TECHNICAL REPORT

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Information technology — Telecommunications and information exchange between systems — The structure and coding of Logical Link Control addresses in Local Area Networks

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Structure et codage des adresses de contrôle de liaison logique dans les réseaux locaux

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Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The main task of technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 10178, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

Annexes A to C of this Technical Report are for information only.

Introduction

The standards for LANs generally comprise the physical layer, the medium access control (MAC) sublayer, and the logical link control (LLC) sublayer. In OSI terminology, the MAC and LLC sublayers are considered to be sublayers of the OSI data link layer. Both the MAC and LLC sublayers contain fields for addressing.

This Technical Report contains a description of the LLC addresses, together with a list of those values in current use.

The addressing space in LLC is limited, and it is such that it is considered to be a scarce resource. It is therefore prudent to consume this resource in a considered and conservative manner. To this end this Technical Report indicates the kind of considerations which will be used by ISO/IEC when making the association between a particular LLC address value and use to which it is put. These considerations are intended to be sufficiently broad to allow a wide variety of LLC address uses to be recorded, and also sufficiently restrictive so that addresses values are not unwisely assigned.

This Technical Report will be kept up to date by ISO/IEC JTC 1 as new entries are added to the tables.

Information technology — Telecommunications and information exchange between systems — The structure and coding of Logical Link Control addresses in Local Area Networks

1 Scope

This Technical Report (TR) provides:

a) a description of the ISO 8802-2 addressing conventions;
b) the consideration for the manner in which new LLC address uses are assigned an entry in this TR, and
c) a record, in the form of a table, of assigned uses of ISO 8802-2 address values.

This TR is for use by implementors to ascertain the value, or values, of LLC addresses that have been assigned for use in a particular circumstance.

It is outside the scope of this TR to provide architectural judgments regarding the entities which are identified by particular address value(s).

2 References

ISO/IEC TR 9577 : 1990, *Information technology – Telecommunications and information exchange between systems – Protocol identification in the network layer.*

ISO 8802-2:1988, *Information processing systems – Local area networks – Part 2 : Logical Link Control.*

3 Abbreviations

The following abbreviations are used in this Technical Report.

DSAP	Destination Service Access Point
IEEE	Institute of Electrical and Electronics Engineers
LLC	Logical Link Control
PDU	Protocol Data Unit
SAP	Service Access Point
SNAP	Sub Network Access Protocol
SSAP	Source Service Access Point
LSAP	Link Service Access Point

4 General considerations

4.1 Functions of LLC addresses

Logical Link Control (LLC) protocol data units contain addressing information. This addressing information consists of two fields; the Destination Service Access Point (DSAP) address field, and the Source Service Access Point (SSAP) address field. Each of these is an 8 bit field and each is made up of two components.

In the DSAP address field, the components are an *address type designation bit*, and seven bits of *actual address*. When the *address type designation bit* is set to '0', it denotes that the *actual address* is an individual address. When the *address type designation bit* is set to '1', it denotes that the DSAP *actual address* is a group address. This Technical Report considers and records the two types of *actual address* separately.

In the SSAP address field, the components are the *command/response identifier bit*, and seven bits of *actual address*. The *actual address* in the SSAP field is always an individual address.

Table 1 is a record of individual address values and is applicable to SSAP *actual addresses*, and DSAP individual *actual addresses*. Table 2 is a record of DSAP group *actual addresses*.

In the general case, an individual *actual address* identifies a protocol, or set of protocols, in the next higher layer. In OSI environments, the next higher layer is the Network Layer. In non-OSI environments, the next higher layer is dependent on the architecture in use.

There are certain exceptions to this general rule as discussed below.

NOTES

1 The terms in italics, namely; *address type designation bit*, *command/response identifier bit* and *actual address* are as defined in ISO 8802-2. See ISO 8802-2 clause 3.3.1.1 items (2), (3), and (4).
2 The format of LLC addresses is defined in ISO 8802-2. For information this is reproduced in Annex A.
3 An individual *actual address* value does not necessarily have any relationship with a group address of the same *actual address* value.

4.2 Binary and Hexadecimal representation of LLC addresses

4.2.1 Binary representation

The seven-bit LLC *actual address* value is conveyed in the eight-bit DSAP/SSAP fields and therefore can be represented as a sequence of eight binary digits. The least significant digit is shown to the left and the significance of the digits increases from left to right. The least significant digit of the sequence represents the *address type designation bit* of the DSAP address field and the *command/response identifier bit* of the SSAP address field, see figure A.1.

The following are the two permitted binary representations of an example individual *actual address*;

0111 1011
Z111 1011

The following is the permitted binary representation of an example group *actual address*;

1101 0101

4.2.2 Hexadecimal representation

The eight-bit binary representation of an *actual address* value may be represented as two hexadecimal digits encoding the value of the octet address field with the least significant bit set to 0 in the case of an individual address and the least significant bit set to 1 in the case of a group address.

The following is the permitted hexadecimal representation of the example individual *actual address* shown in clause 4.2.1 (Z111 1011);

DE/DF

The following is the permitted hexadecimal representation of the example group *actual address* shown in 4.2.1 (1101 0101);

AB

4.2.3 Bit order of transmission

The order of transmission of bits or other components of the octet address field by any particular MAC is outside the scope of this Technical Report which describes LLC address values in terms of the significance of individual bits.

4.3 The null address

4.3.1 Function of the null address

The null LLC address designates the LLC entity associated with the underlying MAC SAP. The null address does not identify any higher layer protocol nor the LLC sublayer management entity.

The null address is only valid for use in the address fields of XID and TEST PDUs. The use of the null address (DSAP and SSAP) is specified in ISO 8802-2.

4.3.2 Definition of the null address

The null address (DSAP and SSAP) is defined in ISO 8802-2.

The null LLC address is included in table 1.

4.4 The global address

4.4.1 Function of the global address

The global LLC address is an address reserved from the range of group addresses (see table 2) and is used to identify all LSAPs at the station identified by the MAC address.

4.4.2 Definition of the global address

The global LLC (DSAP) address is defined in ISO 8802-2.

The global LLC address is included in table 2.

NOTE - The global address can only exist as a DSAP address. The Individual *actual addresses* value '111 1111' in DSAP and SSAP address fields is a different address and should not be confused with the global address.

4.5 The address used in conjunction with ISO/IEC TR 9577

The mechanisms described in ISO/IEC TR 9577 is an important feature of this Technical Report. It provides a means for standardised network layer protocols to be self identifying. Protocols within the scope of ISO/IEC TR 9577 do not therefore need to be separately identified by means of distinct individual *actual address* values. A specific individual *actual address* has been assigned to ISO/IEC TR 9577 and this is recorded in table 1.

The considerations in clause 7 include the notion that whenever possible, new protocols should be identified by ISO/IEC TR 9577.

It might not be possible in all cases to identify the protocol which operates above the LLC sublayer by means of ISO/IEC TR 9577. In these cases, associating that protocol with a different *actual address* value could be necessary; see clause 7.

4.6 The address used in conjunction with SNAP

Proprietary protocols do not qualify for inclusion in this Technical Report, nor are they suitable for identification by ISO/IEC TR 9577. To accommodate the use of private and proprietary protocols in a LAN environment, the method defined in Annex B is available.

This method of identifying private/proprietary protocols is associated with a specific individual *actual address* value as indicated in table 1.

5 Unreserved addresses

This Technical Report defines a range of individual *actual addresses* as unreserved. The corresponding DSAP and SSAP addresses are in the range 'Z000 0001' through to 'Z011 1111' inclusive (the left most bit is the least significant bit); see table 1.

This Technical Report defines a range of group *actual addresses* as unreserved. The corresponding DSAP addresses are in the range '1000 0000' through '1011 1111' inclusive (the left most bit is the least significant bit); see table 2.

Further definition of the unreserved addresses is beyond the scope of this Technical Report. They may be used for any purpose whatsoever, including identification of protocols to which reserved addresses have been assigned. The responsibility for controlling the use of unreserved LLC addresses rests with an appropriate authority, for example a system designer, an implementor, or a LAN administrative manager.

6 Reserved addresses

This Technical Report defines a portion of the individual *actual address* range as reserved. The corresponding DSAP and SSAP addresses have the general form 'Z1XX XXXX'.

These addresses are used to identify protocols as described in 4.1 above. Table 1 shows all the reserved individual LLC address values.

This Technical Report defines a portion of the group *actual address* range as reserved. The corresponding DSAP addresses have the general form '11XX XXXX'.

Table 2 shows the reserved group LLC address values.

For each value, the tables indicate:

i) the standards organisation responsible for the protocol, and
ii) the document reference that records the purpose for which it is being used.

The entries indicate the values that are reserved for use in the documents indicated. All other entries are reserved for future assignment.

7 Procedures for assignment of reserved addresses

7.1 General considerations

The number of reserved LLC addresses is limited and therefore a case-by-case review against the criteria for assignment is made before a protocol is listed against a value in table 1. Where possible, the use of complementary mechanisms, for example ISO/IEC TR 9577, is also considered.

7.2 Specific procedures

The need for a higher layer protocol to be listed in table 1 is brought to the attention of ISO/IEC JTC1 by means of a submission to Subcommittee JTC1/SC6. A request for an LLC address value shall be accompanied by a copy of the protocol standard.

The protocol proposed for inclusion in table 1 should be one which

i) is a standard published by an internationally recognised standards organisation and

ii) is only changed as a result of a public review process, and

iii) has a potentially large field of application.

Wherever possible, network layer protocols should be identified by using the value in table 1 for ISO/IEC TR 9577. It is likely therefore that consultation between JTC1/SC6 working groups, and between JTC1/SC6 and the submitting member, will be needed to ensure that this goal is fulfilled. It is possible that the outcome of such a liaison could lead to a revision of ISO/IEC TR 9577.

If it is not possible to use the mechanisms of ISO/IEC TR 9577 and hence a need for a specific LLC address is evident, then an LSAP address not currently assigned in table 1 shall be assigned.

Generally only one use should be associated with each address value. However, in exceptional circumstances, it could be necessary to mark an address value as being used for more than one protocol. Caution should be exercised in associating multiple protocols with a single LLC address value, and considerations could include the fact that the protocols concerned have their own mechanisms for protocol identification, or that they will never coexist in the same installation.

Proposals seeking more than one LLC address value, or a new address value for a revised protocol which is already associated with an existing LLC address value, will not usually be accepted. It is assumed that modern protocols contain their own version identifiers and hence will be able to interoperate or coexist using a single LLC address value. Therefore, the need for a protocol to be associated with more than one LLC address value would be exceptional.

Requestors are reminded that the available *actual addressing* space is limited to 7-bits, of which 1 value is defined to be the null *actual address*, 63 values are unrestricted, and 64 values are controlled by ISO/IEC by way of this Technical Report. Applications for new assignments can therefore expect to be scrutinized to ensure that the consumption of addressing is done in a careful and considered manner.

NOTES

1 The term standard is used in a broad sense to include standards at an advanced stage of development (e g, a Draft International Standard or a CCITT Recommendation).

2 Vendor proprietary protocols shall not be assigned a reserved LLC address value. The mechanism provided in IEEE 802 SNAP may be applicable in these cases.

3 Liaisons by submitting National Member Bodies, and within ISO/IEC JTC 1 SC6, will be required in order to take advantage of the protocol identification mechanisms available in ISO/IEC TR 9577.

8 LLC address assignments

Table 1 records the current assignment of individual LSAP address values.

Table 1 - Individual LLC address values

LLC address value (applicable to SSAP and individual DSAP) Hexadecimal / Binary	Organisation responsible for the document	Document references
00 Z000 0000	ISO/IEC JTC1/SC6	ISO 8802-2 (1)
80 Z000 0001 through to FC Z011 1111	---	Unreserved use
02 Z100 0000	ANSI	IEEE 802.1B (2)
82 Z100 0001		
42 Z100 0010	ISO/IEC JTC 1/SC6	ISO/IEC 10038 (3)
C2 Z100 0011		
22 Z100 0100		
A2 Z100 0101		
62 Z100 0110		
E2 Z100 0111		
12 Z100 1000		
92 Z100 1001		
52 Z100 1010		
D2 Z100 1011		
32 Z100 1100		
B2 Z100 1101		
72 Z100 1110		
F2 Z100 1111		
0A Z101 0000		
8A Z101 0001		
4A Z101 0010		
CA Z101 0011		
2A Z101 0100		
AA Z101 0101	ANSI	IEEE 802 (4)
6A Z101 0110		
EA Z101 0111		
1A Z101 1000		
9A Z101 1001		
5A Z101 1010		
DA Z101 1011		
3A Z101 1100		
BA Z101 1101		
7A Z101 1110		
FA Z101 1111		
06 Z110 0000	ANSI	ARPANET/IP (5)
86 Z110 0001		
46 Z110 0010		
C6 Z110 0011		
26 Z110 0100		
A6 Z110 0101		
66 Z110 0110		
E6 Z110 0111		
16 Z110 1000		
96 Z110 1001		
56 Z110 1010		
D6 Z110 1011		
36 Z110 1100		
B6 Z110 1101		
76 Z110 1110		
F6 Z110 1111		
0E Z111 0000	IEC	IEC 955 (6)
8E Z111 0001	IEC	IEC 955 (7)
4E Z111 0010	ISO	ISO 9506 (8)
CE Z111 0011		
2E Z111 0100		
AE Z111 0101		
6E Z111 0110		
EE Z111 0111		
1E Z111 1000		
9E Z111 1001		
5E Z111 1010		
DE Z111 1011		
3E Z111 1100		
BE Z111 1101		
7E Z111 1110	ISO/IEC JTC 1/SC6	ISO/IEC 8208 (9)
FE Z111 1111	ISO/IEC JTC 1/SC6	ISO/IEC TR 9577 (10)

NOTES

1 The bit marked 'Z' is the least significant bit and represents:
   i) The *command/response identifier bit* in an SSAP field; or
   ii) The *address type designation bit* (set to the value '0' - Individual) in a DSAP field.

2 LSAP values that are neither assigned nor identified for unreserved use are reserved.

The following numbered list provides additional information about each of the protocols in table 1. The numbers in the list correspond to the numbers in parenthesis shown in the document reference column.

1) Used in ISO 8802-2 as the Null Address
2) Used by IEEE 802.1b (IEEE 802.1b : IEEE Standard for Local Area Networks and Metropolitan Area Networks Network Management) to indicate LLC Sublayer Management
3) Used in ISO 10038 (ISO/IEC 10038 : Information processing system - Telecommunications and information exchange between systems - Local area networks MAC sublayer interconnection) to identify the Bridge Spanning Tree Protocol
4) Used in IEEE 802 (IEEE Std 802-1990, IEEE Standard for Local Area Networks and Metropolitan Area Networks: Overview and Architecture of Network Standards) to identify the SNAP SAP
5) Used in ARPANET (RFC 791 : ARPANET/IP, Internet Protocol, DARPA Internet Program Protocol Specification) to identify the Internet Protocol
6) Used in IEC 955 (IEC 955 : 1989, Process Data Highway, Type C (Proway C), for Distributed Process Control Systems) to identify Network Management Maintenance and Initialization
7) Used in IEC 955 (IEC 955 : 1989, Process Data Highway, Type C (Proway C), for Distributed Process Control Systems to identify Active station list Maintenance
8) Used in ISO 9506 (ISO 9506 : 1990, Industrial Automation Systems - Manufacturing Message Specification - Part 1 : Service Definition 1st Edition; Part 2 : Protocol Specification 1st Edition; Part 3 : Robot Specific Message Systems) to identify Manufacturing Message Service
9) Used to identify ISO 8208 (ISO 8208 : 1990, Information Processing Systems - Data Communication - X.25 packet layer protocol for data terminal equipment) as the Network Layer Protocol
10) Used to identify ISO/IEC TR 9577