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International numbering plan for public data networks

ITU-T Recommendation X.121

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International numbering plan for public data networks

Summary

This Recommendation defines the design, characteristics and application of the Numbering Plan for Public Data Networks. The International Numbering Plan for Public Data Networks has been developed in order to facilitate the operation of public data networks and provide for their interworking on a worldwide basis. The numbering plan allows for the identification of a country as well as a specific public data network in that country by means of Data Country Codes and Data Network Identification Codes. Additionally the numbering plan also allows for the identification of Global public data networks by means of a Global Data Network Identification Code. Interworking with other numbering plans can be achieved by use of an escape code mechanism.

In order to conserve the valuable numbering resource, guidance is provided on the efficient use of Data Country codes for the creation of Data Network Identification Codes, and on the use of variable length Private Network Identification Codes for the numbering of private data networks in harmony with the Public Network Numbering Plan. Procedures for the allocation of Data Country Codes are defined. The eligibility criteria and procedures for the allocation of Data Network Identification Codes to Global public data networks are also defined. Guidance is also provided on the numbering of global networks.

Source

ITU-T Recommendation X.121 was revised by ITU-T Study Group 7 (1997-2000) and approved by the World Telecommunication Standardization Assembly (Montreal, 27 September – 6 October 2000).

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.

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International numbering plan for public data networks

1 Introduction

This Recommendation defines the design, characteristics and application of the Numbering Plan for Public Data Networks. The International Numbering Plan has been developed in order to facilitate the operation of public data networks and provide for their interworking on a worldwide basis. The numbering plan allows for a number of public data networks in a country; the identification of a country as well as a specific public data network in that country; and a mechanism (use of escape codes) for interworking with other numbering plans.

2 Scope

The scope of this Recommendation is to describe the form and function of the International Numbering Plan for Public Data Networks. In order to conserve the valuable numbering resource, guidance is also given on methods for the efficient use of Data Country Codes to create Data Network Identification Codes, the numbering of private data networks and the use of variable length Private Network Identification Codes. Procedures for the allocation of Data Country codes are defined. Eligibility criteria and procedures for the allocation of Data Network Identification Codes to Global public data networks are provided.

3 References

The following ITU-T Recommendations and other references contain provisions, which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; 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 E.164 (1997), *The international public telecommunication numbering plan*.
- ITU-T E.165 (1988), *Timetable for coordinated implementation of the full capability of the numbering plan for the ISDN era (Recommendation E.164)*.
- ITU-T E.165.1 (1996), *Use of escape code "0" within the E.164 numbering plan during the transition period to implementation of NPI mechanism*.
- ITU-T E.166/X.122 (1998), *Numbering plan interworking for the E.164 and X.121 numbering plans*.
- ITU-T E.215 (1997), *Telephone/ISDN numbering plan for the mobile-satellite services of Inmarsat*.
- ITU-T F.69 (1994), *The international telex service – Service and operational provisions of telex destination codes and telex network identification codes*.
- ITU-T F.125 (1993), *Numbering plan for access to the mobile-satellite services of INMARSAT from the international telex service*.
- ITU-T I.330 (1988), *ISDN numbering and addressing principles*.

- ITU-T X.25 (1996), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in packet mode and connected to public data networks by dedicated circuit.*
- ITU-T X.28 (1997), *DTE/DCE interface for a start-stop mode Data Terminal Equipment accessing the Packet Assembly/Disassembly facility (PAD) in a public data network situated in the same country.*
- ITU-T X.32 (1996), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and accessing a Packet-Switched Public Data Network through a public switched telephone network or an Integrated Services Digital Network or a Circuit Switched Public Data Network.*
- ITU-T X.36 (2000), *Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for public data networks providing frame relay data transmission service by dedicated circuit.*
- ITU-T X.75 (1996), *Packet-switched signalling system between public networks providing data transmission services.*
- ITU-T X.76 (2000), *Network-to-network interface between public networks providing PVC and/or SVC frame relay data transmission service.*
- ITU-T X.123 (1996), *Mapping between escape codes and TOA/NPI for E.164/X.121 numbering plan interworking during the transition period.*
- ITU-T X.124 (1999), *Arrangements for the interworking of the E.164 and X.121 numbering plans for frame relay and ATM Networks.*

4 Definitions

Within the public switched telephone and public data network environment, the terms used for all networks and services must be compatible and consistent. Therefore this Recommendation, in addition to the terms defined herein, relies on a list of terms and definitions contained in E.164. Additionally, the terms and their applicability to number plan interworking can be found in E.166/X.122. A list of definitions is given in Annex K.

5 Abbreviations

This Recommendation uses the following abbreviations.

ATM	Asynchronous Transfer Mode
CC	Country Code
DCC	Data Country Code
DCE	Data Circuit-terminating Equipment
DNIC	Data Network Identification Code
DTE	Data Terminal Equipment
FR	Frame Relay
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
NN	National Number
NPI	Numbering Plan Identifier

NTN	Network Terminal Number
PDN	Public Data Network
PNIC	Private data Network Identification Code
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
ROA	Recognized Operating Agency
TDC	Telex Destination Code
TOA	Type Of Address
TON	Type Of Number
TSB	Telecommunication Standardization Bureau

6 Design considerations

The general design considerations that form the basis of this Numbering Plan are as follows:

- a) The international data number is used to identify a country, a particular network, if several data networks exist in the same country, and a specific data terminal equipment/data circuit-terminating equipment (DTE/DCE) interface on that network.
- b) Where a number of public data networks are to be established in a country, it should not be mandatory to integrate the numbering plans of the various networks.
- c) The number of digits comprising the code used to identify a country and a specific public data network in that country should be a fixed number of digits and should be the same for all countries.
- d) A national data number assigned to a DTE/DCE interface should be unique within a particular national network. This national data number should form part of the international data number which should also be unique on a worldwide basis.
- e) The number of digits to be used in an international data number should be governed by national and international requirements and a reasonable limit on the overall number of digits should be imposed.
- f) The Numbering Plan should make provision for the interworking of data terminals on public data networks (e.g. X.25) with data terminals on public telephone and telex networks and on Integrated Services Digital Networks (ISDNs).
- g) The Numbering Plan should not preclude the possibility of a single national network providing an integrated telecommunications system for services of all kinds.

7 Characteristics and application of the Numbering Plan

7.1 Number system

The 10-digit numeric character set 0-9 should be used for numbers (or addresses) assigned to DTE/DCE interfaces on public data networks. This principle should apply to both national and international data numbers.

Use of the above number system will make it possible for data terminals on public data networks to interwork with data terminals on public telephone and telex networks and on Integrated Services Digital Networks (ISDNs).

7.2 Data network identification codes and data country codes

7.2.1 A Data Network Identification Code (DNIC) could be assigned as follows:

- a) to each Public Data Network (PDN) within a country;
- b) to a global service, such as the public mobile satellite system and to global public data networks (see 7.4 and 7.5);
- c) to a Public Switched Telephone Network (PSTN) or to an ISDN for the purpose of making calls from DTEs connected to a PDN to DTEs connected to that PSTN or ISDN;

NOTE 1– In order to facilitate the interworking of telex networks with data networks, some countries have allocated DNIC to telex networks.

- d) to a group of PDNs within a country, when permitted by national regulations;
- e) to a group of private data networks connected to PDNs within a country, where permitted by national regulations.

NOTE 2 – For administrative purposes, including charging, a group of networks which have been assigned a single DNIC will, in the international context, be considered as a single entity.

7.2.2 The first digit of the data network identification codes should be in accordance with Table 1.

NOTE 1 – The digit 1 is reserved for the creation of DNICs for allocation to the public mobile satellite systems (e.g. Inmarsat) and global public data networks having special numbering requirements (see also 7.4 and 7.5).

NOTE 2 – Digits 8, 9 and 0 are used as escape codes, not being part of the DNIC. They are defined in 7.9.

Table 1/X.121 – First digit of data network identification code

1	For public mobile satellite systems and global public data networks (see also 7.4 and 7.5)
2	For country or geographic specific Data Network Identification Codes (DNICs) (see also 7.2.3)
3	
4	
5	
6	
7	

7.2.3 All Data Network Identification Codes (DNICs) shall consist of four digits. There are two categories of DNICs. If the first digit of the DNIC is the digit 1, the DNIC identifies a public mobile satellite system or a global public data network. (see 7.4, 7.5, 7.6). If the first digit of the DNIC is any digit 2 through 7 (as per Table 1), the DNIC identifies a public data network in a specific country or geographic region. In this case the first three digits will always identify a country and are to be regarded as a Data Country Code (DCC). The fourth, or network digit, should identify a specific data network in the country. The format of the country specific Data Network Identification Code is shown in Figure 1.

7.2.4 Each country should be assigned at least one 3-digit Data Country Code (DCC). The Data Country Code (DCC) in conjunction with the fourth digit can identify up to 10 public data networks.

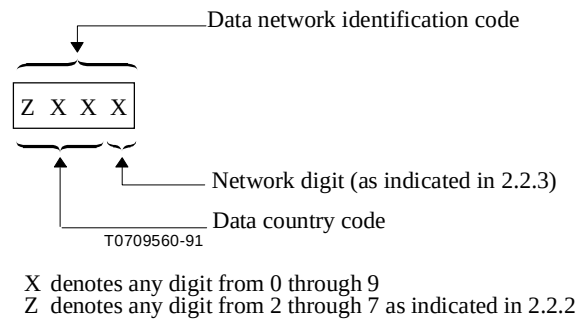


Figure 1/X.121 – Format of country specific Data Network Identification Codes (DNICs)

7.2.5 The system of Data Network Identification Codes (DNICs) indicated in 7.2.3 and 7.2.4 will provide for 600 Data Country Codes (DCCs) with a theoretical maximum of 6000 DNICs plus 1000 Global DNICs.

7.2.6 In the case where a country requires more than 10 DNICs, multiple Data Country Codes (DCCs) could be assigned to the country if spare DCC codes (within the geographic zone) exist. Procedures for the allocation of DCCs and the assignment of network digits are specified in 7.3. If spare DCC codes do not exist consideration should be given to a number of data networks sharing a common DNIC (see Annex C).

7.2.7 A list of Data Country Codes (DCCs) to be used in the development of Data Network Identification Codes (DNICs) is given in Annex J. This list was prepared in accordance with the requirement that the first digit of a DNIC, which is also the first digit of the embedded Data Country Code (DCC), should be restricted to the digits 2-7 inclusive (see 7.2.2). As first digits of Data Country Codes (DCCs), the digits 2-7 are arranged to represent geographic zones.

7.2.8 Examples indicating how Data Network Identification Codes (DNICs) could be developed, are given in Annex B.

7.3 Procedures for the allocation of Data Country Codes and assignment of Network Digits

7.3.1 Procedures for the allocation of Data Country Codes

The assignment of Data Country Codes (DCCs) is administered by the ITU. A list of allocated and spare DCCs (at the time of publication) is given in Annex J. Additions (new allocations that are accepted) changes and deletions will be published in the ITU Operational Bulletin. A consolidated list of allocated and spare DCCs will be published annually in the ITU Operational Bulletin. A consolidated list of allocated and spare DCCs is also published on the ITU Website.

Since DCCs are a limited resource, the efficient utilization of previously allocated codes may be taken into account when considering applications for further codes. In order to ensure the conservation of this limited resource, Administrations are requested to carefully consider the manner in which the generated Data Network Identification Codes (DNICs) are used. Recommendations on the efficient use of DCCs for the creation of DNICs is given in Annex C. It is suggested that sixty or seventy per cent of the available code space should be efficiently utilized before further applications are made for additional DCCs.

Detailed procedures for the allocation of Data Country Codes and the notification of the assignment of Network Digits are given in Annex A.

7.3.2 Assignment of Network Digits

Although the assignment of network digits to create Data Network Identification Codes (DNICs) is a national matter (and will be in accordance with national laws and regulations), the ITU TSB is to be notified of any new assignments, re-allocations or removals of network digits by completing the notification form shown in Annex L.

7.4 Data Network Identification Codes for public mobile satellite systems

The DNICs currently allocated to public mobile satellite systems are 111S where the digit S indicates the ocean area. The digit S has the values as shown in Annex I. The international data number format for mobile earth stations is specified in 7.6.3.

7.5 Data Network Identification Codes for Global Public Data Networks

DNICs 1000 through to 1109 are reserved and codes 1120 through to 1999 are available for allocation to Global Public Data Networks (see Annex I). As this is a limited resource (only 990 code points available), eligibility criteria and procedures for the allocation (by the TSB) of such DNICs have been developed and are described in Annex G. These DNICs are a common asset and not the property of any individual network operator or ITU member country. Accordingly these DNICs cannot be resold, traded or transferred and shall only be used for the purpose of identifying Global Public Data Networks. These DNICs will be recovered if not used, or no longer required by the assignee, or not used in accordance with the guidelines given in Annex G.

Network operators should recognise that a number of technical alternatives are available for the numbering of Global Public Data Networks. Guidelines for the numbering of Global Public Data Networks are given in Annex H.

7.6 International data number

7.6.1 The international data number assigned to a DTE/DCE interface consists of the Data Network Identification Code (DNIC) of the public data network, followed by the Network Terminal Number (NTN) or, where an integrated numbering scheme exists within a country, the Data Country Code (DCC) followed by the national number (NN) i.e.:

International data number = DNIC + NTN, or DCC + NN

7.6.2 The Network Terminal Number (NTN) should consist of the full address that is used when calling the data terminal from within its serving public data network. The National Number (NN) should consist of the full address used when calling the data terminal from another terminal within the national integrated numbering scheme. These numbers should consist of all the digits necessary to uniquely identify the corresponding DTE/DCE interface within the serving network and should not include any prefix (or access code) that might be employed for such calling. A data terminal on a public data network when called from another country (or where an integrated numbering scheme does not exist, from another network in the same country) should be addressed by the international data number assigned to its DTE/DCE interface.

NOTE 1 – Network Terminal Numbers (NTNs) or National Numbers (NNs) may be assigned by a PDN to DTEs connected to other public networks, when interworking capabilities are provided with that PDN.

NOTE 2 – In the case where a DNIC is assigned to identify a group of public data networks or a group of private data networks, a Private Network Identification Code (PNIC) mechanism may be used. See 7.11 and Annex D.

7.6.3 The complete international data number for an Inmarsat mobile earth station is composed as follows:

$$111S + \text{mobile earth station number} + X$$

where X is an optional digit which, if present, designates a particular DTE associated with the mobile earth station.

The mobile station is identified by a unique mobile earth station number (Inmarsat mobile number) which depending upon the service offerings of the Inmarsat system required is common for telephony, telex, data transmission and other services as defined in ITU-T E.215 and F.125.

NOTE 1 – In the Inmarsat mobile satellite systems, the use of the S digit for indicating the ocean area in which the mobile earth station is located at the time of the call is considered a temporary arrangement. It is recognized that such an arrangement should be avoided in the future, if possible, since it requires the calling user to know the exact area of a destination mobile earth station at the time of the call, and such an area may change from time to time for the mobile earth station.

NOTE 2 – Digit "X" requires further studies regarding aeronautical and land mobile earth stations.

NOTE 3 – The information contained in this clause relating to Inmarsat was correct at the time of publication, but may change with technical development.

7.7 Number of digits

International data numbers have a maximum length of 14 digits and a minimum length of 5 digits. The length chosen will be dependent on network requirements.

Since the length of the Data Network Identification Code (DNIC) is fixed at 4 digits and the length of the Data Country Code (DCC) is fixed at 3 digits, it would, therefore, be possible to have a Network Terminal Number (NTN) of 10 digits maximum, or a National Number (NN) of 11 digits maximum.

NOTE – The limit of 14 digits specified above applies exclusively to the number of digits used to specify the international data number information. Adequate register capacity should be made available at data switching exchanges to accommodate the above number of digits (14) plus any additional digits that might be introduced for signalling, or other purposes.

7.8 Prefixes

7.8.1 A prefix is an indicator consisting of one or more digits, allowing the selection of different types of address formats (e.g. national data number or international data number formats). Prefixes are not part of the international X.121 format and are not signalled across internetwork or international boundaries.

7.8.2 To distinguish between different address formats within a public data network (e.g. national data number and international data number formats), a prefix would generally be required. Any such prefix does not form a part of the data number. The use and composition of such a prefix is a national matter. However, the possible need to accommodate such a prefix with regard to digit register capacity should be noted. It is also a national matter to decide on evaluation of prefixes, escape codes, parts of the international data number of incoming path of entry for routing or other purposes.

With regard to the prefix shown in Figure 2, it should be noted that the same prefix (designated P) could be used for all four types of calls. The choice of prefix is, however, a national matter.

NOTE – In the case of X.25 access, if the Non TOA/NPI address format is used, a prefix indicating international data number format can only be one digit, due to a limit of 15 digits for the X.25 calling/called address field.

7.9 Escape codes for number plan interworking

To facilitate number plan interworking, with either the E.164 or F.69 Numbering Plans, the X.121 numbering plan provides for the use of an escape code. An X.121 escape code is an indicator consisting of one digit. It indicates that the following digits represent a number from a different numbering plan.

An escape code, when required, has to be carried forward through the originating network and can be carried across internetwork and international boundaries.

Digits used for escape codes are the digits 8, 9 and 0. The allocation and their purpose are shown in Table 2. The escape codes are not part of the international data number but are part of the "international X.121 format" (see Figure 2).

The escape codes are provided to enable DTEs and networks, (numbered under the X.121 numbering plan), which do not have the capability to support a signalling mechanism such as the TOA/NPI address format as defined in the X.25 signalling protocol, to interwork with terminals numbered under the E.164 or F.69 numbering plans (see Figure 2).

The maximum length of an E.164 number is 15 digits. Support of the TOA/NPI address format is required in the case of terminals on Packet Switched Public Data Networks (X.25) interworking with terminals identified by a 15 digit E.164 number.

Networks and terminals should where possible, evolve towards supporting the TOA/NPI address format/signalling protocol mechanisms in order to avoid the use of escape codes. It is recommended that the development of any new signalling protocols for Public Data Networks should not use the escape code mechanism as a means of number plan interworking.

NOTE – ITU-T E.164 formally discontinued the use of escape codes within the E.164 numbering plan as of 31 December 2000.

7.10 Numbering plan interworking

Specific details and procedures on numbering plan interworking between PSPDNs and ISDNs for the E.164 and X.121 numbering plans are outlined in ITU-T E.166/X.122 (see also ITU-T E.165, E.165.1, X.123, X.301 and I.330). Transit cases are considered in these Recommendations. For routing aspects, see also ITU-T X.110.

Specific details and procedures on numbering plan interworking between Public Frame Relay Data Networks and ATM networks for the E.164 and X.121 numbering plans are outlined in ITU-T X.124. Escape codes are not used within the Frame Relay (ITU-T X.36, X.76) and ATM signalling protocols (ITU-T Q.2931) for the purposes of number plan interworking as these protocols utilize a TON/NPI mechanism for number plan interworking.

7.11 Private data Network Identification Codes (PNICs)

In order that private networks (which are connected to the public data network) can be numbered in accordance with the X.121 Numbering Plan, a Private data Network Identification Code (PNIC) can be utilized to identify a specific private network connected to the public data network.

A PNIC code consists of up to 6 digits. The International Data Number of a terminal on a private network is as shown:

$$\text{International Data Number} = \text{DNIC} + \text{PNIC} + \text{Private Network Terminal Number}$$

The use of PNICs for the development of network terminal numbers on either a group of public data networks or a group of private data networks is described in Annex D. Guidelines for the structure of variable length PNICs are given in Annex E. Guidelines for the numbering of private networks which may have a future requirement for attachment to the public data network are given in Annex F.