

Multicast Address Allocation MIB

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

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

Table of Contents

1. Introduction	2
2. The Internet-Standard Management Framework	2
3. Overview	2
3.1. Protocol-independent objects	3
3.2. Protocol-specific objects.	3
4. Definitions.	4
5. IANA Considerations.	32
6. Security Considerations.	33
7. Acknowledgements	34
8. Intellectual Property Statement.	34
9. References	35
9.1. Normative References	35
9.2. Informative References	35
10. Author's Address	36
11. Full Copyright Statement	37

1. Introduction

This document defines a Management Information Base (MIB) module for managing multicast address allocation in a protocol-independent manner, as well as for managing specific protocols used in allocating multicast addresses. The protocol-independent objects in this MIB apply to all multicast address allocation servers (MAASS) and clients, as described in [ARCH], including those that allocate source-specific multicast addresses for the local machine.

The protocol-specific objects in this MIB include objects related to the Multicast Address Dynamic Client Allocation Protocol (MADCAP) [MADCAP]. Interactions with the Multicast-scope Zone Announcement Protocol (MZAP) [MZAP] are also noted where appropriate.

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 [RFC3410].

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 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

3. Overview

The purpose of this MIB module is to provide the ability to configure and monitor the status of multicast address allocation within the local domain.

Some important monitoring questions which can be answered by this MIB module include:

- o How full is scope X?
- o Who's using up the space?
- o Who allocated a given address A?
- o Are requests being met?

This MIB module is divided into two primary sections:

- o Protocol-independent objects relevant to all multicast address allocation servers and clients.
- o Protocol-specific objects related to the MADCAP client-server protocol.

3.1. Protocol-independent objects

The protocol-independent objects consist of one "capabilities" scalar and five tables. The tables are:

- o The Scope Table contains information on the multicast scopes known to a multicast address allocation server. This table allows configuring scopes, and viewing what scopes are known to the local system after being configured elsewhere.
- o The Scope Name Table contains the names of the multicast scopes. This table logically extends the Scope Table with the list of scope names in various languages for each scope.
- o The Allocation Range Table contains the address ranges out of which the device may allocate addresses. It also allows answering the questions "How full is scope X?" and "Are requests being met?"
- o The Request Table contains the requests for address allocations, and allows answering the question "Who's using up the space?"
- o The Address Table contains the blocks of addresses which have been allocated, and together with the Request Table, allows answering the question "Who allocated a given address A?"

3.2. Protocol-specific objects

The MADCAP objects consist of a group of (scalar) configuration parameters, and a group of (scalar) statistics.

4. Definitions

MALLOC-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY, mib-2,
Unsigned32, Gauge32, Counter32 FROM SNMPv2-SMI

RowStatus, TruthValue, StorageType FROM SNMPv2-TC

MODULE-COMPLIANCE, OBJECT-GROUP FROM SNMPv2-CONF

InetAddress, InetAddressType FROM INET-ADDRESS-MIB

LanguageTag FROM IPMROUTE-STD-MIB

SnmpAdminString FROM SNMP-FRAMEWORK-MIB

IANAscopeSource, IANAmallocRangeSource FROM IANA-MALLOC-MIB;

mallocMIB MODULE-IDENTITY

LAST-UPDATED "200306090000Z" -- June 9, 2003

ORGANIZATION "IETF MALLOC Working Group"

CONTACT-INFO

" WG-EMail: malloc@catarina.usc.edu
Subscribe: malloc-request@catarina.usc.edu
Archive: catarina.usc.edu/pub/multicast/malloc/

Co-chair/editor:

Dave Thaler
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052
EMail: dthaler@microsoft.com

Co-chair:

Steve Hanna
Sun Microsystems, Inc.
One Network Drive
Burlington, MA 01803
EMail: steve.hanna@sun.com"

DESCRIPTION

"The MIB module for management of multicast address allocation.

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```
-- revision log

REVISION      "200306090000Z" -- June 9, 2003
DESCRIPTION
    "Initial version, published as RFC 3559."
 ::= { mib-2 101 }

mallocMIBObjects OBJECT IDENTIFIER ::= { mallocMIB 1 }

malloc        OBJECT IDENTIFIER ::= { mallocMIBObjects 1 }

madcap        OBJECT IDENTIFIER ::= { mallocMIBObjects 2 }

--
-- scalars
--

mallocCapabilities OBJECT-TYPE
    SYNTAX      BITS {
        startTime(0),
        serverMobility(1),
        retryAfter(2)
    }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object describes the capabilities which a client or
        server supports.  The startTime bit indicates that
        allocations with a future start time are supported.  The
        serverMobility bit indicates that allocations can be renewed
        or released from a server other than the one granting the
        original allocation.  The retryAfter bit indicates support
        for a waiting state where the client may check back at a
        later time to get the status of its request."
    ::= { malloc 1 }

--
-- the Scope Table
--

mallocScopeTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF MallocScopeEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The (conceptual) table containing information on multicast
        scopes from which addresses may be allocated.  Entries in
        this table may be dynamically discovered via some other
```

protocol, such as MZAP, or may be statically configured, such as in an isolated network environment. Each scope is associated with a range of multicast addresses, and ranges for different rows must be disjoint."

::= { malloc 2 }

mallocScopeEntry OBJECT-TYPE

SYNTAX MallocScopeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) containing the information on a particular multicast scope."

INDEX { mallocScopeAddressType, mallocScopeFirstAddress }

::= { mallocScopeTable 1 }

MallocScopeEntry ::= SEQUENCE {

mallocScopeAddressType InetAddressType,

mallocScopeFirstAddress InetAddress,

mallocScopeLastAddress InetAddress,

mallocScopeHopLimit Unsigned32,

mallocScopeStatus RowStatus,

mallocScopeSource IANAScopeSource,

mallocScopeDivisible TruthValue,

mallocScopeServerAddressType InetAddressType,

mallocScopeServerAddress InetAddress,

mallocScopeSSM TruthValue,

mallocScopeStorage StorageType

}

mallocScopeAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The type of the addresses in the multicast scope range.

Legal values correspond to the subset of address families

for which multicast address allocation is supported."

::= { mallocScopeEntry 1 }

mallocScopeFirstAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE(0..20))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The first address in the multicast scope range. The type of this address is determined by the value of the mallocScopeAddressType object."

```
 ::= { mallocScopeEntry 2 }

mallocScopeLastAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "The last address in the multicast scope range.  The type of
        this address is determined by the value of the
        mallocScopeAddressType object."
    ::= { mallocScopeEntry 3 }

mallocScopeHopLimit OBJECT-TYPE
    SYNTAX      Unsigned32 (0..255)
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "The default IPv4 TTL or IPv6 hop limit which applications
        should use for groups within the scope."
    DEFVAL      { 255 }
    ::= { mallocScopeEntry 4 }

mallocScopeStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "The status of this row, by which new entries may be
        created, or old entries deleted from this table.  If write
        access is supported, the other writable objects in this
        table may be modified even while the status is 'active'."
    ::= { mallocScopeEntry 5 }

mallocScopeSource OBJECT-TYPE
    SYNTAX      IANAScopeSource
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The method by which this entry was learned."
    ::= { mallocScopeEntry 6 }

mallocScopeDivisible OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "If false, the server may allocate addresses out of the
        entire range.  If true, the server must not allocate
```

addresses out of the entire range, but may only allocate addresses out of a subrange learned via another method. Creating or deleting a scope which is not divisible has the side effect of creating or deleting the corresponding entry in the mallocAllocRangeTable. Deleting a scope which is divisible has the side effect of deleting any corresponding entries in the mallocAllocRangeTable, and the mallocRequestTable."

DEFVAL { false }
::= { mallocScopeEntry 7 }

mallocScopeServerAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The type of the address of a multicast address allocation server to which a request may be sent."

DEFVAL { unknown }
::= { mallocScopeEntry 8 }

mallocScopeServerAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The address of a multicast address allocation server to which a request may be sent. The default value is an zero-length address, indicating that no server is known. The type of this address is determined by the value of the mallocScopeServerAddressType object."

DEFVAL { ''h } -- the empty string
::= { mallocScopeEntry 9 }

mallocScopeSSM OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates whether the scope is a Source-Specific Multicast (SSM) range."

DEFVAL { false }
::= { mallocScopeEntry 10 }

mallocScopeStorage OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The storage type for this conceptual row. Conceptual rows having the value 'permanent' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile }
 ::= { mallocScopeEntry 11 }

--
 -- the Scope Name Table
 --

mallocScopeNameTable OBJECT-TYPE

SYNTAX SEQUENCE OF MallocScopeNameEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The (conceptual) table containing information on multicast scope names. Entries in this table may be dynamically discovered via some other protocol, such as MZAP, or may be statically configured, such as in an isolated network environment."

::= { malloc 3 }

mallocScopeNameEntry OBJECT-TYPE

SYNTAX MallocScopeNameEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) containing the information on a particular multicast scope name."

INDEX { mallocScopeAddressType, mallocScopeFirstAddress,
 IMPLIED mallocScopeNameLangName }

::= { mallocScopeNameTable 1 }

MallocScopeNameEntry ::= SEQUENCE {

mallocScopeNameLangName	LanguageTag,
mallocScopeNameScopeName	SnmpAdminString,
mallocScopeNameDefault	TruthValue,
mallocScopeNameStatus	RowStatus,
mallocScopeNameStorage	StorageType

}

mallocScopeNameLangName OBJECT-TYPE

SYNTAX LanguageTag (SIZE(1..94))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The RFC 3066 language tag for the language of the scope name."

::= { mallocScopeNameEntry 1 }

mallocScopeNameScopeName OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The textual name associated with the multicast scope. The value of this object should be suitable for displaying to end-users, such as when allocating a multicast address in this scope. If the scope is an IPv4 scope, and no name is specified, the default value of this object should be the string 239.x.x.x/y with x and y replaced appropriately to describe the address and mask length associated with the scope. If the scope is an IPv6 scope, and no name is specified, the default value of this object should generically describe the scope level (e.g., site)."

::= { mallocScopeNameEntry 2 }

mallocScopeNameDefault OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"If true, indicates a preference that the name in the associated language should be used by applications if no name is available in a desired language."

DEFVAL { false }

::= { mallocScopeNameEntry 3 }

mallocScopeNameStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The status of this row, by which new entries may be created, or old entries deleted from this table. If write access is supported, the other writable objects in this table may be modified even while the status is 'active'."

::= { mallocScopeNameEntry 4 }

mallocScopeNameStorage OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The storage type for this conceptual row. Conceptual rows having the value 'permanent' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile }
 ::= { mallocScopeNameEntry 5 }

--

-- the Allocation Range Table

--

mallocAllocRangeTable OBJECT-TYPE

SYNTAX SEQUENCE OF MallocAllocRangeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The (conceptual) table containing information on subranges of addresses from which the device may allocate addresses, if it is a MAAS. If the device is a Prefix Coordinator, any ranges which the device is advertising to MAAS's will be in this table. Note that the device may be both a MAAS and a Prefix Coordinator.

Address ranges for different rows must be disjoint, and must be contained within the address range of the corresponding row of the mallocScopeTable.

Deleting an allocation range has the side effect of deleting any entries within that range from the mallocAddressTable."

::= { malloc 4 }

mallocAllocRangeEntry OBJECT-TYPE

SYNTAX MallocAllocRangeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) containing the information on a particular allocation range."

INDEX { mallocScopeAddressType, mallocScopeFirstAddress,
 mallocAllocRangeFirstAddress }

::= { mallocAllocRangeTable 1 }

MalloAllocRangeEntry ::= SEQUENCE {

mallocAllocRangeFirstAddress InetAddress,

mallocAllocRangeLastAddress InetAddress,

mallocAllocRangeStatus RowStatus,

mallocAllocRangeSource IANAMallocRangeSource,

mallocAllocRangeLifetime Unsigned32,

mallocAllocRangeMaxLeaseAddr Unsigned32,

```

    mallocAllocRangeMaxLeaseTime      Unsigned32,
    mallocAllocRangeNumAllocatedAddrs Gauge32,
    mallocAllocRangeNumOfferedAddrs   Gauge32,
    mallocAllocRangeNumWaitingAddrs   Gauge32,
    mallocAllocRangeNumTryingAddrs    Gauge32,
    mallocAllocRangeAdvertisable      TruthValue,
    mallocAllocRangeTotalAllocatedAddrs Gauge32,
    mallocAllocRangeTotalRequestedAddrs Gauge32,
    mallocAllocRangeStorage            StorageType
}

mallocAllocRangeFirstAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The first address in the allocation range.  The type of
         this address is determined by the value of the
         mallocScopeAddressType object."
    ::= { mallocAllocRangeEntry 1 }

mallocAllocRangeLastAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The last address in the allocation range.  The type of this
         address is determined by the value of the
         mallocScopeAddressType object."
    ::= { mallocAllocRangeEntry 2 }

mallocAllocRangeStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The status of this row, by which new entries may be
         created, or old entries deleted from this table.  If write
         access is supported, the other writable objects in this
         table may be modified even while the status is 'active'."
    ::= { mallocAllocRangeEntry 3 }

mallocAllocRangeSource OBJECT-TYPE
    SYNTAX      IANAmallocRangeSource
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The means by which this entry was learned."

```

```
::= { mallocAllocRangeEntry 4 }
```

mallocAllocRangeLifetime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of seconds remaining in the lifetime of the (sub)range out of which addresses are being allocated. A value of 0 indicates that the range is not subject to aging."

DEFVAL { 0 }

```
::= { mallocAllocRangeEntry 5 }
```

mallocAllocRangeMaxLeaseAddrs OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum number of addresses which the server is willing to grant for each future request in this range. A value of 0 means that no specific limit is enforced, as long as the server has valid addresses to allocate."

DEFVAL { 0 }

```
::= { mallocAllocRangeEntry 6 }
```

mallocAllocRangeMaxLeaseTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum lifetime which the server will grant for future requests in this range. A value of 0 means that no additional limit is enforced beyond that of mallocAllocRangeLifetime."

DEFVAL { 0 }

```
::= { mallocAllocRangeEntry 7 }
```

mallocAllocRangeNumAllocatedAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of addresses in the range which have been allocated. This value can be used to determine the current address space utilization within the scoped range. This

should match the total number of addresses for this scope covered by entries in the mallocAddressTable."
 ::= { mallocAllocRangeEntry 8 }

mallocAllocRangeNumOfferedAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of addresses in the range which have been offered. This number should match the sum of mallocRequestNumAddrs for all entries in the mallocRequestTable in the offered state. Together with mallocAllocRangeNumAllocatedAddrs and mallocAllocRangeNumTryingAddrs, this can be used to determine the address space utilization within the scoped range in the immediate future."

::= { mallocAllocRangeEntry 9 }

mallocAllocRangeNumWaitingAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of addresses in the range which have been requested, but whose state is waiting, while the server attempts to acquire more address space."

::= { mallocAllocRangeEntry 10 }

mallocAllocRangeNumTryingAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of addresses in the scope covered by entries in the mallocRequestTable in the trying state."

::= { mallocAllocRangeEntry 11 }

mallocAllocRangeAdvertisable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is true if the range is eligible to be advertised to other MAASS. When the row is first created, the default value of this object is true if the scope is divisible, and is false otherwise."

::= { mallocAllocRangeEntry 12 }

mallocAllocRangeTotalAllocatedAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The approximate number of addresses in the range which have been allocated by any MAAS, as determined by a Prefix Coordinator. This object need only be present if mallocAllocRangeAdvertisable is true. If the number is unknown, a value of 0 may be reported."

::= { mallocAllocRangeEntry 13 }

mallocAllocRangeTotalRequestedAddrs OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The approximate number of addresses in the range for which there is potential demand among MAASs, as determined by a Prefix Coordinator. This object need only be present if mallocAllocRangeAdvertisable is true. If the number is unknown, a value of 0 may be reported."

::= { mallocAllocRangeEntry 14 }

mallocAllocRangeStorage OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The storage type for this conceptual row. Conceptual rows having the value 'permanent' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile }

::= { mallocAllocRangeEntry 15 }

--

-- the Request Table

--

mallocRequestTable OBJECT-TYPE

SYNTAX SEQUENCE OF MallocRequestEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The (conceptual) table containing information on allocation requests, whether allocated or in progress. This table may also be used to determine which clients are responsible for high address space utilization within a given scope."

Entries in this table reflect requests dynamically received by an address allocation protocol."
 ::= { malloc 5 }

mallocRequestEntry OBJECT-TYPE
 SYNTAX MallocRequestEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry (conceptual row) containing the information on a particular allocation request."

INDEX { mallocRequestId }
 ::= { mallocRequestTable 1 }

MallocRequestEntry ::= SEQUENCE {
 mallocRequestId Unsigned32,
 mallocRequestScopeAddressType InetAddressType,
 mallocRequestScopeFirstAddress InetAddress,
 mallocRequestStartTime Unsigned32,
 mallocRequestEndTime Unsigned32,
 mallocRequestNumAddrs Unsigned32,
 mallocRequestState INTEGER,
 mallocRequestClientAddressType InetAddressType,
 mallocRequestClientAddress InetAddress,
 mallocRequestServerAddressType InetAddressType,
 mallocRequestServerAddress InetAddress,
 mallocRequestLeaseIdentifier OCTET STRING
 }

mallocRequestId OBJECT-TYPE
 SYNTAX Unsigned32 (1..4294967295)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An arbitrary value identifying this row."
 ::= { mallocRequestEntry 1 }

mallocRequestScopeAddressType OBJECT-TYPE
 SYNTAX InetAddressType
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The type of the first address of the scope to which the request applies. Legal values correspond to the subset of address families for which multicast address allocation is supported."
 ::= { mallocRequestEntry 2 }

mallocRequestScopeFirstAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The first address of the scope to which the request applies. This must match mallocScopeFirstAddress for some row in the mallocScopeTable. The type of this address is determined by the value of the mallocRequestScopeAddressType object."

::= { mallocRequestEntry 3 }

mallocRequestStartTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of seconds remaining before the start time of the request. A value of 0 means that the allocation is currently in effect."

::= { mallocRequestEntry 4 }

mallocRequestEndTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of seconds remaining before the end time of the request."

::= { mallocRequestEntry 5 }

mallocRequestNumAddrs OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of addresses requested. If the addresses have been allocated, this number should match the total number of addresses for this request covered by entries in the mallocAddressTable."

::= { mallocRequestEntry 6 }

mallocRequestState OBJECT-TYPE

SYNTAX INTEGER {
 allocated(1),
 offered(2), -- tentatively allocated

```
        waiting(3),    -- waiting for more space
        trying(4)     -- working on allocating
    }
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The state of the request.  A value of allocated(1)
    indicates that one or more entries for this request are
    present in the mallocAddressTable.  A value of offered(2)
    indicates that addresses have been offered to the client
    (e.g. via a MADCAP OFFER message), but the allocation has
    not been committed.  A value of waiting(3) indicates that
    the allocation is blocked while the server attempts to
    acquire more space from which it can allocate addresses.  A
    value of trying(4) means that no addresses have been offered
    to the client, but that an attempt to allocate is in
    progress."
 ::= { mallocRequestEntry 7 }

mallocRequestClientAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
        "The type of the address of the client that (last) requested
        this allocation."
    ::= { mallocRequestEntry 8 }

mallocRequestClientAddress OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
        "The address of the client that (last) requested this
        allocation.  The type of this address is determined by the
        value of the mallocRequestClientAddressType object."
    ::= { mallocRequestEntry 9 }

mallocRequestServerAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
        "The type of the address of the server to which the request
        was (last) sent."
    ::= { mallocRequestEntry 10 }
```

mallocRequestServerAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The address of the server to which the request was (last) sent. The type of this address is determined by the value of the mallocRequestServerAddressType object."

::= { mallocRequestEntry 11 }

mallocRequestLeaseIdentifier OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (0..255))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Lease Identifier of this request. If the allocation mechanism in use does not use Lease Identifiers, then the value is a 0-length string."

::= { mallocRequestEntry 12 }

--

-- the Address Table

--

mallocAddressTable OBJECT-TYPE

SYNTAX SEQUENCE OF MallocAddressEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The (conceptual) table containing information on blocks of allocated addresses. This table may be used to map a given multicast group address to the associated request."

::= { malloc 6 }

mallocAddressEntry OBJECT-TYPE

SYNTAX MallocAddressEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) containing the information on a particular block of allocated addresses. The block of addresses covered by each entry in this table must fall within a range corresponding to an entry in the mallocAllocRangeTable."

INDEX { mallocAddressAddressType, mallocAddressFirstAddress }

::= { mallocAddressTable 1 }

```
MallocAddressEntry ::= SEQUENCE {
    mallocAddressAddressType      InetAddressType,
    mallocAddressFirstAddress     InetAddress,
    mallocAddressNumAddrs         Unsigned32,
    mallocAddressRequestId        Unsigned32
}

mallocAddressAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The type of the first address in the allocated block.
        Legal values correspond to the subset of address families
        for which multicast address allocation is supported."
    ::= { mallocAddressEntry 1 }

mallocAddressFirstAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The first address in the allocated block.  The type of this
        address is determined by the value of the
        mallocAddressAddressType object."
    ::= { mallocAddressEntry 2 }

mallocAddressNumAddrs OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of addresses in the allocated block."
    ::= { mallocAddressEntry 3 }

mallocAddressRequestId OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The index of the request which caused this block of
        addresses to be allocated.  This value must match the value
        of mallocRequestId for some entry in the
        mallocRequestTable."
    ::= { mallocAddressEntry 4 }

--
-- MADCAP-specific objects
```

--

madcapConfig OBJECT-IDENTITY

STATUS current

DESCRIPTION

"Group of objects that count various MADCAP events."

::= { madcap 1 }

madcapConfigExtraAllocationTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The amount of extra time on either side of a lease which the MADCAP server allocates to allow for clock skew among clients."

::= { madcapConfig 1 }

madcapConfigNoResponseDelay OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The amount of time the MADCAP client allows for receiving a response from a MADCAP server."

::= { madcapConfig 2 }

madcapConfigOfferHold OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The amount of time the MADCAP server will reserve an address for after sending an OFFER message in anticipation of receiving a REQUEST message."

::= { madcapConfig 3 }

madcapConfigResponseCacheInterval OBJECT-TYPE

SYNTAX Unsigned32 (0..300)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The amount of time the MADCAP server uses to detect duplicate messages."

```
::= { madcapConfig 4 }
```

madcapConfigClockSkewAllowance OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The clock skew threshold used by the MADCAP server to generate Excessive Clock Skew errors."

```
::= { madcapConfig 5 }
```

madcapCounters OBJECT-IDENTITY

STATUS current

DESCRIPTION

"A group of objects that count various MADCAP events."

```
::= { madcap 2 }
```

madcapTotalErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of transactions for which the MADCAP server has detected an error of any type, regardless of whether the server ignored the request or generated a NAK."

```
::= { madcapCounters 1 }
```

madcapRequestsDenied OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of valid requests for which the MADCAP server could not complete an allocation, regardless of whether NAKs were sent. This corresponds to the Valid Request Could Not Be Completed error code in MADCAP."

```
::= { madcapCounters 2 }
```

madcapInvalidRequests OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of invalid requests received by the MADCAP server, regardless of whether NAKs were sent. This corresponds to the Invalid Request error code in MADCAP."

```
::= { madcapCounters 3 }
```

madcapExcessiveClockSkews OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of requests received by the MADCAP server with an excessive clock skew, regardless of whether NAKs were sent. This corresponds to the Excessive Clock Skew error code in MADCAP."

::= { madcapCounters 4 }

madcapBadLeaseIds OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of requests received by the MADCAP server with an unrecognized Lease Identifier, regardless of whether NAKs were sent. This corresponds to the Lease Identifier Not Recognized error code in MADCAP."

::= { madcapCounters 5 }

madcapDiscovers OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of DISCOVER messages received by the MADCAP server."

::= { madcapCounters 6 }

madcapInforms OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of INFORM messages received by the MADCAP server."

::= { madcapCounters 7 }

madcapRequests OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of REQUEST messages received by the MADCAP server."

::= { madcapCounters 8 }

```

madcapRenews OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of RENEW messages received by the MADCAP
        server."
    ::= { madcapCounters 9 }

madcapReleases OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of RELEASE messages received by the MADCAP
        server."
    ::= { madcapCounters 10 }

-- conformance information

mallocConformance  OBJECT IDENTIFIER ::= { mallocMIB 2 }
mallocCompliances  OBJECT IDENTIFIER ::= { mallocConformance 1 }
mallocGroups       OBJECT IDENTIFIER ::= { mallocConformance 2 }

-- compliance statements

mallocServerReadOnlyCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for multicast address allocation
        servers implementing the MALLOC MIB without support for
        read-create (i.e., in read-only mode).  Such a server can
        then be monitored but can not be configured with this MIB."
    MODULE      -- this module
    MANDATORY-GROUPS { mallocBasicGroup,
                        mallocServerGroup }

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

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

```


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

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

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

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

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

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

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

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

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

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

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

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

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

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

GROUP madcapServerGroup
DESCRIPTION

 "This group is mandatory for servers which implement the
 MADCAP client-server protocol."

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

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

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

```
OBJECT      madcapConfigClockSkewAllowance
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
 ::= { mallocCompliances 1 }

mallocClientReadOnlyCompliance MODULE-COMPLIANCE
STATUS      current
DESCRIPTION
    "The compliance statement for clients implementing the
    MALLOC MIB without support for read-create (i.e., in read-
    only mode).  Such clients can then be monitored but can not
    be configured with this MIB."
MODULE -- this module
MANDATORY-GROUPS { mallocBasicGroup,
                    mallocClientGroup }

GROUP mallocClientScopeGroup
DESCRIPTION
    "This group is mandatory for clients which maintain a list
    of multicast scopes."

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

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

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

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

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

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

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

GROUP madcapClientGroup
DESCRIPTION
 "This group is mandatory for clients which implement the
 MADCAP client-server protocol."

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

::= { mallocCompliances 2 }

mallocPrefixCoordinatorReadOnlyCompliance MODULE-COMPLIANCE

STATUS current
DESCRIPTION
 "The compliance statement for prefix coordinators
 implementing the MALLOC MIB without support for read-create
 (i.e., in read-only mode). Such devices can then be
 monitored but can not be configured with this MIB."

MODULE -- this module
MANDATORY-GROUPS { mallocBasicGroup,
 mallocPrefixCoordinatorGroup }

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

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

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

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

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

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

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

::= { mallocCompliances 3 }

mallocServerFullCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

 "The compliance statement for multicast address allocation servers implementing the MALLOC MIB with support for read-create. Such servers can then be both monitored and configured with this MIB."

MODULE -- this module

MANDATORY-GROUPS { mallocBasicGroup,
 mallocServerGroup }

GROUP madcapServerGroup

DESCRIPTION

 "This group is mandatory for servers which implement the MADCAP client-server protocol."

::= { mallocCompliances 4 }

mallocClientFullCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

 "The compliance statement for hosts implementing the MALLOC MIB with support for read-create. Such clients can then be both monitored and configured with this MIB."

MODULE -- this module

MANDATORY-GROUPS { mallocBasicGroup,
 mallocClientGroup }

```
GROUP mallocClientScopeGroup
DESCRIPTION
    "This group is mandatory for clients which maintain a list
    of multicast scopes."

GROUP madcapClientGroup
DESCRIPTION
    "This group is mandatory for clients which implement the
    MADCAP client-server protocol."
::= { mallocCompliances 5 }

mallocPrefixCoordinatorFullCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
    "The compliance statement for prefix coordinators
    implementing the MALLOC MIB with support for read-create.
    Such devices can then be both monitored and configured with
    this MIB."
MODULE -- this module
MANDATORY-GROUPS { mallocBasicGroup,
                    mallocPrefixCoordinatorGroup }
::= { mallocCompliances 6 }

-- units of conformance

mallocBasicGroup OBJECT-GROUP
OBJECTS { mallocCapabilities, mallocRequestScopeAddressType,
          mallocRequestScopeFirstAddress,
          mallocRequestStartTime,
          mallocRequestEndTime, mallocRequestNumAddrs,
          mallocRequestState,
          mallocAddressNumAddrs, mallocAddressRequestId
        }
STATUS current
DESCRIPTION
    "The basic collection of objects providing management of IP
    multicast address allocation."
::= { mallocGroups 1 }

mallocServerGroup OBJECT-GROUP
OBJECTS { mallocScopeLastAddress, mallocScopeHopLimit,
          mallocScopeSSM, mallocScopeStatus, mallocScopeStorage,
          mallocAllocRangeLastAddress, mallocAllocRangeLifetime,
          mallocAllocRangeNumAllocatedAddrs,
          mallocAllocRangeNumOfferedAddrs,
          mallocAllocRangeNumWaitingAddrs,
          mallocAllocRangeNumTryingAddrs,
          mallocAllocRangeMaxLeaseAddrs,
```

```

        mallocAllocRangeMaxLeaseTime, mallocAllocRangeSource,
        mallocAllocRangeStatus, mallocAllocRangeStorage,
        mallocScopeDivisible, mallocScopeSource,
        mallocScopeNameScopeName, mallocScopeNameDefault,
        mallocScopeNameStatus, mallocScopeNameStorage,
        mallocRequestClientAddressType,
        mallocRequestClientAddress
    }
    STATUS current
    DESCRIPTION
        "A collection of objects providing management of multicast
        address allocation in servers."
 ::= { mallocGroups 2 }

mallocClientGroup OBJECT-GROUP
    OBJECTS { mallocRequestServerAddressType,
               mallocRequestServerAddress }
    STATUS current
    DESCRIPTION
        "A collection of objects providing management of multicast
        address allocation in clients."
 ::= { mallocGroups 3 }

madcapServerGroup OBJECT-GROUP
    OBJECTS { madcapConfigClockSkewAllowance,
               madcapConfigExtraAllocationTime, madcapConfigOfferHold,
               madcapConfigResponseCacheInterval,
               madcapTotalErrors, madcapRequestsDenied,
               madcapInvalidRequests, madcapBadLeaseIds,
               madcapExcessiveClockSkews, madcapDiscovers,
               madcapInforms, madcapRequests,
               madcapRenews, madcapReleases }
    STATUS current
    DESCRIPTION
        "A collection of objects providing management of MADCAP
        servers."
 ::= { mallocGroups 4 }

madcapClientGroup OBJECT-GROUP
    OBJECTS { mallocRequestLeaseIdentifier,
               madcapConfigNoResponseDelay }
    STATUS current
    DESCRIPTION
        "A collection of objects providing management of MADCAP
        clients."
 ::= { mallocGroups 5 }

```

```

mallocClientScopeGroup OBJECT-GROUP
    OBJECTS { mallocScopeLastAddress, mallocScopeHopLimit,
               mallocScopeStatus, mallocScopeStorage, mallocScopeSource,
               mallocScopeServerAddressType, mallocScopeServerAddress,
               mallocScopeSSM, mallocScopeNameScopeName,
               mallocScopeNameDefault, mallocScopeNameStatus,
               mallocScopeNameStorage }
    STATUS      current
    DESCRIPTION
        "A collection of objects providing management of multicast
        scope information in clients."
    ::= { mallocGroups 6 }

mallocPrefixCoordinatorGroup OBJECT-GROUP
    OBJECTS { mallocAllocRangeLastAddress, mallocAllocRangeLifetime,
               mallocAllocRangeStatus, mallocAllocRangeStorage,
               mallocAllocRangeSource,
               mallocAllocRangeTotalAllocatedAddrs,
               mallocAllocRangeTotalRequestedAddrs,
               mallocAllocRangeAdvertisable, mallocScopeLastAddress,
               mallocScopeDivisible, mallocScopeSource }
    STATUS      current
    DESCRIPTION
        "A collection of objects for managing Prefix Coordinators."
    ::= { mallocGroups 7 }
END

```

5. IANA Considerations

The IANAScopeSource and IANAmallocRangeSource textual conventions are imported from the IANA-MALLOC-MIB. The purpose of defining these textual conventions in a separate MIB module is to allow additional values to be defined without having to issue a new version of this document. The Internet Assigned Numbers Authority (IANA) is responsible for the assignment of all Internet numbers, including various SNMP-related numbers; it will administer the values associated with these textual conventions.

The rules for additions or changes to the IANA-MALLOC-MIB are outlined in the DESCRIPTION clause associated with its MODULE-IDENTITY statement.

The current versions of the IANA-MALLOC-MIB can be accessed from the IANA home page at: "<http://www.iana.org/>".

6. 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:

`mallocScopeTable, mallocAllocRangeTable:`

Unauthorized modifications to these tables can result in denial of service by not being able to allocate and use multicast addresses, allocating too many addresses, allocating addresses that other organizations are already using, or causing applications to use a hop limit that results in extra bandwidth usage.

`mallocScopeNameTable:`

Unauthorized modifications to this table can result in incorrect or misleading scope names being presented to users, resulting in potentially using the wrong scope for application data.

`madcapConfigExtraAllocationTime, madcapConfigOfferHold:`

Unauthorized modifications to these objects can result in reservations lasting too long, potentially resulting in denial of service if allocation ranges are small.

`madcapConfigNoResponseDelay:`

Unauthorized modifications can result in a client not being able to allocate multicast addresses.

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 GET and/or NOTIFY access to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

`mallocRequestLeaseIdentifier:`

If address allocation servers are configured to allow renewal or release purely on the basis of knowledge of the Lease Identifier, then unauthorized read access to `mallocRequestLeaseIdentifier` can be used in a denial-of-service attack.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), 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 [RFC3410], 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 for only those principals (users) with legitimate rights to have access to GET or SET (change/create/delete) objects.

7. Acknowledgements

This MIB module was updated based on feedback from the IETF's Multicast Address Allocation (MALLOC) Working Group. Lars Viklund, Frank Strauss, and Mike Heard provided helpful feedback on this document.

8. Intellectual Property Statement

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10. Author's Address

Dave Thaler
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399

Phone: +1 425 703 8835
EMail: dthaler@microsoft.com

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