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TITLE: Private Network DTE Addressing

1. INTRODUCTION

There is a need to allow interoperation between DTE's connected to a private data network and DTE's connected to or accessed through a public data network. The number and sizes of private data networks are increasing, and further standardization in this area is urgently needed.

The scope of this activity is to propose a standard addressing scheme to facilitate interoperation between DTE's in this environment.

This document discusses several alternative addressing mechanisms to identify user devices connected to private networks. The Annex contains a specific proposal for one alternative which seems to meet the objectives outlined below.

2. OBJECTIVES

The private network DTE addressing method chosen should satisfy the following objectives:

- Common DTE's which conform to current packet switching standards should be able to operate between private and public data networks without modification.

- Impact on public data networks in countries which do not allow private data networks should be avoided.

3. ALTERNATIVES

3.1 Shared Address Space. Individual public data networks may allocate a portion of their X.121 address space to interconnected private networks, by subscription agreement.

3.2 Extended X.121 Addressing. Public data network X.121 addresses may be extended by providing additional address fields in the CALL REQUEST packet. These fields could be contained within the facilities field or within the call user data field.

3.3 Second Dial Tone. The call may be established to the interface between a public network and the private network using a normal CALL REQUEST packet. The call may then be extended either using a following special CALL REQUEST packet or by call request information contained in subsequent DATA packets.

3.4 Private Network Identification Code. A single private network DNIC may be allocated in each country which allows private networks. This DNIC would be shared among all private networks having public network connections in that country. The remaining ten digits of the DTE numbering space for that DNIC would consist of a Private Network Identification Code (PNIC) followed by a network terminal number (NTN).

4. CONSIDERATIONS

4.1 Shared Address Space. This approach has no impact on countries which do not allow private networks and has no impact on X.121 numbering. However, it may consume large amounts of address space in public networks, for example, if a private network supports a large number of terminals, or if a private network is directly connected to more than one public data network.

4.2 Extended X.121 Addressing. This alternative would consume potentially limited space in the facilities field or would require allocation of the call user data field. Both current DTE implementations and public data networks in countries not allowing private networks would be impacted.

4.3 Second Dial Tone. For this approach, the user must know how to route all calls, and must construct a non-standard CALL REQUEST packet or specially formatted call request data in DATA packets. This impacts both current DTE implementations and public networks in countries not allowing private networks.

4.4 Private Network Identification Code (PNIC). Using this approach, the common private network DNIC may be used to specify the country for interconnection, and PNIC and NTN addresses may be

consistent between multiple public network interconnections. Neither existing DTE implementations nor public networks in countries not permitting private networks are affected. Figures 1 and 2 illustrate this.

In Figure 1 an originating DTE on a private network placing a call to a normal DTE on a destination public data network requires no modification in either DTE, the transit public network, or the destination public network. The called and calling DTE addresses both conform to X.121. The calling address is composed of the shared private DNIC of the country of the originating public network, followed by the PNIC and the NTN.

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ORIG --> PRIVATE --> ORIG --> TRANSIT --> DEST --> DEST
DTE      NETWORK     PDN      PDN        PDN      DTE
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Figure 1

In Figure 2, an originating DTE on a public network places a call to a DTE on a private network which is interconnected through another public data network. This requires no modification to either DTE, the transit public network, or the originating public network. The called and calling DTE addresses both conform to X.121. The called address is composed of the shared private DNIC of the country of the destination public network, followed by the PNIC and the NTN.

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ORIG --> ORIG --> TRANSIT --> DEST --> PRIVATE --> DEST
DTE      PDN      PDN        PDN      NETWORK     DTE
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Figure 2

Other combinations are possible, such as communication between DTE's, each on a separate private network, by means of one or more public data networks.

5. CONCLUSIONS

The shared address space and the private network identification code approaches meet the basic objectives outlined above. Each has attributes that may make it more attractive for specific situations, taking into account characteristics such as the size of the private network. Both approaches should be provided within the family of CCITT Recommendations.

ANNEX

Draft Recommendation X.12x

INTERNATIONAL NUMBERING PLAN FOR PRIVATE DATA NETWORKS

The purpose of this International Numbering Plan is to facilitate the introduction of private data networks and provide for their interworking on a worldwide basis.

1. Design considerations

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

1.1 There could be a large number of private data networks in a country*;

1.2 Where a number of private data networks are to be established in a country*, it should not be mandatory to integrate the numbering plans of the various networks;

1.3 The International Numbering Plan should permit the identification of a called country* as well as a specific private data network in that country*;

1.4 The number of digits comprising the code used to identify a country* should be the same for all countries*;

1.5 The number of digits comprising the code used to identify a private data network should be inversely related to the number of data terminals to be suported on the private data network, resulting in efficient use of the numbering space;

1.6 A network data number assigned to a data terminal should be unique within a particular private network. This network data number should form part of the international data number which should also be unique on a worldwide basis;

1.7 The number of digits to be used in an international data number should be governed by national and international requirements but a reasonable limit on the overall number of digits should be imposed;

1.8 The Numbering Plan should make provision for the interworking of data terminals on private data networks with data terminals on public data, telephone, and telex networks;

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* Country or geographical area.

Note - The term "telex" employed in this Recommendation, includes TWX networks.

1.9 The International Numbering Plan should provide for substantial spare capacity to accommodate future requirements;

2. Characteristics and applications of the Numbering Plan

2.1 Number system

2.1.1 The 10 digit numeric character set 0-9 should be used for numbers (or addresses) assigned to data terminals on private data networks. This principle should apply to both network data numbers and international data numbers.

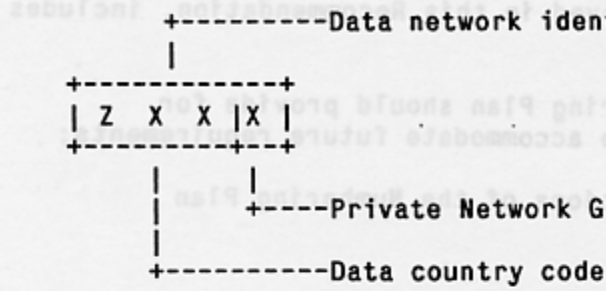
2.1.2 Use of the above number system will make it possible for data terminals on private data networks to interwork with data terminals on public data, telephone, and telex networks.

2.2 Data network identification codes

2.2.1 A data network identification code (DNIC) should be assigned to groups of private data networks within a country*.

2.2.2 All data network identification codes (DNIC) should consist of four digits. The first three digits should always identify a country* and could be regarded as a data country* code (DCC). The fourth digit should identify a specific group of private data networks within a country*.

2.2.3 Each country* should be assigned at least one 3-digit data country* code (DCC) in accordance with Recommendation X.121. The data country* code (DCC) in conjunction with a specific fourth digit may identify a group of private data networks. The format for data network identification codes (DNIC) should be as indicated in Figure 1/X.12x.



X - denotes any digit from 0 through 9

Z - denotes any digit from 2 through 7 as indicated in 2.2.4

TABLE 1/X.12x - First digit of data network identification code

0 -
1 - Reserved

2 -
3 -
4 - For data network identification codes (DNIC)
5 -
6 -
7 -

8 - For interworking with telex networks
9 - For interworking with telephone networks

Note 1 - The allocation of codes for non-zoned services, such as the marine satellite services, is for further study. The following points could be considered:

- select a data country code (DCC) in each zone to indicate the location, or

- use an escape DNIC such as 11XX.

Note 2 - Details on the Numbering Plan aspects of interworking between private data networks and public telephone and telex networks will be given in another Recommendation.

2.2.6 The assignment of data country codes (DCC) is to be administered by the CCITT. The assignment of private network group digits will be made nationally and the CCITT Secretariat notified.

Assignments by the Director of the CCITT of data country* codes (DCC) as well as assignments by countries of the private network group digits will be published in the Operational Bulletin of the International Telecommunication Union.

2.3 Private network identification codes

2.3.1 A private network identification code (PNIC) should be assigned to each private data network contained within a group of private networks identified by a specific DNIC.

2.3.2 The first digit of the private network identification code (PNIC) indicates the total number of digits comprising the private network identification code (PNIC). In the system of private network identification codes, the first digit of such codes should be in accordance with Table 2/X.12x.

TABLE 2/X.12x - Format of private network identification code and national terminal number

First Digit of PNIC	PNIC + NTN	Maximum Number of Networks per DNIC
0		
1	reserved	
2	2X + 8 digit NTN maximum	10
3	3XX + 7 digit NTN maximum	100
4	4XXX + 6 digit NTN maximum	1,000
5	5XXXX + 5 digit NTN maximum	10,000
6	6XXXXX + 4 digit NTN maximum	100,000
7		
8	reserved	
9		

NTN - denotes network terminal number
X - denotes any digit from 0 through 9

2.3.3 Should a country have more private data networks than can be grouped under one DNIC, another DNIC may be allocated for a new group of private data networks.

2.3.4 The assignment of private network identification codes is to be administered nationally.

2.4 International data number

2.4.1 A data terminal on a private data network when called from another network should be addressed by its international data number. Likewise, when a data terminal on a private data network calls a data terminal on any other network, the called data terminal should be addressed by its international data number. The international data number for a data terminal on a private data network should consist of the data network identification code (DNIC) of the appropriate private network group, followed by the private network identification code (PNIC), followed by the network terminal number (NTN); i.e., international data number = DNIC + PNIC + NTN.

The network terminal number (NTN) should consist of all the digits necessary to uniquely identify the data terminal within the serving network and should not include any prefix (or access code) that might be employed for such calling.

2.5 Maximum number of digits

2.5.1 International data numbers could be of different lengths but should not consist of more than 14 digits.

Note - The limit of 14 digits specified above applies exclusively to the address information. Adequate register capacity should be made available at data switching exchanges to accommodate the above address digits as well as any additional digits that might be introduced for signalling, or other purposes.

2.6 Prefix

2.6.1 For outgoing calls from a private data network, a prefix (or access code) would generally be required to access appropriate facilities for network interworking. The composition of this prefix is a network matter as the prefix does not form part of the international data number. However, the possible need to accommodate such a prefix with regard to digit register capacity in the calling network should be noted.

2.7 Number analysis - calls between data networks

2.7.1 In the case of calls between data networks, provision should be made in originating networks to interpret the first three digits of the international data number. These digits constitute the data country* code (DCC) component of the data network identification code (DNIC) and identify the terminal country*. This information may be required in the originating network for routing purposes.

2.7.2 In originating networks, it might also be necessary to interpret the fourth digit, of a DNIC. Such interpretation may provide the identity of a specific public data network in a country* where several public data network are in service. This information might be required for the selection of specific routes to called public data networks.

2.7.3 In networks connected to private data networks, it is necessary to interpret the private network identification code (PNIC). Such interpretation provides the identity of a specific private data network in a country* where private data networks are in service. This information is required for the selection of specific routes to called private data networks.

2.7.4 Networks receiving calls for private data networks should receive the complete international data number including the data network identification code (DNIC). However, where a country* of destination indicates that it does not wish to receive the data country* code (DCC) component of the DNIC, arrangements should be made to suppress the DCC.

2.7.5 In transit countries*, the complete international data number including the data network identification code (DNIC) must always be received. Interpretation of the first three digits would identify the called country*. Interpretation of the fourth digit would identify a specific data network, a group of private data networks, or a service in the called country. Interpretation of the fourth digit might be required for billing purposes or for route selection beyond the transit country*.

2.7.6 Where a data call is to be routed beyond a transit country* through a second transit country*, the complete international data number, including the data network identification code (DNIC) should always be sent to the second transit country*. Where the data call is to be routed by a transit country* to the country* of destination, the arrangements indicated in 2.6.4 above should apply.

2.8 Directories and written international data number representation

2.8.1 Directories for private data networks should include information on the procedures to be followed for making outgoing data calls. A diagram could assist the customer in these procedures.

2.8.2 With regard to the publication of international data numbers on letterheads or other written material, it is recommended that the network terminal number (NTN) and private network identification code (PNIC) should be easily

distinguished within the international number, i.e., that there be a space between the 4-digit DNIC, the PNIC, and the network terminal number (NTN).