IP Version 6 Management Information Base for
The Multicast Listener Discovery Protocol

Status of this Memo

This document specifies an Internet standards track protocol for the
Internet community, and requests discussion and suggestions for
improvements. Please refer to the current edition of the "Internet
Official Protocol Standards" (STD 1) for the standardization state
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Abstract

This document defines a portion of the Management Information Base
(MIB) for use with network management protocols in Internet Protocol
Version 6 internets. Specifically, this document is the MIB module
that defines managed objects for implementations of the Multicast
Listener Discovery Protocol [RFC2710].

Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in [RFC2119].

1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major
components:

An overall architecture, described in RFC 2571 [RFC2571].

Mechanisms for describing and naming objects and events for the
purpose of management. The first version of this Structure of
Management Information (SMI) is called SMIv1 and described in STD 16,
Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].

Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].

A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine-readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine-readable information is not considered to change the semantics of the MIB.

2. Overview

This MIB module contains two tables:

1. The MLD Interface Table, which contains one row for each interface on which MLD is enabled.
2. The MLD Cache Table which contains one row for each IPv6
Multicast group for which there are members on a particular
interface.

Both tables are intended to be implemented by hosts and routers. Some
objects in each table apply to routers only.

3. Definitions

IPV6-MLD-MIB DEFINITIONS ::= BEGIN

IMPORTS
MODULE-IDENTITY, OBJECT-TYPE, Counter32, Gauge32,
Unsigned32, TimeTicks, mib-2 FROM SNMPv2-SMI
RowStatus, TruthValue FROM SNMPv2-TC
InetAddressIPv6 FROM INET-ADDRESS-MIB
InterfaceIndex, InterfaceIndexOrZero FROM IF-MIB

MODULE-COMPLIANCE, OBJECT-GROUP FROM SNMPv2-CONF;

mldMIB MODULE-IDENTITY
LAST-UPDATED "200101250000Z" -- 25 Jan 2001
ORGANIZATION "IETF IPNGWG Working Group."
CONTACT-INFO
"Brian Haberman
Nortel Networks
4309 Emperor Blvd.
Durham, NC 27703
USA

Phone: +1 919 992 4439
e-mail: haberman@nortelnetworks.com"

DESCRIPTION
"The MIB module for MLD Management."

REVISION "200101250000Z" -- 25 Jan 2001

DESCRIPTION
"Initial version, published as RFC 3019."

::= { mib-2 91 }

mldMIBObjects OBJECT IDENTIFIER ::= { mldMIB 1 }

-- The MLD Interface Table

mldInterfaceTable OBJECT-TYPE
SYNTAX SEQUENCE OF MldInterfaceEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"The (conceptual) table listing the interfaces on which
MLD is enabled."
::= { mldMIBObjects 1 }

mldInterfaceEntry OBJECT-TYPE
SYNTAX    MldInterfaceEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"An entry (conceptual row) representing an interface on
which MLD is enabled."
INDEX      { mldInterfaceIfIndex }
::= { mldInterfaceTable 1 }

MldInterfaceEntry ::= SEQUENCE {
   mldInterfaceIfIndex               InterfaceIndex,
   mldInterfaceQueryInterval         Unsigned32,
   mldInterfaceStatus                RowStatus,
   mldInterfaceVersion               Unsigned32,
   mldInterfaceQuerier               InetAddressIPv6,
   mldInterfaceQueryMaxResponseDelay Unsigned32,
   mldInterfaceJoins                 Counter32,
   mldInterfaceGroups                Gauge32,
   mldInterfaceRobustness            Unsigned32,
   mldInterfaceLastListenQueryIntvl  Unsigned32,
   mldInterfaceProxyIfIndex          InterfaceIndexOrZero,
   mldInterfaceQuerierUpTime         TimeTicks,
   mldInterfaceQuerierExpiryTime     TimeTicks
}

mldInterfaceIfIndex OBJECT-TYPE
SYNTAX    InterfaceIndex
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The internetwork-layer interface value of the interface
for which MLD is enabled."
::= { mldInterfaceEntry 1 }

mldInterfaceQueryInterval OBJECT-TYPE
SYNTAX    Unsigned32
UNITS      "seconds"
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"The frequency at which MLD Host-Query packets are transmitted on this interface."
DEFVAL { 125 }
::= { mldInterfaceEntry 2 }

mldInterfaceStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The activation of a row enables MLD on the interface. The destruction of a row disables MLD on the interface."
::= { mldInterfaceEntry 3 }

mldInterfaceVersion OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The version of MLD which is running on this interface. This object is a place holder to allow for new versions of MLD to be introduced. Version 1 of MLD is defined in RFC 2710."
DEFVAL { 1 }
::= { mldInterfaceEntry 4 }

mldInterfaceQuerier OBJECT-TYPE
SYNTAX InetAddressIPv6 (SIZE (16))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The address of the MLD Querier on the IPv6 subnet to which this interface is attached."
::= { mldInterfaceEntry 5 }

mldInterfaceQueryMaxResponseDelay OBJECT-TYPE
SYNTAX Unsigned32
UNITS "seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The maximum query response time advertised in MLD queries on this interface."
DEFVAL { 10 }
::= { mldInterfaceEntry 6 }

mldInterfaceJoins OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of times a group membership has been added on this interface; that is, the number of times an entry for this interface has been added to the Cache Table. This object gives an indication of the amount of MLD activity over time."
::= { mldInterfaceEntry 7 }

mldInterfaceGroups OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The current number of entries for this interface in the Cache Table."
::= { mldInterfaceEntry 8 }

mldInterfaceRobustness OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Robustness Variable allows tuning for the expected packet loss on a subnet. If a subnet is expected to be lossy, the Robustness Variable may be increased. MLD is robust to (Robustness Variable-1) packet losses. The discussion of the Robustness Variable is in Section 7.1 of RFC 2710."
DEFVAL { 2 }
::= { mldInterfaceEntry 9 }

mldInterfaceLastListenQueryIntvl OBJECT-TYPE
SYNTAX Unsigned32
UNITS "seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Last Member Query Interval is the Max Response Delay inserted into Group-Specific Queries sent in response to Leave Group messages, and is also the amount of time between Group-Specific Query messages. This value may be tuned to modify the leave latency of the network. A reduced value results in reduced time to detect the loss of the last member of a group."
DEFVAL { 1 }
::= { mldInterfaceEntry 10 }

mldInterfaceProxyIfIndex OBJECT-TYPE
SYNTAX     InterfaceIndexOrZero
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"Some devices implement a form of MLD proxying whereby
memberships learned on the interface represented by this
row, cause MLD Multicast Listener Reports to be sent on
the internetwork-layer interface identified by this
object. Such a device would implement mldRouterMIBGroup
only on its router interfaces (those interfaces with
non-zero mldInterfaceProxyIfIndex). Typically, the
value of this object is 0, indicating that no proxying
is being done."
DEFVAL     { 0 }
::= { mldInterfaceEntry 11 }

mldInterfaceQuerierUpTime OBJECT-TYPE
SYNTAX     TimeTicks
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The time since mldInterfaceQuerier was last changed."
::= { mldInterfaceEntry 12 }

mldInterfaceQuerierExpiryTime OBJECT-TYPE
SYNTAX     TimeTicks
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
"The time remaining before the Other Querier Present
Timer expires. If the local system is the querier,
the value of this object is zero."
::= { mldInterfaceEntry 13 }

--
-- The MLD Cache Table
--

mldCacheTable OBJECT-TYPE
SYNTAX     SEQUENCE OF MldCacheEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The (conceptual) table listing the IPv6 multicast

groups for which there are members on a particular interface."  
::= { mldMIBObjects 2 }

mldCacheEntry OBJECT-TYPE
SYNTAX MldCacheEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION  
"An entry (conceptual row) in the mldCacheTable."  
INDEX  
{ mldCacheAddress, mldCacheIfIndex }
::= { mldCacheTable 1 }

MldCacheEntry ::= SEQUENCE {
  mldCacheAddress         InetAddressIPv6,  
  mldCacheIfIndex            InterfaceIndex,  
  mldCacheSelf               TruthValue,  
  mldCacheLastReporter   InetAddressIPv6,  
  mldCacheUpTime             TimeTicks,  
  mldCacheExpiryTime         TimeTicks,  
  mldCacheStatus             RowStatus
}

mldCacheAddress OBJECT-TYPE
SYNTAX InetAddressIPv6 (SIZE (16))
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION  
"The IPv6 multicast group address for which this entry contains information."  
::= { mldCacheEntry 1 }

mldCacheIfIndex OBJECT-TYPE
SYNTAX InterfaceIndex
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION  
"The internetwork-layer interface for which this entry contains information for an IPv6 multicast group address."  
::= { mldCacheEntry 2 }

mldCacheSelf OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION  
"An indication of whether the local system is a member of
this group address on this interface."
DEFVAL ( true )
::= { mldCacheEntry 3 }

mldCacheLastReporter OBJECT-TYPE
SYNTAX InetAddressIPv6 (SIZE (16))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The IPv6 address of the source of the last membership
report received for this IPv6 Multicast group address on
this interface. If no membership report has been
received, this object has the value 0::0."
::= { mldCacheEntry 4 }

mldCacheUpTime OBJECT-TYPE
SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time elapsed since this entry was created."
::= { mldCacheEntry 5 }

mldCacheExpiryTime OBJECT-TYPE
SYNTAX TimeTicks
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The minimum amount of time remaining before this entry
will be aged out. A value of 0 indicates that the entry
is only present because mldCacheSelf is true and that if
the router left the group, this entry would be aged out
immediately. Note that some implementations may process
Membership Reports from the local system in the same way
as reports from other hosts, so a value of 0 is not
required."
::= { mldCacheEntry 6 }

mldCacheStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The status of this row, by which new entries may be
created, or existing entries deleted from this table."
::= { mldCacheEntry 7 }
-- conformance information

mldMIBConformance
   OBJECT IDENTIFIER ::= { mldMIB 2 }
mldMIBCompliances
   OBJECT IDENTIFIER ::= { mldMIBConformance 1 }
mldMIBGroups
   OBJECT IDENTIFIER ::= { mldMIBConformance 2 }

-- compliance statements

mldHostMIBCompliance MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION "The compliance statement for hosts running MLD and
                  implementing the MLD MIB."
   MODULE -- this module
   MANDATORY-GROUPS { mldBaseMIBGroup,
                        mldHostMIBGroup
                      }
   OBJECT mldInterfaceStatus
   MIN-ACCESS read-only
   DESCRIPTION "Write access is not required."
   ::= { mldMIBCompliances 1 }

mldRouterMIBCompliance MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION "The compliance statement for routers running MLD and
                  implementing the MLD MIB."
   MODULE -- this module
   MANDATORY-GROUPS { mldBaseMIBGroup,
                        mldRouterMIBGroup
                      }
   OBJECT mldInterfaceStatus
   MIN-ACCESS read-only
   DESCRIPTION "Write access is not required."
   ::= { mldMIBCompliances 2 }

-- units of conformance
mldBaseMIBGroup OBJECT-GROUP
   OBJECTS { mldCacheSelf,
             mldCacheStatus, mldInterfaceStatus
         }
   STATUS  current
   DESCRIPTION
   "The basic collection of objects providing management of
   MLD. The mldBaseMIBGroup is designed to allow for the
   manager creation and deletion of MLD cache entries."  
   ::= { mldMIBGroups 1 }

mldRouterMIBGroup OBJECT-GROUP
   OBJECTS { mldCacheUpTime, mldCacheExpiryTime,
             mldInterfaceQueryInterval,
             mldInterfaceJoins, mldInterfaceGroups,
             mldCacheLastReporter,
             mldInterfaceQuerierUpTime,
             mldInterfaceQuerierExpiryTime,
             mldInterfaceQuerier,
             mldInterfaceVersion,
             mldInterfaceQueryMaxResponseDelay,
             mldInterfaceRobustness,
             mldInterfaceLastListenQueryIntvl
         }
   STATUS  current
   DESCRIPTION
   "A collection of additional objects for management of MLD
   in routers."  
   ::= { mldMIBGroups 2 }

mldHostMIBGroup OBJECT-GROUP
   OBJECTS { mldInterfaceQuerier
   }
   STATUS  current
   DESCRIPTION
   "A collection of additional objects for management of MLD
   in hosts."  
   ::= { mldMIBGroups 3 }

mldProxyMIBGroup OBJECT-GROUP
   OBJECTS { mldInterfaceProxyIfIndex }
   STATUS  current
   DESCRIPTION
   "A collection of additional objects for management of MLD
   proxy devices."
Security Considerations

This MIB contains readable objects whose values provide information related to multicast sessions. Some of these objects could contain sensitive information. In particular, the mldCacheSelf and mldCacheLastReporter could be used to identify machines which are listening to a given group address. There are also a number of objects that have a MAX-ACCESS clause of read-write and/or read-create, which allow an administrator to configure MLD in the router.

While unauthorized access to the readable objects is relatively innocuous, unauthorized access to the writeable objects could cause a denial of service. Hence, the support of SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is such an insecure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the network is allowed to access and SET (change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

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References


Authors’ Addresses

Brian Haberman
Nortel Networks
4309 Emperor Blvd.
Suite 200
Durham, NC 27703
USA

Phone: +1-919-992-4439
EMail: haberman@nortelnetworks.com

Randy Worzella
IBM Corporation
800 Park Office Drive
Research Triangle Park, NC 27709
USA

Phone: +1-919-254-2202
EMail: worzella@us.ibm.com
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