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Network Mobility (NEMO) Management Information Base

Status of This Memo

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

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Abstract

This memo defines a portion of the Management Information Base (MIB), the Network Mobility (NEMO) support MIB, for use with network management protocols in the Internet community. In particular, the NEMO MIB will be used to monitor and control a Mobile IPv6 node with NEMO functionality.

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1. The Internet-Standard Management Framework

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

2. Overview

2.1. The Mobile IPv6 Protocol and NEMO Entities

Mobile IPv6 (MIPv6) [RFC3775] specifies a protocol that allows nodes to remain reachable while moving around in the IPv6 Internet. The Network Mobility (NEMO) Basic Support Protocol [RFC3963] is an extension to the Mobile IPv6 protocol that facilitates the movement of an entire network. The goals of Network Mobility support and related terminology are discussed in [RFC4886] and [RFC4885], respectively.

Typically, mobile routers implement NEMO functionality for achieving network mobility. However, a mobile router may also function as a mobile node. In the context of this document, an entity that implements the NEMO protocol is a NEMO entity.

This document defines a set of managed objects (MOs) that can be used to monitor and control NEMO entities.

2.2. Relationship to Other MIB Modules

This document focuses on the management of a NEMO entity. It is assumed that implementations will support the ifTable from the IF-MIB [RFC2863]. The MOBILEIPV6-MIB [RFC4295] defines the managed objects for a mobile node. Implementations supporting both the mobile node and NEMO functionality SHOULD implement the managed objects defined for the NEMO entities and mobile nodes from both the MOBILEIPV6-MIB and NEMO-MIB. The NEMO-MIB uses the textual conventions defined in the INET-ADDRESS-MIB [RFC4001].

2.3. Terminology

The terminology used in this document is consistent with the definitions used in the Mobile IPv6 protocol specification [RFC3775] and the NEMO Basic Support specification [RFC3963].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, RFC 2119 [RFC2119].

2.4. MIB Design

The NEMO MIB comprises the following groups of definitions:

nemoCore: a generic group containing objects that are common to all NEMO entities.

nemoHa: this group models the home agent service. It is composed of objects specific to the services and associated advertisement parameters offered by the home agent on each of its links. It also contains objects pertaining to the maintenance of the home agent list on each of the links on which the service is offered.

nemoMr: this group models the mobile router service. It is composed of objects specific to the Dynamic Home Agent discovery function and related parameters. It also contains objects that record the movement of the mobile router.

nemoNotifications: defines the set of notifications that will be used to asynchronously monitor the NEMO entities.

The tables contained in the above groups are as follows:

nemoBindingCacheTable: models the Binding Cache on the home agent and correspondent node. It contains details of the Binding Update requests that have been received and accepted.

nemoMrEgressIfTable: contains information on the configured egress interfaces.

nemoMrBLTable: models the Binding Update List on the mobile router. It contains information about the registration requests sent by the mobile router and the corresponding results.

nemoHaCounterTable: contains registration statistics for all mobile routers registered with the home agent.

nemoHaMobileNetworkPrefixTable: contains the list of the mobile network prefixes that are maintained by the home agent.

3. The NEMO MIB

```

NEMO-MIB DEFINITIONS ::= BEGIN
IMPORTS
    MODULE-IDENTITY, mib-2, Unsigned32, Counter32,
    Gauge32,
    OBJECT-TYPE, NOTIFICATION-TYPE
        FROM SNMPv2-SMI
    TEXTUAL-CONVENTION,
    TruthValue, DateAndTime, TimeStamp
        FROM SNMPv2-TC
    SnmpAdminString
        FROM SNMP-FRAMEWORK-MIB
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF
    InetAddressType, InetAddress, InetAddressPrefixLength
        FROM INET-ADDRESS-MIB
    InterfaceIndex
        FROM IF-MIB
    mip6BindingHomeAddressType, mip6BindingHomeAddress,
    mip6MnBLEntry, mip6BindingCacheEntry,
    mip6MnBLCOAType, mip6MnBLCOA
        FROM MOBILEIPV6-MIB
;

nemoMIB MODULE-IDENTITY
    LAST-UPDATED "200903100000Z"      -- 10 March 2009
    ORGANIZATION "IETF MEXT Working Group"

```

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"

DESCRIPTION

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This version of this MIB module is part of RFC 5488; see the RFC itself for full legal notices."

REVISION "200903100000Z" -- 10 March 2009
DESCRIPTION "Initial version, published as RFC 5488."

::= { mib-2 184 }

-- The NEMO MIB has the following primary groups

nemoNotifications	OBJECT IDENTIFIER ::= { nemoMIB 0 }
nemoObjects	OBJECT IDENTIFIER ::= { nemoMIB 1 }
nemoConformance	OBJECT IDENTIFIER ::= { nemoMIB 2 }
nemoCore	OBJECT IDENTIFIER ::= { nemoObjects 1 }
nemoMr	OBJECT IDENTIFIER ::= { nemoObjects 2 }
nemoCn	OBJECT IDENTIFIER ::= { nemoObjects 3 }
nemoHa	OBJECT IDENTIFIER ::= { nemoObjects 4 }

-- The sub groups

nemoSystem	OBJECT IDENTIFIER ::= { nemoCore 1 }
nemoBindings	OBJECT IDENTIFIER ::= { nemoCore 2 }

```

nemoConfiguration      OBJECT IDENTIFIER ::= { nemoCore 3 }
nemoStats              OBJECT IDENTIFIER ::= { nemoCore 4 }

nemoMrSystem           OBJECT IDENTIFIER ::= { nemoMr 1 }
nemoMrConf             OBJECT IDENTIFIER ::= { nemoMr 2 }
nemoMrRegistration     OBJECT IDENTIFIER ::= { nemoMr 3 }
nemoMrGlobalStats     OBJECT IDENTIFIER ::= { nemoMr 4 }

nemoHaAdvertisement    OBJECT IDENTIFIER ::= { nemoHa 1 }
nemoHaStats           OBJECT IDENTIFIER ::= { nemoHa 2 }
nemoHaRegistration    OBJECT IDENTIFIER ::= { nemoHa 3 }
nemoHaGlobalStats     OBJECT IDENTIFIER ::= { nemoHaStats 1 }

```

-- Textual Conventions

```

NemoBURequestRejectionCode ::= TEXTUAL-CONVENTION
    STATUS          current
    DESCRIPTION
        "The value of the status field in the Binding
        Acknowledgment message when the Binding Update
        was rejected for NEMO-specific reasons."
    REFERENCE
        "RFC 3963: Section 4.2"
    SYNTAX          INTEGER {
        mobileRouterOperationNotPermitted (140),
        invalidPrefix                    (141),
        notAuthorizedForPrefix           (142),
        forwardingSetupFailed            (143)
    }

```

```

--
--
-- nemoSystem group
--
--

```

```

nemoCapabilities OBJECT-TYPE
    SYNTAX          BITS {
        mobileRouter          (0),
        homeAgentSupport      (1)
    }
    MAX-ACCESS      read-only
    STATUS          current

```

DESCRIPTION

"This object indicates the NEMO functions that are supported by this managed entity. Multiple NEMO functions may be supported by a single entity.

"

REFERENCE

"RFC 3963: Section 3"

::= { nemoSystem 1 }

nemoStatus OBJECT-TYPE

SYNTAX INTEGER { enabled(1), disabled(2) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object indicates whether the NEMO function is enabled for the managed entity. If it is enabled, the agent discovery and registration functions will be operational.

Changing the status from enabled(1) to disabled(2) will terminate the agent discovery and registration functions. On the other hand, changing the status from disabled(2) to enabled(1) will start the agent discovery and registration functions.

The value of this object MUST remain unchanged across reboots of the managed entity.

"

::= { nemoSystem 2 }

nemoCounterDiscontinuityTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which any one or more of this NEMO entity's counters, viz., counters with OID prefix 'nemoMrConf', 'nemoMrRegnCounters', 'nemoMrGlobalStats', or 'nemoHaGlobalStats', suffered a discontinuity. If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object will have a zero value.

"

::= { nemoStats 1 }

--

--

```

-- nemoConfiguration group
--
--

nemoMrBLTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NemoMrBLEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table corresponds to the Binding Update List
        (BL) that includes NEMO-related information and that
        is maintained by the mobile router.  The table
        holds a row for every binding that the mobile
        router has established or is trying to establish.
        Entries from the table are deleted as the lifetime
        of the binding expires.
        "
    REFERENCE
        "RFC 3775: Sections 4.5, 11.1
        RFC 3963: Section 5.2"
    ::= { nemoMrRegistration 1 }

nemoMrBLEntry OBJECT-TYPE
    SYNTAX      NemoMrBLEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry pertaining to NEMO-related information
        contained in a Binding Update sent by a NEMO-enabled
        mobile router to its home agent.
        "
    AUGMENTS { mip6MnBLEntry }
    ::= { nemoMrBLTable 1 }

NemoMrBLEntry ::= SEQUENCE {
    nemoMrBLMode      INTEGER,
    nemoMrBLMrFlag    TruthValue,
    nemoMrBLHomeAddressPrefixLength  InetAddressPrefixLength,
    nemoMrBLCareofAddressPrefixLength  InetAddressPrefixLength,
    nemoMrBLActiveEgressIfIndex      InterfaceIndex,
    nemoMrBLEstablishedHomeTunnelIfIndex  InterfaceIndex
}

nemoMrBLMode OBJECT-TYPE
    SYNTAX      INTEGER {
        implicitMode (1),
        explicitMode (2)
    }
    MAX-ACCESS  read-only

```

```

STATUS      current
DESCRIPTION
    "implicitMode(1): the Mobile Network Prefix Option
    is not included in the Binding Update by the mobile
    router.

    explicitMode(2): the mobile router included one or
    more Mobile Network Prefix Options in the Binding
    Update."
REFERENCE
    "RFC 3963: Section 5.2"
 ::= { nemoMrBLEntry 1 }

```

```

nemoMrBLMrFlag OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "true(1): the mobile router sent the Binding Update
    with Mobile Router Flag set.

    false(2): the mobile router did not send the Binding
    Update with Mobile Router Flag set. This implies that
    the mobile router is acting as a mobile node."
REFERENCE
    "RFC 3963: Sections 4.1, 5.1"
 ::= { nemoMrBLEntry 2 }

```

```

nemoMrBLHomeAddressPrefixLength OBJECT-TYPE
SYNTAX      InetAddressPrefixLength
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The prefix length of the mobile router's home network."
REFERENCE
    "RFC 3963: Section 3"
 ::= { nemoMrBLEntry 3 }

```

```

nemoMrBLCareofAddressPrefixLength OBJECT-TYPE
SYNTAX      InetAddressPrefixLength
MAX-ACCESS  read-only
STATUS      current

```

DESCRIPTION

"The prefix length of the care-of address of the mobile router.

"

REFERENCE

"RFC 3963: Section 3"

::= { nemoMrBLEntry 4 }

nemoMrBLActiveEgressIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The interface index of the currently active egress interface.

"

REFERENCE

"RFC 3963: Section 5.5"

::= { nemoMrBLEntry 5 }

nemoMrBLEstablishedHomeTunnelIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The interface index of the tunnel established between the mobile router and the home agent for NEMO traffic.

"

REFERENCE

"RFC 3963: Section 5.5"

::= { nemoMrBLEntry 6 }

-- Mobile Router Registration Group Counters

nemoMrRegnCounters OBJECT IDENTIFIER ::= { nemoMrRegistration 2 }

nemoMrMobilityMessagesSent OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of mobility messages, i.e., IPv6 datagrams with Mobility Header, sent by the mobile node. This will include Binding Updates sent by a mobile router with the Mobile Router Flag set.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Sections 4.2, 6.1

RFC 3963: Section 4.1"

::= { nemoMrRegnCounters 1 }

nemoMrMobilityMessagesRecd OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of mobility messages, i.e., IPv6 datagrams with Mobility Header, received by the mobile node. This will include Binding Acknowledgements with Mobile Router Flag set that are sent to a mobile router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Sections 4.2, 6.1

RFC 3963: Sections 4.1, 4.2"

::= { nemoMrRegnCounters 2 }

nemoMrPrefixRegMode OBJECT-TYPE

SYNTAX INTEGER {
 implicitMode (1),
 explicitMode (2)
 }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object indicates the mode in which the mobile network prefixes will be registered with the home agent.

implicitMode(1): the Mobile Network Prefix Option will not be included in the Binding Update by the mobile router.

explicitMode(2): the mobile router will include one or more Mobile Network Prefix Options in the Binding Update.

The value of this object MUST remain unchanged across reboots of the managed entity.

"

REFERENCE

"RFC 3963: Section 5.2"

::= { nemoMrRegistration 3 }

nemoHaMobileNetworkPrefixTable OBJECT-TYPE

SYNTAX SEQUENCE OF NemoHaMobileNetworkPrefixEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains the mobile network prefixes that the home agent maintains for the mobile router. The mobile network prefixes in this table are registered by Binding Updates or are manually pre-configured.

"

REFERENCE

"RFC 3963: Section 6.1.2"

::= { nemoHaRegistration 1 }

nemoHaMobileNetworkPrefixEntry OBJECT-TYPE

SYNTAX NemoHaMobileNetworkPrefixEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry for a mobile network prefix.

The instances of the columnar objects in this entry pertain to an interface for a particular value of mip6BindingHomeAddressType, mip6BindingHomeAddress, and nemoHaMobileNetworkPrefixSeqNo.

The nemoHaMobileNetworkPrefixSeqNo object is used to distinguish between multiple instances of the mobile network prefix in the same Binding Update for the same set of mip6BindingHomeAddressType and mip6BindingHomeAddress.

There is no upper-bound on the maximum number of mobile network prefixes in a Binding Update but, for practical purposes, the upper bound of the value

nemoHaMobileNetworkPrefixSeqNo is set to 1024.

Implementers need to be aware that if the total number of octets in mip6BindingHomeAddress exceeds 112, then OIDs of column instances in this row will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3.

```

"
INDEX { mip6BindingHomeAddressType,
        mip6BindingHomeAddress,
        nemoHaMobileNetworkPrefixSeqNo
}
 ::= { nemoHaMobileNetworkPrefixTable 1 }

NemoHaMobileNetworkPrefixEntry ::= SEQUENCE {
    nemoHaMobileNetworkPrefixSeqNo      Unsigned32,
    nemoHaMobileNetworkPrefixType       InetAddressType,
    nemoHaMobileNetworkPrefix           InetAddress,
    nemoHaMobileNetworkPrefixLength     Unsigned32,
    nemoHaMobileNetworkPrefixSource     INTEGER
}

nemoHaMobileNetworkPrefixSeqNo OBJECT-TYPE
    SYNTAX      Unsigned32 (1..1024)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A Binding Update may have multiple mobile network
        prefixes.

        This object, along with mip6BindingHomeAddressType
        and mip6BindingHomeAddress, uniquely identifies a
        row containing a single mobile network prefix for
        a mobile router in this table.
        "
    REFERENCE
        "RFC 3963: Sections 2, 6.1, 6.2"
    ::= { nemoHaMobileNetworkPrefixEntry 1 }

nemoHaMobileNetworkPrefixType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The address type for the mobile network prefix
        that follows.
        "

```

```
::= { nemoHaMobileNetworkPrefixEntry 2 }
```

nemoHaMobileNetworkPrefix OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A mobile network prefix related to the corresponding Binding Update.

The type of the address represented by this object is specified by the corresponding nemoHaMobileNetworkPrefixType object.

"

REFERENCE

"RFC 3963: Sections 2, 6.1, 6.2"

```
::= { nemoHaMobileNetworkPrefixEntry 3 }
```

nemoHaMobileNetworkPrefixLength OBJECT-TYPE

SYNTAX Unsigned32 (0..128)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The length of the prefix specified by the corresponding nemoHaMobileNetworkPrefix object.

"

REFERENCE

"RFC 3963: Sections 4.3, 6.1, 6.2"

```
::= { nemoHaMobileNetworkPrefixEntry 4 }
```

nemoHaMobileNetworkPrefixSource OBJECT-TYPE

SYNTAX INTEGER {
 configured (1),
 bindingUpdate (2)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The information source of the mobile network prefix configured with the Binding Update.

configured(1): indicates that the mobile network prefix has been manually pre-configured.

bindingUpdate(2): indicates that the information is introduced to the home agent by the Mobile Network

Prefix Option in the Binding Updates received by the home agent.

"

REFERENCE

"RFC 3963: Sections 4.3, 6.1, 6.2"

::= { nemoHaMobileNetworkPrefixEntry 5 }

nemoBindingCacheTable OBJECT-TYPE

SYNTAX SEQUENCE OF NemoBindingCacheEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table models the Binding Cache that includes NEMO-related information and that is maintained by the home agent. Entries in this table are not required to survive a reboot of the home agent.

"

REFERENCE

"RFC 3775: Sections 4.5, 9.1, 10.1,

RFC 3963: Section 6.1"

::= { nemoBindings 1 }

nemoBindingCacheEntry OBJECT-TYPE

SYNTAX NemoBindingCacheEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing additional information related to NEMO-enabled entries in the Binding Cache table of the home agent.

"

AUGMENTS { mip6BindingCacheEntry }

::= { nemoBindingCacheTable 1 }

```
NemoBindingCacheEntry ::= SEQUENCE {
    nemoBindingMrFlag    TruthValue,
    nemoBindingMrMode    INTEGER
}
```

nemoBindingMrFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"true(1): indicates that the Binding Cache entry is from an entity acting as a mobile router.

false(2): implies that the Binding Cache entry is from an entity acting as a mobile node.

"

REFERENCE

"RFC 3963: Sections 6.1.1, 6.2"

::= { nemoBindingCacheEntry 1 }

nemoBindingMrMode OBJECT-TYPE

SYNTAX INTEGER {
implicitMode(1),
explicitMode(2)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"implicitMode(1): the Mobile Network Prefix Option is not included in the Binding Update by the mobile router.

explicitMode(2): the mobile router included one or more Mobile Network Prefix Options in the Binding Update.

"

REFERENCE

"RFC 3963: Sections 5.2, 6.1.1, 6.2"

::= { nemoBindingCacheEntry 2 }

--

-- nemoMrEgressIfTable

--

nemoMrEgressIfTable OBJECT-TYPE

SYNTAX SEQUENCE OF NemoMrEgressIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table representing the egress interfaces that will be used by the mobile router for roaming to foreign networks. Each entry in this table represents a configured egress interface.

"

::= { nemoMrSystem 1 }

nemoMrEgressIfEntry OBJECT-TYPE

SYNTAX NemoMrEgressIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the egress interface table. It

represents a single egress interface entry.

"

```
INDEX { nemoMrEgressIfIndex }
 ::= { nemoMrEgressIfTable 1 }
```

NemoMrEgressIfEntry ::=

```
SEQUENCE {
  nemoMrEgressIfIndex          InterfaceIndex,
  nemoMrEgressIfPriority       Unsigned32,
  nemoMrEgressIfDescription   SnmpAdminString,
  nemoMrEgressIfRoamHoldDownTime Gauge32
}
```

nemoMrEgressIfIndex OBJECT-TYPE

```
SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "The index of the interface on the mobile router.
  "
 ::= { nemoMrEgressIfEntry 1 }
```

nemoMrEgressIfPriority OBJECT-TYPE

```
SYNTAX      Unsigned32 (0..255)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The priority configured to the egress interface.
  This value will be configured to a value between 0
  and 255.
  "
 ::= { nemoMrEgressIfEntry 2 }
```

nemoMrEgressIfDescription OBJECT-TYPE

```
SYNTAX      SnmpAdminString
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A human-readable textual description of the egress
  interface on the mobile router.
  "
 ::= { nemoMrEgressIfEntry 3 }
```

nemoMrEgressIfRoamHoldDownTime OBJECT-TYPE

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

DESCRIPTION

"This object indicates the time for which the egress interface will be held down during roaming to avoid interface flapping.

"

::= { nemoMrEgressIfEntry 4 }

nemoMrDiscoveryRequests OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of Modified Dynamic Home Agent Address Discovery Requests, with Mobile Router Support Flag set, sent by the mobile router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Sections 10.5, 11.4.1

RFC 3963: Section 7.1"

::={ nemoMrConf 1 }

nemoMrDiscoveryReplies OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of Modified Dynamic Home Agent Address Discovery Replies, with Mobile Router Support Flag set, received by the mobile router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Sections 10.5, 11.4.1

RFC 3963: Section 7.2"

::= { nemoMrConf 2 }

nemoMrDiscoveryRepliesRouterFlagZero OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of Modified Dynamic Home Agent Address Discovery Replies, with Mobile Router Support Flag set to 0 although the flag in the corresponding request is set to 1. It implies that there is no home agent that supports mobile router functionality in the home network.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Sections 10.5, 11.4.1
RFC 3963: Section 7.2"

::= { nemoMrConf 3 }

nemoMrMovedHome OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of times the mobile router has detected movement from a foreign network to its home network.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 3"

::= { nemoMrConf 4 }

nemoMrMovedOutOfHome OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of times the mobile router has detected movement to a foreign network from the home network, has acquired a care-of address, and has initiated the care-of address registration process.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 3"
 ::= { nemoMrConf 5 }

nemoMrMovedFNtoFN OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"Number of times the mobile router has detected movement to/from a foreign network from/to another foreign network. Note that 'movement' implies movement in layer 3, i.e., the mobile router's care-of address changed, and it initiated the care-of address registration process.

If there are multiple egress interfaces, this counter counts the total number of movements. The movement as a mobile node of the mobile entity is not counted.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 3"
 ::= { nemoMrConf 6 }

nemoMrBetterIfDetected OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"Number of times the NEMO entity has found an egress interface with better priority.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

::= { nemoMrConf 7 }

```
--
--
--
```

```
nemoMrBindingAcksWONemoSupport OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of Binding Acknowledgements without
        NEMO support received by the mobile router.

        Discontinuities in the value of this counter can
        occur at re-initialization of the management system,
        and at other times as indicated by the value of
        nemoCounterDiscontinuityTime."
    REFERENCE
        "RFC 3963: Section 5.3"
        ::= { nemoMrGlobalStats 1 }
```

```
nemoMrBindingAcksRegTypeChangeDisallowed OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of Binding Acknowledgements
        received by the mobile router with status code
        indicating 'Registration type change disallowed'
        (Code 139).

        Discontinuities in the value of this counter can
        occur at re-initialization of the management system,
        and at other times as indicated by the value of
        nemoCounterDiscontinuityTime."
    REFERENCE
        "RFC 3775: Section 9.5.1
        RFC 3963: Section 6.2"
        ::= { nemoMrGlobalStats 2 }
```

```
nemoMrBindingAcksOperationNotPermitted OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of Binding Acknowledgements
        received by the mobile router with status code
```

indicating 'Mobile Router Operation not permitted'
(Code 140).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"
 ::= { nemoMrGlobalStats 3 }

nemoMrBindingAcksInvalidPrefix OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of Binding Acknowledgements received by the mobile router with status code indicating 'Invalid Prefix' (Code 141).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"
 ::= { nemoMrGlobalStats 4 }

nemoMrBindingAcksNotAuthorizedForPrefix OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of Binding Acknowledgements received by the mobile router with status code indicating 'Not Authorized for Prefix' (Code 142).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963 : Section 6.6"
 ::= { nemoMrGlobalStats 5 }

nemoMrBindingAcksForwardingSetupFailed OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Acknowledgements received by the mobile router with status code indicating 'Forwarding Setup failed' (Code 143).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoMrGlobalStats 6 }

nemoMrBindingAcksOtherError OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Acknowledgements received by the mobile router (Mobile Router Flag is set) with status code other than:

successfully processed	--(Code 0)
mobileRouterOperationNotPermitted (140)	--(Code 140)
invalidPrefix (141)	--(Code 141)
notAuthorizedForPrefix (142)	--(Code 142)
forwardingSetupFailed (143)	--(Code 143)

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963 : Section 6.6"

::= { nemoMrGlobalStats 7 }

--

-- nemoStats:nemoHaGlobalStats

--

nemoHaBUAcksWONemoSupport OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The total number of Binding Acknowledgements without NEMO support sent by the home agent.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 5.3"

::= { nemoHaGlobalStats 1 }

nemoHaBUAcksRegTypeChangeDisallowed OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The total number of Binding Update requests rejected by the home agent with status code in the Binding Acknowledgement indicating 'Registration type change disallowed' (Code 139).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3775: Section 9.5.1

RFC 3963: Section 6.2"

::= { nemoHaGlobalStats 2 }

nemoHaBUAcksOperationNotPermitted OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The total number of Binding Update requests rejected by the home agent with status code in the Binding Acknowledgement indicating 'Mobile Router Operation not permitted' (Code 140).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of

nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoHaGlobalStats 3 }

nemoHaBUAcksInvalidPrefix OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Update requests rejected by the home agent with status code in the Binding Acknowledgement indicating 'Invalid Prefix' (Code 141).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoHaGlobalStats 4 }

nemoHaBUAcksNotAuthorizedForPrefix OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Update requests rejected by the home agent with status code in the Binding Acknowledgement indicating 'Not Authorized for Prefix' (Code 142).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoHaGlobalStats 5 }

nemoHaBUAcksForwardingSetupFailed OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Update requests rejected by the home agent with status code in the Binding Acknowledgement indicating 'Forwarding Setup failed' (Code 143).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoHaGlobalStats 6 }

nemoHaBUAcksOtherError OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Binding Update requests from mobile routers (Mobile Router Flag is set) rejected by the home agent with status code other than:

mobileRouterOperationNotPermitted	(140)
invalidPrefix	(141)
notAuthorizedForPrefix	(142)
forwardingSetupFailed	(143)

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoCounterDiscontinuityTime.

"

REFERENCE

"RFC 3963: Section 6.6"

::= { nemoHaGlobalStats 7 }

nemoHaCounterTable OBJECT-TYPE

SYNTAX SEQUENCE OF NemoHaCounterEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table containing registration statistics for all mobile routers registered with the home agent.

"

::= { nemoHaStats 2 }

```

nemoHaCounterEntry OBJECT-TYPE
    SYNTAX      NemoHaCounterEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Home agent registration statistics for a mobile
        router.

        Implementers need to be aware that if the total
        number of octets in mip6BindingHomeAddress
        exceeds 113, then OIDs of column instances in
        this row will have more than 128 sub-identifiers and
        cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3.
        "
    INDEX       { mip6BindingHomeAddressType,
                  mip6BindingHomeAddress
                }
    ::= { nemoHaCounterTable 1 }

NemoHaCounterEntry ::= SEQUENCE {
    nemoHaBURequestsAccepted      Counter32,
    nemoHaBURequestsDenied        Counter32,
    nemoHaBCEntryCreationTime     DateAndTime,
    nemoHaBUAcceptedTime          DateAndTime,
    nemoHaBURejectionTime         DateAndTime,
    nemoHaRecentBURejectionCode   NemoBURequestRejectionCode,
    nemoHaCtrDiscontinuityTime    TimeStamp
}

nemoHaBURequestsAccepted OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Total number of Binding Update requests from the
        mobile router accepted by the home agent.

        Discontinuities in the value of this counter can
        occur at re-initialization of the management system,
        and at other times as indicated by the value of
        nemoHaCtrDiscontinuityTime.
        "
    ::= { nemoHaCounterEntry 1 }

nemoHaBURequestsDenied OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current

```

DESCRIPTION

"Total number of Binding Update requests from the mobile router rejected by the home agent.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of nemoHaCtrDiscontinuityTime.

"

::= { nemoHaCounterEntry 2 }

nemoHaBCEntryCreationTime OBJECT-TYPE

SYNTAX DateAndTime (SIZE (11))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time when the current Binding Cache entry was created for the mobile router. An implementation MUST return all 11 bytes of the DateAndTime textual-convention so that a manager may retrieve the offset from GMT time.

"

::= { nemoHaCounterEntry 3 }

nemoHaBUAcceptedTime OBJECT-TYPE

SYNTAX DateAndTime (SIZE (11))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time at which the last Binding Update was accepted by the home agent for this mobile router. An implementation MUST return all 11 bytes of the DateAndTime textual-convention so that a manager may retrieve the offset from GMT time.

"

::= { nemoHaCounterEntry 4 }

nemoHaBURejectionTime OBJECT-TYPE

SYNTAX DateAndTime (SIZE (11))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time at which the last Binding Update was rejected by the home agent for this mobile router. If there have been no rejections, then this object will be inaccessible. An implementation MUST return all 11 bytes of the DateAndTime textual-convention so that a manager may retrieve the offset from GMT

```

        time.
    "
 ::= { nemoHaCounterEntry 5 }

nemoHaRecentBURejectionCode OBJECT-TYPE
    SYNTAX      NemoBURequestRejectionCode
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The Status code (>= 128) in the latest Binding
        Acknowledgment indicating a rejection, sent to this
        mobile router.

        If a Binding Update request is rejected and a Binding
        Acknowledgment is not sent to this mobile router,
        then this will be the value of the Status code that
        corresponds to the reason of the rejection.  If there
        have been no Binding Update request rejections, then
        this object will be inaccessible.
    "
 ::= { nemoHaCounterEntry 6 }

nemoHaCtrDiscontinuityTime OBJECT-TYPE
    SYNTAX      TimeStamp
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion
        at which any one or more of the counters in this row,
        viz., instances of 'nemoHaBURequestsAccepted' and
        'nemoHaBURequestsDenied', suffered a discontinuity.
        If no such discontinuity has occurred since the
        last re-initialization of the local management
        subsystem, then this object will have a zero value.
    "
 ::= { nemoHaCounterEntry 7 }

--
--
-- nemoNotifications
--
--

nemoHomeTunnelEstablished NOTIFICATION-TYPE
    OBJECTS {
        nemoMrBLActiveEgressIfIndex,
        nemoMrBLEstablishedHomeTunnelIfIndex,
        mip6MnBLCOAType,
    }

```

```

        mip6MnBLCOA,
        nemoMrBLHomeAddressPrefixLength,
        nemoMrBLCareofAddressPrefixLength
    }

```

STATUS current

DESCRIPTION

"This notification is sent by the mobile router every time the tunnel is established between the home agent and the mobile router.

"

REFERENCE

"RFC 3963: Section 5.5"

::= { nemoNotifications 1 }

nemoHomeTunnelReleased NOTIFICATION-TYPE

OBJECTS {

```

        nemoMrBLActiveEgressIfIndex,
        nemoMrBLEstablishedHomeTunnelIfIndex,
        mip6MnBLCOAType,
        mip6MnBLCOA,
        nemoMrBLHomeAddressPrefixLength,
        nemoMrBLCareofAddressPrefixLength
    }

```

STATUS current

DESCRIPTION

"This notification is sent by the mobile router every time the tunnel is deleted between the home agent and the mobile router.

"

REFERENCE

"RFC 3963: Section 5.5"

::= { nemoNotifications 2 }

-- Conformance information

nemoGroups OBJECT IDENTIFIER ::= { nemoConformance 1 }

nemoCompliances OBJECT IDENTIFIER ::= { nemoConformance 2 }

-- Units of conformance

nemoSystemGroup OBJECT-GROUP

OBJECTS {

```

        nemoCapabilities,
        nemoStatus
    }

```

STATUS current

DESCRIPTION

"A collection of objects for basic NEMO monitoring.

```

"
 ::= { nemoGroups 1 }

nemoBindingCacheGroup    OBJECT-GROUP
  OBJECTS {
    nemoBindingMrFlag,
    nemoBindingMrMode
  }
  STATUS    current
  DESCRIPTION
    "A collection of objects for monitoring the
    NEMO extensions of the Binding Cache.
    "
 ::= { nemoGroups 2 }

nemoStatsGroup          OBJECT-GROUP
  OBJECTS {
    nemoCounterDiscontinuityTime
  }
  STATUS    current
  DESCRIPTION
    "A collection of objects for
    monitoring NEMO statistics.
    "
 ::= { nemoGroups 3 }

nemoMrConfGroup        OBJECT-GROUP
  OBJECTS {
    nemoMrEgressIfPriority,
    nemoMrEgressIfDescription,
    nemoMrEgressIfRoamHoldDownTime,
    nemoMrDiscoveryRequests,
    nemoMrDiscoveryReplies,
    nemoMrDiscoveryRepliesRouterFlagZero,
    nemoMrMovedHome,
    nemoMrMovedOutOfHome,
    nemoMrMovedFNtoFN,
    nemoMrBetterIfDetected
  }
  STATUS    current
  DESCRIPTION
    "A collection of objects for monitoring
    the configuration-related information on
    the mobile router.
    "
 ::= { nemoGroups 4 }

nemoMrRegistrationGroup OBJECT-GROUP

```

```

OBJECTS {
    nemoMrBLMode,
    nemoMrBLMrFlag,
    nemoMrBLHomeAddressPrefixLength,
    nemoMrBLCareofAddressPrefixLength,
    nemoMrBLActiveEgressIfIndex,
    nemoMrBLEstablishedHomeTunnelIfIndex,
    nemoMrMobilityMessagesSent,
    nemoMrMobilityMessagesRecd,
    nemoMrPrefixRegMode,
    nemoMrBindingAcksWONemoSupport,
    nemoMrBindingAcksRegTypeChangeDisallowed,
    nemoMrBindingAcksOperationNotPermitted,
    nemoMrBindingAcksInvalidPrefix,
    nemoMrBindingAcksNotAuthorizedForPrefix,
    nemoMrBindingAcksForwardingSetupFailed,
    nemoMrBindingAcksOtherError
}
STATUS current
DESCRIPTION
    "A collection of objects for monitoring
    the registration details and statistics for
    the mobile router.
    "
 ::= { nemoGroups 5 }

nemoHaSystemGroup OBJECT-GROUP
OBJECTS {
    nemoHaMobileNetworkPrefixType,
    nemoHaMobileNetworkPrefix,
    nemoHaMobileNetworkPrefixLength,
    nemoHaMobileNetworkPrefixSource
}
STATUS current
DESCRIPTION
    "A collection of objects for basic NEMO
    configuration monitoring at the home agent.
    "
 ::= { nemoGroups 6 }

nemoHaStatsGroup OBJECT-GROUP
OBJECTS {
    nemoHaBURequestsAccepted,
    nemoHaBURequestsDenied,
    nemoHaBCEntryCreationTime,
    nemoHaBUAcceptedTime,
    nemoHaBURejectionTime,
    nemoHaRecentBURejectionCode,

```

```

        nemoHaCtrDiscontinuityTime
    }
    STATUS current
    DESCRIPTION
        "A collection of objects for monitoring NEMO
        registration-related statistics pertaining to
        the mobile routers registered with the home agent.
        "
    ::= { nemoGroups 7 }

nemoHaGlobalStatsGroup OBJECT-GROUP
    OBJECTS {
        nemoHaBUAcksWONemoSupport,
        nemoHaBUAcksRegTypeChangeDisallowed,
        nemoHaBUAcksOperationNotPermitted,
        nemoHaBUAcksInvalidPrefix,
        nemoHaBUAcksNotAuthorizedForPrefix,
        nemoHaBUAcksForwardingSetupFailed,
        nemoHaBUAcksOtherError
    }
    STATUS current
    DESCRIPTION
        "A collection of objects for monitoring basic
        NEMO advertisement and registration statistics
        on a home agent.
        "
    ::= { nemoGroups 8 }

nemoNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        nemoHomeTunnelEstablished,
        nemoHomeTunnelReleased
    }
    STATUS current
    DESCRIPTION
        "A collection of notifications from a home agent
        or correspondent node to the manager about the
        tunnel status of the mobile router.
        "
    ::= { nemoGroups 9 }

-- Compliance statements
nemoCoreCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities
        that implement the NEMO-MIB.
        "

```

```

MODULE -- this module
  MANDATORY-GROUPS { nemoSystemGroup
                    }
 ::= { nemoCompliances 1 }

```

```
nemoCompliance2 MODULE-COMPLIANCE
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The compliance statement for SNMP entities that
implement the NEMO-MIB and support monitoring of
the Binding Cache.
```

```
There are a number of INDEX objects that cannot be
represented in the form of OBJECT clauses in SMIV2,
but for which there are compliance requirements,
expressed in OBJECT-clause form in this description:
```

```
-- OBJECT      mip6BindingHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
```

```
-- OBJECT      mip6BindingHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
```

```
"
```

```
MODULE -- this module
  MANDATORY-GROUPS { nemoSystemGroup,
                    nemoBindingCacheGroup
                    }
 ::= { nemoCompliances 2 }

```

```
nemoCoreReadOnlyCompliance MODULE-COMPLIANCE
```

```
STATUS current
```

```
DESCRIPTION
```

```
"The compliance statement for SNMP entities
that implement the NEMO-MIB without support
for read-write (i.e., in read-only mode).
```

```
"
```

```
MODULE -- this module
  MANDATORY-GROUPS { nemoSystemGroup
                    }

```

```

OBJECT      nemoStatus
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
 ::= { nemoCompliances 3 }

```

nemoReadOnlyCompliance2 MODULE-COMPLIANCE

```

STATUS      current
DESCRIPTION
    "The compliance statement for SNMP entities that
    implement the NEMO-MIB without support for read-write
    (i.e., in read-only mode) and with support for
    monitoring of the Binding Cache."

```

There are a number of INDEX objects that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there are compliance requirements, expressed in OBJECT-clause form in this description:

```

-- OBJECT      mip6BindingHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
-- OBJECT      mip6BindingHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
"

```

```

MODULE -- this module
    MANDATORY-GROUPS { nemoSystemGroup,
                       nemoBindingCacheGroup
    }

```

```

OBJECT      nemoStatus
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
 ::= { nemoCompliances 4 }

```

nemoMrCompliance MODULE-COMPLIANCE

```

STATUS      current
DESCRIPTION
    "The compliance statement for SNMP entities that

```

implement the NEMO-MIB for monitoring configuration-related information, registration details, and statistics on a mobile router.

There are a number of INDEX objects that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there are compliance requirements, expressed in OBJECT-clause form in this description:

```
-- OBJECT      mip6MnHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnHomeAddress
--      object.
--
-- OBJECT      mip6MnHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnHomeAddress
--      object.
--
-- OBJECT      mip6MnBLNodeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnBLNodeAddress
--      object.
--
-- OBJECT      mip6MnBLNodeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnBLNodeAddress
--      object.
"
```

```
MODULE -- this module
  MANDATORY-GROUPS { nemoStatsGroup,
                    nemoMrConfGroup,
                    nemoMrRegistrationGroup
                  }
  ::= { nemoCompliances 5 }
```

```
nemoMrReadOnlyCompliance2 MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
    "The compliance statement for SNMP entities that
```

implement the NEMO-MIB without support for read-write (i.e., in read-only mode) and with support for monitoring of configuration-related information, registration details, and statistics on a mobile router.

There are a number of INDEX objects that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there are compliance requirements, expressed in OBJECT-clause form in this description:

```
-- OBJECT      mip6MnHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnHomeAddress
--      object.
--
-- OBJECT      mip6MnHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnHomeAddress
--      object.
--
-- OBJECT      mip6MnBLNodeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnBLNodeAddress
--      object.
--
-- OBJECT      mip6MnBLNodeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6MnBLNodeAddress
--      object.
"
MODULE -- this module
  MANDATORY-GROUPS { nemoStatsGroup,
                    nemoMrConfGroup,
                    nemoMrRegistrationGroup
  }

OBJECT      nemoMrPrefixRegMode
MIN-ACCESS  read-only
DESCRIPTION
```

```
"Write access is not required."
 ::= { nemoCompliances 6 }
```

nemoHaCoreCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for SNMP entities that implement the NEMO-MIB for configuration monitoring at the home agent.

There are a number of INDEX objects that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there are compliance requirements, expressed in OBJECT-clause form in this description:

```
-- OBJECT      mip6BindingHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
-- OBJECT      mip6BindingHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
"
```

```
MODULE -- this module
  MANDATORY-GROUPS { nemoHaSystemGroup
                    }
 ::= { nemoCompliances 7 }
```

nemoHaCompliance2 MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for SNMP entities that implement the NEMO-MIB with support for monitoring of the home agent functionality, specifically the home-agent-registration-related statistics.

There are a number of INDEX objects that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there are compliance requirements, expressed in OBJECT-clause form in this description:

```

-- OBJECT      mip6BindingHomeAddressType
-- SYNTAX      InetAddressType { ipv6(2) }
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
-- OBJECT      mip6BindingHomeAddress
-- SYNTAX      InetAddress (SIZE(16))
-- DESCRIPTION
--      This MIB module requires support for global
--      IPv6 addresses for the mip6BindingHomeAddress
--      object.
--
"
MODULE -- this module
    MANDATORY-GROUPS { nemoHaSystemGroup,
                       nemoHaStatsGroup,
                       nemoHaGlobalStatsGroup
                     }
 ::= { nemoCompliances 8 }

nemoNotificationCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities that
        implement the NEMO-MIB and support Notification
        from the home agent.
        "
    MODULE -- this module
        MANDATORY-GROUPS { nemoNotificationGroup
                          }
    ::= { nemoCompliances 9 }

END

```

4. IANA Considerations

IANA has assigned a base arc in the mib-2 (Standards Track) OID tree for the 'nemoMIB' (184).

5. Security Considerations

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

nemoStatus: The value of this object is used to enable or disable the NEMO functionality on a NEMO entity. Access to this MO may be abused to disrupt the communication that depends on NEMO.

nemoMrPrefixRegMode: The value of this object is used to control the mode in which mobile network prefixes will be registered with the home agent. Access to this object may be abused to disrupt the setting up of mobile network prefixes.

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

nemoHaMobileNetworkPrefixType

nemoHaMobileNetworkPrefix

nemoHaMobileNetworkPrefixLength:

The above address-related objects may be considered to be particularly sensitive and/or private. The mobile-network-prefix-related objects reveal the configuration of the mobile router and, as such, may be considered to be sensitive.

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

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [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.

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