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Internet Group Management Protocol MIB

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1. Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects used for managing the Internet Group Management Protocol (IGMP).

2. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects used for managing the Internet Group Management Protocol (IGMP), version 1 [16] or version 2 [17]. A future version of this MIB will support IGMP version 3 (currently a work in progress). All of this MIB module is applicable to IPv4 multicast routers; a subset is applicable to hosts implementing IGMP. Since IGMP is specific to IPv4, this MIB does not support management of equivalent functionality for other address families, such as IPv6. Such management may be supported by other MIBs.

3. The SNMP Network Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [1].
- 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 RFC 1155 [2], RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described

in RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].

o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

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.

4. Overview

This MIB module contains two tables:

(1) the IGMP Interface Table which contains one row for each interface on which IGMP is enabled, and

(2) the IGMP Cache Table which contains one row for each IP multicast group for which there are members on a particular interface.

Both tables are intended to be implemented by hosts and routers, but some columnar objects in each table apply only to routers.

5. Definitions

```
IGMP-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, mib-2, Counter32, Gauge32,
    Integer32, IpAddress, TimeTicks  FROM SNMPv2-SMI
    RowStatus, TruthValue            FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP  FROM SNMPv2-CONF
    InterfaceIndexOrZero,
    InterfaceIndex                   FROM IF-MIB;

igmpStdMIB MODULE-IDENTITY
    LAST-UPDATED "200001311200Z" -- January 31, 2000
    ORGANIZATION "IETF IDMR Working Group."
    CONTACT-INFO
            " Dave Thaler
              Microsoft Corporation
              One Microsoft Way
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    DESCRIPTION
            "The MIB module for IGMP Management."
    REVISION     "200001311200Z" -- January 31, 2000
    DESCRIPTION
            "Initial version, published as RFC xxxx (to be filled in by
            RFC-Editor)."
    ::= { 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.


igmpMIBObjects     OBJECT IDENTIFIER ::= { igmpStdMIB 1 }

igmp      OBJECT IDENTIFIER ::= { igmpMIBObjects 1 }
```

```
--
--  The IGMP Interface Table
--

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

igmpInterfaceEntry OBJECT-TYPE
    SYNTAX     IgmpInterfaceEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) representing an interface on
            which IGMP is enabled."
    INDEX      { igmpInterfaceIfIndex }
    ::= { igmpInterfaceTable 1 }

IgmpInterfaceEntry ::= SEQUENCE {
    igmpInterfaceIfIndex               InterfaceIndex,
    igmpInterfaceQueryInterval         Integer32,
    igmpInterfaceStatus                RowStatus,
    igmpInterfaceVersion               Integer32,
    igmpInterfaceQuerier               IpAddress,
    igmpInterfaceQueryMaxResponseTime  Integer32,
    igmpInterfaceVersion1QuerierTimer  TimeTicks,
    igmpInterfaceWrongVersionQueries   Counter32,
    igmpInterfaceJoins                 Counter32,
    igmpInterfaceGroups                Gauge32,
    igmpInterfaceRobustness            Integer32,
    igmpInterfaceLastMembQueryIntvl    Integer32,
    igmpInterfaceProxyIfIndex          InterfaceIndexOrZero,
    igmpInterfaceQuerierUpTime         TimeTicks,
    igmpInterfaceQuerierExpiryTime     TimeTicks
}

igmpInterfaceIfIndex OBJECT-TYPE
    SYNTAX     InterfaceIndex
    MAX-ACCESS not-accessible
    STATUS     current
```

```
    DESCRIPTION
            "The ifIndex value of the interface for which IGMP is
            enabled."
    ::= { igmpInterfaceEntry 1 }

igmpInterfaceQueryInterval OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The frequency at which IGMP Host-Query packets are
            transmitted on this interface."
    DEFVAL     { 125 }
    ::= { igmpInterfaceEntry 2 }

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

igmpInterfaceVersion OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The version of IGMP which is running on this interface.
            This object can be used to configure a router capable of
            running either value.  For IGMP to function correctly, all
            routers on a LAN must be configured to run the same version
            of IGMP on that LAN."
    DEFVAL     { 2 }
    ::= { igmpInterfaceEntry 4 }

igmpInterfaceQuerier OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The address of the IGMP Querier on the IP subnet to which
            this interface is attached."
```

```
    ::= { igmpInterfaceEntry 5 }

igmpInterfaceQueryMaxResponseTime OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "tenths of seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The maximum query response time advertised in IGMPv2
            queries on this interface."
    DEFVAL     { 100 }
    ::= { igmpInterfaceEntry 6 }

igmpInterfaceVersion1QuerierTimer OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time remaining until the host assumes that there are no
            IGMPv1 routers present on the interface.  While this is non-
            zero, the host will reply to all queries with version 1
            membership reports."
    ::= { igmpInterfaceEntry 9 }

igmpInterfaceWrongVersionQueries OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of queries received whose IGMP version does not
            match igmpInterfaceVersion.   IGMP requires that all routers
            on a LAN be configured to run the same version of IGMP.
            Thus, if any queries are received with the wrong version,
            this indicates a configuration error."
    ::= { igmpInterfaceEntry 10 }

igmpInterfaceJoins 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 IGMP activity
```

```
            over time."
    ::= { igmpInterfaceEntry 11 }

igmpInterfaceGroups OBJECT-TYPE
    SYNTAX     Gauge32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The current number of entries for this interface in the
            Cache Table."
    ::= { igmpInterfaceEntry 13 }

igmpInterfaceRobustness OBJECT-TYPE
    SYNTAX     Integer32
    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.  IGMP is
            robust to (Robustness Variable-1) packet losses."
    DEFVAL     { 2 }
    ::= { igmpInterfaceEntry 14 }

igmpInterfaceLastMembQueryIntvl OBJECT-TYPE
    SYNTAX     Integer32
    UNITS      "tenths of seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The Last Member Query Interval is the Max Response Time
            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.  The value of this object is irrelevant
            if igmpInterfaceVersion is version1."
    DEFVAL     { 10 }
    ::= { igmpInterfaceEntry 15 }

igmpInterfaceProxyIfIndex OBJECT-TYPE
    SYNTAX     InterfaceIndexOrZero
    MAX-ACCESS read-create
    STATUS     current
```

```
    DESCRIPTION
            "Some devices implement a form of IGMP proxying whereby
            memberships learned on the interface represented by this
            row, cause IGMP Host Membership Reports to be sent on the
            interface whose ifIndex value is given by this object.  Such
            a device would implement the igmpV2RouterMIBGroup only on
            its router interfaces (those interfaces with non-zero
            igmpInterfaceProxyIfIndex).  Typically, the value of this
            object is 0, indicating that no proxying is being done."
    DEFVAL     { 0 }
    ::= { igmpInterfaceEntry 16 }

igmpInterfaceQuerierUpTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time since igmpInterfaceQuerier was last changed."
    ::= { igmpInterfaceEntry 17 }

igmpInterfaceQuerierExpiryTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The amount of time remaining before the Other Querier
            Present Timer expires.  If the local system is the querier,
            the value of this object is zero."
    ::= { igmpInterfaceEntry 18 }
```

```
--
--  The IGMP Cache Table
--

igmpCacheTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF IgmpCacheEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing the IP multicast groups for
            which there are members on a particular interface."
    ::= { igmp 2 }

igmpCacheEntry OBJECT-TYPE
    SYNTAX     IgmpCacheEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the igmpCacheTable."
    INDEX      { igmpCacheAddress, igmpCacheIfIndex }
    ::= { igmpCacheTable 1 }

IgmpCacheEntry ::= SEQUENCE {
    igmpCacheAddress            IpAddress,
    igmpCacheIfIndex            InterfaceIndex,
    igmpCacheSelf               TruthValue,
    igmpCacheLastReporter       IpAddress,
    igmpCacheUpTime             TimeTicks,
    igmpCacheExpiryTime         TimeTicks,
    igmpCacheStatus             RowStatus,
    igmpCacheVersion1HostTimer  TimeTicks
}

igmpCacheAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The IP multicast group address for which this entry
            contains information."
    ::= { igmpCacheEntry 1 }

igmpCacheIfIndex OBJECT-TYPE
    SYNTAX     InterfaceIndex
    MAX-ACCESS not-accessible
```

```
    STATUS     current
    DESCRIPTION
            "The interface for which this entry contains information for
            an IP multicast group address."
    ::= { igmpCacheEntry 2 }

igmpCacheSelf 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 }
    ::= { igmpCacheEntry 3 }

igmpCacheLastReporter OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The IP address of the source of the last membership report
            received for this IP Multicast group address on this
            interface.  If no membership report has been received, this
            object has the value 0.0.0.0."
    ::= { igmpCacheEntry 4 }

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

igmpCacheExpiryTime 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 igmpCacheSelf 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."
    ::= { igmpCacheEntry 6 }

igmpCacheStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The status of this entry."
    ::= { igmpCacheEntry 7 }

igmpCacheVersion1HostTimer OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time remaining until the local router will assume that
            there are no longer any IGMP version 1 members on the IP
            subnet attached to this interface.  Upon hearing any IGMPv1
            Membership Report, this value is reset to the group
            membership timer.  While this time remaining is non-zero,
            the local router ignores any IGMPv2 Leave messages for this
            group that it receives on this interface."
    ::= { igmpCacheEntry 8 }
```

```
-- conformance information

igmpMIBConformance
               OBJECT IDENTIFIER ::= { igmpStdMIB 2 }
igmpMIBCompliances
               OBJECT IDENTIFIER ::= { igmpMIBConformance 1 }
igmpMIBGroups  OBJECT IDENTIFIER ::= { igmpMIBConformance 2 }


-- compliance statements

igmpV1HostMIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for hosts running IGMPv1 and
            implementing the IGMP MIB."
    MODULE  -- this module
    MANDATORY-GROUPS { igmpBaseMIBGroup }

    OBJECT     igmpInterfaceStatus
    MIN-ACCESS read-only
    DESCRIPTION
             "Write access is not required."

    ::= { igmpMIBCompliances 1 }

igmpV1RouterMIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for routers running IGMPv1 and
            implementing the IGMP MIB."
    MODULE  -- this module
      MANDATORY-GROUPS { igmpBaseMIBGroup,
                         igmpRouterMIBGroup
                       }

    OBJECT     igmpInterfaceStatus
    MIN-ACCESS read-only
    DESCRIPTION
             "Write access is not required."

    ::= { igmpMIBCompliances 2 }

igmpV2HostMIBCompliance MODULE-COMPLIANCE
    STATUS  current
```

```
    DESCRIPTION
            "The compliance statement for hosts running IGMPv2 and
            implementing the IGMP MIB."
    MODULE  -- this module
    MANDATORY-GROUPS { igmpBaseMIBGroup,
                       igmpV2HostMIBGroup
                     }

    OBJECT     igmpInterfaceStatus
    MIN-ACCESS read-only
    DESCRIPTION
             "Write access is not required."

    ::= { igmpMIBCompliances 3 }

igmpV2RouterMIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for routers running IGMPv2 and
            implementing the IGMP MIB."
    MODULE  -- this module
    MANDATORY-GROUPS { igmpBaseMIBGroup,
                       igmpRouterMIBGroup,
                       igmpV2RouterMIBGroup
                     }

    OBJECT     igmpInterfaceStatus
    MIN-ACCESS read-only
    DESCRIPTION
             "Write access is not required."

    ::= { igmpMIBCompliances 4 }


-- units of conformance

igmpBaseMIBGroup OBJECT-GROUP
    OBJECTS { igmpCacheSelf,
              igmpCacheStatus, igmpInterfaceStatus
            }
    STATUS  current
    DESCRIPTION
            "The basic collection of objects providing management of
            IGMP version 1 or 2."
    ::= { igmpMIBGroups 1 }
```

```
igmpRouterMIBGroup OBJECT-GROUP
    OBJECTS { igmpCacheUpTime, igmpCacheExpiryTime,
              igmpInterfaceJoins, igmpInterfaceGroups,
              igmpCacheLastReporter, igmpInterfaceQuerierUpTime,
              igmpInterfaceQuerierExpiryTime,
              igmpInterfaceQueryInterval
            }
    STATUS  current
    DESCRIPTION
            "A collection of additional objects for management of IGMP
            version 1 or 2 in routers."
    ::= { igmpMIBGroups 2 }


igmpV2HostMIBGroup OBJECT-GROUP
    OBJECTS { igmpInterfaceVersion1QuerierTimer }
    STATUS  current
    DESCRIPTION
            "A collection of additional objects for management of IGMP
            version 2 in hosts."
    ::= { igmpMIBGroups 3 }

igmpHostOptMIBGroup OBJECT-GROUP
    OBJECTS { igmpCacheLastReporter, igmpInterfaceQuerier }
    STATUS  current
    DESCRIPTION
            "A collection of optional objects for IGMP hosts.
            Supporting this group can be especially useful in an
            environment with a router which does not support the IGMP
            MIB."
    ::= { igmpMIBGroups 4 }

igmpV2RouterMIBGroup OBJECT-GROUP
    OBJECTS { igmpInterfaceVersion, igmpInterfaceQuerier,
              igmpInterfaceQueryMaxResponseTime,
              igmpInterfaceRobustness,
              igmpInterfaceWrongVersionQueries,
              igmpInterfaceLastMembQueryIntvl,
              igmpCacheVersion1HostTimer
            }
    STATUS  current
    DESCRIPTION
            "A collection of additional objects for management of IGMP
            version 2 in routers."
    ::= { igmpMIBGroups 5 }
```

```
igmpV2ProxyMIBGroup OBJECT-GROUP
    OBJECTS { igmpInterfaceProxyIfIndex }
    STATUS  current
    DESCRIPTION
            "A collection of additional objects for management of IGMP
            proxy devices."
    ::= { igmpMIBGroups 6 }

END
```

6. 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 igmpCacheSelf and igmpCacheLastReporter can 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 IGMP 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 for 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 secure 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 [12] and the View-based Access Control Model RFC 2575 [15] 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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8. Acknowledgements

This MIB module was updated based on feedback from the IETF's Inter-Domain Multicast Routing (IDMR) Working Group.

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