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Multicast Source Discovery protocol MIB
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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](#). 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](#)].

[2](#). Revision History

A record of changes which will be removed before publication.

[20](#) October 2005

Added explicit reasoning for IPv4-only-osity and for the unorganized organization.

Updated Copyright and IPR statements.

Updated Security Considerations, per [RFC4181](#).

Added IANA Considerations, per [RFC4181](#).

Added REVISION and WG mailing list to MODULE-IDENTITY, per [RFC4181](#).

Changed some TimeTicks to TimeStamp, on [RFC4181](#)'s advice.

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Added advice on non-volatile storage, row creation and column modification to tables with RowStatus columns, per [RFC4181](#).

Added msdpReadOnlyCompliance to permit implementations that don't implement writing.

Clarified that msdpSAStatePeriod was an accidental duplication of msdpCacheLifetime.

Described the epochs for TimeTicks objects, per [RFC4181](#). Add a note that msdpCacheLifetime would really be better as a TimeInterval, but is TimeTicks for hysterical raisins.

[11](#) July 2004

Renamed to [draft-ietf-mboned-msdp-mib-00](#).

Fixed spec references and defaults for msdpPeerHoldTimeConfigured, msdpPeerKeepAliveConfigured and msdpPeerConnectRetryInterval, as pointed out by Ketan Talaulikar.

Deprecated all objects related to SA-Requests and notifications, since [RFC 3618](#) doesn't have either one. As pointed out by Ketan Talaulikar.

Clarified that msdpSACachePeerLearnedFrom should be 0.0.0.0 on the originator. From Mike Davison.

Removed msdpSAStatePeriod. I couldn't figure out what it's for; at best it should be SG State Period, but that's already msdpCacheLifetime. From Mike Davison.

[17](#) October 2003

Undid most of the hard work since draft -03, which is the only implementation I was able to find by querying the MSDP mailing

list.

[29](#) May 2003

Republished with no changes. How did it get to be almost 2 years?

[18](#) July 2001

Since the INET-ADDRESS-MIB relaxed restrictions on InetAddressType, remove msdpPeerLocalAddressType, rename msdpSACacheGroupAddrType to msdpCacheAddrType, remove msdpCacheSourceAddrType, msdpSACacheOriginRPTYPE, msdpSACachePeerLearnedFromType,

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msdpSACacheRPFPeerType.

Updated the DESCRIPTION of msdpRequestsTable to describe exactly how it is used.

Added msdpPeerDiscontinuityTime.

Changed msdpPeerFsmEstablishedTime to a TimeStamp instead of a counting number of seconds.

Changed msdpPeerInMessageElapsedTime to msdpPeerInMessageTime and changed it to a TimeStamp.

Added msdpMeshGroupTable.

Updated conformance information.

[1](#) March 2001

Added msdpPeerIfIndex.

Converted all IPAddress items to InetAddressType/InetAddress pairs. This bigtime violates [RFC2578](#)'s rules about MIB evolution, so take extra care when implementing this change.

Added msdpRequestsPriority, in order to allow configuration of multiple peers to whom Requests will be sent. Note that this violates [RFC2578](#)'s rules about MIB evolution, so take extra care when implementing this change.

Removed DEFVAL on scalars, since it should only be needed for table row creation.

Removed msdpPeerSAAdvPeriod, since the spec changed to say its value MUST be 60.

Added none(0) to msdpPeerEncapsulationType enumeration (is this OK? should it be 4?)

Removed msdpPeerEncapsulationState since the encapsulation "negotiation" was removed from the spec.

Added msdpRPAddress to specify the RP address to use when sourcing SA messages.

Added msdpSACacheSourcePrefix to msdpSACacheTable, and added it to the INDEX. Note that this violates [RFC2578](#)'s rules about MIB evolution, so take extra care when implementing this change.

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Completely renumbered the MIB, removing the extra level of msdpMIBojects and creating an msdpScalars group to contain all scalars. Note that this violates [RFC2578](#)'s rules about MIB evolution, so take extra care when implementing this change.

[16](#) December 1999

Added msdpSAHoldDownPeriod, msdpPeerEncapsulationState, msdpPeerEncapsulationType, msdpPeerConnectionAttempts, msdpPeerInNotifications, msdpPeerOutNotifications, and msdpLastError

Removed msdpPeerConfigMethod, since this has disappeared from the spec.

Renamed the states in msdpPeerState to go with the state machine in the spec.

Added msdpPeerLocalPort and msdpPeerRemotePort in order to provide full information about the TCP connection in use. I'd like to reorder the Peer Table but that can wait until the MIB gets published as an RFC in order to only change things like that once.

Added msdpSACacheOriginRP as an INDEX to the msdpSACacheTable. Note that this violates [RFC2578](#)'s rules about MIB evolution, so take extra care when implementing this change.

[25](#) June 1999

Renamed to DRAFT-MSDP-MIB. It will be renamed back to MSDP-MIB when it gets renumbered under mib-2, in order to avoid module naming problems.

Turned msdpSendRequestsTo into a table in order to handle administratively scoped groups with different RP's.

[27](#) May 1999

Added IANA-assigned experimental OID

Added msdpSendRequestsTo and msdpPeerProcessRequestsFrom to configure MSDP SA-Request/Response processing.

Added msdpPeerDataTtl to allow TTL scoping of data packets forwarded across MSDP peerings.

Renumbered msdpSACacheInDataPackets and further items in msdpSACacheTable, to eliminate duplicate OIDs

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[20](#) April 1999

initial version.

[3](#). Overview

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

- o 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;

- o the Peer Table, containing information on the system's peers;
- o the Source-Active Cache Table, containing the SA cache entries; and
- o 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 to not 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](#)

```
--
--
```

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

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    experimental, Counter32, Gauge32, TimeTicks, Integer32,
```

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```
IpAddress
```

```
    FROM SNMPv2-SMI
```

```
RowStatus, TruthValue, TimeStamp, DisplayString
```

```
    FROM SNMPv2-TC
```

```
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
```

```
    FROM SNMPv2-CONF;
```

```
msdpMIB MODULE-IDENTITY
```

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DESCRIPTION

"An experimental MIB module for MSDP Management and Monitoring.

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REVISION "200510210000Z"

DESCRIPTION

"Initial version, published as RFC XXXX."

::= { experimental 92 }

-- RFC Ed.: replace XXXX with actual RFC number & remove this note

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

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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 compatability."

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 RP address used when sourcing MSDP SA messages. May be 0.0.0.0 on non-RP's.

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, and 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

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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

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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,
    msdpPeerInSARRequests     Counter32,
    msdpPeerOutSARRequests    Counter32,
    msdpPeerInSAResponses     Counter32,
    msdpPeerOutSAResponses    Counter32,
    msdpPeerInControlMessages Counter32,
    msdpPeerOutControlMessages Counter32,
    msdpPeerInDataPackets     Counter32,
    msdpPeerOutDataPackets    Counter32,
    msdpPeerFsmEstablishedTransitions Counter32,
    msdpPeerFsmEstablishedTime TimeStamp,

```

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```

    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 which
```

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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 }
```

```
msdpPeerInSARRequests 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 }
```

```
msdpPeerOutSARRequests 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.
```

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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."

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DEFVAL { 1 }
 ::= { msdpPeerEntry 23 }

msdpPeerProcessRequestsFrom OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-create
STATUS deprecated
DESCRIPTION

"This object indicates whether or not 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 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

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"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."

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 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 0-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 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
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',

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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

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"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
there 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

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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 which 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 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."

```

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```
 ::= { msdpMIBCompliances 1 }
```

```
msdpMIBFullCompliance MODULE-COMPLIANCE
```

```
  STATUS      current
```

```
  DESCRIPTION
```

```
    "The compliance statement for entities which 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 which 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,
            msdpPeerInSARRequests, msdpPeerOutSARRequests,
            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 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,
          msdpPeerInSARRequests, msdpPeerOutSARRequests,
          msdpPeerInControlMessages, msdpPeerOutControlMessages,
          msdpPeerFsmEstablishedTransitions,
          msdpPeerFsmEstablishedTime,
          msdpPeerLocalAddress,
          msdpPeerRemotePort, msdpPeerLocalPort,

```

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```
        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 that have 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.

There are a number of managed objects in this MIB that may contain sensitive information. These are:

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

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

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SNMPv1 by itself is not a secure 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 GET/SET (read/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 3414](#) [2] and the View-based Access Control Model [RFC 3415](#) [3] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, 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	[Fenner]

The IANA is requested to change the Reference for this entry to point to this document.

[7](#). Acknowledgements

Tom Pusateri and Billy Ng both provided valuable input on early versions of this draft. It was completed based upon feedback from Mike Davison and Ketan Talaulikar. Lucy Lynch provided a desperately-needed reminder to finish this document.

[8](#). Authors' Addresses

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- [2] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", STD 62, [RFC 3414](#), December 2002.
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- [4] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M.,

and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.

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[6] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.

[9.1](#). Informative References

[7] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.

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