TR 101 079 V1.1.1 (1997-07)

Technical Report

Network Aspects (NA); Routeing of calls to pan-European services using European Telephony Numbering Space (ETNS)

European Telecommunications Standards Institute

Reference
DTR/NA-021410 (9zo00ics.PDF)

Keywords
Addressing

ETSI Secretariat

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

X.400
c= fr; a=atlas; p=etsi; s=secretariat

Internet
secretariat@etsi.fr
http://www.etsi.fr

Contents

Intellectual Property Rights

ETSI has not been informed of the existence of any Intellectual Property Right (IPR) which could be, or could become essential to the present document. However, pursuant to the ETSI Interim IPR Policy, no investigation, including IPR searches, has been carried out. No guarantee can be given as to the existence of any IPRs which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Network Aspects (NA).

Introduction

Both the CC and the NDC methods are covered within the present document following a proposal from the European Numbering Forum (May 1996) that both options will be considered for implementation although European Committee for Telecommunications Regulatory Affairs (ECTRA) decided on 7th November 1996 that the ETNS should be based on the CC-scheme.

1 Scope

The present document provides guidelines for the selection of Routeing Methods (RMs) and alternatives for routeing of calls to pan-European services implemented with a designated Country Code (CC-scheme) and/or through the use of a spare national resource (NDC-scheme).

Guidance is given on the selection of a preferred Routeing Method (RM) and on routeing between the calling user and the Service Provider (SP).

Routeing aspects of mobility are outside the scope of the present document.

Parts of the present document will later be developed to an EN.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ITU-T Recommendation E.162: "Capability for seven digit analysis of international E.164 numbers at time T".

[2] ITU-T Recommendation E.164: "Numbering plan for the ISDN era".

[3] ITU-T Recommendation E.412: "Network management controls".

[4] ITU-T Recommendation E.170: "Traffic routeing".

[5] ITU-T Recommendation Q.731: "Stage 3 description for number identification supplementary services using signalling system No. 7".

[6] TR 101 073 (1997): "Number portability for pan-European services".

[7] TR 101 074 (1997): "European Numbering Task Force; Management of the European Telephony Numbering Space (ETNS)".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

assisted network: A network which routes all the calls to European Numbers (ENs) towards a serving network it has agreement with.

called party: A party that terminates a call involving an EN. The called party may be the subscriber to the EN itself, or a terminating equipment of the service network (e.g. an answering machine).

calling party: A party that dials an EN.

ETNS administrative database: The part of the ETNS registrar database where administrative data, for each EN, is registered.

ETNS registrar database: The database where all datas, both administrative and operational, for each EN are registered.

ETNS routeing/portability database: The part of the ETNS registrar database where all operational datas necessary for routeing and portability (e.g. Routeing Number(s) (RN)(s), Service Provider (SP) identity), for each European Number (EN) are registered.

ETNS translation database: A database which, in the call process, translates the EN into a RN.

European Number (EN): A number out of the ETNS.

Routeing Number (RN): An E.164 number, specified by the service network, which can be used to identify and reach the service exchange. It can also identify the called party, the SP, or the originating network.

originating network: A network, either assisted or serving, to which the calling party is connected.

service exchange: An exchange of the service network that triggers the provision of the service on reception of the RN, and then forwards the call.

service network: A network that operates the service exchange(s).

Service Provider (SP): An entity that is contracted to provide one or more pan-European service(s) to its subscribers.

serving exchange: An exchange, in the serving network, that can interrogate directly or indirectly an ETNS translation database to obtain a RN related to the EN, and then forward the call.

serving network: A national or multi-national network, with one or several serving exchanges.

subscriber: An entity that requests an EN from a SP in order to offer access from a calling party to a pan-European service.

Terminating Number (TN): A number containing explicit information on the terminating point of the called party. The number is used to route towards the called party. It can be a RN, an EN or a geographical number.

3.2 Symbols

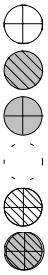
For the purposes of the present document, the following symbols apply:

Calling party

Called party

Originating, transit or destination exchange

Serving exchange



Service exchange

ETNS translation database

Service provider database

Database

Combined serving and service exchange

Combined ETNS translation and service provider database

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

B-ISDN	Broadband-Integrated Services Digital Network
B-ISUP	Broadband-ISDN User Part
CC	Country Code
CLIP	Calling Line Identification Presentation
CN	Corporate Networks
CS	Capability Set
CSSC	Country Specific Service Code
DSS1	Digital Signalling System No. one (ISDN access protocol)
DSS2	Digital Signalling System No. two (B-ISDN access protocol)
ECC	European Country Code
ECMA	European Computer Manufacturers Association
ECTRA	European Committee for Telecommunications Regulatory Affairs
EN	European Number
ESC	European Service Code
ESI	European Service Identifier
ETNS	European Telephony Numbering Space
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
ITU-T	ITU-Telecommunication standardization sector
NDC	National Destination Code
N(S)N	National (Subscriber) Number
PISN	Private Integrated Services Network
RM	Routeing Method
RN	Routeing Number
SCP	Service Control Point
SN	Subscriber Number
SP	Service Provider
SSP	Service Switching Point
TN	Terminating Number

4 Executive summary

Four Routeing Methods (RMs), and three alternative ways of locating the ETNS translation databases are together with their routeing consequences described. A detailed description of the addressing and addressing parameters used for double translation is given.

A reference model for the ETNS is given showing the overall ETNS architecture for the routeing of calls to an ETNS number, for the Service Provider (SP) portability in the ETNS and for the management of the ETNS.

ITU-T Recommendation E.162 [1] does not influence on the choice between the CC-scheme and the NDC-scheme, nor on the choice in the location of the ETNS translation database(s), since identification of an individual European service can be done within the limit of 7 digits analysis both for routeing and charging purposes. It sets, however, a limitation to the structuring of ESI.

ITU-T Recommendation Q.731 [5] need to be changed if number identification supplementary services are to be provided for the NDC-scheme with ETNS translation databases located outside the country from where the number series is taken from.

Direct routeing (Routeing Method 1) without number translation can be introduced at once.

Single translation (Routeing Method 2) with standardized signallings cannot be implemented through any of the mentioned Capability Sets of Intelligent Network Application Protocol (INAP), because no work has yet been planned to try to introduce a direct signalling interface between a serving exchange in one network and an ETNS translation database in another network. It can, however, be introduced through other data interfaces, but it would still require agreements upon the role of the translation database(s) and what to transfer between the serving exchange and the database. Routeing Method 2 with non standardized signallings can, however, be implemented in short term. This can only be used for services that are provided from recording announcements.

It is possible through double translation to increase the flexibility for service provisioning for the called subscriber. Double translation can be implemented in two ways: using the speech path (Routeing Method 3) or the signalling path (Routeing Method 4).

Double translation can be introduced as soon as the addressing parameters to be used between the serving address and service exchange have been agreed and implemented, and the procedures and mechanisms for updating the ETNS translation databases have been decided. It is recommended that Routeing Method 3 (double translation using the speech paths) be used. This can later evolve to the more economical Routeing Method 4.

Routeing Method 4 can, however, not be implemented until INAP CS2 is implemented i.e. in the period 1999-2001.

Double translation combined with alternative 3 for locating the ETNS translation database(s) makes is possible to avoid a complex decision process of where to locate the translation databases, because it offers each subscriber to a pan-European service the possibility to choose individually a pan-European Service Provider (SP).

Double translation can be implemented through two different addressing methods: Routeing Numbers (RN)s identifying the called party or SPs. The creation of a RN series for ETNS is a network operator/national matter. Due to the technical difficulties in implementing the identification of SPs prior to the implementation of ISUP version 2, it is recommended that RNs identifying the called party in phase 1 of the ETNS.

Location alternative 3 should in principle give the lowest cost of routeing because the ETNS translation database is very close to the calling European user, irrespective of what Routeing Method (RM) is used. The uncertainty about this is firstly due to the added flexibility, because the distances to and from the Service Providers (SPs) network is now chosen by the subscriber to an European number, secondly that the costs for utilizing all the ETNS translation databases need to be included.

In long term the cost of routeing will be reduced by the introduction of Routeing Method 4.

The demands stemming from Corporate Networks (CN) could affect the capacity of the European service identity, and indirectly the depth of the digit analysis necessary for routeing purposes, without a rigid framework for allocation of CN-indicators.

As long as the service can be identified within the analysing limits defined in subclause 7.1, there should in principle be no problem in identifying where and when to set in controlling methods to protect the networks involved against sudden explosions of calls. Some protection methods need to be established in and between the European network operators to prevent the new pan-European services to destroy the capability to carry European international traffic.

5 Reference model for the ETNS

This clause provides a conceptual description of the implementation of the ETNS. Its aim is to explain the connections between the three ETRs covering the management, portability and routeing issues of the ETNS (for further study).

The architecture detailed in figure 1 is a target architecture for the medium/long term, and does not preclude a specific short term solution.

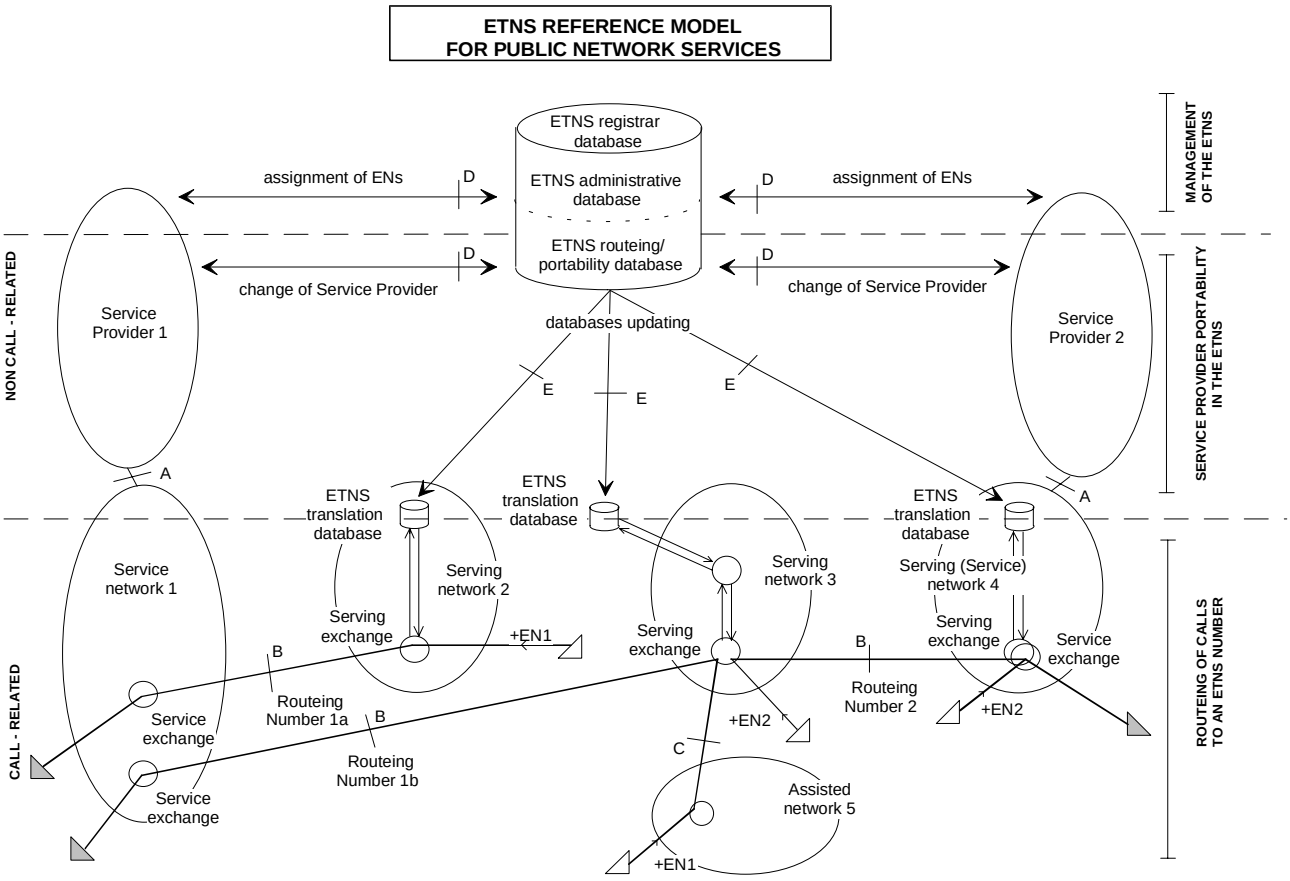


Figure 1: Overall ETNS architecture for services opened to competition

5.1 Requirements

Provision of services in ETNS is an open and competitive area, which means that any subscriber can select a specific Service Provider (SP) from one among all the SPs within Europe offering the service identified by the ESI. A Service Provider (SP) should treat all requests for subscription from European customers in a non-discriminatory manner.

In order to understand and develop issues pertaining to the management of an ETNS, it is necessary to understand what a pan-European call is. A pan-European call can originate outside Europe, terminate outside Europe, but the intelligence (the serving exchange, the ETNS translation database, the service exchange and the Service Provider (SP)) of the call should be located inside Europe.

Two key features characterize the model.

The model has to enable the connection of any new authorized Service Provider (SP) and/or service operator. As a consequence, there should be a clear distinction between the serving network and the service network. The serving network is responsible for routeing a call towards the service network. The service network is responsible for the service itself. This distinction makes necessary the use of an intermediary number (Routeing Number (RN)) for the serving network to address the service network.

The second requirement is that the European Numbers (ENs) are portable between Service Providers (SPs). This implies they are managed by an independent centralized authority, the Registrar. This authority keeps a database for all the European Numbers (ENs) and distributes the routeing information to the serving networks.

NOTE: Regarding the updating of the ETNS translation databases, the reference model has been developed for a centralized approach; other variants, e.g. decentralized, will also be studied during the standardization process.

5.2 Call-related part

This subclause describes the principles for routeing a call from the calling party to the called party. This is studied in detail in the future ETR on routeing (for further study).

The calling party dials the European Number (EN) in its international format.

Based on the European Service Identifier (ESI), the call is routed to the serving exchange in the serving network. Potentially, this exchange is not in the calling party's network, but is located in an assisting network (e.g. assisted network 5 does not wish - or is unable - to handle calls to European Numbers (ENs), and routes all these calls to serving network 3). The calling party's network is then called an assisted network, interconnected to the serving network through interface C.

The serving exchange, analysing the ESI, triggers the ETNS translation database to translate the incoming European Number (EN) into an outgoing Routeing Number (RN). The ETNS translation database can be inside or outside the serving network. The Routeing Number (RN) need not to be the same for each serving network (e.g. networks 2 and 3 route the calls to EN1 towards RNs 1a and 1b respectively).

This ends the first leg of the call which consists of routeing the call to the service exchange. This leg, including interface B between the serving exchange and the service exchange, has to be standardized.

At the service exchange can take place a second translation to redirect the call to the subscriber, or the call can be terminated to an answering machine.

Note that one network operator can have several of the above functions:

- the service network and the Service Provider (SP) are the same, so that interface A is internal;
- the serving network and the service network are the same (e.g. network 4). There, the same switch can be used as a serving and service exchange. Interface B is internal for a call originating from this network, and external elsewhere; the Routeing Number (RN) being necessary only in the latter case;
- the serving network, the service network and the Service Provider (SP) are the same, so that both interfaces A and B are internal.

5.3 Non call-related part

This subclause describes the organization of the databases that contain the Routeing Numbers (RNs) associated to European Numbers (ENs). The main one is the ETNS registrar database; the others are the serving networks' partial copies of it, the ETNS translation databases.

The ETNS registrar database can be logically split into two databases.

The first one is the ETNS administrative database, which interacts with the Service Providers (SPs) through interface D, for EN request and attribution, and for change of Service Provider (SP). The interaction between the Registrar and the Service Provider (SP) could be a human interface, e.g. using phone and fax, but should be an automatic interface, e.g. using the Internet.

The second one is the ETNS routeing/portability database, which interacts with the ETNS translation databases through interface E in updating procedures, occurring when:

- a new EN has been assigned together with one or several Routeing Numbers (RNs); only the originating networks where the service is opened should be updated with the right routeing information;
- a change of SP has occurred, entailing new Routeing Numbers (RNs);
- an ETNS translation database failure has occurred, erasing all or part of the datas;
- the Service Provider (SP) has decided to change any parameter present in the ETNS translation database.

In any case, the Registrar should be first informed of the change.

6 Routeing

In the following subclauses the terms "Routeing Methods (RMs)" and "location alternatives" are used. By Routeing Methods (RMs) are meant the technical methods (mechanisms) for retrieving information about the destination number from the European Numbers (ENs) utilizing combinations of speech and signalling paths. By location alternatives is meant the routeing of calls to the SP with alternative locations of the ETNS translation database(s). A location alternative can be implemented by one or more of the RMs.

Although the present document focuses on the use of IN capability to translate between the EN and the RN it is recognized that other mechanisms can be used.

6.1 Routeing Methods (RMs)

Routeing Methods (RMs) are the technical means (mechanisms) that enable the involved exchanges to obtain routeing information from the dialled European Numbers (ENs) utilizing combinations of speech and signalling paths. Four RMs have been identified:

RM 1: Direct routeing.

RM 2: Single translation.

RM 3: Double translation using the speech path.

RM 4: Double translation using the signalling path.

None of the RMs are considered mutually exclusive.

In the following subclauses the three translation methods are all illustrated using the same reference figure. The speech and signalling paths that are being used for each method are shown in bold lines. All the figures used in this subclause are examples, and the number of exchanges in the figures are for illustrative purposes only.

6.1.1 Direct routeing

By direct routeing is meant a method that bases each routeing decision on the content of the dialled EN, as shown in figure 2. No number translation takes place.

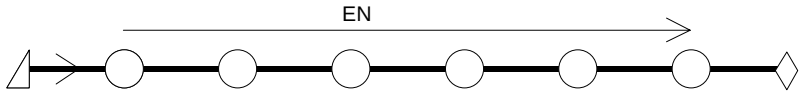


Figure 2: Direct routeing

6.1.2 Single translation

Single translation is a RM that utilizes one number translation during the call setup between the calling and called party. All routeing decisions will either be based upon the called European Number (EN) or the Terminating Number (TN) as shown in figure 3.

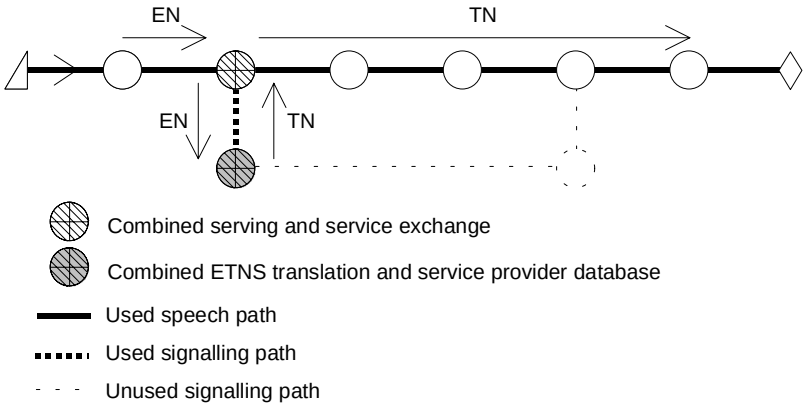


Figure 3: Single translation

The implementation of this method depends upon the location of the exchange and the database.

If the exchange and the database are co-located by one service network operator the interrogation between the exchange and the database takes place through a proprietary or non standardized interface.

If the exchange and the database are located in different networks the method can only be realized through the use of a standardized interface between the combined serving/service exchange and the combined ETNS translation/Service Provider (SP) database e.g. X.25/X.75. There are no plans to standardize such an interface between the exchange and the database.

6.1.3 Double translation using the speech path

It is possible through double translation to increase the flexibility for service provisioning for the called subscriber. Double translation can be implemented in two ways: using speech or signalling path. In both methods the routeing decision is based upon the analysing of three addressing parameters: the dialled European Number (EN), a Routeing Number (RN) and the Terminating Number (TN). Figure 4 illustrates the method with non-standardized interfaces.

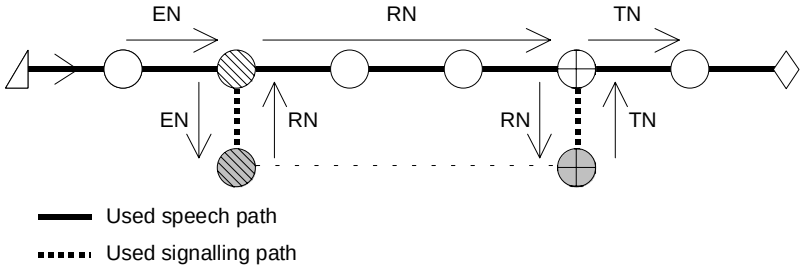


Figure 4: Double translation using speech path

Non-standardized interfaces requires that the serving exchange and the ETNS translation database are co-located within one network operator. The service exchange and the Service Provider (SP) database are also co-located within one network, which can either be the same as for the serving exchange/ETNS translation database or another.

The serving exchange interrogates the ETNS translation database to find the Routeing Number (RN), and the service exchange identified by the found number interrogates the Service Provider (SP) database to locate the termination number of the call. The number translation from EN to RN takes place in the ETNS translation database, while the translation from RN to TN takes place in the Service Provider (SP) database.

The addressing information that cross internetwork boundaries or international borders may be the EN, RN and/or the TN, which aside from the communication between the exchanges and the databases follows the speech path between the calling and called party.

Functionally each network operator can provide both a serving and a service exchange, but they are independent functions and should from a routeing and addressing point of view remain so.

6.1.4 Double translation using the signalling path

Whilst this subclause focuses on a standardized interface it is recognized that other options exist, including the realization of this scenario using non-standardized interfaces between the databases.

The second double translation method with standardized interfaces utilizes for routeing purposes the same three numbering parameters i.e. the dialled European Number (EN), a Routeing Number (RN) and the Terminating Number (TN). However, obtaining the terminating number takes place in a different way, as illustrated in figure 5.

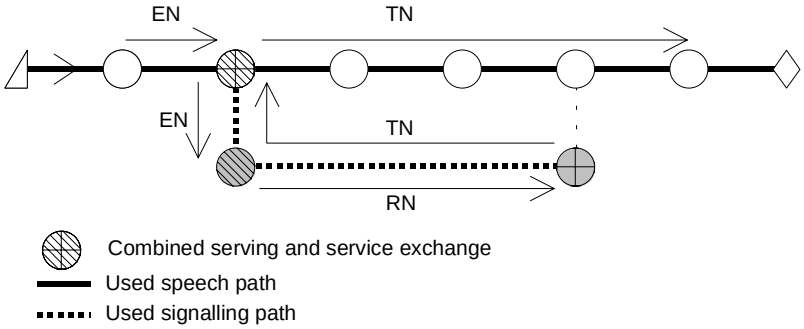


Figure 5: Double translation using signalling path

Standardized interfaces mean that the Service Provider (SP) database is connected to the ETNS translation database through a standardized interface. The combined serving/service exchange and the ETNS translation database are normally co-located within one network.

The serving exchange interrogates the ETNS translation database to find the Routeing Number (RN) of the Service Provider (SP) database exchange, and the ETNS translation database uses RN to route to the Service Provider (SP) database where the Termination Number (TN) of the call is located. The number translation from EN to RN takes place in the ETNS translation database, while the translation from RN to TN takes place in the Service Provider (SP) database.

The addressing information that cross internetwork boundaries or international borders may be the EN, RN and/or the TN, of which EN and TN follows the speech path between the calling and called party, and RN follows the signalling path.

Functionally each network operator can provide both a serving and a service exchange, but they are independent functions and should from a routeing and addressing point of view remain so.

6.2 Further description of double translation

6.2.1 Addressing

Both Routeing Methods (RMs) that utilize double translation need routeing numbers to locate the Service Provider (SP) database. Addressing for double translation can take place in two ways, distinguished only by what the Routeing Numbers (RNs) identify and how they are transferred between the ETNS translation database and the Service Provider (SP) database. The two addressing methods can thus be described as:

1. Routeing Numbers identifying the called party (RN1).

2. Routeing Numbers identifying Service Providers (SPs)s (RN2).

To understand the detailed differences between these two addressing methods, we need to look at what the addresses look like in the network. Figure 6 shows 4 reference interfaces between a calling and called party at which the structure of the address (number) will be presented. These interfaces are:

C: In front of the serving exchange (see figure 1).

B: Between the serving and service exchange (see figure 1).

F: Between the ETNS translation database and the Service Provider (SP) database.

G: After the service exchange.

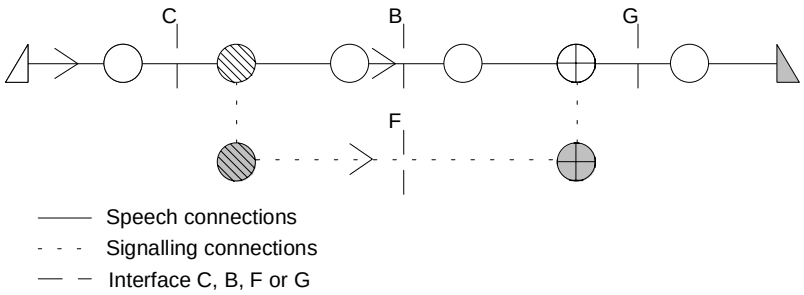


Figure 6: Addressing interfaces

The double translation methods uses the interfaces as follows:

RM3: Double translation using the speech path utilizing C, B and G.

RM4: Double translation using signalling path utilizing C, F and G. Interface B is internal within the combined serving/service exchange.

Table 1 shows the addresses, transferred in the direction of the arrows in figure 6, at the four mentioned interfaces for the two addressing methods used with double translation. The addresses shown are those that are transferred in the direction of the arrows in figure 6.

Table 1: Addresses used with double translation

Addressing method	Interface C	Interface B	Interface F	Interface G
1	EN (note 2)	RM 3: RN1 RM 4: NA	RM 3: NA RM 4: RN1	TN
2	EN (note 2)	RM 3: RN2 and EN RM 4: NA	RM 3: NA RM 4: RN2 and EN	TN

NA: Not applicable
EN: ECC+ESC+SN
RN1: CC+NDC+SN
RN2: CC+NDC+SN
TN: CC+NDC+SN

NOTE 1: + is not part of the address, it is only used to separate the different numbering parameters.
NOTE 2: The international prefix is not part of the dialled numbers.

One Service Provider (SP) may have more than one identity (RN2).

The two methods differentiate also in the way the numbers are transferred across interface B and F. The Routeing Numbers (RNs) are always transferred in the "called party number" parameter.

With addressing method 2 both RN2 and EN have to be transferred across interface B or F. This cannot be done before ISUP version 2 is established between the involved exchanges.

With RNs a state of dependence between a part of the national numbering schemes and the ETNS is created. The RNs can either be taken from the number series assigned to the Service Providers (SPs) or from a number series assigned to the network operators. The creation of a RN series for ETNS is a network operator/national matter.

Change of Service Provider (SP) means change of Routeing Number (RN).

6.2.2 Speech and signalling paths

Routeing Methods 3 and 4 will result in different speech and signalling paths through the European networks. One example of this is illustrated in figure 7.

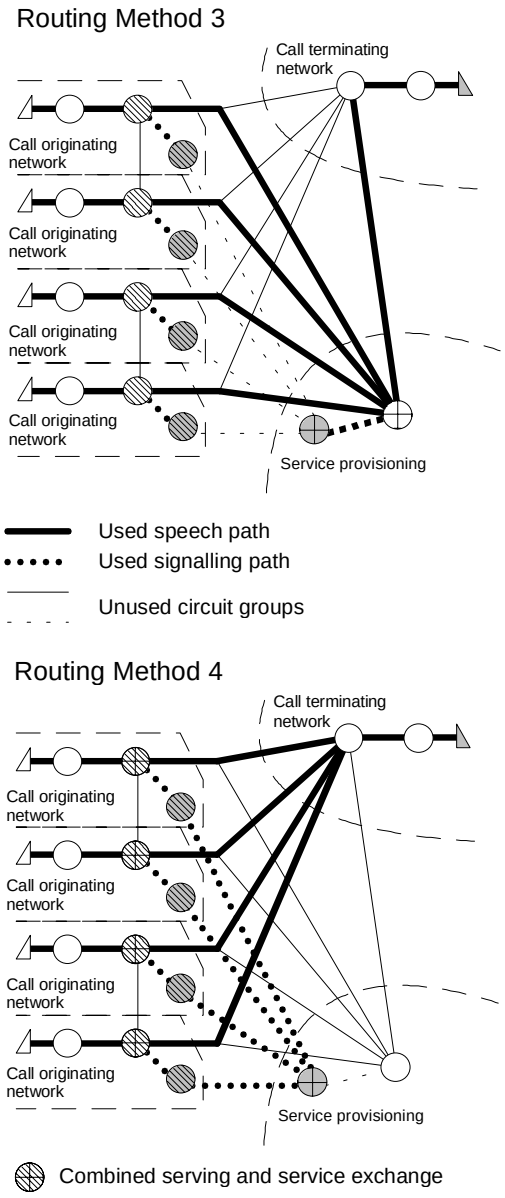


Figure 7: Illustrated example of speech and signalling paths with double translation

Figure 7 shows that the used speech paths with RM3 are longer than the speech paths used with RM4. The figure also shows that RM4 utilizes more of the signalling network.

6.3 Routeing alternatives

The routeing from the calling party to the Service Provider (SP) will depend upon the location of the ETNS translation database and the service database, and whether the originating network has IN capability or not. Special arrangements are required for assisted networks.

6.3.1 Assisted networks

An assisted network is defined as a network without ETNS translation database. As such it will, in most cases, have to rely on networks with IN capability to handle the necessary translating functions. A fixed network may assist a network for mobile services, an incumbent network may assist a new entrant, an European network may assist a non-European network and so on.

An assisted network has to analyse the ESI or part of it, before a routeing decision is taken. For charging purposes all the ESI has to be analysed. Table 2 shows the consequences of different digit analysis in the assisted networks for the CC-scheme and the NDC-scheme.

Table 2: Digit analysis in assisted networks and its consequences

Digit analysis	Consequences
CC-scheme	
ECC	All calls to pan-European services have to be routed to the same European gateway, and all pan-European services have to have identical charges.
ECC+ESC	The European gateway can be decided on a service by service basis, and each service can be charged individually.
NDC-scheme	
CC	All calls to pan-European services have to be routed to the gateway identified by CC, and the charges for the pan-European services have to follow the international charges to the country identified by CC.
CC+CSSC	The European gateway can be decided on a service by service basis, and each service can be charged individually.

The networks in all non-European countries are assisted networks, when it comes to routeing of calls to pan-European services. Europe should in general require that the routeing from non-European countries is done on an individual service basis after analysing the ESI.

An assisted network will always be an originating network.

It should be acknowledged that routeing in a competing environment is a commercial issue between the involved parties.

6.3.2 Location alternatives of the ETNS translation databases

Three alternatives are described. All can be implemented using the Routeing Methods (RMs) 2, 3 and 4 described in subclause 6.4.

The routeing differ according to the location of the serving exchange, the ETNS translation database, the service exchange and the Service Provider (SP) database. The following alternatives cover totally all existing possibilities for locating the ETNS translation database.

Alternative 1: The ETNS translation database for one pan-European service is located in one serving network.

Alternative 2: The translation database for one pan-European service is located in a limited number of serving networks.

Alternative 3: The translation database for one pan-European service is located potentially in all serving networks.

Alternative 2 covers location of ETNS translation databases in a limited number of serving networks. It opens for the possibility that one translation database can serve more networks, countries and Service Providers (SPs)s, including their European numbering scheme.

The alternatives are mutually exclusive when it comes to one pan-European service, but each alternative can be used for different services. It is, however, possible for a service to evolve from one alternative to the other.

The routeing consequences of these location alternatives are described in subclause 6.4.

6.4 Routeing consequences of the location alternatives

In the following subclauses, the routeing consequences for each location alternative is described.

6.4.1 ETNS translation database located in one network

With this alternative all calls to one pan-European service are routed via one specific ETNS translation database in Europe irrespective of what Routeing Methods (RMs) is used. Before a routeing decision can be taken, the exchanges in the originating countries have to identify what European service the call relates to, i.e. analyse the ESI (ECC+ESC or CC+CSSC).

The translation from an European Number (EN) to a Routeing Number (RN) will always take place at the serving network, that has been given the responsibility to manage the ETNS translation database for one specific service. All the Routeing Methods (RMs) can be used with alternative 1, even though direct routeing is irrelevant for services that need number translation.

RM2 will, without any additional standardization work, require that the serving/service exchange and the ETNS translation/Service Provider (SP) database are all located by the same serving network, such that the signalling between them can be non-standardized.

RM3 using the speech path can be used to locate the centralized ETNS translation database, but it would mean that we in total may have to perform two number translations: the first to find the Service Provider (SP) database and the second one to find the Terminating Number (TN).

RM4 cannot be used until CS2 of INAP is ready and implemented.

For the NDC-scheme, alternative 1 provides two options for location of the ETNS translation database:

1. Locate the translation database in the country from where the number series is taken.

   Easier recognition and implementation of routeing e.g. routeing to the translation database in France when the number series is taken from the French number plan.

   Easier to obtain political agreement in some countries for the allocation of this resource.

2. Locate it elsewhere.

Difficult for non-European countries to understand the routeing requirements.

Requires change in ITU-T Recommendation Q.731 [5] to be able to offer number identification supplementary services.

Concentrating all calls to one pan-European service to one ETNS translation database has the major drawback that it relies on the real-time availability of one single database.

Alternative 1 will require an agreement on the location of the ETNS translation database.

6.4.2 ETNS translation database located in a limited number of networks

With this alternative all calls to one pan-European service is routed to one of a limited number of ETNS translation databases in Europe irrespective of what RMs is used. Before a routeing decision can be taken, the exchanges in the originating countries have to identify what European service the call relates to, i.e. analyse the ESI (ECC+ESC or CC+CSSC), and then decide what ETNS translation database to route the call to.

From a service point of view the ETNS translation databases can for instance be organized as shown in figure 8, where a limited number of translation points may jointly be used for more than one service.

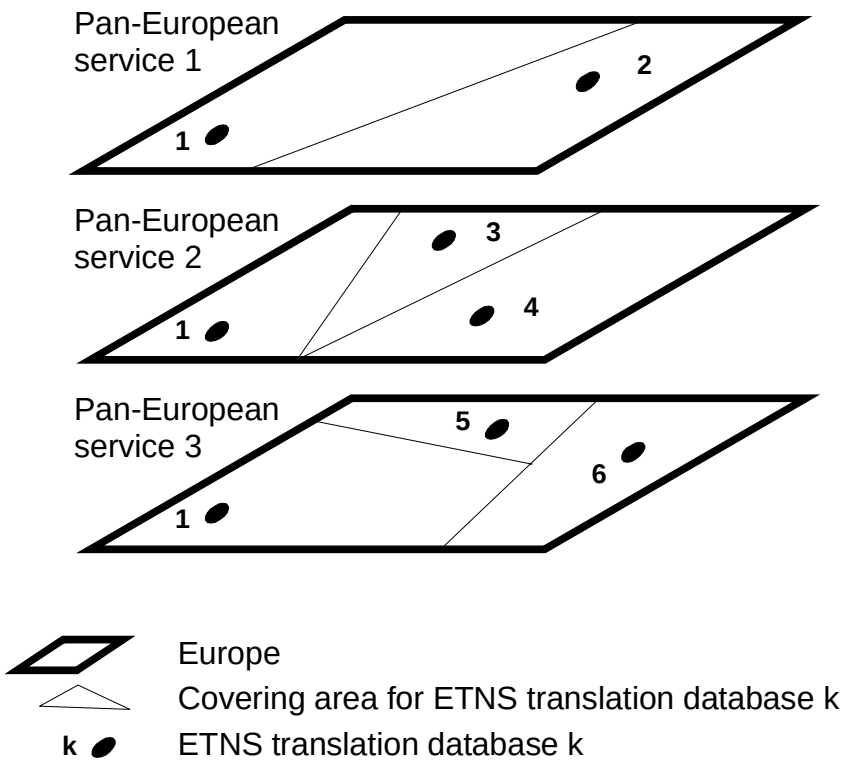


Figure 8: Use of a limited number of translation databases for each service

In the example only translation database 1 is jointly used by all the three services. Service 1 utilizes 2 ETNS translation databases, while service 2 and 3 each utilizes 3 translation databases.

All the comments given for alternative 1, regarding digit analysis and use of the different Routeing Methods (RMs), will be equally valid for alternative 2.

Alternative 2 will require an agreement on the location of the ETNS translation databases.

The structure of routeing from the originating networks to the service network will be as for alternative 1.

6.4.3 ETNS translation database located at potentially all networks

With this alternative all calls to the pan-European services are routed to one or more national ETNS translation databases. Before a routeing decision can be taken, the exchanges in the originating network have to identify that it is a call to a pan-European service, i.e. analyse the ESI (ECC+ESC or CC+CSSC), and then decide what national database to route the call to.

If only one national ETNS translation database is used for all the European services, each individual service need not to be identified for routeing purposes in the national network. All we need to identify is the "European identity". However, for charging purposes each European service has to be identified in each of the originating networks.

The RMs described in subclause 6.1 can all be used if more than one national ETNS translation database exists within a country.

Alternative 3 will require that the content of all the involved national ETNS translation databases used for European services is identical, i.e. when significant data in one translation database is changed, parallel updating of all the other translation databases used for the same service in all European countries have to follow. This will require that all the national translation databases participating in the creation of pan-European services either be interconnected for automatic updating, or otherwise an effective manual process must be developed.

Alternative 3 does not require an European decision on the location of the ETNS translation databases, but it may require a national decision.

7 An evaluation of the Routeing Methods (RMs) and routeing alternatives

The evaluation of the Routeing Methods (RMs) and location alternatives concerns different aspects of routeing i.e. whether an evolution in numbering may influence routeing, the necessary routeing procedures, how to secure the networks against sudden and unforeseen increase in traffic or call attempts, routeing of traffic from mobile networks, resilience, costs and whether the supplementary services are influenced negatively. In addition to this we have investigated whether any existing European Telecommunication Standard (ETS) or ITU-T Recommendation could influence the use of the methods/alternatives, whether the CN demands may influence it and how, and if the evolution of the European signalling network will influence the selection of one or more of the methods/alternatives.

7.1 International recommendations

Two ITU-T Recommendations could influence the choice of routeing alternative. These are ITU-T Recommendation E.164 [2] approved in 1988, revised in 1991 and under review now, and ITU-T Recommendation E.162 [1] approved in 1994. In addition ITU-T Recommendation Q.731 [5] contains some important statements that need to be looked into.

ITU-T Recommendation E.164 [2] states:

> "The Country Code (CC) is used to select the destination country or geographical area and varies in length as outlined in .....".

This could in the worst case be used as arguments against the NDC scheme. A co-ordinated approach between European countries would need to be adopted to overcome the problems that this could create.

ITU-T Recommendation E.162 [1] states:

> "On international calls the number analysis performed at the originating country need not be more than the Country Code (CC) and:
>
> - four digits on the N(S)N in the case of a country with a three-digit Country Code (CC);
> - five digits on the N(S)N in the case of a country with a two-digit Country Code (CC);
> - six digits on the N(S)N in the case of a country with a one-digit Country Code (CC).
>
> Although the potential for seven-digits analysis exists, it is not required for every call. The terminating country will inform the originating country which of the digits of the E.164 number will indicate that seven-digits analysis is required.
>
> Some administrations will be able to implement the charging arrangements with seven-digit analysis at the same time as the associated routeing. Others may not be able to implement the charging arrangements at the same time; bilateral arrangements should be established between these administrations, if needed."

ITU-T Recommendation E.162 [1] does not influence on the choice between the Routeing Methods (RMs)/alternatives, as long as identification of an individual European service can be done within the limit of 7 digits analysis for routeing and charging purposes.

ITU-T Recommendation Q.731 [5] states for CLIP (Calling Line Identification Presentation):

> "The exchange shall check if the country code of the calling party number is the network's own country code. If this is the case, then the Country Code (CC) shall be removed."

Identical statements can be found for other supplementary services. This could influence the use of some supplementary services related to the NDC or CC-scheme.

7.2 Evolution to a global numbering scheme

A detailed description of the evolution to a global scheme can be found in TR 101 073 [6] and TR 101 074 [7].

7.3 Evolution of IN signalling

When it comes to selection of RMs for the European numbering scheme the development of the signalling capability is the most critical. Figure 9 shows two networks with IN capability and the involved signalling systems.

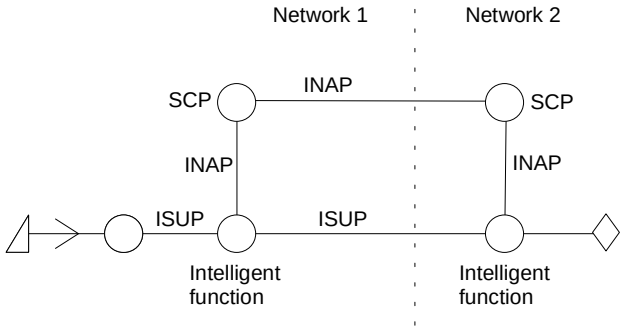


Figure 9: IN signalling involved in development of European numbering schemes

In network 1 the serving exchange is a transit exchange, while in network 2 it is a terminating/originating exchange.

INAP is being developed in three steps defined as Capability Set 1, 2 and 3 (CS1, CS2 and CS3).

CS1 is based on the configuration of a single network and a single point of control. The CS1 standards were approved in 1994. What currently is implemented by network operators, are proprietary versions resembling more or less CS1. Full support of CS1 is still some years ahead.

CS2 is based on the configuration of multiple networks and multiple points of control. For ETSI the activity on CS2 is mainly integrated with the corresponding work in ITU-T. A minimum of 4-8 years have to be added to get CS2 implemented in the networks.

CS3 is as CS2 based on the configuration of multiple networks and multiple points of control, but in addition it supports advanced mobility and integration of IN with B-ISDN. For ETSI the activity on CS3 is mainly integrated with the corresponding work in ITU-T. A minimum of 4-8 years have to be added to get CS3 implemented in the networks.

The Capability Sets 2 and 3 are by themselves incomplete, because they miss the interaction with other network protocols e.g. ISUP, B-ISUP, DSS1 and DSS2. A first specification of the interaction between INAP and ISUP for CS1 was approved in 1995.

Direct routeing (Routeing Method 1) does not require additional international or internetwork signalling. It can be developed and introduced without reference to any of the mentioned Capability Sets related to IN.

Single translation (Routeing Method 2) can with few exceptions only be implemented if the combined serving/service exchange and the combined ETNS translation/Service Provider (SP) database are all located within one network operator.

The exceptions are for the first that the communication, between a combined serving/service exchange and a combined ETNS translation/Service Provider (SP) database located in different networks, can take place through different interfaces. These could be a standard data interface like X.25 or X.75, a tailor-made interface adapted to each of the involved networks or a simplified version of INAP, as long as the information to be transferred is limited and non-controversial. None of the mentioned Capability Sets supports such an interface.

Double translation with non-standardized interfaces (Routeing Method 3) do not require international or internetwork signalling in the call setup phase, since each of the two involved SCP/SSP combinations belongs to one network operator. However, it does need an automatic or effective manual process to update all the ETNS translation databases in Europe.

Double translation with standardized interfaces (Routeing Method 4) can be implemented with CS2, but the method will also require interaction between INAP and ISUP/DSS1.

If the second addressing method with double translation, where Routeing Numbers (RNs) identify the Service Provider (SP), is to be implemented, the relevant existing INAP implementations should have the capability to support the transport of both the Service Provider (SP) identity and the called party number that results from the necessary mapping between ISUP and INAP.

When and if CS2 is implemented, the double translation method using speech path can gradually evolve towards the double translation method with using signalling path.

7.4 Locating the ETNS translation database

The CC-scheme and the NDC-scheme enables different methods for determining where the ETNS translation database(s) can be located.

For both schemes it is a fact that the location of the ETNS translation database(s) is normally done within one of the existing operators national networks. The national operators will normally expect that they should receive a larger share of the potential income for all the calls generated to the pan-European service(s) that they offer translation capability for. This is natural according to the extra cost of providing an ETNS translation database.

If this principle is accepted for the CC-scheme, then most of the operators in Europe will compete for the provisioning of the ETNS translation database for one or more pan-European services for the single translation method. There are no ways that a possible final selection can be made just according to technical criterias.

When it comes to the NDC-scheme the ETNS translation database(s) should primarily be located in one or more of the countries offering part of their national numbering resource for the ETNS to ease the routeing from non-European countries.

The only location alternative that can be considered fair to all the operators and Service Providers (SPs)s in Europe, for services that need double translation, is location alternative 3 with double translation (Routeing Methods 3 and/or 4), i.e. each network operator creates its own ETNS translation database. For services that terminate at an recorded announcement equipment the single translation method can be considered equally fair, because the recorded announcement equipment can be located all over Europe.

The single translation method and the double translation method with non-standardized interfaces, are the only RMs that can be implemented in short time. The double translation method with non-standardized interfaces can later be replaced by the same method with standardized interfaces without influencing the realization of location alternative 3.

7.5 Cost

The evaluation of costs related to routeing is primarily directed towards estimating the additional costs necessary to implement the identified RMs and location alternatives. This includes different type of functions within a number of exchanges and the use of group of circuits for either speech or signalling purposes. Normally it consists of a national and an international part.

The additional costs will vary between the RMs and location alternatives. Such costs are dependent upon the length of both speech and signalling paths, and the size, number and use of databases. Additional management costs should also be considered.

To access the pan-European services from the rest of the world each non-European network operator should be able to identify the ESI, irrespective of RMs and location of databases. The cost to introduce this capability lies with the non-European operators. Since every routeing alternative can be implemented in a number of different ways depending mainly on where the translation databases are located for the different European services, the comparing of costs should always be done between the cheapest implementation of each routeing alternative and Routeing Method (RM).

With only one ETNS translation database in Europe for the translation from the European number, as described in subclause 6.3.2.2, the costs for routeing all the calls connected to one pan-European service completely on the physical paths through one European location will be high. Calls could with this alternative travel through Europe more than once.

The comments above will also be valid for location alternative 2 with a limited number of ETNS translation databases in Europe, but the total cost will probably be less.

Location alternative 3 should in principle give the lowest cost of routeing because the ETNS translation database is very close to the origin of the call, irrespective of what Routeing Method (RM) is used. A degree of uncertainty arises over the added flexibility, firstly because the distances to and from the Service Providers (SPs) are now chosen by the subscriber to an European Number (EN), secondly that the costs for utilizing all the ETNS translation databases need to be included.

It is recommended that a detailed cost/benefit analysis should not be carried out until there is an agreement in principle throughout Europe. The choice of any given alternative is the choice of the networks involved.

7.6 Corporate Networks (CN) requirements

ECMA is describing the CN requirements on public numbering in their draft standard "Private Integrated Services Network (PISN) - corporate network requirements on public numbering" of September 1995. Two numbering parameters are introduced: Corporate Network (CN)-indicator and CN-identity.

In the context of the two numbering options that exists for European services (CC-scheme and NDC-scheme) the CN-indicator may be considered as an European service identity, which means that for the CC-scheme the ESC will identify the CN-indicator, while for the NDC-scheme the CC+CSSC will do the same.

The introduction of a CN-indicator and a CN-identity in the European numbering scheme will not influence the routeing of calls to this service, as long as there is no requirement to identify and analyse the CN-identity for routeing or charging purposes in the calling country. This means that the routeing should be based on the analysis of ECC+ESC for the CC-scheme and CC+CSSC for the NDC-scheme.

If there is a demand to identify and analyse the CN-identity for routeing or charging purposes in the calling country, it would mean expanding the analysis from 4-5 digits to 8-10 digits, which is far beyond the maximum analysis introduced in ITU-T Recommendation E.162 [1] for international calls. The charging of calls to CN can take place through charging of the calling user or the customer i.e. the corporate network.

The demands stemming from CN could affect the capacity of the European service identity if agreed, and indirectly the depth of the digit analysis necessary for routeing purposes, without a rigid framework for allocation of CN-indicators.

7.7 Methods to protect the European network against overload

With routeing alternatives 1 and 2 some of the pan-European services will concentrate traffic towards a single or limited number of focal point(s) in Europe. This is primarily related to numbers connected to televoting competitions and games, or advertising international products in such a way that a limited number of the first callers are offered a significant discount if ordered at once. Services like this will normally generate high volume traffic or call bursts into the countries/networks where the translation database(s) is located. The focused overload could be very high and exacerbated when advertised through satellite television.

Experiences in a number of European countries have shown that it is very easy to block a large part of a national, regional or local network, unless specific limitations are implemented. These may take the form of network management controls without which sudden traffic bursts to an European service could easily impact the capability to carry international traffic within Europe.

ITU-T have identified in ITU-T Recommendation E.412 [3] different methods to limit the call rate or traffic through a network, and by that protecting the networks involved. For European services introduced according to the CC-scheme or the NDC-scheme the most effective methods will be those that can act on a specific service i.e. a dialled number series or exceptionally a dialled single number. These methods can be characterized as:

1. Hard-to-reach process.
2. Call rate control methods.
3. Automatic destination control.

Unless the service can be identified within the analysing limits defined in subclause 7.1 there will be a problem in identifying where and when to put one or more of these controlling methods into use.

It is recommended that, the serving exchange should have mass call detection capability, with associated call rate control methods. By carrying out detection at this point, individual numbers can be identified and controlled rather than ranges, which identify entire services.

It is recommended that a detailed study, modelling the proposed scenarios is undertaken as soon as possible.

7.8 Timescales for implementation

The following assessment of timescales for implementation is based on current estimates of the time required to obtain the resource and set in place the administration capabilities, technical and commercial agreements, and implement the scheme.

Initially only a limited number of services should be introduced due to the current signalling limitations. Further development of the INAP protocol is required for all applications that could use IN interworking between networks for routeing. This will impact on the timetable for the implementation of both schemes.

It is estimated that the implentation of an ETNS, through the use of national numbering resource using double translation and direct routeing, is considered possible eighteen months after an ECTRA decision is made to enable the necessary standards to be implemented.

It is further estimated that the implementation of an ETNS, through the use of international numbering resource using double translation and direct routeing, is considered possible eighteen months after the code assignment is made by ITU-T to enable the necessary standards to be implemented.

8 Conclusion

For the introduction of pan-European service through the CC-scheme and/or the NDC-scheme, it is recommended that in short term double translation utilizing speech path (Routeing Method 3) and location alternative 3 for the ETNS translation database(s) be used.

Routeing Method 3 could later be replaced by Routeing Method 4.

It is further recommended that addressing method 1 (Routeing Rumbers (RNs) identifying the called party) be used until ISUP version 2 is implemented all over Europe. Then addressing method 1 should be replaced by addressing method 2 (Routeing Numbers (RNs) identifying Service Providers (SPs)s).

History

Document history		
V1.1.1	July 1997	Publication

ISBN 2-7437-1592-8
Dépôt légal : Juillet 1997