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

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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,

RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

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
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              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."
```

```
        ::= { mldMIBGroups 4 }

    END
```

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 write-able 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.

Acknowledgements

This MIB module is based on the IGMP MIB authored by Keith McCloghrie, Dino Farinacci, and Dave Thaler. It was updated based on feedback from the IPNGWG working group, Bert Wijnen, Peder Norgaard, and extensive comments from Juergen Schoenwaelder.

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