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

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Abstract

This document defines an experimental 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 [[RFC 2119](#)].

1. The SNMP Management Framework

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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](#)], [RFC 2579](#) [[RFC2579](#)] and [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:

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- 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
Ipv6Address, Ipv6IfIndexOrZero,
Ipv6IfIndex FROM IPV6-TC
MODULE-COMPLIANCE, OBJECT-GROUP FROM SNMPv2-CONF;

mldMIB MODULE-IDENTITY

LAST-UPDATED "200007051000Z"
ORGANIZATION "IETF IPNGWG Working Group."
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DESCRIPTION

"The MIB module for MLD Management."

REVISION "200007051000Z"

DESCRIPTION

"Initial version, published as RFC XXXX."

::= { mib-2 xx }

-- NOTE TO RFC EDITOR: When this document is published as
-- an RFC, replace xx with IANA-assigned value and delete
-- this comment.

mldMIBObjects OBJECT IDENTIFIER ::= { mldMIB 1 }

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--

-- 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

Ipv6IfIndex,

```

mldInterfaceQueryInterval      Unsigned32,
mldInterfaceStatus             RowStatus,
mldInterfaceVersion            Unsigned32,
mldInterfaceQuerier            Ipv6Address,
mldInterfaceQueryMaxResponseDelay Unsigned32,
mldInterfaceJoins              Counter32,
mldInterfaceGroups             Gauge32,
mldInterfaceRobustness         Unsigned32,
mldInterfaceLastListenQueryIntvl Unsigned32,
mldInterfaceProxyIfIndex       Ipv6IfIndexOrZero,
mldInterfaceQuerierUpTime      TimeTicks,
mldInterfaceQuerierExpiryTime  TimeTicks
}

```

mldInterfaceIfIndex OBJECT-TYPE

```

SYNTAX      Ipv6IfIndex
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"

```

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```

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 Ipv6Address

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

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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 Ipv6IfIndexOrZero
 MAX-ACCESS read-create
 STATUS current

"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 interface whose ifIndex value is given 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."

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```
INDEX      { mldCacheAddress, mldCacheIfIndex }
 ::= { mldCacheTable 1 }

MldCacheEntry ::= SEQUENCE {
    mldCacheAddress      Ipv6Address,
    mldCacheIfIndex      Ipv6IfIndex,
    mldCacheSelf         TruthValue,
    mldCacheLastReporter Ipv6Address,
    mldCacheUpTime       TimeTicks,
    mldCacheExpiryTime   TimeTicks,
    mldCacheStatus       RowStatus
}

mldCacheAddress OBJECT-TYPE
    SYNTAX      Ipv6Address
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The IPv6 multicast group address for which this entry
        contains information."
    ::= { mldCacheEntry 1 }

mldCacheIfIndex OBJECT-TYPE
    SYNTAX      Ipv6IfIndex
    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      Ipv6Address
```

```

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 }

```

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```

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

```

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```

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,
```

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```
        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.

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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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