SNMP MIB extension for Multiprotocol Interconnect over X.25

Status of this Memo

This RFC specifies an IAB standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing Multiprotocol Interconnect (including IP) traffic carried over X.25. The objects defined here, along with the objects in the "SNMP MIB extension for the Packet Layer of X.25"[8], "SNMP MIB extension for LAPB"[7], and the "Definitions of Managed Objects for RS-232-like Hardware Devices" [6], combine to allow management of the traffic over an X.25 protocol stack.

Table of Contents

1. The Network Management Framework ......................... 1
2. Objects .................................................................... 2
2.1 Format of Definitions ........................................... 2
3. Overview ............................................................ 3
3.1 Scope ............................................................... 3
3.2 Structure of MIB objects ....................................... 3
4. Definitions .......................................................... 4
5. Acknowledgements .................................................. 19
6. References .................................................................. 20
7. Security Considerations ............................................. 21
8. Author’s Address ..................................................... 21

1. The Network Management Framework

The Internet-standard Network Management Framework consists of three components. These components give the rules for defining objects, the definitions of objects, and the protocol for manipulating objects.
The network management framework structures objects in an abstract information tree. The branches of the tree name objects and the leaves of the tree contain the values manipulated to effect management. This tree is called the Management Information Base or MIB. The concepts of this tree are given in STD 16, RFC 1155, "The Structure of Management Information" or SMI [1]. The SMI defines the trunk of the tree and the types of objects used when defining the leaves. STD 16, RFC 1212, "Towards Concise MIB Definitions" [3], defines a more concise description mechanism that preserves all the principals of the SMI.

The core MIB definitions for the Internet suite of protocols can be found in STD 17, RFC 1213 [4], "Management Information Base for Network Management of TCP/IP-based internets".

STD 15, RFC 1157 [2] defines the SNMP protocol itself. The protocol defines how to manipulate the objects in a remote MIB.

The tree structure of the MIB allows new objects to be defined for the purpose of experimentation and evaluation.

2. Objects

The definition of an object in the MIB requires an object name and type. Object names and types are defined using the subset of Abstract Syntax Notation One (ASN.1) [5] defined in the SMI [1]. Objects are named using ASN.1 object identifiers, administratively assigned names, to specify object types. The object name, together with an optional object instance, uniquely identifies a specific instance of an object. For human convenience, we often use a textual string, termed the descriptor, to refer to objects.

Objects also have a syntax that defines the abstract data structure corresponding to that object type. The ASN.1 language [5] provides the primitives used for this purpose. The SMI [1] purposely restricts the ASN.1 constructs which may be used for simplicity and ease of implementation.

2.1. Format of Definitions

Section 4 contains the specification of all object types contained in this MIB module. The object types are defined using the conventions defined in the SMI, as amended by the extensions specified in "Towards Concise MIB Definitions" [3].
3. Overview

3.1. Scope

Instances of the objects defined below provide management information for Multiprotocol Interconnect traffic on X.25 as defined in RFC 1356 [9]. That RFC describes how X.25 can be used to exchange IP or network level protocols. The multiprotocol packets (IP, CLNP, ES-IS, or SNAP) are encapsulated in X.25 frames for transmission between nodes. All nodes that implement RFC 1356 must implement this MIB.

The objects in this MIB apply to the software in the node that manages X.25 connections and performs the protocol encapsulation. A node in this usage maybe the end node source or destination host for the packet, or it may be a router or bridge responsible for forwarding the packet. Since RFC 1356 requires X.25, nodes that implement RFC 1356 must also implement the X.25 MIB, RFC 1382.

This MIB only applies to Multiprotocol Interconnect over X.25 service. It does not apply to other software that may also use X.25 (for example PAD). Thus the presence, absence, or operation of such software will not directly affect any of these objects. (However, connections in use by that software will appear in the X.25 MIB).

3.2. Structure of MIB objects

The objects of this MIB are organized into three tables: the mioxPleTable, the mioxPeerTable, and the mioxPeerEncTable. All objects in all tables are mandatory for conformance with this MIB.

The mioxPleTable defines information relative to an interface used to carry Multiprotocol Interconnect traffic over X.25. Such interfaces are identified by an ifType object in the Internet-standard MIB [4] of ddn-x25 or rfc877-x25. Interfaces of type ddn-x25 have a self contained algorithm for translating between IP addresses and X.121 addresses. Interfaces of type rfc877-x25 do not have such an algorithm. Note that not all X.25 Interfaces will be used to carry Multiprotocol Interconnect traffic. Those interfaces not carrying such traffic will not have entries in the mioxPleTable. The entries in the mioxPleTable are only for interfaces that do carry Multiprotocol Interconnect traffic over X.25. Entries in the mioxPleTable are indexed by ifIndex to make it easy to find the mioxPleTable entry for an interface.

The mioxPeerTable contains information needed to contact an X.25 Peer to exchange packets. This includes information such as the X.121 address of the peer and a pointer to the X.25 call parameters needed to place the call. The instance identifiers used for the objects in
this table are independent of any interface or other tables defined outside this MIB. This table contains the ifIndex value of the X.25 interface to use to call a peer.

The mioxPeerEncTable contains information about the encapsulation type used to communicate with a peer. This table is an extension of the mioxPeerTable in its instance identification. Each entry in the mioxPeerTable may have zero or more entries in this table. This table will not have any entries that do not have correspondent entries in mioxPeerTable.

4. Definitions

MIOX25-MIB DEFINITIONS ::= BEGIN

IMPORTS
Counter,
TimeTicks
FROM RFC1155-SMI
OBJECT-TYPE
FROM RFC-1212
DisplayString, transmission,
ifIndex
FROM RFC1213-MIB
InstancePointer
FROM RFC1316-MIB
X121Address
FROM RFC1382-MIB
PositiveInteger
FROM RFC1381-MIB;

-- IP over X.25 MIB
miox
OBJECT IDENTIFIER ::= { transmission 38 }
mioxPle
OBJECT IDENTIFIER ::= { miox 1 }
mioxPeer
OBJECT IDENTIFIER ::= { miox 2 }

-- Systems that implement RFC 1356 must also implement
-- all objects in this group.

mioxPleTable
OBJECT-TYPE
SYNTAX SEQUENCE OF MioxPleEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION 
"This table contains information relative to
an interface to an X.25 Packet Level Entity 
(PLE)."
 ::= { mioxPle 1  }

mioxPleEntry OBJECT-TYPE
SYNTAX  MioxPleEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION 
"These objects manage the encapsulation of
other protocols within X.25."
INDEX  { ifIndex }
 ::= {  mioxPleTable 1  }

MioxPleEntry ::= SEQUENCE {
  mioxPleMaxCircuits
   INTEGER,
  mioxPleRefusedConnections
   Counter,
  mioxPleEnAddrToX121LkupFlrs
   Counter,
  mioxPleLastFailedEnAddr
   OCTET STRING,
  mioxPleEnAddrToX121LkupFlrTime
   TimeTicks,
  mioxPleX121ToEnAddrLkupFlrs
   Counter,
  mioxPleLastFailedX121Address
   X121Address,
  mioxPleX121ToEnAddrLkupFlrTime
   TimeTicks,
  mioxPleQbitFailures
   Counter,
  mioxPleQbitFailureRemoteAddress
   X121Address,
  mioxPleQbitFailureTime
   TimeTicks,
  mioxPleMinimumOpenTimer
   PositiveInteger,
  mioxPleInactivityTimer
   PositiveInteger,
  mioxPleHoldDownTimer
   PositiveInteger,
  mioxPleCollisionRetryTimer
   .

Throop
[Page 5]
mioxPleMaxCircuits OBJECT-TYPE
SYNTAX INTEGER (0..2147483647)
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The maximum number of X.25 circuits that can be open at one time for this interface. A value of zero indicates the interface will not allow any additional circuits (as it may soon be shutdown). A value of 2147483647 allows an unlimited number of circuits."
 ::= { mioxPleEntry 1 }

mioxPleRefusedConnections OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of X.25 calls from a remote systems to this system that were cleared by this system. The interface instance should identify the X.25 interface the call came in on."
 ::= { mioxPleEntry 2 }

mioxPleEnAddrToX121LkupFlrs OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of times a translation from an Encapsulated Address to an X.121 address failed to find a corresponding X.121 address. Encapsulated addresses can be looked up in the mioxPeerTable or translated via an algorithm as for the DDN. Addresses that are successfully recognized do not increment this counter. Addresses that are not recognized (reflecting an abnormal packet delivery condition) increment this counter.

If an address translation fails, it may be
difficult to determine which PLE entry
should count the failure. In such cases the
first likely entry in this table should be
selected. Agents should record the failure
even if they are unsure which PLE should be
associated with the failure.

::= { mioxPleEntry 3 }

mioxPleLastFailedEnAddr OBJECT-TYPE
SYNTAX OCTET STRING (SIZE(2..128))
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The last Encapsulated address that failed
to find a corresponding X.121 address and
caused mioxPleEnAddrToX121LkupFlrs to be
incremented. The first octet of this object
contains the encapsulation type, the
remaining octets contain the address of that
type that failed. Thus for an IP address,
the length will be five octets, the first/octet will contain 204 (hex CC), and the
last four octets will contain the IP
address. For a snap encapsulation, the
first byte would be 128 (hex 80) and the
rest of the octet string would have the snap
header." 

::= { mioxPleEntry 4 }

mioxPleEnAddrToX121LkupFlrTime OBJECT-TYPE
SYNTAX TimeTicks
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The most recent value of sysUpTime when the
translation from an Encapsulated Address to
X.121 address failed to find a corresponding
X.121 address."

::= { mioxPleEntry 5 }

mioxPleX121ToEnAddrLkupFlrs OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
"The number of times the translation from an
X.121 address to an Encapsulated Address
failed to find a corresponding Encapsulated Address. Addresses successfully recognized by an algorithm do not increment this counter. This counter reflects the number of times call acceptance encountered the abnormal condition of not recognizing the peer."

 ::= { mioxPleEntry 6 }

mioxPleLastFailedX121Address OBJECT-TYPE
SYNTAX  X121Address
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"The last X.121 address that caused mioxPleX121ToEnAddrLkupFlrs to increase."
 ::= { mioxPleEntry 7 }

mioxPleX121ToEnAddrLkupFlrTime OBJECT-TYPE
SYNTAX  TimeTicks
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"The most recent value of sysUpTime when the translation from an X.121 address to an Encapsulated Address failed to find a corresponding Encapsulated Address."
 ::= { mioxPleEntry 8 }

mioxPleQbitFailures OBJECT-TYPE
SYNTAX  Counter
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"The number of times a connection was closed because of a Q-bit failure."
 ::= { mioxPleEntry 9 }

mioxPleQbitFailureRemoteAddress OBJECT-TYPE
SYNTAX  X121Address
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"The remote address of the most recent (last) connection that was closed because of a Q-bit failure."
 ::= { mioxPleEntry 10 }
mioxPleQbitFailureTime OBJECT-TYPE
SYNTAX  TimeTicks
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"The most recent value of sysUpTime when a
collection was closed because of a Q-bit
failure. This will also be the last time
that mioxPleQbitFailures was incremented."
 ::= { mioxPleEntry 11 }

mioxPleMinimumOpenTimer OBJECT-TYPE
SYNTAX  PositiveInteger
ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"The minimum time in milliseconds this
interface will keep a connection open before
allowing it to be closed. A value of zero
indicates no timer."
DEFVAL { 0 }
 ::= { mioxPleEntry 12 }

mioxPleInactivityTimer OBJECT-TYPE
SYNTAX  PositiveInteger
ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"The amount of time in milliseconds
this interface will keep an idle connection
open before closing it. A value of
2147483647 indicates no timer."
DEFVAL { 10000 }
 ::= { mioxPleEntry 13 }

mioxPleHoldDownTimer OBJECT-TYPE
SYNTAX  PositiveInteger
ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"The hold down timer in milliseconds. This
is the minimum amount of time to wait before
trying another call to a host that was
previously unsuccessful. A value of
2147483647 indicates the host will not be
retried."
DEFVAL { 0 }
 ::= { mioxPleEntry 14 }
mioxPleCollisionRetryTimer OBJECT-TYPE
SYNTAX  PositiveInteger
ACCESS  read-write
STATUS  mandatory
DESCRIPTION  
"The Collision Retry Timer in milliseconds. The time to delay between call attempts when the maximum number of circuits is exceeded in a call attempt."
DEFVAL { 0 }
::= { mioxPleEntry 15 }

mioxPleDefaultPeerId OBJECT-TYPE
SYNTAX  InstancePointer
ACCESS  read-write
STATUS  mandatory
DESCRIPTION  
"This identifies the instance of the index in the mioxPeerTable for the default parameters to use with this interface.

The entry identified by this object may have a zero length Encapsulation address and a zero length X.121 address.

These default parameters are used with connections to hosts that do not have entries in the mioxPeerTable. Such connections occur when using ddn-x25 IP-X.25 address mapping or when accepting connections from other hosts not in the mioxPeerTable.

The mioxPeerEncTable entry with the same index as the mioxPeerTable entry specifies the call encapsulation types this PLE will accept for peers not in the mioxPeerTable. If the mioxPeerEncTable doesn’t contain any entries, this PLE will not accept calls from entries not in the mioxPeerTable."
::= { mioxPleEntry 16 }

-- ##########################################################
--              Peer Table
-- ##########################################################
-- Systems that implement RFC 1356 must also implement
-- all objects in this group.

mioxPeerTable OBJECT-TYPE
SYNTAX  SEQUENCE OF MioxPeerEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION
"This table contains information about the
possible peers this machine may exchange
packets with."
::= { mioxPeer 1 }

mioxPeerEntry OBJECT-TYPE
SYNTAX  MioxPeerEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION
"Per peer information."
INDEX { mioxPeerIndex   }
::= { mioxPeerTable 1 }

MioxPeerEntry ::= SEQUENCE {
   mioxPeerIndex
      PositiveInteger,
   mioxPeerStatus
      INTEGER,
   mioxPeerMaxCircuits
      PositiveInteger,
   mioxPeerIfIndex
      PositiveInteger,
   mioxPeerConnectSeconds
      Counter,
   mioxPeerX25CallParamId
      InstancePointer,
   mioxPeerEnAddr
      OCTET STRING,
   mioxPeerX121Address
      X121Address,
   mioxPeerX25CircuitId
      InstancePointer,
   mioxPeerDescr
      DisplayString
}

mioxPeerIndex   OBJECT-TYPE
SYNTAX  PositiveInteger
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
"An index value that distinguished one entry from another. This index is independent of any other index."
 ::= { mioxPeerEntry 1 }

-- Systems can claim conformance with this MIB without implementing sets to mioxPeerStatus with a value of clearCall or makeCall.
-- All other defined values must be accepted.
-- Implementors should realize that allowing these values provides richer management, and implementations are encouraged to accept these values.

mioxPeerStatus OBJECT-TYPE
SYNTAX  INTEGER {
  valid (1),
  createRequest (2),
  underCreation (3),
  invalid (4),
  clearCall (5),
  makeCall (6)
}

ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"This reports the status of a peer entry. A value of valid indicates a normal entry that is in use by the agent. A value of underCreation indicates a newly created entry which isn’t yet in use because the creating management station is still setting values.

The value of invalid indicates the entry is no longer in use and the agent is free to delete the entry at any time. A management station is also free to use an entry in the invalid state.

Entries are created by setting a value of createRequest. Only non-existent or invalid entries can be set to createRequest. Upon receiving a valid createRequest, the agent will create an entry in the underCreation state. This object can not be set to a value of underCreation directly, entries can
only be created by setting a value of createRequest. Entries that exist in other than the invalid state can not be set to createRequest.

Entries with a value of underCreation are not used by the system and the management station can change the values of other objects in the table entry. Management stations should also remember to configure values in the mioxPeerEncTable with the same peer index value as this peer entry.

An entry in the underCreation state can be set to valid or invalid. Entries in the underCreation state will stay in that state until 1) the agent times them out, 2) they are set to valid, 3) they are set to invalid. If an agent notices an entry has been in the underCreation state for an abnormally long time, it may decide the management station has failed and invalidate the entry. A prudent agent will understand that the management station may need to wait for human input and will allow for that possibility in its determination of this abnormally long period.

Once a management station has completed all fields of an entry, it will set a value of valid. This causes the entry to be activated.

Entries in the valid state may also be set to makeCall or clearCall to make or clear X.25 calls to the peer. After such a set request the entry will still be in the valid state. Setting a value of makeCall causes the agent to initiate an X.25 call request to the peer specified by the entry. Setting a value of clearCall causes the agent to initiate clearing one X.25 call present to the peer. Each set request will initiate another call or clear request (up to the maximum allowed); this means that management stations that fail to get a response to a set request should query to see if a call was in fact placed or cleared before
retrying the request. Entries not in the valid state cannot be set to makeCall or clearCall.

The values of makeCall and clearCall provide for circuit control on devices which perform Ethernet Bridging using static circuit assignment without address recognition; other devices which dynamically place calls based on destination addresses may reject such requests.

An agent that (re)creates a new entry because of a set with createRequest, should also (re)create a mioxPeerEncTable entry with a mioxPeerEncIndex of 1, and a mioxPeerEncType of 204 (hex CC).

::= { mioxPeerEntry 2 }

mioxPeerMaxCircuits OBJECT-TYPE
SYNTAX PositiveInteger
ACCESS read-write
STATUS mandatory
DESCRIPTION "The maximum number of X.25 circuits allowed to this peer."
DEFVAL { 1 }
::= { mioxPeerEntry 3 }

mioxPeerIfIndex OBJECT-TYPE
SYNTAX PositiveInteger
ACCESS read-write
STATUS mandatory
DESCRIPTION "The value of the ifIndex object for the interface to X.25 to use to call the peer."
DEFVAL { 1 }
::= { mioxPeerEntry 4 }

mioxPeerConnectSeconds OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION "The number of seconds a call to this peer was active. This counter will be incremented by one for every second a connection to a peer was open. If two calls
are open at the same time, one second of elapsed real time will results in two seconds of connect time."

 ::= { mioxPeerEntry 5 }

mioxPeerX25CallParamId OBJECT-TYPE
SYNTAX InstancePointer
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The instance of the index object in the x25CallParmTable from RFC 1382 for the X.25 call parameters used to communicate with the remote host. The well known value {0 0} indicates no call parameters specified."
DEFVAL { {0 0} }
 ::= { mioxPeerEntry 6 }

mioxPeerEnAddr OBJECT-TYPE
SYNTAX OCTET STRING (SIZE (0..128))
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The Encapsulation address of the remote host mapped by this table entry. A length of zero indicates the remote IP address is unknown or unspecified for use as a PLE default.

The first octet of this object contains the encapsulation type, the remaining octets contain an address of that type. Thus for an IP address, the length will be five octets, the first octet will contain 204 (hex CC), and the last four octets will contain the IP address. For a snap encapsulation, the first byte would be 128 (hex 80) and the rest of the octet string would have the snap header."
DEFVAL { ''h }
 ::= { mioxPeerEntry 7 }

mioxPeerX121Address OBJECT-TYPE
SYNTAX X121Address
ACCESS read-write
STATUS mandatory
DESCRIPTION
"The X.25 address of the remote host mapped
by this table entry. A zero length string indicates the X.25 address is unspecified for use as the PLE default.

DEFVAL { ""h } ::= { mioxPeerEntry 8 }

-- Systems can claim conformance to this MIB without -- implementing sets to mioxPeerX25CircuitId. -- However systems that use PVCs with RFC1356 -- are encouraged to implement sets.

mioxPeerX25CircuitId OBJECT-TYPE
SYNTAX  InstancePointer
ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"This object identifies the instance of the index for the X.25 circuit open to the peer mapped by this table entry. The well known value {0 0} indicates no connection currently active. For multiple connections, this identifies the index of a multiplexing table entry for the connections. This can only be written to configure use of PVCs which means the identified circuit table entry for a write must be a PVC."

DEFVAL { {0 0} }
 ::= { mioxPeerEntry 9 }

mioxPeerDescr   OBJECT-TYPE
SYNTAX  DisplayString (SIZE (0..255))
ACCESS  read-write
STATUS  mandatory
DESCRIPTION
"This object returns any identification information about the peer. An agent may supply the comment information found in the configuration file entry for this peer. A zero length string indicates no information available."

DEFVAL { "h } ::= { mioxPeerEntry 10 }

-- ###############################################################################
-- Peer Encapsulation Table
-- ###############################################################################
mioxPeerEncTable OBJECT-TYPE
SYNTAX  SEQUENCE OF MioxPeerEncEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION
"This table contains the list of encapsulations used to communicate with a peer. This table has two indexes, the first identifies the peer, the second distinguishes encapsulation types.

The first index identifies the corresponding entry in the mioxPeerTable. The second index gives the priority of the different encapsulations.

The encapsulation types are ordered in priority order. For calling a peer, the first entry (mioxPeerEncIndex of 1) is tried first. If the call doesn’t succeed because the remote host clears the call due to incompatible call user data, the next entry in the list is tried. Each entry is tried until the list is exhausted.

For answering a call, the encapsulation type requested by the peer must be found in the list or the call will be refused. If there are no entries in this table for a peer, all call requests from the peer will be refused.

Objects in this table can only be set when the mioxPeerStatus object with the same index has a value of underCreation. When that status object is set to invalid and deleted, the entry in this table with that peer index must also be deleted."

::= { mioxPeer 2 }

mioxPeerEncEntry OBJECT-TYPE
SYNTAX  MioxPeerEncEntry
ACCESS  not-accessible
STATUS  mandatory
DESCRIPTION
"Per connection information."
INDEX { mioxPeerIndex, mioxPeerEncIndex}
::= { mioxPeerEncTable 1 }
MioxPeerEncEntry ::= SEQUENCE {
    mioxPeerEncIndex          PositiveInteger,
    mioxPeerEncType           INTEGER
}

mioxPeerEncIndex OBJECT-TYPE
SYNTAX          PositiveInteger
ACCESS          read-only
STATUS          mandatory
DESCRIPTION     "The second index in the table which distinguishes different encapsulation types."
 ::= { mioxPeerEncEntry 1 }

mioxPeerEncType OBJECT-TYPE
SYNTAX          INTEGER (0..256)
ACCESS          read-write
STATUS          mandatory
DESCRIPTION     "The value of the encapsulation type. For IP encapsulation this will have a value of 204 (hex CC). For SNAP encapsulated packets, this will have a value of 128 (hex 80). For CLNP, ISO 8473, this will have a value of 129 (hex 81). For ES-ES, ISO 9542, this will have a value of 130 (hex 82). A value of 197 (hex C5) identifies the Blacker X.25 encapsulation. A value of 0, identifies the Null encapsulation.

This value can only be written when the mioxPeerStatus object with the same mioxPeerIndex has a value of underCreation. Setting this object to a value of 256 deletes the entry. When deleting an entry, all other entries in the mioxPeerEncTable with the same mioxPeerIndex and with an mioxPeerEncIndex higher then the deleted entry, will all have their mioxPeerEncIndex values decremented by one."
 ::= { mioxPeerEncEntry 2 }

-- ###################################################################

END
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6. References


7. Security Considerations

Security issues are not discussed in this memo.

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