X3S3.3/91-337

From: Paul F. Tsuchiya, Bellcore

To: X3S3.3

Topic: Comments on proposed DAM 1 to ISO 9542 to add area address administration

1.0 Proposed Modifications to X3S3.3/91-261

At the Boulder 1991 meeting of X3S3.3, the need for automatic area address administration was discussed. It was decided that automatic area address administration is a desirable feature, and that it is best standardized by including it in the existing proposed DAM 1 to ISO 9542. This contribution proposes changes to X3S3.3/91-261, "Text of ISO 9542:1988/PDAM1".

1.1 Overview

Of those ESs that participate in address administration, there are two types; 1) those that have an ID field pre-configured (for instance, by looking at their system ID or MAC address), and 2) those that do not.

Those that do not use address administration procedures similar to those in the current 91-261. That is, they send a Request Address to an IS, and get back addresses. However, they get back addresses in a different form than what the current 91-261 specifies. They do not get back a fully composed NET. Instead, they get an ID (called End System IDs, or ESIDs in this proposal) and one or more Area Addresses (called End System Group Identifiers, or GIDs, in this proposal). From this, they compose one or more NETs by concatenating the ID with the Area Addresses. Like the current 91-261, the learned IDs have a time-out on them.

Once an ES learns its ID (or IDs) via the Request Address/Assign Address exchange, they operate similarly to those ESs that have their ID pre-configured. That is, they listen for List GID (LGID) PDUs. The LGID PDU is sent out by ISs at the same time that the ISH is sent out (and to the same SNPA address). The LGID PDU lists the IS's current set of Area Addresses. This is the union of the Manual Area Addresses of the IS, and the Area Addresses advertized by other ISs in its Area. When an ES receives an LGID PDU that lists a different set of Area Addresses from the previous LGID, it modifies its set of NETs

In theory, an ES does not need to form NETs out of all of the Area Addresses advertized, and different ESs can choose different Area Addresses from which to form NETs. IS-IS routers (except perhaps the last hop router) will route 8473 PDUs to ESs whether or not the ES has formed an NSAP address out of the Area Address in the 8473 PDU (assuming that the Area Address in the NSAP is a valid one for the area). And, if used, directory service will return only those NSAP addresses being used by and ES.

This being said, it is useful for all ESs to agree on at least one common Area Address from which to form NETs. This might be a GID formed from an NSAP Address prefix that was NOT derived

from any backbone network, and is therefore a permanent prefix for the routing domain. To facilitate this, ESs must at least form a NET from the first Area Address listed by the IS. ISs can be configured to list a particular Area Address first.

2.0 Proposed Modifications to X3S3.3/91-261

2.1 Introduction

No changes are required to the introduction.

2.2 Section 2. (Motivation for Address Administration)

Add the following before the first paragraph:

> The administration of ES addresses is a substantial administrative task. This task can be partitioned into two parts:
>
> 1. Administration of the Network Entity Title (NET, which includes both the ID and Area Address portions of the NSAP address) to individual ESs.
> 2. Administration of the Area Address portion of the NSAP address to all ESs in an area.

Modify the first sentence of the first paragraph as follows:

> The first part, administration of individual ES NETs, is a desirable feature for allowing users, to the greatest extent possible, to uncrate a new computer system, plug it in, and start using it without having to configure it manually.

Add the word “especially” before “true” in the second sentence of the first paragraph.

Add the following paragraph after the first paragraph:

> The second part, administration of Area Addresses (called End System Group Identifiers, or GIDs) to all ESs in an area, is a desirable feature for the situation where an area undergoes changes in its set of Area Addresses. An Area Address may be added or deleted for any number of reasons. For instance, changes in the topology within a routing domain may require the splitting or merging of areas. Or, an area address may have topological significance outside of the routing domain, for instance because an NSAP address prefix has been assigned by an adjacent backbone routing domain.

Change the last paragraph to the following:

With address administration, on the other hand, the NSAP address assignment task of a network administrator is greatly eased (although by no means eliminated). The network administrator does not need to administer the NSAP addresses of any ESs that do no appear in directory services. And, the network administrator does not need to administer ESs that are capable of automatically updating their own directory service entries, except perhaps to give them an initial unique End System ID (ESID) field.

2.3 Section 3 (Specification of Address Administration)

Change "Four" in the first sentence to "Six".

Change "*record address* by End Systems" to "*record ESID* by End Systems"

Add the following to the list of functions in the first sentence:

list area addresses by Intermediate Systems; and *record area address* by End Systems.

Change "Two" in the second sentence to "Three".

Add the following to the list of new PDUs in the second sentence:

and the *list area addresses* (LGID) PDU.

2.4 Section 3.1

Change "request a temporary assignment of a" to "learn its set of".

Change "Title" to "Title(s)"

2.5 New Definitions

In the first sentence of 3.5, change "definition" to "definitions".

Add the following definitions:

3.5.2 **End System Group Identifier (GID)**: The part of the Network Entity Title that identifies a group of ESs (see clause 5.2).

3.5.2 **End System Identifier (ESID)**: The part of the Network Entity Title that identifies an ES within the group of ESs identified by the GID (see clause 5.2).

2.6 Section 3.2

Change “4.1” in the first sentence to “4.2”.

Add the following abbreviation to the list:

LGID PDU”	List GIDs Protocol Data Unit

2.7 Section 3.3

Add the following parameters to the list:

PNPL	Preferred NSAP Prefix Length
PNP	Preferred NSAP Prefix

2.8 New Symbols and Abbreviations

Add the following to section 4.5:

ESID	End System Identifier

2.9 Section 3.4

Change “a temporary Network Entity Title” to “Network Entity Titles”.

2.10 New Text

Add the following after the first paragraph of 5.2:

> For the purposes of address administration, this International Standard partitions an NET into two parts: the End System Group Identifier (GID) and the End System Identifier (ESID). Use of this partitioning is optional. The GID is the part of the Network Entity Title that identifies a group of ESs. This part is the most significant part of the Network Entity Title. The ESID is the part of the Network Entity Title that identifies an ES within the group of ESs identified by the GID. The ESID is contiguous with the GID. In the case where ISO 10589 is being used as

the intra-domain routing protcol, the GID is identical to the Area Address of ISO 10589, and the ESID is identical to the ID of ISO 10589.

2.11 Section 3.5

Make “Network Entity Title” plural in the first sentence (and capitalize “title”).

Change “or even permitted” to “or, in the case of ESs that learn the ESID part of their Network Entity Title from the AA PDU, even permitted”.

2.12 Section 3.7

2.12.1 New Subsection 6.4 (List GIDs Function)

Add the following new function before the Request Address Function (6.4), and renumber the subsequent functions accordingly:

6.4 List GIDs Function

The List GIDs Function is used by ISs to inform ESs of the current list of GIDs employed by the IS. This function is invoked every time the IS invokes the Report Configuration Function. This function is also invoked every time there is a change in the set of GIDs of the IS.

NOTE — When ISO 10589 is being used as the intra-domain routing protocol, the set of GIDs is equal to the union of the IS’s own Manual Area Addresses and those advertised by other ISs in its area.

An IS Network entity constructs and transmits a List GIDs (LGID) PDU over each of its SNPAs. All of the GIDs advertized by the IS must be included in each LGID PDU. If the most significant PNPL semi-octets of one of the advertized GIDs matches the Preferred NSAP Prefix (PNP), then one of the matching GIDs must be listed as the first GID in the LGID PDU.

NOTE — It is expected that many Routing Domains will assign NSAP addresses from an NSAP address prefix (the preferred NSAP prefix) that is not influenced by NSAP address conventions outside of the routing domains (for instance, an NSAP address prefix assigned by a transit Routing Domain for scaling purposes). The preferred NSAP prefix constitutes a stable source of NSAP addresses, that cannot be changed because of influences outside of the Routing Domain, and can therefore in many cases be statically configured into systems (for instance, directory service). By listing this prefix first, ESs that cannot use all of the GIDs listed by the IS can at least use the preferred one.

2.12.2 Subsection 6.5 (formerly 6.4, Request Address Function)

Change the first two sentences of the first paragraph up to the word "initiates" to the following:

> End Systems may be configured with 1) all of their Network Entity Titles, 2) their ESID only, or 3) neither their ESID nor their GIDs. An ES that has been configured with neither its ESID or its GIDs initiates.....

2.12.3 Subsection 6.6 (formerly 6.5, Assign Address Function in the IS)

Change "Network Entity Title" in the first sentence to "set of Network Entity Titles".

Add the following sentence after the first sentence:

> The IS determines the Network Entity Titles by first determining the ESID part of the Network Entity Title, and then concatenating that with each of the IS's GIDs.
>
> > NOTE — When ISO 10589 is being used as the intra-domain routing protocol, the set of GIDs is equal to the union of the IS's own Manual Area Addresses and those advertised by other ISs in its area.

In paragraph 4, change the first sentence to:

> The intermediate system constructs an assign address (AA) PDU, placing the newly determined ESID and GIDs in the appropriate fields, and including an address holding time (AHT), which represents the amount of time that the End System may continue to use the ESID.

In paragraph 4, add the following sentence after the first sentence:

> The ESID combined with each GID creates a NET.

In the last two paragraphs (paragraphs 5 and 6), make all singular instances of "NET" plural.

2.12.4 Subsection 6.7 (formerly 6.6, Record Address Function in the ES)

Change the title to "Record ESID Function in the ES"

In the first sentence of the first paragraph, change "Network Entity Title" to "ESID" each time it appears.

Change the second and third sentences to:

> In the case where an ES receives multiple ESIDs from multiple ISs, the ES may choose to record zero, one, or more of the ESIDs. The ES must record the NET of the IS from which

each ESID was received for the purposes of 1) flushing the ESID if the IS becomes unreachable, and 2) determining which List GID PDUs to associate with which ESIDs. It starts an address holding timer (see clause 6.9) for each AA PDU from which it recorded an ESID, using the address holding time contained in the AA PDU.

Change the fourth sentence of the first paragraph ("The assigned....") to:

The assigned ESID may be used by the record area address function to form NSAP addresses. The record area address function immediately follows the record ESID function.

Delete the last sentence (and Note) from the first paragraph (it is used instead in the text of the record area address function).

2.12.5 New Subsection 6.8 (Record GID Function in the ES)

Add the following subsection:

6.8 Record GID Function in the ES

An ES executes the Record GID Function both a) after execution of the Record ESID Function, and b) upon receipt of an LGID PDU. In either case, the ES must determine which ESID the received set of GIDs is associated with. In the first case (case a), the set of GIDs comes from the AA PDU, and is associated with the ESID in the AA PDU. In the second case (case b), there are three possibilities:

1. The ES has zero ESIDs.
2. The ES has one ESID, which was not learned from any IS. Rather, it was manually configured. This ESID must be unique among the ESIDs of all ES Groups (areas in ISO 10589) that the ES belongs to. (A convenient way to insure this uniqueness is to use an IEEE 802 MAC address for all ESIDs.)
3. The ES has one or more ESIDs, each of which was learned from an IS via an AA PDU.

In the first case, the LGID PDU is ignored.

In the second case, the ES may safely associate the GIDs in the LGID PDU with its ESID, and form NETs from the concatenation of each GID with the ESID.

In the third case, the ES must match the NET of the IS that sent the LGID PDU with the NET of the ISs from which each ESID was learned. If there is no match, then the LGID PDU is ignored. If there is a match, then the ES may form NETs from the concatenation of the GIDs in the LGID PDU and the matching ESID.

A NET is formed from by concatenating a GID and an ESID where the GID occupies the most significant octets of the NET, the ESID occupies the next most significant octets of the NET, and an octet of value 0 occupies the least most significant octet. An ES may derive multiple NSAP addresses from any NET by using the code points provided by the 0 in the last octet [Note: The method of derivation is not specified in this standard.]

Any NETs formed by the ES (or the NSAP addresses formed from the NETs) may subsequently be advertised in any of the ES's ESH PDUs. However, the ES may wish to advertise the NETs only over the SNPA from which the corresponding LGID PDU was received.

The ES must form a NET from the first GID listed in the LGID PDU. It is up to the discretion of the ES which of the other GIDs are used to form NETs. In the absence of any explicit information on this matter, the ES should form as many NETs as it can in the order in which they are listed in the LGID PDU.

2.12.6 Subsection 6.9 (Formally 6.7, Flush Address Function)

Change both instances of "Network Entity Title" in the first sentence to "ESID".

In the second sentence, change the end of the sentence from the word "discard" on to:

discard the ESID and all derived Network Entity Titles and NSAP addresses.

In the third sentence of the Note, change "Network Entity Title" to "set of Network Entity Titles".

In the third sentence of the Note, change "one" to "ones".

In the first sentence of the last paragraph, change the end of the sentence from the word "discard" on to:

discard the ESID and derived Network Entity Titles and NSAP addresses.

2.13 Section 3.8

Add an additional code point:

LGID PDU - bits 00101

2.14 Section 3.10

Change the addition to:

"the AA PDU carries a set of End System NETs (in the form of an ESID and a set of GIDs); the LGID carries a set of GIDs;"

2.15 Section 3.11

Change the text in the body of 7.3.5 to:

> The NET parameter is the set of NETs that is being provided to the End System in response to the Request Address PDU. It is present only in the AA PDU, and is encoded as shown in Figure 5.

2.16 Section 3.12

Change the entire text of 3.12 to the following:

> Add the following new figure after Figure 4, and renumber the subsequent figures accordingly:

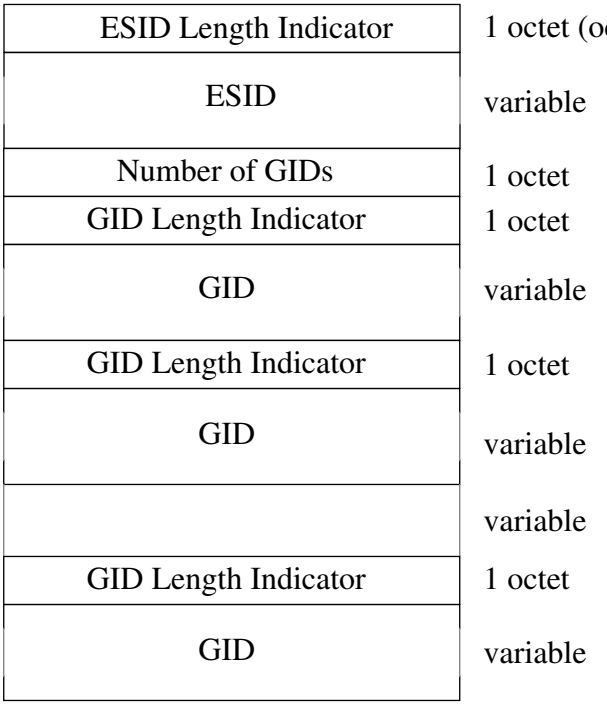

Figure 5 - AA PDU —NET Parameter

2.17 New Section

Add a new section after 3.12 and renumber the remaining sections accordingly:

Add the following clause immediately after the last clause in 7.3 (Subnetwork Address Parameter for RD PDU):

7.3.8 GID Parameter for LGID PDU

The GID Parameter is present only in the LGID and AA PDUs. It is used to convey the current set of GIDs to End Systems that already have an ESID so that those End Systems may form new NETs. The GID Parameter is encoded as shown in Figure 8.

Add the following figure after the new clause, and renumber the subsequent figures accordingly:

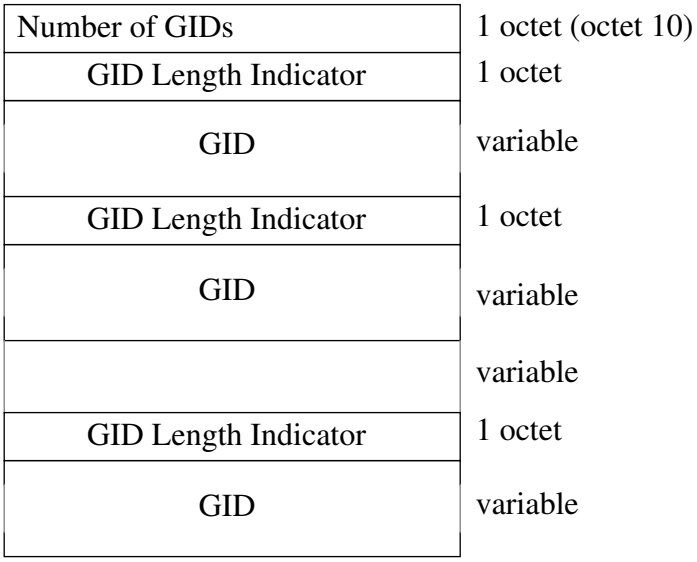

Figure 8 - LGID and AA PDUs —GID Parameter

2.18 Sections 3.13 through 3.16

Add “LGID” to the list of PDU types.

2.19 Section 3.18

Change Figure 14 to the following:

Network Layer Protocol Identifier				1
Length Indicator				2
Version/Protocol ID Extension				3
Reserved (must be zero)				4
0	0	0	Type	5
Address Holding Time (AHT)				6,7
Checksum				8,9
ESID Length Indicator				1 octet (octet 10)
ESID				variable
Number of GIDs				1 octet
GID Length Indicator				1 octet
GID				variable
GID Length Indicator				1 octet
GID				variable
				variable
GID Length Indicator				1 octet
GID				variable

Figure 16 - AA PDU

2.20 New Section

Add the following new section after 3.18:

7.10 List GIDs (LGID) PDU

The LGID PDU has the following format:

Network Layer Protocol Identifier					1
Length Indicator					2
Version/Protocol ID Extension					3
Reserved (must be zero)					4
0	0	0	Type		5
Address Holding Time (AHT)					6,7
Checksum					8,9
Number of GIDs					1 octet (octet 10)
GID Length Indicator					1 octet
GID					variable
GID Length Indicator					1 octet
GID					variable
					variable
GID Length Indicator					1 octet
GID					variable

Figure 17 - LGID PDU

2.21 Section 3.19

Change the table as follows:

List GIDs	new 6.4	—	—	—	O	O
Request Address	new 6.5	O	O	O	—	—
Assign Address	new 6.6	—	—	—	O	O
Record ESID	new 6.7	O	O	O	—	—
Record GID	new 6.8	O	O	O	—	—

2.22 Section 3.19 through 3.27

Add the appropriate new entries.