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Information processing systems — Telecommunications and information exchange between systems — End system to Intermediate system routeing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)

AMENDMENT 1: Addition of group composition information

Systèmes de traitement de l'information — Téléinformatique — Protocole de routage d'un système d'extrémité à un système intermédiaire à utiliser conjointement avec le protocole fournissant le service de réseau en mode sans connexion (ISO 8473)

AMENDEMENT 1: Addition d'information de composition de groupe

Reference number
ISO 9542:1988/Amd.1:1999(E)

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 1 to ISO 9542:1988 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Information processing systems — Telecommunications and information exchange between systems — End system to Intermediate system routeing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)

AMENDMENT 1: Addition of group composition information

Add the following new annex D.

Annex D

(normative)

Group composition information

Introduction

This annex adds optional functionality relating to the exchange of information about group membership, in support of known-group multicast transfer. The entire ES - IS protocol is contained in ISO 9542:1988. There are two modes defined for exchange of this group composition information. In one mode, the extended mode, End systems are informed about all existing address groups and their members. This information is necessary to implement a known-group multicasting on End systems. Since the distribution of this group information for larger groups means a not negligible usage of network bandwidth, the main field of application of this mode will be smaller networks with demands on a known-group multicasting facility. In the second mode, the basic mode, an End system has neither the information about any existing groups nor about their composition. End systems have only the possibility to join or leave existing address groups. Since this mode enforces a minimum amount of group information to be exchanged between End systems and Intermediate systems, it is also suitable for large networks.

ISO 9542:1988 provides the capability to support the routing of non-multicast NPDUs; however, it does not directly support the exchange of multicast NPDUs. The capabilities required to support End Systems sourcing or sinking multicast NPDUs include the means for Intermediate Systems to find which multicast NPDUs are needed on which subnetworks.

This annex defines the optional additional functionality to the ES-IS Routing Protocol (ISO 9542:1988) which supports the transfer of multicast NPDUs. It is an explicit goal of this Amendment that ESs and ISs, some of which will have known-group multicast capabilities and some without, will be able to fully function on the same networks. This annex does not change any aspect of a currently defined (i.e. non-multicast) ISO 9542:1988 implementation; it adds new optional functionality without modifying current functionality.

Note: The rationale for this annex is based on the following considerations:

- The information exchanged between systems has also a security aspect. In the case of unicast information exchange both originator and recipient are identified by their NSAP address. This information can be used as one element for the identification of the communication partners (e.g. the NLSP uses this information for address mapping). In the case of a multicast recipient address with information hiding about group members (basic case in the following description) an originator is not able to determine concrete members within a group address. In the case of the requirement of efficient resource usage the security requirements may then be in contrast to the usage of multicast addresses.
- In the case of mobile users within a network members may change from one subnetwork to another. Therefore multicast addressing shall be supported not only within one subnetwork (as proposed in ISO 9542:1988/DAM2) but within the whole domain as defined in ISO 10589.
- In contrast to ISO 9542/1988:DAM2, no more timers are further supported in this amendment. The reason for this is that the necessary information exchange shall be based on an event driven basis (initialised on an attribute value change basis) and not on a periodical basis. This fact is for further definition. If required, timers as within ISO 9542/1988:DAM2 can be added without changing the remaining part of this amendment.

D.1 Scope

This annex specifies

a) procedures for transmission of multicast announcement, multicast address mapping and group composition information between Network entities residing in End Systems and Network entities residing in Intermediate Systems;

b) the encoding of the protocol data units used for multicast announcement, multicast address mapping and group composition information.

D.2 References

ISO/IEC10589:1992/Amd.2:1999(E) Information processing systems - Telecommunications and information exchange between systems - Intermediate system to Intermediate system intra-domain routing information exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473) - Annex G: Extensions for group composition and related MST multicast routing.

D.3 Definitions

For the purposes of this annex, the following definition applies.

Associated set of NSAP Addresses: The set of NSAP addresses associated with a particular group Network address on a specific network.

D.4 Abbreviations

ESGC PDU	End System Group Composition Protocol Data Unit
ISGC PDU	Intermediate System Group Composition Protocol Data Unit
GNAL	Group Network Address Length Indicator
GNA	Group Network Address
SNAL	Set of NSAP Addresses Length Indicator
PNA	Paired NSAP Address
ALI	Address Length Indicator
AFI	Authority and Format Indicator

D.5 Overview of the protocol

D.5.1 Information provided by the Protocol

This Annex provides three types of information to Network entities which support its operation:

a) multicast announcement information

b) multicast address mapping information, and

c) group composition information

An IS should forward a multicast NPDU containing a particular destination group Network address onto a subnetwork to which it is attached if and only if one or more of the systems attached to that subnetwork are members of this group and have declared an interest in receiving multicast PDUs destined for that group network address or if one or more of the ISs attached to that subnetwork can be used for addressing additional group members. The distribution of group composition information, that is group creation, modification and deletion information, enables an IS that supports known-group multicast to dynamically discover, for each subnetwork to which it is attached, the group Network addresses and its members for which systems attached to that subnetwork have declared an interest.

There are two modes of the distribution of group composition information:

- Basic mode: In this mode a system (IS or ES) has only the possibilities to join an existing group, or to leave it. For this features only the group Network address and the NSAP of the joining or leaving system has to be exchanged.
- Extended mode: In this mode a system has the more expanded possibilities to create a new group, to completely modify an existing group, or to delete an existing group. Using one of this features, always the whole new group composition has to be exchanged.

For reasons of interoperability between ISs and ESs supporting known-group multicast it is provided, that each system on the same subnetwork deciding to support known-group multicast applies the same mode of distributing group composition information as specified in this amendment.

In order to receive multicast PDUs destined for a particular group Network address, a system may be able to take advantage of an association of the group Network address with a set of NSAP addresses. Running the extended mode group composition information also enables an IS to inform ESs that they can receive multicast PDUs destined for a particular group Network address associated to a set of NSAP addresses. Running the basic mode ESs are not informed about existing groups and their compositions by the means of this amendment.

D.5.2 Addressing

The **group Network addresses** referred to in this amendment are OSI Network Service Access Point Addresses. To distinguish them from unicast Network Service Access Point Addresses at least one digit of their AFI has to be set to a hexadecimal value in the range from A to F. For details see ISO/IEC 8348.

D.5.3 Group composition information on different Subnetwork Types

D.5.3.1 Point-to-point subnetworks

In the basic mode on a point-to-point subnetwork the group composition information informs a known-group multicast capable IS attached to that subnetwork, that an ES wants to join an existing group, or that it wants to leave an existing group.

In the extended mode on a point-to-point subnetwork the group composition information can be used by a system, to inform its peer system about the creation of a new group or the modification or the deletion of an existing group.

D.5.3.2 Broadcast subnetworks

In the basic mode on a broadcast subnetwork the group composition information informs all known-group multicast capable ISs attached to that subnetwork, that any ES attached to that subnetwork wants to join an existing group, or that it wants to leave an existing group.

In the extended mode on a broadcast subnetwork the group composition information can be used by any ES attached to that subnetwork to inform all known-group multicast capable ISs attached to the same subnetwork about the creation of a new group or the modification or the deletion of an existing group. Vice versa the group composition information can also be used by any IS attached to that subnetwork to inform all ESs attached to the same subnetwork about the creation of a new group or the modification or the deletion of an existing group.

D.5.3.3 General topology subnetworks

In the basic mode on a general topology subnetwork the group composition information informs all known-group multicast capable ISs attached to that subnetwork, that any ES attached to that subnetwork wants to join an existing group, or that it wants to leave an existing group.

In the extended mode on a general topology subnetwork the group composition information can be used by any ES attached to that subnetwork to inform all known-group multicast capable ISs attached to the same subnetwork about the creation of a new group or the modification or the deletion of an existing group. Vice versa the group composition information also can be used by any IS attached to that subnetwork to inform all ESs attached to the same subnetwork about the creation of a new group or the modification or the deletion of an existing group.

D.6 Protocol functions

D.6.1 Create Address Group function

This function is executed from known-group multicast capable Intermediate Systems and End Systems supporting the extended mode. If a system is informed about the new generation of an address group, it distributes this information by means of this amendment over its connected subnetworks.

D.6.1.1 Create Address Group function by End Systems

The only two ways an End System can be informed about a newly generated group are by means of the Systems Management or the receipt of an ISGC PDU. Doing so an ESGC PDU is constructed for conveying this group composition information. If the contents of the group don't fit in a single ESGC PDU, it has to be distributed over more PDUs. In the first case each ESGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ESGC PDU

SN_Destination_Address _ multi-destination address that indicates "All Intermediate System Network Entities"

In the second case, that is the information about the new group has been obtained from an ISGC PDU, an ESGC PDU is sent back for acknowledgement only to the Intermediate System generating the received ISGC PDU.

The Group Information Part carries the group Network address of the newly generated group and the NSAP address of each member of this group.

D.6.1.2 Create Address Group Function by Intermediate Systems

An Intermediate System can be informed about a newly generated group by the means of the Systems Management or by the receipt of an ESGC PDU or an ISO 10589 Group State PDU containing a new group Network address. In this case an ISGC PDU is constructed for conveying this group composition information. If the contents of the group don't fit in a single ISGC PDU, it has to be distributed over more PDUs. Each ISGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ISGC PDU

SN_Destination_Address _ multi-destination address that indicates "All End System Network Entities"

If this flooding of an ISGC PDU was initiated by the receipt of an ESGC PDU, the End System, which has generated this PDU, also receives a copy from the flooded ISGC PDU. This copy is used as a kind of acknowledgement at the End System.

The Group Information Part carries the group Network address of the newly generated group and the NSAP address of each member of this group.

D.6.2 Modify Address Group function

This function is executed from known-group multicast capable Intermediate Systems and End Systems supporting the extended mode. If a system is informed about the modification of an already stored address group, it distributes this information by means of this amendment over its connected subnetworks. A modification of an existing group is detected, if the Sequence Number of the stored group version is lower than the Sequence Number of newly received group version and the group isn't empty.

D.6.2.1 Modify Address Group function by End Systems

The only two ways an End System can be informed about the modification of an already stored group are by means of the Systems Management or the receipt of an ISGC PDU. Doing so an ESGC PDU is constructed for conveying the modified group composition information. If the contents of the group don't fit in a single ESGC PDU, it has to be distributed over more PDUs. In the first case each ESGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ESGC PDU

SN_Destination_Address _ multi-destination address that indicates “All End System Network Entities”

SN_Destination_Address _ multi-destination address that indicates “All Intermediate System Network Entities”

In the second case, that is the information about the group modification has been obtained from an ISGC PDU, an ESGC PDU is sent back for acknowledgement only to the Intermediate System generating the received ISGC PDU.

The Group Information Part carries the group Network address of the modified group and the NSAP address of each member of this group.

D.6.2.2 Modify Address Group function by Intermediate Systems

An Intermediate System can be informed about the modification of an already stored group by the means of the Systems Management or by the receipt of an ESGC PDU or an ISO 10589 Group State PDU containing a new group composition. In this case an ISGC is constructed for conveying the modified group composition information. If the contents of the group don’t fit in a single ISGC PDU, it has to be distributed over more PDUs. Each ISGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ISGC PDU

SN_Destination_Address _ multi-destination address that indicates “All End System Network Entities”

If this flooding of an ISGC PDU was initiated by the receipt of an ESGC PDU, the End System, which has generated this PDU, also receives a copy of the flooded ISGC PDU. This copy is used as a kind of acknowledgement at the End System.

The Group Information Part carries the group Network address of the modified group and the NSAP address of each member of this group.

D.6.3 Delete Address Group function

This function is executed from known-group multicast capable Intermediate Systems and End Systems supporting the extended mode. If a system is informed about the deletion of an already stored address group, it distributes this information by means of this amendment over its connected subnetworks. A deletion of an existing group is detected, if the Sequence Number of the stored group version is lower than the Sequence Number of the newly received group version, and the new group version doesn’t contain any members.

D.6.3.1 Delete Address Group function by End Systems

The only two ways an End System can be informed about the deletion of an already stored group are by means of the Systems Management or the receipt of an ISGC PDU. Doing so an ESGC PDU is constructed for conveying the information about the deleted group. Since there are no group members present, this information will always fit in a single ESGC. In the first case the ESGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ESGC PDU

SN_Destination_Address _ multi-destination address that indicates “All Intermediate System Network Entities”

In the second case, that is the information about the deletion of a group has been obtained from an ISGC PDU, an ESGC PDU is sent back for acknowledgement only to the Intermediate System generating the received ISGC PDU.

The Group Information Part carries only the group Network address of the deleted group.

D.6.3.2 Delete Address Group function by Intermediate Systems

An Intermediate System can be informed about the deletion of an already stored group by the means of the management or by the receipt of an ESGC PDU or an ISO 10589 Group State PDU containing a group to be deleted. In this case an ISGC PDU is constructed for conveying the information about the deleted group. Since there are no group members present, this information will always fit in a single ISGC PDU. The ISGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ISGC PDU

SN_Destination_Address _ multi-destination address that indicates “All End System Network Entities”

If this flooding of an ISGC PDU was initiated by the receipt of an ESGC PDU, the End System, which has generated this PDU, also receives a copy from the flooded ISGC PDU. This copy is used as a kind of acknowledgement at the End System.

The Group Information Part carries only the group Network address of the deleted group.

D.6.4 Join Address Group function

This function is executed only from known-group multicast capable End Systems supporting the basic mode. It has been introduced as a possibility to change group compositions without transmitting the information about all members.

If an End System is informed by means of the Systems Management, that it shall join an already existing group, this information is distributed within an ESGC PDU. The way in which an End System gets the information about existing address groups it can join is not specified in this amendment. The ESGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ESGC PDU

SN_Destination_Address _ multi-destination address that indicates “All Intermediate System Network Entities”

The Group Information Part carries only the group Network address of the group the End System wants to join and the NSAP address of the End System itself. Since an End System running the extended mode isn’t informed by means of this amendment about the composition of a particular address group, the parameters Sequence Number, Paired Set of NSAP Addresses Length Indicator and Number of Group Address Pairs are not used here and set to 0.

D.6.5 Leave Address Group function

This function is executed only from known-group multicast capable End Systems supporting the basic mode. It has been introduced as a possibility to change group compositions without transmitting the information about all members.

If an End system is informed by means of the Systems Management, that it shall leave an existing group, this information is distributed within an ESGC PDU. The way in which an End System gets the information about the address groups, whose member it is, is not specified in this amendment. The ESGC PDU is transmitted by issuing an SN-UNITDATA.Request with the following parameters:

SN_Userdata (SNSDU) _ ESGC PDU

SN_Destination_Address _ multi-destination address that indicates “All Intermediate System Network Entities”

The Group Information Part carries only the group Network address of the group the End System wants to leave and the NSAP address of the End System itself. Since an End System running the extended mode isn’t informed by means of this amendment about the composition of a particular address group, the parameters Sequence Number, Paired Set of NSAP Addresses Length Indicator and Number of Group Address Pairs are set to 0.

D.6.6 Record End System Group Composition Information Function

The Record End System Group Composition Information function is executed only from known-group multicast capable Intermediate Systems. It receives the group composition information, which is distributed from End Systems within ESGC PDUs, and updates the information in the routing information data base.

The receiving Intermediate System is not required to process any option fields in a received ESGC PDU.

Note: -- When an Intermediate System chooses to process any option fields, the precise actions are not specified by this International Standard.

An ESGC PDU is only processed by an Intermediate System, if this PDU was generated from an End System supporting the same mode as the Intermediate System. This condition holds in the following two cases:

- The Intermediate System supports the basic mode, and the received ESGC PDU contains information about a single End System joining or leaving an address group, that is the modification flag of the ESGC PDU is set to 1 or 2.
- The Intermediate System supports the extended mode, and the received ESGC PDU contains information about the creation, the modification or the deletion of an address group, that is the modification flag is set to 0.

If neither of these conditions holds, the ESGC PDU will be discarded without further action.

If the Intermediate System decides to process the ESGC PDU, it checks in the next step, whether the group composition information contained in this PDU is newer than the one stored in the local routing information data base. This applies in the following four cases:

- The ESGC PDU contains information about the creation of a group, which isn't already stored in the local routing information data base.
- The ESGC PDU contains information about the modification or deletion of an already locally stored group, and the Sequence Number of the ESGC PDU is higher than the one stored for this group.
- The ESGC PDU contains information about an End System, which wants to join a locally stored address group. If the End System is already a member of this group, the ESGC PDU isn't further processed.
- The ESGC PDU contains information about an End System, which wants to leave a locally stored address group. If the End System is no member of this group, the ESGC PDU isn't further processed.

If no one of these four conditions holds, the ESGC PDU will be discarded without further action.

Otherwise this new group composition information is locally stored in the routing information data base. If the Intermediate System supports the basic mode, the ESGC PDU is acknowledged by sending an ISGC PDU with the same contents back to the End System, which generated the ESGC PDU. If the Intermediate System supports the extended mode, an ISGC PDU with the same contents is sent to all End Systems on the subnetwork the ESGC PDU was received. In this way also the End System, which has generated the ESGC PDU, receives a copy of the ISGC PDU as acknowledgement.

D.6.7 Record Intermediate System Group Composition Information Function

The Record Intermediate System Group Composition Information function is executed only from known-group multicast capable End Systems. It receives the group composition information, which is distributed from Intermediate Systems within ISGC PDUs, and updates the information in the routing information data base.

The receiving End System is not required to process any option fields in a received ISGC PDU.

Note — When an End System chooses to process any option fields, the precise actions are not specified by this International Standard.

An ISGC PDU is only processed by an End System, if this PDU was generated from an Intermediate System supporting the same mode as the End System. This condition holds in the following two cases:

- The End System supports the basic mode, and the received ISGC PDU contains information about a single End System joining or leaving an address group, that is the modification flag of the ISGC PDU is set to 1 or 2. This ISGC PDU has been sent by the Intermediate System as an acknowledgement for a previous sent ESGC PDU.
- The End System supports the extended mode, and the received ISGC PDU contains information about the creation, the modification or the deletion of an address group, that is the modification flag is set to 0.

If neither of these conditions holds, the ISGC PDU will be discarded without further action.

If the End System decides to process the ISGC PDU, it checks in the next step, if the group composition information contained in this PDU is newer than the one stored in the local routing information data base. This is only possible, if the End System supports the extended mode. In the basic mode ISGC PDUs contain never new group composition information, but an acknowledgement for a previous sent ESGC PDU. Therefore only in the following two cases newer group composition information is received:

- The ISGC PDU contains information about the creation of a group, which isn't already stored in the local routing information data base.
- The ISGC PDU contains information about the modification or deletion of an already locally stored group, and the Sequence Number of the ISGC PDU is higher than the one stored for this group.

If neither of these conditions holds, the ESGC PDU will be discarded without further action.

Otherwise this new group composition information is locally stored in the routing information data base, and has to be acknowledged. This is done by sending an ESGC PDU with the same contents back to the Intermediate System, which has generated the ISGC PDU.

D.7 Structure and Encoding of PDUs

D.7.1 Structure

ISGC and ESGC PDUs contain, in the following order:

a) the Fixed Part; and

b) the Group Information Part.

D.7.2 Fixed Part

D.7.2.1 General

The fixed part of the header of ISGC and ESGC PDUs has the format shown in figure D-1.

	Octet
Network Layer Protocol Identifier	1
Length Indicator	2
Version / Protocol Id Extension	3
reserved (must be zero)	4
0 0 0 Type	5
Sequence Number	6,7
Checksum	8,9

Figure D-1 — Fixed Part of ISGC and ESGC PDU Header

D.7.2.2 Type Code

The Type code field identifies the type of the protocol data unit. The additional values for this field defined in this Annex are given in table D-1.

Table D-1 — Additional PDU Types

	Bits 5 4 3 2 1
ISGC PDU	1 0 1 0 0
ESGC PDU	1 0 1 1 0

D.7.2.3 Sequence Number

The Sequence Number field is present in the fixed part of ISGC and ESGC PDUs at the same position as used for the Holding Time field in the PDUs defined in the main body of this International Standard. It specifies the topicality of a group composition information. If a group is newly created this value shall be set to 1. In each distribution of a group modification information, even if this modification is a deletion of the group, the Sequence Number has to be incremented by 1.

In the basic mode ESs are not informed by means of this annex about existing groups and their composition. Therefore they have no idea about the value of the actual Sequence Number of a particular group. The Sequence Number field is always set to zero in this mode.

D.7.3 Group Information Part

D.7.3.1 General

The Group Information Part contains a group Network address with its associated paired set of NSAP addresses. The group Network address identifies specific multicast NPDUs and the paired set of NSAP addresses is the set of NSAP addresses on which a system expects to receive such multicast NPDUs on the network. The Group Information Part is encoded in ISGC and ESGC PDUs as shown in figure D-2.

	Octet
Paired Set of NSAP Addresses Length Indicator (SNAL)	10, 11
Number of Address Pairs	12, 13
Modification Flag	14
Group Network Address Length Indicator (GNAL)	15
Group Network Address (GNA)	
Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	

Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	m-1

Figure D-2 — ESGC and ISGC PDUs: Group Information Part

D.7.3.2 Paired Set of NSAP Addresses Length Indicator

In the extended mode this parameter is set to the number of octets needed for storing the whole group information, that is the Group Network Address Length Indicator, the Group Network Address and for each member of this group the appropriate Address Length Indicator and its Paired NSAP Address.

In the basic mode the ESs are not informed about the composition of a particular group. Therefore this parameter is set to 0.

D.7.3.3 Number of Address Pairs

In the extended mode this parameter is set to the number of members contained in the group specified in this PDU. If the Group Information Part contains information about the deletion of the group, this parameter is set to zero.

In the basic mode the ESs are not informed about the composition of a particular group. Therefore this parameter is set to 0.

D.7.3.4 Modification Flag

If an IS or an ES decides to support the extended mode, this flag is set to 0 in all ISGC or ESGC PDUs.

If the basic mode applies, the only group information distributed is the events that an ES wants to join or leave an existing group, and the acknowledgements for these events. For the joining event the Modification Flag is set to 1 in the appropriate PDUs, for the leaving of a group it is set to 2.

D.7.3.5 Group Network Address Length Indicator

This parameter contains the length in octets of the Group Network Address in octets.

D.7.3.6 Group Network Address

The Group Network Address is used for the identification of a particular address group. For a closer description of this address see D.5.2.

D.7.3.7 Address Length Indicator

This parameter specifies the length in octets of the Paired NSAP Address of each member of the group contained in the PDU.

D.7.3.8 Paired NSAP Address

This address specifies the NSAP address of a group member.

Since in the extended mode always the whole group composition is distributed, this parameter has to occur one time for each member of the group. If a group shall be deleted, there are no more members left in the group, and therefore this parameter shall not be present in the appropriate PDU.

Supporting the basic mode this parameter occurs only one time for the ES, which wants to join or to leave an existing group.

D.7.4 End System Group Composition (ESGC) PDU

The ESGC PDU has the format shown in figure D-3.

	Octet
Network Layer Protocol Identifier	1
Length Indicator	2
Version / Protocol Id Extension	3
reserved (must be zero)	4
0 | 0 | 0 | Type	5
Sequence Number	6,7
Checksum	8,9
Paired Set of NSAP Addresses Length Indicator (SNAL)	10,11
Number of Group Address Pairs	12,13
Modification Flag	14
Group Network Address Length Indicator (GNAL)	15
Group Network Address (GNA)	
Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	

Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	m-1
Options	m/p-1

Figure D-3 — ESGC PDU Format

D.7.5 Intermediate System Group Composition (ISGC) PDU

The ISGC PDU has the format shown in figure D-4.

	Octet
Network Layer Protocol Identifier	1
Length Indicator	2
Version / Protocol Id Extension	3
reserved (must be zero)	4
0 0 0 Type	5
Sequence Number	6,7
Checksum	8,9
Paired Set of NSAP Addresses Length Indicator (SNAL)	10,11
Number of Group Address Pairs	12,13
Modification Flag	14
Group Network Address Length Indicator (GNAL)	15
Group Network Address (GNA)	
Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	

Address Length Indicator (ALI)	
Paired NSAP Address (PNA)	m-1
Options	m/p-1

Figure D-4 — ISGC PDU Format

D.8 Conformance

If a Network entity is known-group multicast capable, it can support the basic or the extended mode, but it has to be ensured, that each known-group multicast capable system on a particular subnetwork supports the same mode.

An End System implementation that is known-group multicast capable and runs the basic mode shall support group composition information and implement the functions marked as Mandatory (M) in column 4 of table D-2. An End System implementation that is known-group multicast capable and runs the extended mode shall support group composition information and implement the functions marked as Mandatory (M) in column 5 of table D-2.

An Intermediate System implementation that is known-group multicast capable and runs the basic mode shall support group composition information and implement the functions marked as Mandatory (M) in column 6 of table D-2. An Intermediate System implementation that is known-group multicast capable and runs the extended mode shall support group composition information and implement the functions marked as Mandatory (M) in column 7 of table D-2.

Table D-2 — Static conformance requirements for known-group multicast capable Network entities

Label	Function	Defining Clause	ES		IS	
			BM	EM	BM	EM
CrAdGr	Create Address Group	6.14	-	M	-	M
MoAdGr	Modify Address Group	6.15	-	M	-	M
DeAdGr	Delete Address Group	6.16	-	M	-	M
JoAdGr	Join Address Group	6.17	M	-	-	-
LeAdGr	Leave Address Group	6.18	M	-	-	-
ReESGrCoI	Record End System Group Composition Information	6.19	-	-	M	M
ReISGrCoI	Record Intermediate System Group Composition Information	6.20	M	M	-	-
Key:						
	BM = Known-group multicast capable system running the basic mode					
	EM = Known-group multicast capable system running the extended mode					
	M = Mandatory - = not applicable					

Note — No PICS proforma is available for the known-group multicast capabilities provided in this annex.

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Price based on 13 pages