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SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

International operation – Numbering plan of the international telephone service

Application of E.164 numbering plan for UPT

ITU-T Recommendation E.168

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ITU-T Recommendation E.168

Application of E.164 numbering plan for UPT

Summary

This Recommendation provides a basis for a common understanding of the underlying issues in order to facilitate implementation of Universal Personal Telecommunications (UPT) within a common numbering framework. UPT introduces the concept of personal mobility across many networks. This includes but is not limited to ISDN, PSTN, PLMN and PSPDN. The use of personal UPT numbers has broadened the practice of how numbering can be used across and within international and national telecommunication networks.

This Recommendation provides a framework of numbering for calls inbound to a UPT user (incalls), transactions between the UPT user and their UPT service profile (e.g. incall registration), calls made by the UPT user (outcalls) and identification of the UPT service profile and service provider.

History

First issue – 03/1993

Revision 1 – 05/1999

Revision 2 – 05/2002

Source

ITU-T Recommendation E.168 was prepared by ITU-T Study Group 2 (2001-2004) and approved under the WTSA Resolution 1 procedure on 16 May 2002.

FOREWORD

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

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

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

CONTENTS

Introduction

Universal personal telecommunications (UPT) introduces the concept of personal mobility across many networks. This includes but is not limited to ISDN, PSTN, PLMN and PSPDN. The use of personal UPT numbers has broadened the practice of how numbering can be used across and within international and national telecommunication networks.

ITU-T Recommendation E.168

Application of E.164 numbering plan for UPT

1 Scope

This Recommendation provides a basis for a common understanding of the underlying issues in order to facilitate early implementation of UPT within a common numbering framework.

This Recommendation provides a framework of numbering for calls inbound to a UPT user (incalls), transactions between the UPT user and their UPT service profile (e.g. incall registration), calls made by the UPT user (outcalls) and identification of the UPT service profile and service provider.

2 References

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

– ITU-T Recommendation E.152 (2001), *International freephone service.*

– ITU-T Recommendation E.161 (2001), *Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network.*

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

– ITU-T Recommendation E.164.1 (1998), *Criteria and procedures for the reservation, assignment and reclamation of E.164 country codes and associated Identification Codes (ICs).*

– ITU-T Recommendation E.166/X.122 (1998), *Numbering plan interworking for the E.164 and X.121 numbering plans.*

– ITU-T Recommendation E.168.1 (2002), *Assignment procedures for universal personal telecommunications numbers in the provisioning of the international UPT service.*

– ITU-T Recommendation E.169.1 (2001), *Application of Recommendation E.164 numbering plan for universal international freephone numbers for the international freephone service.*

– ITU-T Recommendation E.174 (1995), *Routing principles and guidance for Universal Personal Telecommunications (UPT).*

– ITU-T Recommendation E.190 (1997), *Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources.*

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

– ITU-T Recommendation E.214 (1988), *Structure of the land mobile global title for the signalling connection control part (SCCP).*

– ITU-T Recommendation F.850 (1993), *Principles of universal personal telecommunication (UPT).*

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

3 Terms and definitions

This Recommendation defines the following terms:

3.1 country code (CC): Refer to ITU-T Rec. E.164.

3.2 home domain: Refers to a network, localized area or telephone exchange, within which a dialled UPT number is recognized as being UPT.

3.3 incalls: Calls inbound to the UPT user.

3.4 outcalls: Calls outbound from the UPT user.

3.5 personal mobility: The ability of a user to access telecommunications services at any terminal on the basis of a personal identifier (e.g. the UPT number), and the capability of the network to provide those services delineated in the user's service profile. Personal mobility involves the network capability to locate the terminal associated with the user for the purpose of addressing, routing and charging the UPT user's calls. (1.3.6/F.851)

3.6 personal user identity (PUI): A PUI is an identity which unambiguously identifies the UPT user but is different from the UPT number although there is a one-to-one mapping between them. The PUI is an identity by which the UPT user is known to his UPT service provider and by which the UPT user's service provider is known to other service providers and networks supporting UPT.

3.7 personal identity module (PIM): A personal identity module is, for example, a microprocessor or magnetic strip equipped card or other device which contains procedures or data necessary for accessing the UPT service including a UPT user's personal user identity.

3.8 prefix: A prefix is an indicator consisting of one or more digits that allows selection of different types of number formats, networks and/or service.

3.9 universal personal telecommunications (UPT): Universal personal telecommunications enables access to telecommunication services while allowing personal mobility. It enables each UPT user to participate in a user-defined set of subscribed services and to initiate and receive calls on the basis of a personal, network-transparent UPT number across multiple networks on any fixed terminal and or mobile terminal, irrespective of geographical location, limited only by network capabilities and restrictions imposed by the network operator. (1.3.10/F.851)

3.10 universal personal telecommunication access code (UPTAC): A code the UPT user may need to dial, when using certain terminals and networks, in order to enter the UPT environment before any UPT procedures can be carried out. (1.3.11/F.851)

3.11 universal personal telecommunication access number (UPTAN): A number the UPT user may need to dial, when using certain terminals and networks, in order to contact his UPT service profile (provider).

3.12 UPT environment: The environment within which the facilities of the UPT service are offered. It consists of combinations of networks and UPT service control facilities which, when combined, enable the UPT user to make use of the telecommunication services offered by these networks. (1.3.12/F.851)

3.13 UPT global title (UPTGT): An E.164 number derived from the PUI in accordance with UIT-T Rec. E.214, which is used for routing purposes.

3.14 UPT number: A number that uniquely identifies the UPT user; it is also used by a calling party to reach the UPT user. A UPT user may have more than one UPT number (for example, a business UPT number for business calls and a private UPT number for private calls). (1.3.13/F.851)

3.15 UPT service profile: The UPT service profile is a record containing all the information related to a UPT user in order to provide that user with the UPT service. Each UPT service profile is associated with a single UPT number. (1.3.15/F.851)

3.16 UPT serving exchange: A UPT serving exchange is any exchange that has the technical capabilities necessary to access a UPT service profile. (5.10/E.174)

3.17 UPT user code (UC): A UPT user code is that part of the PUI which identifies the UPT subscriber.

4 Abbreviations

This Recommendation uses the following abbreviations:

CC	An E.164 country code
CC(UPT)	E.164 country code "878" which has been reserved as a UPT indicator
IFS	International freephone service
IMSI	An E.212 international mobile subscriber identity
MCC	An E.212 mobile country code
MNC	An E.212 mobile network code
NDC(CC)	An E.164 country code assigned to a country or other purpose that would allow it to be used for UPT
PIM	Personal identity module
PIN	Personal identification number
PUI	Personal user identity
SP	Service provider
UC	UPT user code
UIFN	Universal international freephone number
UPT	Universal personal telecommunications
UPTAC	Universal personal telecommunication access code
UPTAN	Universal personal telecommunication access number
UPTGT	UPT global title

5 UPT number structure

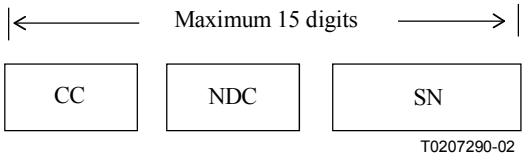
The structure of UPT numbers must conform to ITU-T Rec. E.164.

Three independent numbering scenarios are considered. These scenarios may coexist in the international network and are defined below.

Information necessary for call completion to a UPT number is held in the associated UPT service profile. Identification of the associated UPT service profile is achieved through the analysis of the full number.

5.1 Scenario 1 – Home-related scheme

The structure of the home-related numbering scheme is shown in Figure 1.



CC Geographic country code as defined in ITU-T Rec. E.164
NDC National destination code
SN Subscriber number identifies UPT customer

Figure 1/E.168 – Scenario 1 E.164 number structure

For this scenario the E.164 structure may be interpreted as follows:

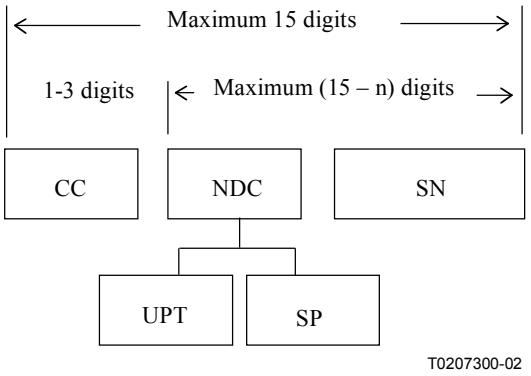
CC country code;

NDC + SN national (significant) number.

In this scenario the leading digits of the national (significant) number do not permit identification of the number as being a UPT number. Information relating to the UPT service is held in the associated UPT service profile in the subscriber's home domain. The mobility of the UPT user is then limited by the capability of the home domain and restricted only by routing and performance considerations.

5.2 Scenario 2 – Country-based scheme

The structure of the country-based numbering scheme is shown in Figure 2.



CC Geographic country code as defined in ITU-T Rec. E.164
NDC National destination code
SN Subscriber number identifies UPT customer
UPT A UPT indicator
SP Service provider indicator (This field is optional)
n Number of digits in the country code

Figure 2/E.168 – Scenario 2 UPT number structure

Management of the country-based numbering scheme is under the purview of the numbering administrator identified by the country code. The national destination code (NDC) will allow (at least) national calling parties and national networks to identify a UPT number.

From international networks the complete UPT number must be dialled. A national short dialling format may exist but must include both the NDC and SN.

When considering the deployment of UPT in this scenario, sub-structuring of the NDC and SN fields may need to be considered.

5.2.1 Scenario 2 NDC structure

In addition to identification of a UPT call, as a national option, it may be necessary to identify the UPT service providers within the NDC structure as specific values of the service provider (SP) field.

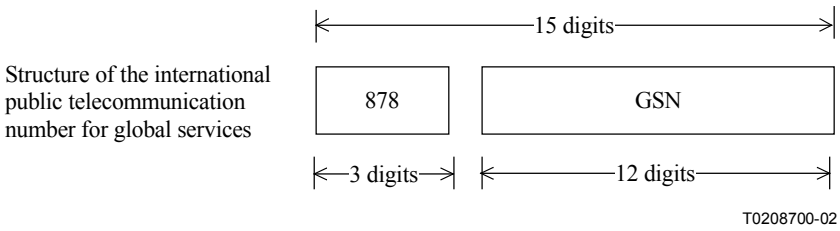
The order and allocation of the UPT and SP indicator fields within the NDC is a national matter.

5.2.2 Scenario 2 SN structure

A likely requirement is to identify groups of numbers which are associated with network nodes. To this end, the SN can be structured.

5.3 Scenario 3 – Country code-based global scheme

The number structure of the country code-based global scheme shown in Figure 3 is based on the international public telecommunication number for global services defined in ITU-T Rec. E.164. The presence of country code "878" identifies a UPT call.



CC(UPT) An E.164 country code used for the UPT global service
GSN Global subscriber number

Figure 3/E.168 – UPT scenario 3 number structure

In scenario 3 the country code CC(UPT) is "878". The GSN is a flat number (i.e. the GSN does not include either identification of geography or service provider).The GSNs cannot start with 800, as 878-800 is reserved for the UPTAC, see 8.2

In scenario 3 it is always required to dial the full international public telecommunications number format.

The interim and long-term application procedures for scenario 3 are contained ITU-T Rec. E.168.1.

6 Number administration responsibility

Table 1 assigns responsibility for the number administration.

Table 1/E.168 – Number administration responsibility

Scenario	CC	NDC	GSN	SN
1	ITU-T	National	Not applicable	National
2	ITU-T	National	Not applicable	National
3	ITU-T	Not applicable	ITU-T	Not applicable

7 National prefix option for UPT

The use of a prefix within dialling plans has been identified as a method of recognizing that the following digits represent a UPT number.

The development of dialling plans is a national matter and some countries may find it advantageous to incorporate a UPT prefix in their dialling plans for scenario 1 and scenario 2.

Within a national scheme dialling plans remain a national option.

8 UPT service profile access

Two methods by which UPT users may access their UPT service profile have been identified:

i) *A UPT access number (UPTAN)*

It is expected that service providers will initially implement UPTANs to allow UPT users to access their UPT service profiles via a voice path after engaging the appropriate national or international dialling procedures. The UPTAN is UPT service provider specific and can also be UPT user specific.

ii) *A UPT access code (UPTAC)*

The UPTAC is unique, internationally standardized, and places higher demands on the interconnection of international networks than UPTAN. The UPTAC functionality is expected to take longer to implement and is considered a long-term solution. When implemented, the goal is that the UPTAC should be available on a worldwide basis.

8.1 UPT access number (UPTAN)

UPT access numbers are provided by UPT service providers to their UPT users to enable them to access their UPT service profile. The UPTAN contains the necessary information to establish a voice path to the user's service profile.

UPTANs may be implemented in many ways and optimum ease of use is achieved if they are E.164 numbers diallable both nationally and internationally.

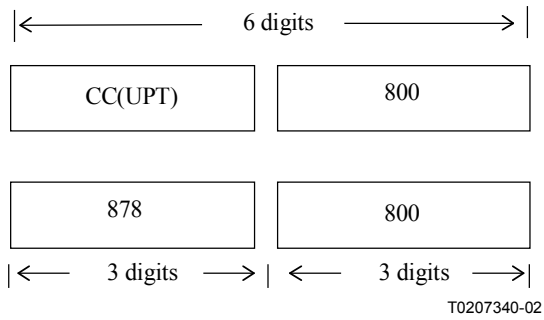
The choice of UPTAN type and call charge is left as a national and/or UPT service provider option. Examples of possible types of UPTAN include:

- special national (non-E.164) number;
- E.164 number;
- national freephone number;
- universal international freephone number (UIFN ITU-T Rec. E.169.1).

8.2 UPT access code (UPTAC)

The UPTAC is a unique internationally standardized E.164 number for UPT users to enter the UPT environment before any UPT procedures can be carried out and it does not contain any geographical or UPT service provider specific information. The UPTAC functionality requires UPT service providers' databases to be interconnected or accessible via a signalling path and capable of exchanging UPT service profile information.

It is recommended that the UPTAC +878 800 be adopted for the UPT service. When available it can only be dialled in the international public telecommunication number format, + 878 800, and the structure is shown in Figure 4.



CC(UPT) An E.164 country code used for the UPT global service
"800" UPTAC identifier
"878" The E.164 country code reserved for the UPT global service {CC(UPT)}

Figure 4/E.168 – Format of global UPTAC

9 UPT identification and authentication requirements

In the UPT service it is necessary for UPT service providers to identify the UPT users service profiles, the UPT users service provider and to authenticate the UPT user. The following numbers and identities are used within the UPT service to identify UPT users' service profiles and/or provider.

i) *A UPT number*

A UPT number, normally used by the caller to reach a UPT user, unambiguously identifies the UPT user. The UPT number can be used by the UPT user in a procedure to unambiguously identify his UPT service profile.

ii) *A UPT user-specific UPTAN*

As a national and UPT service provider option, it may be possible to assign one UPTAN to each UPT user. The UPT user-specific UPTAN must be an E.164 number if it is to be dialled from international networks, and should comply with other requirements of ITU-T Rec. E.164 (e.g. the 7-digit maximum length of number analysis for routing and charging).

iii) *A personal user identity (PUI)*

A PUI is an identity which unambiguously identifies the UPT user but is different from the UPT number although there is a one-to-one mapping between them. The PUI is an identity by which the UPT user is known to his UPT service provider, and by which the UPT user's service provider is known to other service providers and networks supporting UPT. As a UPT service provider option, the UPT PUI may also be used for authentication.

There are two possible authentication functions associated with a UPT user accessing their UPT service profile:

i) UPT user authentication at the user-network interface;

ii) UPT user authentication at the network-network interface(s).

9.1 UPT user authentication at the user-network interface

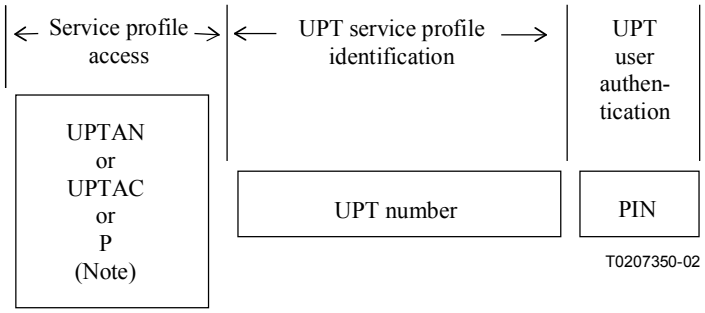
Two methods for user-to-network authentication are described below. Other authentication methods are described in ITU-T Rec. F.851.

In the methods described below, the PIN is mandatory.

9.1.1 UPT user-network authentication with a UPT number and PIN

This method uses UPTAN or UPTAC to reach the user-network interface at which time the UPT user identifies his UPT service profile to the network by inputting his UPT number, followed by a personal identification number (PIN) for authentication.

A variation of this method is to use a national prefix (P) to access the user-network interface, in this case the UPT user's UPT service provider, followed by input of the national UPT number (i.e. excluding CC) to identify the UPT service profile. The UPT user then authenticates himself to the network by inputting his personal identification number (PIN). See Figure 5.



PIN Personal identification number
P National prefix

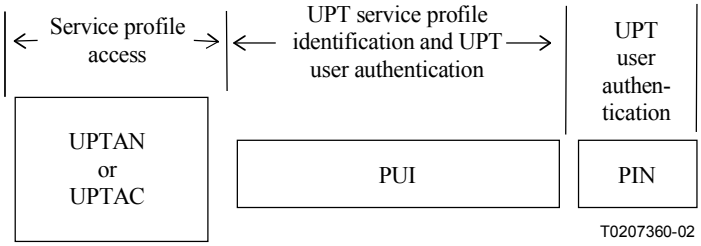
NOTE – The choice of using UPTAN, UPTAC, or a national prefix P to access to user's UPT service profile, is a national or service provider matter.

Figure 5/E.168 – UPT user authentication with a UPT number and PIN

If a UPT user-specific UPTAN is used, then, referring to Figure 5 above, the access and identification functions would be combined.

9.1.2 UPT user-network authentication with an E.212-based PUI

This method uses the UPTAN or UPTAC to reach the user-network interface. The user identifies himself to the network by inputting a PUI and a PIN. This is shown in Figure 6.



PUI Personal user identity
PIN Personal identification number

Figure 6/E.168 – UPT user authentication with a E.212-based PUI

The PUI is known to the UPT service provider and is not available to the public. Along with PINs and dedicated security algorithms, PUIs can assist in providing a more secure way of activating UPT procedures than through the use of a UPT number.

9.2 UPT user authentication at the network-network interface

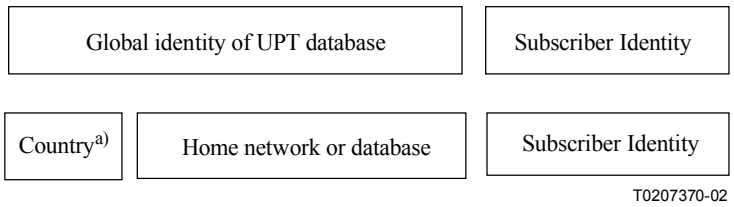
Authentication at the network-network interface is required when the UPT user is roaming between different UPT service provider networks nationally or internationally, and is using an UPTAC to access his UPT service profile. In this case, identification of his UPT service provider and the location of his UPT service profile must be available to the serving network (exchange).

A personal user identity (PUI) for the UPT service is described in this clause and it contains all the information required by the serving exchange to identify the UPT user's UPT service profile.

If a personal identity module (PIM) containing the PUI is not used, a PUI may need to be known by the user as well as by his service provider.

9.3 Information content and structure of the PUI

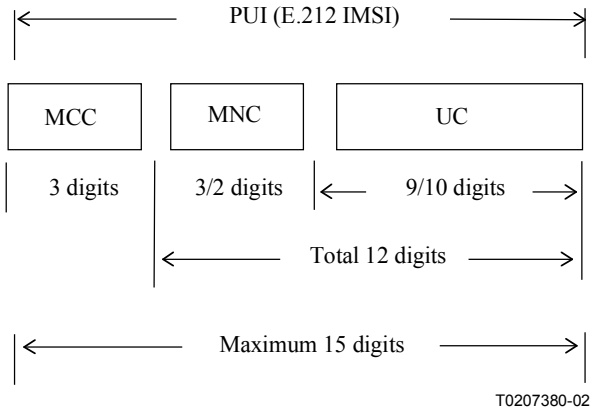
The information contained in the PUI is described in Figure 7.



a) "Country" may represent geographic country code, a global service code or a shared country code for networks.

Figure 7/E.168 – Information content of the PUI

The personal user identity (PUI) recommended for the UPT service is based on the international mobile subscriber identity (IMSI) defined in ITU-T Rec. E.212[1]. The PUI consists of a 15-digit (maximum) string of decimal digits arranged in three fields, the mobile country code (MCC), the mobile network code (MNC) and UPT user code (UC). Figure 8 shows the PUI structure.



MCC Mobile country code
MNC Mobile network code
UC UPT user code

Figure 8/E.168 – Structure of the PUI in accordance with Recommendation E.212

[1] The reader should note that in ITU-T Rec. E.212 the term "international mobile subscriber identity (IMSI)" is synonymous with the UPT personal user identity (PUI). Also, the mobile subscriber identification number (MSIN) is synonymous with UPT user code (UC).

The MCC is a 3-digit code defined in ITU-T Rec. E.212 identifying the country or domicile of the user's UPT service profile.

The MCC may also be used in the identification plans for different services including land mobile stations and UPT. It is the National Numbering Authority's responsibility to create a plan for the sharing and structuring of the number space behind the MCC between all the potential services that will require use of MCCs.

Where an MCC is shared among international network operators, it is the responsibility of the ITU-T to create a plan for the sharing and structuring of the numbering space behind the MCC.

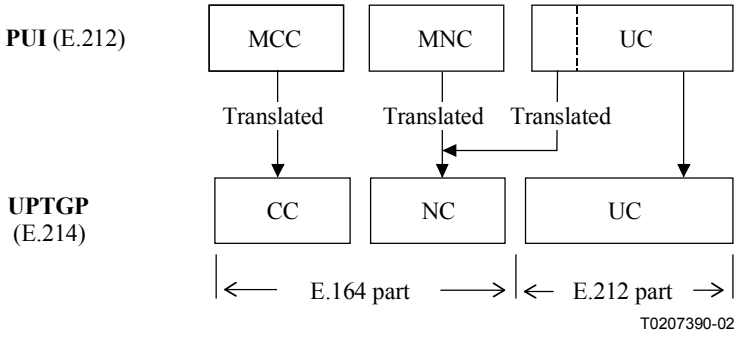
Within the limits shown in Figure 8 the number of digits in each of the MNC and UC fields is a national matter, but the total number of digits in these two fields should always be 12 in accordance with ITU-T Rec. E.212.

9.4 Derivation of the UPT global title from the PUI

In order to permit the UPT user to roam to other networks, there is a need to transfer information including the PUI between the visited and home networks involved.

The UPT global title (UPTGT) contains the E.164 address of the home database and is derived from the PUI in accordance with a translation described in ITU-T Rec. E.214, as shown in Figure 9. The ability to translate the PUI UC to the UPTGT UC may require truncation of some digits due to digit length restrictions.

With this structure, the UPT serving exchange can extract from the PUI all the information needed.



MCC Mobile country code
MNC Mobile network code
UC UPT user code
CC An E.164 country code
NC Network code

Figure 9/E.168 – Structure of UPT PUI and a UPT global title based on Recommendations E.212 and E.214

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