgoing Call Barring (OCB)** if subscribed to by the access line, should not affect outgoing UPT calls which would be charged to the UPT user anyway unless a specific line access restriction to UPT user has been deliberately applied by the line access owner.

11 Interworking – Requirements on IN

11.1 Transport of parameters required for UPT services

In the case of the UPT service, all networks parameters (numbers/identities) needed in the INAP protocol are listed.

The following parameters should be transmitted (SSP to SCP) at the originating side for outgoing calls:

– calling LI (certified by the network);

– calling LI[6] (optional, not certified);

– calling UPTN (if present. If UPTN is not available, the PUI should be given);

– called number (UPTN or other).

The following parameters should be transmitted (SCP to SSP) at the terminating side for outgoing calls[7]:

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[6] It could be given, for example, by a PBX. This note is valid for the calling LI (optional, not certified).

[7] Calling LI (certified by the network) and UPTN are not needed because already available at the SSP.

– calling LI (optional, not certified. If not provided by the calling user);
– calling UPTN (mandatory);
– called line.

The following parameters should be transmitted (SSP to SCP) at the originating side for incoming calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls. If the UPTN of the calling user is not available, the PUI should be given);
– called UPTN.

The following parameters may be transmitted (SCP to SSP) at the originated side for incoming calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls. If the UPTN of the calling user is not available, the PUI should be given);
– called UPTN;
– UPT service indicators (optional).

The following parameters should be transmitted (SCP to SSP) at the terminating side for incoming calls[7]:

– calling LI (optional, not certified. If not provided by the calling user);
– calling UPTN (optional, only needed for UPT to UPT calls);
– called line;
– UPT service indicators (optional).

12 Requirements on network signalling

12.1 UPT calls versus non-UPT calls

In both the PSTN and ISDN cases, Signalling System No. 7 is assumed to be available.

The need exists to distinguish calls associated with the UPT user at this access point (outgoing UPT calls or incoming UPT calls) from other calls involving this access point so as to be able to treat specific service requests or supplementary services or features appropriately. For example, differentiating between an incoming UPT call vs. an incoming ISDN call to correctly apply Call Forwarding Busy (see below). Therefore, it is recommended to:

- include a UPT indicator in signalling messages (ISDN and SS No. 7) associated with a UPT call;
- include associated UPT service indicators and parameters (like Called UPT Number) in signalling messages (ISDN and SS No. 7) where appropriate;
- associate a UPT identifier in the controlling exchange with active UPT calls in progress (incoming or outgoing) to enable differentiation between the two call types (UPT and non-UPT) for proper feature treatment.

An important additional consideration is that some service features may be provided remotely, i.e. not directly in the local switching exchange, and such arrangements must be accommodated.

12.2 Transport of parameters required for UPT services

In order to carry the called UPT number (necessary for "Intended Recipient Identity Presentation" or "Called party specified secure answering"), a new ISUP parameter is needed. The new parameter is carried by Initial Address Message.

In the same way, in order to deliver to the called party the UPT calling number and/or the calling party number, the current generic number can be enhanced or a new ISUP parameter created.

In the case of the UPT service, all networks parameters (numbers/identities) needed in the ISUP protocol are listed.

The following parameters should be transmitted at the originating side for outgoing calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (if present. If UPTN is not available, the PUI should be given);
– called number (UPTN or other).

The following parameters should be transmitted at the terminating side for outgoing calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (mandatory);
– called line;
– called UPTN (optional, only for UPT to UPT calls).

The following parameters should be transmitted at the originating side for incoming calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls. If the UPTN of the calling user is not available, the PUI should be given);
– called UPTN;
– UPT service indicators.

The following parameters should be transmitted at the terminating side for incoming calls:

– calling LI (certified by the network);
– calling LI (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls);
– called line;
– called UPTN;
– UPT service indicators.

12.2.1 Transport of UPT service indicators

UPT service interaction indicators are used to properly invoke the supplementary services for the called UPT user (incoming UPT call). This clause describes how they are managed in the originating, destination and transit networks. The UPT indicator (marking a UPT call) is also described in this clause.

In the originating network

The UPT indicator is needed in the TLE. Consequently the originating network must include the UPT indicator for each outgoing UPT call.

It may also include the service interaction indicators. There are two options for the originating network, depending on operators' bilateral agreements:

– the service interaction indicators are included unless the SCFo removes them;

– the service interaction indicators are included when explicitly required by the SCFo.

If there is no agreement, the SCFo does not transmit the service interaction indicators (or removes them) when the service logic is triggered in the terminating network, on condition that this information is explicitly available in the SDFh in the home network. It is required that the service interaction indicators are included by default.

If this information is stored in the SDFh, each time the UPT user registers, it must be either updated or cancelled.

NOTE 1 – It is not detailed which kind of supplementary services require this service interaction indicator. At least Call Forwarding service requires this indicator.

In the terminating network

The service indicators must be transported transparently up to the TLE.

On receipt of the IAM message at the SSF-TE, when no SSF is available in the TLE:

– if the service interaction indicators are included in the IAM message, they are left unchanged and the IAM is forwarded to the TLE (call with one trigger);

– if the service interaction indicators are not included in the IAM message, the SSF triggers the SCF; the SCF retrieves the UPT user's service profile and includes these indicators (incoming call with two triggers).

On receipt of the IAM message at the TLE:

– if the TLE has a SSF: the service interaction indicators may be ignored, and the SCFt is triggered (incoming call with two triggers);

– if the TLE has no SSF: the TLE uses the service interaction indicators in order to invoke the UPT user's services.

NOTE 2 – It is not detailed which kind of supplementary services require this service interaction indicator. At least Call Forwarding service requires this indicator.

In transit networks

The indicators in the IAM message are left unchanged while going through transit networks.

13 Requirements on access signalling

In the PSTN network case, it can be assumed that the terminal at which the UPT user is located is capable of DTMF access signalling. In the case of ISDN networks, the access signalling should be assumed to be DSS1 over the D-channel. In either case, there must be appropriate signalling sequences defined to accommodate the requirements for interaction between the UPT user and the visited network.

13.1 Transport of parameters required for UPT services

In the case of the UPT service, all networks parameters (numbers/identities) needed in the DSS 1 protocol are listed[8].

[8] The provision on the terminating side of the numbers listed may depend on subscribed supplementary services.

The following parameters should be transmitted at the originating side for outgoing calls:

– calling UPTN[9] (if present. If UPTN is not available, the PUI should be given);
– calling LI (optional, not certified);
– called number (UPTN or other).

The following parameters may be transmitted at the terminating side for outgoing calls:

– calling LI[10] (certified by the network);
– calling LI[9] (optional, not certified);
– calling UPTN (mandatory);
– called line;
– called UPTN (optional, only needed for UPT to UPT calls).

The following parameters should be transmitted at the originating side for incoming calls:

– calling LI (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls. If the UPTN of the calling user is not available, the PUI should be given);
– called UPTN.

The following parameters may be transmitted at the terminating side for incoming calls:

– calling LI[9] (certified by the network);
– calling LI[9] (optional, not certified);
– calling UPTN (optional, only needed for UPT to UPT calls);
– called line;
– called UPTN.

NOTE – Concerning the PUI versus UPTN use, three options are possible:

– the UPTN is the only known number (E.164 [8]) to the originating side;
– the PUI is the only known identity (E.212 [9]) to the originating side;
– the UPTN and the PUI are the only known numbers to the originating side.

In the first case, the UPTN given is used for identifying the caller. It is a user provided number.

In the second case, the PUI given must be transported until the SSP. The SCP will then find the UPTN of the user and put it in the correct parameter.

In the third case, the same procedure as the one in the first could be used.

13.2 Requirements on DSS1

The requirements for UPT stage 3 description on DSS1 using D-channel access in ISDN environment are as follows:

1) to have protocol structure to flexibly define UPT and advanced ISDN services;
2) to adjust the capabilities of IN CS-2.

   DSS1 protocols for user interaction generally influence IN capability. Therefore the capability impact to IN CS-2 must be clarified so that IN CS-2 can support it;

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[9] It is optional, depending on previous procedure. In the case of an outgoing call after an outcall registration, this number does not need to be transmitted.

[10] Normally not transmitted but this number could be delivered in the case of emergency centre.

3) to guarantee the effective usage of network resources.

   Registration and authentication procedures using D-channel access do not need to establish B-channel. If B-channel is established every time, the effective use of network resources cannot be performed. In case of D-channel access, strong authentication should be performed. In registration UPT users could recognize registration conditions by an ISDN terminal with display;

4) to enable messages and information elements defining UPT specific operations to be commonly used for several UPT procedures;

5) in-band announces provided to the UPT user are optional.

13.3 Requirements for Information Flows

The focus is on UPT Stage 2 description in IN structured networks that utilizes functional protocol of DSS1 for user interaction.

The following conditions are required:

1) generic UPT functional architecture is assumed;

2) general Basic Call State Model (BCSM) and Basic Call Unrelated State Model (BCUSM) are used;

3) generic CCF/SSF/CUSF defined by ITU-T Q.1224 [10] is used for UPT;

4) information flows should be compliant with ITU-T Q.1214 [3] and ITU-T Q.1224 [10];

5) ISUP has capability to carry UPT Number (UPTN) for network interworking to establish UPT call.

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