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Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim-European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

This ETR is intended to give general requirements on the Universal Personal Telecommunication (UPT) dialling, routeing and numbering, based on the capabilities existing or required in the network. It is also intended, generally, to clarify numbering, dialling and routeing issues, i.e. how the network uses numbering and dialling information, which kind of restrictions can exist in the network and what can be the consequences from the numbering and dialling solutions and network capabilities. Both incoming and outgoing calls are discussed. This document does not propose any numbering scenario as mandatory.

This ETR is ground work that may be used by ETSI STC NA2, who have the final responsibility for determining the basic principles and guidelines to be used for numbering and routeing issues within ETSI.

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1 Scope

This ETSI Technical Report (ETR) covers the following issues for Universal Personal Telecommunication (UPT):

- network dialling requirements;
- procedures for incoming calls;
- OutCall procedures;
- routeing aspects;
- network requirements on numbering including network capabilities;
- interworking requirements;
- evolution of UPT numbering issues;
- procedures for outgoing calls, registration, database interrogation and service profile management.

Although the scope of this ETR covers near and long term issues, the architectural considerations provided are related to phase 1 only. Long term issues will be handled more thoroughly in ETRs for later phases of UPT.

This ETR covers the Public Switched Telephone Network (PSTN) and the Integrated Services Digital Network (ISDN). Further study is needed for broadband ISDN, Private Land Mobile Networks (PLMNs) (e.g. Special Mobile Group (GSM), Universal Mobile Telecommunications Services (UMTSs) and Public Telecommunication Networks (PTNs), and their interworking to support the UPT service.

2 References

The following references are used within this ETR:

[1] CCITT Recommendation E.160: "Definitions relating to national and international numbering plans".

[2] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[3] CCITT Recommendation E.166/X.122: "Numbering plan interworking in the ISDN era".

[4] CCITT Draft Recommendation E.168: "Application of E.164 numbering plan for UPT".

[5] CCITT Recommendation E.170: "Traffic routing".

[6] CCITT Recommendation E.171: "International telephone routeing plan".

[7] CCITT Recommendation E.172: "Call routing in the ISDN era".

[8] CCITT Recommendation E.173: "Routing plan for interconnection between public land mobile networks and fixed terminal networks".

[9] CCITT Recommendation I.330: "ISDN numbering and addressing principles".

[10] CCITT Recommendation X.121: "International numbering plan for public data networks".

3 Abbreviations

For the purposes of this ETR, the following abbreviations are used:

CCAF	Call Control Agent Function
CCF	Call Control Function
CLI	Calling Line Identity
HF	Human Factors
IN	Intelligent Network
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
LE	Local Exchange
NPI	Numbering Plan Identifier
N(S)N	National (Significant) Number
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
QOS	Quality Of Service
RA	Routeing Address
SCF	Service Control Function
SDF	Service Data Function
SMAF	Service Management Access Function
SMF	Service Management Function
SSF	Service Switching Function
SSP	Service Switching Point
TE	Trunk (Transit) Exchange
TON	Type Of Number
UPT	Universal Personal Telecommunication
UPT-AA	UPT-Access Address
UPT-AC	UPT-Access Code
UPT-AN	UPT-Access Number
UPTN	UPT Number

4 Incoming calls

4.1 UPT number

The UPT number identifies the UPT user and is used to route the call from the originating terminal to a Service Switching Point (SSP) (containing the Service Switching Function (SSF) of the intelligent Network (IN) architecture). This may also involve the use of a prefix. The UPT number is used to determine which database should be addressed. Such a database (e.g. the Service Control Function (SCF)/Service Data Function (SDF) in the IN architecture) will contain the relevant service data. The number may also be used to facilitate identification, validation, charging and the location of the UPT user.

4.2 Dialling

4.2.1 General

Dialling is a function of users to input a sequence of digits from a terminal to make a call to other subscribers. This sequence contains the number of the called subscriber and possibly a prefix and/or an escape code in front of the number. It may also include a subaddress following the number.

Prefixes are usually used to distinguish between local, national and international calls (numbers). The use of prefixes allows shorter dialling sequences for local and national calls, instead of dialling the full international number. Prefixes, being considered a national matter, are not signalled over internetwork or international boundaries. They are generally not harmonised and, therefore, vary from country to country (if used at all) although there exists a strive for harmonising national (trunk) and international prefixes.

Prefixes are also used for routeing.

Escape codes are used to distinguish different numbering plans from each other, e.g. to make distinction between CCITT Recommendations E.164 [2] and X.121 [10] numbers. Escape codes may or may not be signalled over internetwork or international boundaries (see CCITT Recommendations E.166/X.122 [3]).

A subaddress (see CCITT Recommendation I.330 [9]) is a sequence of digits, the maximum length of which is 20 octets (40 digits). Subaddressing is not to be considered as part of the numbering plan, but constitutes an intrinsic part of ISDN addressing capabilities. Subaddresses are passed transparently across the network.

General definitions of the preceding terms liaised to numbering can be found in the CCITT Recommendation E.160 [1].

4.2.2 Dialling and UPT

Dialling plans for UPT incoming calls can be designed to use ordinary dialling with national and international prefixes where applicable or special dialling with a UPT prefix.[1)]

The purpose of a UPT prefix could be to distinguish UPT numbers from other numbers, to assist in routeing to an SSP and possibly assist in the UPT number portability. However, the use of a UPT prefix in front of a number will not guarantee that the number is a UPT number. Care must be taken to ensure that the advantages and drawbacks of using a prefix are considered. Some of these are highlighted in the subsequent text.

4.3 Routeing

A considerable number of parameters can be used to route a call. The emphasis, in this ETR, is on the impact of numbering and dialling and relevant network capabilities.

4.4 Use of the UPT number

NOTE 1: The following discussion presumes some UPT indication in the dialled sequence.

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1) The concept of special dialling with a UPT prefix requires further evaluation. However, it has already been recognised that full benefit could only be gained if it proved possible to achieve an international standard UPT prefix.

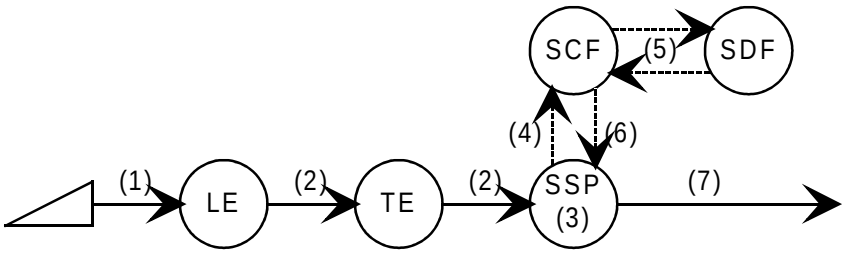
When a call to a UPT user is made, the calling user dials a sequence of digits that includes the UPT number and possibly a national, international, or UPT prefix.

Examining in more detail the use of this dialled sequence by the network, it is noted that:

a) the network must be able to recognise the UPT call, in order to handle it in the most efficient manner, specifically in order to route it from the originating terminal to the SSP, as indicated in subclause 4.1. This action by the network is performed as a consequence of the digit analysis by the local originating exchange and by subsequent exchanges (if necessary) up to the SSP. The analysis is performed on the leading digits of the dialled sequence. The leading digits may coincide with the prefix or with the prefix plus some additional digits of the UPT number, this is treated in more detail in subclause 4.5. However, it is immediately apparent that the smaller number of digits to be analyzed implies less digit analysis capabilities that must be provided by the network. See phases (1) to (3) in figure 1;

b) once the call has reached the SSP, a query must be sent to a database (containing SDF), in order to translate the UPT number into a network number (routeing address) which corresponds to the current location of the UPT user, and which is used by the network (from the SSP onwards) to route the call in a traditional way. The destination of the query and the identification of the UPT user are both provided by the analysis of the UPT number (performed by the SCF and SDF).

NOTE 2: The SSP must only be able to address the query to the nearest SCF, and the user's identification is done through actions initiated/performed by this control function. See phases (4) to (7) in figure 1.



LE = Local Exchange.
TE = Trunk Exchange.
SSP = Service Switching Point.
SCF = Service Control Function.
SDF = Service Data Function.

Figure 1: Example of UPT call phases

The SSF may be located in a Local Exchange (LE), in a Trunk Exchange (TE), in an International Switching Centre (ISC), or in a dedicated exchange. In the examples contained in Clauses 6 and 7 of this ETR, it is assumed that the SSF is located in a dedicated exchange SSP. In these examples, the connection path is longer than in other cases.

Explanations:

1) the calling user dials a sequence of digits, e.g. (prefix +) UPTN;

2) the dialled sequence is used to route the call to the SSP. In some networks, the SSP can be in the local exchange - this call phase is then missing. In case that the originating network has no UPT functionalities (e.g. if a UPT call is originating from a country that has no UPT capabilities), the SSP may be in another network, belonging to the same country or to the called user's home country[2)] - in this case the overall routeing may be non-optimised;

3) the SSP will recognise the call as a UPT call from the received digits to query a database for number translation;

4) the SSP will forward a service request in a signalling message to the SCF. The SCF is normally in the same network as the SSP;

5) the SCF interrogates the SDF to receive the Routeing Address (RA). The SDF can be in another network than the SCF and SSP. Information in the UPTN is used to route the signalling message to a correct SDF;

6) the received RA is sent to the SSP;

7) the call is routed to the destination according to the RA received from the SCF.

4.5 Network considerations of dialling plans

The following discussion on the UPT dialling plans is not exhaustive - more comprehensive assessing is required. The actual choice of UPT numbering and dialling plan is a crucial issue, but it is outside the scope of this ETR.

The UPT dialling plan may be composed with or without a UPT prefix. The UPT prefix dialling sequence would be, e.g.:

- UPT prefix + UPT number (Solution 1).

Optionally, a UPT incoming call may be made by dialling the trunk or international prefix and the UPT number immediately after, e.g.:

- 0 + UPT number; or

- 00 + UPT number. (Solution 2).

Solution 1 presents the following advantages over solution 2:

1) UPT prefix in front of the dialling sequence may immediately indicate that the call is a UPT call (in a UPT supporting country);

2) especially, an internationally standardised UPT prefix would make UPT dialling plans consistent throughout the world, which may alleviate some Human Factors (HF) difficulties and assist in using network resources efficiently;

3) excluding the UPT indicator from the UPT number, because of the UPT identification through the prefix, allows more digits to be available for the UPT number, although it is not envisaged that this would become a limiting factor. Consequently, more UPT numbers would be available for future uses. However, if there are no IN facilities within the originating country, then leaving out the UPT indicator from the number will lead to inefficient routeing. Another consideration is that because several IN services are handled by the same IN entities, they probably will require identification through the number;

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2) Note that in practical realisations the call could also be routed to an SSP of a third country which may be neither the originating nor the home country (it may be a neighbouring one). This case may be subject to standardisation, depending upon the numbering scenario applied

4) international use of a UPT prefix could assist in making the UPT number globally portable. However, UPT prefix is not an unconditional requirement for UPT number portability.

There are also drawbacks:

1) new prefixes may be difficult to allocate. This is even more complex concerning a common, international prefix;

2) use of UPT prefixes which vary from country to country will cause HF difficulties, leading to inefficient use of network resources;

3) if a non-UPT number is incorrectly dialled by preceding it with a UPT prefix, it would result in the inefficient use of network resources, and could demand the implementation of methods to limit this effect.

Use of dialling without a UPT prefix according to solution 2 offers advantages, too:

1) the dialling plan is familiar to everyone - UPT users are accessed in a similar manner as other subscribers (of course, there are other reasons, e.g. charging, that make it helpful to know the called subscriber is a UPT user);

2) it may be easier to allocate numbers for UPT than prefixes.

NOTE: However, the use of a UPT indicator in the number will not necessarily exclude the use of a UPT prefix.

Drawbacks of the solution 2 include:

- the number of leading digits to be analyzed in the network may be higher than currently used. This may lead into costly changes in switches, difficulties in maintaining analysis tables or inefficient use of network resources.

4.6 Routeing aspects

The considerations provided in this subclause expand those contained in point a) of subclause 4.4, i.e. they concentrate on the digit analysis required for recognising the UPT incoming call and routeing it up to the SSP, before its translation to a network number.

General requirements for routeing are specified, e.g. in CCITT Recommendations E.170 [5], E.171 [6], E.172 [7] and E.173 [8]. In principle, these recommendations should also be followed by the routeing of UPT calls.

The overall route followed by the UPT incoming call may be optimised (i.e. equal or almost equal to the route that would be followed by a non-UPT call with the same origin and destination) or non-optimised (i.e. considerably longer than the route that would be followed by a non-UPT call with the same origin and destination, with the worst case being "tromboning").

Non-optimised routeing can unnecessarily impair the Quality Of Service (QOS) although requirements of relevant routeing specifications (e.g. number of links) were fulfilled. If the dimensioning of circuit groups is tight, tromboning can cause increased blocking, the significance of this factor may not be noticeable for other traffic, but it can be for the UPT traffic. Non-optimised routeing and tromboning can also cost more to the subscribers.

4.6.1 Routeing scenarios

As already stated in the above subclauses, a UPT incoming call consists of the following phases:

a) the calling user inputs the UPT dialling sequence;

b) the UPT incoming call is recognised and routed to the SSP;

c) the UPT number is translated into a network number;

d) the network routes the call to the destination in a traditional fashion, using the network number provided.

The Public Switched Telephone Network (PSTN) or ISDN are currently divided into local, trunk and international levels. For call routeing, capabilities to analyze some initial digits are required in all exchanges. Number analysis capabilities may be different on each level, depending on the network structure, on the national numbering plans and on the technology of exchanges.

Concerning the analysis of the UPT number for the incoming calls, consequences for the routeing are different, depending on the structure of the UPT number, on the destination of the call and on the point where the analysis can be performed. There are at least the following cases and possibilities:

1) UPT recognition in the local exchange, local call;

2) UPT recognition in the local exchange, national call;

3) UPT recognition in the local exchange, international call;

4) UPT recognition in the trunk exchange, local call;

5) UPT recognition in the trunk exchange, national call;

6) UPT recognition in the trunk exchange, international call;

7) UPT recognition in the ISC, local call;

8) UPT recognition in the ISC, national call;

9) UPT recognition in the ISC, international call.

The "local call" means here that the called UPT user is in the same local area as the caller, i.e. originating local area = terminating local area. The "national call" means here that the called UPT user is in the same country as the caller but in a different area. The "international call" means here that the called UPT user is in a different country than the caller.

Recognising a call as a UPT incoming call in the local exchange will allow to route the call directly to the SSP. This implies the possibility to have the most optimised routeing (cases 1, 2 and 3 above). An example of case 1 is shown in figure 2.

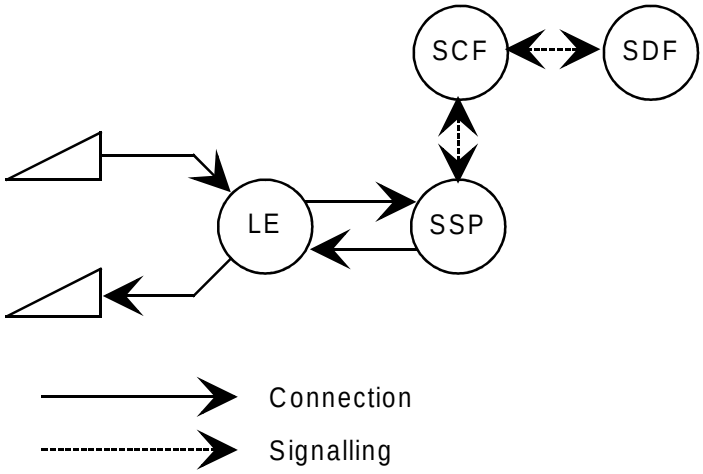

Figure 2: Example of routeing in case 1

Recognising a call as a UPT incoming call first in the trunk exchange will, in the case of local call, turn the call back from the SSP to the local level. Non-optimised routeing will probably exist in local calls (case 4 above).

Recognising a call as a UPT incoming call firstly in the trunk exchange will, in the case of national and international calls, allow an optimised routeing through the SSP (cases 5 and 6 above).

Recognising a call as a UPT incoming call firstly in the ISC will, in the case of local and national calls, turn the call back from the SSP to the local and/or national level. Non-optimised routeing will probably exist in local and in most national calls (cases 7 and 8 above) (sometimes a trunk and an international exchange are combined). An example of case 7 is shown in figure 3.

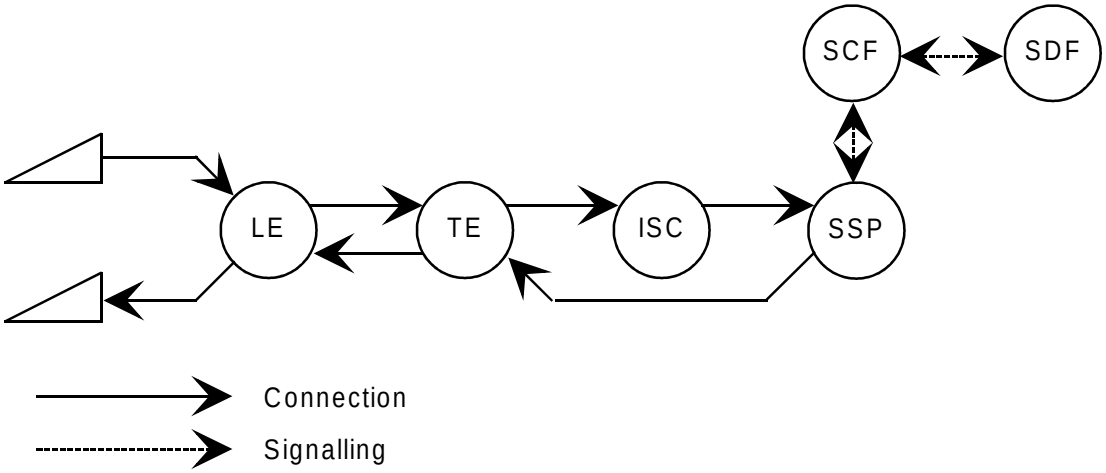

Figure 3: Example of possible routeing in case 7

Recognising a call as a UPT incoming call firstly in the ISC will, in the case of the international call, allow to route the call to the SSP located inside or outside of the country of origin. Optimised routeing is possible (case 9 above).

Conclusion: the optimised routeing is easiest to perform, if the call is identified as a UPT incoming call in the local (originating) exchange, supposing that UPT calls can be routed to the SSP already on this level. The non-optimised routeing will exist most often, if the call is identified as a UPT incoming call firstly in the ISC.

NOTE: The discussion above covers cases where the UPT recognition is made by the originating network. If the UPT call can be recognised in the home domain (local) only, as is the case when applying the home-related UPT numbering scheme of CCITT Recommendation E.168 [4] without UPT prefix, optimised routeing is possible if either the calling or called user is in the home area.

The preceding discussion is limited to call routeing inside the same network. Optimised routeing is also possible between competing or overlapping networks serving the same area, if interworking inside the IN(s) is provided.

4.6.2 Application of redirection

Redirection could be applied according to figure 4. In this case it is supposed that the connection will be released after receiving the translated number from the SCF. The call control could be returned back until the originating local exchange. It is realised that this type of routeing would require development in signalling and exchange capabilities. In particular, current network and signalling capabilities do not allow for charging of the UPT user or change of supplementary services during the call if redirection was used.

NOTE: This routeing scenario is different from the "basic" scenario presented in subclause 4.4.

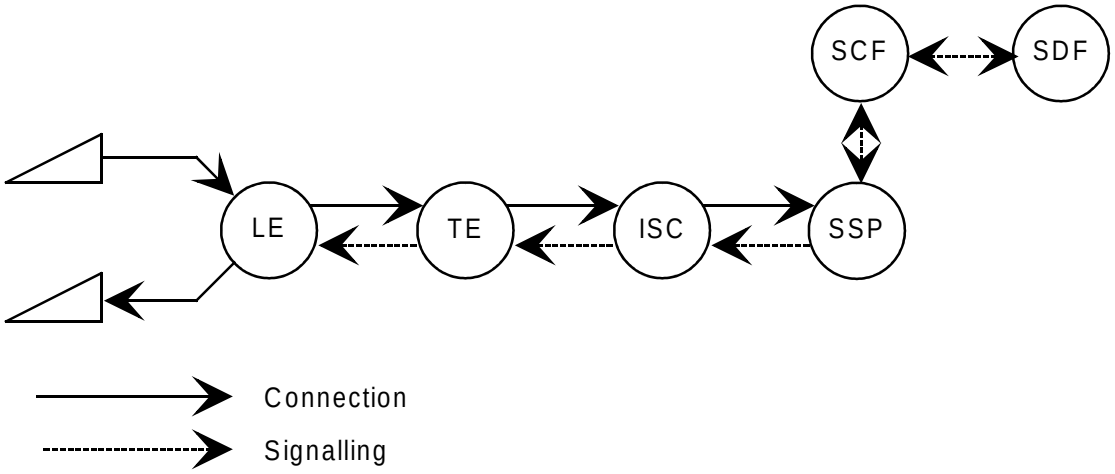

Figure 4: Example of possible use of redirection applied in case 1 of subclause 4.6.1

4.7 Calling scenarios

The following examples are not extensive and are only representatives of possible options. The first 2 cover the cases where the originating country has IN capability. Although the UPT prefix is used in the examples, it is not the only option within these scenarios.

There are a number of possible network scenarios for incoming UPT calls, depending on the fact that call is originated in the home country of the called UPT user or in another country, and on the fact that the country where the call is originated (originating country) is able to recognise and handle UPT incoming calls or not. The following combinations can be considered:

1) UPT incoming call originated in country A, directed to a UPT user whose home SDF is in country A. Obviously, since it manages the called UPT user, country A is able to recognise and handle UPT incoming calls appropriately (A = home and originating);

2) UPT incoming call originated in country B, directed to a UPT user whose home SDF is in country A. Country B is able to recognise and handle UPT incoming calls appropriately (A = home, B = originating);

3) UPT incoming call originated in country C, directed to a UPT user whose home SDF is in country A. Country C is not able to recognise and handle UPT incoming calls appropriately (e.g. it does not have an IN infrastructure in place) (A = home, C = originating).

NOTE: The actual location of the UPT user, i.e. the terminating country, is of no relevance for the considerations that follow.

Scenario 1 (figure 5) (A = home and originating)

The calling user initiates the call, e.g. by dialling the UPT prefix and the UPT number. The originating network recognises the UPT incoming call as such, as early as possible (from the UPT indicator in the number or the UPT prefix) and routes the call to the SSP. The SSP has to send the query to the appropriate database to get the translation. The database is most likely to be in country A.

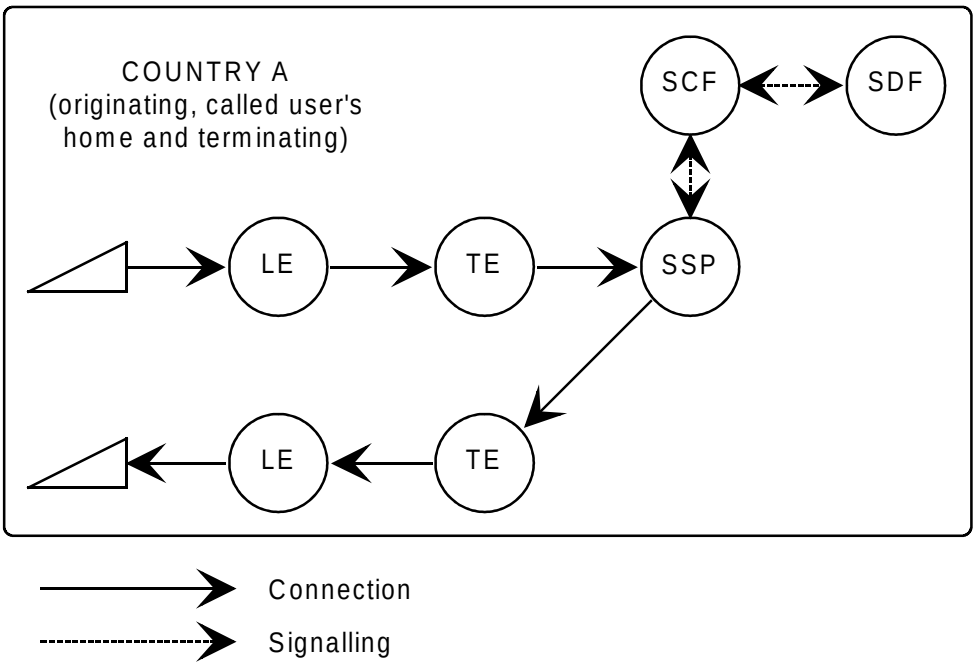

Figure 5: Example of scenario 1

Scenario 2 (figure 6) (A = home, B = originating)

The calling user initiates the call, e.g. by dialling the UPT prefix and the UPT number. The originating network recognises the UPT incoming call as such, as early as possible and routes the call to the SSP. The SSP has to send a query to the appropriate database to get the number translation. This can be done through the location information in the UPT number (see subclause 4.10).

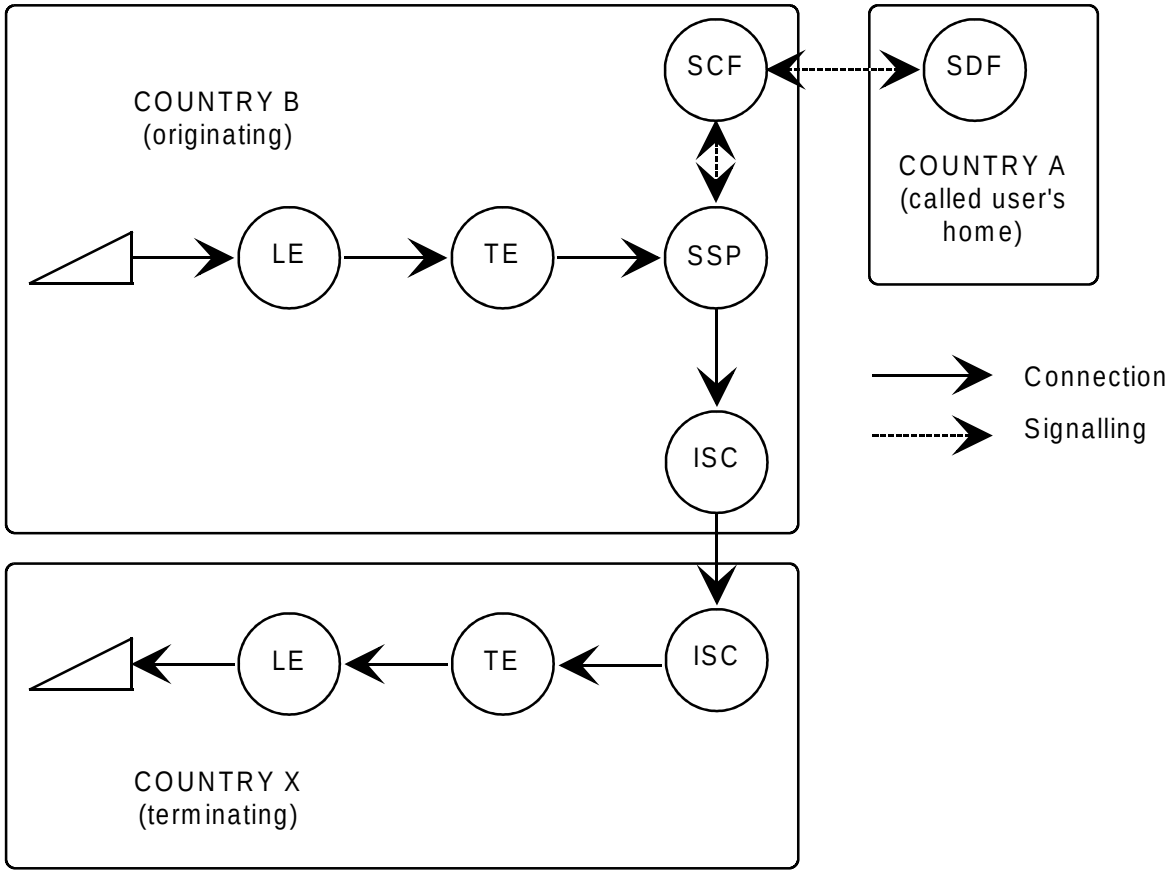

Figure 6: Example of scenario 2

Scenario 3 (figure 7) (A = home, C = originating)

The originating network has no means of recognising the UPT incoming call as such. If a UPT numbering conforming to CCITT Recommendation E.164 [2] is used, incoming UPT calls are possible from country C with a normal, dialling procedure for international calls. The phases could be as follows:

- the calling user knows there is no UPT prefix in that country - possibly opposite to the UPT user's home country - so he/she dials the international prefix instead (e.g. 00) and then the UPT number;

- the call is routed, according to normal routeing procedures in country C, to the network in country A: this is possible because of the CCITT Recommendation E.164 [2] conformance;

- country A's network recognises the UPT call and routes it to the appropriate SSP: this is possible if the UPT number bears a UPT indicator or exact information on the location of the SSP.

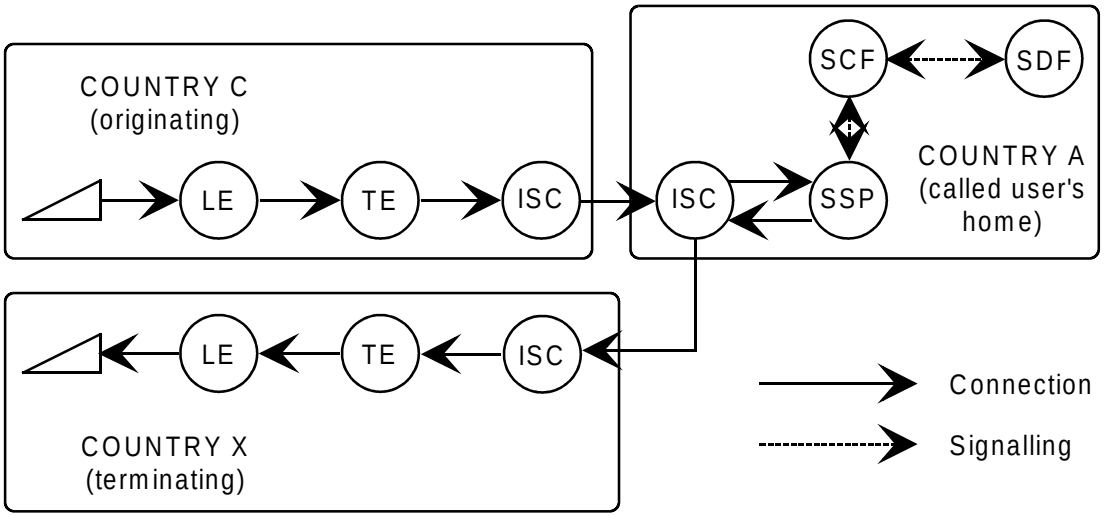

Figure 7: Example of scenario 3

NOTE 1: In this case the routeing will probably be non-optimised - in particular, if the called UPT user is at that moment in country C, the call is tromboned.

NOTE 2: The 3 scenarios depicted above have been considered in relation with different countries. Nevertheless, they are equally applicable to geographical areas covered by a single UPT service provider on each area, regardless of their coincidence or non-coincidence with national territories.

These examples require that the UPT number contains necessary addressing information that the SCF can interrogate the SDF. In case of the home-related scheme of CCITT Recommendation E.168 [4], there is no UPT indicator in the number known outside the home domain. Although the UPT prefix was used in this case, the SCF would not be able to distinguish these UPT numbers from non-UPT numbers. Consequently, it remains to be decided how the SCF should handle these calls.

4.8 Network capabilities for number analysis

As expressed previously, the lower the hierarchy level of the network, where the decisions based on the number analysis are performed, the more optimised routeing can be achieved, if the network structure and distribution of UPT capabilities otherwise allow. In the existing networks, the capabilities to analyze the initial digits of the number differ, depending on the hierarchy level or on the structure of the network and on the technology of the exchanges.

CCITT Recommendation E.164 [2] recommends that no more than 4 or 5 initial digits from the international number need to be analyzed for routeing and charging prior to time T (1/1/1997). After time T, no more than 6 initial digits from the international number need to be analyzed. From this, minimum analysis capabilities of ISCs can be concluded. Capabilities to analyze international numbers for routeing are also often needed in trunk exchanges. Consequently, analysis capabilities in these exchanges are (at least) equal to those of ISCs. In addition, it is believed that the minimum number of leading digits of the National (Significant) Number (N(S)N), that trunk exchanges generally need to be able to analyze, is 4 or 5 digits. However, these figures are not verified. Concerning local exchanges, it is likely that the primary number analysis (calls to different circuit groups) is not more extensive than that of trunk exchanges.

It is apparent from the previous discussion, that the structure of the UPT number and/or a possible use of a UPT prefix to call a UPT user may affect the existing number analysis requirements in such a way, that, to achieve an optimised routeing, the number of digits needing to be analyzed would increase in some, or in all, parts of the network. This could be a limiting factor, particularly with older equipment.

EXAMPLE 1: If a UPT prefix is used to indicate a UPT incoming call, then all that the network has to analyze, in order to recognise the call as special and route it to the SSP, is the UPT prefix itself. Generally, exchanges will introduce no capability restrictions.

NOTE: However, if the call has to be routed to the SSP through internetwork boundaries (i.e. LE/TE or TE/ISC), special attention has to be paid for the call/prefix handling

.EXAMPLE 2: The UPT indication can be based on the analysis of the trunk prefix (e.g. 0) followed by a special area code reserved for UPT. This may imply a routeing of the call before the number translation up to the trunk exchange (e.g. if the local exchange has not sufficient capabilities for number analysis, see cases 4), 5) and 6) in subclause 4.6.1). However, no restrictions will be presented by the trunk switches.

EXAMPLE 3: The UPT indication can be based on the analysis of the international prefix, (e.g. 00), followed by a special country code reserved for UPT. In this case, the local exchange should analyze the country code digits following the international prefix if optimised routeing is sought, and this may imply heavy modifications in existing local networks. Concerning trunk switches, no capability limitations are expected, but the analysis of the country codes should be extended to the trunk level that would cause problems in maintaining analysis tables.

EXAMPLE 4: If the UPT recognition is possible only through the analysis of the international prefix + country code + other digits, the implications on the network would be even heavier than in EXAMPLE 3. The required analysis length would probably be too long for local exchanges. Trunk switches will likely have sufficient capabilities, but the maintenance overhead could be too demanding, even for ISCs, to recognise a foreign UPT.

Capabilities of networks are continuously improving, and probably the status of most networks already is such that no serious restrictions of analysis capabilities of exchanges exist. However, this may not be true everywhere. Despite the different pace of evolution, it should be possible to provide an early start for UPT service in all countries, not waiting the development of the entire network.

4.9 Signalling considerations

Signalling items that are for further study may include Type Of Number (TON)/Numbering Plan Identifier (NPI), Calling Line Identity (CLI), etc. If redirection is to be applied, signalling will need appropriate enhancements (see subclause 4.6.2).

4.10 Number analysis and database query

The considerations provided in this subclause expand those contained in point b) of subclause 4.4, i.e. they concentrate on the appropriate UPT number structure so that the SCF is able to address the proper database (SDF), and the database can perform the appropriate translation.

In principle, there are two possible approaches to the structuring of the UPT number:

1) no location information in the number structure;

2) complete location information in the number structure.

The "location information" in this context means some knowledge about the location of the database where the subscriber service profile is stored.

The amount of location information in the number structure may affect the structure of the database, database searches and, consequently, the post-dialling delay.

No location information in the number structure implies a worldwide UPT database or all UPT databases must include these numbers at least with a reference to the relevant database. Extensive database searches may increase the post-dialling delay and in this way deteriorate the quality of the service. This type of number is difficult to implement worldwide. However, from the service point of view, it has benefits (e.g. worldwide number portability) and should be for future studies.

Complete location information in the number structure allows an easy implementation and a faster search of a roaming UPT user.

It is felt that as a short term need database searches would be simplified if an indicator of the service provider was given in the number. However, this may restrict the number portability.

4.11 Number analysis and charging

Charging of normal calls takes place through number analysis performed by the originating local and trunk exchanges. For UPT calls, it is assumed that the charging mechanisms will be realised by an IN functionality. This means, that it should be possible to inhibit ordinary charging procedures , to allow charging to be performed under the control of the IN functions (i.e. SCF, SnDF). One way to inhibit the normal charging is based on the recognition of a UPT call through the analysis of the dialled sequence. In this case, that exchange that charges ordinary calls must have sufficient capabilities to identify UPT calls, and the analysis requirements for charging to recognise UPT are similar as for routeing.

If a UPT prefix is used (see preceding subclauses), the prefix itself may indicate to the network the application of a special charging treatment.

NOTE: Additional charging mechanisms, not described above, are required in case of redirection (see subclause 4.6.2).

4.12 Numbering interworking requirements

UPT will be provided across PSTN, ISDN, Public Land Mobile Networks (PLMNs) and possibly other networks. To allow UPT calls, e.g. from PSPDN to ISDN, application of CCITT Recommendation E.164 [2] for the UPT number structure will make the numbering plans interoperable when applying methods recommended in CCITT Recommendation E.166 [3]. Application of a UPT numbering plan, which does not conform to CCITT Recommendation E.164 [2], would result in interworking difficulties.

The network number resulted from the translation has to be in a form that the UPT call in question can be routed to the right network even if the destination network is of different type than the originating network. The application of CCITT Recommendation E.166 [3] for the number translation is sufficient.

4.13 Evolution of UPT numbering plans

An essential capability supported by the UPT numbering is locating the UPT users "home database" to access service profile and current location information (see subclause 4.10). The target UPT numbering should provide global portability, i.e. the users keep their numbers, independent of service providers or countries, as they move anywhere in the world. This, of course, requires networks to have a number analysis capability powerful enough to support such a numbering.

However, today's telecommunications industry, within and among many countries, is an autonomous environment in which service providers operate independently. Consequently, a UPT numbering plan such as a global-based plan, or even a national-based plan, requires major development in administrative, business, and technical areas to provide interoperability among service providers for updating databases and interworking. Therefore, the problems associated with immediate implementation of global-based or national-based UPT numbers would prevent the UPT service from being offered in the near future.

To reach the ultimate goal of global-based personal numbers from the present network structure and technology, the UPT numbering has to evolve as the network capabilities evolve. Such an evolutionary UPT numbering should allow UPT service providers to begin offering personal communication services in the near future, and provide a framework for service providers so that they could use a consistent numbering to avoid incompatibility in the future transition to the global-based UPT numbering.

A key consideration must be to develop a numbering plan that minimises the need for users to change UPT numbers as networks evolve towards the ultimate goal.

5 Other UPT procedures

NOTE: This text is of an introductory nature and will be expanded as issues develop in NA7 (e.g. in Technical Reports for UPT phases 2 and 3).

Besides UPT incoming calls, there are other UPT procedures requiring consideration. These include registration for UPT incoming/outgoing calls, database interrogation, service profile management and making UPT outgoing calls.

5.1 Registration for incoming/outgoing calls, database interrogation and service profile management

For procedures stated in the title of this subclause, it is necessary to have a contact with a UPT database. In principle, three cases, analogous with the calling scenarios in subclause 4.7, can be identified:

1) the UPT user residing in his/her home area (e.g. country), which supports the UPT service, wants to interact with his/her database. In this case, the call of the UPT user is preferably routed to the nearest SSP, through which necessary interactions are performed. See figure 8;

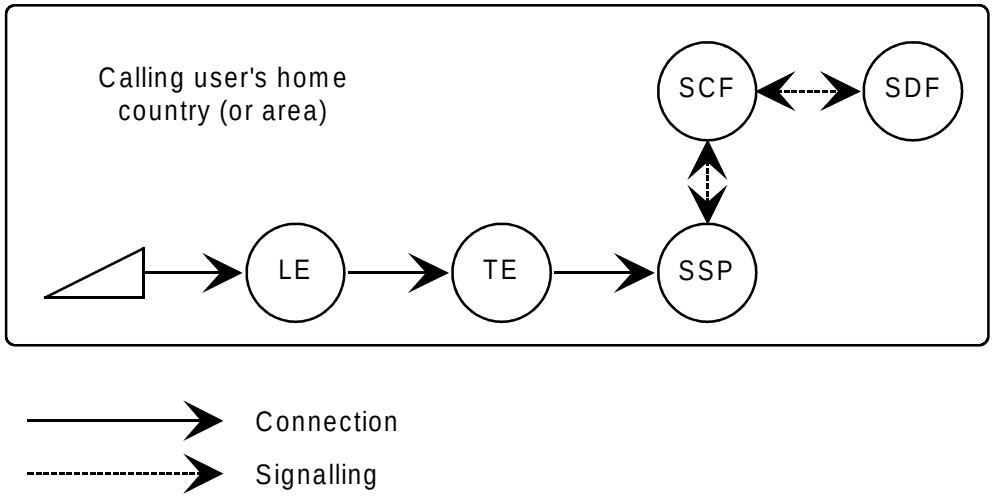

Figure 8: Example of performing UPT procedures in the user's home country

2) the UPT user visiting a UPT supporting area (e.g. country), wants to interact with his/her database. In this case again, the call is preferably routed to the nearest SSP. Necessary database interactions are performed through this exchange although the user's home database was in another country. See figure 9;

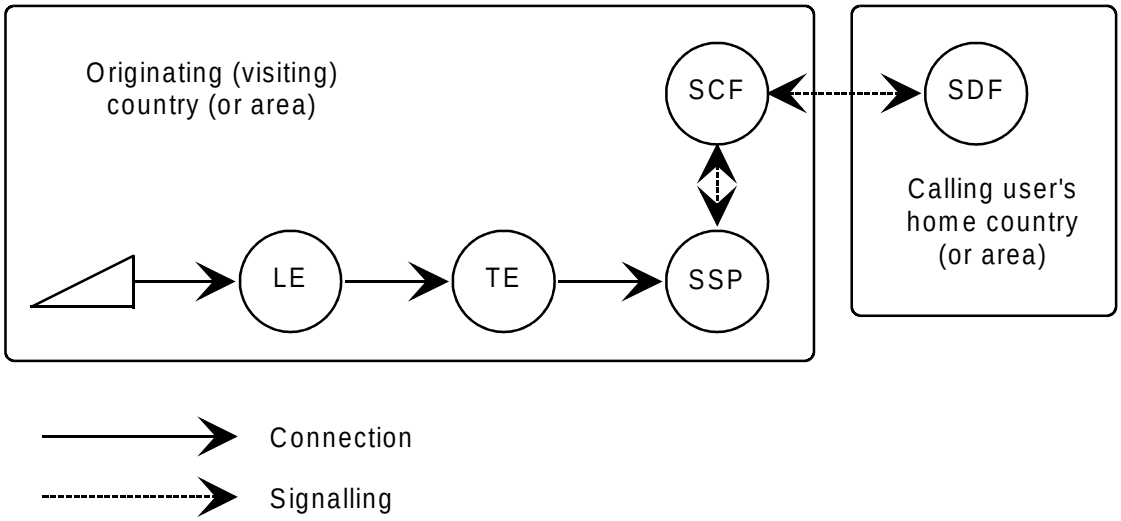

Figure 9: Example of performing UPT procedures in a visiting, UPT supporting country

3) the UPT user visiting a non-UPT area. In this case, the call has to be routed to an SSP in the user's home area/country. This routeing possibility may also be required as an option in case 2 above. See figure 10.

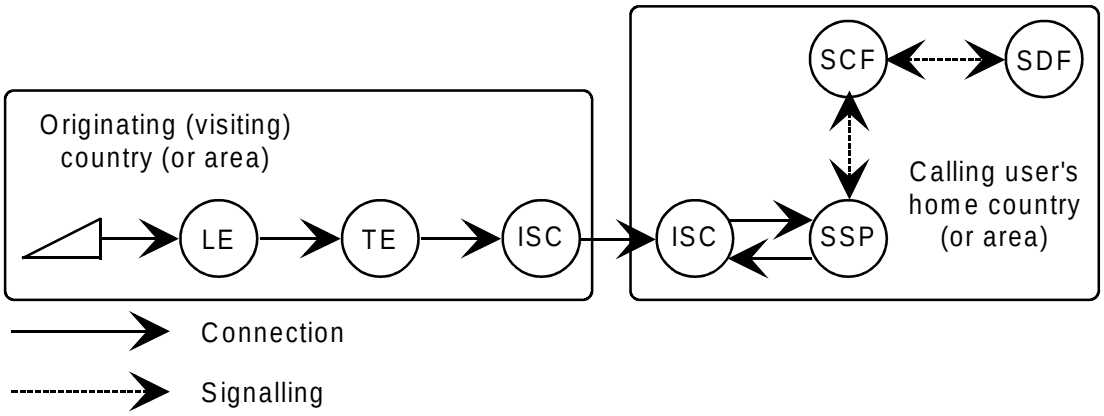

Figure 10: Example of performing UPT procedures in a visiting, non-UPT country

In all cases presented, a UPT-Access Code (UPT-AC) or UPT-Access Number (UPT-AN) is required. UPT-ACs and UPT-ANs can differentiate between different service providers. In the IN architecture, the SSF will use these codes and numbers to recognise UPT request. Detailed principles of the structure and use of UPT-AC and UPT-AN are outside the scope of this ETR.

There are two ways to perform the procedures above:

1) with the same terminal used for making/receiving calls through Call Control Agent Function (CCAF), Call Control Function (CCF), SSF, SCF, and Service Management Function (SMF) entities of the IN architecture, in this order;

2) with a special terminal used for service management through Service Management Access Function (SMAF), SMF, SCF and SSF entities of the IN architecture, in this order.

As can be seen, two interfaces to the IN architecture are used. These interfaces may require different addresses. In the second case, also a CCITT Recommendation X.121 [10] number may be applicable; this is for further study. Possible locations of the interfaces in the IN architecture to be addressed are shown in figure 11.

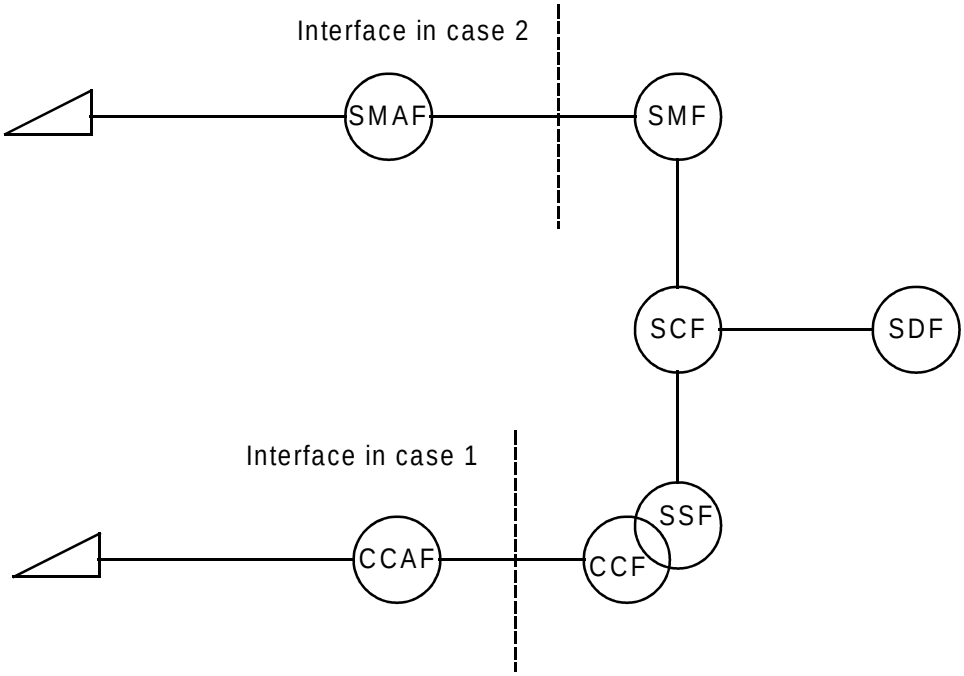

Figure 11: Possible network interfaces in the IN architecture to be addressed to perform registration, database interrogation, etc.

5.2 UPT outgoing calls

Registration for UPT outgoing calls is included in the previous subclause; this subclause deals with making UPT outgoing calls only.

Until a major development in signalling and exchange capabilities are introduced, UPT outgoing calls have to be routed through the SSP. Scenarios are the same as presented in subclause 5.1, with the addition that from the SSP onwards, the call has to be routed to the called subscriber. Case 3 in subclause 5.1 can be undesirable, however, it may be required. In this case, unoptimised routeing can easily take place.

Whatever the case, also for UPT outgoing calls, UPT-ACs and/or UPT-ANs are required. Detailed principles of the structure and use of these codes and numbers are outside the scope of this ETR.

History

Document history	
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