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SERIES E: TELEPHONE NETWORK AND ISDN

Operation, numbering, routing and mobile services –
International operation – Tones in national signalling
systems

B-ISDN numbering and addressing

ITU-T Recommendation E.191

(Previously CCITT Recommendation)

ITU-T E-SERIES RECOMMENDATIONS

TELEPHONE NETWORK AND ISDN

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ITU-T RECOMMENDATION E.191

B-ISDN NUMBERING AND ADDRESSING

Summary

This Recommendation provides numbering and addressing principles in B-ISDN. This Recommendation is structured to give guidance on the different use of numbers and addresses in B-ISDN.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The 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 Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

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.

Superseded by a more recent version

CONTENTS

Recommendation E.191

B-ISDN NUMBERING AND ADDRESSING

(Geneva, 1996)

1   Scope

This Recommendation provides guidance, principles and requirements for addressing reference points located at subscribers' premises, servers allowing communications between terminals, applications and persons in B-ISDN networks.

B-ISDN numbering and addressing is based on Recommendation E.164. Additional numbering and addressing requirements not covered in Recommendation E.164 will be developed in this Recommendation.

The reason for conforming to the E.164 numbering plan is based on the compatibility with existing network arrangements and the provision for uniform and ubiquitous access. The B-ISDN represents an interconnecting means for other networks supporting E.164 numbering plan or interworking with it (e.g. X.121). E.164 guarantees both backward compatibility and consistency for customers and network operators. There is also sufficient flexibility within E.164 to allow the introduction of new services to meet future requirements. In addition, interworking mechanisms with other public numbering plans are already defined in Recommendation E.166/X.122.

2   References

The following 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; all 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.

–   CCITT Recommendation E.164 (1991), *Numbering plan for the ISDN era*.

–   ITU-T Recommendation E.166/X.122, (1996), *Numbering plan interworking for the E.164 and X.121 numbering plans*.

–   ITU-T Recommendation X.121 (1996), *International numbering plan for public data networks*.

–   ITU-T Recommendation X.213 (1995) | ISO/IEC 8348: 1996, *Information technology – Open Systems Interconnection – Network service definition*.

3   Terms and definitions

For the purposes of this Recommendation, the following definitions apply.

3.1   address: It describes location information of an endpoint. In general addresses specify the location of an endpoint, but they do not necessarily imply geographic information.

3.2   number: The traditional addressing information in networks is a string of decimal digits and it is usually referred to as the number. The syntax and semantic of a number are determined by the numbering plan in which it is allocated. The number identifies points of attachment of customer premises or private environment at the public network termination. In some cases the number identifies points beyond the public network termination (e.g. direct-dialling-in).

3.3 **B-ISDN number**: The B-ISDN number is the information that is used by the network to identify the B-ISDN interface. The B-ISDN number is an E.164 number.

3.4 **B-ISDN address**: The B-ISDN address is the full address by which the communication entity is known and comprises the B-ISDN number and additional addressing information.

3.5 **additional address**: The additional address complements the information provided by the B-ISDN number in order to identify the entity involved in the specific B-ISDN communication. The additional address is transported transparently by the public B-ISDN and it is not used for routing in the public B-ISDN.

3.6 **subaddress**: The subaddress is an addressing element that provides a means to convey transparently additional address information through the public network.

3.7 **ATM end system address**: The ATM end system address is an address that uniquely identifies an ATM endpoint.

3.8 **individual address**: Individual address is an address identifying a single endpoint.

3.9 **group address**: The group address is a destination address identifying a number of recipients, each of them being accessed through the use of the unique "group" identity. It represents a set of individual addresses, each of them being E.164 numbers.

3.10 **B-ISDN user**: A B-ISDN user is a user attached to the B-ISDN network via an interface at T_B, coincident S_B/T_B or S_B reference points.

3.11 **reference configurations**: Reference configurations are conceptual configurations useful in identifying various possible physical user access arrangements. Two concepts are used in defining reference configurations: reference points and functional groups.

3.12 **functional groups**: They are sets of functions which may be needed in user access arrangements. In a particular access arrangement, specific functions in a functional group may or may not be present.

3.13 **reference points**: The conceptual points dividing functional groups are reference points. In a specific access arrangement, a reference point may correspond to a physical interface between pieces of equipment, or there may not be any physical interface corresponding to the reference point (virtual interface).

3.14 **server**: A server is a network element able to offer some specific service (e.g. a connectionless server offers the connectionless data service to users).

4   Abbreviations

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

AESA   ATM End System Address

AFI   Authority and Format Identifier

ATM   Asynchronous Transfer Mode

B-ISDN   Broadband Integrated Services Digital Network

B-NT2   Broadband-Network Termination 2

BCD   Binary Coded Decimal

BCDBS   Broadband Connectionless Data Bearer Services

CLSF   ConnectionLess Service Functions

DDI Direct-Dialling-In

DSP Domain Specific Part

IDI Initial Domain Identifier

IDP Initial Domain Part

ISDN Integrated Services Digital Network

MSN Multiple Subscriber Number

NSAP Network Service Access Point

OSI Open Systems Interconnection

PSTN Public Switched Telephone Network

TE Terminal Equipment

UNI User-to-Network Interface

UPT Universal Personal Telecommunication

5 B-ISDN numbering and addressing basic principles

The aim of the **B-ISDN address** is to give information about the location of the entity involved in the specific B-ISDN communication. Examples of such entities are networks elements, applications and interfaces. It is worth noting that the entities whose B-ISDN address specifies the location information can belong to the public domain or to the private environment. In particular the B-ISDN address can be used to identify interfaces in the private domain.

The aim of the **B-ISDN number** is to identify points of attachment of customer premises or private environments at the public termination. B-ISDN number is analysed by the public network in order to route and charge the call. In some specific cases the B-ISDN number can be used to identify interfaces within the private domain.

The use of the B-ISDN number to identify other kinds of interfaces corresponding to reference points not related to the attachment of the customer premises to the public network is for further study. An example of such interfaces are interfaces between two nodes, between a public network and a specialized node or between two public networks.

The aim of the **additional address** of the B-ISDN address is to complete the information provided by the B-ISDN number in order to identify the entity involved in the specific B-ISDN communication as depicted in Figure 1.
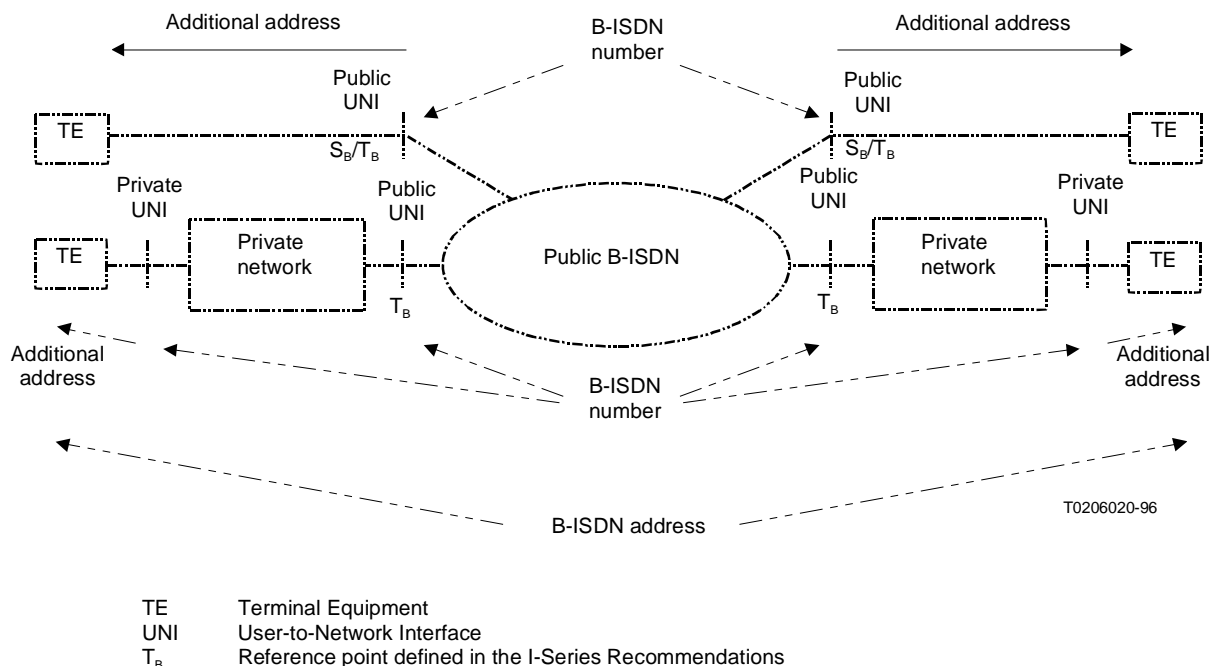
FIGURE 1/E.191

Scope of B-ISDN number and B-ISDN address

6 B-ISDN address

In order to fulfil the principles described in clause 5 the structure depicted in Figure 2 has to be taken into consideration for B-ISDN addressing.
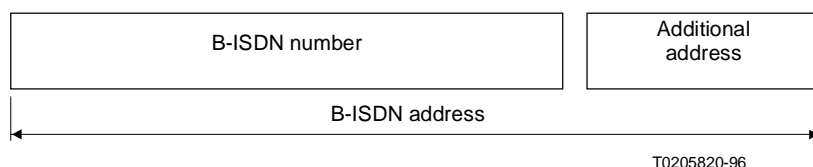
FIGURE 2/E.191

B-ISDN address

The B-ISDN address comprises the B-ISDN number and additional address information. The B-ISDN address is capable of identifying the entity involved in the specific communication application. In particular the B-ISDN number is used in the public network to determine routing, while the additional address is transported transparently.

7   B-ISDN numbering plan

The B-ISDN number is a number related to B-ISDN and it follows the rules and regulations defined in Recommendation E.164. Figure 3 depicts the B-ISDN number on the basis of Recommendation E.164.

FIGURE 3/E.191

B-ISDN number

The B-ISDN number is used to determine the route to the destination user-to-network interface in the public domain. The B-ISDN number is used to define the routing within the public domain.
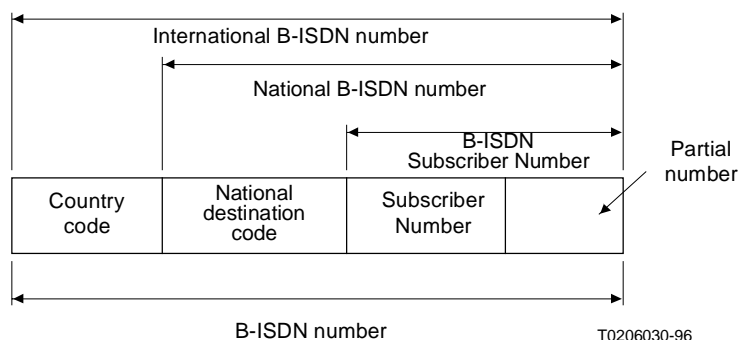
The B-ISDN number is used to identify both the originating and the destination endpoints, and it shall unambiguously identify one or more of the following interfaces defined in the I-Series Recommendations:

- a physical/virtual interface at T_B reference point;

- for point-to-point configurations, physical/virtual interface at S_B/S and coincident S_B/T_B reference points;

- for multipoint configuration all interfaces at S_B/S and coincident S_B/T_B reference points.

When selecting a destination in the subscriber installation, the digits forming the B-ISDN number or the digits forming the end of the B-ISDN number may be transferred to the called subscriber installation as a partial number. The number of digits used depends upon the requirements of the called subscriber equipment and on the capacity of the numbering plan used.

If the subscriber installation includes a B-NT2, the partial number will be used in the context of the Direct-Dialling-In (DDI) supplementary service.

If the subscriber installation consists of terminal equipment only, the transferred digits will be used in the context of the Multiple Subscriber Number (MSN) supplementary service.

One or more E.164 number(s) may be assigned to B-ISDN user-to-network interface (DDI, MSN Context).

In countries served by more than one B-ISDN, ISDN and/or PSTN, the network identification is a national matter.

The B-ISDN number by itself will not identify the particular nature of the service, the type of connection or the quality of service required.

The need for assigning E.164 number(s) to server interfaces (i.e. P, M) requires further studies (Figure 4).

CLSF   Connectionless Service Functions
ATM   Asynchronous Transfer Mode
P and M Reference points defined in the I-Series Recommendations
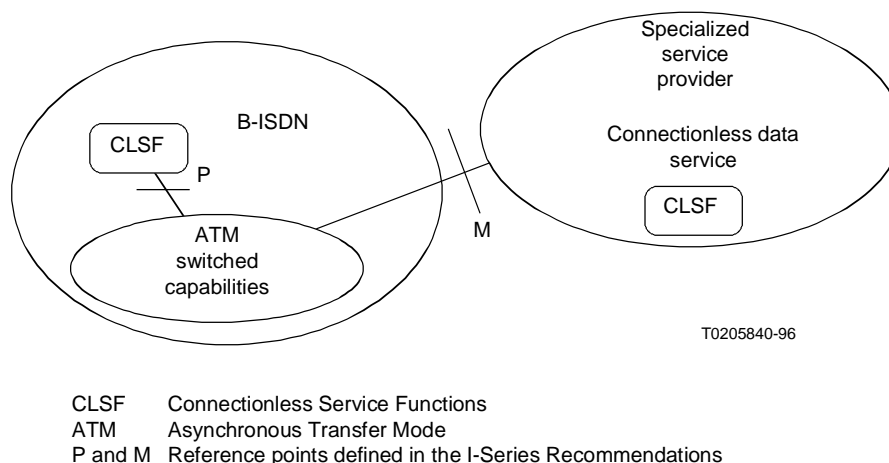
FIGURE 4/E.191

P and M reference points

7.1   User requirements on B-ISDN numbering

The B-ISDN number is an object that is not only utilized by the network but it is used directly by the user as well. In this sense it is important to consider what the user requirements are on the B-ISDN number and on the B-ISDN numbering plan.

The user requirements are mainly expressed in user friendliness that in this context is a measure of the ease of use of the B-ISDN number and of the B-ISDN numbering scheme from the user point of view. In particular there are specific user requirements concerning the type and formats of the selection information that should be provided. These can include structure, service variants, tariff perception and domain information.

Structure

In order to be handled in an easy manner the structure of the B-ISDN number as perceived by the user should be hierarchical and from the dialling viewpoint, only the necessary information needs to be dialled. The structure should be visible and meaningful to the user.

Service variants

From a user viewpoint, for some services it is important to be able to distinguish between different variants of the service. In other words the E.164 number, presented at the calling interface, may include the possibility of identifying the various characteristics of service (e.g. freephone, UPT, etc.).

The possibility of distinguishing between the different services is also important from the network point of view. In particular the use of the network resources can be optimized making a distinction as soon as possible (e.g. in the local exchange) between the various services that in some cases are treated in different manners requiring the use of different network resources.

Tariffing indication

Closely related to the service variants are the tariffing indications that may be contained in the B-ISDN number. By using these indications, the user may have an initial indication of how expensive the service is and how the service is charged.

Domain information

The selection could indicate domains of major importance to the user, or to the operator:

– operator or network serving the called party;

– private network, in case the called party is served by a private network.

8 Individual and group address

B-ISDN address will be used to identify both originating and destination endpoints (individual address) and they will be used also for identifying multiple destination recipients (group address). A group address would not in itself address the individual destination endpoint, but would be used as a destination address to route to an entity, or entities, capable of interpreting the group address, or unique group identity, into individual recipient addresses.

The E.164 numbering plan will not provide any means to distinguish individual address from group address, but an address type field in the appropriate protocol will be used for such a purpose. To maintain the unambiguity of the E.164 numbering plan, group addresses should not be allocated in a manner that allows the same B-ISDN number to be used within both an individual and a group address.

9 B-ISDN addressing structures

The B-ISDN address is used to determine the route to the destination endpoint. The choice on the format and functionality of the additional address is network-dependent. Two options are identified in Figure 5.

B-ISDN addressing structure A

E.164 number	Subaddress

B-ISDN addressing structure B

AFI	E.164 number	DSP

IDP
IDI
ATM end system address

T0206040-96

AFI Authority and Format Identifier
IDI Initial Domain Identifier
IDP Initial Domain Part
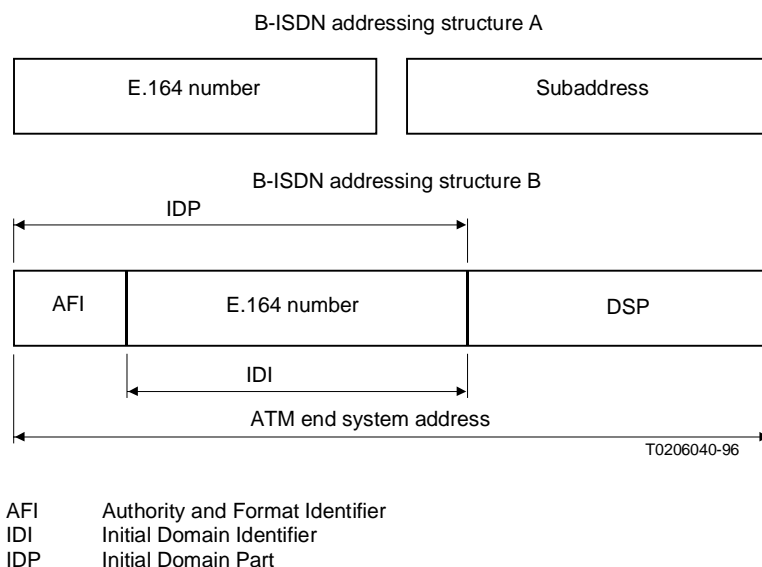
FIGURE 5/E.191

B-ISDN addressing structures

9.1 Structure A

Structure A is based on the use of the subaddress. The additional address information which is added to complement the addressing information provided by the E.164 number in order to identify the entity involved in the specific B-ISDN communication is called **subaddress**. The subaddress may be a simple string of digits or it may be a structured address. For example, the subaddress may be an NSAP address as defined in Annex A of ITU-T Rec. X.213 | ISO/IEC 8348.

The main purpose of such an addressing structure is to identify network entities or application processes beyond the public boundary independently of the specific network. The subaddress is carried transparently across the B-ISDN and it is not used to determine the location of the entity identified within the public domain by the B-ISDN address.

While the E.164 number is a mandatory element in the identification of endpoints, the additional address information may be optionally present. The subaddress, being an addressing mechanism independent of the network technique, cannot substitute the E.164 numbering role, i.e. it cannot identify user-to-network interfaces and it cannot be used for routing purposes. Public B-ISDN shall not be required to examine or operate on any additional address information.

The subaddress is a sequence of decimal digits and/or binary octets which can be encoded into a 20-octet field, as a maximum.

9.2 Structure B

Structure B is based on the use of the E.164 format of the NSAP address structured in accordance with Annex A of ITU-T Rec. X.213 | ISO/IEC 8348. The E.164 number contained in the Initial Domain Identifier (IDI) identifies the user-to-network interface associated to the entity identified by the B-ISDN address. This structure is known as an ATM End System Address (AESA).

The Initial Domain Part (IDP) specifies an administrative authority which has the responsibility for allocating and assigning the values of the Domain Specific Part (DSP). The IDP consists of two fields: the Authority and Format Identifier (AFI) and the Initial Domain Identifier (IDI).

The AFI identifies the coding authority, the format of the IDI and the syntax of the remainder address. The Format Identifier values may be 45 or 59 (E.164 value). The code AFI=59 should not be used while digit "0" is used as an E.164 escape code. Other values of the AFI and their usage are described ITU-T Rec. X.213 | ISO/IEC 8348. This field is 1 octet long. The encoding used is the Binary Coded Decimal (BCD) syntax.

The IDI field is 8 octets, encoded with BCD syntax. An appropriate number of leading padding characters (either 0000 or 1111) are used to obtain a maximum length of the E.164 number (15 digits). A trailing semi-octet of 1111 is used to obtain octet alignment.

The Domain Specific Part is 11 octets, the encoding is specified by the authority identified by the IDP. The authority determines how it will be assigned and interpreted within that domain. The authority can create further subdomains.

The use of the subaddress in conjunction with structure B is allowed to further complement addressing information in the private domain.

Table 1 describes all the possible combinations of the structures described before.

TABLE 1/E.191

Structure combinations

B-ISDN address	B-ISDN number	Additional address
E.164 number	E.164 number	Null
E.164 number + subaddress	E.164 number	Subaddress
NSAP (E.164 format)	E.164 number extracted from the NSAP IDI field	NSAP (E.164 format)
NSAP (E.164 format) + subaddress	E.164 number extracted from the NSAP IDI field	NSAP (E.164 format) + subaddress

10   Interworking between public and private B-ISDN

If the terminal on the private network is identified only by its private network address, it is necessary that in order to route the call across the public B-ISDN, the private network address must be mapped into an E.164 number specifying the public user-to-network interface number. The E.164 number can be determined directly from its private network address only in the case when an NSAP address with the E.164 IDI format is used. The determination of the E.164 number of the destination public user-to-network interface in other cases requires additional functionality in the network.

11   Service aspects of B-ISDN addressing schemes

Whilst recognizing that a number of existing and new service offerings may utilize B-ISDNs it is helpful to consider some of the differing numbering and addressing requirements that need to be taken into account as these services are considered in broadband environment. Frame relay and Broadband Connectionless Data Bearer Services (BCDBS) are examples of broadband service offerings, usually on a separate service platform or network. Frame relay requires that the B-ISDN number is included in the connection request for switched connections, while BCDBS requires that the B-ISDN number is present in each protocol data unit. It is beyond the scope of this Recommendation to solve any protocol issue or deal with other forms of addresses which may be relevant to the customer domain.

B-ISDN services may impact on E.164 international and national numbering resources and this item is for further studies.

12   Recommendation history

Recommendation E.191 was first published in 1996.

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