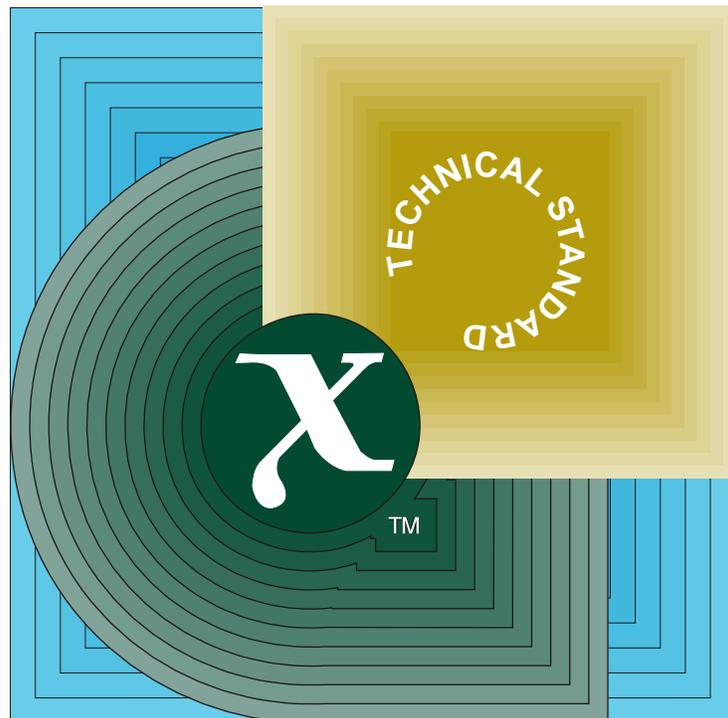


Technical Standard

Multiprotocol Transport Networking (XMPTN): Data Formats



THE *Open* GROUP

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X/Open CAE Specification

Multiprotocol Transport Networking (XMPTN): Data Formats

X/Open Company Ltd.



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X/Open CAE Specification

Multiprotocol Transport Networking (XMPTN): Data Formats

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Preface

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X/Open is an independent, worldwide, open systems organisation supported by most of the world's largest information systems suppliers, user organisations and software companies. Its mission is to bring to users greater value from computing, through the practical implementation of open systems.

X/Open's strategy for achieving this goal is to combine existing and emerging standards into a comprehensive, integrated, high-value and usable open system environment, called the Common Applications Environment (CAE). This environment covers the standards, above the hardware level, that are needed to support open systems. It provides for portability and interoperability of applications, and so protects investment in existing software while enabling additions and enhancements. It also allows users to move between systems with a minimum of retraining.

X/Open defines this CAE in a set of specifications which include an evolving portfolio of application programming interfaces (APIs) which significantly enhance portability of application programs at the source code level, along with definitions of and references to protocols and protocol profiles which significantly enhance the interoperability of applications and systems.

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CAE (Common Applications Environment) specifications are the stable specifications that form the basis for X/Open-branded products. These specifications are intended to be used widely within the industry for product development and procurement purposes.

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Preliminary specifications are analogous to the *trial-use* standards issued by formal standards organisations, and product development teams are encouraged to develop products on the basis of them. However, because of the nature of the technology that a Preliminary specification is addressing, it may be untried in multiple independent implementations, and may therefore change before being published as a CAE specification. There is always the intent to progress to a corresponding CAE specification, but the ability to do so depends on consensus among X/Open members. In all cases, any resulting CAE specification is made as upwards-compatible as possible. However, complete upwards-compatibility from the Preliminary to the CAE specification cannot be guaranteed.

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- *Technical Studies*

X/Open Technical Studies present results of analyses performed by X/Open on subjects of interest in areas relevant to X/Open's Technical Programme. They are intended to communicate the findings to the outside world and, where appropriate, stimulate discussion and actions by other bodies and the industry in general.

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- a new *Issue* does include changes to the definitive information contained in the previous publication of that title (and may also include extensions or additional information). As such, X/Open maintains *both* the previous and new issue as current publications.

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```
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This Document

This document is an X/Open CAE Specification. It defines the XMPTN Data Formats; that is, formats of message and data structures used by XMPTN.

The X/Open Multiprotocol Transport Networking (XMPTN) architecture supports mixed transport protocol networking, enabling application programs that were designed to operate over one transport protocol — such as SNA, NetBIOS, OSI or TCP/IP — to run over other transport networks. With XMPTN, existing applications can still run when the transport protocol for which they were written is exchanged for another one, and applications written for one transport can be introduced into networks which use other transports.

X/Open has published an XMPTN Architecture Guide which explains XMPTN. The associated XMPTN Access Node and XMPTN Address Mapper are defined in separate X/Open specifications. X/Open offers a package of all four XMPTN documents, in Document Set T504.

Audience

This document is intended primarily for use by implementors of the XMPTN Address Mapper functionality who wish to conform to the X/Open XMPTN formats and protocols specification. It will also be of interest to diagnosticians who interpret these formats when analysing line flows, and to others who may wish to learn about the XMPTN architecture from the data formats.

Network designers, network managers or application program vendors who are interested in mixed protocol networking or network interconnection, as addressed by the MPTN architecture, are referred to the X/Open **Multiprotocol Transport Networking (MPTN) Architecture Guide** (see **Referenced Documents** on page xii).

Structure

- Chapter 1 introduces the XMPTN formats.
- Chapter 2 describes the presentation style of the XMPTN formats.
- Chapter 3 describes the XMPTN connection establishment XMPTN formats.
- Chapter 4 on page 21' 1 describes the XMPTN headers.
- Chapter 5 describes the XMPTN connectionless data (Datagram) formats.
- Chapter 6 describes the XMPTN Address Mapper formats.
- Chapter 7 describes the XMPTN Multicast Server formats.
- Chapter 8 describes those XMPTN formats that are common to multiple messages.
- Chapter 9 describes messages, compensation and optional field identifiers that are used in the XMPTN data formats.

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Referenced Documents

The following documents are referenced in this Specification:

XMPTN Access Node

X/Open CAE Specification, Multiprotocol Transport Networking (XMPTN): Access Node (ISBN: 1-85912-106-3, C521).

XMPTN Address Mapper

X/Open CAE Specification, Multiprotocol Transport Networking (MPTN): Address Mapper (ISBN: 1-85912-101-2, C520).

XMPTN Architecture Guide

X/Open Guide, December 1995, Multiprotocol Transport Networking (XMPTN) Architecture (ISBN: 1-85912-116-0, G506).

Analyzing NOVELL Network

Analyzing NOVELL Network, C. Malamud, published by Von Nostrand Reinhold, New York, NY, 1990.

The Multiprotocol Transport Networking (MPTN) architecture supports:

- mixed protocol networking — running application programs that were designed to operate over one transport networking protocol (such as SNA, OSI, or TCP/IP) over additional transport networks
- network interconnection — connecting matching application program partners across transport networks of different types.

MPTN messages are used for:

- non-native connection establishment — this message is referred to as **MPTN_Connect**; it is described in Chapter 3
- coordinated performance of compensations on connections — these messages are referred to as **MPTN headers**; they are described in Chapter 4
- non-native datagram delivery — these messages are referred to as **MPTN_Datagram**, **MPTN_DG_OOB_Data**, **MPTN_DG_KEEPLIVE_Hdr** and **MPTN_Cntrl_Datagram**; they are described in Chapter 5
- address registration and resolution — these messages are referred to as **Address Mapper** commands; they are described in the associated **XMPTN Address Mapper** Specification (see **Referenced Documents** on page xii).

The formats used for MPTN messages all appear within the user data field of the native formats used by the transport provider.

For a complete list of these messages, and the corresponding codes that identify them, refer to Chapter 9.

1.1 Commands and Headers

MPTN formats can be divided into MPTN commands and MPTN headers.

MPTN commands are the more complex formats sent between MPTN components to request or provide a service. Commands can be requests, positive responses, or negative responses. Positive responses indicate that the request was received and acceptable. Negative responses indicate that a request was received but was either unrecognised or unacceptable. Negative responses may contain diagnostic information explaining why the request failed.

MPTN headers are single-byte markers inserted into the data sent on a connection in order to identify the compensation, if any, associated with the record that follows. For example, a record can be marked as termination data or expedited data. On a stream-oriented transport network, the MPTN header is preceded by a 4-byte length field to identify the extent of the record.

1.2 Command Structure

MPTN commands follow the structure shown in Figure 1-1.

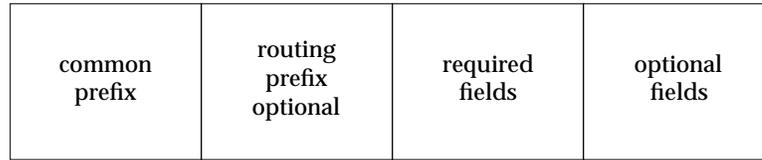


Figure 1-1 MPTN Command Structure

The **common prefix** is a 4-byte field containing information that appears in every command. (The MPTN headers described in Chapter 4 on page 21 are not considered to be “commands”, and do not contain this 4-byte prefix.) It consists of:

- command type
- a 1-byte field that specifies whether the command is a request, positive response or negative response, and what the receiver should do if it fails to recognise the request (fail it, forward it or discard it) — this latter information is referred to as *processing information*; it allows MPTN nodes that do not understand the most recently-defined MPTN messages to participate in MPTN communications with those that do
- command length.

The *routing prefix* is a variable-length field that is included in formats where the receiving MPTN function needs information to identify the destination transport user of the request. The field is not included in some commands because it is not needed. The routing prefix includes the following information:

- source and destination transport-user addresses, in the MPTN address format
- a correlator that can be used to correlate requests and responses.

The *required* fields can be either fixed length or variable length. In either case, the position of the field in the format uniquely identifies the field, so there is no information identifying the field:

- A *fixed-length required field* does not contain information identifying its length.
- A *variable-length required field*, on the other hand, always contains information identifying its length.

Each *optional* field contains a 4-byte prefix describing the field. The prefix includes the following information:

- field identifier
- what the receiver should do if it fails to recognise the field (fail the command or ignore the field) — this is *processing information*, similar to that used in the common prefix field; it allows MPTN nodes that do not understand the most recently-defined optional fields in MPTN messages to interoperate with those that do
- field length (including the length of this optional prefix).

Optional fields can be omitted entirely if not needed in a particular command. The *optional* fields in a command appear in order of ascending field identifier value. Section 9.2 lists all the *optional* field identifiers.

1.3 Length Fields

There are a number of different length fields used in MPTN formats. These length fields are used when variable length fields are included or to preserve the option of future expansion. For the latter reason, a length field may be larger than the formats described in any specific version of this document. Length fields are used:

- on stream-oriented transports
- in the common prefix of an MPTN command
- in optional field prefixes
- on variable length strings.

For messages that flow on a stream-oriented transport network, a length field is added at the beginning of the message. This is referred to as the *record length* field, and it occupies four bytes when used.

A *length* field occurs in the prefix for each command. This length field specifies the length of the entire message from the beginning of the prefix field, up to but not including any user data. A precise specification of what is included in each length field is given in the Field Description sections.

Each *optional* field within a message includes a 4-byte prefix. This prefix contains a length field, where the value represents the length of the entire optional field including the four bytes needed for the prefix.

Some byte strings use only one byte to specify their length. The value in this field includes the one byte used for its own specification. Therefore, an empty string is denoted by having its length field set to X'01'.

1.4 MPTN Address Formats

To support routing, transport addresses must be unique within each protocol. Since transport addresses are simply bit strings, the same transport address may appear in different protocol address spaces. To allow duplicate transport addresses to be used by different protocols, MPTN uses an ordered pair (address type, protocol-specific address) in the MPTN formats. Such an ordered pair is called an **MPTN-qualified transport address**. The address type indicates the format of the protocol-specific address. For example, an OSI transport user with a transport service access point (TSAP) address is known to the MPTN network as (X'07', TSAP), where X'07' is a code defined to mean *this is an OSI address*. Since both the address type and the specific transport addresses in a protocol address space are unique, the MPTN transport address is also unique. (Specific address values are listed in Section 8.3 on page 110).

Any MPTN format that carries transport addresses explicitly carries the associated address types.

Format Specification

This chapter explains the method used in the XMPTN specifications to describe the format of message and data structures.

2.1 Style used in Describing Formats

Each chapter describing Formats follows the same approach to defining its messages. Sections are included for:

- Explanation of the message in general terms. This section is titled **General Description**.
- A table that specifies the fields within the message. This section is titled **Message Format**. The table includes columns for:
 - field name
 - the hex value that identifies this field, if any
 - the size range, in bytes, of this field
 - the number of occurrences of this field in the message.
- **Field Descriptions**. These follow directly after their associated **Message Format** table, and provide more information about each of the fields in the table.

An example of a **Message Format** table and its **Field Descriptions** is shown below.

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
common prefix		4	1
command type	X'80'	1	
processing specification		1	
command length		2	
routing prefix		12 to 1034	1

Table 2-1 Example Message Format Table

Field Name

Description: Description of the field.

Presence Rule: Optional. Used for all optionally present fields to identify the specific conditions under which the field can be present.

Format: Section 2.3 describes the types allowed here.

Contents: Optional. Used when only specific values are allowable.

2.2 Conventions

The conventions that have been used in specifying the message format tables and the field descriptions apply to all chapters.

- *Message Format Tables*

- The concept of *subfields* (that is, fields that are components of other fields) is shown in the tables using indentation in the *Field Name* column.

The example shown above in Table 2-1 illustrates this technique. In the example, *common prefix* has three field names following it that are indented further to the right. Those fields are named *command type*, *processing specification*, and *command length*. All three of these field names begin at the same indentation, which shows that they are all at the same level, that is, they are all subfields of *common prefix*. This example also shows one more field, *routing prefix*, indented at the same level as *common prefix*. This means that the *common prefix* field, actually composed of three subfields, is followed in the message format by the field named *routing prefix*.

- An identifier is given in the *Identifier (if any)* column whenever applicable. In some cases, the identifier value that is given is the entire value of the field. In other cases, the identifier occupies only the first byte of the field. The *Size Range* column tells which of these two approaches is being used: if the size is one byte, then the identifier is the value of that one byte; if the size is more than one byte, then the identifier occupies the first of those bytes.
- Two conventions are used in the *Size Range* column.
 - The size range for a field that consists of subfields is the total number of bytes from the subfield descriptions. In the example given above, the size of *common prefix* is four bytes, those four bytes being the 1-byte *command type* and 1-byte *processing specification*, plus the 2-byte *command length*.
 - Many of the fields have a variable length. This is indicated in the table by *m to n*, where *m* is the minimum number of bytes the field can occupy, and *n* is the maximum number of bytes for the same field.
- The *Occurrences* column shows how many times a given field occurs in the message format. If the number in this column is 1, then the field is always present in that message, that is, it is a required field. If this column states *0 or 1*, then the field is optional for this message. If this column states *0 or more*, then any number of occurrences (including zero) may occur for this field in a given message.

A subfield row that has no entry in the *Occurrences* column indicates that the subfield is required whenever the enclosing field occurs.

- *Field Descriptions*

- The name of the field being described is given in bold type within the heading. Each heading includes a description of the field.
- The concept of subfields is shown in the field descriptions using *highlighted* text for subfield names, and the text *consists of the subfields*. When a field has subfields, the heading for each subfield follows, and it is under these headings that more detail is given. (If the subfield is common to multiple messages, however, a reference is given to where that field is described.)
- Fields that are optional contain a *Presence Rule* entry, along with a description of when the field is present.

- For those field descriptions that have no further subfields described under following headings, additional entries may appear. Those entries are:
 - A *Format* entry. This entry is always used in a description that has no further subfield headings. It describes how the field is formatted, using one of the formats described in Section 2.3.
 - A *Content* entry. This entry is only used in a description where there is some specific value, or small set of possible values, that can be listed for this field.

2.3 Basic Types used in Format Specifications

The formats used in this document are comprised of the following basic types. For each of these types, the properties given here apply throughout this document.

Type	Properties of this Type
Bit String	<p>Bit strings are specified in the order they will appear in the encoded format, starting with the most-significant bit in the byte. Bits within one byte are numbered from 0 through 7 in this document, with bit 0 being the most significant. The notation <i>B'xx'</i> is used to discuss a bit-string value, where <i>x</i> can take the values 0 or 1.</p> <p>When a bit represents a Boolean condition, the value 0 indicates that the condition is FALSE, and the value 1 indicates that the condition is TRUE.</p>
Boolean	<p>Boolean fields are 1 byte in length. The Boolean value FALSE is represented by X'00' (see Hexadecimal Code, below). The Boolean value TRUE is represented by X'01'. Other values in a Boolean field shall be interpreted as TRUE.</p>
Byte String	<p>The value in a byte string can be any arbitrary string of octets.</p>
Character String	<p>Where the format is given as character string, the values that can be used in that string come from the character set 01134, encoded using the ASCII code page 00819, unless otherwise stated in the field description. The character set 01134 contains the upper-case alphabetic (A through Z) and the digits (0 through 9). The complete identifier for the character set is therefore 01134-00819.</p> <p>The null value (X'00') does not represent the end of a string if it occurs in a message.</p> <p>Many of the character strings used in MPTN formats are preceded by a 1-byte length field. This length field has type unsigned binary (see below).</p>
Hexadecimal Code	<p>Hexadecimal code is used when there is a certain hexadecimal value that is defined to represent specific information, such as a message type identifier. The values for this type are represented using the notation X'mn', where <i>mn</i> is used for each byte in the field, and can take any value from " 00 through FF.</p>
Unsigned Binary	<p>Unsigned binary is used to represent all integer values in these MPTN formats. Unsigned binary fields are typically 1, 2, or 4 bytes in length. (The specific length will be indicated in the Message Format table.)</p> <p>Integers are encoded in the big-endian form (that is, with their most-significant bits first), and are not aligned on any specific word boundary.</p> <p>No negative numbers are used in any MPTN formats.</p>

2.4 Reserved Fields

Some fields within the message formats are specified as *Reserved*. This indicates that a sender of the message should fill the field with binary 0's, and that a receiver of the message should **not** perform any validity-checking on the contents of that field.

2.5 Field Order

All fields within a message appear in the order in which they are specified in the tables in this specification.

Connection Establishment Format

3.1 General Description

An MPTN_Connect request is the first message sent over a transport-provider connection in order to establish a non-native MPTN connection. An MPTN_Connect response acknowledges that request, and indicates whether or not the connection was accepted.

When MPTN_Connect flows on a stream-oriented transport network, it is preceded by a 4-byte record length field.

Table 3-1 The following table defines the layout of the MPTN_Connect request and response. (Note that this figure shows, as the first element, the optional record length field.)

Both positive and negative responses are defined for MPTN_Connect.

3.2 MPTN_Connect

3.2.1 Message Format

Table 3-1 Format of MPTN_Connect

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'80'	1	
processing specification		1	
command length		2	
routing prefix		13 to 1034	1
time to live		1	
destination user address		5 to 512	
destination MPTN qualifier		1	
destination address mode		1	
destination node address		2 to 255	
destination local address		1 to 255	
source user address		5 to 512	
source MPTN qualifier		1	
source address mode		1	
source node address		2 to 255	
source local address		1 to 255	
correlator suffix		2 to 9	
user transport requirements		15	1
user transport requirements length		1	
maximum record length		4	
maximum expedited data length		4	
maximum termination data length		4	
termination type		1	
expedited marking		1	
direct TLPB user type field		6 to 12	0 or 1
direct TLPB user type prefix	X'04'	4	
direct TLPB user type		2 to 8	
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
connection data		4 to (2 ¹⁶ - 1)	0 or 1
connection data prefix	X'0A'	4	
connection data value		0 to (2 ¹⁶ - 5)	
user characteristics		5 to 36	0 or 1
user characteristics prefix	X'18'	4	
user characteristics value		1 to 32	

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
compensations required		4 to 23	0 or 1
compensations prefix	X'19'	4	
compensations value		0 to 19	
optional compensations		5 to 36	0 or 1
optional compensations prefix	X'1A'	4	
optional compensations value		1 to 32	
node initialisation ID		6 to 12	0 or 1
node initialisation ID prefix	X'1C'	4	
node initialisation ID value		2 to 8	
user data field		5 to (2(16) - 1) See Note	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16) - 5) See Note.	
diagnostics			
(Only allowed in negative response)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector MPTN qualifier		1	
error detector address mode		1	
error detector node address		2 to 255	
error detector local address		1 to 255	
error detector data		1 to 255	

3.2.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when transport provider network is stream-oriented (for example, used when transport provider is TCP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes)

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'80'.

Bits 4 and 6 of the *Processing Specification* field are both set to 1. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the Common Prefix, but does not include the four bytes for the optional Record Length field.

Routing Prefix

Description: Specifies routing information for this message. Consists of the subfields *Time To Live*, *Destination User Address*, *Source User Address*, and *Correlator Suffix*.

Time To Live

Description: Used to prevent messages from circulating endlessly. When a message arrives with a value of 1, the message is either at its destination or, if not, will be rejected and returned to the initiator of the connection as a negative response.

Format: Unsigned binary (1 byte)

Destination User Address

Description: Specifies the transport user address of the target of the connection. This is the receiver of an MPTN_Connect request, and the sender of an MPTN_Connect response. Consists of the subfields *Destination MPTN Qualifier*, *Destination Address Mode*, *Destination Node Address*, and *Destination Local Address*. These fields are described in Section 8.3 on page 110.

Destination MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Source User Address

Description: Specifies the transport user address of the initiator of the connection. This is the sender of an MPTN_Connect request, and the receiver of an MPTN_Connect response. Consists of the subfields *Source MPTN Qualifier*, *Source Address Mode*, *Source Node Address*, and *Source Local Address*. These fields are described in MPTN Addresses.

Source MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Correlator Suffix

Description: Used to correlate a request with its response.
The source user address, taken together with the correlator suffix, uniquely identifies the MPTN connection for all time.

Format: Byte string

Byte	Content
0	Length (n + 1), in binary, of the correlator suffix value
1 to n	Correlator suffix value

User Transport Requirements

Description: The set of transport characteristics requested by the transport user. Consists of the subfields *User Transport Requirements Length*, *Maximum Record Length*, *Maximum Expedited Data Length*, *Maximum Termination Data Length*, *Termination Type*, and *Expedited Marking*.

User Transport Requirements Length

Description: Length field for the user transport requirements.
 Format: Unsigned binary (1 byte)
 Content: If the value in this field is greater than 15 (the length of currently-defined subfields), all data beyond the first 15 bytes is ignored.

Maximum Record Length

Description: Maximum size for a record that can be sent on this connection. If a stream transport is requested by the transport user, this value is set to 0. If record transport is requested and this connection has no limits on record size, this value is set to $2^{32}-1$. (Thus, the actual limit on maximum record size is $2^{32}-2$.)
 Format: Unsigned binary (4 bytes)

Maximum Expedited Data Length

Description: Maximum size for an expedited data record that can be sent on this connection. If expedited data is not required by the transport user, this value is set to 0. $2^{32}-1$ is interpreted as a specific limit.
 Format: Unsigned binary (4 bytes)

Maximum Termination Data Length

Description: Maximum size for termination data provided by the transport user that can be sent on this connection. If termination data is not required, this value is set to 0. $2^{32}-1$ is interpreted as a specific limit.
 Format: Unsigned binary (4 bytes)

Termination Type

Description: Specifies the termination types that are being requested.
 Format: Bit string

Bit	Meaning
0	simplex-abortive
1	simplex-orderly
2	duplex-abortive
3	duplex-orderly
4 to 7	reserved

Bits set to 1 are termination types being requested. Multiple bits can be set to 1.

Expedited Marking

Description: Specifies whether the user wants the ability to mark the position in the normal data where expedited data was sent.

Format: Boolean (1 byte)

Content: X'00' indicates FALSE; X'01' indicates TRUE.

Direct TLPB User Type Field

Description: Contains optional direct TLPB user type identifier. Consists of the subfields *Direct TLPB User Type Prefix* and *Direct TLPB User Type*.

Direct TLPB User Type Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'04'. Bits 4 and 6 of the processing specification (byte 1) are both set to 1. This indicates that a negative response is to be returned if the field is not recognised by an extended MPTN node or the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the user is a direct TLPB user, and the transport user address being used might be used by another transport user.

Direct TLPB User Type Field

Description: The Direct TLPB User Type contains an *identifier*, as defined in Section 8.4.1 on page 113.

Direct TLPB users use transport addresses taken from the address space of other transport protocols. Usually this means the direct TLPB user will use an address that is already being used by another transport user on that access node. This field lets the CMM differentiate between different TLPB users that might be using the same transport user address.

Format: Byte string.

Service Mode

Description: Specification of the level of transport service required in each transport network. Consists of the subfields *Service Mode Prefix*, *MPTN Service Mode* and *User-defined Service Mode*.

Service Mode Prefix is an optional prefix field, as described in Prefix for Optional Fields. Section 8.2 on page 109. The type indicator (byte 0) is set to X'05'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender requires a specific level of service.

MPTN Service Mode

Description: Predefined service mode required by the transport user.
 Format: Byte string (1 byte).
 Contents: Refer to Section 8.5 on page 114 for a description of the possible values.

User-defined Service Mode

Description: Service mode required by the transport user. When this field is supported by the MPTN node, then this value takes precedence over the value in *MPTN Service Mode*.

Format: Byte string

Byte	Content
0	Length (n + 1), in binary, of the user-defined service mode
1 to n	User-defined service mode (when present). Format is ASCII character string. See Section 2.3 on page 8 for more information.

Connection Data

Description: In a request, contains connection data that the transport user provides. In a positive response, contains connection response data. In a negative response, contains data related to the connection failure if any was specified. However, if any Diagnostic optional field except X'0007', rejected by user, is present, this field echoes back the data sent on the MPTN_Connect request. Consists of the subfields *Connection Data Prefix* and *Connection Data Value*.

Connection Data Prefix is an optional prefix field, as described in (Prefix for Optional Fields, in Section 8.2 on page 109. The type indicator (byte 0) is set to X'0A'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the transport user provides data for the MPTN_Connect request or response.

Connection Data Value

Description: Connection data specified by the user.
 Format: Byte string

User Characteristics

Description: Specifies the user characteristics that are required on this connection.
 When more than one user characteristic is required, the user characteristic identifiers can be specified in any order.

Consists of the subfields *User Characteristics Prefix* and *User Characteristics Value*.

User Characteristics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'18'. Bits 4 and 6 of the

processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when specific user characteristics are required.

User Characteristics Value

Description: List of user characteristic values representing the user characteristics to be used on this connection.

Format: List of 1-byte unsigned binary values. Number of elements in the list is determined by subtracting 4 from the value stored in length subfield (bytes 2 and 3) of the *User Characteristics Prefix* field.

Contents: The values that can appear in this field are defined in Section 9.3 on page 122. If the *User Characteristics* field is understood by the destination but a certain value is not supported then that value should be set to X'00' in the response.

Compensations Required

Description: Specifies the compensations that will be used on this connection.

When more than one compensation is required, the compensation identifiers can be specified in any order.

Consists of the subfields *Compensations Prefix* and *Compensations Value*.

Compensations Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'19'. Bits 4 and 6 of the processing specification (byte 1) are both set to 1. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when compensations are required.

Compensations Value

Description: List of MPTN headers and command identifier values representing the compensations to be used on this MPTN segment.

Format: List of 1-byte unsigned binary values. Number of elements in the list is determined by subtracting 4 from the value stored in length subfield (bytes 2 and 3) of the *Compensations Prefix* field.

The values that can appear in this field are defined in Section 9.4 on page 122.

Optional Compensations

Description: Specifies the optional compensations that are requested on this connection.

When more than one optional compensation is specified, the compensation identifiers can be specified in any order.

Consists of the subfields *Optional Compensations Prefix* and *Optional Compensations Value*.

Optional Compensations Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'1A'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when optional compensations are requested.

Optional Compensations Value

Description: List of MPTN headers and command identifier values representing the compensations to be used on this MPTN segment.

Format: List of 1-byte unsigned binary values. Number of elements in the list is determined by subtracting 4 from the value stored in length subfield (bytes 2 and 3) of the *Optional Compensations Prefix* field.

Contents: The values that can appear in this field are defined in Section 9.4 on page 122. If the *Optional Compensations* field is understood by the destination but a certain value is not supported then that value should be set to X'00' in the response.

Node Initialisation ID

Description: A node inserts a value that uniquely identifies the instance of the sending node, for example, a time stamp corresponding to when the node was initialised. Consists of the subfields *Node Initialisation ID Prefix*, and *Node Initialisation ID Value*.

Node Initialisation ID Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'1C'. Bits 4 and 6 of the processing specification are both set to 0, indicating that a negative response is not required if the field is unrecognised either by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Optional. Used when there is a danger that a node may be terminated and reinitialised in less time than the keepalive process will detect.

Node Initialisation ID Value

Description: Specifies the node initialisation ID; for example, a time stamp.

Format: Byte string (2 to 8 bytes).

User Data Field

Description: Contains optional user data to be communicated between transport users/syntax mappers as part of the connection setup. Consists of the subfields *User Data Prefix* and *User Data*.

User Data Prefix is an Optional Field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AF'. The setting of the individual bits of the processing specification byte (byte 1) depends on the payload. Refer to the particular transport user characteristic chapter in the referenced **MPTN Access Node Specification** for details.

Presence Rule: Present when user data is to be communicated between syntax mappers as part of the connection setup.

User Data

Description: The *User Data* contains user data to be communicated between the syntax mappers as part of the connection setup.

Format: Byte string.

Diagnostics

Description: Describes why the connection was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator is set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command type, X'80'.

Presence Rule: May be present in a negative response. Not present in a request or in a positive response.

4.1 General Description

MPTN headers are 1-byte fields that are inserted before the user's data on an MPTN connection. The field specifies which compensation, if any, is in use. The possible identifiers are described in MPTN Header, below.

When an MPTN header flows on a stream-oriented transport network, it is preceded by a 4-byte record length field.

The following table defines the layout of the MPTN headers. (Note that this table, as the first element, the optional record length field.)

MPTN headers are generated independently for each segment of an MPTN connection, depending on the compensation required for that transport provider.

4.2 Connection-oriented Data using MPTN Headers

4.2.1 Message Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
MPTN header		1	1
user data		0 to 2 ³² (See Note)	0 or 1

Table 4-1 Format of Connection-oriented Data using MPTN Headers

Note: Because the record length, when present, includes itself, the maximum length of the user data is 4 bytes less.

4.2.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when the transport provider network is stream-oriented.

Format: Unsigned binary

MPTN Header

Description: Identifier that tells what kind of data message this is.

Format: Hexadecimal code

Content: Allowable values, and their meaning, are:

Value	Meaning
-------	---------

'00'	On a record-oriented transport network, a message with no associated compensation. On a stream-oriented transport network, a record boundary marker (when no other compensation is needed).
X'01'	expedited message
X'03'	expedited message acknowledgement
X'10'	duplex-abortive termination
X'12'	duplex-abortive termination acknowledgement
X'14'	duplex-orderly termination
X'16'	duplex-orderly termination acknowledgement
X'18'	simplex-abortive termination
X'1A'	simplex-orderly termination acknowledgement
X'1C'	simplex-orderly termination
X'1E'	simplex-orderly termination acknowledgement
X'20'	segmented message
X'21'	segmented expedited message

User Data

- Description:** Contains any data the user wants to send over this connection.
When *User Data* follows MPTN headers X'10', X'14', X'18', or X'1C', then that data is termination data specified by the transport user.
- Presence Rule:** Present when the transport user sends data associated with this header. Not required for some compensations, such as the various termination compensations when they are used without user termination data and acknowledgements.
- Format:** Byte string.

Datagram Formats

5.1 General Description

Five datagram messages are defined for use in the MPTN architecture:

- MPTN_Datagram is used to send a user datagram over a non-native transport provider. This message consists of the original user datagram created by the transport user, with information added to the front to allow proper routing through the network.
- MPTN_DG_OOB_Data is a message defined for sending data on a separate path from a connection (*out of band*), to ensure that it reaches the partner.
- MPTN_DG_KEEPLIVE_Hdr is a message defined for detecting session outage notification in a timely manner.
- MPTN_Cntrl_Datagram is used to send a control datagram over a non-native transport provider. The payload of the control datagram is an existing native signal, usually a lower layer signal, that is delivered to the transport user.
- MPTN_Syntax_Mapper_Signal_Datagram is used to send a signal between syntax mappers. The payload of the signal datagram is a new signal between syntax mappers needed to replace lower layer protocols that do not exist when routing non-native.

If the transport provider gives no easy way of determining the overall user datagram length (for example, when the transport provider is UDP), then the MPTN datagram will include a 4-byte record length field at the beginning.

All datagram messages have both request and response messages. Only negative responses are generated for MPTN_Datagram, MPTN_Cntrl_Datagram and MPTN_Syntax_Mapper_Signal_Datagram.

The following sections define the layout of the datagram messages. The format of the MPTN_Datagram, MPTN_Cntrl_Datagram and MPTN_Syntax_Mapper_Signal_Datagram are the same except for the command type field:

- MPTN_Datagram
- MPTN_DG_OOB_Data
- MPTN_DG_KEEPLIVE_Hdr
- MPTN_Cntrl_Datagram
- MPTN_Syntax_Mapper_Signal_Datagram.

Note: The tables in these sections show, as the first element, the optional length field used when a transport provider does not give a simple way to determine a datagram's length.

5.2 MPTN_Datagram

5.2.1 Message Format

Table 5-1 Format of MPTN_Datagram

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'81'	1	
processing specification		1	
command length		2	
routing prefix		13 to 1034	1
time to live		1	
destination user address		5 to 512	
destination MPTN qualifier		1	
destination address mode		1	
destination node address		2 to 255	
destination local address		1 to 255	
source user address		5 to 512	
source MPTN qualifier		1	
source address mode		1	
source node address		2 to 255	
source local address		1 to 255	
correlator suffix		2 to 9	
direct TLPB user type field		6 to 12	0 or 1
direct TLPB user type prefix	X'04'	4	
direct TLPB user type		2 to 8	
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
sequence number field		6 to 8	0 or 1
sequence number prefix	X'07'	4	
sequence number		2 to 4	
retry		5	0 or 1
retry prefix	X'12'	4	
retry value		1	
node initialisation ID		6 to 12	0 or 1
node initialisation ID prefix	X'1C'	4	
node initialisation ID value		2 to 8	
source provider		9 to 516	0 or 1
source provider prefix	X'28'	4	
source provider address		5 to 512	
destination provider		9 to 516	0 or 1
destination provider prefix	X'2B'	4	

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
destination provider address		5 to 512	
segment specification		12	0 or 1
segment specification prefix	X'2D'	4	
segment specification value		8	
maximum datagram size		8	0 or 1
maximum datagram prefix	X'2E'	4	
maximum datagram value		4	
diagnostics (only allowed in response)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector data		1 to 255	
user datagram (optional in response)		0 to $(2^{32} - 28)^*$	0 or 1

* Note that because the datagram length, when present, includes itself, the maximum length of the user data is 4 bytes less when the length field is present.

5.2.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when the transport provider gives no easy way of determining the overall message length (for example, used when transport provider is UDP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes)

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'81'.

Bits 4 and 6 of the *Processing Specification* field are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the Common Prefix, but does not include the four bytes for the optional Record Length field. The size of the user datagram is not included.

Routing Prefix

Description: Specifies routing information for this command. Consists of the subfields *Time To Live*, *Destination User Address*, *Source User Address*, and *Correlator Suffix*.

Time To Live

Description: Used to prevent messages from circulating endlessly. When a message arrives with a value of 1, the message is either at its destination or, if not, will be rejected and returned to the source of the datagram message as a negative response.

Format: Unsigned binary (1 byte)

Destination User Address

Description: Specifies the transport user address of the target of the datagram message. This is the receiver of an MPTN_Datagram request, and the sender of an MPTN_Datagram response. Consists of the subfields *Destination MPTN Qualifier*, *Destination Address Mode*, *Destination Node Address*, and *Destination Local Address*. These fields are described in Section 8.3 on page 110.

Destination MPTN Qualifier value of X'7F' (local form address) is not valid.

Source User Address

Description: Specifies the transport user address of the source of this datagram message. This is the sender of an MPTN_Datagram request, and the receiver of an MPTN_Datagram response. Consists of the subfields *Source MPTN Qualifier*, *Source Address Mode*, *Source Node Address*, and *Source Local Address*. These fields are described in Section 8.3 on page 110.

Source MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Correlator Suffix

Description: Used to correlate segments of the datagram.
This value is required to remain unique long enough for all segments of the datagram to arrive.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the correlator suffix value
1 to n	Correlator suffix value

Direct TLPB User Type Field

Description: Contains optional direct TLPB user type identifier. Consists of the subfields *Direct TLPB User Type Prefix* and *Direct TLPB User Type*.

Direct TLPB User Type Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'04'. Bits 4 and 6 of the processing specification (byte 1) are both set to 1. This indicates that a negative response is to be returned if the field is not recognized by an extended MPTN node, or the destination. The remaining bits in the processing

specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the user is a direct TLPB user, and the transport user address being used might be used by another transport user.

Direct TLPB User Type

Description: The *Direct TLPB User Type* contains an identifier, as defined in Section 8.4.1 on page 113. This field lets the CMM differentiate between different TLPB users that might be using the same transport user address.

Format: Byte string.

Service Mode

Description: Specification of the level of transport service required in each transport network. Consists of the subfields *Service Mode Prefix*, *MPTN Service Mode*, and *User-defined Service Mode*.

Service Mode Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'05'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender requires a specific quality of service.

MPTN Service Mode

Description: Predefined service mode required by the transport user.

Format: Byte string (1 byte).

Content: Refer to Section 8.5 on page 114 for a description of the possible values.

User-defined Service Mode

Description: Service mode required by the transport user. When this field is used and the field value is supported by the MPTN node, then this value takes precedence over the value in *MPTN Service Mode*.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the user-defined service mode
1 to n	User-defined service mode (when present). Format is ASCII character string.

Sequence Number Field

Description: This field contains the sequence number. Consist of the subfields *Sequence Number Prefix* and *Sequence Number*.

Sequence Number Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'07'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. This indicates that a negative response is required if the field is unrecognized by an extended MPTN node, but it is not required if the field is unrecognized by the

destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender/receiver needs to detect missing datagrams.

Sequence Number

Description: *Sequence Number* is the sequence number of this datagram. A value of 0 means that sequence numbers are not being used. The sequence number is returned unchanged on responses.

Format: Unsigned binary (2 to 4 bytes).

Retry

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing. Consists of the subfields *Retry Prefix* and *Retry Value*.

Retry Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'12'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Optional.

Retry Value

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing.

Format: Boolean:

Content: X'00' indicates FALSE, X'01' indicates TRUE.

Node Initialisation ID

Description: A node inserts the value that uniquely identifies the instance of the sending node, for example, a time stamp corresponding to when the node was initialized. Consists of the subfields *Node Initialisation ID Prefix* and *Node Initialisation ID Value*.

Node Initialisation ID Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'1C'. Bits 4 and 6 of the processing specification are both set to 0, indicating that a negative response is not required if the field is unrecognized either by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Note: This is the *Node Initialisation ID* of the *sending* node, that is, the node that sent *this format*. For a request or reply, this is the node that sends the request or reply. For a response, it is the node that sends the response, not the node that sent the original request.

Presence Rule: Optional. Used when there is a danger that a node may be terminated and reinitialized in less time than the keepalive timer will detect.

Node Initialisation ID Value

Description: Specifies the node initialisation ID, for example, a time stamp.

Format: Byte string (2 to 8 bytes).

Source Provider

Description: If the sender prefers to have return datagrams sent to a different address than the well-known address for non-native datagrams, it can use this optional field to specify an alternate address. Consists of the subfields *Source Provider Prefix* and *Source Provider Address*.

Source Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Optional. Used when sender has preferred address that it wants used for any datagrams sent to it by the destination.

Source Provider Address

Description: Specifies the source provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Destination Provider

Description: If the sender has saved a preferred address for the partner, it is carried in this optional field to make the information available to the last MPTN node before the destination. An MPTN node that receives this field uses the local address specified in this field rather than the well-known local address usually used for non-native datagram routing. Consists of the subfields *Destination Provider Prefix* and *Destination Provider Address*.

Destination Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Optional. Used when sender has a preferred address for sending datagrams to this destination.

Destination Provider Address

Description: Specifies the destination provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Segment Specification

Description: Used to reassemble segmented datagrams. Consists of the subfields *Segment Specification Prefix* and *Segment Specification Value*.

Segment Specification Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'2D'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when datagram has been segmented.

Segment Specification Value

Description: Segment specification information.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the entire datagram which was segmented.
4 to 7	Byte number, assuming offset zero from the beginning of the original datagram, where this segment belongs in the reassembled datagram.

Maximum Datagram Size

Description: Specifies the maximum datagram receive size supported by the sending transport provider. Consists of the subfields *Maximum Datagram Prefix* and *Maximum Datagram Value*.

Maximum Datagram Prefix is an *Optional Field* prefix as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'2E'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the transport provider can receive a datagram bigger than the largest datagram guaranteed to be receivable on this transport protocol.

Maximum Datagram Value

Description: Maximum datagram receive size supported by the sending transport provider.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the maximum datagram receive size.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command value, X'81'.

Presence Rule: May be present in a negative response. Not present in a request.

User Datagram

Description: The datagram containing the user's data.

Format: Byte string.

Presence Rule: Required in a request, not required in a response.

5.3 MPTN_DG_OOB_Data

5.3.1 Message Format

Table 5-2 Format of MPTN_DG_OOB_Data

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'83'	1	
processing specification		1	
command length		2	
connection sequence number		2	1
connection correlator		7 to 521	1
correlator address		5 to 512	
correlator MPTN qualifier		1	
correlator address mode		1	
correlator node address		2 to 255	
correlator local address		1 to 255	
correlator suffix		2 to 9	
sender connection alias		9 to 516	0 or 1
sender alias prefix	X'28'	4	
sender alias MPTN qualifier	X'7F'	1	
sender alias address mode	X'01'	1	
sender alias node address		2 to 255	
sender alias local address		1 to 255	
receiver connection alias		9 to 516	0 or 1
receiver alias prefix	X'29'	4	
receiver alias MPTN qualifier	X'7F'	1	
receiver alias address mode	X'01'	1	
receiver alias node address		2 to 255	
receiver alias local address		1 to 255	
maximum datagram size		8	0 or 1
maximum datagram prefix	X'2E'	4	
maximum datagram value		4	
diagnostics (only allowed on response.)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector data		1 to 255	
MPTN header (always present on request)		0 or 1	0 or 1
user data (only allowed on request)		0 to (2 ³² - 28)*	0 or 1

* Note that because the datagram length, when present, includes itself, the maximum length of the user data is 4 bytes less when the length field is present.

5.3.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when transport provider gives no easy way of determining the overall message length (for example, used when transport provider is UDP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes).

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'83'.

Bits 4 and 6 of the *Processing Specification* field are set to 0 and 1, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the Common Prefix, but does not include the four bytes for the optional Record Length field. The size of the user data is not included.

Connection Sequence Number

Description: Sequence number used to correlate this datagram with activity on a specific connection.

Format: Unsigned binary (2 bytes).

Connection Correlator

Description: Used to correlate this message to its connection. Consists of the subfields *Correlator Address* and *Correlator Suffix*.

Correlator Address

Description: Address of the transport user that initiated the connection that the out-of-band data relates to. Consists of the subfields *Correlator MPTN Qualifier*, *Correlator Address Mode*, *Correlator Node Address*, and *Correlator Local Address*. These fields are described in Section 8.3 on page 110.

Correlator MPTN Qualifier value of X'7F' (local form address) is not valid.

Correlator Suffix

Description: Used with *Correlator Address* to correlate this out-of-band data to its connection. (This is the same value that was sent in the MPTN_Connect message for the connection.)

Format: Byte string:

Byte	Byte string
0	Length (n + 1), in binary, of the correlator suffix value
1 to n	Correlator suffix value

Sender Connection Alias

Description: Specifies a connection alias that, when used in the acknowledgement, will enable the sender to quickly identify the associated connection. Consists of the subfields *Sender Alias Prefix*, *Sender Alias MPTN Qualifier*, *Sender Alias Address Mode*, *Sender Alias Node Address*, and *Sender Alias Local Address*.

Sender Alias Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.3 on page 110.

Sender Alias MPTN Qualifier is restricted to the value X'7F'.

Sender Alias Address Mode is restricted to the value X'01'.

Presence Rule: Present when the sender (of a request or response) wants to communicate a local form address to the destination.

Receiver Connection Alias

Description: Specifies a connection alias that enables the receiver to quickly identify the connection for which this out-of-band data was sent. This is the connection alias that the sender received earlier from the partner. Consists of the subfields *Receiver Alias Prefix*, *Receiver Alias MPTN Qualifier*, *Receiver Alias Address Mode*, *Receiver Alias Node Address*, and *Receiver Alias Local Address*.

Receiver Alias Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'29'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.3 on page 110.

Receiver Alias MPTN Qualifier is restricted to the value X'7F'.

Receiver Alias Address Mode is restricted to the value X'01'.

Presence Rule: Present when the sender has previously received a sender connection alias from the partner.

Maximum Datagram Size

Description: Specifies the maximum datagram receive size supported by the sending transport provider. Consists of the subfields *Maximum Datagram Prefix* and *Maximum Datagram Value*.

Maximum Datagram Prefix is an *Optional Field* prefix as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'2E'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the transport provider can receive a datagram bigger than the largest datagram guaranteed to be receivable on this transport protocol.

Maximum Datagram Value

Description: Maximum datagram receive size supported by the sending transport provider.

Format: Byte string:

Byte	Byte string
0 to 3	Length, in binary, of the maximum datagram receive size.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the Processing Specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command value, X'83'.

Presence Rule: May be present in a negative response. Not present in a request or in a positive response.

MPTN Header

Description: Indicates the compensation associated with this message.

Format: Hexadecimal code.

Content: Allowable values, and their meaning, are:

Value	Meaning
X'01'	user expedited data
X'10'	duplex-abortive termination
X'18'	simplex-abortive termination

Presence Rule: Required in a request. Not present in a response.

User Data

Description: Contains the transport user's data. If *MPTN Header* is X'01', then this is user expedited data. If *MPTN Header* is X'10' or X'18', then this is termination data specified by the transport user.

Format: Byte string.

Presence Rule: May be present in a request depending on the MPTN Header. Not present in a response.

5.4 MPTN_DG_KEEPLIVE_Hdr

5.4.1 Message Format

Table 5-3 Format of MPTN_DG_KEEPLIVE_Hdr

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'84'	1	
processing specification		1	
command length		2	
source address		5 to 512	
source MPTN qualifier		1	
source address mode		1	
source node address		2 to 255	
source local address		1 to 255	
destination address		5 to 512	
destination MPTN qualifier		1	
destination address mode		1	
destination node address		2 to 255	
destination local address		1 to 255	
diagnostics (only allowed on response)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector data		1 to 255	

5.4.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when transport provider gives no easy way of determining the overall message length (for example, used when transport provider is UDP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes).

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'84'.

Bits 4 and 6 of the *Processing Specification* field are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the *Common Prefix*, but does not include the four bytes for the optional *Record Length* field.

Source Address

Description: Specifies the provider address of the sender of the keepalive message. This is the sender of an MPTN_DG_KEEPLIVE_Hdr request, and the receiver of the MPTN_DG_KEEPLIVE_Hdr response. Consists of the subfields *Source MPTN Qualifier*, *Source Address Mode*, *Source Node Address*, and *Source Local Address*. These fields are described in Section 8.3 on page 110.

Destination Address

Description: Specifies the provider address of the receiver of the keepalive message. This is the receiver of an MPTN_DG_KEEPLIVE_Hdr request, and the sender of the MPTN_DG_KEEPLIVE_Hdr response. Consists of the subfields *Destination MPTN Qualifier*, *Destination Address Mode*, *Destination Node Address*, and *Destination Local Address*. These fields are described in Section 8.3 on page 110.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command value, X'84'.

Presence Rule: May be present in a negative response. Not present in a request or in a positive response.

5.5 MPTN_Cntrl_Datagram

5.5.1 Message Format

Table 5-4 Format of MPTN_Cntrl_Datagram

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'8F'	1	
processing specification		1	
command length		2	
routing prefix		13 to 1034	1
time to live		1	
destination user address		5 to 512	
destination MPTN qualifier		1	
destination address mode		1	
destination node address		2 to 255	
destination local address		1 to 255	
source user address		5 to 512	
source MPTN qualifier		1	
source address mode		1	
source node address		2 to 255	
source local address		1 to 255	
correlator suffix		2 to 9	
direct TLPB user type field		6 to 12	0 or 1
direct TLPB user type prefix	X'04'	4	
direct TLPB user type		2 to 8	
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
sequence number field		6 to 8	0 or 1
sequence number prefix	X'07'	4	
sequence number		2 to 4	
retry		5	0 or 1
retry prefix	X'12'	4	
retry value		1	
node initialisation ID		6 to 12	0 or 1
node initialisation ID prefix	X'1C'	4	
node initialisation ID value		2 to 8	
source provider		9 to 516	0 or 1
source provider prefix	X'28'	4	
source provider address		5 to 512	
destination provider address		9 to 516	0 or 1
destination provider prefix	X'2B'	4	

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
destination provider address		5 to 512	
segment specification		12	0 or 1
segment specification prefix	X'2D'	4	
segment specification value		8	
maximum datagram size		8	0 or 1
maximum datagram prefix	X'2E'	4	
maximum datagram value		4	
diagnostics (only allowed in response.)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector data		1 to 255	
control datagram (optional in response.)		0 to $(2^{32} - 28)^*$	0 or 1

* Because the datagram length, when present, includes itself, the maximum length of the control data is 4 bytes less when the length field is present.

5.5.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when the transport provider gives no easy way of determining the overall message length (for example, used when transport provider is UDP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes).

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'8F'.

Bits 4 and 6 of the *Processing Specification* field are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the *Common Prefix*, but does not include the four bytes for the optional *Record Length* field. The size of the control datagram is not included.

Routing Prefix

Description: Specifies routing information for this command. Consists of the subfields *Time To Live*, *Destination User Address*, *Source User Address*, and *Correlator Suffix*.

Time To Live

Description: Used to prevent messages from circulating endlessly. When a message arrives with a value of 1, the message is either at its destination or, if not, will be rejected and returned to the source of the datagram message as a negative response.

Format: Unsigned binary (1 byte).

Destination User Address

Description: Specifies the transport user address of the target of the datagram message. This is the receiver of an MPTN_Datagram request, and the sender of an MPTN_Datagram response. Consists of the subfields *Destination MPTN Qualifier*, *Destination Address Mode*, *Destination Node Address*, and *Destination Local Address*. These fields are described in Section 8.3 on page 110.

Destination MPTN Qualifier value of X'7F' (local form address) is not valid.

Source User Address

Description: Specifies the transport user address of the source of this datagram message. This is the sender of an MPTN_Datagram request, and the receiver of an MPTN_Datagram response. Consists of the subfields *Source MPTN Qualifier*, *Source Address Mode*, *Source Node Address*, and *Source Local Address*. These fields are described in Section 8.3 on page 110.

Source MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Correlator Suffix

Description: Used to correlate segments of the datagram.
This value is required to remain unique long enough for all segments of the datagram to arrive.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the correlator suffix value
1 to n	Correlator suffix value

Direct TLPB User Type Field

Description: Contains optional direct TLPB user type identifier. Consists of the subfields *Direct TLPB User Type Prefix* and *Direct TLPB User Type*.

Direct TLPB User Type Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'04'. Bits 4 and 6 of the processing specification (byte 1) are both set to 1. This indicates that a negative response is to be returned if the field is not recognized by an extended MPTN node or the destination. The remaining bits in the processing

specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the user is a direct TLPB user and the transport user address being used might be used by another transport user.

Direct TLPB User Type

Description: The *Direct TLPB User Type* contains an identifier, as defined in Section 8.4.1 on page 113. This field lets the CMM differentiate between different TLPB users that might be using the same transport user address.

Format: Byte string.

Service Mode

Description: Specification of the level of transport service required in each transport network. Consists of the subfields *Service Mode Prefix*, *MPTN Service Mode*, and *User-defined Service Mode*.

Service Mode Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'05'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Present when the sender requires a specific quality of service.

MPTN Service Mode

Description: Predefined service mode required by the transport user.

Format: Byte string (1 byte).

Content: Refer to Section 8.5 on page 114 for a description of the possible values.

User-defined Service Mode

Description: Service mode required by the transport user. When this field is used and the field value is supported by the MPTN node, then this value takes precedence over the value in *MPTN Service Mode*.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the user-defined service mode
1 to n	User-defined service mode (when present). Format is ASCII character string.

Sequence Number Field

Description: This field contains the sequence number. Consist of the subfields *Sequence Number Prefix* and *Sequence Number*.

Sequence Number Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'07'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. This indicates that a negative response is required if the field is unrecognized by an extended MPTN node, but it is not required if the field is unrecognized by the destina-

tion. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender/receiver needs to detect missing datagrams.

Sequence Number

Description: *Sequence Number* is the sequence number of this datagram. A value of 0 means that sequence numbers are not being used. The sequence number is returned unchanged on responses.

Format: Unsigned binary (2 to 4 bytes).

Retry

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing. Consists of the subfields *Retry Prefix* and *Retry Value*.

Retry Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'12'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional.

Retry Value

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing.

Format: Boolean.

Content: X'00' indicates FALSE, X'01' indicates TRUE.

Node Initialisation ID

Description: A node inserts the value that uniquely identifies the instance of the sending node, for example, a time stamp corresponding to when the node was initialized. Consists of the subfields *Node Initialisation ID Prefix* and *Node Initialisation ID Value*.

Node Initialisation ID Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'1C'. Bits 4 and 6 of the processing specification are both set to 0, indicating that a negative response is not required if the field is unrecognized either by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in

Note: This is the *Node Initialisation ID* of the *sending* node, that is, the node that sent *this format*. For a request or reply, this is the node that sends the request or reply. For a response, it is the node that sends the response, not the node that sent the original request.

Presence Rule: Optional. Used when there is a danger that a node may be terminated and reinitialized in less time than the keepalive timer will detect.

Node Initialisation ID Value

Description: Specifies the node initialisation ID, for example, a time stamp.

Format: Byte string (2 to 8 bytes).

Source Provider

Description: If the sender prefers to have return datagrams sent to a different address than the well-known address for non-native datagrams, it can use this optional field to specify an alternate address. Consists of the subfields *Source Provider Prefix* and *Source Provider Address*.

Source Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional. Used when sender has preferred address that it wants used for any datagrams sent to it by the destination.

Source Provider Address

Description: Specifies the source provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Destination Provider

Description: If the sender has saved a preferred address for the partner, it is carried in this optional field to make the information available to the last MPTN node before the destination. An MPTN node that receives this field uses the local address specified in this field rather than the well-known local address usually used for non-native datagram routing. Consists of the subfields *Destination Provider Prefix* and *Destination Provider Address*.

Destination Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional. Used when sender has a preferred address for sending datagrams to this destination.

Destination Provider Address

Description: Specifies the destination provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Segment Specification

Description: Used to reassemble segmented datagrams. Consists of the subfields *Segment Specification Prefix* and *Segment Specification Value*.

Segment Specification Prefix is an optional prefix field, as described in (byte 0) is set to X'2D'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Present when datagram has been segmented.

Segment Specification Value

Description: Segment specification information.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the entire datagram which was segmented.
4 to 7	Byte number, assuming offset zero from the beginning of the original datagram, where this segment belongs in the reassembled datagram.

Maximum Datagram Size

Description: Specifies the maximum datagram receive size supported by the sending transport provider. Consists of the subfields *Maximum Datagram Prefix* and *Maximum Datagram Value*.

Maximum Datagram Prefix is an *Optional Field* prefix as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'2E'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the transport provider can receive a datagram bigger than the largest datagram guaranteed to be receivable on this transport protocol.

Maximum Datagram Value

Description: Maximum datagram receive size supported by the sending transport provider.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the maximum datagram receive size.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command value, X'8F'.

Presence Rule: May be present in a negative response. Not present in a request.

Control Datagram

Description: The datagram containing the user's data.

Format: Byte string.

Presence Rule: Required in a request. Not required in a response.

5.6 MPTN_Syntax_Mapper_Signal_Datagram

5.6.1 Message Format

Table 5-5 Format of MPTN_Syntax_Mapper_Signal_Datagram

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
record length		4	0 or 1
common prefix		4	1
command type	X'8E'	1	
processing specification		1	
command length		2	
routing prefix		13 to 1034	1
time to live		1	
destination user address		5 to 512	
destination MPTN qualifier		1	
destination address mode		1	
destination node address		2 to 255	
destination local address		1 to 255	
source user address		5 to 512	
source MPTN qualifier		1	
source address mode		1	
source node address		2 to 255	
source local address		1 to 255	
correlator suffix		2 to 9	
direct TLPB user type field		6 to 12	0 or 1
direct TLPB user type prefix	X'04'	4	
direct TLPB user type		2 to 8	
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
sequence number field		6 to 8	0 or 1
sequence number prefix	X'07'	4	
sequence number		2 to 4	
retry		5	0 or 1
retry prefix	X'12'	4	
retry value		1	
node initialisation ID		6 to 12	0 or 1
node initialisation ID prefix	X'1C'	4	
node initialisation ID value		2 to 8	
source provider		9 to 516	0 or 1
source provider prefix	X'28'	4	
source provider address		5 to 512	
destination provider address		9 to 516	0 or 1
destination provider prefix	X'2B'	4	

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
destination provider address		5 to 512	
segment specification		12	0 or 1
segment specification prefix	X'2D'	4	
segment specification value		8	
maximum datagram size		8	0 or 1
maximum datagram prefix	X'2E'	4	
maximum datagram value		4	
diagnostics (only allowed in response.)		18 to 779	0 or more
diagnostics prefix	X'F0'	4	
primary return code		4	
secondary return code		4	
error detector address		5 to 512	
error detector data		1 to 255	
control datagram (optional in response.)		0 to $(2^{32} - 28)^*$	0 or 1

* Because the datagram length, when present, includes itself, the maximum length of the control data is 4 bytes less when the length field is present.

5.6.2 Field Descriptions

Record Length

Description: Specifies the overall length of the message, including the four bytes used for its own specification.

Presence Rule: Present when the transport provider gives no easy way of determining the overall message length (for example, used when transport provider is UDP; not used when transport provider is SNA or NetBIOS).

Format: Unsigned binary (4 bytes).

Common Prefix

Description: Provides information about this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*. These fields are described in Section 8.1 on page 107.

The *Command Type* field (byte 0) is set to X'8F'.

Bits 4 and 6 of the *Processing Specification* field are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The value in the *Command Length* field (bytes 2 and 3) represents the size of this entire message. It includes the four bytes used for the Common Prefix, but does not include the four bytes for the optional Record Length field. The size of the control datagram is not included.

Routing Prefix

Description: Specifies routing information for this command. Consists of the subfields *Time To Live*, *Destination User Address*, *Source User Address*, and *Correlator Suffix*.

Time To Live

Description: Used to prevent messages from circulating endlessly. When a message arrives with a value of 1, the message is either at its destination or, if not, will be rejected and returned to the source of the datagram message as a negative response.

Format: Unsigned binary (1 byte).

Destination User Address

Description: Specifies the transport user address of the target of the datagram message. This is the receiver of an MPTN_Datagram request, and the sender of an MPTN_Datagram response. Consists of the subfields *Destination MPTN Qualifier*, *Destination Address Mode*, *Destination Node Address*, and *Destination Local Address*. These fields are described in Section 8.3 on page 110.

Destination MPTN Qualifier value of X'7F' (local form address) is not valid.

Source User Address

Description: Specifies the transport user address of the source of this datagram message. This is the sender of an MPTN_Datagram request, and the receiver of an MPTN_Datagram response. Consists of the subfields *Source MPTN Qualifier*, *Source Address Mode*, *Source Node Address*, and *Source Local Address*. These fields are described in Section 8.3 on page 110.

Source MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Correlator Suffix

Description: Used to correlate segments of the datagram.
This value is required to remain unique long enough for all segments of the datagram to arrive.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the correlator suffix value
1 to n	Correlator suffix value

Direct TLPB User Type Field

Description: Contains optional direct TLPB user type identifier. Consists of the subfields *Direct TLPB User Type Prefix* and *Direct TLPB User Type*.

Direct TLPB User Type Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'04'. Bits 4 and 6 of the processing specification (byte 1) are both set to 1. This indicates that a negative response is to be returned if the field is not recognized by an extended MPTN node or the destination. The remaining bits in the processing

specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the user is a direct TLPB user and the transport user address being used might be used by another transport user.

Direct TLPB User Type

Description: The *Direct TLPB User Type* contains an identifier, as defined in Section 8.4.1 on page 113. This field lets the CMM differentiate between different TLPB users that might be using the same transport user address.

Format: Byte string.

Service Mode

Description: Specification of the level of transport service required in each transport network. Consists of the subfields *Service Mode Prefix*, *MPTN Service Mode*, and *User-defined Service Mode*.

Service Mode Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'05'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Present when the sender requires a specific quality of service.

MPTN Service Mode

Description: Predefined service mode required by the transport user.

Format: Byte string (1 byte).

Content: Refer to Section 8.5 on page 114 for a description of the possible values.

User-defined Service Mode

Description: Service mode required by the transport user. When this field is used and the field value is supported by the MPTN node, then this value takes precedence over the value in *MPTN Service Mode*.

Format: Byte string:

Byte	Content
0	Length (n + 1), in binary, of the user-defined service mode
1 to n	User-defined service mode (when present). Format is ASCII character string.

Sequence Number Field

Description: This field contains the sequence number. Consist of the subfields *Sequence Number Prefix* and *Sequence Number*.

Sequence Number Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'07'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. This indicates that a negative response is required if the field is unrecognized by an extended MPTN node, but it is not required if the field is unrecognized by the destina-

tion. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender/receiver needs to detect missing datagrams.

Sequence Number

Description: *Sequence Number* is the sequence number of this datagram. A value of 0 means that sequence numbers are not being used. The sequence number is returned unchanged on responses.

Format: Unsigned binary (2 to 4 bytes).

Retry

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing. Consists of the subfields *Retry Prefix* and *Retry Value*.

Retry Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'12'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional.

Retry Value

Description: Indicates whether intermediate MPTN nodes should flush their caches to retry routing.

Format: Boolean.

Content: X'00' indicates FALSE, X'01' indicates TRUE.

Node Initialisation ID

Description: A node inserts the value that uniquely identifies the instance of the sending node, for example, a time stamp corresponding to when the node was initialized. Consists of the subfields *Node Initialisation ID Prefix* and *Node Initialisation ID Value*.

Node Initialisation ID Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'1C'. Bits 4 and 6 of the processing specification are both set to 0, indicating that a negative response is not required if the field is unrecognized either by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in

Note: This is the *Node Initialisation ID* of the *sending* node, that is, the node that sent *this format*. For a request or reply, this is the node that sends the request or reply. For a response, it is the node that sends the response, not the node that sent the original request.

Presence Rule: Optional. Used when there is a danger that a node may be terminated and reinitialized in less time than the keepalive timer will detect.

Node Initialisation ID Value

Description: Specifies the node initialisation ID, for example, a time stamp.

Format: Byte string (2 to 8 bytes).

Source Provider

Description: If the sender prefers to have return datagrams sent to a different address than the well-known address for non-native datagrams, it can use this optional field to specify an alternate address. Consists of the subfields *Source Provider Prefix* and *Source Provider Address*.

Source Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional. Used when sender has preferred address that it wants used for any datagrams sent to it by the destination.

Source Provider Address

Description: Specifies the source provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Destination Provider

Description: If the sender has saved a preferred address for the partner, it is carried in this optional field to make the information available to the last MPTN node before the destination. An MPTN node that receives this field uses the local address specified in this field rather than the well-known local address usually used for non-native datagram routing. Consists of the subfields *Destination Provider Prefix* and *Destination Provider Address*.

Destination Provider Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'28'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Optional. Used when sender has a preferred address for sending datagrams to this destination.

Destination Provider Address

Description: Specifies the destination provider address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Segment Specification

Description: Used to reassemble segmented datagrams. Consists of the subfields *Segment Specification Prefix* and *Segment Specification Value*.

Segment Specification Prefix is an optional prefix field, as described in (byte 0) is set to X'2D'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

Presence Rule: Present when datagram has been segmented.

Segment Specification Value

Description: Segment specification information.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the entire datagram which was segmented.
4 to 7	Byte number, assuming offset zero from the beginning of the original datagram, where this segment belongs in the reassembled datagram.

Maximum Datagram Size

Description: Specifies the maximum datagram receive size supported by the sending transport provider. Consists of the subfields *Maximum Datagram Prefix* and *Maximum Datagram Value*.

Maximum Datagram Prefix is an *Optional Field* prefix as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'2E'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the transport provider can receive a datagram bigger than the largest datagram guaranteed to be receivable on this transport protocol.

Maximum Datagram Value

Description: Maximum datagram receive size supported by the sending transport provider.

Format: Byte string:

Byte	Content
0 to 3	Length, in binary, of the maximum datagram receive size.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. The remaining bits in the *Processing Specification* are set as described in Section 8.1 on page 107.

The remaining subfields are described in Section 8.6 on page 115. Byte 1 of *Primary Return Code* is set to the command value, X'8F'.

Presence Rule: May be present in a negative response. Not present in a request.

Control Datagram

Description: The datagram containing the user's data.

Format: Byte string.

Presence Rule: Required in a request. Not required in a response.

Address Mapper Formats

6.1 General Description

Address Mapper commands are carried in the *User Datagram* field of an *MPTN_Datagram*. Each Address Mapper command contains an ABM Header (see Section 6.2 on page 59), followed by any additional fields associated with the specific Address Mapper commands.

The Address Mapper commands are:

- ABM_AM_Register_Request (Section 6.6 on page 69)
- ABM_MA_Register_Reply (Section 6.7 on page 75)
- ABM_AM_Deregister_Request (Section 6.8 on page 76)
- ABM_MA_Deregister_Reply (Section 6.9 on page 79)
- ABM_AM_Locate_Request (Section 6.10 on page 80)
- ABM_MA_Locate_Reply (Section 6.11 on page 89)
- ABM_MA_R_U_There (Section 6.5 on page 68)
- ABM_MA_I_Am_Back_Request (Section 6.3 on page 64)
- ABM_AM_Not_Found_Request (Section 6.4 on page 66).

Address Mapper commands that originate at an MPTN Access Node and directed to the Address Mapper are referred to as *AM* commands, and those that originate at the Address Mapper and directed to an MPTN Access Node are referred to as *MA* commands. Each Address Mapper command originally flows as a request and is acknowledged by the receiver with a response. However, some *AM* command requests may initiate lengthy processes, in which case a preliminary *pending* response is returned immediately, followed later by an *MA* command reply to complete the transaction. In this case, it is the *MA* command reply which acknowledges completion of the requested process, whereas the *pending* response only serves as an indication of prolonged activity. To summarise:

- AM command requests flow from an MPTN Access Node to the Address Mapper.
- AM command responses flow from the Address Mapper to an MPTN Access Node.
- MA command requests flow from the Address Mapper to an MPTN Access Node.
- MA command responses flow from an MPTN Access Node to an address Mapper.

Most Address Mapper scenarios begin with an MPTN Access Node sending a command as a request, for example, an *ABM_AM_Enquire_Request*, to the Address Mapper.

- If the command contains an error, the Address Mapper will return the command as a negative response; for example, an *ABM_AM_Enquire_Request* response to the MPTN Access Node, indicating the error in the *Return Code* field of the ABM Header.

- If the command can be executed without delay, the Address Mapper will execute the command and notify the MPTN Access Node of the results by use of a positive response, for example, an ABM_AM_Enquire_Request response. The *Return Code* field of the ABM Header will be set to OK and optional fields within the command will be changed to reflect the result of the command.
- If the command cannot be executed without delay:
 1. The Address Mapper notifies the MPTN Access Node by returning a positive response; for example, an ABM_AM_Enquire_Request response, with the *Return Code* field of the ABM Header set to PENDING.
 2. When the requested function has been completed, the Address Mapper will notify the MPTN Access Node by use of an Address Mapper reply command; for example, an ABM_MA_Enquire_Reply command, with the *Return Code* field of the ABM Header set to indicate the result of the command.
 3. The MPTN Access Node acknowledges the reply by returning a positive response; for example, an ABM_AM_Enquire_Reply response.

6.2 ABM Header Fields Common to Address Mapper Commands

6.2.1 Fields Format

This section contains information on the ABM Header fields common to Address Mapper commands.

Table 6-1 ABM Header Fields Common to Address Mapper Commands

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
ABM header prefix		4	1
command type		1	
processing specification		1	
command length		2	
command modifier		1	1
transaction identifier		2 to 9	1
return code		3	1
return code value		1	
return code modifier		2	
source CMM routing		9 to 262	0 or 1
source CMM routing prefix	X'A1'	4	
source CMM address		5 to 258	
ABM's alias		9 to 262	0 or 1
ABM's alias prefix	X'A3'	4	
ABM's alias address		5 to 258	

6.2.2 Field Descriptions

ABM Header Prefix

Description: Each Address Mapper command includes a 4-byte prefix that identifies the command, provides processing information, and specifies the length of the command. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

Command Type

Description: The *Command Type* identifies the Address Mapper command. Possible values are:

X'A1' ABM_AM_Register_Request
 X'A2' ABM_AM_Deregister_Request
 X'A5' ABM_AM_Locate_Request
 X'A8' ABM_MA_I_Am_Back_Request
 X'B1' ABM_MA_Register_Reply
 X'B2' ABM_MA_Deregister_Reply
 X'B5' ABM_MA_Locate_Reply

X'B8' ABM_AM_Not_Found_Request
 X'E0' ABM_MA_R_U_There_Request

Format: Hexadecimal code (1 byte).

Processing Specification

Description: The *Processing Specification* is described in Section 8.1 on page 107.

Format: Unsigned binary (1 byte).

Command Length

Description: The value in the *Command Length* field represents the size of the entire Address Mapper command. Includes the four bytes used for this common prefix.

Format: Unsigned binary (2 bytes).

Command Modifier

Description: The *Command Modifier* modifies the Address Mapper command. It is used to identify various options on some of the Address Mapper commands, including:

- ABM_AM_Register_Request
- ABM_AM_Deregister_Request
- ABM_AM_Locate_Request
- ABM_MA_Locate_Reply
- ABM_MA_R_U_There_Request.

Format: Hexadecimal code (1 byte).

Transaction Identifier

Description: Used to correlate Address Mapper commands.

The originator is required to assure that this value is unique to one transaction group for all time between this ABM and the access node.

Format: Byte string

Byte	Content
------	---------

0	Length (n+1), in binary, of the transaction identifier value
---	--

1 to n	Transaction identifier value.
--------	-------------------------------

Return Code

Description: The *Return Code* field, meaningful only on a response, provides the result of the Address Mapper command. Consists of the subfields *Return Code Value* and *Return Code Modifier*.

The *Return Code Value* field (byte 0) may have one of the following values:

Value	Meaning
X'00'	OK The requested function has been performed successfully; for example, for ABM_AM_REGISTER_REQUEST, the Address Mapper has included the transport user address in its data base; for ABM_AM_LOCATE_REQUEST, the Address Mapper has found an appropriate transport provider address.
X'02'	USER_NOT_FOUND The network of the target transport user can be reached, but the transport user address is not found within that network.
X'03'	USER_NOT_REACHABLE The network of the target transport user cannot be reached.
X'04'	ADDRESS_CONFLICT An Address Mapper has discovered multiple existing registrations for the same transport user address. This differs from DUPLICATE_ADDRESS in that the duplicate existed before the function requested by this format was attempted.
X'05'	DUPLICATE_ADDRESS Either the Address Mapper or a remote network has determined that the transport user address is already in use. No entry made in the Address Mapper's data base.
X'06'	CONFLICT_WITH_INDIVIDUAL_ADDRESS The multicast group name conflicts with an individual transport user address already registered. No entry made in the Address Mapper's data base.
X'07'	PENDING The Address Mapper cannot complete the requested function without a delay. The final result of the requested function will be communicated to the MPTN Access Node using an Address Mapper command reply when it has been completed.
X'08'	UNAUTHORIZED_ACTION The MPTN Access Node is not authorised for the requested function.
X'09'	MULTICAST_GROUP_ALREADY_EXISTS The multicast group name already exists. The address of the Multicast Server will be returned in the response.

The *Return Code Modifier* field (bytes 1-2) is reserved for future use.

Source CMM Routing

Description: Specifies routing information for this command. Consists of the subfields *Source CMM Routing Prefix*, and *Source CMM Address*.

Presence Rule: Present on AM commands; optional on MA commands.

Source CMM Routing Prefix

Description: Provides information about about the source CMM of this message. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

The *Command Type* field (byte 0) is set to X'A1'.

Bits 4 and 6 of the processing specification field (byte 1) are set to 0 and 1, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Source CMM Routing Prefix.

Source CMM Address

Description: Specifies the CMM address of the source of the Address Mapper command. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

The *MPTN Qualifier* varies with the command.

The *Address Mode* field is set to X'01', indicating an individual address.

The *Node Address* field is set as defined by the *MPTN Qualifier*.

The *Local Address* field is set to X'00'.

ABM's Alias

Description: Provides the alias of the Address Mapper. Consists of the subfields *ABM's Alias Prefix*, and *ABM's Alias Address*.

Presence Rule: Present on MA commands when the Address Mapper wants to communicate a local form address to the MPTN Access Node. Optional on AM commands if one was previously returned by the Address Mapper.

ABM's Alias Prefix

Description: Provides information about Address Mapper alias. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

The *Command Type* field (byte 0) is set to X'A3'.

Bits 4 and 6 of the processing specification field (byte 1) are both set to 0. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Source CMM Routing Prefix.

ABM's Alias Address

Description: Specifies the Address Mapper's alias address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

The *MPTN Qualifier* field is set to X'7F', indicating a local address.

The *Address Mode* field is set to X'01', indicating an individual address.

The *Node Address* field is set to an implementation dependent value that assists the Address Mapper in indexing his database of address mappings.

The *Local Address* field is set to X'00'.

6.3 ABM_MA_I_Am_Back_Request

6.3.1 Command Format

Table 6-2 Format of ABM_MA_I_Am_Back_Request

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
address mapper header		10 to 541	1
count of registered pairs prefix	X'15'	4	0 or 1
count of registered pairs		2	1
volatility flag	X'16'	4	0 or 1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.3.2 Field Descriptions

Address Mapper Header

Description: Contains the Address Mapper header common to Address Mapper commands (see Section 6.2 on page 59).

The Address Mapper *Header Prefix Command Type* is set to X'A8', indicating ABM_MA_I_Am_Back_Request.

The Address Mapper *Header Command Modifier* is reserved on ABM_MA_I_Am_Back_Request.

Bit 0 of Address Mapper *Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 1, indicating a response is to be returned if the message is not recognised by an extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

Count of Registered Pairs Prefix

Description: Contains the count of transport user/providers pairs currently registered at the MPTN Address Mapper for this node. Consists of the subfields *Count of Registered Pairs Prefix* and *Count of Registered Pairs*.

Count of Registered Pairs Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'15'. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by an extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

Count of Registered Pairs is a 2-byte field which contains the actual count of user/provider pairs (that is, a single user registered with three providers is counted as three pairs).

Presence Rule: Present if the *Volatility Flag* is present and 1 or more transport user/provider pair are registered for this node.

Volatility Flag

Description: Indicates that the MPTN Address Mapper uses non-volatile storage to store the registered transport user/provider pairs. Consists of the subfield *Volatility Flag*.

Volatility Flag is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'16'. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by an extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 8.2 on page 109).

Presence Rule: Present if the Address Mapper uses non-volatile storage to store registered address pairs.

6.4 ABM_AM_Not_Found_Request

6.4.1 Command Format

Table 6-3 Format of ABM_AM_Not_Found_Request

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
address mapper header		10 to 541	1
transport user's address field		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
transport provider's address field		10 to 517	0 or 1
transport provider's address prefix	X'A8'	4	
transport provider's address		5 to 512	1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.4.2 Field Descriptions

Address Mapper Header

Description: Contains the Address Mapper header common to Address Mapper commands (see Section 6.2 on page 59).

The Address Mapper *Header Prefix Command Type* is set to X'B8', indicating ABM_AM_Not_Found_Request.

The Address Mapper *Header Command Modifier* is reserved on ABM_AM_Not_Found_Request.

Bit 0 of Address Mapper *Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 1, indicating a response is to be returned if the message is not recognised by an extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

Transport User's Address Field

Description: Contains the transport user's address. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.

Transport User's Address Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A7'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport User's Address List

Description: Specifies the transport user's address that apparently failed. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address* and *Local Address*. These fields are described in Section 8.3 on page 110.

Transport Provider's Address List

Description: Contains the transport provider's address that was used in the failed locate attempt. Consists of the subfields *Transport Provider's Address List Prefix* and *Transport Provider's Address*.

Transport Provider's Address List Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A8'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport Provider's Address

Description: Specifies one or more transport providers' address. Each address consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address* and *Local Address*. These fields are described in Section 8.3 on page 110.

6.5 ABM_MA_R_U_There

6.5.1 Command Format

Table 6-4 Format of ABM_MA_R_U_There

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
ABM header		18 to 540	1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.5.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26).

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'E0' indicating ABM_MA_R_U_There.

The *ABM Header Command Modifier* is reserved on ABM_MA_R_U_There.

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*. These fields are described in Section 8.6 on page 115.

Presence Rule: May be present on negative response. Not present in a request.

6.6 ABM_AM_Register_Request

6.6.1 Command Format

Table 6-5 Format of ABM_AM_Register_Request

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
ABM header		18 to 540	1
transport user's address field		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
transport provider's address list		9 to 516	1
transport provider's address prefix	X'AA'	4	
transport provider's address list count		1	
transport provider's address		5 to 512	1 or more
registrant's MPTN type field		6	0 or 1
registrant's MPTN type prefix	X'AD'	4	
registrant's MPTN type		1	
registrant's MPTN Qualifier		1	
user data field		5 to (2(16)-1) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16) - 5) *	
transport user's address mask field		9 to 516	0 or 1
transport user's address mask prefix	X'B0'	4	
transport user's address mask		5 to 512	
load_level field		8	0 or 1
load_level prefix	X'B1'	4	
load_level		4	
limited use cache field		5	0 or 1
limited use cache prefix	X'B3'	4	
limited use cache count		1	
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

* Note that the actual maximum length for the *User Data* field is (2(16)-1) minus the total length of all the other fields in the record.

6.6.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26.)

The *Destination User Address* may be either:

unique The address of a specific Address Mapper as described in Section 5.2 on page 26.

family The family address, as described in Section 8.3 on page 110, may be used if the unique address of the Address Mapper is not known.

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'A1' indicating ABM_AM_Register_Request.

The *ABM Header Command Modifier* indicates whether or not the addresses are to be verified for uniqueness. The *Command Modifier* may have one of the following values:

Value	Meaning
X'00'	The transport user address is <i>a priori</i> unique.
X'01'	The transport user address requires verification.
X'02'	The transport user's address is a multicast group name.

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59.)

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
X'00'	OK
X'04'	ADDRESS_CONFLICT
X'05'	DUPLICATE_ADDRESS
X'06'	CONFLICT_WITH_INDIVIDUAL_ADDRESS
X'07'	PENDING
X'09'	MULTICAST_GROUP_ALREADY_EXISTS

Transport User's Address Field

Description: Contains the transport user's address. Consists of the subfields *Transport User's Address Prefix*, and *Transport User's Address*.

Transport User's Address Prefix

Description: Provides information about the registered addresses. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

The *Command Type* field is set to X'A7'.

Bits 4 and 6 of the processing specification field (byte 1) are set to 0 and 1, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Command Prefix and the following *Transport User's Address Field* and *Transport Provider's Address List*.

Transport User's Address

Description: Specifies the transport user's address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3.1 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Transport Provider's Address List

Description: Contains a list of transport provider's addresses. The transport provider's list is in the preferred order of usage. Consists of the subfields *Transport Provider's Address Prefix*, and *Transport Provider's Address*.

Transport Provider's Address List Prefix

Description: Provides information about the transport provider's registered address. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

The *Command Type* field is set to X'AA'.

Bits 4 and 6 of the processing specification field (byte 1) are set to 0 and 1, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Command Prefix.

Transport Provider's Address List Count

Description: Specifies the number of transport provider's addresses in the list.

Transport Provider's Address

Description: Specifies one or more transport provider's address. Each address consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Registrant's MPTN Type

Description: Specifies the type of the MPTN component registering this information. Consists of the subfields *Registrant's MPTN Type Prefix*, *Registrant's MPTN Type* and *Registrant's MPTN Qualifier*.

Registrant's MPTN Type Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AD'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The valid values for the *Registrant's MPTN Type Field* are described in Section 8.4 on page 113. The valid values for the *Registrant's MPTN Qualifier* field are described in Section 8.3.1 on page 110.

Presence Rule: Present when the type of node registering this information needs to be kept by the address mapper.

User Data Field

Description: Contains optional user data associated with the transport user being registered. Consists of the subfields *User Data Prefix* and *User Data*.

User Data Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AF'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. This indicates that a negative response is not to be returned if the field is not recognised by an extended MPTN node or the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when user data is to be associated with the transport user being registered.

User Data

Description: The User Data contains user data associated with the transport user being registered.

Format: Byte string.

Transport User's Address Mask

Description: Specifies the transport user's address subnet Mask. Consists of the subfields *Transport User's Address Mask Prefix* and *Transport User's Address Mask*.

Transport User's Address Mask Prefix is an optional field prefix, as described in Section 8.2 on page 109.

The type indicator (byte 0) is set to X'B0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport User's Address Mask is in the format of an MPTN address. It indicates which bits of the transport user's address that is being registered are significant, that is, the transport user's address being registered is a wildcard.

The MPTN Address is described in Section 8.3 on page 110.

Presence Rule: Present when the transport user address being registered is incomplete, that is, a wildcard.

Load-level Field

Description: Specifies the load level. Consists of the subfields *Load Level Prefix* and *Load Level*.

Load Level Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator is set to X'B1'. The processing specification bits are all set to 0. *Load Level* is a one-byte field with valid values 0 to 256.

Presence Rule: Present when the registering entity wants the load level to be used by the Address Mapper in determining the order of transport provider addresses returned on a locate.

Limited Use Cache Field

Description: Consists of the subfields *Limited Use Cache Prefix* and *Limited Use Cache Count*.

Limited Use Cache Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator is set to X'B3'. The processing specification bits are all set to 0.

Presence Rule: Present on an ABM_AM_Register_Request when this mapping also includes a *load_level* field. It indicates that this mapping is based on conditions that are likely to change over time.

Limited Use Cache Prefix

Description: Contains the limited use cache prefix, whose presence indicates this transport user/provider mapping also includes a *load_level* field which is based on conditions that are likely to change over time. Any access node that is given this mapping should be told to store the mapping in a limited use cache.

Limited Use Cache Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'B3'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognized by an extended MPTN node, but it is required if the field is unrecognized by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Limited Use Cache Count

Description: Contains the recommended usage count for this limited cache entry. This count is the maximum number of times that a CMM should use these transport user/provider mappings before clearing them from the cache and issuing another ABM_AM_Locate_Request to get an up-to-date mapping.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*. These fields are described in Section 8.6 on page 115.

Presence Rule: May be present on negative response. Not present in a request.

6.7 ABM_MA_Register_Reply

6.7.1 Command Format

Table 6-6 Format of ABM_MA_Register_Reply

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
ABM header		18 to 540	1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.7.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26).

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'B1' indicating ABM_MA_Register_Reply.

The *ABM Header Command Modifier* is reserved on ABM_MA_Register_Reply.

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

The *Return Code Value* field may have one of the following values:

Value	Meaning
X'00'	OK
X'04'	ADDRESS_CONFLICT
X'05'	DUPLICATE_ADDRESS
X'06'	CONFLICT_WITH_INDIVIDUAL_ADDRESS
X'09'	MULTICAST_GROUP_ALREADY_EXIST

Diagnostics: The corresponding field description given under ABM_AM_Register_Request applies (see Section 6.6 on page 69).

6.8 ABM_AM_Deregister_Request

6.8.1 Command Format

Table 6-7 Format of ABM_AM_Deregister_Request

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
ABM header		18 to 540	1
transport user's address field		9 to 516	0 or 1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
transport provider's address field		9 to 516	0 or 1
transport provider's address prefix	X'A8'	4	
transport provider's address		5 to 512	
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.8.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26).

The *Destination User Address* may be either:

- unique The address of a specific Address Mapper as described in Section 5.2 on page 26.
- family The family address, as described in Section 8.3 on page 110, may be used if the unique address of the Address Mapper is not known.

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'A2' indicating ABM_AM_Deregister_Request.

The *ABM Header Command Modifier* identifies the processing required. The *Command Modifier* may have one of the following values:

Value Meaning

X'00' Clear all registered address pairs for this Access Node.

- X'01' Delete all transport users associated with this transport provider.
 X'02' Delete this transport user and all its associated transport providers.
 X'03' Delete this transport user with a particular transport provider.

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
X'00'	OK
X'07'	PENDING
X'08'	UNAUTHORIZED_ACTION

Transport User's Address Field

Description: Contains a transport user's address to be deregistered. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.

Presence Rule: Present when the *Command Modifier* is set to X'02' or X'03'.

Transport User's Address Prefix

Description: Provides information about the registered addresses. Consists of the subfields *Command Type*, *Processing Specification* and *Command Length*.

The *Command Type* field is set to X'A7'.

Bits 4 and 6 of the processing specification field (byte 1) are set to 0 and 1, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Command Prefix and the following *Transport User's Address Field*.

Transport User's Address

Description: Specifies the transport user's address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address* and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Transport Provider's Address Field

Description: Contains the transport provider's address. Consists of the subfields *Transport Provider's Address Prefix*, and *Transport Provider's Address*.

Presence Rule: Present when the *Command Modifier* is set to X'01' or X'03'.

Transport Provider's Address Prefix

Description: Provides information about the transport provider's registered address. Consists of the subfields *Command Type*, *Processing Specification*, and *Command Length*.

The *Command Type* field is set to X'A8'.

Bits 4 and 6 of the processing specification field (byte 1) are set to 0 and 1, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The value in the *Command Length* field represents the size of this entire optional field. It includes the four bytes used for the Command Prefix.

Transport Provider's Address

Description: Specifies the transport provider's address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*. These fields are described in Section 8.6 on page 115.

Presence Rule: May be present on negative response. Not present in a request.

6.9 ABM_MA_Deregister_Reply

6.9.1 Command Format

Table 6-8 Format of ABM_MA_Deregister_Reply

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
ABM header		18 to 540	1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

6.9.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26.)

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'B2' indicating ABM_MA_Deregister_Reply.

The *ABM Header Command Modifier* is reserved on ABM_MA_Deregister_Reply.

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

The *Return Code Value* field may have one of the following values:

Value Meaning

X'00' OK

X'08' UNAUTHORIZED_ACTION

Diagnostics: The corresponding field description given under ABM_AM_Deregister_Request applies (see Section 6.8 on page 76).

6.10 ABM_AM_Locate_Request

6.10.1 Command Format

Table 6-9 Format of ABM_AM_Locate_Request

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
address mapper header		10 to 541	1
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
requestor's user address field		9 to 516	1
requestor's user address prefix	X'AC'	4	
requestor's user address		5 to 512	
Type 1 locate request field		9 to 552	0 or 1
transport user's address field		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
requestor's supported providers		5 to 36	0 or 1
supported provider prefix	X'A6'	4	
supported provider qualifier list		1 to 32	
Type 2 locate request field		9 to 516	0 or 1
transport provider's address prefix	X'A8'	4	
transport provider's address		5 to 512	
Type 3 locate request field		6 to 1038	0 or 1
transport user's address field		9 to 516	0 or 1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
requested MPTN type field		6	1
requested MPTN type prefix	X'AD'	4	
requested MPTN type		1	
requested MPTN qualifier		1	
transport user's address mask field		9 to 516	0 or 1
transport user's address mask prefix	X'B0'	4	
transport user's address mask		5 to 512	
Type 1 locate response field		10 to (2(16)-1) *	0 or 1
limited use cache field		5	0 or 1
limited use cache prefix	X'B3'	4	
limited use cache count		1	
transport provider's address list prefix	X'AA'	4	1
transport provider's address list count		1	1
transport provider info field	X'AB'	5 to (2(16)-1) *	1 or more
transport provider's address		5 to 512	1
dubious validity flag	X'B2'	4	0 or 1

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
user data field		5 to (2(16)-1) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to(2(16) - 5) *	
transport user's address field		9 to 516	0 or 1
transport user's address mask prefix	X'B0'	4	
transport user's address mask		5 to 512	
Type 2 locate response field		10 to (2(16)-1) see Note	0 or 1
transport user's address list prefix	X'A9'	4	1
transport user's address list count		1	1
transport user's info field	X'AE'	5 to (2(16) - 5) *	1 or more
transport user's address		5 to 512	1 or more
user data field		5 to (2(16) - 5) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16) - 5) *	
Type 3 locate response field		10 to (2(16)-1) *	0 or 1
transport user's address list prefix	X'A9'	4	1
transport user's address list count		1	1
transport user's info field	X'AE'	15 to (2(16)-1) *	1 or more
transport user's address		5 to 512	1 or more
user data field		5 to (2(16) - 5) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16)-10) *	
associated providers address list		10 to 517	1 or more
transport provider's address list prefix	X'AA'	4	
transport provider's address list count		1	
transport provider's address		5 to 512	1 or more
Common locate response field		18 to 779	0 or 1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

* Note that the actual maximum length for the *User Data* field is (2(16)-1) minus the total length of all the other fields in the record.

6.10.2 Field Descriptions

Where a Field Name occurs more than once in a Command Format, it is described only once, in order of its first occurrence in the related Command Format table.

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26).

The *Destination User Address* may be either:

unique The address of a specific Address Mapper as described in Section 5.2 on page 26.

family The family address, as described in Section 8.3 on page 110, may be used if the unique address of the Address Mapper is not known.

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

Address Mapper Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The Address Mapper *Header Prefix Command Type* is set to X'A5', indicating ABM_AM_Locate_Request.

The Address Mapper *Header Command Modifier* indicates the type of *Locate* the MPTN Access Node is requesting. The *Command Modifier* may have one of the following values:

Value Meaning

X'01' Type 1 Locate: user-to-providers

X'02' Type 2 Locate: provider-to-users

X'03' Type 3 Locate: MPTN Type

Bit 0 of the Address Mapper *Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value Meaning

X'00' OK

X'02' USER_NOT_FOUND

X'03' USER_NOT_REACHABLE

X'04' ADDRESS_CONFLICT

X'07' PENDING

Service Mode

Description: Specification of the level of transport service required in each transport network. Consists of the subfields *Service Mode Prefix*, *MPTN Service Mode* and *User-defined Service Mode*.

Service Mode Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'05'. Bits 4 and 6 of the processing specification (byte 1) are set to 1 and 0, respectively. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present when the sender requires a specific quality of service.

MPTN Service Mode

- Description: Predefined service mode required by the transport user.
- Format: Byte string (1 byte).
- Contents: Refer to Section 8.5 on page 114 for a description of the possible values.

User-defined Service Mode

- Description: Service mode required by the transport user. When this field is supported by the MPTN node, then this value takes precedence over the value in *MPTN Service Mode*.

- Format: Byte string.

Byte Content

- | | |
|--------|--|
| 0 | Length (n + 1), in binary, of the user-defined service mode |
| 1 to n | User-defined service mode (when present). Format is ASCII character string (see Section 2.3 on page 8 for more information). |

Requestor's User Address Field

- Description: Contains the requestor's user address. Consists of the subfields *Requestor's User Address Prefix* and *Requestor's User Address*.

Requestor's User Address Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AC'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Type 1 Locate Request field

- Description: Contains the subfields needed for a type 1 locate request. Consists of the subfields *Transport User's Address Field* and *Requestor's Supported Providers*.

Limited Use Cache Field

- Description: Consists of the subfields *Limited Use Cache Prefix* and *Limited Use Cache Count*.
- Presence Rule: Present on a Type 1 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request when the Address Mapper sorted the returned list based on conditions that are likely to change over time.

Limited Use Cache Prefix

- Description: Contains the limited use cache prefix, whose presence indicates these transport user/provider mappings are returned in sorted order (for example, as a result of load balancing done by the Address Mapper) and should be stored in a limited use cache. This is due to the fact that the conditions used for sorting the list are only valid for a limited time and may change.

Limited Use Cache Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'B3'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an

extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in

Limited Use Cache Count

Description: Contains the recommend usage count for this limited cache entry. The transport user/providers mapping that is being returned are in sorted order. This count is the maximum number of times the CMM should uses these transport user/provider mappings before clearing them from the cache and issuing another ABM_AM_Locate_Request to get an up todate mapping.

Transport User's Address Field

Description: Contains the transport user address that is to be located. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.

Transport User's Address Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A7'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport User's Address is an *MPTN Address* and is described in Section 8.3 on page 110.

Presence Rule: Present on a Type 1 ABM_AM_Locate_Request request; not present otherwise.

Requestor's Supported Providers

Description: Specifies the transport provider types, or *MPTN Qualifiers*, supported by the requestor.

When more than one transport provider type is specified, the transport provider types can be specified in any order.

Consists of the subfields *Supported Provider Prefix* and *Supported Provider Qualifier List*.

Supported Provider Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A6'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0, indicating that a negative response is not required if the field is unrecognised either by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a type 1 ABM_AM_Locate_Request.

Supported Provider Qualifier List

- Description:** List of transport provider types supported by the requester.
- Format:** List of 1-byte unsigned binary values. Number of elements in the list is determined by subtracting 4 from the value stored in length subfield (bytes 2 and 3) of the *User Characteristics Prefix* field.
- Contents:** The values that can appear in this field are defined in Section 8.3.1 on page 110.

Type 2 Locate Request Field

- Description:** Contains the subfields needed for a type 2 locate request. Consists of the subfields *Transport Provider's Address Prefix* and *Transport Provider's Address*.
- Transport Provider's Address Prefix* is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A8'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.
- Presence Rule:** Present on a type 2 ABM_AM_Locate_Request request; not present otherwise.

Type 3 Locate request Field

- Description:** Contains the subfields needed for a type 3 locate request. Consists of the subfields *Transport User's Address Field*, *Requested MPTN Type Field* and *Transport User's Address Mask Field*.
- A Type 3 locate will return all registrations made by nodes of the requested *MPTN Type/Qualifier*. An optional transport user's address and mask may be specified to limit the search.

Transport User's Address Field

- Description:** Contains the subfields needed to specify the optional transport user's address on a type 3 locate request. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.
- Transport User's Address Prefix* is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A7'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.
- Presence Rule:** Present on a type 3 ABM_AM_Locate_Request request when the scope of the search is to be limited.

Transport User's Address Mask field

Description: Contains the subfields needed to specify the optional transport user's address mask on a type 3 locate request. When present, the mask indicates that the *TransportUser'sAddress* specified in the Type 3 locate request field is to be treated as a wildcard, that is, the mask specifies which bits of the address are significant in the search. Consists of the subfields *Transport User's Address Mask Prefix* and *Transport User's Address Mask*.

Transport User's Address Mask Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'B0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport User's Address Mask is in the format of an MPTN address. It indicates which bits of the requested transport user's address are significant, that is, the requested transport user's address is a wildcard. The MPTN Address is described in Section 8.3 on page 110.

Presence Rule: Present on a type 3 ABM_AM_Locate_Request request when the scope of the search is to be limited.

Type 1 Locate Response Field

Description: Contains the registered provider addresses associated with the requested user. Consists of the subfields *Limited Use Cache Field*, *Transport Provider's Address List Prefix*, *Transport Provider's Address List Count*, *Transport Provider's Info Field* and *Transport User's Address Mask Field*.

Transport Provider's Address List Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AA'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a Type 1 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request, when the *Return Code Value* field is set to OK; not present otherwise.

Transport Providers Info Field

Description: Contains the address and optional user data for each transport provider found for a type 1 locate. Consists of the subfields *Transport Provider's Address*, *Dubious Validity Flag* and *User Data Field*.

Transport Provider's Info Field is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'AB'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a Type 1 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request, when the *Return Code Value* field is set to OK; not present otherwise.

Dubious Validity Flag

Description: Contains the dubious validity flag, whose presence indicates that this transport user/provider mapping is dubious, that is, a previous transport user was unable to successfully contact the requested transport user using this transport provider.

Dubious Validity Flag is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'B2'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a Type 1 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request when a previous user was unable to successfully reach the requested transport user using this transport provider.

Type 2 Locate Response Field

Description: Contains all the registered user addresses associated with the requested provider. Consists of the subfields *Transport User's Address List Prefix*, *Transport User's Address List Count* and *Transport User's Info Field*.

Transport User's Address List Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A9'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a Type 2 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request, when the *Return Code Value* field is set to OK; not present otherwise.

Transport User's Address List Count

Description: Specifies the number of transport user's addresses in the list.

Transport User's Info Field

Description: Specifies the transport user address and optional user data for each user associated with the requested provider address. Consists of the subfields *Transport User's Address*, *User Data Field* and *Associated Providers Address List*.

Transport User's Info Field is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'??'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as

described in Section 8.2 on page 109.

Associated Providers Address List is only present on a Type 3 Locate Response; it is invalid on a Type 2 Locate Response.

Associated Providers Address List

Description: Specifies the number of transport user's addresses in the list.
May not be needed.

Type 3 Locate Response Field

Description: Contains all the registered user addresses and associated providers registered by a node of the requested MPTN Type. Consists of the subfields *Transport User's Address List Prefix*, *Transport User's Address List Count* and *Transport User's Info Field*.

Transport User's Address List Prefix is an optional field prefix, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A9'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by an extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on a Type 3 ABM_AM_Locate_Request response and ABM_MA_Locate_Reply request, when the *Return Code Value* field is set to OK; not present otherwise.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*. These fields are described in Section 8.6 on page 115.

Presence Rule: May be present on negative response. Not present in a request.

6.11 ABM_MA_Locate_Reply

6.11.1 Command Format

Table 6-10 Format of ABM_MA_Locate_Reply

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
address mapper header		10 to 541	1
service mode		6 to 260	0 or 1
service mode prefix	X'05'	4	
MPTN service mode		1	
user-defined service mode		1 to 255	
requestor's user address field		9 to 516	1
requestor's user address prefix	X'AC'	4	
requestor's user address		5 to 512	
Type 1 locate request field		9 to 552	0 or 1
transport user's address field		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
requestor's supported providers		5 to 36	0 or 1
supported provider prefix	X'A6'	4	
supported provider qualifier list		1 to 32	
Type 2 locate request field		9 to 516	0 or 1
transport provider's address prefix	X'A8'	4	
transport provider's address		5 to 512	
Type 3 locate request field		6 to 1038	0 or 1
transport user's address field		9 to 516	0 or 1
transport user's address prefix	X'A7'	4	
requested MPTN type field		6	1
requested MPTN type prefix	X'AD'	4	
requested MPTN type		1	
requested MPTN qualifier		1	
transport user's address mask field		9 to 516	0 or 1
transport user's address mask prefix	X'B0'	4	
transport user's address mask		5 to 512	
Type 1 locate response field		10 to (2(16)-1) *	0 or 1
limited use cache field		5	0 or 1
limited use cache prefix	X'B3'	4	
limited use cache count		1	
transport provider's address list prefix	X'AA'	4	1
transport provider's address list count		1	1
transport provider info field	X'AB'	5 to (2(16)-1) *	1 or more
transport provider's address		5 to 512	1
dubious validity flag	X'B2'	4	0 or 1
user data field		5 to (2(16)-1) *	0 or 1

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
user data prefix	X'AF'	4	
user data		1 to (2(16) - 5) *	
transport user's address mask field		9 to 516	0 or 1
transport user's address mask prefix	X'B0'	4	
transport user's address mask		5 to 512	
Type 2 locate response field		10 to (2(16)-1) *	0 or 1
transport user's address list prefix	X'A9'	4	1
transport user's address list count		1	1
transport user's info field	X'AE'	5 to (2(16) - 5) *	1 or more
transport user's address		5 to 512	1 or more
user data field		5 to (2(16) - 5) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16) - 5) *	
Type 3 locate response field		10 to (2(16)-1) *	0 or 1
transport user's address list prefix	X'A9'	4	1
transport user's address list count	1	1	
transport user's info field	X'AE'	15 to (2(16)-1) *	1 or more
transport user's address		5 to 512	1 or more
user data field		5 to (2(16) - 5) *	0 or 1
user data prefix	X'AF'	4	
user data		1 to (2(16)-10) *	
associated providers address list		10 to 517	1 or more
transport provider's address list prefix	X'AA'	4	
transport provider's address list count		1	
transport provider's address		5 to 512	1 or more
Common locate response field		18 to 779	0 or 1
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

* Note that the actual maximum length for the *User Data* field is (2(16)-1) minus the total length of all the other fields in the record.

6.11.2 Field Descriptions

For field descriptions not listed in this section, the corresponding field descriptions under ABM_AM_Locate_Request apply (see Section 6.10 on page 80).

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26).

Service Mode subfields set by the Address Mapper include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-defined Service Mode* is not applicable to Address Mapper commands.

ABM Header

Description: Contains the ABM header common to Address Mapper commands (see Section 6.2 on page 59).

The *ABM Header Prefix Command Type* is set to X'B5' indicating ABM_MA_Locate_Reply.

The *ABM Header Command Modifier* indicates the type of Locate the MPTN Access Node requested. The *Command Modifier* may have one of the following values:

Value Meaning

X'01' Type 1 Locate: user-to-providers

X'02' Type 2 Locate: provider-to-users

X'03' Type 3 Locate: MPTN Type

Bit 0 of *ABM Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 6.2 on page 59).

The *Return Code Value* field may have one of the following values:

Value Meaning

X'00' OK

X'02' USER_NOT_FOUND

X'03' USER_NOT_REACHABLE

X'04' ADDRESS_CONFLICT

X'06' CONFLICT_WITH_INDIVIDUAL_ADDRESS

X'09' MULTICAST_GROUP_ALREADY_EXIST

Multicast Server Formats

7.1 General Description

Multicast Server commands are carried in the *User Datagram* field of an multicast server datagram. Each Multicast Server command contains an Multicast Server Header (see Section 7.2 on page 94.) followed by any additional fields associated with the specific Multicast Server commands.

The Multicast Server commands are:

- MCS_CM_Register_Request (see Section 7.3 on page 97)
- MCS_MC_Register_Reply (see Section 7.4 on page 99)
- MCS_MC_R_U_There_Request (see Section 7.5 on page 100)
- MCS_AC_Join_Request (see Section 7.6 on page 101)
- MCS_AC_Quit_Request (see Section 7.7 on page 103)
- MCS_AC_Distribute_Request (see Section 7.8 on page 104).

7.2 Header Fields Common to Multicast Server Commands

7.2.1 Fields Format

This section contains information on the Multicast Server Header fields common to Multicast Server commands.

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
multicast server header prefix		4	1
command type		1	
processing specification		1	
command length		2	
command modifier		1	1
transaction identifier		2 to 9	1
return code		3	1
return code value			1
return code modifier			2
source CMM routing		9 to 262	0 or 1
source CMM routing prefix	X'A1'	4	
source CMM address		5 to 258	

Table 7-1 MC Server Header Fields Common to Multicast Server Commands

All subsequent fields following the Multicast Server Header require a prefix whether they are optional or mandatory to facilitate parsing of the Multicast Server command.

7.2.2 Field Descriptions

Multicast Server Header Prefix

Description: Each Multicast Server command includes a 4-byte prefix that identifies the command, provides processing information, and specifies the length of the command. Consists of the subfields *Command Type*, *Processing Specification* and *Command Length*.

Command Type

Description: The *Command Type* identifies the Multicast Server command.

Format: Hexadecimal code (1 byte).

Contents: Possible values are:

Value	Command
X'C0'	MCS_CM_Register_Request
X'C1'	MCS_MC_Register_Reply
X'C8'	MCS_AC_Join_Request
X'CA'	MCS_AC_Quit_Request

X'CC' MCS_AC_Distribute_Request
 X'E1' MCS_MC_R_U_There_Request

Processing Specification

Description: The *Processing Specification* is described in Section 8.1 on page 107.
 Format: Unsigned binary (1 byte).

Command Length

Description: The value in the *Command Length* field represents the size of the entire Multicast Server command. Includes the four bytes used for this common prefix.
 Format: Unsigned binary (2 bytes)

Command Modifier

Description: The *Command Modifier* is reserved for future use.
 Format: Hexadecimal code (1 byte).

Transaction Identifier

Description: Used to correlate Multicast Server commands.
 The originator is required to assure that this value is unique to one transaction group for all time between this Multicast Server and the access node.

Format: Byte string

Byte Content

0 Length (n + 1), in binary, of the transaction identifier value.
 1 to n Transaction identifier value.

Return Code

Description: The *Return Code* field provides the result of the Multicast Server command. Consists of the subfields *Return Code Value* and *Return Code Modifier*.

The *Return Code Value* field (byte 0) may have one of the following values:

Value Meaning

X'00' OK
 The requested function has been performed successfully; for example, for MCS_AC_Join_Request, the Multicast Server has included the transport user address in the group; for MCS_AC_Quit_Request, the Multicast Server has removed the transport user address from the group.

X'01' NEW_GROUP
 The requested multicast group did not exist, but was created.

X'05' SERVER_ALREADY_EXISTS
 A Multicast Server already exists. No entry made in the Address Mapper's data base.

X'07' PENDING
 The Multicast Server cannot complete the requested function without a delay. The final result of the requested function will be communicated to the MPTN Access Node using an Multicast Server command reply when it has been completed.

X'08' UNSUCCESSFUL
 The Multicast Server cannot complete the requested function.

The *Return Code Modifier* field (bytes 1-2) is reserved for future use.

Source CMM Routing

Description: Specifies routing information for this command. Consists of the subfields *Source CMM Routing Prefix*, and *Source CMM Address*.

Source CMM Routing Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A1'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not to be returned if the field is not recognised by a non-destination extended MPTN node, but is required if the field is not recognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Presence Rule: Present on AM commands; optional on MA commands.

Source CMM Address

Description: Specifies the CMM address of the source of the Multicast Server command. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

The *MPTN Qualifier* varies with the command.

The *Address Mode* field is set to X'01', indicating an individual address.

The *Node Address* field is set as defined by the *MPTN Qualifier*.

The *Local Address* field is set to X'00'.

7.3 MCS_CM_Register_Request

7.3.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
multicast server's address		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
diagnostics (Only allowed in response.)	X'F0'	18 to 779	0 or more

Table 7-2 Format of MCS_CM_Register_Request

7.3.2 Field Descriptions

MPTN_Datagram Header

Description: Contains the MPTN_Datagram header (see Section 5.2 on page 26). The MPTN_Datagram header, while not actually a part of the Multicast Server command, is shown in the figure to provide the diagnostician with a complete description of the message as it appears in the line flow. It has been included for purely informational purposes and does not imply that the Multicast Server directly builds the MPTN_Datagram header or directly retrieves information from it.

Service Mode subfields set by the Multicast Server include:

- *MPTN Service Mode* is set to X'01', indicating no specific service mode is required.
- *User-Defined Service Mode* is not applicable to Multicast Server commands.

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'C0', indicating MCS_CM_Register_Request.

The *Multicast Server Header Command Modifier* indicates the type of transport provider supported by the Multicast Server. The *Command Modifier* may have one of the following values:

Value	Meaning
X'02'	IP
X'07'	OSI
X'0B'	SNA

X'12' NetBIOS

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 7.2 on page 94).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
X'00'	OK
X'07'	PENDING

Multicast Server's Address

Description: Contains a multicast server's address to be registered. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.

Transport User's Address Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A7'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by a non-destination extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

Transport User's Address

Description: Specifies the multicast server's transport user's address. Consists of the subfields *MPTN Qualifier*, *Address Mode*, *Node Address*, and *Local Address*. These fields are described in Section 8.3 on page 110.

MPTN Qualifier values of X'7F' (local form address) and X'F0' (Address Mapper family address) are not valid.

Diagnostics

Description: Describes why the message was rejected. Consists of the subfields *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address*, and *Error Detector Data*.

Diagnostics Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'F0'. Bits 4 and 6 of the processing specification (byte 1) are both set to 0, indicating that a negative response is not required if the field is unrecognised either by a non-destination extended MPTN node or by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

The remaining subfields are described in Section 8.6 on page 115.

Presence Rule: May be present on negative response. Not present in a request.

7.4 MCS_MC_Register_Reply

7.4.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
multicast server's address		9 to 516	1
transport user's address prefix	X'A7'	4	
transport user's address		5 to 512	
diagnostics (only allowed in response)	X'F0'	18 to 779	0 or more

Table 7-3 Format of MCS_MC_Register_Reply

7.4.2 Field Descriptions

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'C1', indicating MCS_MC_Register_Reply.

The *Multicast Server Header Command Modifier* indicates the type of transport provider supported by the Multicast Server. The *Command Modifier* may have one of the following values: *

Value	Meaning
X'02'	IP
X'07'	OSI
X'0B'	SNA
X'12'	NetBIOS

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 7.2 on page 94).

The *Return Code Value* field may have one of the following values:

Value	Meaning
X'00'	OK
X'05'	SERVER_ALREADY_EXISTS

7.5 MCS_MC_R_U_There_Request

7.5.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
diagnostics (only allowed in response).	X'F0'	18 to 779	0 or more

Table 7-4 Format of MCS_MC_R_U_There_Request

7.5.2 Field Descriptions

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'E1', indicating MCS_MC_R_U_There_Request.

The *Multicast Server Header Command Modifier* is reserved on MCS_MC_R_U_There_Request.

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 7.2 on page 94).

7.6 MCS_AC_Join_Request

7.6.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
multicast group name		9 to 516	1
transport user's address field	X'A7'	4	
transport user's address		5 to 512	
diagnostics (only allowed in response).	X'F0'	18 to 779	0 or more

Table 7-5 Format of MCS_MC_R_U_There_Request

7.6.2 Field Descriptions

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'C8', indicating MCS_AC_Join_Request.

The *Multicast Server Header Command Modifier* indicates the type of transport provider the requester requires. The *Command Modifier* may have one of the following values:

Value	Meaning
-------	---------

X'02'	IP
-------	----

X'07'	OSI
-------	-----

X'0B'	SNA
-------	-----

X'12'	NetBIOS
-------	---------

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate (see Section 7.2 on page 94).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
X'00'	OK
X'01'	NEW_GROUP
X'08'	UNSUCCESSFUL

Multicast Group Name

Description: Contains the multicast group name. Consists of the subfields *Transport User's Address Prefix* and *Transport User's Address*.

Transport User's Address Prefix is an optional prefix field, as described in Section 8.2 on page 109. The type indicator (byte 0) is set to X'A7'. Bits 4 and 6 of the processing specification (byte 1) are set to 0 and 1, respectively. This indicates that a negative response is not required if the field is unrecognised by a non-destination extended MPTN node, but it is required if the field is unrecognised by the destination. The remaining bits in the processing specification are set as described in Section 8.2 on page 109.

7.7 MCS_AC_Quit_Request

7.7.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
multicast group name		9 to 516	1
transport user's address field	X'A7'	4	
transport user's address		5 to 512	
diagnostics (only allowed in response).	X'F0'	18 to 779	0 or more

Table 7-6 Format of MCS_AC_Quit_Request

7.7.2 Field Descriptions

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'CA', indicating MCS_AC_Quit_Request.

The *Multicast Server Header Command Modifier* is reserved on MCS_AC_Quit_Request.

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate. (see Section 7.2 on page 94).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
-------	---------

X'00'	OK
-------	----

7.8 MCS_AC_Distribute_Request

7.8.1 Command Format

Field Name	Identifier (if any)	Size Range (in bytes)	Occurrences
MPTN_Datagram header		17 to 1058	1
multicast server header		10 to 279	1
multicast group name		9 to 516	1
transport user's address field	X'A7'	4	
transport user's address		5 to 512	
diagnostics (only allowed in response).	X'F0'	18 to 779	0 or more
user datagram (optional in response).		0 to (2 ³² - 28) (See Note)	0 or 1

Table 7-7 Format of MCS_AC_Distribute_Request

Because the record length, when present, includes itself, the maximum length of the user data is 4 bytes less when the length field is present.

7.8.2 Field Descriptions

Multicast Server Header

Description: Contains the Multicast Server header common to Multicast Server commands. See Section 7.2 on page 94.

The *Multicast Server Header Prefix Command Type* is set to X'CC', indicating MCS_AC_Distribute_Request.

The *Multicast Server Header Command Modifier* is reserved on MCS_AC_Distribute_Request.

Bit 0 of *Multicast Server Header Prefix Processing Specification* is set to indicate whether this is a request or a response. Bit 4 is set to 0, indicating a response is not to be returned if the message is not recognised by a non-destination extended MPTN node. Bit 6 is set to 1, indicating a response is to be returned if the message is not recognised by the destination. The rest of the bits are set as appropriate. (see Section 7.2 on page 94).

The *Return Code Value* field, meaningful only on a response, may have one of the following values:

Value	Meaning
X'00'	OK

User Datagram

Description: The datagram containing the user's data.

Presence Rule: Required in a request, not required in a response.

Format: Byte string

Formats Common to Multiple Messages

This chapter contains information that is applicable to more than one MPTN message. It is presented in this chapter for ease of reference.

8.1 Common Prefix for MPTN Commands

Each MPTN command includes a 4-byte prefix, referred to in this book as the “common prefix” field. This prefix identifies which command this is, provides processing information, and specifies the length of the command.

The format of this prefix is as follows:

Byte	Content
0	Type indicator for this command. Possible values are:
X'80'	MPTN_Connect
X'81'	MPTN_Datagram
X'83'	MPTN_DG_OOB_Data
X'84'	MPTN_DG_KEEPLIVE_Hdr
X'8E'	MPTN_Syntax_Mapper_Signal_Datagram
X'8F'	MPTN_Cntrl_Datagram

Flag field that indicates whether this is a request or response, and also provides processing information.

Bit	Meaning
0	When set to 1, indicates that this is a response. Otherwise, this is a request.
1	Reserved in a request. When set to 1 in a response, indicates that this is a negative response.
2	Reserved in a request and a positive response. When set to 1, indicates that the command was recognised by the destination but rejected.
3	Reserved.
4	When set to 1 in a request, indicates that a non-destination extended MPTN node must reject the command if it is unrecognised by sending a negative response to the originator. When set to 0 in a request, indicates that a non-destination extended MPTN node must forward the unrecognised command to the destination. The bit is forwarded without modification in a response.
5	Reserved in a request. When set to 1 in a response, indicates that a non-destination extended MPTN node did not recognise this command. Bits 4 and 5 both set to 1 in a response indicate that the command failed because it was not recognised by a non-destination extended MPTN node.

- 6 When set to 1 in a request, indicates that the destination must reject the command if it is unrecognised. When set to 0 in a request, indicates that the destination is to discard the unrecognised command.
The bit is returned without modification in a response.
- 7 Reserved in a request. When set to 1 in a response, indicates that the destination did not recognise this command.
Bits 6 and 7 both set to 1 in a response indicate that the command failed because it was not recognised by the destination.
- 2 to 3 Length, in binary, of this command. Includes the four bytes used for this common prefix.

8.2 Prefix for Optional Fields

Each optional field is preceded by a 4-byte prefix. This prefix identifies which optional field this is, provides processing information, and specifies the length of the optional field.

The format of this prefix is as follows:

Byte	Content
0	Type indicator for this optional field. Possible values are listed in Section 9.2 on page 120.
1	Processing specification for this optional field.
	Bit Meaning
	0 to 3 Reserved
	4 When set to 1 in a request, indicates that a ' non-destination extended MPTN node must reject the command if this optional field is unrecognised. Echoed in a response.
	5 Reserved in a request. When set to 1 in a response, indicates that a non-destination extended MPTN node did not recognise this optional field.
	Bits 4 and 5 both set to 1 in a response indicate that the command failed because this optional field was not recognised by a non-destination extended MPTN node.
	6 When set to 1 in a request, indicates that the destination must reject the command if this optional field is unrecognised. Echoed in a response.
	7 Reserved in a request. When set to 1 in a response, indicates that the destination did not recognise this optional field.
	Bits 6 and 7 both set to 1 in a response indicate that the command failed because this optional field was not recognised by the destination.
2 to 3	Length, in binary, of this optional field. Includes the four bytes used for this optional field prefix.

8.3 MPTN Addresses

Addresses used in MPTN messages have a common format. (MPTN address formats are also discussed in Chapter 1. Each MPTN address consists of an *MPTN Qualifier*, an *Address Mode*, a *Node Address*, and a *Local Address*. These subfields are described in the sections that follow.

When an address used in an MPTN message is optional, it is preceded by the 4-byte prefix used for all optional fields, described in Section 8.2 on page 109.

8.3.1 MPTN Qualifier

An MPTN qualifier is a 1-byte hexadecimal code that identifies the “address family” to which an address belongs. The possible values are:

X'02' IP address. Address values will be encoded in binary.

For more information on how IP addresses are encoded, refer to **Internetworking with TCP/IP: Principles, Protocols and Architecture**, (second edition), D. E. Comer, published by Prentice Hall, Englewood Cliffs, NJ, 1991.

X'07' OSI TSAP address. Address values will be encoded in binary.

For more information on how OSI addresses are encoded, refer to **The Open Book: A Practical Perspective on OSI**, M. T. Rose, published by Prentice Hall, Englewood Cliffs, NJ, 1990.

X'0B' SNA network-qualified LU name. Address values will be encoded in EBCDIC.

For more information on how SNA names are encoded, refer to **Systems Network Architecture: Formats**, IBM Corporation;

X'12' NetBIOS name. Address values will be encoded in binary.

For more information on how NetBIOS addresses are encoded, refer to **Local Area Network: Technical Reference**, IBM Corporation.

X'16' IPX/SPX Address. Address values will be encoded in binary. The node address is a X'0A', followed by a 4-byte network address and a 6-byte node address. For SPX, the local address is a X'05' followed by a 2-byte socket number and a 2-byte connection id. For IPX, the local address is a X'03' followed by a 2-byte socket number.

For more information on how IPX/SPX addresses are encoded, refer to the referenced document **Analyzing NOVELL Network**.

X'7C' Old SNA (Downstream LUs) Address. Address values will be encoded in binary. The node address is a 1 byte length followed by the ID block/ID num which is an 8-byte number.

For more information on how SNA addresses are encoded, refer to **Systems Network Architecture: Formats** (available from IBM Corporation).

X'7F' Local form address. Address values depend on the sending system type.

X'F0' Address Mapper family address. Address values are encoded in hexadecimal.

When the specific transport address of the Address Mapper is not known, the Address Mapper family address may be encoded as:

- The *Address Mode* field is set to X'01', indicating an individual address.
- The *Node Address* field is set to X'02F0', indicating the Address Mapper family address.

- The *Local Address* field is set to X'01', indicating the Address Mapper local address.

Depending on which address family an address is specified in, it will have a different maximum size.

8.3.2 Address Mode

The address mode used in an MPTN address is a 1-byte hexadecimal code that identifies the type of addressing used. Possible values are:

X'01'	Individual address
X'02'	Group address (used for multicast datagrams)
X'03'	Value used for datagrams when it is unknown whether it is unicast or multicast.
X'04'	Address mapper client
X'05'	Address mapper server
X'06'	Multicast server

8.3.3 Node Address

The node address in an MPTN address is the transport address by which the node can be located. This address has a variable length, and therefore includes a 1-byte length field. Since a null node address¹ is not permitted, the node address length field will take values from 2 to 255 bytes. A node address used with IP (MPTN qualifier = X'02') corresponds to an IP address. A node address used with OSI (MPTN qualifier = X'07') corresponds to an NSAP address. For SNA (MPTN qualifier = X'0B'), the node address corresponds to a network-qualified LU name, and for NetBIOS (MPTN qualifier = X'12'), to a NetBIOS name.

The format of the node address is:

Byte	Content
0	Length (n + 1), in binary, of the node address.
1 to n	Node address.

8.3.4 Local Address

A local address can be used in several address families. This address has a variable length, and therefore includes a 1-byte length field. Since a null local address is permitted, the local address length field will take values from 1 to 255 bytes. (One byte is always required to specify the length of the local address.)

Local addresses are not used with fully-qualified SNA LU names (MPTN qualifier = X'0B') nor with NetBIOS names (MPTN qualifier = X'12').

A local address used with IP (MPTN qualifier = X'02') corresponds to a port address. A local address used with OSI (MPTN qualifier = X'07') corresponds to a TSAP.

1. A *null address* field of any type consists of only the one-byte length field (containing X'01'). There is no address value.

The format of the local address is:

Byte	Content
0	Length (n + 1), in binary, of the local address.
1 to n	Local address.

8.4 MPTN Type

This field is used to identify what type of MPTN component registered certain information with the address mapper.

MPTN Types X'00' through X'05' are defined, and have the following meaning:

- X'01' Non-MPTN Node
- X'02' MPTN Access Node
- X'04' Extended MPTN Node
- X'08' Address Mapper
- X'16' Multicast Server

8.4.1 Direct TLPB User Type

This field is used to identify what type of direct TLPB user this MPTN connect, or MPTN datagram is intended for.

Direct TLPB User Type X'01' is defined, and has the following meaning:

- X'01' Reserved.

8.5 MPTN Service Modes

Several MPTN messages include a service mode field. This field is used when the transport user requires a certain level of service, to indicate which service mode is required.

Service modes X'00' through X'05' are defined, and have the following semantics:

Mode	Semantics
-------------	------------------

X'00'	Only user-defined service mode is specified. No MPTN-defined service mode will be used as a default.
X'01'	No specific service mode is required.
X'02'	High bandwidth is required.
X'03'	Fast response time is required.
X'04'	Secure service with high bandwidth is required.
X'05'	Secure service with fast response time is required.

8.6 Diagnostic Values

Diagnostics can be sent on any negative response. When used, they provide information about the reason for the failure of the message.

A negative response message can include more than one Diagnostics field. The subfields of the Diagnostics field are *Diagnostics Prefix*, *Primary Return Code*, *Secondary Return Code*, *Error Detector Address* and *Error Detector Data*. The *Diagnostics Prefix* is an optional prefix field (as described in Section 8.2 on page 109), having its type indicator (byte 0) set to X'F0'. The remaining subfields are described in the sections that follow.

8.6.1 Primary Return Code Values

The primary return code describes the primary reason for the failure of the message. The format of this field is as follows:

Byte	Content
0	Reserved.
1	1-byte hexadecimal code of the command type that was in error.
2 to 3	Primary return code.

The following values are defined for this field:

X'0001'	Connection limits exceeded
X'0002'	User not found
X'0003'	User not reachable
X'0006'	Service mode not supported
X'0007'	Rejected by user
X'0008'	User not listening
X'0009'	Time To Live counter expired
X'0014'	User characteristics mismatch
X'0015'	Compensation unrecognised
X'0016'	Compensation mismatch
X'0017'	Error in user data
X'001E'	Connection data unexpected
X'001F'	Connection data missing
X'0020'	Compensations Required field missing
X'0029'	Error in destination address
X'002A'	Error in source address
X'002B'	Optional fields out of sequence
X'002C'	Error in correlator
X'002D'	Length error: field too long
X'002E'	Length error: field too short

X'002F'	Error in receiver connection alias
X'0032'	Format error
X'0033'	Invalid header in &mdgconn.
X'003C'	Internal processing error

Primary return codes X'0001', X'0002', X'0003', X'0020', X'0029', X'002A', X'002C', X'002D', X'002E', X'0032' and X'003C' provide additional diagnostic information through use of a secondary return code. Secondary return codes are described in the next section.

8.6.2 Secondary Return Code Values

Three alternative uses and formats are defined for this field. Format 1 specifies an offset into the message where an error was detected. This value is given relative to the start of the common prefix field, assuming offset 0 for the first byte of that field. Format 2 describes the secondary reason for the failure, where the secondary return code is defined in the context of the primary return code. Format 3 identifies the optional field in error and the instance of the field if multiple instances are present in the request.

The format of this field is as follows:

Byte	Content
------	---------

0	Format of the Secondary Return Code.
---	--------------------------------------

The following values are defined for this field:

X'00'	Format 1
X'80'	Format 2
X'C0'	Format 3

1	Reserved
---	----------

2 to 3	Dependent on Format:
--------	----------------------

Format 1: Offset to error in message

Format 2: For primary return code = X'0001':

X'0001'	Rejected by Access Node
---------	-------------------------

X'0002'	Rejected by a node that implements MPTN extensions
---------	--

For primary return code = X'0002':

X'0005'	Address unknown
---------	-----------------

X'0006'	Qualifier unknown
---------	-------------------

For primary return code = X'0029' or X'002A':

X'000E'	Unrecognised MPTN qualifier
---------	-----------------------------

X'000F'	Unrecognised address mode
---------	---------------------------

X'0010'	Invalid address mode
---------	----------------------

X'0011'	Missing node address
---------	----------------------

X'0012'	Node address too long
---------	-----------------------

X'0013' Invalid node address

For primary return code = X'002C':

X'0018' Out of range

X'0019' Duplicate

For primary return code = X'0032':

X'001B' Error in fixed field

For primary return code = X'003C':

X'001E' Temporary error

X'001F' Permanent error

Format 3: For primary return code = X'0020', X'002D', or X'002E':

Byte	Meaning
0	Field identifier of the optional field in error.
1	Index (starting from 0) of the instance of the field having the error.

8.7 Error Detector Address

The error detector address contains the address of the node that detected the failure. It is an MPTN address, and is therefore structured according to the description in Section 8.3 on page 110. In this usage, the *Local Address* subfield is always present, but may or may not include an address value.

8.8 Error Detector Data

The node that detects the failure is allowed to send up to 254 bytes of additional information related to the failure. The format of this field is as follows:

Byte	Content
------	---------

0	Length ($n + 1$), in binary, of the error detector data.
---	--

1 to n	Error data specified by the error detector. Format for this data is byte string.
----------	--

9.1 Identifiers for MPTN Messages

Each MPTN message (except the MPTN headers described in Chapter 4) is identified by a 1-byte value that appears as the first byte of the *Common Prefix* subfield of the message. (The location of the *Common Prefix* subfield is explained in the individual chapters.) The identifiers, and the messages they identify, are:

Identifier	MPTN Message
X'80'	MPTN_Connect
X'81'	MPTN_Datagram
X'83'	MPTN_DG_OOB_Data
X'84'	MPTN_DG_KEEPLIVE_Hdr
X'8E'	MPTN_Syntax_Mapper_Signal_Datagram
X'8F'	MPTN_Cntrl_Datagram

9.2 Identifiers for Optional Fields

Each optional field used within MPTN messages is identified by a 1-byte value that appears as the first byte of the optional field. The identifiers, and the fields they identify, are given in the following table. The final column lists the formats in which this optional field can appear. (The identifiers are listed in ascending order of their hexadecimal identifier.)

Hex Value	Optional Field Name	Formats That Use This Field
X'04'	direct TLPB user type	MPTN_Connect, MPTN_Datagram, MPTN_Cntrl_Datagram, MPTN_Syntax_Mapper_Signal_Datagram
X'05'	service mode	MPTN_Connect, MPTN_Datagram, MPTN_Cntrl_Datagram
X'07'	sequence number	MPTN_Datagram, MPTN_Cntrl_Datagram, MPTN_Syntax_Mapper_Signal_Datagram
X'0A'	connection data	MPTN_Connect
X'12'	retry	MPTN_Datagram, MPTN_Cntrl_Datagram
X'15'	count of registered pairs	ABM_MA_I_Am_Back_Request
X'16'	volatility flag	ABM_MA_I_Am_Back_Request
X'18'	user characteristics	MPTN_Connect
X'19'	compensations required	MPTN_Connect
X'1A'	optional compensations	MPTN_Connect
X'1C'	node initialisation ID	MPTN_Connect, MPTN_Datagram, MPTN_Cntrl_Datagram, MPTN_Syntax_Mapper_Signal_Datagram
X'28'	sender connection alias	MPTN_DG_OOB_Data
X'29'	receiver connection alias	MPTN_DG_OOB_Data
X'2A'	source provider	MPTN_Datagram, MPTN_Cntrl_Datagram
X'2B'	destination provider	MPTN_Datagram, MPTN_Cntrl_Datagram
X'2D'	segment specification	MPTN_Datagram, MPTN_Cntrl_Datagram
X'2E'	maximum datagram size	MPTN_Datagram, MPTN_Cntrl_Datagram
X'A1'	source CMM routing	Address Mapper header, Multicast Server header
X'A3'	address mapper's alias	Address Mapper header
X'A6'	requestor's supported providers	ABM_AM_Locate_Request
X'A7'	transport user's address	ABM_MA_I_Am_Back_Request, ABM_AM_Register_Request, ABM_AM_Deregister_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply, MCS_CM_Register_Request, MCS_MC_Register_Reply, MCS_AC_Join_Request, MCS_AC_Quit_Request, MCS_AC_Distribute_Request
X'A8'	transport provider's address	ABM_AM_Not_Found_Request, ABM_AM_Deregister_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'A9'	transport user's address list	ABM_AM_Locate_Request, ABM_MA_Locate_Reply

Hex Value	Optional Field Name	Formats That Use This Field
X'AA'	transport provider's address list	ABM_AM_Register_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'AB'	transport provider info list	ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'AC'	requestor's user address	ABM_AM_Locate_Request
X'AD'	registrant/requested MPTN type	ABM_AM_Register_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'AE'	transport user info list	ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'AF'	user data	ABM_AM_Register_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply, MPTN_Connect
X'B0'	transport user's address mask list	ABM_AM_Register_Request, ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'B1'	load level	ABM_AM_Register_Request
X'B2'	dubious validity flag	ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'B3'	limited use cache	ABM_AM_Locate_Request, ABM_MA_Locate_Reply
X'F0'	diagnostics	Negative responses to all MPTN formats

Table 9-1 Optional Field Identifiers

9.3 Identifiers for User Characteristics

The user characteristics used in MPTN are identified by 1-byte values. Those values, and the associated user characteristics, are:

Value	Meaning
X'01'	Session outage notification (SON)
X'02'	Non-Queued responses sent as expedited data

9.4 Identifiers for Compensations

The compensations used in MPTN are identified by 1-byte values. Those values, and the associated compensation, are:

Value	Meaning
X'00'	On a record-oriented transport network, a message with no associated compensation. On a stream-oriented transport network, a record boundary marker (when no other compensation is needed).
X'01'	Expedited message
X'03'	Expedited message acknowledgement
X'10'	Duplex-abortive termination
X'12'	Duplex-abortive termination acknowledgement
X'14'	Duplex-orderly termination
X'16'	Duplex-orderly termination acknowledgement
X'18'	Simplex-abortive termination
X'1A'	Simplex-orderly termination acknowledgement
X'1C'	Simplex-orderly termination
X'1E'	Simplex-orderly termination acknowledgement
X'20'	Segmented message
X'21'	Segmented expedited message
X'83'	MPTN_DG_OOB_Data message needed for expedited data.
X'84'	MPTN_DG_KEEPALIVE_Hdr message needed for session outage notification.

Glossary

The following MPTN definitions of terms and abbreviations are common to the *Multiprotocol Transport Networking (MPTN)* environment. Not all of them are used in this document.

address-mapper function

An MPTN component that maps non-native transport-user addresses to a form used in the native transport network.

address space

The set of all legal transport addresses that may be formed according to the rules of a given address type. These rules include the maximum number of characters that can be in the address and the permissible characters. Each protocol has its own set of rules. Since addresses in one protocol may also be legitimate in another protocol, MPTN qualifies all transport addresses with an address type.

address type

An identifier in an MPTN header that indicates the protocol category (e.g., OSI or TCP/IP) and hence the specific syntax and structure of the accompanying address. A given transport-user address plus its address type form an MPTN-qualified address.

API

Application programming interface.

application programming interface

An interface between the application program and the application support layer.

ASCII

American National Standard Code for Information Interchange.

below-specific protocol boundary (BSPB)

The interface between the common MPTN manager (CMM) and the protocol-specific MPTN manager (PMM).

below-specific

Specific to one transport provider that exists below the CMM.

BSD

Berkeley software distribution.

BSPB

Below-specific protocol boundary.

CMIP

Common management information protocol.

CMM

Common MPTN manager.

common MPTN manager (CMM)

The component of the MPTN architecture that provides services independent of any protocol. Examples include registering transport users with the MPTN address mapper component, selecting a transport provider, and establishing MPTN connections.

compensation

The function of making up for differences in functions requested by the transport user and those provided by the transport provider.

connectionless service

A service that treats each packet or datagram as a separate entity that contains the source address and destination address. Connectionless services are on a best-effort basis and do not guarantee reliable or in-sequence delivery.

connection-oriented service

A service that establishes a logical connection between two partners for the duration that they want to communicate. Data transfer takes place in a reliable, sequenced manner.

CPI-C

Common Programming Interface for Communications.

datagram

A self-contained packet, independent of other packets, that carries information sufficient for routing from the source transport user to the destination transport user.

datagram segment

A part of a datagram. A datagram may be segmented (that is, split into more than one part) if it contains too many bytes of data to send at one time.

EBCDIC

Extended binary-coded decimal interchange code.

expedited data

Data that is considered urgent. Such data may be delivered ahead of normal data that preceded it.

group address

A single transport address identifying a collection of users. The collection of users is formed so that they can all receive common multicast datagrams.

IP

The networking protocol that forms part of the Internet Protocol suite referred to as TCP/IP. The internet protocol defines the internet datagram as the unit of information passed across the internet, and provides the basis for the internet connectionless, best-effort packet-delivery service.

LU

Logical unit.

LU 6.2

An SNA logical unit that supports general communication between programs in a distributed processing environment.

matching

The relationship between peer transport users or peer transport providers that are of the same family.

MPTN

Multiprotocol Transport Networking.

MPTN access node

A node that has MPTN components installed, allowing transport users to use non-native transport providers.

MPTN-qualified transport address

A transport address that is qualified by its corresponding address type. The address conforms to the syntax and meaning of the specified address type. An example of an MPTN-qualified transport address is the pair: (SNA, Net ID.LUname).

multicast

A technique that allows a single packet (or datagram) to be passed to a selected group of destinations that share a group address.

multicast datagram

A packet that is sent to more than one partner.

multiprotocol node

An implementation that supports more than one transport protocol.

multiprotocol transport networking (MPTN)

The architecture for mixed-protocol networking.

native

A relationship between a transport user and a transport provider that are based on the same transport protocol.

native network

With respect to a particular transport user, a transport network that provides the address type and transport characteristics assumed in the design of the transport user. No MPTN address mapping or compensation protocols are used for data transfer.

native node

A node with no MPTN capability.

native transport address

A transport-user address having the address type that corresponds to the type employed by the transport network underlying the transport user, e.g., an SNA name that is being registered within an SNA network.

NetBEUI

NetBIOS Extended User Interface.

NetBIOS

Network Basic Input/Output System.

NetBIOS extended user interface

NetBEUI: the API to the NetBIOS transport protocol.

net ID

Network Identifier. The address qualifier of a transport address that identifies a group of nodes according to the network in which they reside.

In an MPTN environment, the transport user and transport provider have separate NetId domains.

Network Basic Input/Output System

NetBIOS: a protocol used by many small computers for network access.

networking

Providing a relaying and routing service.

networking protocol

A specification of the rules governing the exchange of information between components of a network.

non-native

A relationship between a transport user and transport provider that are based on different transport protocols.

non-native network

With respect to a particular transport user, a transport network whose addressing structure and transport service are different from that assumed in the design of that transport user.

non-native protocols

Protocols used by a non-native network.

non-native transport address

A transport-user address having an address type different from the transport network address type, e.g., an OSI address for the target of a connection request carried on an SNA transport network.

OSI

Open Systems Interconnection. The interconnection of open systems in accordance with the hierarchical arrangement of the seven layers of networking functionality described in specific International Standards Organization standards.

PMM

Protocol-specific MPTN manager.

protocol boundary

A generic description of a functional boundary defined by the architecture; implementations must conform to the semantics of the protocol boundary, but not necessarily the syntax.

protocol-specific MPTN manager (PMM)

A component of the MPTN architecture that performs management, routing, and binding functions that are performed differently for the different transport providers.

record data format

A format that maintains record boundaries for the data being transmitted.

RFC

Request for Comment. The process by which some standards bodies define specialised solutions. In the case of MPTN, it is the definition of specialised transport protocols.

service mode

The designation by a transport user of the characteristics that must be maintained for a given connection or datagram transmission. Each networking protocol has its own way of requesting these characteristics, which must be mapped to the MPTN service mode.

single-protocol transport network

A collection of physically connected nodes that implement a single common transport protocol. A single-protocol transport network may span multiple net IDs.

SNA

Systems Network Architecture.

SNMP

Simple network management protocol.

socket

The abstraction provided by Berkeley 4.3 BSD UNIX that allows an application program to access TCP/IP protocols.

SON

Session Outage Notification - this is a transport user characteristic.

SPTN

Single-protocol transport network.

stream data format

Data that has no record boundaries. The data is simply a stream of bits.

TCP

Transmission Control Protocol.

Transmission Control Protocol (TCP)

The Internet standard transport level protocol that provides the reliable, full-duplex, stream service for TCP applications.

TCP/IP

Abbreviation for the protocols (i.e., TCP, IP, UDP) that comprise the Defense Advanced Research Projects Agency (DARPA) Internet protocol standards.

TLPB

Transport-layer protocol boundary

transport characteristics

The set of transport services that a transport user expects, e.g. whether data will be sent using connections or datagrams, and formatted as streams or records.

transport-layer protocol boundary (TLPB)

The MPTN protocol boundary that provides access in a protocol-independent fashion to multiple transport protocols.

transport network

An implementation of transport networking. Examples are parts of SNA, TCP/IP, OSI, IPX, NetBIOS, DECnet and Appletalk.

transport networking

The communications services provided at the transport layer and below.

transport networking protocol

A specification of the rules governing the exchange of information between components of a transport network.

transport provider

A component that provides the transport functions associated with a particular protocol stack.

transport-provider address

A transport address used to identify a transport provider.

transport user

An application program or application support element that uses transport services to convey data through a network. A program that directly requests transport services.

transport-user address

A transport address used to identify a transport user.

UDP

User Datagram Protocol.

unicast datagram

A packet that is sent to a single partner.

UNIX

An operating system originally developed by Bell Laboratories, and now owned as a trade mark by X/Open Company Limited.

User Datagram Protocol (UDP)

The TCP/IP protocol that allows an application program in one node to send a datagram to an application program in another node. UDP uses the internet protocol (IP) to deliver datagrams.

XMPTN

X/Open specification of Multiprotocol Transport Networking (MPTN).

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