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Multicast Source Discovery Protocol (MSDP) MIB

Status of This Memo

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Abstract

This memo defines an experimental portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing Multicast Source Discovery Protocol (MSDP) (RFC 3618) speakers.

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1. Introduction

This memo defines an experimental portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing Multicast Source Discovery Protocol (MSDP) [1] speakers.

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [7].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [4], STD 58, RFC 2579 [5] and STD 58, RFC 2580 [6].

3. Overview

This MIB module contains four scalars and four tables, one deprecated. The tables are:

- The deprecated Requests Table, containing the longest-match table used to determine the peer to send SA-Requests to for a given group. This table is deprecated because Requests were removed from MSDP before it became an RFC.

- The Peer Table, containing information on the system’s peers.

- The Source-Active (SA) Cache Table, containing the SA cache entries.

- The Mesh Group Table, containing the list of MSDP mesh groups to which this system belongs.

This MIB module uses the IpAddress SYNTAX, making it only suitable for IPv4 systems. Although the desired direction for MIBs is to use InetAddressType/InetAddress pairs to allow both IPv4 and IPv6 (and future formats as well), the MSDP protocol itself is IPv4-only, and the MSDP working group made an explicit decision not to create an IPv6 version of the protocol.

This MIB module is somewhat disorganized, with scalars before and after tables, holes in the OID space, tables with the RowStatus in the middle, and so on. This is because objects were added and removed as necessary as the MSDP protocol evolved, and the plan was to renumber the whole MIB when moving to the standard mib-2 tree. The MSDP Working Group then changed direction, publishing the MSDP protocol as Experimental. Since there were existing implementations using the strange object order under the experimental OID, the WG decided not to renumber the MIB and to publish it as experimental, keeping the experimental OID.

4. Definitions

```
--
--
MSDP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    experimental, Counter32, Gauge32, TimeTicks, Integer32,
    IpAddress
        FROM SNMPv2-SMI
    RowStatus, TruthValue, TimeStamp, DisplayString
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF;

msdpMIB MODULE-IDENTITY
    LAST-UPDATED "200608010000Z"
    ORGANIZATION "IETF MBONED Working Group"
    CONTACT-INFO
           "Bill Fenner
            75 Willow Road
            Menlo Park, CA  94025
            Phone: +1 650 867 6073
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            One Microsoft Way
            Redmond, WA  98052
            Phone: +1 425 703 8835
            Email: dthaler@microsoft.com

            MBONED Working Group: mboned@lists.uoregon.edu"
    DESCRIPTION
           "An experimental MIB module for MSDP Management and
            Monitoring.
```

```
            Copyright (C) The Internet Society 2006.  This version of
            this MIB module is part of RFC 4624; see the RFC itself
            for full legal notices."
    REVISION "200608010000Z"
    DESCRIPTION
           "Initial version, published as RFC 4624."
    ::= { experimental 92 }

msdpMIBobjects OBJECT IDENTIFIER ::= { msdpMIB 1 }

msdp           OBJECT IDENTIFIER ::= { msdpMIBobjects 1 }


msdpEnabled OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
           "The state of MSDP on this MSDP speaker - globally enabled
            or disabled.

            Changes to this object should be stored to non-volatile
            memory."
    ::= { msdp 1 }

msdpCacheLifetime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
           "The lifetime given to SA cache entries when created or
            refreshed.  This is the [SG-State-Period] in the MSDP
            spec.  A value of 0 means no SA caching is done by this
            MSDP speaker.

            Changes to this object should be stored to non-volatile
            memory.

            This object does not measure time per se; instead, it
            is the delta from the time at which an SA message is
            received at which it should be expired if not refreshed.
            (i.e., it is the value of msdpSACacheExpiryTime
            immediately after receiving an SA message applying to
            that row.)  As such, TimeInterval would be a more
            appropriate SYNTAX; it remains TimeTicks for backwards
            compatibility."
    REFERENCE "RFC 3618 section 5.3"
    ::= { msdp 2 }
```

```
msdpNumSACacheEntries OBJECT-TYPE
    SYNTAX     Gauge32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of entries in the SA Cache table."
    ::= { msdp 3 }

--
-- The spec doesn't define SA-Hold-Down-Period any more.
-- msdpSAHoldDownPeriod OBJECT-TYPE
--     ::= { msdp 9 }

-- This object was introduced in error, with a similar definition
-- to msdpCacheLifetime.
-- msdpSAStatePeriod OBJECT-TYPE
--     ::= { msdp 10 }

msdpRPAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
           "The Rendezvous Point (RP) address used when sourcing
            MSDP SA messages.  May be 0.0.0.0 on non-RPs.

            Changes to this object should be stored to non-volatile
            memory."
    ::= { msdp 11 }

--
-- The MSDP Requests table
-- SA Requests were removed from the MSDP spec, so this entire table
-- is deprecated.

msdpRequestsTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF MsdpRequestsEntry
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
           "The (conceptual) table listing group ranges and MSDP peers
            used when deciding where to send an SA Request message, when
            required.  If SA Requests are not enabled, this table may be
            empty.

            In order to choose a peer to whom to send an SA Request for
            a given group, G, the subset of entries in this table whose
            (msdpRequestsPeerType, msdpRequestsPeer) tuple represents a
```

```
            peer whose msdpPeerState is established are examined.  The
            set is further reduced by examining only those entries for
            which msdpPeerRequestsGroupAddressType equals the address
            type of G.  The entries with the highest value of
            msdpRequestsGroupPrefix are considered, where the group G
            falls within the range described by the combination of
            msdpRequestsGroup and msdpRequestsGroupPrefix.  (This
            sequence is commonly known as a 'longest-match' lookup.)

            Finally, if multiple entries remain, the entry with the
            lowest value of msdpRequestsPriority is chosen.  The SA
            Request message is sent to the peer described by this row."
       ::= { msdp 4 }

msdpRequestsEntry OBJECT-TYPE
    SYNTAX     MsdpRequestsEntry
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
           "An entry (conceptual row) representing a group range
            used when deciding where to send an SA Request
            message."
    INDEX { msdpRequestsGroupAddress, msdpRequestsGroupMask }
    ::= { msdpRequestsTable 1 }

MsdpRequestsEntry ::= SEQUENCE {
        msdpRequestsGroupAddress  IpAddress,
        msdpRequestsGroupMask     IpAddress,
        msdpRequestsPeer          IpAddress,
        msdpRequestsStatus        RowStatus
    }

msdpRequestsGroupAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
           "The group address that, when combined with the mask
            in this entry, represents the group range to which
            this row applies."
    ::= { msdpRequestsEntry 1 }

msdpRequestsGroupMask OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     deprecated
    DESCRIPTION
           "The mask that, when combined with the group address
```

```
            in this entry, represents the group range to which
            this row applies."
    ::= { msdpRequestsEntry 2 }

msdpRequestsPeer OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-create
    STATUS     deprecated
    DESCRIPTION
           "The peer to which MSDP SA Requests for groups matching
            this entry's group range will be sent.  This object,
            combined with msdpRequestsPeerType, must match the INDEX
            of a row in the msdpPeerTable, and to be considered,
            this peer's msdpPeerState must be established."
    ::= { msdpRequestsEntry 3 }

msdpRequestsStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     deprecated
    DESCRIPTION
           "The status of this row, by which new rows may be added
            to the table or old rows may be deleted."
    ::= { msdpRequestsEntry 4 }


--
-- The MSDP Peer table
--

msdpPeerTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF MsdpPeerEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The (conceptual) table listing the MSDP speaker's peers."
    ::= { msdp 5 }

msdpPeerEntry OBJECT-TYPE
    SYNTAX     MsdpPeerEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "An entry (conceptual row) representing an MSDP peer.

            If row creation is supported, dynamically added rows are
            added to the system's stable configuration (corresponding
            to a StorageType value of nonVolatile).  "
```

```
    INDEX      { msdpPeerRemoteAddress }
    ::= { msdpPeerTable 1 }

MsdpPeerEntry ::= SEQUENCE {
        msdpPeerRemoteAddress              IpAddress,
        msdpPeerState                      INTEGER,
        msdpPeerRPFFailures                Counter32,
        msdpPeerInSAs                      Counter32,
        msdpPeerOutSAs                     Counter32,
        msdpPeerInSARequests               Counter32,
        msdpPeerOutSARequests              Counter32,
        msdpPeerInSAResponses              Counter32,
        msdpPeerOutSAResponses             Counter32,
        msdpPeerInControlMessages          Counter32,
        msdpPeerOutControlMessages         Counter32,
        msdpPeerInDataPackets              Counter32,
        msdpPeerOutDataPackets             Counter32,
        msdpPeerFsmEstablishedTransitions  Counter32,
        msdpPeerFsmEstablishedTime         TimeStamp,
        msdpPeerInMessageTime              TimeStamp,
        msdpPeerLocalAddress               IpAddress,
        msdpPeerConnectRetryInterval       Integer32,
        msdpPeerHoldTimeConfigured         Integer32,
        msdpPeerKeepAliveConfigured        Integer32,
        msdpPeerDataTtl                    Integer32,
        msdpPeerProcessRequestsFrom        TruthValue,
        msdpPeerStatus                     RowStatus,
        msdpPeerRemotePort                 Integer32,
        msdpPeerLocalPort                  Integer32,
        msdpPeerEncapsulationType          INTEGER,
        msdpPeerConnectionAttempts         Counter32,
        msdpPeerInNotifications            Counter32,
        msdpPeerOutNotifications           Counter32,
        msdpPeerLastError                  OCTET STRING,
        msdpPeerDiscontinuityTime          TimeStamp
    }

msdpPeerRemoteAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The address of the remote MSDP peer."
    ::= { msdpPeerEntry 1 }

-- dunno what happened to 2.

msdpPeerState OBJECT-TYPE
```

```
    SYNTAX     INTEGER {
                         inactive(1),
                         listen(2),
                         connecting(3),
                         established(4),
                         disabled(5)
                       }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The state of the MSDP TCP connection with this peer."
    ::= { msdpPeerEntry 3 }

msdpPeerRPFFailures OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of SA messages received from this peer that
            failed the Peer-RPF check.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 4 }

msdpPeerInSAs OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of MSDP SA messages received on this
            connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 5 }

msdpPeerOutSAs OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of MSDP SA messages transmitted on this
            connection.
```

```
            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 6 }

msdpPeerInSARequests OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of MSDP SA-Request messages received on this
            connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 7 }

msdpPeerOutSARequests OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of MSDP SA-Request messages transmitted on
            this connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 8 }

msdpPeerInSAResponses OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
           "The number of MSDP SA-Response messages received on this
            connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 9 }
```

```
msdpPeerOutSAResponses OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
           "The number of MSDP SA Response messages transmitted on
            this TCP connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 10 }

msdpPeerInControlMessages OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of MSDP messages, excluding encapsulated
            data packets, received on this TCP connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 11 }

msdpPeerOutControlMessages OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of MSDP messages, excluding encapsulated
            data packets, transmitted on this TCP connection.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 12 }

msdpPeerInDataPackets OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of encapsulated data packets received
```

```
            from this peer.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 13 }

msdpPeerOutDataPackets OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of encapsulated data packets sent to
            this peer.

            Discontinuities in the value of this counter can occur at
            re-initialization of the management system, and at other
            times as indicated by the value of
            msdpPeerDiscontinuityTime."
    ::= { msdpPeerEntry 14 }

msdpPeerFsmEstablishedTransitions OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The total number of times the MSDP FSM transitioned into
            the ESTABLISHED state."
    REFERENCE "RFC 3618 section 11"
    ::= { msdpPeerEntry 15 }

msdpPeerFsmEstablishedTime OBJECT-TYPE
    SYNTAX     TimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "This timestamp is set to the value of sysUpTime when a
            peer transitions into or out of the ESTABLISHED state.
            It is set to zero when the MSDP speaker is booted."
    REFERENCE "RFC 3618 section 11"
    ::= { msdpPeerEntry 16 }

msdpPeerInMessageTime OBJECT-TYPE
    SYNTAX     TimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
```

```
            "The sysUpTime value when the last MSDP message was
             received from the peer.  It is set to zero when the MSDP
             speaker is booted."
    ::= { msdpPeerEntry 17 }

msdpPeerLocalAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "The local IP address used for this entry's MSDP TCP
            connection."
    ::= { msdpPeerEntry 18 }

-- msdpPeerSAAdvPeriod ([SA-Advertisement-Timer]) has been removed.
--     ::= { msdpPeerEntry 19 }
-- RFC 3618, Section 5.1, says it MUST be 60 seconds.


msdpPeerConnectRetryInterval OBJECT-TYPE
    SYNTAX     Integer32 (1..65535)
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "Time interval, in seconds, for the [ConnectRetry-period]
            for this peer."
    REFERENCE "RFC 3618 section 5.6"
    DEFVAL { 30 }
    ::= { msdpPeerEntry 20 }

msdpPeerHoldTimeConfigured OBJECT-TYPE
    SYNTAX     Integer32 (0|3..65535)
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "Time interval, in seconds, for the [HoldTime-Period]
            configured for this MSDP speaker with this peer.  If the
            value of this object is zero (0), the MSDP connection is
            never torn down due to the absence of messages from the
            peer."
    REFERENCE "RFC 3618 section 5.4"
    DEFVAL { 75 }
    ::= { msdpPeerEntry 21 }

msdpPeerKeepAliveConfigured OBJECT-TYPE
    SYNTAX     Integer32 (0|1..21845)
```

```
    UNITS      "seconds"
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "Time interval, in seconds, for the [KeepAlive-Period]
            configured for this MSDP speaker with this peer.  If the
            value of this object is zero (0), no periodic KEEPALIVE
            messages are sent to the peer after the MSDP connection
            has been established."
    REFERENCE "RFC 3618 section 5.5"
    DEFVAL { 60 }
    ::= { msdpPeerEntry 22 }

msdpPeerDataTtl OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "The minimum TTL a packet is required to have before it
            may be forwarded using SA encapsulation to this peer."
    DEFVAL { 1 }
    ::= { msdpPeerEntry 23 }

msdpPeerProcessRequestsFrom OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-create
    STATUS     deprecated
    DESCRIPTION
           "This object indicates whether to process MSDP SA
            Request messages from this peer.  If True(1), MSDP SA
            Request messages from this peer are processed and replied
            to (if appropriate) with SA Response messages.  If
            False(2), MSDP SA Request messages from this peer are
            silently ignored.  It defaults to False when
            msdpCacheLifetime is 0 and to True when msdpCacheLifetime
            is non-0.

            This object is deprecated because MSDP SA Requests were
            removed from the MSDP specification."
    ::= { msdpPeerEntry 24 }

msdpPeerStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
           "The RowStatus object by which peers can be added and
            deleted.  A transition to 'active' will cause the MSDP
```

```
            'Enable MSDP peering with P' Event to be generated.  A
            transition out of the 'active' state will cause the MSDP
            'Disable MSDP peering with P' Event to be generated.
            Care should be used in providing write access to this
            object without adequate authentication.

            msdpPeerRemoteAddress is the only variable that must be
            set to a valid value before the row can be activated.
            Since this is the table's INDEX, a row can be activated
            by simply setting the msdpPeerStatus variable.

            It is possible to modify other columns in the same
            conceptual row when the status value is active(1)."
    REFERENCE "RFC 3618 section 11.1"
    ::= { msdpPeerEntry 25 }

msdpPeerRemotePort OBJECT-TYPE
    SYNTAX     Integer32 (0..65535)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The remote port for the TCP connection between the MSDP
            peers."
    DEFVAL { 639 }
    ::= { msdpPeerEntry 26 }

msdpPeerLocalPort OBJECT-TYPE
    SYNTAX     Integer32 (0..65535)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The local port for the TCP connection between the MSDP
            peers."
    DEFVAL { 639 }
    ::= { msdpPeerEntry 27 }

-- msdpPeerEncapsulationState has been removed
-- because there is no longer an encapsulation
-- state machine.
--     ::= { msdpPeerEntry 28 }

msdpPeerEncapsulationType OBJECT-TYPE
    SYNTAX     INTEGER {
                         none(0),
                         tcp(1)
                       }
    MAX-ACCESS read-create
    STATUS     current
```

```
    DESCRIPTION
           "The encapsulation in use when encapsulating data in SA
            messages to this peer."
    ::= { msdpPeerEntry 29 }

msdpPeerConnectionAttempts OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The number of times the state machine has transitioned
            from INACTIVE to CONNECTING."
    ::= { msdpPeerEntry 30 }

msdpPeerInNotifications OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
           "The number of MSDP Notification messages received from
            this peer.
            This object is deprecated because MSDP Notifications have
            been removed from the spec."
    ::= { msdpPeerEntry 31 }

msdpPeerOutNotifications OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
           "The number of MSDP Notification messages transmitted to
            this peer.

            This object is deprecated because MSDP Notifications have
            been removed from the spec."
    ::= { msdpPeerEntry 32 }

msdpPeerLastError OBJECT-TYPE
    SYNTAX     OCTET STRING (SIZE (2))
    MAX-ACCESS read-only
    STATUS     deprecated
    DESCRIPTION
           "The last error code and subcode received via Notification
            from this peer.  If no error has occurred, this field is
            zero.  Otherwise, the first byte of this two-byte OCTET
            STRING contains the O-bit and error code, and the second
            byte contains the subcode.
```

```
            This object is deprecated because MSDP Notifications have
            been removed from the spec."
    DEFVAL   { '0000'h }
    ::= { msdpPeerEntry 33 }

msdpPeerDiscontinuityTime OBJECT-TYPE
    SYNTAX     TimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The value of sysUpTime on the most recent occasion at
            which one or more of this entry's counters suffered a
            discontinuity.  See the DESCRIPTION of each object to see
            if it is expected to have discontinuities.  These
            discontinuities may occur at peer connection
            establishment.

            If no such discontinuities have occurred since the last
            reinitialization of the local management subsystem, then
            this object contains a zero value."
    ::= { msdpPeerEntry 34 }

--
-- The MSDP Source-Active Cache table
--

msdpSACacheTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF MsdpSACacheEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The (conceptual) table listing the MSDP SA advertisements
            currently in the MSDP speaker's cache."
    ::= { msdp 6 }

msdpSACacheEntry OBJECT-TYPE
    SYNTAX     MsdpSACacheEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "An entry (conceptual row) representing an MSDP SA
            advertisement.  The INDEX to this table includes
            msdpSACacheOriginRP for diagnosing incorrect MSDP
            advertisements; normally, a Group and Source pair would
            be unique.

            Row creation is not permitted; msdpSACacheStatus may only
            be used to delete rows from this table."
```

```
    INDEX      { msdpSACacheGroupAddr, msdpSACacheSourceAddr,
                 msdpSACacheOriginRP }
    ::= { msdpSACacheTable 1 }

MsdpSACacheEntry ::= SEQUENCE {
        msdpSACacheGroupAddr        IpAddress,
        msdpSACacheSourceAddr       IpAddress,
        msdpSACacheOriginRP         IpAddress,
        msdpSACachePeerLearnedFrom  IpAddress,
        msdpSACacheRPFPeer          IpAddress,
        msdpSACacheInSAs            Counter32,
        msdpSACacheInDataPackets    Counter32,
        msdpSACacheUpTime           TimeTicks,
        msdpSACacheExpiryTime       TimeTicks,
        msdpSACacheStatus           RowStatus
    }

msdpSACacheGroupAddr OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The group address of the SA Cache entry."
    ::= { msdpSACacheEntry 1 }

msdpSACacheSourceAddr OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The source address of the SA Cache entry."
    ::= { msdpSACacheEntry 2 }

msdpSACacheOriginRP OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The RP of the SA Cache entry.  This field is in the INDEX
            in order to catch multiple RP's advertising the same
            source and group."
    ::= { msdpSACacheEntry 3 }

msdpSACachePeerLearnedFrom OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
```

```
            "The peer from which this SA Cache entry was last
             accepted.  This address must correspond to the
             msdpPeerRemoteAddress value for a row in the MSDP Peer
             Table.  This should be 0.0.0.0 on the router that
             originated the entry."
    ::= { msdpSACacheEntry 4 }

msdpSACacheRPFPeer OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The peer from which an SA message corresponding to this
             cache entry would be accepted (i.e., the RPF peer for
             msdpSACacheOriginRP).  This may be different than
             msdpSACachePeerLearnedFrom if this entry was created by
             an MSDP SA-Response.  This address must correspond to
             the msdpPeerRemoteAddress value for a row in the MSDP
             Peer Table, or it may be 0.0.0.0 if no RPF peer exists."
    ::= { msdpSACacheEntry 5 }

msdpSACacheInSAs OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of MSDP SA messages received relevant to this
             cache entry.  This object must be initialized to zero
             when creating a cache entry."
    ::= { msdpSACacheEntry 6 }

msdpSACacheInDataPackets OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of MSDP-encapsulated data packets received
             relevant to this cache entry.  This object must be
             initialized to zero when creating a cache entry."
    ::= { msdpSACacheEntry 7 }

msdpSACacheUpTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The time since this entry was first placed in the SA
             cache.
```

```
            The first epoch is the time that the entry was first
            placed in the SA cache, and the second epoch is the
            current time."
    ::= { msdpSACacheEntry 8 }

msdpSACacheExpiryTime OBJECT-TYPE
    SYNTAX     TimeTicks
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
           "The time remaining before this entry will expire from
            the SA cache.

            The first epoch is now, and the second epoch is the time
            that the entry will expire."
    ::= { msdpSACacheEntry 9 }

msdpSACacheStatus OBJECT-TYPE
    SYNTAX     RowStatus { active(1), destroy(6) }
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
           "The status of this row in the table.  The only allowable
            actions are to retrieve the status, which will be
            'active', or to set the status to 'destroy' in order to
            remove this entry from the cache.

            Row creation is not permitted.

            No columnar objects are writable, so there are none that
            may be changed while the status value is active(1)."
    ::= { msdpSACacheEntry 10 }


--
-- MSDP Mesh Group Membership table
--

msdpMeshGroupTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF MsdpMeshGroupEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The (conceptual) table listing MSDP Mesh Group
            configuration."
    ::= { msdp 12 }

msdpMeshGroupEntry OBJECT-TYPE
```

```
    SYNTAX     MsdpMeshGroupEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "An entry (conceptual row) representing a peer in an MSDP
            Mesh Group.

            If row creation is supported, dynamically added rows are
            added to the system's stable configuration
            (corresponding to a StorageType value of nonVolatile)."
    INDEX        { msdpMeshGroupName, msdpMeshGroupPeerAddress }
    ::= { msdpMeshGroupTable 1 }

MsdpMeshGroupEntry ::= SEQUENCE {
        msdpMeshGroupName         DisplayString,
        msdpMeshGroupPeerAddress  IpAddress,
        msdpMeshGroupStatus       RowStatus
    }

msdpMeshGroupName OBJECT-TYPE
    SYNTAX     DisplayString (SIZE(1..64))
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "The name of the mesh group."
    ::= { msdpMeshGroupEntry 1 }

msdpMeshGroupPeerAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
           "A peer address that is a member of the mesh group with
            name msdpMeshGroupName.  The msdpMeshGroupPeerAddress
            must match a row in the msdpPeerTable."
    ::= { msdpMeshGroupEntry 2 }

msdpMeshGroupStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
               "This entry's status, by which new entries may be added
               to the table and old entries deleted.

               msdpMeshGroupName and msdpMeshGroupPeerAddress must be
               set to valid values before the row can be activated.
               Since these are the table's INDEX, a row can be activated
```

```
                by simply setting the msdpMeshGroupStatus variable.

                It is not possible to modify other columns in the same
                conceptual row when the status value is active(1),
                because the only other objects in the row are part of the
                INDEX.  Changing one of these changes the row, so an old
                row must be deleted and a new one created."
        ::= { msdpMeshGroupEntry 3 }


-- Traps

msdpTraps   OBJECT IDENTIFIER ::= { msdp 0 }

msdpEstablished NOTIFICATION-TYPE
    OBJECTS { msdpPeerFsmEstablishedTransitions }
    STATUS     current
    DESCRIPTION
           "The MSDP Established event is generated when the MSDP FSM
            enters the ESTABLISHED state."
    ::= { msdpTraps 1 }

msdpBackwardTransition NOTIFICATION-TYPE
    OBJECTS { msdpPeerState }
    STATUS     current
    DESCRIPTION
           "The MSDPBackwardTransition Event is generated when the
            MSDP FSM moves from a higher-numbered state to a
            lower-numbered state."
    ::= { msdpTraps 2 }

-- conformance information

msdpMIBConformance OBJECT IDENTIFIER ::= { msdp 8 }
msdpMIBCompliances OBJECT IDENTIFIER ::= { msdpMIBConformance 1 }
msdpMIBGroups      OBJECT IDENTIFIER ::= { msdpMIBConformance 2 }

-- compliance statements

msdpMIBCompliance MODULE-COMPLIANCE
    STATUS     deprecated
    DESCRIPTION
           "The compliance statement for entities that implement a pre-
            RFC version of MSDP.  This statement is deprecated because
            it includes objects used for managing/monitoring aspects of
            MSDP that were removed before it was published as an RFC."
   MODULE  -- this module
   MANDATORY-GROUPS { msdpMIBGlobalsGroup, msdpMIBPeerGroup,
```

```
                    msdpMIBNotificationGroup }

       GROUP  msdpMIBEncapsulationGroup
        DESCRIPTION
           "This group is mandatory if MSDP encapsulation interfaces are
            not given their own interface index numbers."
       GROUP  msdpMIBSACacheGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker has the ability
            to cache SA messages."
        GROUP  msdpMIBRequestsGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker has the ability
            to send SA-Request messages and to parse SA-Response
                messages."
        GROUP  msdpMIBRPGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker sources (as
            opposed to forwards) MSDP messages."
        GROUP  msdpMIBMeshGroupGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker can participate
            in MSDP Mesh Groups."
   ::= { msdpMIBCompliances 1 }

msdpMIBFullCompliance MODULE-COMPLIANCE
    STATUS     current
    DESCRIPTION
           "The compliance statement for entities that implement MSDP
            (RFC3618)."
   MODULE  -- this module
   MANDATORY-GROUPS { msdpMIBGlobalsGroup, msdpMIBPeerGroup2,
                      msdpMIBSACacheGroup, msdpMIBEncapsulationGroup }
        GROUP  msdpMIBRPGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker sources (as
            opposed to forwards) MSDP messages."
        GROUP  msdpMIBMeshGroupGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker can participate
            in MSDP Mesh Groups."
   ::= { msdpMIBCompliances 2 }

msdpMIBReadOnlyCompliance MODULE-COMPLIANCE
    STATUS     current
    DESCRIPTION
           "The compliance statement for entities that implement MSDP
            (RFC3618), but do not permit configuration (or only permit
```

```
           partial configuration) via SNMP."
   MODULE  -- this module
   MANDATORY-GROUPS { msdpMIBGlobalsGroup, msdpMIBPeerGroup2,
                      msdpMIBSACacheGroup, msdpMIBEncapsulationGroup }
        GROUP  msdpMIBRPGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker sources (as
            opposed to forwards) MSDP messages."
        GROUP  msdpMIBMeshGroupGroup
        DESCRIPTION
           "This group is mandatory if the MSDP speaker can participate
            in MSDP Mesh Groups."
        OBJECT     msdpEnabled
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpCacheLifetime
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerLocalAddress
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerConnectRetryInterval
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerHoldTimeConfigured
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerKeepAliveConfigured
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerDataTtl
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerStatus
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpPeerEncapsulationType
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
```

```
        OBJECT     msdpSACacheStatus
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpRPAddress
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
        OBJECT     msdpMeshGroupStatus
        MIN-ACCESS read-only
        DESCRIPTION
           "Write access is not required."
   ::= { msdpMIBCompliances 3 }

-- units of conformance

msdpMIBGlobalsGroup OBJECT-GROUP
   OBJECTS { msdpEnabled }
    STATUS     current
    DESCRIPTION
           "A collection of objects providing information on global MSDP
            state."
    ::= { msdpMIBGroups 1 }

msdpMIBPeerGroup OBJECT-GROUP
   OBJECTS { msdpPeerRPFFailures,
             msdpPeerState, msdpPeerInSAs, msdpPeerOutSAs,
             msdpPeerInSARequests, msdpPeerOutSARequests,
             msdpPeerInSAResponses, msdpPeerOutSAResponses,
             msdpPeerInNotifications, msdpPeerOutNotifications,
             msdpPeerInControlMessages, msdpPeerOutControlMessages,
             msdpPeerFsmEstablishedTransitions,
             msdpPeerFsmEstablishedTime,
             msdpPeerLocalAddress,
             msdpPeerRemotePort, msdpPeerLocalPort,
             msdpPeerConnectRetryInterval,
             msdpPeerHoldTimeConfigured,
             msdpPeerKeepAliveConfigured,
             msdpPeerInMessageTime,
             msdpPeerProcessRequestsFrom,
             msdpPeerConnectionAttempts,
             msdpPeerLastError,
             msdpPeerStatus,
             msdpPeerDiscontinuityTime
           }
    STATUS     deprecated
    DESCRIPTION
           "A collection of objects for managing MSDP peers.  This group
```

```
            is deprecated in favor of msdpMIBPeerGroup2 because it
            contains objects for managing aspects of MSDP that were
            removed before it was published as an RFC."
    ::= { msdpMIBGroups 2 }

msdpMIBEncapsulationGroup OBJECT-GROUP
   OBJECTS { msdpPeerInDataPackets, msdpPeerOutDataPackets,
             msdpPeerDataTtl,
             msdpPeerEncapsulationType
           }
    STATUS     current
    DESCRIPTION
           "A collection of objects for managing encapsulations if the
            MSDP encapsulation interfaces are not given interface
            indices."
    ::= { msdpMIBGroups 3 }

msdpMIBSACacheGroup OBJECT-GROUP
    OBJECTS { msdpCacheLifetime, msdpNumSACacheEntries,
              msdpSACachePeerLearnedFrom,
              msdpSACacheRPFPeer, msdpSACacheInSAs,
              msdpSACacheInDataPackets,
              msdpSACacheUpTime, msdpSACacheExpiryTime,
              msdpSACacheStatus }
    STATUS     current
    DESCRIPTION
           "A collection of objects for managing MSDP SA cache entries."
    ::= { msdpMIBGroups 4 }

msdpMIBNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { msdpEstablished,
                    msdpBackwardTransition }
    STATUS     current
    DESCRIPTION
           "A collection of notifications for signaling changes in MSDP
            peer relationships."
    ::= { msdpMIBGroups 5 }

msdpMIBRequestsGroup OBJECT-GROUP
    OBJECTS { msdpRequestsPeer, msdpRequestsStatus }
    STATUS     deprecated
    DESCRIPTION
           "A collection of objects for managing MSDP Request
            transmission.  This group is deprecated because Requests
            were removed from MSDP before its publication as an RFC."
    ::= { msdpMIBGroups 6 }

msdpMIBRPGroup OBJECT-GROUP
```

```
    OBJECTS { msdpRPAddress }
    STATUS     current
    DESCRIPTION
           "A collection of objects for MSDP speakers that source MSDP
            messages."
    ::= { msdpMIBGroups 7 }

msdpMIBMeshGroupGroup OBJECT-GROUP
    OBJECTS { msdpMeshGroupStatus }
    STATUS     current
    DESCRIPTION
           "A collection of objects for MSDP speakers that can
            participate in MSDP mesh groups."
    ::= { msdpMIBGroups 8 }

msdpMIBPeerGroup2 OBJECT-GROUP
   OBJECTS { msdpPeerRPFFailures,
             msdpPeerState, msdpPeerInSAs, msdpPeerOutSAs,
             msdpPeerInSARequests, msdpPeerOutSARequests,
             msdpPeerInControlMessages, msdpPeerOutControlMessages,
             msdpPeerFsmEstablishedTransitions,
             msdpPeerFsmEstablishedTime,
             msdpPeerLocalAddress,
             msdpPeerRemotePort, msdpPeerLocalPort,
             msdpPeerConnectRetryInterval,
             msdpPeerHoldTimeConfigured,
             msdpPeerKeepAliveConfigured,
             msdpPeerInMessageTime,
             msdpPeerConnectionAttempts,
             msdpPeerStatus,
             msdpPeerDiscontinuityTime
           }
    STATUS     current
    DESCRIPTION
           "A collection of objects for managing MSDP peers."
    ::= { msdpMIBGroups 9 }

END
```

5. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

msdpEnabled
Obviously, by modifying msdpEnabled, an attacker could simply disable MSDP processing on the router.

msdpCacheLifetime
If allowed to modify msdpCacheLifetime, an attacker could set the value to a value lower than a peer's refresh interval, causing all state to time out and be refreshed.

msdpRequestsPeer, msdpRequestsStatus
If allowed to modify entries in the msdpRequestsTable, an attacker could cause this system to send MSDP Requests to an unknown system, or could simply remove the proper configuration. Note that the msdpRequestsTable is deprecated, and the MSDP Request functionality is not in the published MSDP spec.

msdpPeerTable objects
The writable objects in the msdpPeerTable are: msdpPeerLocalAddress, msdpPeerConnectRetryInterval, msdpPeerHoldTimeConfigured, msdpPeerKeepAliveConfigured, msdpPeerDataTtl, msdpPeerProcessRequestsFrom, msdpPeerStatus, and msdpPeerEncapsulationType. Of these, modifying msdpPeerIpAddress and msdpPeerStatus could cause a changed or deleted peer configuration. Modifying any of the other values could cause subtle protocol misbehavior.

msdpSACacheStatus
This writable object can be used to remove valid values from the router's SA cache.

msdpRPAddress
Changing this object can cause a failure of the Peer-RPF rules for SA messages sourced by this router.

msdpMeshGroupStatus
This object can be used to change this router's idea of its mesh group membership and those of its peers. Misconfiguration of mesh groups can cause subtle protocol misbehavior.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

- The entire msdpPeerTable. Peer information can result in discovering internal topology, which many want to keep secret.
- msdpNumSACacheEntries. The size of the SA Cache could reveal whether this system has MSDP entries for public and/or private groups.
- The entire msdpSACacheTable. The active sources and groups in a network could be private.
- The entire msdpMeshGroupTable. This information can also lead to internal topology information.

SNMP versions prior to SNMPv3 did not include adequate security. 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 GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [6], Section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

6. IANA Considerations

Since this MIB is for an experimental protocol, it uses an experimental OID.

Decimal	Name	Description	References
92	MSDP-MIB	Multicast Source Discovery MIB	RFC 4624

7. Acknowledgements

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8.2. Informative References

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