ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-117

DOMAIN SPECIFIC PART OF NETWORK LAYER ADDRESSES

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BRIEF HISTORY

This ECMA Standard specifies a way in which the authority responsible for the administration of a private addressing domain may choose to structure the Domain Specific Part (DSP) of an ISO Network Layer address to facilitate interconnection of multi-vendor equipment. It defines an address format for the DSP to be used in conjunction with the work of ISO on Network Layer addressing (ISO 8348/DAD2) thus permitting, for example, connection of the private domain to public wide-area networks. It is based upon the principles of ECMA TR/20.

This Standard has been developed by ECMA/TC32.

Approved as an ECMA Standard by the General Assembly of June 26, 1986.

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1. GENERAL

1.1 Scope

This ECMA Standard specifies a syntax and interpretation of the Domain Specific Part (DSP) of an ISO Network Layer address which may be used where heterogeneous equipment (i.e. equipment supplied by various vendors) is to be used to construct a private domain of the OSI network. The Standard specifies:

- A syntax of the DSP for use within a network addressing domain which is identified by an Initial Domain Part (IDP) in accordance with ISO 8348/DAD2. (This includes use with the local IDP formats).
- The interpretation of the components of the DSP.

The syntax and semantics of the DSP, as described in this Standard, are required only when equipment comprising the private domain is of a heterogeneous nature. Usage of the DSP within a domain the equipment of which is homogeneous is not subject to standardization.

In particular, addresses for equipment within a private domain are assigned and controlled by the authority responsible for the administration of the domain. It is outside the scope of this Standard to restrict in any way the form of the address format which an end-system within a private domain may be assigned.

1.2 Conformance

The Domain Specific Part of the Network Service Access Point Address conforms with this Standard if it is constructed according to either the Binary Syntax or the Decimal Syntax as defined in Section 3.

1.3 References

ECMA TR/14	Local Area Networks - Layers 1 to 4 - Architecture and Protocols
ECMA TR/20	Layer 4 to 1 Addressing
ISO 6523	Data Interchange - Structure for the Identification of Organizations
ISO 7498	Data Processing - Open Systems Interconnection - Basic Reference Model
ISO 8348	Data Processing - Data Communications - Network Service Definition
ISO 8348/DAD 2	Information Processing Systems - Data Communications - Addendum to Network Service Definition Covering network Layer Addressing
ISO 8802	Information Processing Systems - Data Communications - Local Area networks

CCITT Rec. E.163	Numbering Plan for the International Telephone Service
CCITT Rec. E.164	Numbering Plan for the ISDN Era
CCITT Rec. F.69	Plan for Telex Destination Codes
CCITT Rec. X.121	International Numbering Plan for Public Data Networks

1.4 Definitions

1.4.1 Reference Model Definitions

This Standard makes use of the following terms defined in ISO 7498:

- Network Layer
- Network service
- Network service access point (NSAP)
- Network service access point address
- Network address
- Routing

1.4.2 Network Layer Architecture Definitions

This Standard makes use of the following terms defined in ISO 8648 (Internal Organization of the Network Layer):

- Subnetwork
- End system
- Interworking unit

1.4.3 Network Addressing Definitions

This Standard makes use of the following terms defined in ISO 8348/DAD 2:

- Subnetwork point of attachment
- Subnetwork address
- Global network addressing domain
- Network addressing domain
- Network addressing authority
- Abstract syntax

2. ADDRESSING PRINCIPLES

2.1 Concepts of Network Layer Addressing

This clause presents a summary of the major points contained in ISO 8348/DAD 2, as they are relevant to this Standard.

Network addresses are defined to be hierarchical. An authority may either assign a complete address, or else may identify a subdomain of its own addressing domain within which addresses may be further assigned by an identified authority for the subdomain. This is done in such a way that all addresses are unique.

When an authority identifies a subdomain, this creates in effect a prefix which applies to all addresses assigned within the subdomain.

Certain methods of assigning authority are recognized within the body of ISO 8348/DAD 2. These take account of existing addressing standards such as CCITT Rec. X.121. The abstract structure of an address is shown in Figure 1.

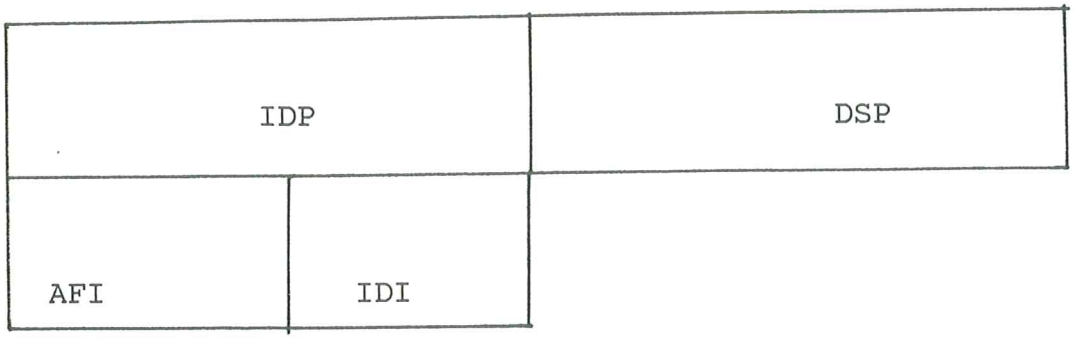

Figure 1: NSPA Address Structure

The component of this structure are as follows.

IDP Initial Domain Part

This is the part of the address the entire content of which is standardized. It consists of two parts, the AFI and the IDI.

AFI Authority and Format Identifier

This specifies the format of the IDI, the authority responsible for allocating IDI values, and the syntax of the DSP.

IDI Initial Domain Identifier

This identifies the subdomain from which DSP values are allocated, and the authority responsible for allocating the values.

DSP Domain Specific Part

The contents and semantics of the DSP are not specified in ISO 8348/DAD 2. Its abstract syntax is however defined by the AFI. In most cases, this means that the DSP abstract syntax can be either binary or decimal.

IDI formats specified in ISO 8348/DAD 2 include a number of authorities for IDI allocation. These include the following.

1. CCITT Rec. X.121 (Public data network numbering)
2. CCITT Rec. F.69 (Telex numbering)
3. CCITT Rec. E.163 (Telephone numbering)
4. CCITT Rec. E.164 (ISDN numbering)
5. ISO DCC (Geographic address assignment under ISO control)
6. ISO ICD (Non-geographic address assignment under ISO control)
7. Local (the IDI is null and the entire address is contained in the DSP)

2.1.1 A Topographical Example

The IDP and DSP may be illustrated in terms of an addressing topography comprising one central domain, representing a global public network, surrounded by many satellite domains.

The boundary of the central domain represents the addressable range of the Initial Domain Identifier within the IDP, for an AFI corresponding to a particular addressing scheme. The boundaries of the satellite domains represent the OSI-visible end-points which require a non-null DSP to extend the range of one more IDIs. They represent address spaces which may be privately administered.

The private domain may itself be complex. It is not restricted, for example, to a single LAN. It may consist of several LANs interconnected by interworking units. It may also include other links, and may even comprise an entire global private network. The complexity of the domain is limited only by the addressing capability permitted by the restriction on the maximum DSP length in ISO 8348/DAD 2.

It should be noted that although an IDP may correspond to a particular point of attachment to a public network, it is not constrained to do so. A private domain may have several points of attachment to public network. Equally, private domains may exist which are not attached to public network at all.

Other topographies are possible. This Standard is applicable to all OSI addressing topographies as covered by OSI 8348/DAD 2.

2.2 DSP Requirements

The DSP must satisfy the following requirements.

i) It must enable multiple NSAPs to be separately identified in a single computer system which is directly attached to a public network.

ii) It must enable multiple computer systems attached to the private domain to be identified.

iii) It must enable multiple NSAPs to be separately identified in a computer system which is attached to a private domain.

This Standard permits the DSP to be expressed in either binary or decimal abstract syntax as appropriate to the type or types of subnetwork concerned. The particular syntax being used is identified by the appropriate value of the AFI.

2.3 DSP Size Constraints

The permitted maximum lengths of the DSP are not consistent, for the various address syntaxes permitted by ISO/DAD 2. They vary according to the AFI. The highest permissible lengths, common to all formats, are nine octets for binary abstract syntax and 23 digits for decimal abstract syntax. Therefore, these are the maximum lengths the use of which is described by this Standard.

2.4 Components of the DSP

This Standard defines a DSP structure with several components. These are identified and described below.

2.4.1 Subnetwork Identification

The internal structure of a private domain may have considerable complexity. It may include, for example, several Local Area Networks interconnected by internal gateways, using wide-area facilities. To facilitate operation of the internal gateways, it may be necessary for addresses to identify a particular internal subnetwork within the domain.

Within the length constraint identified in clause 2.3, it is not possible to allocate globally unique subnetwork identification. In any case, the existence of the IDI portion of the address largely serves this function.

The subnetwork identification must however allow sufficient range for any reasonable combination of subnetworks, including the possibility that some amount of dynamic configuration may take place.

The subnetwork identified by the subnetwork identification may, but is not constrained to, coincide with a physical subnetwork.

The subnetwork identification may be null, if the topology of the private domain is such that routing can be done using only the subnetwork address. This may be the case, for example, where the private domain consists of a single LAN.

2.4.2 Subnetwork Address

The subnetwork address provides the way in which a particular point of attachment to the subnetwork may be addressed. To allow for efficient and easily managed use of Local Area Networks, it must be possible for this to be the real address used by the subnetwork.

Alternatively, the subnetwork address component may not, in fact, contain a real subnet address. Synonyms may be used to represent subnetwork points of attachment in some cases, including:

- several SNPAs exist and any one may be used,
- no suitable SNPA exists,
- for some other reasons, a mapping of a logical representation of the subnetwork address to a real subnetwork address is required.

The means by which synonyms are interpreted to find an actual subnetwork address are outside the scope of this Standard.

The length of the subnetwork address depends on the subnetwork. Its maximum length must accommodate ISO 8802 MAC addresses and addresses expressed in decimal abstract syntax, such as X.121, X.21 and X.25 addresses. Therefore this Standard allows a maximum length of 6 octets or 15 decimal digits.

The subnetwork address may be absent in the case of an end-system the subnetwork point of attachment of which is completely identified by the IDP. In this case, the subnetwork identification would have the null value.

2.4.3 NSAP Selector

This identifies a particular NSAP which can be accessed through the particular subnetwork point of attachment. Its range can be limited since the number of distinct NSAPs required is small.

2.5 Address Encoding

Encodings are specified in Network Layer protocol standards, and preferred encodings are described in ISO 8348/DAD 2. An additional preferred encoding is needed for use with certain protocol sets, such as ECMA/TR 14 protocol set 1, which do not have fields in which an NSAP selector can be carried. Network addresses carried by such protocols shall be defined as having a selector field value of zero. NSAPs with addresses with a non-zero selector field value cannot be reached by such protocols.

3. ADDRESS SYNTAX

This clause describes the abstract syntax to be used for an NSAP address, when conforming to this Standard. Two address formats are defined, a binary address format and a decimal address format. The format being used in any particular case is determined by the AFI value.

3.1 Description of Binary Syntax

This format uses the binary abstract syntax described in ISO 8348/DAD 2.

The length of the DSP defined by this Standard shall be between 3 and 9 octets.

The length of the subnetwork identification is fixed at two octets (16 bits). The identification with both octets set to (00) is reserved as a null value to indicate that the subnetwork is not explicitly identified. The identification with both octets set to (FF) is reserved to indicate that the remainder of the DSP is in a private format not constrained by this Standard. Otherwise the assignment of subnetwork identifications is under the control of the administering authority for the private domain.

The length of the subnetwork address may be up to six octets, and is determined by the DSP length minus three octets. For subnetworks using ISO 8802 MAC addressing, this field consists of the octets of the MAC address in the same order as they are defined in ISO 8802.

The NSAP selector field occupies a single octet, binary encoded. The permissible selector values are limited to the range 0 - 127 (decimal). A value of the selector field greater than 127 is defined to indicate that the associated subnetwork address is to be treated as a synonym. The actual selector value will then be the value of the selector field minus 128.

The DSP format is shown in the following figure:

subnet-id 2 octets	subnet-adr 0 - 6 octets	selector 1 octet

Figure 2: Binary syntax DSP format

3.2 Description of Decimal Syntax

This format uses the decimal abstract syntax described in ISO/DAD 2.

The length of the DSP defined by this Standard shall be between 8 and 23 decimal digits.

The length of the subnetwork identification is fixed at 5 decimal digits. The identification with a value of 00000 is reserved as a null value to indicate that the subnetwork is not explicitly identified. The identification with a value of 99999 is reserved to indicate that the remainder of the DSP is in a private format not constrained by this Standard. Other values of this field greater than 65534 are not permitted. Otherwise the assignment of subnetwork identifications is under the control of the administering authority for the private domain.

The length of the subnetwork address may be up to fifteen decimal digits, and is determined by the DSP length minus eight decimal digits.

The NSAP selector field occupies three decimal digits. The permissible selector values are limited to the range 0 - 127 (decimal). A value of the selector field greater than 127 is defined to indicate that the associated subnetwork address is to be treated as a synonym. The actual selector value will then be the value of the selector field minus 128. Values of the field greater than 255 are not permitted.

The DSP format is shown in the following figure:

subnet-id 5 digits	subnet-adr 0 - 15 digits	selector 3 digits

Figure 3: Decimal syntax DSP format

4. EXAMPLES OF APPLICATION

Two specific examples of particular configurations illustrate how this Standard may be applied.

4.1 A cluster of Private Networks Attached to a Public Network

When a private domain consists of a cluster of networks attached to a public network, the addresses in the private domain may consist of the IDP corresponding to a point of at-

tachment to the public network, followed by a DSP allocated according to the syntax described in this Standard.

The address thus formed is globally unique and is valid for use anywhere within the global OSI network, although communication may not in fact be possible between a given pair of NSAPs due to connectivity restrictions.

4.2 A Private Network

A private network may be completely self-contained, that is, it may not have any access to or from the global OSI network. In this case, there may be no IDI appropriate to the network, nor is there any reason why one should be needed. Therefore, the "local" AFI may be used, with value 49 corresponding to a binary abstract syntax for the DSP, or value 48 corresponding to a decimal abstract syntax.

Examples of such private networks include:

i) A collection of private subnetworks not attached to any public network.

ii) A collection of private subnetworks, using public network facilities for their interconnection but not permitting communication other between the interworking units of the private network.