Definitions of Managed Objects for Network Address Translators (NAT)

Status of This Memo

This document specifies an Internet standards track protocol for the
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Abstract

This memo defines a portion of the Management Information Base (MIB)
for devices implementing Network Address Translator (NAT) function.
This MIB module may be used for configuration as well as monitoring
of a device capable of NAT function.

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1. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   for devices implementing NAT function. This MIB module may be used
   for configuration and monitoring of a device capable of NAT function.
   NAT types and their characteristics are defined in[RFC2663].
   Traditional NAT function, in particular is defined in [RFC3022].
   This MIB does not address the firewall functions and must not be used
   for configuring or monitoring these. Section 2 provides references
   to the SNMP management framework, which was used as the basis for the
   MIB module definition. Section 3 describes the terms used throughout
   the document. Section 4 provides an overview of the key objects,
   their inter-relationship, and how the MIB module may be used to
   configure and monitor a NAT device. Lastly, section 5 has the
   complete NAT MIB definition.

   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].

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. Terminology

Definitions for a majority of the terms used throughout the document may be found in RFC 2663 [RFC2663]. Additional terms that further classify NAPT implementations are defined in RFC 3489 [RFC3489]. Listed below are terms used in this document.

Address realm - An address realm is a realm of unique network addresses that are routable within the realm. For example, an enterprise address realm could be constituted of private IP addresses in the ranges specified in RFC 1918 [RFC1918], which are routable within the enterprise, but not across the Internet. A public realm is constituted of globally unique network addresses.

Symmetric NAT - Symmetric NAT, as defined in RFC 3489 [RFC3489], is a variation of Network Address Port Translator (NAPT). Symmetric NAT does not use port bind for translation across all sessions originating from the same private host. Instead, it assigns a new public port to each new session, irrespective of whether the new session used the same private end-point as before.

Bind or Binding - Several variations of the term 'Bind' (or 'Binding') are used throughout the document. Address Bind (or Address Binding) is a tuple of (Private IP address, Public IP Address) used for translating an IP address end-point in IP packets. Port Bind (or, Port Binding, or Address Port Bind, or Address Port Binding) is a tuple of (transport protocol, Private IP address, Private port, Public IP Address, Public port) used for translating a port end-point tuple of (transport protocol, IP address, port). Bind is used to refer to either Address Bind or Port Bind. Bind Mode identifies whether a bind is Address Bind or Port Bind.

NAT Session - A NAT session is an association between a session as seen in the private realm and a session as seen in the public realm, by virtue of NAT translation. If a session in the private realm were to be represented as (PrivateSrcAddr, PrivateDstAddr, TransportProtocol, PrivateSrcPort, PrivateDstPort) and the same session in the public realm were to be represented as (PublicSrcAddr,

PublicDstAddr, TransportProtocol, PublicSrcPort, PublicDstPort), the
NAT session will provide the translation glue between the two session
representations. NAT sessions in the document are restricted to
sessions based on TCP and UDP only. In the future, NAT sessions may
be extended to be based on other transport protocols such as SCTP,
UDP-lite and DCCP.

The terms 'local' and 'private' are used interchangeably throughout
the document when referring to private networks, IP addresses, and
ports. Likewise, the terms 'global' and 'public' are used
interchangeably when referring to public networks, IP addresses, and
ports.

4. Overview

NAT MIB is configurable on a per-interface basis and depends in
several parts on the IF-MIB [RFC2863].

NAT MIB requires that an interface for which NAT is configured be
connected to either a private or a public realm. The realm
association of the interface plays an important role in the
definition of address maps for the interface. An address map entry
identifies the orientation of the session (inbound or outbound to the
interface) for which the entry may be used for NAT translation. The
address map entry also identifies the end-point of the session that
must be subject to translation. An SNMP Textual-Convention
'NatTranslationEntity' is defined to capture this important
characteristic that combines session orientation and applicable
session endpoint for translation.

An address map may consist of static or dynamic entries. NAT creates
static binds from a static address map entry. Each static bind has a
direct one-to-one relationship with a static address map entry. NAT
creates dynamic binds from a dynamic address map entry upon seeing
the first packet of a new session.

The following subsections define the key objects used in NAT MIB,
their inter-relationship, and how to configure a NAT device using the
MIB module.

4.1. natInterfaceTable

natInterfaceTable is defined in the MIB module to configure interface
specific realm type and the NAT services enabled for the interface.
natInterfaceTable is indexed by ifIndex and also includes interface
specific NAT statistics.

The first step for an operator in configuring a NAT device is
determining the interface over which NAT service is to be configured.
When NAT service is operational, translated packets traverse the NAT
device by ingressing on a private interface and egressing on a public
interface or vice versa. An operator may configure the NAT service
on either the public interface or the private interface in the
traversal path.

As the next step, the operator must identify the NAT service(s)
desired for the interface. The operator may configure one or more
NAT services on the same interface. The MIB module identifies four
types of NAT services: Basic NAT, NAPT, twice NAT and bidirectional
NAT. These are NAT varieties as defined in RFC 2663 [RFC2663]. Note
that RFC 3489 [RFC3489] further classifies NAPT implementations based
on the behavior exhibited by the NAPT devices from different vendors.
However, the MIB module does not explicitly distinguish between the
NAPT implementations. NAPT implementations may be distinguished
between one another by monitoring the BIND and NAT Session objects
generated by the NAT device as described in section 4.6.

4.2. natAddrMapTable

natAddrMapTable is defined in the MIB module to configure address
maps on a per-interface basis. natAddrMapTable is indexed by the
tuple of (ifIndex, natAddrMapIndex). The same table is also used to
collect Statistics for the address map entries. Address maps are key
to NAT configuration. An operator may configure one or more address
map entries per interface. NAT looks up address map entries in the
order in which they are defined to determine the translation function
at the start of each new session traversing the interface. An
address map may consist of static or dynamic entries. A static
address map entry has a direct one-to-one relationship with binds.
NAT will dynamically create binds from a dynamic address map entry.

The operator must be careful in selecting address map entries for an
interface based on the interface realm-type and the type of NAT
service desired. The operator can be amiss in the selection of
address map entries when not paying attention to the associated
interface characteristics defined in natInterfaceTable (described in
section 4.1). For example, say the operator wishes to configure a
NAPT map entry on an interface of a NAT device. If the operator
chooses to configure the NAPT map entry on a public interface (i.e.,
interface realm-type is public), the operator should set the
TranslationEntity of the NAPT address map entry to be
outboundSrcEndPoint. On the other hand, if the operator chooses to
configure the NAPT map entry on a private interface (i.e., interface
realm-type is private), the operator should set the TranslationEntity
of the NAPT address map entry to be InboundSrcEndPoint.

4.3. Default Timeouts, Protocol Table, and Other Scalars

   DefTimeouts is defined in the MIB module to configure idle Bind
   timeout and IP protocol specific idle NAT session timeouts. The
   timeouts defined are global to the system and are not interface
   specific.

   Protocol specific statistics are maintained in natProtocolTable,
   which is indexed by the protocol type.

   The scalars natAddrBindNumberOfEntries and
   natAddrPortBindNumberOfEntries hold the number of entries that
   currently exist in the Address Bind and the Address Port Bind tables,
   respectively.

   The generation of natPacketDiscard notifications can be configured by
   using the natNotifThrottlingInterval scalar MIB object.

4.4. natAddrBindTable and natAddrPortBindTable

   Two Bind tables, natAddrBindTable and natAddrPortBindTable, are
   defined to hold the bind entries. Entries are derived from the
   address map table and are not configurable. natAddrBindTable
   contains Address Binds, and natAddrPortBindTable contains Address
   Port Binds. natAddrBindTable is indexed by the tuple of (ifIndex,
   LocalAddrType, LocalAddr). natAddrPortBindTable is indexed by the
   tuple of (ifIndex, LocalAddrType, LocalAddr, LocalPort, Protocol).
   These tables also maintain bind specific statistics. A Symmetric NAT
   will have no entries in the Bind tables.

4.5. natSessionTable

   natSessionTable is defined to hold NAT session entries. NAT session
   entries are derived from NAT Binds (except in the case of Symmetric
   NAT) and are not configurable.

   The NAT session provides the necessary translation glue between two
   session representations of the same end-to-end session; that is, a
   session as seen in the private realm and in the public realm.
   Session orientation (inbound or outbound) is determined from the
   orientation of the first packet traversing the NAT interface.
   Address map entries and bind entries on the interface determine
   whether a session is subject to NAT translation. One or both
   endpoints of a session may be subject to translation.

   With the exception of symmetric NAT, all other NAT functions use
   end-point specific bind to perform individual end-point translations.
   Multiple NAT sessions would use the same bind as long as they share

the same endpoint. Symmetric NAT does not retain a consistent port
bind across multiple sessions using the same endpoint. For this
reason, the bind identifier for a NAT session in symmetric NAT is set
to zero. natSessionTable is indexed by the tuple of (ifIndex,
natSessionIndex). Statistics for NAT sessions are also maintained in
the same table.

4.6. RFC 3489 NAPT Variations, NAT Session and Bind Tables

[RFC3489] defines four variations of NAPT - Full Cone, Restricted
Cone, Port Restricted Cone, and Symmetric NAT. These can be
differentiated in the NAT MIB based on different values for the
objects in the session and the bind tables, as indicated below.

In a Port Restricted Cone NAT, NAT Session objects will contain a
non-zero PrivateSrcEPBindId object. Further, all address and port
objects within a NAT session will have non-zero values (i.e., no
wildcard matches).

An Address Restricted Cone NAT may have been implemented in the same
way as a Port Restricted Cone NAT, except that the UDP NAT Sessions
may use ANY match on PrivateDstPort and PublicDstPort objects; i.e.,
PrivateDstPort and PublicDstPort objects within a NAT session may be
set to zero.

A Full Cone NAT may have also been implemented in the same way as a
Port Restricted Cone NAT, except that the UDP NAT Sessions may use
ANY match on PrivateDstAddr, PrivateDstPort, PublicDstAddr, and
PublicDstPort objects. Within a NAT Session, all four of these
objects may be set to zero. Alternately, all address and port
objects within a NAT Session may have non-zero values, yet the
TranslationEntity of the PrivateSrcEPBindId for the NAT Sessions may
be set bi-directionally, i.e., as a bit mask of (outboundSrcEndPoint
and inboundDstEndPoint) or (inboundSrcEndPoint and
outboundDstEndPoint), depending on the interface realm type. Lastly,
a Symmetric NAT does not maintain Port Bindings. As such, the NAT
Session objects will have the PrivateSrcEPBindId set to zero.

4.7. Notifications

natPacketDiscard notifies the end user/manager of packets being
discarded due to lack of address mappings.

4.8. Relation Among Tables

The association between the various NAT tables can be represented as
follows:

```
                            Interface
                                |
                                |
                           Address map
                                |
                                |
                                |
            ------------------------------------------------
            |                                              |
            |                                              |
            |                                              |
      Address Bind                                    Port Bind
            |                                              |
            |                                              |
            |                                              |
            ------------------------------------------------
                                |
                                |
                           NAT Session
```
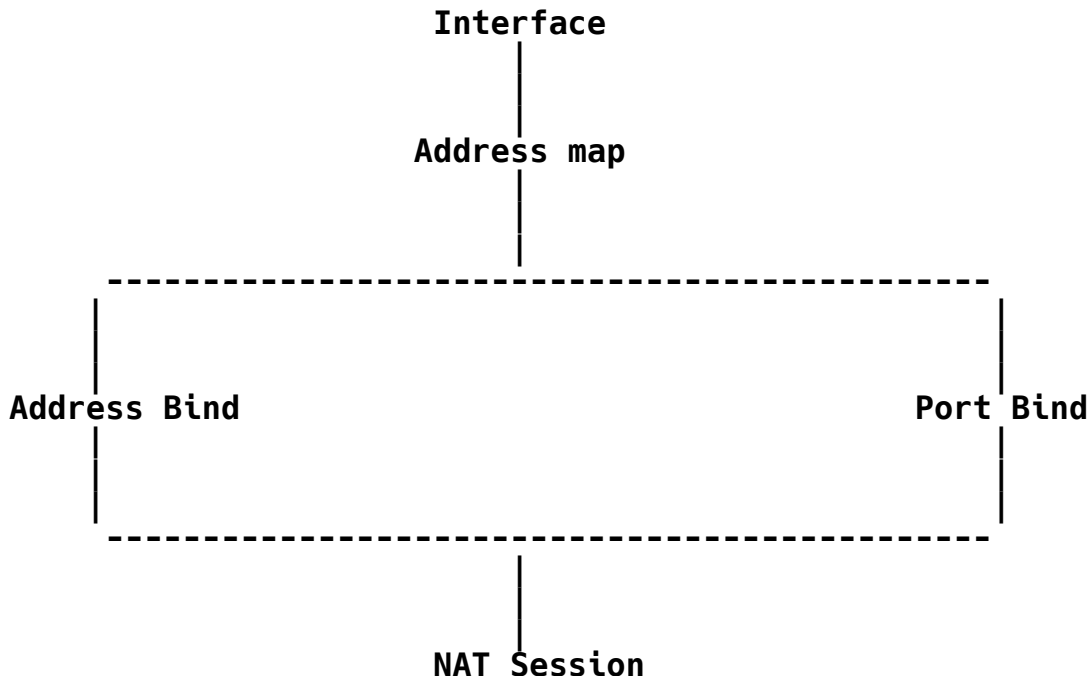
All NAT functions, with the exception of Symmetric NAT, use Bind(s)
to provide the glue necessary for a NAT Session.
natSessionPrivateSrcEPBindId and natSessionPrivateDstEPBindId objects
represent the endpoint Binds used by NAT Sessions.

4.9. Configuration via the MIB

Sections 4.1 and 4.2 and part of section 4.3 refer to objects that
are configurable on a NAT device. NAT derives Address Bind and
Address Port Bind entries from the Address Map table. Hence, an
Address Bind or an Address Port Bind entry must not exist without an
associated entry in the Address Map table.

Further, NAT derives NAT session entries from NAT Binds, except in
the case of symmetric NAT, which derives translation parameters for a
NAT session directly from an address map entry. Hence, with the
exception of Symmetric NAT, a NAT session entry must not exist in the
NAT Session table without a corresponding bind.

A Management station may use the following steps to configure entries
in the NAT-MIB:

- Create an entry in the natInterfaceTable specifying the value of
  ifIndex as the interface index of the interface on which NAT is
  being configured. Specify appropriate values, as applicable, for
  the other objects (e.g., natInterfaceRealm,
  natInterfaceServiceType) in the table (refer to Section 4.1).

- Create one or more address map entries sequentially in reduced
  order of priority in the natAddrMapTable, specifying the value of
  ifIndex to be the same for all entries. The ifIndex specified
  would be the same as that specified for natInterfaceTable (refer
  to Section 4.2).

- Configure the maximum permitted idle time duration for BINDs and
  TCP, UDP, and ICMP protocol sessions by setting the relevant
  scalars in natDefTimeouts object (refer to Section 4.3).

4.10. Relationship to Interface MIB

The natInterfaceTable specifies the NAT configuration attributes on
each interface. The concept of "interface" is as defined by
InterfaceIndex/ifIndex of the IETF Interfaces MIB [RFC2863].

5. Definitions

This MIB module IMPORTs objects from RFCs 2578 [RFC2578], 2579
[RFC2579], 2580 [RFC2580], 2863 [RFC2863], 3411 [RFC3411], and 4001
[RFC4001]. It also refers to information in RFCs 792 [RFC792], 2463
[RFC2463], and 3413 [RFC3413].

```
NAT-MIB DEFINITIONS ::= BEGIN

IMPORTS
      MODULE-IDENTITY,
      OBJECT-TYPE,
      Integer32,
      Unsigned32,
      Gauge32,
      Counter64,
      TimeTicks,
      mib-2,
      NOTIFICATION-TYPE
              FROM SNMPv2-SMI
      TEXTUAL-CONVENTION,
      StorageType,
      RowStatus
```

```
            FROM SNMPv2-TC
     MODULE-COMPLIANCE,
     NOTIFICATION-GROUP,
     OBJECT-GROUP
            FROM SNMPv2-CONF
     ifIndex,
     ifCounterDiscontinuityGroup
            FROM IF-MIB
     SnmpAdminString
            FROM SNMP-FRAMEWORK-MIB
     InetAddressType,
     InetAddress,
     InetPortNumber
            FROM INET-ADDRESS-MIB;

natMIB MODULE-IDENTITY
     LAST-UPDATED "200503210000Z"
     ORGANIZATION "IETF Transport Area"
     CONTACT-INFO
                "
           Rohit
           Mascon Global Limited
           #59/2 100 ft Ring Road
           Banashankari II Stage
           Bangalore 560 070
           India
           Phone: +91 80 2679 6227
           Email: rrohit74@hotmail.com

           P. Srisuresh
           Caymas Systems, Inc.
           1179-A North McDowell Blvd.
           Petaluma, CA 94954
           Tel: (707) 283-5063
           Email: srisuresh@yahoo.com

           Rajiv Raghunarayan
           Cisco Systems Inc.
           170 West Tasman Drive
           San Jose, CA 95134
           Phone: +1 408 853 9612
           Email: raraghun@cisco.com

           Nalinaksh Pai
           Cisco Systems, Inc.
           Prestige Waterford
           No. 9, Brunton Road
           Bangalore - 560 025
```

                    India
                    Phone: +91 80 532 1300
                    Email: npai@cisco.com

                    Cliff Wang
                    Information Security
                    Bank One Corp
                    1111 Polaris Pkwy
                    Columbus, OH 43240
                    Phone: +1 614 213 6117
                    Email: cliffwang2000@yahoo.com
                  "
        DESCRIPTION
                "This MIB module defines the generic managed objects
                 for NAT.

        REVISION   "200503210000Z" -- 21th March 2005
        DESCRIPTION
                "Initial version, published as RFC 4008."
        ::= { mib-2 123 }

natMIBObjects OBJECT IDENTIFIER ::= { natMIB 1 }

NatProtocolType ::= TEXTUAL-CONVENTION
        STATUS   current
        DESCRIPTION
                "A list of protocols that support the network
                 address translation. Inclusion of the values is
                 not intended to imply that those protocols
                 need to be supported. Any change in this
                 TEXTUAL-CONVENTION should also be reflected in
                 the definition of NatProtocolMap, which is a
                 BITS representation of this."
        SYNTAX   INTEGER {
                    none (1), -- not specified
                    other (2), -- none of the following
                    icmp (3),
                    udp (4),
                    tcp (5)
                  }

NatProtocolMap ::= TEXTUAL-CONVENTION
        STATUS   current
        DESCRIPTION
                "A bitmap of protocol identifiers that support

```
                      the network address translation.  Any change
                      in this TEXTUAL-CONVENTION should also be
                      reflected in the definition of NatProtocolType."
            SYNTAX    BITS {
                        other (0),
                        icmp (1),
                        udp (2),
                        tcp (3)
                      }

NatAddrMapId ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS current
        DESCRIPTION
                "A unique id that is assigned to each address map
                 by a NAT enabled device."
        SYNTAX    Unsigned32 (1..4294967295)

NatBindIdOrZero ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS current
        DESCRIPTION
                "A unique id that is assigned to each bind by
                 a NAT enabled device.  The bind id will be zero
                 in the case of a Symmetric NAT."
        SYNTAX    Unsigned32 (0..4294967295)

NatBindId ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS current
        DESCRIPTION
                "A unique id that is assigned to each bind by
                 a NAT enabled device."
        SYNTAX    Unsigned32 (1..4294967295)

NatSessionId ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS current
        DESCRIPTION
                "A unique id that is assigned to each session by
                 a NAT enabled device."
        SYNTAX    Unsigned32 (1..4294967295)

NatBindMode ::= TEXTUAL-CONVENTION
        STATUS current
        DESCRIPTION
                "An indication of whether the bind is
                 an address bind or an address port bind."
```

```
        SYNTAX   INTEGER {
                     addressBind (1),
                     addressPortBind (2)
                 }

NatAssociationType ::= TEXTUAL-CONVENTION
        STATUS current
        DESCRIPTION
                "An indication of whether the association is
                static or dynamic."
        SYNTAX   INTEGER {
                     static (1),
                     dynamic (2)
                 }

NatTranslationEntity ::= TEXTUAL-CONVENTION
        STATUS       current
        DESCRIPTION
                "An indication of a) the direction of a session for
                which an address map entry, address bind or port
                bind is applicable, and b) the entity (source or
                destination) within the session that is subject to
                translation."
        SYNTAX   BITS {
                   inboundSrcEndPoint (0),
                   outboundDstEndPoint(1),
                   inboundDstEndPoint (2),
                   outboundSrcEndPoint(3)
                 }
--
-- Default Values for the Bind and NAT Protocol Timers
--

natDefTimeouts OBJECT IDENTIFIER ::= { natMIBObjects 1 }

natNotifCtrl OBJECT IDENTIFIER ::= { natMIBObjects 2 }

--
-- Address Bind and Port Bind related NAT configuration
--

natBindDefIdleTimeout OBJECT-TYPE
    SYNTAX     Unsigned32  (0..4294967295)
    UNITS      "seconds"
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
```

```
                "The default Bind (Address Bind or Port Bind) idle
                 timeout parameter.

                 If the agent is capable of storing non-volatile
                 configuration, then the value of this object must be
                 restored after a re-initialization of the management
                 system."
        DEFVAL { 0 }
        ::= { natDefTimeouts 1 }

--
-- UDP related NAT configuration
--

natUdpDefIdleTimeout OBJECT-TYPE
        SYNTAX      Unsigned32  (1..4294967295)
        UNITS       "seconds"
        MAX-ACCESS read-write
        STATUS      current
        DESCRIPTION
                "The default UDP idle timeout parameter.

                 If the agent is capable of storing non-volatile
                 configuration, then the value of this object must be
                 restored after a re-initialization of the management
                 system."
        DEFVAL { 300 }
        ::= { natDefTimeouts 2 }

--
-- ICMP related NAT configuration
--

natIcmpDefIdleTimeout OBJECT-TYPE
        SYNTAX      Unsigned32  (1..4294967295)
        UNITS       "seconds"
        MAX-ACCESS read-write
        STATUS      current
        DESCRIPTION
                "The default ICMP idle timeout parameter.

                 If the agent is capable of storing non-volatile
                 configuration, then the value of this object must be
                 restored after a re-initialization of the management
                 system."
        DEFVAL { 300 }
        ::= { natDefTimeouts 3 }
```

```
--
-- Other protocol parameters
--

natOtherDefIdleTimeout OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    UNITS       "seconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
            "The default idle timeout parameter for protocols
             represented by the value other (2) in
             NatProtocolType.

             If the agent is capable of storing non-volatile
             configuration, then the value of this object must be
             restored after a re-initialization of the management
             system."
    DEFVAL { 60 }
    ::= { natDefTimeouts 4 }

--
-- TCP related NAT Timers
--

natTcpDefIdleTimeout OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    UNITS       "seconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
            "The default time interval that a NAT session for an
             established TCP connection is allowed to remain
             valid without any activity on the TCP connection.

             If the agent is capable of storing non-volatile
             configuration, then the value of this object must be
             restored after a re-initialization of the management
             system."
    DEFVAL { 86400 }
    ::= { natDefTimeouts 5 }

natTcpDefNegTimeout OBJECT-TYPE
    SYNTAX      Unsigned32 (1..4294967295)
    UNITS       "seconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
```

                  "The default time interval that a NAT session for a TCP
                   connection that is not in the established state
                   is allowed to remain valid without any activity on
                   the TCP connection.

                   If the agent is capable of storing non-volatile
                   configuration, then the value of this object must be
                   restored after a re-initialization of the management
                   system."
          DEFVAL { 60 }
          ::= { natDefTimeouts 6 }

natNotifThrottlingInterval OBJECT-TYPE
     SYNTAX   Integer32 (0 | 5..3600)
     UNITS   "seconds"
     MAX-ACCESS read-write
     STATUS   current
     DESCRIPTION
                  "This object controls the generation of the
                   natPacketDiscard notification.

                   If this object has a value of zero, then no
                   natPacketDiscard notifications will be transmitted by the
                   agent.

                   If this object has a non-zero value, then the agent must
                   not generate more than one natPacketDiscard
                   'notification-event' in the indicated period, where a
                   'notification-event' is the generation of a single
                   notification PDU type to a list of notification
                   destinations. If additional NAT packets are discarded
                   within the throttling period, then notification-events
                   for these changes must be suppressed by the agent until
                   the current throttling period expires.

                   If natNotifThrottlingInterval notification generation
                   is enabled, the suggested default throttling period is
                   60 seconds, but generation of the natPacketDiscard
                   notification should be disabled by default.

                   If the agent is capable of storing non-volatile
                   configuration, then the value of this object must be
                   restored after a re-initialization of the management
                   system.

                   The actual transmission of notifications is controlled
                   via the MIB modules in RFC 3413."
          DEFVAL { 0 }

```
    ::= { natNotifCtrl 1 }

--
-- The NAT Interface Table
--

natInterfaceTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF NatInterfaceEntry
    MAX-ACCESS  not-accessible
    STATUS        current
    DESCRIPTION
            "This table specifies the attributes for interfaces on a
             device supporting NAT function."
    ::= { natMIBObjects 3 }

natInterfaceEntry OBJECT-TYPE
    SYNTAX        NatInterfaceEntry
    MAX-ACCESS  not-accessible
    STATUS        current
    DESCRIPTION
            "Each entry in the natInterfaceTable holds a set of
             parameters for an interface, instantiated by
             ifIndex.  Therefore, the interface index must have been
             assigned, according to the applicable procedures,
             before it can be meaningfully used.
             Generally, this means that the interface must exist.

             When natStorageType is of type nonVolatile, however,
             this may reflect the configuration for an interface whose
             ifIndex has been assigned but for which the supporting
             implementation is not currently present."
    INDEX   { ifIndex }
    ::= { natInterfaceTable 1 }

NatInterfaceEntry ::= SEQUENCE {
    natInterfaceRealm             INTEGER,
    natInterfaceServiceType       BITS,
    natInterfaceInTranslates      Counter64,
    natInterfaceOutTranslates     Counter64,
    natInterfaceDiscards          Counter64,
    natInterfaceStorageType       StorageType,
    natInterfaceRowStatus         RowStatus
}

natInterfaceRealm OBJECT-TYPE
    SYNTAX        INTEGER {
                    private (1),
                    public (2)
```

```
                    }
        MAX-ACCESS read-create
        STATUS      current
        DESCRIPTION
                "This object identifies whether this interface is
                 connected to the private or the public realm."
        DEFVAL  { public }
        ::= { natInterfaceEntry 1 }

natInterfaceServiceType OBJECT-TYPE
        SYNTAX  BITS {
                    basicNat (0),
                    napt (1),
                    bidirectionalNat (2),
                    twiceNat (3)
                }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "An indication of the direction in which new sessions
                 are permitted and the extent of translation done within
                 the IP and transport headers."
        ::= { natInterfaceEntry 2 }

natInterfaceInTranslates OBJECT-TYPE
        SYNTAX      Counter64
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "Number of packets received on this interface that
                 were translated.
                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other
                 times as indicated by the value of
                 ifCounterDiscontinuityTime on the relevant interface."
        ::= { natInterfaceEntry 3 }

natInterfaceOutTranslates OBJECT-TYPE
        SYNTAX      Counter64
        MAX-ACCESS read-only
        STATUS      current
        DESCRIPTION
                "Number of translated packets that were sent out this
                 interface.

                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other
                 times as indicated by the value of
```

```
                    ifCounterDiscontinuityTime on the relevant interface."
         ::= { natInterfaceEntry 4 }

natInterfaceDiscards OBJECT-TYPE
     SYNTAX      Counter64
     MAX-ACCESS read-only
     STATUS      current
     DESCRIPTION
             "Number of packets that had to be rejected/dropped due to
              a lack of resources for this interface.

              Discontinuities in the value of this counter can occur at
              reinitialization of the management system and at other
              times as indicated by the value of
              ifCounterDiscontinuityTime on the relevant interface."
        ::= { natInterfaceEntry 5 }

natInterfaceStorageType OBJECT-TYPE
     SYNTAX      StorageType
     MAX-ACCESS  read-create
     STATUS      current
     DESCRIPTION
             "The storage type for this conceptual row.
              Conceptual rows having the value 'permanent'
              need not allow write-access to any columnar objects
              in the row."
     REFERENCE
             "Textual Conventions for SMIv2, Section 2."
     DEFVAL { nonVolatile }
     ::= { natInterfaceEntry 6 }

natInterfaceRowStatus OBJECT-TYPE
     SYNTAX      RowStatus
     MAX-ACCESS  read-create
     STATUS      current
     DESCRIPTION
             "The status of this conceptual row.

              Until instances of all corresponding columns are
              appropriately configured, the value of the
              corresponding instance of the natInterfaceRowStatus
              column is 'notReady'.

              In particular, a newly created row cannot be made
              active until the corresponding instance of
              natInterfaceServiceType has been set.
```

                   None of the objects in this row may be modified
                   while the value of this object is active(1)."
          REFERENCE
                   "Textual Conventions for SMIv2, Section 2."
          ::= { natInterfaceEntry 7 }

--
-- The Address Map Table
--

natAddrMapTable OBJECT-TYPE
     SYNTAX   SEQUENCE OF NatAddrMapEntry
     MAX-ACCESS not-accessible
     STATUS   current
     DESCRIPTION
              "This table lists address map parameters for NAT."
     ::= { natMIBObjects 4 }

natAddrMapEntry OBJECT-TYPE
     SYNTAX   NatAddrMapEntry
     MAX-ACCESS not-accessible
     STATUS   current
     DESCRIPTION
              "This entry represents an address map to be used for
               NAT and contributes to the dynamic and/or static
               address mapping tables of the NAT device."
     INDEX   { ifIndex, natAddrMapIndex }
     ::= { natAddrMapTable 1 }

NatAddrMapEntry ::= SEQUENCE {
     natAddrMapIndex   NatAddrMapId,
     natAddrMapName   SnmpAdminString,
     natAddrMapEntryType   NatAssociationType,
     natAddrMapTranslationEntity   NatTranslationEntity,
     natAddrMapLocalAddrType   InetAddressType,
     natAddrMapLocalAddrFrom   InetAddress,
     natAddrMapLocalAddrTo   InetAddress,
     natAddrMapLocalPortFrom   InetPortNumber,
     natAddrMapLocalPortTo   InetPortNumber,
     natAddrMapGlobalAddrType   InetAddressType,
     natAddrMapGlobalAddrFrom   InetAddress,
     natAddrMapGlobalAddrTo   InetAddress,
     natAddrMapGlobalPortFrom   InetPortNumber,
     natAddrMapGlobalPortTo   InetPortNumber,
     natAddrMapProtocol   NatProtocolMap,
     natAddrMapInTranslates   Counter64,
     natAddrMapOutTranslates   Counter64,
     natAddrMapDiscards   Counter64,

```
    natAddrMapAddrUsed                Gauge32,
    natAddrMapStorageType             StorageType,
    natAddrMapRowStatus               RowStatus
}

natAddrMapIndex  OBJECT-TYPE
    SYNTAX        NatAddrMapId
    MAX-ACCESS  not-accessible
    STATUS        current
    DESCRIPTION
            "Along with ifIndex, this object uniquely
             identifies an entry in the natAddrMapTable.
             Address map entries are applied in the order
             specified by natAddrMapIndex."
    ::= { natAddrMapEntry 1 }

natAddrMapName OBJECT-TYPE
    SYNTAX        SnmpAdminString (SIZE(1..32))
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "Name identifying all map entries in the table associated
             with the same interface.  All map entries with the same
             ifIndex MUST have the same map name."
    ::= { natAddrMapEntry 2 }

natAddrMapEntryType OBJECT-TYPE
    SYNTAX        NatAssociationType
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "This parameter can be used to set up static
             or dynamic address maps."
    ::= { natAddrMapEntry 3 }

natAddrMapTranslationEntity OBJECT-TYPE
    SYNTAX        NatTranslationEntity
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "The end-point entity (source or destination) in
             inbound or outbound sessions (i.e., first packets) that
             may be translated by an address map entry.

             Session direction (inbound or outbound) is
             derived from the direction of the first packet
             of a session traversing a NAT interface.
             NAT address (and Transport-ID) maps may be defined
```

              to effect inbound or outbound sessions.

              Traditionally, address maps for Basic NAT and NAPT are
              configured on a public interface for outbound sessions,
              effecting translation of source end-point. The value of
              this object must be set to outboundSrcEndPoint for
              those interfaces.

              Alternately, if address maps for Basic NAT and NAPT were
              to be configured on a private interface, the desired
              value for this object for the map entries
              would be inboundSrcEndPoint (i.e., effecting translation
              of source end-point for inbound sessions).

              If TwiceNAT were to be configured on a private interface,
              the desired value for this object for the map entries
              would be a bitmask of inboundSrcEndPoint and
              inboundDstEndPoint."
       ::= { natAddrMapEntry 4 }

natAddrMapLocalAddrType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
              "This object specifies the address type used for
              natAddrMapLocalAddrFrom and natAddrMapLocalAddrTo."
       ::= { natAddrMapEntry 5 }

natAddrMapLocalAddrFrom OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
              "This object specifies the first IP address of the range
               of IP addresses mapped by this translation entry. The
               value of this object must be less than or equal to the
               value of the natAddrMapLocalAddrTo object.

               The type of this address is determined by the value of
               the natAddrMapLocalAddrType object."
       ::= { natAddrMapEntry 6 }

natAddrMapLocalAddrTo OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION

                "This object specifies the last IP address of the range of
                 IP addresses mapped by this translation entry. If only
                 a single address is being mapped, the value of this object
                 is equal to the value of natAddrMapLocalAddrFrom. For a
                 static NAT, the number of addresses in the range defined
                 by natAddrMapLocalAddrFrom and natAddrMapLocalAddrTo must
                 be equal to the number of addresses in the range defined by
                 natAddrMapGlobalAddrFrom and natAddrMapGlobalAddrTo.
                 The value of this object must be greater than or equal to
                 the value of the natAddrMapLocalAddrFrom object.

                 The type of this address is determined by the value of
                 the natAddrMapLocalAddrType object."
        ::= { natAddrMapEntry 7 }

natAddrMapLocalPortFrom OBJECT-TYPE
        SYNTAX   InetPortNumber
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
                "If this conceptual row describes a Basic NAT address
                 mapping, then the value of this object must be zero. If
                 this conceptual row describes NAPT, then the value of
                 this object specifies the first port number in the range
                 of ports being mapped.

                 The value of this object must be less than or equal to the
                 value of the natAddrMapLocalPortTo object. If the
                 translation specifies a single port, then the value of this
                 object is equal to the value of natAddrMapLocalPortTo."
        DEFVAL { 0 }
        ::= { natAddrMapEntry 8 }

natAddrMapLocalPortTo OBJECT-TYPE
        SYNTAX   InetPortNumber
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
                "If this conceptual row describes a Basic NAT address
                 mapping, then the value of this object must be zero. If
                 this conceptual row describes NAPT, then the value of
                 this object specifies the last port number in the range
                 of ports being mapped.

                 The value of this object must be greater than or equal to
                 the value of the natAddrMapLocalPortFrom object. If the
                 translation specifies a single port, then the value of this
                 object is equal to the value of natAddrMapLocalPortFrom."

```
    DEFVAL { 0 }
    ::= { natAddrMapEntry 9 }

natAddrMapGlobalAddrType OBJECT-TYPE
    SYNTAX        InetAddressType
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "This object specifies the address type used for
             natAddrMapGlobalAddrFrom and natAddrMapGlobalAddrTo."
    ::= { natAddrMapEntry 10 }

natAddrMapGlobalAddrFrom OBJECT-TYPE
    SYNTAX        InetAddress
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "This object specifies the first IP address of the range of
             IP addresses being mapped to.  The value of this object
             must be less than or equal to the value of the
             natAddrMapGlobalAddrTo object.

             The type of this address is determined by the value of
             the natAddrMapGlobalAddrType object."
    ::= { natAddrMapEntry 11 }

natAddrMapGlobalAddrTo OBJECT-TYPE
    SYNTAX        InetAddress
    MAX-ACCESS  read-create
    STATUS        current
    DESCRIPTION
            "This object specifies the last IP address of the range of
             IP addresses being mapped to.  If only a single address is
             being mapped to, the value of this object is equal to the
             value of natAddrMapGlobalAddrFrom.  For a static NAT, the
             number of addresses in the range defined by
             natAddrMapGlobalAddrFrom and natAddrMapGlobalAddrTo must be
             equal to the number of addresses in the range defined by
             natAddrMapLocalAddrFrom and natAddrMapLocalAddrTo.
             The value of this object must be greater than or equal to
             the value of the natAddrMapGlobalAddrFrom object.

             The type of this address is determined by the value of
             the natAddrMapGlobalAddrType object."
    ::= { natAddrMapEntry 12 }

natAddrMapGlobalPortFrom OBJECT-TYPE
    SYNTAX        InetPortNumber
```

```
          MAX-ACCESS  read-create
          STATUS      current
          DESCRIPTION
                  "If this conceptual row describes a Basic NAT address
                   mapping, then the value of this object must be zero.  If
                   this conceptual row describes NAPT, then the value of
                   this object specifies the first port number in the range
                   of ports being mapped to.


                   The value of this object must be less than or equal to the
                   value of the natAddrMapGlobalPortTo object.  If the
                   translation specifies a single port, then the value of this
                   object is equal to the value natAddrMapGlobalPortTo."
          DEFVAL { 0 }
          ::= { natAddrMapEntry 13 }

   natAddrMapGlobalPortTo OBJECT-TYPE
          SYNTAX      InetPortNumber
          MAX-ACCESS  read-create
          STATUS      current
          DESCRIPTION
                  "If this conceptual row describes a Basic NAT address
                   mapping, then the value of this object must be zero.  If
                   this conceptual row describes NAPT, then the value of this
                   object specifies the last port number in the range of
                   ports being mapped to.

                   The value of this object must be greater than or equal to
                   the value of the natAddrMapGlobalPortFrom object.  If the
                   translation specifies a single port, then the value of this
                   object is equal to the value of natAddrMapGlobalPortFrom."
          DEFVAL { 0 }
          ::= { natAddrMapEntry 14 }

   natAddrMapProtocol OBJECT-TYPE
          SYNTAX      NatProtocolMap
          MAX-ACCESS  read-create
          STATUS      current
          DESCRIPTION
                  "This object specifies a bitmap of protocol identifiers."
          ::= { natAddrMapEntry 15 }

   natAddrMapInTranslates OBJECT-TYPE
          SYNTAX      Counter64
          MAX-ACCESS read-only
          STATUS      current
          DESCRIPTION
```

                    "The number of inbound packets pertaining to this address
                     map entry that were translated.

                     Discontinuities in the value of this counter can occur at
                     reinitialization of the management system and at other
                     times, as indicated by the value of
                     ifCounterDiscontinuityTime on the relevant interface."
         ::= { natAddrMapEntry 16 }

natAddrMapOutTranslates OBJECT-TYPE
     SYNTAX   Counter64
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
                    "The number of outbound packets pertaining to this
                     address map entry that were translated.

                     Discontinuities in the value of this counter can occur at
                     reinitialization of the management system and at other
                     times, as indicated by the value of
                     ifCounterDiscontinuityTime on the relevant interface."
         ::= { natAddrMapEntry 17 }

natAddrMapDiscards OBJECT-TYPE
     SYNTAX   Counter64
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
                    "The number of packets pertaining to this address map
                     entry that were dropped due to lack of addresses in the
                     address pool identified by this address map. The value of
                     this object must always be zero in case of static
                     address map.

                     Discontinuities in the value of this counter can occur at
                     reinitialization of the management system and at other
                     times, as indicated by the value of
                     ifCounterDiscontinuityTime on the relevant interface."
         ::= { natAddrMapEntry 18 }

natAddrMapAddrUsed OBJECT-TYPE
     SYNTAX   Gauge32
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
                    "The number of addresses pertaining to this address map
                     that are currently being used from the NAT pool.
                     The value of this object must always be zero in the case

```
                    of a static address map."
        ::= { natAddrMapEntry 19 }

natAddrMapStorageType OBJECT-TYPE
        SYNTAX        StorageType
        MAX-ACCESS  read-create
        STATUS        current
        DESCRIPTION
                "The storage type for this conceptual row.
                 Conceptual rows having the value 'permanent'
                 need not allow write-access to any columnar objects
                 in the row."
        REFERENCE
                "Textual Conventions for SMIv2, Section 2."
        DEFVAL { nonVolatile }
        ::= { natAddrMapEntry 20 }

natAddrMapRowStatus OBJECT-TYPE
        SYNTAX        RowStatus
        MAX-ACCESS  read-create
        STATUS        current
        DESCRIPTION
                "The status of this conceptual row.

                 Until instances of all corresponding columns are
                 appropriately configured, the value of the
                 corresponding instance of the natAddrMapRowStatus
                 column is 'notReady'.

                 None of the objects in this row may be modified
                 while the value of this object is active(1)."
        REFERENCE
                "Textual Conventions for SMIv2, Section 2."
        ::= { natAddrMapEntry 21 }

--
-- Address Bind section
--

natAddrBindNumberOfEntries OBJECT-TYPE
        SYNTAX        Gauge32
        MAX-ACCESS read-only
        STATUS        current
        DESCRIPTION
                "This object maintains a count of the number of entries
                 that currently exist in the natAddrBindTable."
        ::= { natMIBObjects 5 }
```

```
--
-- The NAT Address BIND Table
--

natAddrBindTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NatAddrBindEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "This table holds information about the currently
             active NAT BINDs."
    ::= { natMIBObjects 6 }

natAddrBindEntry OBJECT-TYPE
    SYNTAX      NatAddrBindEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "Each entry in this table holds information about
             an active address BIND.  These entries are lost
             upon agent restart.

             This row has indexing which may create variables with
             more than 128 subidentifiers.  Implementers of this table
             must be careful not to create entries that would result
             in OIDs which exceed the 128 subidentifier limit.
             Otherwise, the information cannot be accessed using
             SNMPv1, SNMPv2c or SNMPv3."

    INDEX   { ifIndex, natAddrBindLocalAddrType, natAddrBindLocalAddr }
    ::= { natAddrBindTable 1 }

NatAddrBindEntry ::= SEQUENCE {
    natAddrBindLocalAddrType        InetAddressType,
    natAddrBindLocalAddr            InetAddress,
    natAddrBindGlobalAddrType       InetAddressType,
    natAddrBindGlobalAddr           InetAddress,
    natAddrBindId                   NatBindId,
    natAddrBindTranslationEntity    NatTranslationEntity,
    natAddrBindType                 NatAssociationType,
    natAddrBindMapIndex             NatAddrMapId,
    natAddrBindSessions             Gauge32,
    natAddrBindMaxIdleTime          TimeTicks,
    natAddrBindCurrentIdleTime      TimeTicks,
    natAddrBindInTranslates         Counter64,
    natAddrBindOutTranslates        Counter64
}
```

natAddrBindLocalAddrType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "This object specifies the address type used for
            natAddrBindLocalAddr."
    ::= { natAddrBindEntry 1 }

natAddrBindLocalAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "This object represents the private-realm specific network
             layer address, which maps to the public-realm address
             represented by natAddrBindGlobalAddr.

             The type of this address is determined by the value of
             the natAddrBindLocalAddrType object."
    ::= { natAddrBindEntry 2 }

natAddrBindGlobalAddrType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "This object specifies the address type used for
            natAddrBindGlobalAddr."
    ::= { natAddrBindEntry 3 }

natAddrBindGlobalAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "This object represents the public-realm network layer
             address that maps to the private-realm network layer
             address represented by natAddrBindLocalAddr.

             The type of this address is determined by the value of
             the natAddrBindGlobalAddrType object."
    ::= { natAddrBindEntry 4 }

natAddrBindId OBJECT-TYPE
    SYNTAX   NatBindId
    MAX-ACCESS read-only
    STATUS   current

        DESCRIPTION
                "This object represents a bind id that is dynamically
                 assigned to each bind by a NAT enabled device. Each
                 bind is represented by a bind id that is
                 unique across both, the natAddrBindTable and the
                 natAddrPortBindTable."
        ::= { natAddrBindEntry 5 }

natAddrBindTranslationEntity OBJECT-TYPE
    SYNTAX   NatTranslationEntity
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
                "This object represents the direction of sessions
                 for which this bind is applicable and the endpoint entity
                 (source or destination) within the sessions that is
                 subject to translation using the BIND.

                 Orientation of the bind can be a superset of
                 translationEntity of the address map entry which
                 forms the basis for this bind.

                 For example, if the translationEntity of an
                 address map entry is outboundSrcEndPoint, the
                 translationEntity of a bind derived from this
                 map entry may either be outboundSrcEndPoint or
                 it may be bidirectional (a bitmask of
                 outboundSrcEndPoint and inboundDstEndPoint)."
        ::= { natAddrBindEntry 6 }

natAddrBindType OBJECT-TYPE
    SYNTAX   NatAssociationType
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
                "This object indicates whether the bind is static or
                 dynamic."
        ::= { natAddrBindEntry 7 }

natAddrBindMapIndex OBJECT-TYPE
    SYNTAX   NatAddrMapId
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
                "This object is a pointer to the natAddrMapTable entry
                 (and the parameters of that entry) which was used in
                 creating this BIND. This object, in conjunction with the
                 ifIndex (which identifies a unique addrMapName) points to

                    a unique entry in the natAddrMapTable."
        ::= { natAddrBindEntry 8 }

natAddrBindSessions OBJECT-TYPE
        SYNTAX   Gauge32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "Number of sessions currently using this BIND."
        ::= { natAddrBindEntry 9 }

natAddrBindMaxIdleTime OBJECT-TYPE
        SYNTAX   TimeTicks
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "This object indicates the maximum time for
                 which this bind can be idle with no sessions
                 attached to it.

                 The value of this object is of relevance only for
                 dynamic NAT."
        ::= { natAddrBindEntry 10 }

natAddrBindCurrentIdleTime OBJECT-TYPE
        SYNTAX   TimeTicks
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "At any given instance, this object indicates the
                 time that this bind has been idle without any sessions
                 attached to it.

                 The value of this object is of relevance only for
                 dynamic NAT."
        ::= { natAddrBindEntry 11 }

natAddrBindInTranslates OBJECT-TYPE
        SYNTAX   Counter64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of inbound packets that were successfully
                 translated by using this bind entry.

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

```
                    ifCounterDiscontinuityTime on the relevant interface."
        ::= { natAddrBindEntry 12 }

natAddrBindOutTranslates OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The number of outbound packets that were successfully
             translated using this bind entry.

             Discontinuities in the value of this counter can occur at
             reinitialization of the management system and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime on the relevant interface."
        ::= { natAddrBindEntry 13 }

--
-- Address Port Bind section
--

natAddrPortBindNumberOfEntries OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "This object maintains a count of the number of entries
             that currently exist in the natAddrPortBindTable."
        ::= { natMIBObjects 7 }

--
-- The NAT Address Port Bind Table
--

natAddrPortBindTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NatAddrPortBindEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "This table holds information about the currently
             active NAPT BINDs."
        ::= { natMIBObjects 8 }

natAddrPortBindEntry OBJECT-TYPE
    SYNTAX      NatAddrPortBindEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
```

              "Each entry in the this table holds information
               about a NAPT bind that is currently active.
               These entries are lost upon agent restart.

               This row has indexing which may create variables with
               more than 128 subidentifiers. Implementers of this table
               must be careful not to create entries which would result
               in OIDs that exceed the 128 subidentifier limit.
               Otherwise, the information cannot be accessed using
               SNMPv1, SNMPv2c or SNMPv3."
     INDEX   { ifIndex, natAddrPortBindLocalAddrType,
                natAddrPortBindLocalAddr, natAddrPortBindLocalPort,
                natAddrPortBindProtocol }
     ::= { natAddrPortBindTable 1 }

NatAddrPortBindEntry ::= SEQUENCE {
    natAddrPortBindLocalAddrType   InetAddressType,
    natAddrPortBindLocalAddr   InetAddress,
    natAddrPortBindLocalPort   InetPortNumber,
    natAddrPortBindProtocol   NatProtocolType,
    natAddrPortBindGlobalAddrType   InetAddressType,
    natAddrPortBindGlobalAddr   InetAddress,
    natAddrPortBindGlobalPort   InetPortNumber,
    natAddrPortBindId   NatBindId,
    natAddrPortBindTranslationEntity   NatTranslationEntity,
    natAddrPortBindType   NatAssociationType,
    natAddrPortBindMapIndex   NatAddrMapId,
    natAddrPortBindSessions   Gauge32,
    natAddrPortBindMaxIdleTime   TimeTicks,
    natAddrPortBindCurrentIdleTime   TimeTicks,
    natAddrPortBindInTranslates   Counter64,
    natAddrPortBindOutTranslates   Counter64
}

natAddrPortBindLocalAddrType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
            "This object specifies the address type used for
             natAddrPortBindLocalAddr."
    ::= { natAddrPortBindEntry 1 }

natAddrPortBindLocalAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION

          "This object represents the private-realm specific network
          layer address which, in conjunction with
          natAddrPortBindLocalPort, maps to the public-realm
          network layer address and transport id represented by
          natAddrPortBindGlobalAddr and natAddrPortBindGlobalPort
          respectively.

          The type of this address is determined by the value of
          the natAddrPortBindLocalAddrType object."
   ::= { natAddrPortBindEntry 2 }

natAddrPortBindLocalPort OBJECT-TYPE
    SYNTAX   InetPortNumber
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
          "For a protocol value TCP or UDP, this object represents
          the private-realm specific port number. On the other
          hand, for ICMP a bind is created only for query/response
          type ICMP messages such as ICMP echo, Timestamp, and
          Information request messages, and this object represents
          the private-realm specific identifier in the ICMP
          message, as defined in RFC 792 for ICMPv4 and in RFC
          2463 for ICMPv6.

          This object, together with natAddrPortBindProtocol,
          natAddrPortBindLocalAddrType, and natAddrPortBindLocalAddr,
          constitutes a session endpoint in the private realm. A
          bind entry binds a private realm specific endpoint to a
          public realm specific endpoint, as represented by the
          tuple of (natAddrPortBindGlobalPort,
          natAddrPortBindProtocol, natAddrPortBindGlobalAddrType,
          and natAddrPortBindGlobalAddr)."
    ::= { natAddrPortBindEntry 3 }

natAddrPortBindProtocol OBJECT-TYPE
    SYNTAX   NatProtocolType
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
          "This object specifies a protocol identifier. If the
          value of this object is none(1), then this bind entry
          applies to all IP traffic. Any other value of this object
          specifies the class of IP traffic to which this BIND
          applies."
    ::= { natAddrPortBindEntry 4 }

natAddrPortBindGlobalAddrType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "This object specifies the address type used for
             natAddrPortBindGlobalAddr."
    ::= { natAddrPortBindEntry 5 }

natAddrPortBindGlobalAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "This object represents the public-realm specific network
             layer address that, in conjunction with
             natAddrPortBindGlobalPort, maps to the private-realm

             network layer address and transport id represented by
             natAddrPortBindLocalAddr and natAddrPortBindLocalPort,
             respectively.

             The type of this address is determined by the value of
             the natAddrPortBindGlobalAddrType object."
    ::= { natAddrPortBindEntry 6 }

natAddrPortBindGlobalPort OBJECT-TYPE
    SYNTAX   InetPortNumber
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "For a protocol value TCP or UDP, this object represents
             the public-realm specific port number. On the other
             hand, for ICMP a bind is created only for query/response
             type ICMP messages such as ICMP echo, Timestamp, and
             Information request messages, and this object represents
             the public-realm specific identifier in the ICMP message,
             as defined in RFC 792 for ICMPv4 and in RFC 2463 for
             ICMPv6.

             This object, together with natAddrPortBindProtocol,
             natAddrPortBindGlobalAddrType, and
             natAddrPortBindGlobalAddr, constitutes a session endpoint
             in the public realm. A bind entry binds a public realm
             specific endpoint to a private realm specific endpoint,
             as represented by the tuple of
               (natAddrPortBindLocalPort, natAddrPortBindProtocol,
                natAddrPortBindLocalAddrType, and

```
                    natAddrPortBindLocalAddr)."
        ::= { natAddrPortBindEntry 7 }

natAddrPortBindId OBJECT-TYPE
    SYNTAX      NatBindId
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "This object represents a bind id that is dynamically
             assigned to each bind by a NAT enabled device.  Each
             bind is represented by a unique bind id across both
             the natAddrBindTable and the natAddrPortBindTable."
        ::= { natAddrPortBindEntry 8 }

natAddrPortBindTranslationEntity OBJECT-TYPE
    SYNTAX      NatTranslationEntity
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "This object represents the direction of sessions
             for which this bind is applicable and the entity
             (source or destination) within the sessions that is
             subject to translation with the BIND.

             Orientation of the bind can be a superset of the
             translationEntity of the address map entry that
             forms the basis for this bind.

             For example, if the translationEntity of an
             address map entry is outboundSrcEndPoint, the
             translationEntity of a bind derived from this
             map entry may either be outboundSrcEndPoint or
             may be bidirectional (a bitmask of
             outboundSrcEndPoint and inboundDstEndPoint)."
        ::= { natAddrPortBindEntry 9 }

natAddrPortBindType OBJECT-TYPE
    SYNTAX      NatAssociationType
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "This object indicates whether the bind is static or
             dynamic."
        ::= { natAddrPortBindEntry 10 }

natAddrPortBindMapIndex OBJECT-TYPE
    SYNTAX      NatAddrMapId
    MAX-ACCESS read-only
```

```
    STATUS      current
    DESCRIPTION
            "This object is a pointer to the natAddrMapTable entry
             (and the parameters of that entry) used in
             creating this BIND.  This object, in conjunction with the
             ifIndex (which identifies a unique addrMapName), points
             to a unique entry in the natAddrMapTable."
    ::= { natAddrPortBindEntry 11 }

natAddrPortBindSessions OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "Number of sessions currently using this BIND."
    ::= { natAddrPortBindEntry 12 }

natAddrPortBindMaxIdleTime OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS read-only
    STATUS      current

    DESCRIPTION
            "This object indicates the maximum time for
             which this bind can be idle without any sessions
             attached to it.
             The value of this object is of relevance
             only for dynamic NAT."
    ::= { natAddrPortBindEntry 13 }

natAddrPortBindCurrentIdleTime OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "At any given instance, this object indicates the
             time that this bind has been idle without any sessions
             attached to it.

             The value of this object is of relevance
             only for dynamic NAT."
    ::= { natAddrPortBindEntry 14 }

natAddrPortBindInTranslates OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
```

                "The number of inbound packets that were translated as per
                 this bind entry.

                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other
                 times, as indicated by the value of
                 ifCounterDiscontinuityTime on the relevant interface."
        ::= { natAddrPortBindEntry 15 }

natAddrPortBindOutTranslates OBJECT-TYPE
    SYNTAX   Counter64
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
                "The number of outbound packets that were translated as per
                 this bind entry.

                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other
                 times, as indicated by the value of
                 ifCounterDiscontinuityTime on the relevant interface."
        ::= { natAddrPortBindEntry 16 }

--
-- The Session Table
--

natSessionTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF NatSessionEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
                "The (conceptual) table containing one entry for each
                 NAT session currently active on this NAT device."
        ::= { natMIBObjects 9 }

natSessionEntry OBJECT-TYPE
    SYNTAX   NatSessionEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
                "An entry (conceptual row) containing information
                 about an active NAT session on this NAT device.
                 These entries are lost upon agent restart."
    INDEX   { ifIndex, natSessionIndex }
        ::= { natSessionTable 1 }

NatSessionEntry ::= SEQUENCE {

```
    natSessionIndex                         NatSessionId,
    natSessionPrivateSrcEPBindId            NatBindIdOrZero,
    natSessionPrivateSrcEPBindMode          NatBindMode,
    natSessionPrivateDstEPBindId            NatBindIdOrZero,
    natSessionPrivateDstEPBindMode          NatBindMode,
    natSessionDirection                     INTEGER,
    natSessionUpTime                        TimeTicks,
    natSessionAddrMapIndex                  NatAddrMapId,
    natSessionProtocolType                  NatProtocolType,
    natSessionPrivateAddrType               InetAddressType,
    natSessionPrivateSrcAddr                InetAddress,
    natSessionPrivateSrcPort                InetPortNumber,
    natSessionPrivateDstAddr                InetAddress,
    natSessionPrivateDstPort                InetPortNumber,
    natSessionPublicAddrType                InetAddressType,
    natSessionPublicSrcAddr                 InetAddress,
    natSessionPublicSrcPort                 InetPortNumber,
    natSessionPublicDstAddr                 InetAddress,
    natSessionPublicDstPort                 InetPortNumber,
    natSessionMaxIdleTime                   TimeTicks,
    natSessionCurrentIdleTime               TimeTicks,
    natSessionInTranslates                  Counter64,
    natSessionOutTranslates                 Counter64
}

natSessionIndex OBJECT-TYPE
    SYNTAX      NatSessionId
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
            "The session ID for this NAT session."
    ::= { natSessionEntry 1 }

natSessionPrivateSrcEPBindId OBJECT-TYPE
    SYNTAX      NatBindIdOrZero
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The bind id associated between private and public
             source end points.  In the case of Symmetric-NAT,
             this should be set to zero."
    ::= { natSessionEntry 2 }

natSessionPrivateSrcEPBindMode OBJECT-TYPE
    SYNTAX      NatBindMode
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
```

                    "This object indicates whether the bind indicated
                     by the object natSessionPrivateSrcEPBindId
                     is an address bind or an address port bind."
         ::= { natSessionEntry 3 }

natSessionPrivateDstEPBindId OBJECT-TYPE
    SYNTAX   NatBindIdOrZero
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
             "The bind id associated between private and public
              destination end points."
    ::= { natSessionEntry 4 }

natSessionPrivateDstEPBindMode OBJECT-TYPE
    SYNTAX   NatBindMode
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
             "This object indicates whether the bind indicated
              by the object natSessionPrivateDstEPBindId
              is an address bind or an address port bind."
    ::= { natSessionEntry 5 }

natSessionDirection OBJECT-TYPE
    SYNTAX   INTEGER {
                     inbound (1),
                     outbound (2)
                 }

    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
             "The direction of this session with respect to the
              local network. 'inbound' indicates that this session
              was initiated from the public network into the private
              network. 'outbound' indicates that this session was
              initiated from the private network into the public
              network."
    ::= { natSessionEntry 6 }

natSessionUpTime OBJECT-TYPE
    SYNTAX   TimeTicks
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
             "The up time of this session in one-hundredths of a
              second."

```
     ::= { natSessionEntry 7 }

natSessionAddrMapIndex OBJECT-TYPE
    SYNTAX      NatAddrMapId
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "This object is a pointer to the natAddrMapTable entry
             (and the parameters of that entry) used in
             creating this session.  This object, in conjunction with
             the ifIndex (which identifies a unique addrMapName), points
             to a unique entry in the natAddrMapTable."
    ::= { natSessionEntry 8 }

natSessionProtocolType OBJECT-TYPE
    SYNTAX      NatProtocolType
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The protocol type of this session."
    ::= { natSessionEntry 9 }

natSessionPrivateAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "This object specifies the address type used for
             natSessionPrivateSrcAddr and natSessionPrivateDstAddr."
    ::= { natSessionEntry 10 }

natSessionPrivateSrcAddr OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The source IP address of the session endpoint that
             lies in the private network.

             The value of this object must be zero only when the
             natSessionPrivateSrcEPBindId object has a zero value.
             When the value of this object is zero, the NAT session
             lookup will match any IP address to this field.

             The type of this address is determined by the value of
             the natSessionPrivateAddrType object."
    ::= { natSessionEntry 11 }
```

natSessionPrivateSrcPort OBJECT-TYPE
    SYNTAX   InetPortNumber
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "When the value of protocol is TCP or UDP, this object
             represents the source port in the first packet of session
             while in private-realm. On the other hand, when the
             protocol is ICMP, a NAT session is created only for
             query/response type ICMP messages such as ICMP echo,
             Timestamp, and Information request messages, and this
             object represents the private-realm specific identifier
             in the ICMP message, as defined in RFC 792 for ICMPv4
             and in RFC 2463 for ICMPv6.

             The value of this object must be zero when the
             natSessionPrivateSrcEPBindId object has zero value
             and value of natSessionPrivateSrcEPBindMode is
             addressPortBind(2). In such a case, the NAT session
             lookup will match any port number to this field.

             The value of this object must be zero when the object
             is not a representative field (SrcPort, DstPort, or
             ICMP identifier) of the session tuple in either the
             public realm or the private realm."
    ::= { natSessionEntry 12 }

natSessionPrivateDstAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The destination IP address of the session endpoint that
             lies in the private network.

             The value of this object must be zero when the
             natSessionPrivateDstEPBindId object has a zero value.
             In such a scenario, the NAT session lookup will match
             any IP address to this field.

             The type of this address is determined by the value of
             the natSessionPrivateAddrType object."
    ::= { natSessionEntry 13 }

natSessionPrivateDstPort OBJECT-TYPE
    SYNTAX   InetPortNumber
    MAX-ACCESS read-only
    STATUS   current

          DESCRIPTION
                  "When the value of protocol is TCP or UDP, this object
                   represents the destination port in the first packet
                   of session while in private-realm. On the other hand,
                   when the protocol is ICMP, this object is not relevant
                   and should be set to zero.

                   The value of this object must be zero when the
                   natSessionPrivateDstEPBindId object has a zero
                   value and natSessionPrivateDstEPBindMode is set to
                   addressPortBind(2). In such a case, the NAT session
                   lookup will match any port number to this field.

                   The value of this object must be zero when the object
                   is not a representative field (SrcPort, DstPort, or
                   ICMP identifier) of the session tuple in either the
                   public realm or the private realm."
          ::= { natSessionEntry 14 }

natSessionPublicAddrType OBJECT-TYPE
     SYNTAX   InetAddressType
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
             "This object specifies the address type used for
              natSessionPublicSrcAddr and natSessionPublicDstAddr."
     ::= { natSessionEntry 15 }

natSessionPublicSrcAddr OBJECT-TYPE
     SYNTAX   InetAddress
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
             "The source IP address of the session endpoint that
              lies in the public network.

              The value of this object must be zero when the
              natSessionPrivateSrcEPBindId object has a zero value.
              In such a scenario, the NAT session lookup will match
              any IP address to this field.

              The type of this address is determined by the value of
              the natSessionPublicAddrType object."
     ::= { natSessionEntry 16 }

natSessionPublicSrcPort OBJECT-TYPE
     SYNTAX   InetPortNumber
     MAX-ACCESS read-only

```
        STATUS        current
        DESCRIPTION
                "When the value of protocol is TCP or UDP, this object
                represents the source port in the first packet of
                session while in public-realm.  On the other hand, when
                protocol is ICMP, a NAT session is created only for
                query/response type ICMP messages such as ICMP echo,
                Timestamp, and Information request messages, and this
                object represents the public-realm specific identifier
                in the ICMP message, as defined in RFC 792 for ICMPv4
                and in RFC 2463 for ICMPv6.

                The value of this object must be zero when the
                natSessionPrivateSrcEPBindId object has a zero value
                and natSessionPrivateSrcEPBindMode is set to
                addressPortBind(2).  In such a scenario, the NAT
                session lookup will match any port number to this
                field.

                The value of this object must be zero when the object
                is not a representative field (SrcPort, DstPort or
                ICMP identifier) of the session tuple in either the
                public realm or the private realm."
        ::= { natSessionEntry 17 }

natSessionPublicDstAddr OBJECT-TYPE
        SYNTAX        InetAddress
        MAX-ACCESS read-only
        STATUS        current
        DESCRIPTION
                "The destination IP address of the session endpoint that
                lies in the public network.

                The value of this object must be non-zero when the
                natSessionPrivateDstEPBindId object has a non-zero
                value.  If the value of this object and the
                corresponding natSessionPrivateDstEPBindId object value
                is zero, then the NAT session lookup will match any IP
                address to this field.

                The type of this address is determined by the value of
                the natSessionPublicAddrType object."
        ::= { natSessionEntry 18 }

natSessionPublicDstPort OBJECT-TYPE
        SYNTAX        InetPortNumber
        MAX-ACCESS read-only
        STATUS        current
```

        DESCRIPTION
                "When the value of protocol is TCP or UDP, this object
                 represents the destination port in the first packet of
                 session while in public-realm. On the other hand, when
                 the protocol is ICMP, this object is not relevant for
                 translation and should be zero.

                 The value of this object must be zero when the
                 natSessionPrivateDstEPBindId object has a zero value
                 and natSessionPrivateDstEPBindMode is
                 addressPortBind(2). In such a scenario, the NAT
                 session lookup will match any port number to this
                 field.

                 The value of this object must be zero when the object
                 is not a representative field (SrcPort, DstPort, or
                 ICMP identifier) of the session tuple in either the
                 public realm or the private realm."
        ::= { natSessionEntry 19 }

natSessionMaxIdleTime OBJECT-TYPE
        SYNTAX   TimeTicks
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The max time for which this session can be idle
                 without detecting a packet."
        ::= { natSessionEntry 20 }

natSessionCurrentIdleTime OBJECT-TYPE
        SYNTAX   TimeTicks
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The time since a packet belonging to this session was
                 last detected."
        ::= { natSessionEntry 21 }

natSessionInTranslates OBJECT-TYPE
        SYNTAX   Counter64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of inbound packets that were translated for
                 this session.

                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other

```
                 times, as indicated by the value of
                 ifCounterDiscontinuityTime on the relevant interface."
        ::= { natSessionEntry 22 }

natSessionOutTranslates OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
                "The number of outbound packets that were translated for
                 this session.

                 Discontinuities in the value of this counter can occur at
                 reinitialization of the management system and at other
                 times, as indicated by the value of
                 ifCounterDiscontinuityTime on the relevant interface."
        ::= { natSessionEntry 23 }

--
-- The Protocol table
--

natProtocolTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NatProtocolEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
                "The (conceptual) table containing per protocol NAT
                 statistics."
        ::= { natMIBObjects 10 }

natProtocolEntry OBJECT-TYPE
    SYNTAX      NatProtocolEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
                "An entry (conceptual row) containing NAT statistics
                 pertaining to a particular protocol."
    INDEX   { natProtocol }
        ::= { natProtocolTable 1 }

NatProtocolEntry ::= SEQUENCE {
    natProtocol                 NatProtocolType,
    natProtocolInTranslates     Counter64,
    natProtocolOutTranslates    Counter64,
    natProtocolDiscards         Counter64
}
```

```
natProtocol    OBJECT-TYPE
    SYNTAX      NatProtocolType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "This object represents the protocol pertaining to which
             parameters are reported."
    ::= { natProtocolEntry 1 }

natProtocolInTranslates OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of inbound packets pertaining to the protocol
             identified by natProtocol that underwent NAT.

             Discontinuities in the value of this counter can occur at
             reinitialization of the management system and at other
             times, as indicated by the value of
             ifCounterDiscontinuityTime on the relevant interface."
    ::= { natProtocolEntry 2 }

natProtocolOutTranslates OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of outbound packets pertaining to the protocol
             identified by natProtocol that underwent NAT.

             Discontinuities in the value of this counter can occur at
             reinitialization of the management system and at other
             times, as indicated by the value of
             ifCounterDiscontinuityTime on the relevant interface."
    ::= { natProtocolEntry 3 }

natProtocolDiscards OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of packets pertaining to the protocol
             identified by natProtocol that had to be
             rejected/dropped due to lack of resources.  These
             rejections could be due to session timeout, resource
             unavailability, lack of address space, etc.
```

```
                  Discontinuities in the value of this counter can occur at
                  reinitialization of the management system and at other
                  times, as indicated by the value of
                  ifCounterDiscontinuityTime on the relevant interface."
          ::= { natProtocolEntry 4 }

--
-- Notifications section
--

natMIBNotifications OBJECT IDENTIFIER ::= { natMIB 0 }

--
-- Notifications
--

natPacketDiscard NOTIFICATION-TYPE
    OBJECTS { ifIndex }
    STATUS  current
    DESCRIPTION
            "This notification is generated when IP packets are
             discarded by the NAT function; e.g., due to lack of
             mapping space when NAT is out of addresses or ports.

             Note that the generation of natPacketDiscard
             notifications is throttled by the agent, as specified
             by the 'natNotifThrottlingInterval' object."
    ::= { natMIBNotifications 1 }

--
-- Conformance information.
--

natMIBConformance OBJECT IDENTIFIER ::= { natMIB 2 }

natMIBGroups      OBJECT IDENTIFIER ::= { natMIBConformance 1 }
natMIBCompliances OBJECT IDENTIFIER ::= { natMIBConformance 2 }

--
-- Units of conformance
--

natConfigGroup OBJECT-GROUP
    OBJECTS { natInterfaceRealm,
              natInterfaceServiceType,
              natInterfaceStorageType,
              natInterfaceRowStatus,
              natAddrMapName,
```

```
                natAddrMapEntryType,
                natAddrMapTranslationEntity,
                natAddrMapLocalAddrType,
                natAddrMapLocalAddrFrom,
                natAddrMapLocalAddrTo,
                natAddrMapLocalPortFrom,
                natAddrMapLocalPortTo,
                natAddrMapGlobalAddrType,
                natAddrMapGlobalAddrFrom,
                natAddrMapGlobalAddrTo,
                natAddrMapGlobalPortFrom,
                natAddrMapGlobalPortTo,
                natAddrMapProtocol,
                natAddrMapStorageType,
                natAddrMapRowStatus,
                natBindDefIdleTimeout,
                natUdpDefIdleTimeout,
                natIcmpDefIdleTimeout,
                natOtherDefIdleTimeout,
                natTcpDefIdleTimeout,
                natTcpDefNegTimeout,
                natNotifThrottlingInterval }
    STATUS  current
    DESCRIPTION
            "A collection of configuration-related information
             required to support management of devices supporting
             NAT."
    ::= { natMIBGroups 1 }

natTranslationGroup OBJECT-GROUP
    OBJECTS { natAddrBindNumberOfEntries,
                natAddrBindGlobalAddrType,
                natAddrBindGlobalAddr,
                natAddrBindId,
                natAddrBindTranslationEntity,
                natAddrBindType,
                natAddrBindMapIndex,
                natAddrBindSessions,
                natAddrBindMaxIdleTime,
                natAddrBindCurrentIdleTime,
                natAddrBindInTranslates,
                natAddrBindOutTranslates,
                natAddrPortBindNumberOfEntries,
                natAddrPortBindGlobalAddrType,
                natAddrPortBindGlobalAddr,
                natAddrPortBindGlobalPort,
                natAddrPortBindId,
                natAddrPortBindTranslationEntity,
```

```
                    natAddrPortBindType,
                    natAddrPortBindMapIndex,
                    natAddrPortBindSessions,
                    natAddrPortBindMaxIdleTime,
                    natAddrPortBindCurrentIdleTime,
                    natAddrPortBindInTranslates,
                    natAddrPortBindOutTranslates,
                    natSessionPrivateSrcEPBindId,
                    natSessionPrivateSrcEPBindMode,
                    natSessionPrivateDstEPBindId,
                    natSessionPrivateDstEPBindMode,
                    natSessionDirection,
                    natSessionUpTime,
                    natSessionAddrMapIndex,
                    natSessionProtocolType,
                    natSessionPrivateAddrType,
                    natSessionPrivateSrcAddr,
                    natSessionPrivateSrcPort,
                    natSessionPrivateDstAddr,
                    natSessionPrivateDstPort,
                    natSessionPublicAddrType,
                    natSessionPublicSrcAddr,
                    natSessionPublicSrcPort,
                    natSessionPublicDstAddr,
                    natSessionPublicDstPort,
                    natSessionMaxIdleTime,
                    natSessionCurrentIdleTime,
                    natSessionInTranslates,
                    natSessionOutTranslates }
        STATUS  current

        DESCRIPTION
                "A collection of BIND-related objects required to support
                 management of devices supporting NAT."
        ::= { natMIBGroups 2 }

natStatsInterfaceGroup OBJECT-GROUP
    OBJECTS { natInterfaceInTranslates,
                natInterfaceOutTranslates,
                natInterfaceDiscards }
    STATUS  current
    DESCRIPTION
                "A collection of NAT statistics associated with the
                 interface on which NAT is configured, to aid
                 troubleshooting/monitoring of the NAT operation."
        ::= { natMIBGroups 3 }

natStatsProtocolGroup OBJECT-GROUP
```

```
        OBJECTS { natProtocolInTranslates,
                  natProtocolOutTranslates,
                  natProtocolDiscards }
        STATUS  current
        DESCRIPTION
                "A collection of protocol specific NAT statistics,
                 to aid troubleshooting/monitoring of NAT operation."
        ::= { natMIBGroups 4 }

natStatsAddrMapGroup OBJECT-GROUP
        OBJECTS { natAddrMapInTranslates,
                  natAddrMapOutTranslates,
                  natAddrMapDiscards,
                  natAddrMapAddrUsed }
        STATUS  current
        DESCRIPTION
                "A collection of address map specific NAT statistics,
                 to aid troubleshooting/monitoring of NAT operation."
        ::= { natMIBGroups 5 }

natMIBNotificationGroup NOTIFICATION-GROUP
        NOTIFICATIONS { natPacketDiscard }
        STATUS          current
        DESCRIPTION
                "A collection of notifications generated by
                 devices supporting this MIB."
        ::= { natMIBGroups 6 }

--
-- Compliance statements
--

natMIBFullCompliance MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
                "When this MIB is implemented with support for
                 read-create, then such an implementation can claim
                 full compliance.  Such devices can then be both
                 monitored and configured with this MIB.

                 The following index objects cannot be added as OBJECT
                 clauses but nevertheless have the compliance
                 requirements:
                     "
                -- OBJECT  natAddrBindLocalAddrType
                -- SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
                -- DESCRIPTION
                --          "An implementation is required to support
```

```
                    --          global IPv4 and/or IPv6 addresses, depending
                    --          on its support for IPv4 and IPv6."

                -- OBJECT  natAddrBindLocalAddr
                -- SYNTAX  InetAddress (SIZE(4|16))
                -- DESCRIPTION
                --          "An implementation is required to support
                --          global IPv4 and/or IPv6 addresses, depending
                --          on its support for IPv4 and IPv6."

                -- OBJECT  natAddrPortBindLocalAddrType
                -- SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
                -- DESCRIPTION
                --          "An implementation is required to support
                --          global IPv4 and/or IPv6 addresses, depending
                --          on its support for IPv4 and IPv6."

                -- OBJECT  natAddrPortBindLocalAddr
                -- SYNTAX  InetAddress (SIZE(4|16))
                -- DESCRIPTION
                --          "An implementation is required to support
                --          global IPv4 and/or IPv6 addresses, depending
                --          on its support for IPv4 and IPv6."

        MODULE IF-MIB -- The interfaces MIB, RFC2863
          MANDATORY-GROUPS {
            ifCounterDiscontinuityGroup
          }

        MODULE  -- this module
          MANDATORY-GROUPS { natConfigGroup, natTranslationGroup,
                             natStatsInterfaceGroup }

          GROUP        natStatsProtocolGroup
          DESCRIPTION
                  "This group is optional."
          GROUP        natStatsAddrMapGroup
          DESCRIPTION
                  "This group is optional."
          GROUP        natMIBNotificationGroup
          DESCRIPTION
                  "This group is optional."

          OBJECT  natAddrMapLocalAddrType
          SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
          DESCRIPTION
                  "An implementation is required to support global IPv4
                   and/or IPv6 addresses, depending on its support
```

                    for IPv4 and IPv6."

          OBJECT   natAddrMapLocalAddrFrom
          SYNTAX   InetAddress (SIZE(4|16))
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrMapLocalAddrTo
          SYNTAX   InetAddress (SIZE(4|16))
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrMapGlobalAddrType
          SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrMapGlobalAddrFrom
          SYNTAX   InetAddress (SIZE(4|16))
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrMapGlobalAddrTo
          SYNTAX   InetAddress (SIZE(4|16))
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrBindGlobalAddrType
          SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
          DESCRIPTION
                   "An implementation is required to support global IPv4
                    and/or IPv6 addresses, depending on its support
                    for IPv4 and IPv6."

          OBJECT   natAddrBindGlobalAddr
          SYNTAX   InetAddress (SIZE(4|16))
          DESCRIPTION
                   "An implementation is required to support global IPv4

```
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natAddrPortBindGlobalAddrType
        SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natAddrPortBindGlobalAddr
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natSessionPrivateAddrType
        SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natSessionPrivateSrcAddr
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."


        OBJECT  natSessionPrivateDstAddr
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natSessionPublicAddrType
        SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                and/or IPv6 addresses, depending on its support
                for IPv4 and IPv6."

        OBJECT  natSessionPublicSrcAddr
        SYNTAX  InetAddress (SIZE(4|16))
```

```
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support
                 for IPv4 and IPv6."

        OBJECT  natSessionPublicDstAddr
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support
                 for IPv4 and IPv6."

    ::= { natMIBCompliances 1 }

natMIBReadOnlyCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "When this MIB is implemented without support for
             read-create (i.e., in read-only mode), then such an
             implementation can claim read-only compliance.
             Such a device can then be monitored but cannot be
             configured with this MIB.

             The following index objects cannot be added as OBJECT
             clauses but nevertheless have the compliance
             requirements:
             "
        -- OBJECT  natAddrBindLocalAddrType
        -- SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        -- DESCRIPTION
        --          "An implementation is required to support
        --           global IPv4 and/or IPv6 addresses, depending
        --           on its support for IPv4 and IPv6."

        -- OBJECT  natAddrBindLocalAddr
        -- SYNTAX  InetAddress (SIZE(4|16))

        -- DESCRIPTION
        --          "An implementation is required to support
        --           global IPv4 and/or IPv6 addresses, depending
        --           on its support for IPv4 and IPv6."

        -- OBJECT  natAddrPortBindLocalAddrType
        -- SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        -- DESCRIPTION
        --          "An implementation is required to support
        --           global IPv4 and/or IPv6 addresses, depending
        --           on its support for IPv4 and IPv6."
```

```
                -- OBJECT   natAddrPortBindLocalAddr
                -- SYNTAX   InetAddress (SIZE(4|16))
                -- DESCRIPTION
                --          "An implementation is required to support
                --           global IPv4 and/or IPv6 addresses, depending
                --           on its support for IPv4 and IPv6."

      MODULE IF-MIB -- The interfaces MIB, RFC2863
        MANDATORY-GROUPS {
          ifCounterDiscontinuityGroup
        }

      MODULE  -- this module
        MANDATORY-GROUPS { natConfigGroup, natTranslationGroup,
                           natStatsInterfaceGroup }

        GROUP         natStatsProtocolGroup
        DESCRIPTION
                  "This group is optional."
        GROUP         natStatsAddrMapGroup
        DESCRIPTION
                  "This group is optional."
        GROUP         natMIBNotificationGroup
        DESCRIPTION
                  "This group is optional."
        OBJECT natInterfaceRowStatus
        SYNTAX RowStatus { active(1) }
        MIN-ACCESS    read-only
        DESCRIPTION
                  "Write access is not required, and active is the only
                   status that needs to be supported."

        OBJECT   natAddrMapLocalAddrType
        SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
        MIN-ACCESS    read-only
        DESCRIPTION
                  "Write access is not required.  An implementation is
                   required to support global IPv4 and/or IPv6 addresses,
                   depending on its support for IPv4 and IPv6."

        OBJECT   natAddrMapLocalAddrFrom
        SYNTAX   InetAddress (SIZE(4|16))
        MIN-ACCESS    read-only
        DESCRIPTION
                  "Write access is not required.  An implementation is
                   required to support global IPv4 and/or IPv6 addresses,
                   depending on its support for IPv4 and IPv6."
```

```
   OBJECT   natAddrMapLocalAddrTo
   SYNTAX   InetAddress (SIZE(4|16))
   MIN-ACCESS   read-only
   DESCRIPTION
           "Write access is not required.  An implementation is
            required to support global IPv4 and/or IPv6 addresses,
            depending on its support for IPv4 and IPv6."

   OBJECT   natAddrMapGlobalAddrType
   SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
   MIN-ACCESS   read-only
   DESCRIPTION
           "Write access is not required.  An implementation is
            required to support global IPv4 and/or IPv6 addresses,
            depending on its support for IPv4 and IPv6."

   OBJECT   natAddrMapGlobalAddrFrom
   SYNTAX   InetAddress (SIZE(4|16))
   MIN-ACCESS   read-only
   DESCRIPTION
           "Write access is not required.  An implementation is
            required to support global IPv4 and/or IPv6 addresses,
            depending on its support for IPv4 and IPv6."

   OBJECT   natAddrMapGlobalAddrTo
   SYNTAX   InetAddress (SIZE(4|16))
   MIN-ACCESS   read-only
   DESCRIPTION
           "Write access is not required.  An implementation is
            required to support global IPv4 and/or IPv6 addresses,
            depending on its support for IPv4 and IPv6."

   OBJECT natAddrMapRowStatus
   SYNTAX RowStatus { active(1) }
   MIN-ACCESS   read-only
   DESCRIPTION
           "Write access is not required, and active is the only
            status that needs to be supported."

   OBJECT   natAddrBindGlobalAddrType
   SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
   DESCRIPTION
           "An implementation is required to support global IPv4
            and/or IPv6 addresses, depending on its support for
            IPv4 and IPv6."

   OBJECT   natAddrBindGlobalAddr
   SYNTAX   InetAddress (SIZE(4|16))
```

```
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natAddrPortBindGlobalAddrType
        SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natAddrPortBindGlobalAddr
        SYNTAX   InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natSessionPrivateAddrType
        SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natSessionPrivateSrcAddr
        SYNTAX   InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natSessionPrivateDstAddr
        SYNTAX   InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natSessionPublicAddrType
        SYNTAX   InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT   natSessionPublicSrcAddr
```

```
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

        OBJECT  natSessionPublicDstAddr
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
                "An implementation is required to support global IPv4
                 and/or IPv6 addresses, depending on its support for
                 IPv4 and IPv6."

     ::= { natMIBCompliances 2 }

END
```

6. Acknowledgements

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    Juergen's suggestions.

7. Security Considerations

    It is clear that this MIB can potentially be useful for
    configuration. Unauthorized access to the write-able objects could
    cause a denial of service and/or widespread network disturbance.
    Hence, the support for SET operations in a non-secure environment
    without proper protection can have a negative effect on network
    operations.

    At this writing, no security holes have been identified beyond those
    that SNMP Security is itself intended to address. These relate
    primarily to controlled access to sensitive information and the
    ability to configure a device - or which might result from operator
    error, which is beyond the scope of any security architecture.

    There are a number of managed objects in this MIB that may contain
    information that may be sensitive from a business perspective, in
    that they may represent NAT bind and session information. The NAT
    bind and session objects reveal the identity of private hosts that
    are engaged in a session with external end nodes. A curious outsider

could monitor these two objects to assess the number of private hosts
being supported by the NAT device. Further, a disgruntled former
employee of an enterprise could use the NAT bind and session
information to break into specific private hosts by intercepting the
existing sessions or originating new sessions into the host. There
are no objects that are sensitive in their own right, such as
passwords or monetary amounts. It may even be important to control
GET access to these objects and possibly to encrypt the values of
these objects when they are sent over the network via SNMP. Not all
versions of SNMP provide features for such a secure environment.

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.

It is recommended that the 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.

8. References

8.1. Normative References

   [RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder,
             "Structure of Management Information Version 2 (SMIv2)",
             STD 58, RFC 2578, April 1999.

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

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

   [RFC3022] Srisuresh, P. and K. Egevang, "Traditional IP Network
             Address Translator (Traditional NAT)", RFC 3022, January
             2001.

   [RFC2663] Srisuresh, P. and M. Holdrege, "IP Network Address
             Translator (NAT) Terminology and Considerations", RFC 2663,
             August 1999.

   [RFC4001] Daniele, M., Haberman, B., Routhier, S., Schoenwaelder, J.,
             "Textual Conventions for Internet Network Addresses", RFC
             4001, February 2005.

   [RFC792] Postel, J., "Internet Control Message Protocol", STD 5, RFC
             792, September 1981.

   [RFC3489] Rosenberg, J., Weinberger, J., Huitema, C., and R. Mahy,
             "STUN - Simple Traversal of User Datagram Protocol (UDP)
             Through Network Address Translators (NATs)", RFC 3489,
             March 2003.

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

   [RFC2463] Conta, A. and S. Deering, "Internet Control Message
             Protocol (ICMPv6) for the Internet Protocol Version 6
             (IPv6) Specification", RFC 2463, December 1998.

   [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An
             Architecture for Describing Simple Network Management
             Protocol (SNMP) Management Frameworks", STD 62, RFC 3411,
             December 2002.

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

   [RFC3413] Levi, D., Meyer, P., and B. Stewart, "Simple Network
             Management Protocol (SNMP) Applications", STD 62, RFC 3413,
             December 2002.

8.2. Informative References

   [RFC1918] Rekhter, Y., Moskowitz, B., Karrenberg, D., de Groot, G.,
             and E. Lear, "Address Allocation for Private Internets",
             BCP 5, RFC 1918, February 1996.

   [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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