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The Definitions of Managed Objects for IP Mobility Support using SMIv2, revised draft-ietf-mip4-rfc2006bis-06.txt

Status of this Memo

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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 the Mobile Node, Foreign Agent and Home Agent of the Mobile IP Protocol.

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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing the Mobile Node, Foreign Agent and Home Agent of the Mobile IP Protocol.

This memo is intended to update and possibly obsolete RFC 2006, however, it is designed to be backward compatible

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC2119 [RFC2119].

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. Structure of the MIB

This memo defines a portion of the Management Information Base (MIB) for the use with network management protocols in the Internet community. In particular, it describes managed objects for the Mobile IP Protocol (MIP), as defined in [RFC3344].

3.1. Structure of the Mobile IP

This section describes the basic model of Mobile IP used in developing the Mobile IP MIB. This information should be useful to the implementer in understanding some of the basic design decisions of the MIB.

The Mobile IP Protocol introduces these new functional entities:

Mobile Node

A host or router that changes its point of attachment from one network or subnetwork to another. A mobile node may change its location without losing connectivity and without changing its IP address; it may continue to communicate with other Internet nodes at any location using its (constant) IP address, assuming link-layer connectivity to a point of attachment is available.

Home Agent

A router on a mobile node's home network which tunnels packets for delivery to the mobile node when it is away from home, and maintains current location information for the mobile node.

Foreign Agent

A router on a mobile node's visited network which provides routing services to the mobile node while registered. The foreign agent detunnels and delivers packets to the mobile node that were tunneled by the mobile node's home agent. For datagrams sent by a mobile node, the foreign agent may serve as a default router for registered mobile nodes.

This document specifies the objects used in managing these entities; namely, the Mobile Node, the Home Agent, and the Foreign Agent.

3.2. MIB Groups

Objects in this MIB are arranged into groups. Each group is organized as a set of related objects. The overall structure and the relationship between groups and the Mobile IP entities are shown below:

Groups	Mobile Node	Foreign Agent	Home Agent
MipSystemGroup	X	X	X
MipSecAssociationGroup2	X	X	X
MipSecViolationGroup2	X	X	X
MnSystemGroup2	X		
mnDiscoveryGroup	X		
mnRegistrationGroup2	X		
maAdvertisementGroup2		X	X
maAdvertisementNAIGroup		X	X
faSystemGroup		X	
faAdvertisementGroup2		X	
faRegistrationGroup2		X	
haRegistrationGroup2			X
haRegNodeCountersGroup2			X

mipSecNotificationsGroup2	X	X

3.3. Protocol Extensions

Apart from changes to base specification of Mobile IP [RFC3344], it has been enhanced in number of ways through its ability for added capabilities. Implementations of those capabilities have not been able to have any management capabilities present in RFC 2006 compliant [RFC2006] MIB module agents, since the capabilities themselves postdated the adoption of RFC 2006. For several significant capabilities, in the form of NAI extension [RFC2794], Challenge/Response Extensions [RFC4721], Reverse Tunneling [RFC3024], Vendor/Organization-Specific Extensions [RFC3115] and Extensions for carrying NAI [RFC3846], the MIB Module defined in this document exposes object types to manage those extended capabilities and their operation.

NAI extension requires a thorough redefinition of MIB table row indices from the RFC 2006 state since it provides a one more way to identify the mobile nodes apart from home address. The functional differences between this memo and RFC 2006 [RFC2006] are explained in Appendix A.

3.4. Textual Conventions

The RegistrationFlags, MipEntityIdentifierType, MipEntityIdentifier, MipEntityIdentifierNAI and MipDeliveryStyle are used as textual conventions in this document. These textual conventions are used for the convenience of humans reading the MIB. Objects defined using these conventions are always encoded by means of the rules that define their primitive type. However, the textual conventions havecspecial semantics associated with them. Hence, no changes to the SMI or the SNMP are necessary to accommodate these textual conventions which are adopted merely for the convenience of readers.

4. Mobile IP MIB Definitions

```
MIP-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        Counter32, Gauge32, Integer32, IpAddress,
        Unsigned32, MODULE-IDENTITY, OBJECT-TYPE,
        NOTIFICATION-TYPE, mib-2
                FROM SNMPv2-SMI                    -- [RFC2578]
        RowStatus, TruthValue, TimeStamp,
        StorageType, TEXTUAL-CONVENTION
                FROM SNMPv2-TC                     -- [RFC2579]
        MODULE-COMPLIANCE, OBJECT-GROUP,
        NOTIFICATION-GROUP
                FROM SNMPv2-CONF                   -- [RFC2580]
        InterfaceIndex
                FROM IF-MIB;                       -- [RFC2863]

    mipMIB    MODULE-IDENTITY
        LAST-UPDATED    "200904060000Z"
        ORGANIZATION    "IETF Mobility for IPv4 Working Group"
        CONTACT-INFO
                "          Ravindra Rathi
                           Cisco Systems, Inc.
                           rathi@cisco.com

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                           Cisco Systems, Inc.
                           kleung@cisco.com

                           Hans Sjostrand
                           Transmode
                           hans.sjostrand@transmode.com

                  Comments about this document should be emailed
                  directly to the Mip4 working group mailing list at
                  mip4@ietf.org"
        DESCRIPTION
               "The MIB module for configuring and displaying Mobile
                IP Information.
```

```
                Copyright (C) IETF Trust (2009). This version
                of this MIB module is part of RFC yyyy;  see the RFC
                itself for full legal notices."
        REVISION      "200904060000Z"
        DESCRIPTION
            "Updated for latest changes to Mobile IP."
        REVISION      "199606040000Z"
        DESCRIPTION
            "Initial revision, published as part of RFC 2006."
        ::= { mib-2 44 }

    mipMIBObjects    OBJECT IDENTIFIER ::= { mipMIB 1 }

    -- ============================================================
    -- Groups under mipMIBObjects

    mipSystem         OBJECT IDENTIFIER ::= { mipMIBObjects 1 }
    mipSecurity       OBJECT IDENTIFIER ::= { mipMIBObjects 2 }
    mipMN             OBJECT IDENTIFIER ::= { mipMIBObjects 3 }
    mipMA             OBJECT IDENTIFIER ::= { mipMIBObjects 4 }
    mipFA             OBJECT IDENTIFIER ::= { mipMIBObjects 5 }
    mipHA             OBJECT IDENTIFIER ::= { mipMIBObjects 6 }

    mnSystem          OBJECT IDENTIFIER ::= { mipMN 1 }
    mnDiscovery       OBJECT IDENTIFIER ::= { mipMN 2 }
    mnRegistration    OBJECT IDENTIFIER ::= { mipMN 3 }

    maAdvertisement   OBJECT IDENTIFIER ::= { mipMA 2 }

    faSystem          OBJECT IDENTIFIER ::= { mipFA 1 }
    faAdvertisement   OBJECT IDENTIFIER ::= { mipFA 2 }
    faRegistration    OBJECT IDENTIFIER ::= { mipFA 3 }

    haRegistration    OBJECT IDENTIFIER ::= { mipHA 3 }

    -- All deprecated definitions are put towards the end of the MIB.



    -- ============================================================
    -- MIP Textual conventions
```

```
    RegistrationFlags  ::= TEXTUAL-CONVENTION
        STATUS      current
        DESCRIPTION
                "This data type is used to define the registration
                flags for Mobile IP registration extension:
                   reserved
                       -- Should be set to zero.
                   gre
                       -- Request to use GRE
                   minEnc
                       -- Request to use minimal encapsulation
                   decapsulationByMN
                       -- Decapsulation by mobile node
                   broadcastDatagram
                       -- Request to receive broadcasts
                   simultaneoursBindings
                       -- Request to retain prior binding(s).
                   reverseTunnel
                       -- Reverse Tunneling requested; see [rfc3024]."
        SYNTAX      BITS {
                         reserved(0),
                         gre(1),
                         minEnc(2),
                         decapsulationbyMN(3),
                         broadcastDatagram(4),
                         simultaneousBindings(5),
                         reverseTunnel(6)
                    }

    MipEntityIdentifierType ::=  TEXTUAL-CONVENTION
        STATUS       current
        DESCRIPTION
                "A value that represents a type of Mobile IP entity
                identifier.
                other(1)     Indicates identifier which
                             is not in one of the formats defined
                             below.

                ipaddress(2) IP address as defined by IpAddress
                             textual convention in INET-ADDRESS-MIB.
```

```
                nai(3)       A network access identifier as defined by
                             the MipEntityIdentifierNAI textual
                             convention."
        REFERENCE
                "RFC2851 - Textual Conventions for Internet Network
                Addresses"
        SYNTAX       INTEGER {
                         other(1),
                         ipaddress(2),
                         nai(3)
                         }

    MipEntityIdentifier ::=  TEXTUAL-CONVENTION
        STATUS       current
        DESCRIPTION
                "Represents the generic identifier for Mobile IP
                entities.  A MipEntityIdentifier value is always
                interpreted within the context of a
                MipEntityIdentifierType value. Foreign agents and
                Home agents are identified by the IP addresses.
                Mobile nodes can be identified in more than one
                way e.g. IP addresses, network access identifiers (NAI).
                If mobile node is identified by something other than
                IP address say by NAI and it gets IP address dynamically
                from the home agent then value of object of this type
                should be same as NAI. This is because IP address is not
                tied with mobile node and it can change across
                registrations over period of time. Note that the first
                64 octets are used as index element."
        SYNTAX       OCTET STRING (SIZE (1..64))

    MipEntityIdentifierNAI ::=  TEXTUAL-CONVENTION
        DISPLAY-HINT "255a"
        STATUS       current
        DESCRIPTION
                "Represents a Network Access Identifier (NAI).  Mobile
                nodes may use NAI to authenticate themselves to the
                foreign agent and home agent and to get the home
                address dynamically from the home agent.
                If there are no NAI assigned, a null octet string is
```

```
                used."
        REFERENCE
                "RFC2794 - Mobile IP Network Access Identifier
                Extension for IPv4"
        SYNTAX       OCTET STRING (SIZE (0..255))

    MipDeliveryStyle ::=  TEXTUAL-CONVENTION
        STATUS       current
        DESCRIPTION
                "This data type is used to indicate the delivery
                style requested by the mobile node in its registration
                request."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        SYNTAX       INTEGER { direct(1), encapsulating(2) }



    -- ================================================================
    -- mipSystem Group

    mipEntities OBJECT-TYPE
        SYNTAX      BITS {
                         mobileNode(0),
                         foreignAgent(1),
                         homeAgent(2)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "This object describes which Mobile IP entities are
                supported by this managed entity.  The entity may
                support more than one Mobile IP entities.  For example,
                the entity supports both Foreign Agent (FA) and Home
                Agent (HA).  Therefore, bit 1 and bit 2 are set to 1
                for this object."
        ::= { mipSystem 1 }

    mipEnable OBJECT-TYPE
        SYNTAX      INTEGER { enabled(1), disabled(2) }
        MAX-ACCESS  read-write
```

```
        STATUS      current
        DESCRIPTION
                "Indicates whether the Mobile IP protocol should be
                enabled for the managed entity.  If it is disabled, the
                entity should disable both agent discovery and
                registration functions."
        ::= { mipSystem 2 }


    mipEncapsulationSupported   OBJECT-TYPE
        SYNTAX      BITS {
                         ipInIp(0),
                         gre(1),
                         minEnc(2),
                         other(3),
                         mipUdp(4)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Encapsulation methods supported by the Mobile IP
                entity.  The entity may support multiple encapsulation
                methods or none of them:
                  ipInIp(0) -- IP Encapsulation within IP [RFC2003]
                  gre(1)    -- Generic Routing Encapsulation [RFC1701]
                  minEnc(2) -- Minimal Encapsulation within IP [RFC2004]
                  other(3)  -- Some other other encapsulation
                  mipUdp(4) -- MIP UDP encapsulation [RFC3519] "
        ::= { mipSystem 3 }


    -- ================================================================
    -- mipSecurity Group


    --
    -- Mobile IP security violation total counter
    --

    mipSecTotalViolations OBJECT-TYPE
        SYNTAX      Counter32
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
               "Total number of security violations in the entity."
           ::= { mipSecurity 2 }

    mipSecurityAssocsCount  OBJECT-TYPE
        SYNTAX      Gauge32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
               "Total number of mobility security associations
               known to the entity i.e.  the number of entries in
               the mipSecurityAssocTable."
        ::= { mipSecurity 4 }

    --
    -- Mobile IP security association table
    --

    mipSecurityAssocTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MipSecurityAssocEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing Mobility Security Associations."
        ::= { mipSecurity 5 }

    mipSecurityAssocEntry OBJECT-TYPE
        SYNTAX      MipSecurityAssocEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "One particular Mobility Security Association."
        INDEX   { mipSecurityPeerIdType, mipSecurityPeerId,
                  mipSecuritySPI }
        ::= { mipSecurityAssocTable 1 }

    MipSecurityAssocEntry ::=
        SEQUENCE {
            mipSecurityPeerIdType    MipEntityIdentifierType,
```

```
            mipSecurityPeerId        MipEntityIdentifier,
            mipSecuritySPI           Unsigned32,
            mipSecurityAlgorithmType INTEGER,
            mipSecurityAlgorithmMode INTEGER,
            mipSecurityKey           OCTET STRING,
            mipSecurityReplayMethod  INTEGER,
            mipSecurityReplayTime    Unsigned32,
            mipSecurityPeerNAI       MipEntityIdentifierNAI,
            mipSecurityPeerIpAddress IpAddress,
            mipSecurityStatus        RowStatus,
            mipSecurityStorageType   StorageType
        }

    mipSecurityPeerIdType OBJECT-TYPE
        SYNTAX      MipEntityIdentifierType
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The type of the peer entity's identifier."
        ::= { mipSecurityAssocEntry 1 }

    mipSecurityPeerId OBJECT-TYPE
        SYNTAX      MipEntityIdentifier
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The identifier of the peer entity with which this
                node shares the mobility security association."
        ::= { mipSecurityAssocEntry 2 }

    mipSecuritySPI OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The SPI is the 4-byte opaque index within the
                Mobility Security Association which selects the
                specific security parameters to be used to
                authenticate the peer, i.e.  the rest of the variables
                in this mipSecurityAssocEntry."
        ::= { mipSecurityAssocEntry 3 }
```

```
    mipSecurityAlgorithmType OBJECT-TYPE
        SYNTAX      INTEGER {
                            other(1),
                            md5(2)
                    }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Type of security algorithm."
        DEFVAL     { md5 }
        ::= { mipSecurityAssocEntry 4 }

    mipSecurityAlgorithmMode OBJECT-TYPE
        SYNTAX      INTEGER {
                            other(1),
                            prefixSuffix(2),
                            hmac(3)
                    }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Security mode used by this algorithm."
        DEFVAL     { hmac }
        ::= { mipSecurityAssocEntry 5 }

    mipSecurityKey  OBJECT-TYPE
        SYNTAX      OCTET STRING (SIZE(16))
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The shared secret key for the security
                associations.  Reading this object will always return
                zero length value."
        ::= { mipSecurityAssocEntry 6 }

    mipSecurityReplayMethod OBJECT-TYPE
        SYNTAX      INTEGER {
                             other(1),
                             timestamps(2),
                             nonces(3)
```

```
                }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The replay-protection method supported for this SPI
                within this Mobility Security Association."
        DEFVAL     { timestamps }
        ::= { mipSecurityAssocEntry 7 }

    mipSecurityReplayTime OBJECT-TYPE
        SYNTAX      Unsigned32 (3..255)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The replay-protection time difference that is
                acceptable for this Mobility Security Association when
                MipSecurityReplayMethod is set to timestamps."
        DEFVAL     { 7 }
        ::= { mipSecurityAssocEntry 8 }

    mipSecurityPeerNAI  OBJECT-TYPE
         SYNTAX      MipEntityIdentifierNAI
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "The NAI of the peer entity with which this
                 node shares the mobility security association.
                 Note that the security association must atleast have
                 either a NAI, or a non-zero ip address defined."
         DEFVAL      { ''H }   -- the empty string
         ::= { mipSecurityAssocEntry 9 }

     mipSecurityPeerIpAddress  OBJECT-TYPE
         SYNTAX      IpAddress
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "The IP Address of the peer entity with which this
                 node shares the mobility security association.
```

```
                If the IP address of peer entity is not yet defined,

                an all zero ip address (0.0.0.0) should be used.
                Note that the security association must atleast have
                either a NAI, or a non-zero ip address defined."
        ::= { mipSecurityAssocEntry  10 }

     mipSecurityStatus  OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The row status for this table."
        ::= { mipSecurityAssocEntry 11 }

     mipSecurityStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                 "The storage type for this entry."
        ::= { mipSecurityAssocEntry 12 }


    --
    -- Mobile IP security violation table
    --

    mipSecurityViolationTable  OBJECT-TYPE
        SYNTAX      SEQUENCE OF MipSecurityViolationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing information about security
                violations."
        ::= { mipSecurity 6 }

    mipSecurityViolationEntry  OBJECT-TYPE
        SYNTAX      MipSecurityViolationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
                "Information about one particular security violation."
        INDEX   { mipSecurityViolatorIdType, mipSecurityViolatorId  }
        ::= { mipSecurityViolationTable 1 }

    MipSecurityViolationEntry ::=
        SEQUENCE {
            mipSecurityViolatorIdType        MipEntityIdentifierType,
            mipSecurityViolatorId            MipEntityIdentifier,
            mipSecurityViolationCounter      Counter32,
            mipSecurityRecentViolationSPI    Unsigned32,
            mipSecurityRecentViolationTime   TimeStamp,
            mipSecurityRecentViolationIDLow  Unsigned32,
            mipSecurityRecentViolationIDHigh Unsigned32,
            mipSecurityRecentViolationReason INTEGER,
            mipSecurityViolatorNAI           MipEntityIdentifierNAI,
            mipSecurityViolatorIpAddress     IpAddress,
            mipSecurityRecentViolationErrCode   Unsigned32,
            mipSecurityviolationStorageType  StorageType
        }

    mipSecurityViolatorIdType  OBJECT-TYPE
        SYNTAX      MipEntityIdentifierType
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The type of Violator's identifier."
        ::= { mipSecurityViolationEntry 1 }

    mipSecurityViolatorId  OBJECT-TYPE
        SYNTAX      MipEntityIdentifier
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Violator's identifier.  The violator is not necessary
                in the mipSecurityAssocTable."
        ::= { mipSecurityViolationEntry 2 }

    mipSecurityViolationCounter OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
```

```
        STATUS      current
        DESCRIPTION
                "Total number of security violations for this peer."
        ::= { mipSecurityViolationEntry 3 }

    mipSecurityRecentViolationSPI  OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "SPI of the most recent security violation for this
                peer.  If the security violation is due to an
                identification mismatch, then this is the SPI from the
                Mobile-Home Authentication Extension.  If the security
                violation is due to an invalid authenticator, then
                this is the SPI from the offending authentication
                extension.  In all other cases, it should be set to
                zero."
        ::= { mipSecurityViolationEntry 4 }

    mipSecurityRecentViolationTime OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Time of the most recent security violation for this
                peer."
        ::= { mipSecurityViolationEntry 5 }

    mipSecurityRecentViolationIDLow  OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
               "Low-order 32 bits of identification used in request or
                reply of the most recent security violation for this
                peer."
        ::= { mipSecurityViolationEntry 6 }

    mipSecurityRecentViolationIDHigh  OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "High-order 32 bits of identification used in request
                or reply of the most recent security violation for
                this peer."
        ::= { mipSecurityViolationEntry 7 }

    mipSecurityRecentViolationReason   OBJECT-TYPE
        SYNTAX      INTEGER {
                        noMobilitySecurityAssociation(1),
                        badAuthenticator(2),
                        badIdentifier(3),
                        badSPI(4),
                        missingSecurityExtension(5),
                        other(6)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Reason for the most recent security violation for
                this peer."
        ::= { mipSecurityViolationEntry 8 }

    mipSecurityViolatorNAI  OBJECT-TYPE
         SYNTAX      MipEntityIdentifierNAI
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The NAI of the security violator."
         ::= { mipSecurityViolationEntry 9 }

     mipSecurityViolatorIpAddress  OBJECT-TYPE
         SYNTAX      IpAddress
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The IP Address of the security violator. If the
                 IP address of security violator is not yet defined,
                 an all zero ip address (0.0.0.0) should be returned."
         ::= { mipSecurityViolationEntry  10 }
```

```
     mipSecurityRecentViolationErrCode OBJECT-TYPE
         SYNTAX      Unsigned32
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The error code for the most recent security
                 violation for this peer. If there where no reply
                 message sent back, then zero is used."
         ::= { mipSecurityViolationEntry 11 }

     mipSecurityviolationStorageType OBJECT-TYPE
         SYNTAX      StorageType
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "The storage type for this entry."
         ::= { mipSecurityViolationEntry 12 }


    -- ================================================================
    -- mipMN Group

    --
    -- MN System Group
    --

    mnState OBJECT-TYPE
        SYNTAX      INTEGER {
                            home(1),
                            registered(2),
                            pending(3),
                            isolated(4),
                            unknown(5)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Indicates mobile node's state of Mobile IP:
                     home,
                         -- MN is connected to home network.
```

```
                    registered,
                        -- MN has registered on foreign network
                    pending,
                        -- MN has sent registration request and is
                           waiting for the reply
                    isolated,
                        -- MN is isolated from network
                    unknown
                        -- MN can not determine its state."
        ::= { mnSystem 1 }

    mnHomeAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "An IP address that is assigned for an extended period
                of time to the mobile node.  It remains unchanged
                regardless of the mobile node's current point of
                attachment.  If mobile node doesn't have home address
                assigned yet then this object will take the default
                value."
        DEFVAL { '00000000'H }
        ::= { mnSystem 2 }

    mnIdentifierType OBJECT-TYPE
        SYNTAX      MipEntityIdentifierType
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The type of the identifier of the mobile node."
        ::= { mnSystem 4 }

    mnIdentifier OBJECT-TYPE
        SYNTAX      MipEntityIdentifier
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The identifier of the mobile node."
        ::= { mnSystem 5 }
```

```
    --
    -- Mobile node's home agent list
    --

    mnHATable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MnHAEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing all of the mobile node's potential
                home agents."
        ::= { mnSystem 3 }

    mnHAEntry OBJECT-TYPE
        SYNTAX MnHAEntry
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
                "Information for a particular Home Agent."
        INDEX { mnHAAddress }
        ::= { mnHATable 1 }

    MnHAEntry ::= SEQUENCE {
        mnHAAddress IpAddress,
        mnCurrentHA TruthValue,
        mnHAStatus  RowStatus
    }

    mnHAAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "IP address of mobile node's Home Agent."
        ::= { mnHAEntry 1 }

    mnCurrentHA OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
                "Whether this home agent is the current home agent for
                the mobile node.  If it is true, the mobile node is
                registered with that home agent."
        ::= { mnHAEntry 2 }

    mnHAStatus  OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The row status for this home agent entry.  If the
                status is set to 'createAndGo' or 'active', then the
                mobile node can use mnHAAddress as a valid candidate
                for a home agent.  If the status is set to 'destroy',
                then the mobile node should delete this row, and
                deregister from that home agent."
        ::= { mnHAEntry 3 }

    --
    -- Mobile node's foreign agent list
    --

    mnFATable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MnFAEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing all foreign agents that the mobile
                node knows about and their corresponding COA (care-of
                address).  This COA is an address of a foreign agent
                with which the mobile node is registered.  The table is
                updated when advertisements are received by the mobile
                node.  If an advertisement expires, its entry(s) should
                be deleted from the table.  One foreign agent can
                provide more than one COA in its advertisements."
        ::= { mnDiscovery 1 }

    mnFAEntry OBJECT-TYPE
        SYNTAX      MnFAEntry
        MAX-ACCESS  not-accessible
```

```
        STATUS      current
        DESCRIPTION
                "One pair of foreign agent IP address and COA for that
                foreign agent."
        INDEX { mnFAAddress, mnCOA }
        ::= { mnFATable 1 }

    MnFAEntry ::= SEQUENCE {
        mnFAAddress IpAddress,
        mnCOA       IpAddress
    }

    mnFAAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Foreign agent's IP address."
        ::= { mnFAEntry 1 }

    mnCOA   OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "A care-of address being offered by this foreign agent
                or a co-located care-of address which the mobile node
                has associated with one of its own network
                interfaces."
        ::= { mnFAEntry 2 }


   -- Mobile Node Agent discovery information

   -- Mobile node could store multiple agent advertisements, however,
   -- only the most recently received agent advertisement information
   -- is required to be made available to the manager station.

    mnRecentAdvReceived OBJECT IDENTIFIER ::= { mnDiscovery 2 }

    mnAdvSourceAddress OBJECT-TYPE
```

```
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The source IP address of the most recently received
                Agent Advertisement.  This address could be the address
                of a home agent or a foreign agent."
        ::= { mnRecentAdvReceived 1 }

    mnAdvSequence OBJECT-TYPE
        SYNTAX      Integer32 (0..65535)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The sequence number of the most recently received
                advertisement.  The sequence number ranges from 0 to
                0xffff.  After the sequence number attains the value
                0xffff, it will roll over to 256."
        ::= { mnRecentAdvReceived 2 }

    mnAdvFlags OBJECT-TYPE
        SYNTAX      BITS {
                         reserved0(0),
                         gre(1),
                         minEnc(2),
                         foreignAgent(3),
                         homeAgent(4),
                         busy(5),
                         regRequired(6),
                         reverseTunnel(7) ,
                         udpTunnelling(8),
                         regionalRegistration(9)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The flags are contained in the 7th and 8th bytes in the
                extension of the most recently received mobility agent
                advertisement. :
                    gre
                        -- Agent offers Generic Routing Encapsulation
```

```
                    minEnc,
                        -- Agent offers Minimal Encapsulation
                    foreignAgent,
                        -- Agent is a Foreign Agent
                    homeAgent,
                        -- Agent is a Home Agent
                    busy,
                        -- Foreign Agent is busy
                    regRequired,
                        -- FA registration is required
                    reverseTunnel,
                        -- Agent supports reverse tunneling.
                    udpTunnelling,
                        -- Agent supports MIP UDP Tunnelling.
                    regionalRegistration,
                        -- Domain supports regional registration.
                Note that the order of the bits is different compared
                to the 7th and 8th bytes of the Mobility Agent
                Advertisement Extension. The bits construct is chosen
                to be backwards compatible with RFC2006. Also note
                that new bits may be defined after the publication of
                this mib. "
        ::= { mnRecentAdvReceived 3 }

    mnAdvMaxRegLifetime OBJECT-TYPE
        SYNTAX      Integer32 (1..65535)
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The longest lifetime in seconds that the agent is
                willing to accept in any registration request."
        ::= { mnRecentAdvReceived 4 }

    mnAdvMaxAdvLifetime OBJECT-TYPE
        SYNTAX      Integer32 (1..65535)
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The maximum length of time that the Advertisement is
```

```
                considered valid in the absence of further
                Advertisements."
        REFERENCE
                "AdvertisementLifeTime in RFC1256."
        ::= { mnRecentAdvReceived 5 }

    mnAdvTimeReceived OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The time at which the most recently received
                advertisement was received."
        ::= { mnRecentAdvReceived 6 }


    --
    -- Mobile Node Discovery Group Counter
    --

    mnSolicitationsSent OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Solicitation sent by the mobile
                node."
        ::= { mnDiscovery 3 }

    mnAdvertisementsReceived OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of advertisements received by the mobile
                node."
        ::= { mnDiscovery 4 }

    mnAdvsDroppedInvalidExtension OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
```

```
        STATUS      current
        DESCRIPTION
                "Total number of advertisements dropped by the mobile
                node due to both poorly formed extensions and
                unrecognized extensions with extension number in the
                range 0-127."
        ::= { mnDiscovery 5 }

    mnAdvsIgnoredUnknownExtension OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of unrecognized extensions in the range
                128-255 that were ignored by the mobile node."
        ::= { mnDiscovery 6 }

    mnMoveFromHAToFA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Number of times that the mobile node has decided to
                move from its home network to a foreign network."
        ::= { mnDiscovery 7 }

    mnMoveFromFAToFA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Number of times that the mobile node has decided to
                move from one foreign network to another foreign
                network."
        ::= { mnDiscovery 8 }

    mnMoveFromFAToHA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
```

```
                "Number of times that the mobile node has decided to
                move from a foreign network to its home network."
        ::= { mnDiscovery 9 }

    mnGratuitousARPsSend OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Gratuitous ARPs sent by mobile node
                in order to clear out any stale ARP entries in the ARP
                caches of nodes on the home network."
        ::= { mnDiscovery 10 }

    mnAgentRebootsDectected OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of agent reboots detected by the mobile
                node through sequence number of the advertisement."
        ::= { mnDiscovery 11 }


    -- ================================================================
    -- Mobile Node Registration Group

    --
    -- Registration table of mobile node
    --

    mnRegistrationTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MnRegistrationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing information about the mobile
                node's attempted registration(s).  The mobile node
                updates this table based upon Registration Requests
                sent and Registration Replies received in response to
                these requests.  Certain variables within this table
```

```
                are also updated if when Registration Requests are
                retransmitted."
        ::= { mnRegistration 1 }

    mnRegistrationEntry OBJECT-TYPE
        SYNTAX      MnRegistrationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Information about one registration attempt."
        INDEX { mnRegAgentAddress, mnRegCOA}
        ::= { mnRegistrationTable 1 }

    MnRegistrationEntry ::= SEQUENCE {
        mnRegAgentAddress  IpAddress,
        mnRegCOA           IpAddress,
        mnRegFlags         RegistrationFlags,
        mnRegIDLow         Unsigned32,
        mnRegIDHigh        Unsigned32,
        mnRegTimeRequested Unsigned32,
        mnRegTimeRemaining Gauge32,
        mnRegTimeSent      TimeStamp,
        mnRegIsAccepted    TruthValue,
        mnCOAIsLocal       TruthValue,
        mnRegDeliveryStyle MipDeliveryStyle
        }

    mnRegAgentAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                 "IP address of the agent as used in the destination
                 IP address of the Registration Request.  The agent
                 may be a home agent or a foreign agent."
        ::= { mnRegistrationEntry 1 }

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

```
        DESCRIPTION
                "Care-of address for the registration."
        ::= { mnRegistrationEntry 2 }

    mnRegFlags OBJECT-TYPE
        SYNTAX      RegistrationFlags
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Registration flags sent by the mobile node.  It is the
                second byte in the Mobile IP Registration Request
                message."
        ::= { mnRegistrationEntry 3 }

    mnRegIDLow OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Low-order 32 bits of the Identification used in that
                registration by the mobile node."
        ::= { mnRegistrationEntry 4 }

    mnRegIDHigh OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "High-order 32 bits of the Identification used in that
                registration by the mobile node."
        ::= { mnRegistrationEntry 5 }

    mnRegTimeRequested OBJECT-TYPE
        SYNTAX      Unsigned32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "If the registration is pending, then this is the
                lifetime requested by the mobile node (in seconds).
                If the registration has been accepted, then this is
```

```
                the lifetime actually granted by the home agent in the
                reply."
        ::= { mnRegistrationEntry 6 }

    mnRegTimeRemaining OBJECT-TYPE
        SYNTAX      Gauge32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of seconds remaining until this
                registration expires.  It has the same initial value
                as mnRegTimeRequested and is only valid if
                mnRegIsAccepted is TRUE."
        ::= { mnRegistrationEntry 7 }

    mnRegTimeSent OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The time when the last (re-)transmission occurred."
        ::= { mnRegistrationEntry 8 }

    mnRegIsAccepted OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "true(1) if the mobile node has received a
                Registration Reply indicating that service has been
                accepted; false(2) otherwise.  false(2) implies that
                the registration is still pending."
        ::= { mnRegistrationEntry 9 }

    mnCOAIsLocal OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Whether the COA is local to (dynamically acquired by)
```

```
                the mobile node or not.  If it is false(2), the COA is
                an address of the foreign agent."
        ::= { mnRegistrationEntry 10 }

    mnRegDeliveryStyle OBJECT-TYPE
        SYNTAX      MipDeliveryStyle
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Delivery style requested by the mobile node in the
                registration request.  If mobile node is operating with
                a co-located care-of address i.e. when mnCOAIsLocal is
                true(1), this object should not be instantiated."
        DEFVAL      { direct }
        ::= { mnRegistrationEntry 11 }

    --
    -- Mobile Node Registration Group Counters
    --

    mnRegRequestsSent OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of registration requests sent by the
                mobile node.  This does not include deregistrations
                (those with Lifetime equal to zero)."
        ::= { mnRegistration 2 }

    mnDeRegRequestsSent OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of deregistration requests sent by the
                mobile node (those with Lifetime equal to zero)."
        ::= { mnRegistration 3 }

    mnRegRepliesRecieved OBJECT-TYPE
        SYNTAX      Counter32
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of registration replies received by the
                mobile node in which the Lifetime is greater than
                zero."
        ::= { mnRegistration 4 }

    mnDeRegRepliesRecieved OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of (de)registration replies received by
                the mobile node in which the Lifetime is equal to
                zero."
        ::= { mnRegistration 5 }

    mnRepliesInvalidHomeAddress OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of replies with invalid home address for
                the mobile node."
        ::= { mnRegistration 6 }

    mnRepliesUnknownHA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of replies with unknown home agents
                (not in home agent table)."
        ::= { mnRegistration 7 }

    mnRepliesUnknownFA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
```

```
                "Total number of replies with unknown foreign agents if
                replies relayed through foreign agent."
        ::= { mnRegistration 8 }

    mnRepliesInvalidID OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of replies with invalid Identification
                fields."
        ::= { mnRegistration 9 }

    mnRepliesDroppedInvalidExtension OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies dropped by the
                mobile node due to both poorly formed extensions and
                unrecognized extensions with extension number in the
                range 0-127."
        ::= { mnRegistration 10 }

    mnRepliesIgnoredUnknownExtension OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies that contained
                one or more unrecognized extensions in the range
                128-255 that were ignored by the mobile node."
        ::= { mnRegistration 11 }

    mnRepliesHAAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of replies without a valid Home Agent to
                Mobile Node authenticator."
```

```
        ::= { mnRegistration 12 }

    mnRepliesFAAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of replies without a valid Foreign Agent
                to Mobile Node authenticator."
        ::= { mnRegistration 13 }

    mnRegRequestsAccepted OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of registration requests accepted by the
                mobile node's home agent (Code 0 and Code 1)."
        ::= { mnRegistration 14 }

    mnRegRequestsDeniedByHA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of registration requests denied by
                mobile node's home agent (Sum of Code 128 through
                Code 191)."
        ::= { mnRegistration 15 }

    mnRegRequestsDeniedByFA OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of registration requests denied by the
                foreign agent (Sum of Codes 64 through Code 127)."
        ::= { mnRegistration 16 }

    mnRegRequestsDeniedByHADueToID OBJECT-TYPE
        SYNTAX      Counter32
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Request denied by home
                agent due to identification mismatch."
        ::= { mnRegistration 17 }

    mnRegRequestsWithDirectedBroadcast OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests sent by mobile
                node with a directed broadcast address in the home
                agent field."
        ::= { mnRegistration 18 }



    -- ====================================================================
    -- MA Advertisement Group

    --
    -- MA Advertisement Group Counters
    --

    maAdvertisementsSent OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of advertisements sent by the mobility
                agent."
        ::= { maAdvertisement 2 }

    maAdvsSentForSolicitation OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of advertisements sent by mobility agent
```

```
                in response to mobile node solicitations."
        ::= { maAdvertisement 3 }

    maSolicitationsReceived OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of solicitations received by the
                mobility agent."
        ::= { maAdvertisement 4 }

    --
    -- Mobility agent advertisement configuration table
    --

    maAdvertConfTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MaAdvertConfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing configurable advertisement
                parameters for all advertisement interfaces in
                the mobility agent."
        ::= { maAdvertisement 5 }

    maAdvertConfEntry OBJECT-TYPE
        SYNTAX      MaAdvertConfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Advertisement parameters for one advertisement
                interface."
        INDEX   { maAdvertIfIndex }
        ::= { maAdvertConfTable 1 }

    MaAdvertConfEntry    ::= SEQUENCE {
          maAdvertIfIndex                 InterfaceIndex,
          maAdvertMaxRegLifetime          Integer32,
          maAdvertPrefixLengthInclusion   TruthValue,
          maAdvertAddress                 IpAddress,
```

```
          maAdvertMaxInterval              Integer32,
          maAdvertMinInterval              Integer32,
          maAdvertMaxAdvLifetime           Integer32,
          maAdvertResponseSolicitationOnly TruthValue,
          maAdvertService                  BITS,
          maAdvertNetworkNAI               MipEntityIdentifierNAI,
          maAdvertStatus                   RowStatus,
          maAdvertStorageType              StorageType
        }

    maAdvertIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndex
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The ifIndex value from Interfaces table of
                MIB II for advertisement interface."
        ::= { maAdvertConfEntry 1 }

    maAdvertMaxRegLifetime OBJECT-TYPE
        SYNTAX      Integer32 (1..65535)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The longest lifetime in seconds that mobility agent
                is willing to accept in any Registration Request."
        ::= { maAdvertConfEntry 2 }

    maAdvertPrefixLengthInclusion OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Whether the advertisement should include the Prefix-
                Lengths Extension.  If it is true, all advertisements
                sent over this interface should include the
                Prefix-Lengths Extension."
        ::= { maAdvertConfEntry 3 }

    maAdvertAddress OBJECT-TYPE
```

```
        SYNTAX      IpAddress
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The IP destination address to be used for
                advertisements sent from the interface.  The only
                permissible values are the all-systems multicast
                address (224.0.0.1) or the limited-broadcast address
                (255.255.255.255)."
        REFERENCE
                "AdvertisementAddress in RFC1256."
        ::= { maAdvertConfEntry 4 }

    maAdvertMaxInterval OBJECT-TYPE
        SYNTAX      Integer32 (4..1800)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The maximum time in seconds between successive
                transmissions of Agent Advertisements from this
                interface."
        REFERENCE
                "MaxAdvertisementInterval in RFC1256."
        ::= { maAdvertConfEntry 5 }

    maAdvertMinInterval OBJECT-TYPE
        SYNTAX      Integer32 (3..1800)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The minimum time in seconds between successive
                transmissions of Agent Advertisements from this
                interface."
        REFERENCE
                "MinAdvertisementInterval in RFC1256."
        ::= { maAdvertConfEntry 6 }

    maAdvertMaxAdvLifetime OBJECT-TYPE
        SYNTAX      Integer32 (4..9000)
```

```
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The time (in seconds) to be placed in the Lifetime
                field of the RFC 1256-portion of the Agent
                Advertisements sent over this interface."
        REFERENCE
                "AdvertisementLifetime in RFC1256."
        ::= { maAdvertConfEntry 7 }

    maAdvertResponseSolicitationOnly OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The flag indicates whether the advertisement from
                that interface should be sent only in response to an
                Agent Solicitation message."
        DEFVAL      { false }
        ::= { maAdvertConfEntry 8 }

    maAdvertService OBJECT-TYPE
        SYNTAX      BITS { foreignAgent(0),
                           homeAgent(1)
                    }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Indicates which mobility services are offered on this
                interface."
        ::= { maAdvertConfEntry 9 }

     maAdvertNetworkNAI OBJECT-TYPE
         SYNTAX      MipEntityIdentifierNAI
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "This parameter defines the network NAI as adverticed.
                  The advertised NAI will be included in every HA and FA
                  agent advertisement that is sent out on the interface
```

```
                where the NAI is configured."
        DEFVAL      { ''H }   -- the empty string
        ::= { maAdvertConfEntry 10 }

    maAdvertStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The row status for the agent advertisement table.  If
                this column status is 'active', the manager should not
                change any column in the row."
        ::= { maAdvertConfEntry 11 }

    maAdvertStorageType OBJECT-TYPE
         SYNTAX      StorageType
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "The storage type for this entry."
         ::= { maAdvertConfEntry 12 }


    -- ================================================================
    -- Foreign Agent Group

    --
    -- Foreign Agent System Group
    --

    faCOATable OBJECT-TYPE
        SYNTAX      SEQUENCE OF FaCOAEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing all of the care-of addresses
                (COAs) supported by the foreign agent.  New entries can
                be added to the table.  The order of entries in the
                faCOATAble is also the order in which the COAs are
                listed in the Agent Advertisement."
           ::= { faSystem 1 }
```

```
    faCOAEntry OBJECT-TYPE
        SYNTAX      FaCOAEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Entry of COA"
        INDEX { faSupportedCOA }
        ::= { faCOATable 1 }

    FaCOAEntry     ::=
        SEQUENCE {
                 faSupportedCOA IpAddress,
                 faCOAStatus    RowStatus,
                 faCOAStorageType StorageType
        }

    faSupportedCOA OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Care-of-address supported by this foreign agent."
        ::= { faCOAEntry 1 }

    faCOAStatus  OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The row status for COA entry."
        ::= { faCOAEntry 2 }

    faCOAStorageType OBJECT-TYPE
         SYNTAX      StorageType
         MAX-ACCESS  read-create
         STATUS      current
         DESCRIPTION
                 "The storage type for this entry."
         DEFVAL  { nonVolatile }
         ::= { faCOAEntry 3 }
```

```
    --
    -- Foreign Agent Advertisement Group
    --

    -- FA needs to implement MA Advertisement Group plus that group
    -- Foreign agent advertisement configuration table.

    faAdvertConfTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF FaAdvertConfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing additional configurable
                advertisement parameters beyond that provided by
                maAdvertConfTable for all advertisement interfaces
                in the foreign agent."
           ::= { faAdvertisement 3 }

    faAdvertConfEntry OBJECT-TYPE
        SYNTAX      FaAdvertConfEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Additional advertisement parameters beyond that
                provided by maAdvertConfEntry for one advertisement
                interface."
        INDEX { maAdvertIfIndex }
        ::= { faAdvertConfTable 1 }

    FaAdvertConfEntry    ::= SEQUENCE {
        faAdvertIsBusy          TruthValue,
        faAdvertRegRequired     TruthValue,
        faAdvertChallengeWindow Integer32
        }

    faAdvertIsBusy OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
```

```
                "If true(1), the agent is busy and any Agent
                advertisements sent from the agent on this interface
                should have the 'B' bit set to 1."
        ::= { faAdvertConfEntry 1 }

    faAdvertRegRequired OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
                "If true(1), registration is required and any Agent
                Advertisements sent from the agent on this interface
                should have the 'R' bit set to 1."
        ::= { faAdvertConfEntry 2 }

    faAdvertChallengeWindow  OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
                "Indicates the number of last challenge values
                which can be used by mobile node in the registration
                request sent to the foreign agent on this interface."
        REFERENCE
                "RFC3012 - Mobile IPv4 Challenge/Response Extensions"
        DEFVAL      { 2 }
        ::= { faAdvertConfEntry 3 }

    --
    -- Foreign Agent Registration Group Counters
    --

    faRegRequestsReceived OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of valid Registration Requests
                received."
        ::= { faRegistration 2 }
```

```
    faRegRequestsRelayed OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests relayed to home
                agent by foreign agent."
        ::= { faRegistration 3 }

    faReasonUnspecified OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- reason unspecified (Code 64)."
        ::= { faRegistration 4 }

    faAdmProhibited OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- administratively prohibited (Code
                65)."
        ::= { faRegistration 5 }

    faInsufficientResource OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- insufficient resources (Code 66)."
        ::= { faRegistration 6 }

    faMNAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- mobile node failed authentication
                (Code 67)."
        ::= { faRegistration 7 }

    faRegLifetimeTooLong OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- requested lifetime too long (Code
                69)."
        ::= { faRegistration 8 }

    faPoorlyFormedRequests OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- poorly formed request (Code 70)."
        ::= { faRegistration 9 }

    faEncapsulationUnavailable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- requested encapsulation unavailable
                (Code 72)."
        ::= { faRegistration 10 }

    faHAUnreachable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
```

```
                foreign agent -- home agent unreachable (Codes
                80-95)."
        ::= { faRegistration 12 }

    faRegRepliesRecieved OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of well-formed Registration Replies
                received by foreign agent."
        ::= { faRegistration 13 }

    faRegRepliesRelayed OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of valid Registration Replies relayed to
                the mobile node by foreign agent."
        ::= { faRegistration 14 }

    faHAAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies denied by
                foreign agent -- home agent failed authentication
                (Code 68)."
        ::= { faRegistration 15 }

    faPoorlyFormedReplies OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies denied by
                foreign agent -- poorly formed reply (Code 71)."
        ::= { faRegistration 16 }
```

```
    faReverseTunnelUnavailable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- requested reverse tunnel
                unavailable (Code 74)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { faRegistration 17 }

    faReverseTunnelBitNotSet OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- reverse tunnel is mandatory and
                'T' bit not set (Code 75)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { faRegistration 18 }

    faMnTooDistant OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- mobile node too distant (Code 76)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { faRegistration 19 }

    faDeliveryStyleUnsupported OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
```

```
                foreign agent -- delivery style not supported
                (Code 79)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { faRegistration 20 }

    faNonZeroHomeAddressRequired OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- non zero home address is
                required (Code 96)."
        REFERENCE
                "RFC2794 - Mobile IP Network Access Identifier
                Extension for IPv4"
        ::= { faRegistration 21 }

    faUnknownChallenge OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- challenge was unknown (code 104)."
        REFERENCE
                "RFC3012 - Mobile IPv4 Challenge/Response Extensions"
        ::= { faRegistration 22 }

    faMissingChallenge OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- challenge was missing (code 105)."
        REFERENCE
                "RFC3012 - Mobile IPv4 Challenge/Response Extensions"
        ::= { faRegistration 23 }
```

```
    faStaleChallenge OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- challenge was stale (code 106)."
        REFERENCE
                "RFC3012 - Mobile IPv4 Challenge/Response Extensions"
        ::= { faRegistration 24 }

    faCvsesFromMnUnsupported OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent --  Unsupported Vendor-ID or unable to
                interpret Vendor-CVSE-Type in the CVSE sent by the
                mobile node to the foreign agent (code 100)."
        REFERENCE
                "RFC3025 - Mobile IP Vendor/Organization-Specific
                Extensions"
        ::= { faRegistration 25 }

     faCvsesFromHaUnsupported OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies denied by
                foreign agent --  Unsupported Vendor-ID or unable to
                interpret Vendor-CVSE-Type in the CVSE sent by the
                home agent to the foreign agent (code 101)."
        REFERENCE
                "RFC3025 - Mobile IP Vendor/Organization-Specific
                Extensions"
        ::= { faRegistration 26 }

    faNvsesFromMnIgnored OBJECT-TYPE
        SYNTAX      Counter32
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests which contained
                one or more NVSEs from the mobile node that were
                ignored by the foreign agent."
        REFERENCE
                "RFC3025 - Mobile IP Vendor/Organization-Specific
                Extensions"
        ::= { faRegistration 27 }

     faNvsesFromHaIgnored OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies which contained
                one or more NVSEs from the home agent that were
                ignored by the foreign agent."
        REFERENCE
                "RFC3025 - Mobile IP Vendor/Organization-Specific
                Extensions"
        ::= { faRegistration 28 }

    faRegVisitorCount OBJECT-TYPE
         SYNTAX      Gauge32
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The current number of entries in faRegVisitorTable."
         ::= { faRegistration 29 }


    --
    -- Foreign Agent Visitors List
    --

    faRegVisitorTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF FaRegVisitorEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
                "A table containing the foreign agent's visitor list.
                The foreign agent updates this table in response to
                registration events from mobile nodes."
        ::= { faRegistration 30 }

    faRegVisitorEntry OBJECT-TYPE
        SYNTAX      FaRegVisitorEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "Information for one visitor."
        INDEX   { faRegVisitorIdType, faRegVisitorId }
        ::= { faRegVisitorTable 1 }

    FaRegVisitorEntry     ::= SEQUENCE {
        faRegVisitorIdType           MipEntityIdentifierType,
        faRegVisitorId               MipEntityIdentifier,
        faRegVisitorHomeAddress      IpAddress,
        faRegVisitorHomeAgentAddress IpAddress,
        faRegVisitorTimeGranted      Integer32,
        faRegVisitorTimeRemaining    Gauge32,
        faRegVisitorRegFlags         RegistrationFlags,
        faRegVisitorRegIDLow         Unsigned32,
        faRegVisitorRegIDHigh        Unsigned32,
        faRegVisitorRegIsAccepted    TruthValue,
        faRegVisitorDeliveryStyle    MipDeliveryStyle,
        faRegVisitorNAI              MipEntityIdentifierNAI,
        faRegVisitorInPkts           Counter32,
        faRegVisitorInOctets         Counter32,
        faRegVisitorOutPkts          Counter32,
        faRegVisitorOutOctets        Counter32
        }

    faRegVisitorIdType  OBJECT-TYPE
         SYNTAX      MipEntityIdentifierType
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
                 "The type of the visitor's identifier."
         ::= { faRegVisitorEntry 1 }
```

```
    faRegVisitorId  OBJECT-TYPE
         SYNTAX      MipEntityIdentifier
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
                 "The identifier of the visitor."
         ::= { faRegVisitorEntry 2 }

    faRegVisitorHomeAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Home (IP) address of visiting mobile node."
        ::= { faRegVisitorEntry 3 }

    faRegVisitorHomeAgentAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Home agent IP address for that visiting mobile node."
        ::= { faRegVisitorEntry 4 }

    faRegVisitorTimeGranted OBJECT-TYPE
        SYNTAX      Integer32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The lifetime in seconds granted to the mobile node
                for this registration.  Only valid if
                faRegVisitorRegIsAccepted is true(1)."
        ::= { faRegVisitorEntry 5 }

    faRegVisitorTimeRemaining OBJECT-TYPE
        SYNTAX      Gauge32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
                "The number of seconds remaining until the
                registration is expired.  It has the same initial value
                as faRegVisitorTimeGranted, and is counted down by the
                foreign agent."
        ::= { faRegVisitorEntry 6 }

    faRegVisitorRegFlags OBJECT-TYPE
        SYNTAX      RegistrationFlags
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Registration flags sent by mobile node."
        ::= { faRegVisitorEntry 7 }

    faRegVisitorRegIDLow OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Low 32 bits of Identification used in that
                registration by the mobile node."
        ::= { faRegVisitorEntry 8 }

    faRegVisitorRegIDHigh OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "High 32 bits of Identification used in that
                registration by the mobile node."
        ::= { faRegVisitorEntry 9 }

    faRegVisitorRegIsAccepted OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Whether the registration has been accepted or not.  If
                it is false(2), this registration is still pending for
                reply."
```

```
        ::= { faRegVisitorEntry 10 }

    faRegVisitorDeliveryStyle OBJECT-TYPE
        SYNTAX      MipDeliveryStyle
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Delivery style requested by the mobile node in its
                registration request."
        DEFVAL      { direct }
        ::= { faRegVisitorEntry 11 }

     faRegVisitorNAI OBJECT-TYPE
         SYNTAX      MipEntityIdentifierNAI
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The NAI of the Mobile node. "
         ::= { faRegVisitorEntry 12 }

   faRegVisitorInPkts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of packets, received from the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { faRegVisitorEntry 13 }

   faRegVisitorInOctets OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of octets, received from the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { faRegVisitorEntry 14 }

   faRegVisitorOutPkts OBJECT-TYPE
```

```
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of packets, sent to the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { faRegVisitorEntry 15 }

   faRegVisitorOutOctets OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of octets, sent to the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { faRegVisitorEntry 16 }


    -- ================================================================
    -- Home Agent Group

    --
    -- Home agent mobility binding list
    --

    haMobilityBindingTable  OBJECT-TYPE
        SYNTAX      SEQUENCE OF HaMobilityBindingEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing the home agent's mobility binding
                list.  The home agent updates this table in response
                to registration events from mobile nodes."
        ::= { haRegistration 1 }

    haMobilityBindingEntry OBJECT-TYPE
        SYNTAX      HaMobilityBindingEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
                "An entry on the mobility binding list."
        INDEX   { haMobilityBindingMN, haMobilityBindingCOA }
        ::= { haMobilityBindingTable 1 }

    HaMobilityBindingEntry ::= SEQUENCE {
         haMobilityBindingMN            IpAddress,
         haMobilityBindingCOA           IpAddress,
         haMobilityBindingSourceAddress IpAddress,
         haMobilityBindingRegFlags      RegistrationFlags,
         haMobilityBindingRegIDLow      Unsigned32,
         haMobilityBindingRegIDHigh     Unsigned32,
         haMobilityBindingTimeGranted   Unsigned32,
         haMobilityBindingTimeRemaining Gauge32,
         haMobilityBindingMnIdType      MipEntityIdentifierType,
         haMobilityBindingMnId          MipEntityIdentifier,
         haMobilityBindingHA            IpAddress,
         haMobilityBindingNAI           MipEntityIdentifierNAI,
         haMobilityBindingInPkts        Counter32,
         haMobilityBindingInOctets      Counter32,
         haMobilityBindingOutPkts       Counter32,
         haMobilityBindingOutOctets     Counter32
         }

    haMobilityBindingMN    OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Mobile node's home (IP) address."
        ::= { haMobilityBindingEntry 1 }

    haMobilityBindingCOA   OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Mobile node's care-of-address.  One mobile node can
                have multiple bindings with different
                care-of-addresses."
        ::= { haMobilityBindingEntry 2 }
```

```
    haMobilityBindingSourceAddress    OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "IP source address of the Registration Request as
                received by the home agent.  Will be either a mobile
                node's co-located care-of address or an address of the
                foreign agent."
        ::= { haMobilityBindingEntry 3 }

    haMobilityBindingRegFlags OBJECT-TYPE
        SYNTAX      RegistrationFlags
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Registration flags sent by mobile node."
        ::= { haMobilityBindingEntry 4 }

    haMobilityBindingRegIDLow OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Low 32 bits of Identification used in that binding by
                the mobile node."
        ::= { haMobilityBindingEntry 5 }

    haMobilityBindingRegIDHigh OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
               "High 32 bits of Identification used in that binding by
                the mobile node."
        ::= { haMobilityBindingEntry 6 }

    haMobilityBindingTimeGranted OBJECT-TYPE
        SYNTAX      Unsigned32
        UNITS       "seconds"
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The lifetime in seconds granted to the mobile
                node for this registration."
        ::= { haMobilityBindingEntry 7 }

    haMobilityBindingTimeRemaining OBJECT-TYPE
        SYNTAX      Gauge32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of seconds remaining until the
                registration is expired.  It has the same initial value
                as haMobilityBindingTimeGranted, and is counted down
                by the home agent."
        ::= { haMobilityBindingEntry 8 }

    haMobilityBindingMnIdType OBJECT-TYPE
         SYNTAX      MipEntityIdentifierType
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The type of the mobile node's identifier."
         ::= { haMobilityBindingEntry 9 }

    haMobilityBindingMnId OBJECT-TYPE
         SYNTAX      MipEntityIdentifier
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
                 "The identifier of the mobile node."
         ::= { haMobilityBindingEntry 10 }

    haMobilityBindingHA    OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Mobile node's home agent (IP) address."
```

```
        ::= { haMobilityBindingEntry 11 }

      haMobilityBindingNAI  OBJECT-TYPE
          SYNTAX      MipEntityIdentifierNAI
          MAX-ACCESS  read-only
          STATUS      current
          DESCRIPTION
                  "The NAI of the Mobile node. "
          ::= { haMobilityBindingEntry 12 }

   haMobilityBindingInPkts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of packets, received from the MN.
                 Discontinuities in the value of this counter can
                  occur."
        ::= { haMobilityBindingEntry 13 }

   haMobilityBindingInOctets OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of octets, received from the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { haMobilityBindingEntry 14 }

   haMobilityBindingOutPkts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of packets, sent to the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { haMobilityBindingEntry 15 }

   haMobilityBindingOutOctets OBJECT-TYPE
```

```
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The number of octets, sent to the MN.
                 Discontinuities in the value of this counter can
                 occur."
        ::= { haMobilityBindingEntry 16 }

    --
    -- Home agent registration Counters for all mobile nodes.
    --

    haRegistrationAccepted   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests accepted by
                home agent (Code 0)."
        ::= { haRegistration 3 }

    haMultiBindingUnsupported OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests accepted by
                home agent -- simultaneous mobility bindings
                unsupported (Code 1)."
        ::= { haRegistration 4 }

    haReasonUnspecified   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- reason unspecified (Code 128)."
        ::= { haRegistration 5 }
```

```
    haAdmProhibited   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- administratively prohibited (Code 129)."
        ::= { haRegistration 6 }

    haInsufficientResource  OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- insufficient resources (Code 130)."
        ::= { haRegistration 7 }

    haMNAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- mobile node failed authentication (Code
                131)."
        ::= { haRegistration 8 }

    haFAAuthenticationFailure OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- foreign agent failed authentication (Code
                132)."
        ::= { haRegistration 9 }

    haIDMismatch OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
```

```
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- Identification mismatch (Code 133)."
        ::= { haRegistration 10 }

    haPoorlyFormedRequest OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- poorly formed request (Code 134)."
        ::= { haRegistration 11 }

    haTooManyBindings    OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- too many simultaneous mobility bindings (Code
                135)."
        ::= { haRegistration 12 }

    haUnknownHA   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by home
                agent -- unknown home agent address (Code 136)."
        ::= { haRegistration 13 }

    haGratuitiousARPsSent OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of gratuition ARPs sent by the home
                agent on behalf of mobile nodes."
```

```
        ::= { haRegistration 14 }

    haProxyARPsSent   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of proxy ARPs sent by the home agent on
                behalf of mobile nodes."
        ::= { haRegistration 15 }

    haRegRequestsReceived OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests received by
                home agent."
        ::= { haRegistration 16 }

    haDeRegRequestsReceived OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests received by the
                home agent with a Lifetime of zero (requests to
                deregister)."
        ::= { haRegistration 17 }

    haRegRepliesSent  OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies sent by the home
                agent."
        ::= { haRegistration 18 }

    haDeRegRepliesSent OBJECT-TYPE
        SYNTAX      Counter32
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Replies sent by the home
                agent in response to requests to deregister."
        ::= { haRegistration 19 }

    haReverseTunnelUnavailable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                the home agent -- requested reverse tunnel
                unavailable (Code 137)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { haRegistration 20 }

    haReverseTunnelBitNotSet OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                the home agent -- reverse tunnel is mandatory and
                'T' bit not set (Code 138)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
        ::= { haRegistration 21 }

    haEncapsulationUnavailable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests denied by
                the home agent -- requested encapsulation
                unavailable (Code 72)."
        REFERENCE
                "RFC3024 - Reverse Tunneling for Mobile IP"
```

```
      ::= { haRegistration 22 }

    haCvsesFromMnUnsupported OBJECT-TYPE
       SYNTAX      Counter32
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "Total number of Registration Requests denied by the
               home agent --  Unsupported Vendor-ID or unable to
               interpret Vendor-CVSE-Type in the CVSE sent by the
               mobile node to the home agent (code 140)."
       REFERENCE
               "RFC3025 - Mobile IP Vendor/Organization-Specific
               Extensions"
       ::= { haRegistration 23 }

    haCvsesFromFaUnsupported OBJECT-TYPE
       SYNTAX      Counter32
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "Total number of Registration Requests denied by the
               home agent --  Unsupported Vendor-ID or unable to
               interpret Vendor-CVSE-Type in the CVSE sent by the
               foreign agent to the home agent (code 141)."
       REFERENCE
               "RFC3025 - Mobile IP Vendor/Organization-Specific
               Extensions"
       ::= { haRegistration 24 }

    haNvsesFromMnIgnored OBJECT-TYPE
       SYNTAX      Counter32
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
               "Total number of Registration Requests which contained
               one or more NVSEs from the mobile node that were
               ignored by the home agent."
       REFERENCE
               "RFC3025 - Mobile IP Vendor/Organization-Specific
               Extensions"
```

```
        ::= { haRegistration 25 }

     haNvsesFromFaIgnored OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of Registration Requests which contained
                one or more NVSEs from the foreign agent that were
                ignored by the home agent."
        REFERENCE
                "RFC3025 - Mobile IP Vendor/Organization-Specific
                Extensions"
        ::= { haRegistration 26 }

    haRegMobilityBindingCount OBJECT-TYPE
        SYNTAX      Gauge32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The current number of entries in
                 haMobilityBindingTable."
        ::= { haRegistration 27 }

    --
    -- Home agent registration Counters per node
    --

    haRegCounterTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF HaRegCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "A table containing registration statistics for all
                mobile nodes authorized to use this home agent."
        ::= { haRegistration 28 }

    haRegCounterEntry  OBJECT-TYPE
        SYNTAX      HaRegCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
                "Registration statistics for one mobile node."
        INDEX   { haMobilityBindingMnIdType, haMobilityBindingMnId }
        ::= { haRegCounterTable 1 }

    HaRegCounterEntry      ::= SEQUENCE {
        haRegServiceRequestsAccepted   Counter32,
        haRegServiceRequestsDenied     Counter32,
        haRegOverallServiceTime        Gauge32,
        haRegRecentServiceAcceptedTime TimeStamp,
        haRegRecentServiceDeniedTime   TimeStamp,
        haRegRecentServiceDeniedCode   Integer32
        }

    haRegServiceRequestsAccepted OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of service requests for the mobile node
                accepted by the home agent (Code 0 + Code 1)."
        ::= { haRegCounterEntry 1 }

    haRegServiceRequestsDenied   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Total number of service requests for the mobile node
                denied by the home agent (sum of all registrations
                denied with Code 128 through Code 159)."
        ::= { haRegCounterEntry 2 }

    haRegOverallServiceTime   OBJECT-TYPE
        SYNTAX      Gauge32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Overall service time (in seconds) that has
                accumulated for the mobile node since the home agent
```

```
                last rebooted."
        ::= { haRegCounterEntry 3 }

    haRegRecentServiceAcceptedTime  OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The time at which the most recent Registration
                Request was accepted by the home agent for this mobile
                node."
        ::= { haRegCounterEntry 4 }

    haRegRecentServiceDeniedTime  OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The time at which the most recent Registration
                Request was denied by the home agent for this mobile
                node."
        ::= { haRegCounterEntry 5 }

    haRegRecentServiceDeniedCode  OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The Code indicating the reason why the most recent
                Registration Request for this mobile node was rejected
                by the home agent."
        ::= { haRegCounterEntry 6 }



    -- ================================================================
    -- MIP Notifications


    mipMIBNotificationPrefix    OBJECT IDENTIFIER ::= { mipMIB 2 }
```

```
    mipMIBNotifications  OBJECT IDENTIFIER ::=
                         { mipMIBNotificationPrefix 0 }

    mipAuthFailure2 NOTIFICATION-TYPE
        OBJECTS   { mipSecurityViolatorNAI,
                    mipSecurityViolatorIpAddress,
                    mipSecurityViolationCounter,
                    mipSecurityRecentViolationSPI,
                    mipSecurityRecentViolationTime,
                    mipSecurityRecentViolationIDLow,
                    mipSecurityRecentViolationIDHigh,
                    mipSecurityRecentViolationReason,
                    mipSecurityRecentViolationErrCode
                  }
        STATUS    current
        DESCRIPTION
                "The mipAuthFailure2 indicates that the Mobile IP
                entity has an authentication failure when it validates
                the mobile Registration Request or Reply."
        ::= { mipMIBNotifications 2 }



    -- ================================================================
    -- MIP Conformance Statements


    mipMIBConformance   OBJECT IDENTIFIER ::= { mipMIB 3 }

    mipGroups           OBJECT IDENTIFIER ::= { mipMIBConformance 1 }
    mipCompliances      OBJECT IDENTIFIER ::= { mipMIBConformance 2 }

    --
    -- compliance statements
    --

    mipCompliance2    MODULE-COMPLIANCE
        STATUS    current
        DESCRIPTION
                "The compliance statement for SNMPv2 entities which
                implement the Mobile IP MIB."
```

```
        MODULE

            MANDATORY-GROUPS { mipSystemGroup }

            GROUP    mipSecAssociationGroup2
            DESCRIPTION
                "This group is mandatory for Mobile IP entities (MN,
                FA, and HA) which support security associations.
                Mobile Nodes and Home Agents must implement this
                group.  Foreign Agents must implement this group if
                they maintain any security associations."

            GROUP    mipSecViolationGroup2
            DESCRIPTION
                "This group is mandatory for Mobile IP entities (MN,
                FA, and HA) that can log security violations."

            GROUP     mnSystemGroup2
            DESCRIPTION
                "This group is mandatory for mobile node."

            GROUP     mnDiscoveryGroup
            DESCRIPTION
                "This group is mandatory for mobile nodes which
                implement the Agent Discovery function."

            GROUP     mnRegistrationGroup2
            DESCRIPTION
                "This group is mandatory for mobile nodes."

            GROUP    maAdvertisementGroup2
            DESCRIPTION
                "This group is mandatory for the mobility agents (HA
                and FA) since they must implement Agent
                Advertisement."

            GROUP    maAdvertisementNAIGroup
            DESCRIPTION
                "This group is mandatory for the mobility agents (HA
                and FA) that implements agent NAIs in accordance with
                [RFC3846]."
```

```
            GROUP     faSystemGroup
            DESCRIPTION
                "This group is mandatory for foreign agents."

            GROUP     faAdvertisementGroup2
            DESCRIPTION
                "This group is mandatory for foreign agents."

            GROUP     faRegistrationGroup2
            DESCRIPTION
                "This group is mandatory for foreign agents."

            GROUP    haRegistrationGroup2
            DESCRIPTION
                "This group is mandatory for home agents."

            GROUP    haRegNodeCountersGroup2
            DESCRIPTION
                "This group is mandatory for home agents which log
                registration counters for each individual mobile
                node."

            GROUP    mipSecNotificationsGroup2
            DESCRIPTION
                "This group is mandatory for Mobile IP entities (MN,
                FA, and HA) that can report the security violations."
       ::= { mipCompliances 2 }

    --
    -- Units of conformance
    --

    mipSystemGroup     OBJECT-GROUP
        OBJECTS    { mipEntities, mipEnable, mipEncapsulationSupported }
        STATUS     current
        DESCRIPTION
                "A collection of objects providing the basic Mobile IP
                entity's management information."
        ::= { mipGroups 1 }
```

```
    mnDiscoveryGroup    OBJECT-GROUP
        OBJECTS   { mnFAAddress, mnCOA, mnAdvSourceAddress,
                    mnAdvSequence, mnAdvFlags, mnAdvMaxRegLifetime,
                    mnAdvMaxAdvLifetime, mnAdvTimeReceived,
                    mnSolicitationsSent, mnAdvertisementsReceived,
                    mnAdvsDroppedInvalidExtension,
                    mnAdvsIgnoredUnknownExtension, mnMoveFromHAToFA,
                    mnMoveFromFAToFA, mnMoveFromFAToHA,
                    mnGratuitousARPsSend, mnAgentRebootsDectected }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the Agent Discovery function within a
                mobile node."
        ::= { mipGroups 5 }

    faSystemGroup       OBJECT-GROUP
        OBJECTS   { faCOAStatus}
        STATUS    current
        DESCRIPTION
                "A collection of objects providing the basic
                management information for foreign agents."
        ::= { mipGroups 8 }

    mipSecAssociationGroup2    OBJECT-GROUP
        OBJECTS   { mipSecurityAlgorithmType, mipSecurityAlgorithmMode,
                    mipSecurityKey,
                    mipSecurityReplayMethod,
                    mipSecurityReplayTime, mipSecurityStatus,
                    mipSecurityPeerNAI, mipSecurityPeerIpAddress,
                    mipSecurityStorageType, mipSecurityAssocsCount }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing the management
                information for security associations of Mobile IP
                entities."
        ::= { mipGroups 14 }

    mipSecViolationGroup2    OBJECT-GROUP
        OBJECTS   { mipSecTotalViolations,
                    mipSecurityViolationCounter,
```

```
                    mipSecurityRecentViolationSPI,
                    mipSecurityRecentViolationTime,
                    mipSecurityRecentViolationIDLow,
                    mipSecurityRecentViolationIDHigh,
                    mipSecurityRecentViolationReason,
                    mipSecurityViolatorNAI,
                    mipSecurityViolatorIpAddress,
                    mipSecurityRecentViolationErrCode,
                    mipSecurityviolationStorageType }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing the management
                information for security violation logging of Mobile
                IP entities."
        ::= { mipGroups 15 }

    mnSystemGroup2    OBJECT-GROUP
        OBJECTS   { mnState, mnCurrentHA, mnHomeAddress,
                    mnHAStatus, mnIdentifierType, mnIdentifier }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing the basic
                management information for mobile nodes."
        ::= { mipGroups 16 }

    mnRegistrationGroup2    OBJECT-GROUP
        OBJECTS   { mnRegAgentAddress, mnRegCOA, mnRegFlags, mnRegIDLow,
                    mnRegIDHigh, mnRegTimeRequested, mnRegTimeRemaining,
                    mnRegTimeSent, mnRegIsAccepted, mnCOAIsLocal,
                    mnRegDeliveryStyle, mnRegRequestsSent,
                    mnRegRepliesRecieved, mnDeRegRequestsSent,
                    mnDeRegRepliesRecieved,
                    mnRepliesInvalidHomeAddress, mnRepliesUnknownHA,
                    mnRepliesUnknownFA, mnRepliesInvalidID,
                    mnRepliesDroppedInvalidExtension,
                    mnRepliesIgnoredUnknownExtension,
                    mnRepliesHAAuthenticationFailure,
                    mnRepliesFAAuthenticationFailure,
                    mnRegRequestsAccepted, mnRegRequestsDeniedByHA,
                    mnRegRequestsDeniedByFA,
                    mnRegRequestsDeniedByHADueToID,
```

```
                mnRegRequestsWithDirectedBroadcast }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                mobile node."
        ::= { mipGroups 17 }

    maAdvertisementGroup2    OBJECT-GROUP
        OBJECTS   { maAdvertMaxRegLifetime,
                    maAdvertPrefixLengthInclusion, maAdvertAddress,
                    maAdvertMaxInterval, maAdvertMinInterval,
                    maAdvertMaxAdvLifetime,
                    maAdvertResponseSolicitationOnly,
                    maAdvertService, maAdvertStatus,
                    maAdvertStorageType,
                    maAdvertisementsSent,
                    maAdvsSentForSolicitation,
                    maSolicitationsReceived }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the Agent Advertisement function
                within mobility agents."
        ::= { mipGroups 18 }

    maAdvertisementNAIGroup    OBJECT-GROUP
        OBJECTS   { maAdvertNetworkNAI }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the Agent Advertisement function
                that implements Agent NAIS is accordance with
                [RFC3846]."
        ::= { mipGroups 19 }

    faAdvertisementGroup2    OBJECT-GROUP
        OBJECTS   { faAdvertIsBusy, faAdvertRegRequired,
                    faAdvertChallengeWindow, faCOAStorageType }
        STATUS      current
        DESCRIPTION
```

```
                "A collection of objects providing supplemental
                management information for the Agent Advertisement
                function within a foreign agent."
        ::= { mipGroups 20 }

    faRegistrationGroup2    OBJECT-GROUP
        OBJECTS   {  faRegVisitorCount, faRegVisitorHomeAddress,
                     faRegVisitorHomeAgentAddress,
                     faRegVisitorTimeGranted,
                     faRegVisitorTimeRemaining, faRegVisitorRegFlags,
                     faRegVisitorRegIDLow, faRegVisitorRegIDHigh,
                     faRegVisitorRegIsAccepted,
                     faRegVisitorDeliveryStyle,
                     faRegVisitorNAI, faRegVisitorInPkts,
                     faRegVisitorInOctets,
                     faRegVisitorOutPkts, faRegVisitorOutOctets,
                     faRegRequestsReceived,
                     faRegRequestsRelayed, faReasonUnspecified,
                     faAdmProhibited, faInsufficientResource,
                     faMNAuthenticationFailure, faRegLifetimeTooLong,
                     faPoorlyFormedRequests,
                     faEncapsulationUnavailable,
                     faHAUnreachable, faRegRepliesRecieved,
                     faRegRepliesRelayed, faHAAuthenticationFailure,
                     faPoorlyFormedReplies,
                     faReverseTunnelUnavailable,
                     faReverseTunnelBitNotSet,
                     faMnTooDistant, faDeliveryStyleUnsupported,
                     faNonZeroHomeAddressRequired, faUnknownChallenge,
                     faMissingChallenge, faStaleChallenge,
                     faCvsesFromMnUnsupported, faCvsesFromHaUnsupported,
                     faNvsesFromMnIgnored, faNvsesFromHaIgnored }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                foreign agent."
        ::= { mipGroups 21 }

    haRegistrationGroup2    OBJECT-GROUP
        OBJECTS   { haMobilityBindingMN, haMobilityBindingCOA,
```

```
                    haMobilityBindingSourceAddress,
                    haMobilityBindingRegFlags,
                    haMobilityBindingRegIDLow,
                    haMobilityBindingRegIDHigh,
                    haMobilityBindingTimeGranted,
                    haMobilityBindingTimeRemaining,
                    haMobilityBindingMnIdType, haMobilityBindingMnId,
                    haMobilityBindingHA, haMobilityBindingNAI,
                    haMobilityBindingInPkts, haMobilityBindingInOctets,
                    haMobilityBindingOutPkts,
                    haMobilityBindingOutOctets,
                    haRegistrationAccepted, haMultiBindingUnsupported,
                    haReasonUnspecified, haAdmProhibited,
                    haInsufficientResource, haMNAuthenticationFailure,
                    haFAAuthenticationFailure, haIDMismatch,
                    haPoorlyFormedRequest, haTooManyBindings,
                    haUnknownHA, haGratuitiousARPsSent,
                    haProxyARPsSent, haRegRequestsReceived,
                    haDeRegRequestsReceived, haRegRepliesSent,
                    haDeRegRepliesSent, haReverseTunnelUnavailable,
                    haReverseTunnelBitNotSet,
                    haEncapsulationUnavailable,
                    haCvsesFromMnUnsupported,
                    haCvsesFromFaUnsupported,
                    haRegMobilityBindingCount,
                    haNvsesFromMnIgnored, haNvsesFromFaIgnored }
        STATUS    current
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                home agent."
        ::= { mipGroups 22 }

    haRegNodeCountersGroup2  OBJECT-GROUP
        OBJECTS   { haRegServiceRequestsAccepted,
                    haRegServiceRequestsDenied,
                    haRegOverallServiceTime,
                    haRegRecentServiceAcceptedTime,
                    haRegRecentServiceDeniedTime,
                    haRegRecentServiceDeniedCode }
        STATUS      current
```

```
        DESCRIPTION
                "A collection of objects providing management
                information for counters related to the registration
                function within a home agent."
        ::= { mipGroups 23 }

    mipSecNotificationsGroup2 NOTIFICATION-GROUP
        NOTIFICATIONS { mipAuthFailure2 }
        STATUS      current
        DESCRIPTION
                "The notification related to security violations."
        ::= { mipGroups 24 }



    -- ================================================================
    -- Deprecated Definitions


    --
    -- Security group specific deprecated objects
    --

    mipSecAssocTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MipSecAssocEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "A table containing Mobility Security Associations."
        ::= { mipSecurity 1 }

    mipSecAssocEntry OBJECT-TYPE
        SYNTAX      MipSecAssocEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "One particular Mobility Security Association."
        INDEX   { mipSecPeerAddress, mipSecSPI }
        ::= { mipSecAssocTable 1 }

    MipSecAssocEntry ::=
```

```
        SEQUENCE {
            mipSecPeerAddress   IpAddress,
            mipSecSPI           Unsigned32,
            mipSecAlgorithmType INTEGER,
            mipSecAlgorithmMode INTEGER,
            mipSecKey           OCTET STRING,
            mipSecReplayMethod  INTEGER
        }

    mipSecPeerAddress  OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "The IP address of the peer entity with which this
                node shares the mobility security association."
        ::= { mipSecAssocEntry 1 }

    mipSecSPI OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "The SPI is the 4-byte opaque index within the
                Mobility Security Association which selects the
                specific security parameters to be used to
                authenticate the peer, i.e. the rest of the variables
                in this MipSecAssocEntry."
        ::= { mipSecAssocEntry 2 }

    mipSecAlgorithmType OBJECT-TYPE
        SYNTAX      INTEGER {
                            other(1),
                            md5(2)
                    }
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "Type of security algorithm."
        ::= { mipSecAssocEntry 3 }
```

```
    mipSecAlgorithmMode OBJECT-TYPE
        SYNTAX      INTEGER {
                            other(1),
                            prefixSuffix(2)
                    }
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "Security mode used by this algorithm."
        ::= { mipSecAssocEntry 4 }

    mipSecKey  OBJECT-TYPE
        SYNTAX      OCTET STRING (SIZE(16))
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The shared secret key for the security
                associations.  Reading this object will always return
                zero length value."
        ::= { mipSecAssocEntry 5 }

    mipSecReplayMethod OBJECT-TYPE
        SYNTAX      INTEGER {
                             other(1),
                             timestamps(2),
                             nonces(3)
                    }
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The replay-protection method supported for this SPI
                within this Mobility Security Association."
        ::= { mipSecAssocEntry 6 }

    --
    -- Mobile IP security violation table
    --

    mipSecViolationTable  OBJECT-TYPE
        SYNTAX      SEQUENCE OF MipSecViolationEntry
        MAX-ACCESS  not-accessible
```

```
        STATUS      deprecated
        DESCRIPTION
                "A table containing information about security
                violations."
        ::= { mipSecurity 3 }

    mipSecViolationEntry  OBJECT-TYPE
        SYNTAX      MipSecViolationEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "Information about one particular security violation."
        INDEX   { mipSecViolatorAddress }
        ::= { mipSecViolationTable 1 }

    MipSecViolationEntry ::=
        SEQUENCE {
            mipSecViolatorAddress       IpAddress,
            mipSecViolationCounter      Counter32,
            mipSecRecentViolationSPI    Integer32,
            mipSecRecentViolationTime   TimeStamp,
            mipSecRecentViolationIDLow  Integer32,
            mipSecRecentViolationIDHigh Integer32,
            mipSecRecentViolationReason INTEGER
        }

    mipSecViolatorAddress  OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  accessible-for-notify
        STATUS      deprecated
        DESCRIPTION
                "Violator's IP address.  The violator is not necessary
                in the mipSecAssocTable."
        ::= { mipSecViolationEntry 1 }

    mipSecViolationCounter OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Total number of security violations for this peer."
```

```
        ::= { mipSecViolationEntry 2 }

    mipSecRecentViolationSPI  OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "SPI of the most recent security violation for this
                peer.  If the security violation is due to an
                identification mismatch, then this is the SPI from the
                Mobile-Home Authentication Extension.  If the security
                violation is due to an invalid authenticator, then
                this is the SPI from the offending authentication
                extension.  In all other cases, it should be set to
                zero."
        ::= { mipSecViolationEntry 3 }

    mipSecRecentViolationTime OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Time of the most recent security violation for this
                peer."
        ::= { mipSecViolationEntry 4 }

    mipSecRecentViolationIDLow  OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
               "Low-order 32 bits of identification used in request or
                reply of the most recent security violation for this
                peer."
        ::= { mipSecViolationEntry 5 }

    mipSecRecentViolationIDHigh  OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
```

```
                "High-order 32 bits of identification used in request
                or reply of the most recent security violation for
                this peer."
        ::= { mipSecViolationEntry 6 }

    mipSecRecentViolationReason   OBJECT-TYPE
        SYNTAX      INTEGER {
                            noMobilitySecurityAssociation(1),
                            badAuthenticator(2),
                            badIdentifier(3),
                            badSPI(4),
                            missingSecurityExtension(5),
                            other(6)
                    }
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Reason for the most recent security violation for
                this peer."
        ::= { mipSecViolationEntry 7 }

    --
    -- Depricated Mobility agent advertisement configuration table
    --

    maAdvConfigTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF MaAdvConfigEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "A table containing configurable advertisement
                parameters for all advertisement interfaces in
                the mobility agent."
        ::= { maAdvertisement 1 }

    maAdvConfigEntry OBJECT-TYPE
        SYNTAX      MaAdvConfigEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "Advertisement parameters for one advertisement
```

```
                interface."
        INDEX   { maInterfaceAddress }
        ::= { maAdvConfigTable 1 }

    MaAdvConfigEntry    ::= SEQUENCE {
          maInterfaceAddress            IpAddress,
          maAdvMaxRegLifetime           Integer32,
          maAdvPrefixLengthInclusion    TruthValue,
          maAdvAddress                  IpAddress,
          maAdvMaxInterval              Integer32,
          maAdvMinInterval              Integer32,
          maAdvMaxAdvLifetime           Integer32,
          maAdvResponseSolicitationOnly TruthValue,
          maAdvStatus RowStatus
        }

    maInterfaceAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "IP address for advertisement interface."
        ::= { maAdvConfigEntry 1 }

    maAdvMaxRegLifetime OBJECT-TYPE
        SYNTAX      Integer32 (0..65535)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The longest lifetime in seconds that mobility agent
                is willing to accept in any Registration Request."
        ::= { maAdvConfigEntry 2 }

    maAdvPrefixLengthInclusion OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "Whether the advertisement should include the Prefix-
                Lengths Extension.  If it is true, all advertisements
```

```
                sent over this interface should include the
                Prefix-Lengths Extension."
        ::= { maAdvConfigEntry 3 }

    maAdvAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The IP destination address to be used for
                advertisements sent from the interface.  The only
                permissible values are the all-systems multicast
                address (224.0.0.1) or the limited-broadcast address
                (255.255.255.255)."
        REFERENCE
                "AdvertisementAddress in RFC1256."
        ::= { maAdvConfigEntry 4 }

    maAdvMaxInterval OBJECT-TYPE
        SYNTAX      Integer32 (4..1800)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The maximum time in seconds between successive
                transmissions of Agent Advertisements from this
                interface."
        REFERENCE
                "MaxAdvertisementInterval in RFC1256."
        ::= { maAdvConfigEntry 5 }

    maAdvMinInterval OBJECT-TYPE
        SYNTAX      Integer32 (3..1800)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The minimum time in seconds between successive
                transmissions of Agent Advertisements from this
                interface."
        REFERENCE
```

```
                "MinAdvertisementInterval in RFC1256."
        ::= { maAdvConfigEntry 6 }

    maAdvMaxAdvLifetime OBJECT-TYPE
        SYNTAX      Integer32 (4..9000)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The time (in seconds) to be placed in the Lifetime
                field of the RFC 1256-portion of the Agent
                Advertisements sent over this interface."
        REFERENCE
                "AdvertisementLifetime in RFC1256."
        ::= { maAdvConfigEntry 7 }

    maAdvResponseSolicitationOnly OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The flag indicates whether the advertisement from
                that interface should be sent only in response to an
                Agent Solicitation message."
        DEFVAL      { false }
        ::= { maAdvConfigEntry 8 }

    maAdvStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
                "The row status for the agent advertisement table.  If
                this column status is 'active', the manager should not
                change any column in the row."
        ::= { maAdvConfigEntry 9 }


    --
    -- Foreign agent specific deprecated objects
    --
```

```
    faIsBusy OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Whether or not the foreign agent is too busy to
                accept additional registrations.  If true(1), the agent
                is busy and any Agent advertisements sent from this
                agent should have the 'B' bit set to 1."
        ::= { faAdvertisement 1 }

    faRegistrationRequired OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-write
        STATUS      deprecated
        DESCRIPTION
                "Whether or not this foreign agent requires
                registration even from those mobile nodes that have
                acquired their own, colocated care-of address.  If
                true(1), registration is required and any Agent
                Advertisements sent from this agent should have the
                'R' bit set to 1."
        ::= { faAdvertisement 2 }

    --
    -- Deprecated Foreign Agent Visitors List
    --

    faVisitorTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF FaVisitorEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "A table containing the foreign agent's visitor list.
                The foreign agent updates this table in response to
                registration events from mobile nodes."
        ::= { faRegistration 1 }

    faVisitorEntry OBJECT-TYPE
        SYNTAX      FaVisitorEntry
```

```
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "Information for one visitor."
        INDEX   { faVisitorIPAddress }
        ::= { faVisitorTable 1 }

    FaVisitorEntry     ::= SEQUENCE {
        faVisitorIPAddress        IpAddress,
        faVisitorHomeAddress      IpAddress,
        faVisitorHomeAgentAddress IpAddress,
        faVisitorTimeGranted      Integer32,
        faVisitorTimeRemaining    Gauge32,
        faVisitorRegFlags         RegistrationFlags,
        faVisitorRegIDLow         Integer32,
        faVisitorRegIDHigh        Integer32,
        faVisitorRegIsAccepted    TruthValue
        }

    faVisitorIPAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Source IP address of visitor's Registration Request."
        ::= { faVisitorEntry 1 }

    faVisitorHomeAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Home (IP) address of visiting mobile node."
        ::= { faVisitorEntry 2 }

    faVisitorHomeAgentAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Home agent IP address for that visiting mobile node."
```

```
        ::= { faVisitorEntry 3 }

    faVisitorTimeGranted OBJECT-TYPE
        SYNTAX      Integer32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "The lifetime in seconds granted to the mobile node
                for this registration.  Only valid if
                faVisitorRegIsAccepted is true(1)."
        ::= { faVisitorEntry 4 }

    faVisitorTimeRemaining OBJECT-TYPE
        SYNTAX      Gauge32
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "The number of seconds remaining until the
                registration is expired.  It has the same initial value
                as faVisitorTimeGranted, and is counted down by the
                foreign agent."
        ::= { faVisitorEntry 5 }

    faVisitorRegFlags OBJECT-TYPE
        SYNTAX      RegistrationFlags
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Registration flags sent by mobile node."
        ::= { faVisitorEntry 6 }

    faVisitorRegIDLow OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Low 32 bits of Identification used in that
                registration by the mobile node."
        ::= { faVisitorEntry 7 }
```

```
    faVisitorRegIDHigh OBJECT-TYPE
        SYNTAX      Integer32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "High 32 bits of Identification used in that
                registration by the mobile node."
        ::= { faVisitorEntry 8 }

    faVisitorRegIsAccepted OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Whether the registration has been accepted or not.  If
                it is false(2), this registration is still pending for
                reply."
        ::= { faVisitorEntry 9 }

    faVJCompressionUnavailable OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Total number of Registration Requests denied by
                foreign agent -- requested Van Jacobson header
                compression unavailable (Code 73)."
        ::= { faRegistration 11 }

    --
    -- Deprecated Home agent registration Counters per node
    --

    haCounterTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF HaCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "A table containing registration statistics for all
                mobile nodes authorized to use this home agent."
```

```
        ::= { haRegistration 2 }

    haCounterEntry  OBJECT-TYPE
        SYNTAX      HaCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      deprecated
        DESCRIPTION
                "Registration statistics for one mobile node."
        INDEX   { haMobilityBindingMN }
        ::= { haCounterTable 1 }

    HaCounterEntry      ::= SEQUENCE {
        haServiceRequestsAccepted   Counter32,
        haServiceRequestsDenied     Counter32,
        haOverallServiceTime        Gauge32,
        haRecentServiceAcceptedTime TimeStamp,
        haRecentServiceDeniedTime   TimeStamp,
        haRecentServiceDeniedCode   INTEGER
        }

    haServiceRequestsAccepted OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Total number of service requests for the mobile node
                accepted by the home agent (Code 0 + Code 1)."
        ::= { haCounterEntry 2 }

    haServiceRequestsDenied   OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Total number of service requests for the mobile node
                denied by the home agent (sum of all registrations
                denied with Code 128 through Code 159)."
        ::= { haCounterEntry 3 }

    haOverallServiceTime   OBJECT-TYPE
        SYNTAX      Gauge32
```

```
        UNITS       "seconds"
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "Overall service time (in seconds) that has
                accumulated for the mobile node since the home agent
                last rebooted."
        ::= { haCounterEntry 4 }

    haRecentServiceAcceptedTime  OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "The time at which the most recent Registration
                Request was accepted by the home agent for this mobile
                node."
        ::= { haCounterEntry 5 }

    haRecentServiceDeniedTime  OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "The time at which the most recent Registration
                Request was denied by the home agent for this mobile
                node."
        ::= { haCounterEntry 6 }

    haRecentServiceDeniedCode  OBJECT-TYPE
        SYNTAX      INTEGER {
                        reasonUnspecified(128),
                        admProhibited(129),
                        insufficientResource(130),
                        mnAuthenticationFailure(131),
                        faAuthenticationFailure(132),
                        idMismatch(133),
                        poorlyFormedRequest(134),
                        tooManyBindings(135),
                        unknownHA(136)
                    }
```

```
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
                "The Code indicating the reason why the most recent
                Registration Request for this mobile node was rejected
                by the home agent."
        ::= { haCounterEntry 7 }

    --
    --  deprecated traps
    --

    mipAuthFailure NOTIFICATION-TYPE
        OBJECTS   {    mipSecViolatorAddress,
                       mipSecRecentViolationSPI,
                       mipSecRecentViolationIDLow,
                       mipSecRecentViolationIDHigh,
                       mipSecRecentViolationReason
                  }
        STATUS    deprecated
        DESCRIPTION
                "The mipAuthFailure indicates that the Mobile IP
                entity has an authentication failure when it validates
                the mobile Registration Request or Reply.
                Implementation of this trap is optional."
        ::= { mipMIBNotifications 1 }

    --
    -- deprecated compliance statement
    --

    mipCompliance    MODULE-COMPLIANCE
        STATUS    deprecated
        DESCRIPTION
                "The compliance statement for SNMPv2 entities which
                implement the Mobile IP MIB."
        MODULE
            MANDATORY-GROUPS { mipSystemGroup }

            GROUP    mipSecAssociationGroup
            DESCRIPTION
```

```
            "This group is mandatory for Mobile IP entities (MN,
            FA, and HA) which support security associations.
            Mobile Nodes and Home Agents must implement this
            group.  Foreign Agents must implement this group if
            they maintain any security associations."

        GROUP    mipSecViolationGroup
        DESCRIPTION
            "This group is mandatory for Mobile IP entities (MN,
            FA, and HA) that can log security violations."

        GROUP     mnSystemGroup
        DESCRIPTION
            "This group is mandatory for mobile node."

        GROUP     mnDiscoveryGroup
        DESCRIPTION
            "This group is mandatory for mobile nodes which

            implement the Agent Discovery function."

        GROUP     mnRegistrationGroup
        DESCRIPTION
            "This group is mandatory for mobile nodes."

        GROUP    maAdvertisementGroup
        DESCRIPTION
            "This group is mandatory for the mobility agents (HA
            and FA) since they must implement Agent
            Advertisement."

        GROUP     faSystemGroup
        DESCRIPTION
            "This group is mandatory for foreign agents."

        GROUP     faAdvertisementGroup
        DESCRIPTION
            "This group is mandatory for foreign agents."

        GROUP     faRegistrationGroup
        DESCRIPTION
```

```
                "This group is mandatory for foreign agents."
            GROUP    haRegistrationGroup
            DESCRIPTION
                "This group is mandatory for home agents."

            GROUP    haRegNodeCountersGroup
            DESCRIPTION
                "This group is mandatory for home agents which log
                registration counters for each individual mobile
                node."

            GROUP    mipSecNotificationsGroup
            DESCRIPTION
                "This group is mandatory for Mobile IP entities (MN,
                FA, and HA) that can report the security violations."
        ::= { mipCompliances 1 }

    --
    -- Deprecated groups
    --


    mipSecAssociationGroup OBJECT-GROUP
        OBJECTS   { mipSecAlgorithmType, mipSecAlgorithmMode,
                    mipSecKey, mipSecReplayMethod }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing the management

                information for security associations of Mobile IP
                entities."
        ::= { mipGroups 2 }

    mipSecViolationGroup     OBJECT-GROUP
        OBJECTS   { mipSecTotalViolations,mipSecViolatorAddress,
                    mipSecViolationCounter, mipSecRecentViolationSPI,
                    mipSecRecentViolationTime,
                    mipSecRecentViolationIDLow,
                    mipSecRecentViolationIDHigh,
                    mipSecRecentViolationReason }
        STATUS    deprecated
```

```
        DESCRIPTION
                "A collection of objects providing the management
                information for security violation logging of Mobile
                IP entities."
        ::= { mipGroups 3 }

    mnSystemGroup    OBJECT-GROUP
        OBJECTS   { mnState, mnCurrentHA, mnHomeAddress,
                    mnHAStatus }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing the basic
                management information for mobile nodes."
        ::= { mipGroups 4 }

    mnRegistrationGroup    OBJECT-GROUP
        OBJECTS   { mnRegAgentAddress, mnRegCOA, mnRegFlags, mnRegIDLow,
                    mnRegIDHigh, mnRegTimeRequested, mnRegTimeRemaining,
                    mnRegTimeSent, mnRegIsAccepted, mnCOAIsLocal,
                    mnRegRequestsSent, mnRegRepliesRecieved,
                    mnDeRegRequestsSent, mnDeRegRepliesRecieved,
                    mnRepliesInvalidHomeAddress, mnRepliesUnknownHA,
                    mnRepliesUnknownFA, mnRepliesInvalidID,
                    mnRepliesDroppedInvalidExtension,
                    mnRepliesIgnoredUnknownExtension,
                    mnRepliesHAAuthenticationFailure,
                    mnRepliesFAAuthenticationFailure,
                    mnRegRequestsAccepted, mnRegRequestsDeniedByHA,
                    mnRegRequestsDeniedByFA,
                    mnRegRequestsDeniedByHADueToID,
                    mnRegRequestsWithDirectedBroadcast }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                mobile node."
        ::= { mipGroups 6 }

    maAdvertisementGroup    OBJECT-GROUP
        OBJECTS   { maAdvMaxRegLifetime,
                    maAdvPrefixLengthInclusion, maAdvAddress,
```

```
                    maAdvMaxInterval, maAdvMinInterval,
                    maAdvMaxAdvLifetime,
                    maAdvResponseSolicitationOnly, maAdvStatus,
                    maAdvertisementsSent, maAdvsSentForSolicitation,
                    maSolicitationsReceived }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing management
                information for the Agent Advertisement function
                within mobility agents."
        ::= { mipGroups 7 }

    faAdvertisementGroup OBJECT-GROUP
        OBJECTS   { faIsBusy, faRegistrationRequired }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing supplemental
                management information for the Agent Advertisement
                function within a foreign agent."
        ::= { mipGroups 9 }

    faRegistrationGroup    OBJECT-GROUP
        OBJECTS   {  faVisitorIPAddress, faVisitorHomeAddress,
                     faVisitorHomeAgentAddress, faVisitorTimeGranted,
                     faVisitorTimeRemaining, faVisitorRegFlags,
                     faVisitorRegIDLow, faVisitorRegIDHigh,
                     faVisitorRegIsAccepted, faRegRequestsReceived,
                     faRegRequestsRelayed, faReasonUnspecified,
                     faAdmProhibited, faInsufficientResource,
                     faMNAuthenticationFailure, faRegLifetimeTooLong,
                     faPoorlyFormedRequests,
                     faEncapsulationUnavailable,
                     faVJCompressionUnavailable, faHAUnreachable,
                     faRegRepliesRecieved, faRegRepliesRelayed,
                     faHAAuthenticationFailure, faPoorlyFormedReplies }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                foreign agent."
        ::= { mipGroups 10 }
```

```
    haRegistrationGroup    OBJECT-GROUP

        OBJECTS   { haMobilityBindingMN, haMobilityBindingCOA,
                    haMobilityBindingSourceAddress,
                    haMobilityBindingRegFlags,
                    haMobilityBindingRegIDLow,
                    haMobilityBindingRegIDHigh,
                    haMobilityBindingTimeGranted,
                    haMobilityBindingTimeRemaining,
                    haRegistrationAccepted, haMultiBindingUnsupported,
                    haReasonUnspecified, haAdmProhibited,
                    haInsufficientResource, haMNAuthenticationFailure,
                    haFAAuthenticationFailure, haIDMismatch,
                    haPoorlyFormedRequest, haTooManyBindings,
                    haUnknownHA, haGratuitiousARPsSent,
                    haProxyARPsSent, haRegRequestsReceived,
                    haDeRegRequestsReceived, haRegRepliesSent,
                    haDeRegRepliesSent }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing management
                information for the registration function within a
                home agent."
        ::= { mipGroups 11 }

    haRegNodeCountersGroup  OBJECT-GROUP
        OBJECTS   { haServiceRequestsAccepted,
                    haServiceRequestsDenied, haOverallServiceTime,
                    haRecentServiceAcceptedTime,
                    haRecentServiceDeniedTime,
                    haRecentServiceDeniedCode }
        STATUS    deprecated
        DESCRIPTION
                "A collection of objects providing management
                information for counters related to the registration
                function within a home agent."
        ::= { mipGroups 12 }

    mipSecNotificationsGroup NOTIFICATION-GROUP
        NOTIFICATIONS { mipAuthFailure }
```

```
        STATUS      deprecated
        DESCRIPTION
                "The notification related to security violations."

        ::= { mipGroups 13 }

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 contained in the mipSecurityAssocTable, mipSecurityViolationTable, faRegVisitorTable, and haMobilityBindingTable. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

The Mobile IP MIB affords the network operator the ability to configure and control the Mobile IP links of a particular system, including the Mobile IP authentication protocols, and shared secret key. This represents a security risk.

These risks are addressed in the following manners:

1. All variables which represent a significant security risk are placed in separate MIB Groups. By providing Agent Capability Statements, the implementor of the MIB may elect not to implement these groups.

2. The MIB allows the manager station to create the security association for Mobile IP entities. However, the agent should always return 0 length octet string when the manager station retrieves the shared security key in the mipSecAssocTable. In this way, the Mobile IP entities can prevent the key leaking from SNMP GET, GET-NEXT, or GET-BULK requests.

3. The MIB defines a trap for Mobile IP entities to send a notification to the manager station if there is a security violation. In this way, the operator can notice the source of an intruder.

4. The MIB also defines a table to log the security violations in the Mobile IP entities. The manager station can retrieve this log to analyze the security violation instances in the system.

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 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

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
mipMIB	{ mib-2 44 }

Editor's Note (to be removed prior to publication): this draft makes no additional requests of the IANA.

7. Acknowledgments

The origin of this document is from RFC 2006 "The Definitions of Managed Objects for IP Mobility Support using SMIv2" written by D. Cong, M. Hamlen and C. Perkins. The editor wishes to acknowledge the

good work of these original authors. Thanks to Roy Jose, Rudreshwar N, Basavaraj Patil, Sri Gundavelli and Olavi Kompulainen for their useful comments and contributions.

APPENDIX A: Changes from RFC 2006

There has been a substantial update of this MIP-MIB since RFC2006. However, sometimes backwards compatibility is preferred over perfection. So, some mib peculiarities still exist in this mib.

RFC2006 had some index elements with read access. Although this is not recommended, these index object are not made not-accessible. The non deprecated objects are mnRegAgentAddress and mnRegCOA of row mnRegistrationEntry; and haMobilityBindingMN and haMobilityBindingCOA of row haMobilityBindingEntry. To get a clean compile with smilint, use the "-i index-element-accessible" option.

RFC2006 had BITS constructs for RegistrationFlags and the mnAdvFlags that made sense in relation to RFC2002 but was hard to extend to in relation to the bits flags used in RFC3344. The editors have decided that backwards compatibility and not deprecate more objects than necessary is more important than a direct relation to the flags in later MIP RFCs. Extra care should be taken when RegistrationFlags and mnAdvFlags are implemented.

A.1. Changes in draft-ietf-mobileip-rfc2006bis-00

- Section "The Network Management Framework" was updated.
- Subsection Protocol Extensions was created under Overview section.
- Section Security Considerations was updated.
- Changes to the MIB definition are following. Changes are listed in the order of their occurrence in the MIB definition.

(1) The textual convention RegistrationFlags was updated. The bit for VJ compression was removed and bit for reverse tunneling was added.

Three new textual conventions were added : MipEntityIdentifierType, MipEntityIdentifier and MipEntityIdentifierNAI. These textual conventions were defined to take into account that mobile nodes can be identified by other than ipaddress.

(3) New textual convention MipDeliveryStyle was added to represent the delivery style requested by mobile node in the registration request.
mipSecAssocTable was deprecated and replaced with mipSecurityAssocTable to support the mobile nodes identified by NAI. Indices of the table were changed.
mipSecurityStatus object was added

to manage the creation of new security associations in the table. Default value clause was added to following three objects of the new table.
- mipSecurityAlgorithmType
- mipSecurityAlgorithmMode
- mipSecurityReplayMethod

hmac was added to the enumeration list of mipSecurityAlgorithmMode object.

(5) A new object mipSecurityAssocsCount was added. This gives the number of security associations in the mipSecurityAssocTable.

(6) mipSecViolationTable was deprecated and replaced with mipSecurityViolationTable to support the mobile nodes identified by NAI.
Indices of the table were changed.The objects corresponding to mipSecRecentViolationIDLow and mipSecRecentViolationIDHigh in the new table are changed to have the syntax of Unsigned32 instead of Integer32.

(7) Description of the mnHomeAddress object was changed to support dynamic home address assignment and default value clause was added.

(8) Two new objects mnIdentifierType and mnIdentifier were added to the mnSystem group.

(9) object mnAdvFlags was refined. The bit for VJ compression was removed and bit for reverse tunneling was added.

(10) Lower limit of value-range for objects mnAdvMaxRegLifetime and mnAdvMaxAdvLifetime is changed to 1 from 0.

(11) A new object mnRegDeliveryStyle was added to the mnRegistrationTable

(12) maAdvConfigTable was deprecated and replaced with maAdvertConfTable to support configuration of advertisement parameters on unnumbered interfaces.
Index of the table was changed. A new object maAdvertService was added to maAdvertConfTable to indicate the mobility services offered on the network interface.

(13) objects faIsBusy and faRegistrationRequired were deprecated, replaced with faAdvertConfTable. This is to allow for

different settings of 'B' and 'R' bit on different network interfaces.

(14) A new object faChallengeWindow was added to the faAdvertConfTable to allow for configuration of challenge window.

(15) faVisitorTable was deprecated and replaced with faRegVisitorTable to support the visitors identified by NAI.Indices of the table were changed. The objects corresponding to faVisitorRegIDLow and faVisitorRegIDHigh in the new table are changed to have the syntax of Unsigned32 instead of Integer32.

(16) A new object faRegVisitorDeliveryStyle was added to the FaRegVisitorTable to indicate the delivery style requested by the mobile node.

(17) A new object faRegVisitorCount was added to count the number of entries in faRegVisitorTable.

(18) faVJCompressionUnavailable object was deprecated.

(19) Five new counters specific to reverse tunneling function in for eign agent were added to faRegistration group. These objects are
- faReverseTunnelUnavailable
- faReverseTunnelBitNotSet
- faMnTooDistant
- faDeliveryStyleUnsupported
- faNonZeroHomeAddressRequired

(20) Three new counters specific to agent advertisement challenge extension were added to faRegistration group. These objects
- faUnknownChallenge
- faMissingChallenge
- faStaleChallenge

(21) Two new counters specific to processing of vendor specific extensions by FA were added to faRegistration group.
These objects are
- faCvsesFromMnRejected
- faCvsesFromHaRejected

(22) Two new objects haMobilityBindingMnIdType and haMobilityBindingMnId were added to the haMobilityBindingTable to accommodate for the mobile nodes not identified by the ipaddress. Syntax of objects haMobilityBindingRegIDLow and

haMobilityBindingRegIDHigh
was changed to Unsigned32 from Integer32.

(23) haCounterTable was deprecated and replaced with haRegCounterTable to support the MNs identified by NAI. Indices of the table were changed. The syntax of object corresponding to haRecentServiceDeniedCode in the new table was changed to add more error codes.

(24) Three new counters specific to reverse tunneling function in home agent were added to the haRegistration group. These objects are
- haReverseTunnelUnavailable
- haReverseTunnelBitNotSet
- haEncapsulationUnavailable

(25) Two new counters specific to processing of vendor specific extensions by home agent were added to haRegistration group. These objects are
- haCvsesFromMnRejected
- haCvsesFromFaRejected

(26) A new object haRegMobilityBindingCount was added to count the number of entries in haMobilityBindingTable.

(27) mipAuthFailure notification was deprecated and replaced with mipAuthFailure2.

(28) Compliance statement mipCompliance was deprecated and replaced with mipCompliance2.

(29) Conformance groups were depreciated as needed due to the fact that many new items have been added to the MIB. These groups include:
-mipSecAssociationGroup
-mipSecViolationGroup
-mnSystemGroup
-mnRegistrationGroup
-maAdvertisementGroup
-faAdvertisementGroup
-faRegistrationGroup
-haRegistrationGroup
-haRegNodeCountersGroup
-mipSecNotificationsGroup

New conformance groups were added as needed to replace deprecated groups. These groups include:
-mipSecAssociationGroup2
-mipSecViolationGroup2

```
          -mnSystemGroup2
          -mnRegistrationGroup2
          -maAdvertisementGroup2
          -faAdvertisementGroup2
          -faRegistrationGroup2
          -haRegistrationGroup2
          -haRegNodeCountersGroup2
       -mipSecNotificationsGroup2
```

A.2. Changes in draft-ietf-mobileip-rfc2006bis-02

(1) The textual convention RegistrationFlags was updated to conform to the sequence order of the flag bits in RFC 3344.

(2) Typos "CmiEntityIdentfier" changed "MipEntityIdentifier".

(3) A new object MipSecurityReplayTime was added for acceptable replay protection time range using timestamps.

(4) The following objects changed to have the syntax of Unsigned32 instead of Integer32.

```
        -mnRegIDHigh
        -mnRegIDLow
        -mnRegTimeRequested
        -haMobilityBindingTimeGranted
        -mipSecurityRecentViolationSPI
```

(5) The following values added to object haRegRecentServiceDeniedCode.

```
        -mnCvseUnsupported (140)
        -faCvseUnsupported (141)
```

(6) The following object names were changed to provide better meaning since these are rejection counters.

```
     -haCvsesFromMnRejected to haCvsesFromMnUnsupported
     -haCvsesFromFaRejected to haCvsesFromFaUnsupported
     -faCvsesFromMnRejected to faCvsesFromMnUnsupported
     -faCvsesFromHaRejected to faCvsesFromHaUnsupported
```

(7) The following objects were added to HA registration counters.

```
     -haNvsesFromMnIgnored
     -haNvsesFromFaIgnored
```

(8) The following objects were added to FA registration counters.

```
     -faNvsesFromMnIgnored
     -faNvsesFromHaIgnored
```

A.3. Changes in draft-ietf-mobileip-rfc2006bis-03

(1) The size of the MipEntityIdentifier is changed to OCTET STRING of size 64 octets

(2) Changed the SYNTAX for mnAdvSequence object to Integer32

(3) Changed the SYNTAX for mnAdvMaxRegLifeTime object to Integer32

(4) Changed the SYNTAX for mnAdvMaxAdvLifeTime object to Integer32

(5) faNvsesFromMnIgnored is anchored at faRegistration 27

(6) faNvsesFromHaIgnored is anchored at faRegistration 28

(7) faRegVisitorCount is anchored at faRegistration 29

(8) Changed the faCvsesFromHaSupported object name to faCvsesFromHaUnsupported

(9) Added faNvsesFromMnIgnored and faNvsesFromHaIgnored to faRegistrationGroup2

(10) faRegVisitorTable is anchored at faRegistration 30

(11) Added the haNvsesFromMnIgnored object to the haRegistrationGroup2

(12) Added the haNvsesFromFaIgnored object to the haRegistrationGroup2

(13) Added the NOTIFICATION-GROUP to the imports

A.4. Changes in draft-ietf-mip4-rfc2006bis-00

(1) Draft retitled to draft-ietf-mip4-rfc2006bis-00.txt

A.5. Changes in draft-ietf-mip4-rfc2006bis-01

(1) Chair addresses updated.

A.6. Changes in draft-ietf-mip4-rfc2006bis-02

1) Aligned RegistrationFlags with rfc2006.

2) mipEncapsulationSupported OBJECT-TYPE should also contain RFC3519 [RFC3519] UDP Tunnel option. Aded new bit to the object since new bit

is allowed for MIB revision. (RFC 2578, section 10.2 and RFC4181, section 4.9).

3) mipSecurityAssocEntry and mipSecurityViolationEntry now contain the full NAI and the address objects. Since the index could be either or, and the NAI could be crippled in the index.

4) The error code for a security violation is added. The reason object itself isn't enough (it's almost always other(6). Added mipSecRecentViolationErrorCode to mipSecViolationTable

5) maAdvertIfIndex should be InterfaceIndex from IF-MIB, not integer

6) With RFC3846, NAI is equally applicable to links and adverticements. So, NAI needs to be included for Mobility agent advertisement interfaces.

Added in a group for those that implement agent NAI's a'la RFC3846.

7) NAI needs to be added in the FA Visitor table. The NAI isn't necessarily included in the index, and it might also be crippled if it's to long.

8) Packet and byte conters per session added. This is a most useful debug-tool, and is also practice in all comparable mibs. They should be kept per registration sessson in the FA and HA.

9) HA and NAI information is included in haMobilityBindingTable. There could be many per snmp-agent, so which ha a particular ha session is pertaining to should be incluided in the table. Also, the NAI (as described before) is included.

10) haRegRecentServiceDeniedCode can't be enumerated. It's handled by IANA and should therefore be one of the IANA considerations, the sytax is changed to open Integer32.

11) The mipAuthFailure2 notification needs additional objects. Traps should be complete and don't require addditional read operations. the mipAuthFailure2 trap adds objects from hte seviolation table.

12) StorageType a'la rfc2579 is added to those tables where they are needed.

13) Updated template stuff, such as mib boiler plate, security considerations, references and TC conventions.

A.7. Changes in draft-ietf-mip4-rfc2006bis-03

1) No functional changes at all. Updated boilerplate, dates and address information.

A.8. Changes in draft-ietf-mip4-rfc2006bis-04

mnAdvFlags object updated with I [RFC4857] and U [RFC3519] flags. New bits are allowed for MIB revision. (RFC 2578, section 10.2 and RFC4181, section 4.9).

Updated security guidelines and reference sections.

A.9. Changes in draft-ietf-mip4-rfc2006bis-05

Removed RFC 3978 Section 5.2(b) Derivative Works Limitation.

A.10. Changes in draft-ietf-mip4-rfc2006bis-06

Boilerplate updates for changes in legal provisions relating to IETF documents.

Contact info updates

8. References

8.1. Normative References

[RFC1701] Hanks S. et. al., "Generic Routing Encapsulation (GRE)", RFC1701, October 1994.

[RFC2003] Perkins, C., "IP Encapsulation within IP", RFC 2003, October 1996.

[RFC2004] Perkins, C., "Minimal Encapsulation within IP", RFC 2004, October 1996.

[RFC2006] Cong, D., Hamlen, M., and Perkins, C., "The Definitions of Managed Objects for IP Mobility Support using SMIv2", RFC 2006, October 1996.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2578] 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.

[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[RFC2794] Calhoun, P., and Perkins, C., "Mobile IP Network Access Identifier Extension for IPv4", RFC 2794, January 2000.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB" RFC 2863, June 2000.

[RFC3024] Montenegro, G., "Reverse Tunneling for Mobile IP", RFC 3024, January 2001.

[RFC3115] Dommety, G. and K. Leung, "Mobile IP Vendor/Organization Specific Extensions", RFC 3115, April 2001.

[RFC3344] Perkins, C., "IP Mobility Support for IPv4", RFC 3344, August 2002.

[RFC3519] H. Levkowetz and S. Vaarala, "Mobile IP Traversal of Network Address Translation (NAT) Devices", RFC3519, April 2003

[RFC3846] F. Johansson and T. Johansson, "Mobile IPv4 Extension for Carrying Network Access Identifiers", RFC3846, June 2004

[RFC4721] P. Calhoun,C. Perkins and J. Bharatia, "Mobile IPv4 Challenge/Response Extension (Revised)", RFC 4721, January 2007.

[RFC4857] E. Fogelstroem, A. Jonsson and C. Perkins, "Mobile IPv4 Regional Registration", RFC4857, June 2007.

8.2. Informative References

[RFC3410] 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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