# Definitions of Managed Objects for the NBMA Next Hop Resolution Protocol (NHRP)

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Maria Greene
Contractor
maria@xedia.com

Joan Cucchiara
Bay Networks
joanc@baynetworks.com

James V. Luciani
Bay Networks
luciani@baynetworks.com

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Abstract

This memo defines an experimental portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for the Next Hop Resolution Protocol (NHRP) as defined in [1].

This memo specifies a MIB module in a manner that is both compliant to the SNMPv2 SMI, and semantically identical to the peer SNMPv1 definitions.

This memo does not specify a standard for the Internet community.

## 1. The SNMP Network Management Framework

The SNMP Network Management Framework presently consists of three major components. They are:

- the SMI, described in RFC 1902 [2] - the mechanisms used for describing and naming objects for the purpose of management.
- the MIB-II, STD 17, RFC 1213 [3] - the core set of managed objects for the Internet suite of protocols.
- the protocol, RFC 1157 [4] and/or RFC 1905 [5], - the protocol for accessing managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

### 1.1. Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) defined in the SMI. In particular, each object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to also refer to the object type.

## 2. Overview

The NHRP MIB contains three groups: the General Group, the Client Group, and the Server Group.

### 2.1. The NHRP General Group

The General Group contains objects that apply to both clients and servers -- in particular the NHRP Next Hop Resolution Cache Table. This table represents the internetwork layer address to NBMA address cache that is maintained by both NHRP clients and NHRP servers.

### 2.2. The NHRP Client Group

The Client Group contains objects that only apply to NHRP clients (NHCs).

The NHRP Client Table contains entries for each client associated with this agent. Some agents will allow entries to be created and deleted from this table which starts and stops the client entity on the station.

The NHRP Client NHS Table contains the NBMA subnetwork addresses of servers configured for use by the client.

The NHRP Client Statistics Table contains NHRP statistics maintained by a client.

### 2.3. The NHRP Server Group

The Server Group contains objects that only apply to NHRP servers (NHSes).

The NHRP Server Table contains entries for each server associated with this agent. Some agents will allow entries to be created and deleted from this table which starts and stops the server entity on the station.

The NHRP Server Next Hop Resolution Cache Table contains additional objects that a server keeps for each entry in its cache. This table extends the NHRP Next Hop Resolution Cache Table defined in the General Group.

The NHRP Server Statistics Table contains NHRP statistics maintained by a server.

## 3. NBMA Next Hop Resolution Protocol MIB Definitions

```
NHRP-MIB DEFINITIONS ::= BEGIN

IMPORTS
   OBJECT-TYPE, MODULE-IDENTITY, experimental, Integer32,
   Counter32, Gauge32
      FROM SNMPv2-SMI
   MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF
```

```
    TEXTUAL-CONVENTION, TruthValue, RowStatus
        FROM SNMPv2-TC
    ifIndex
        FROM IF-MIB
    ;

nhrpMIB MODULE-IDENTITY
    LAST-UPDATED "9801251200Z"  -- January 25, 1998
    ORGANIZATION "Internetworking Over NBMA (ion) Working Group"
    CONTACT-INFO
        "Maria Greene (maria@xedia.com)
         Contractor

         Joan Cucchiara (joanc@baynetworks.com)
         Bay Networks

         James V. Luciani (luciani@baynetworks.com)
         Bay Networks"
    DESCRIPTION
        "This MIB contains managed object definitions for the Next Hop
        Resolution Procol, NHRP, as defined in
        draft-ietf-rolc-nhrp-013.txt."
    ::= { experimental xxx } -- to be assigned

--*******************************************************************
-- NHRP Textual Conventions
--*******************************************************************

NhrpIANAAddrFamily ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
        "An address family. Values are defined in Assigned Numbers,
        RFC1700. Note that not all these values make sense in all
        contexts where this type is used in this MIB, but they are
        included for completeness."
    REFERENCE
        "Assigned Numbers, RFC1700, ADDRESS FAMILY NUMBERS"
    SYNTAX      INTEGER {
                    other(0),
                    ipV4(1),
                    ipV6(2),
                    nsap(3),
                    hdlc(4),
                    bbn1822(5),
                    ieee802(6),
                    e163(7),
                    e164(8),
```

```
                f69(9),
                x121(10),
                ipx(11),
                appleTalk(12),
                decnetIV(13),
                banyanVines(14),
                e164WithNsap(15)
              }

NhrpGenAddr ::= TEXTUAL-CONVENTION
   STATUS      current
   DESCRIPTION
      "The value of an internetwork layer or NBMA address."
   SYNTAX      OCTET STRING (SIZE (0..60))

nhrpObjects OBJECT IDENTIFIER ::= { nhrpMIB 1 }

--*********************************************************************
-- NHRP General (Client and Server) Objects
--*********************************************************************

nhrpGeneralObjects OBJECT IDENTIFIER ::= { nhrpObjects 1 }

--
-- The Next Hop Resolution Cache Table
--

nhrpNextHopResTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF NhrpNextHopResEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "This table contains mappings between internetwork layer
      addresses and NBMA subnetwork layer addresses."
   ::= { nhrpGeneralObjects 1 }

nhrpNextHopResEntry OBJECT-TYPE
   SYNTAX      NhrpNextHopResEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "A cached mapping between an internetwork layer address and
      an NBMA address. Entries can be created by the network
      administrator using the nhrpNextHopResRowStatus column, or
      they may be added dynamically based on protocol operation
      (including NHRP, SCSP, and others such as ATMARP)."
   INDEX       {   ifIndex,
```

```
                nhrpNextHopResIndex,
                nhrpNextHopResInternetworkAddrType,
                nhrpNextHopResDestInternetworkAddr
            }
    ::= { nhrpNextHopResTable 1 }

NhrpNextHopResEntry ::= SEQUENCE {
    nhrpNextHopResIndex                 Integer32,
    nhrpNextHopResInternetworkAddrType  NhrpIANAAddrFamily,
    nhrpNextHopResDestInternetworkAddr  NhrpGenAddr,
    nhrpNextHopResPrefixLength          Integer32,
    nhrpNextHopResNextHopInternetworkAddr NhrpGenAddr,
    nhrpNextHopResNbmaAddrType          NhrpIANAAddrFamily,
    nhrpNextHopResNbmaAddr              NhrpGenAddr,
    nhrpNextHopResNbmaSubaddr           NhrpGenAddr,
    nhrpNextHopResEntryType             INTEGER,
    nhrpNextHopResEntryState            INTEGER,
    nhrpNextHopResNegotiatedMtu         Integer32,
    nhrpNextHopResRowStatus             RowStatus
}

nhrpNextHopResIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An identifier for this entry that is unique within the
        scope of this agent."
    ::= { nhrpNextHopResEntry 1 }

nhrpNextHopResInternetworkAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The internetwork layer address type of this Next Hop
        Resolution Cache entry. The value of this object indicates how
        to interpret the values of nhrpNextHopResDestInternetworkAddr
        and nhrpNextHopResNextHopInternetworkAddr."
    ::= { nhrpNextHopResEntry 2 }

nhrpNextHopResDestInternetworkAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The value of the internetwork address of the destination."
```

```
    ::= { nhrpNextHopResEntry 3 }

nhrpNextHopResPrefixLength OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of bits that define the internetwork layer prefix
        associated with the nhrpNextHopResDestInternetworkAddr."
    ::= { nhrpNextHopResEntry 4 }

nhrpNextHopResNextHopInternetworkAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the internetwork address of the next hop."
    ::= { nhrpNextHopResEntry 5 }

nhrpNextHopResNbmaAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The NBMA address type of this Next Hop Resolution Cache
        entry. The value of this object indicates how to interpret
        the values of nhrpNextHopResNbmaAddr and
        nhrpNextHopResNbmaSubaddr."
    ::= { nhrpNextHopResEntry 6 }

nhrpNextHopResNbmaAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the NBMA subnetwork address of the next hop."
    ::= { nhrpNextHopResEntry 7 }

nhrpNextHopResNbmaSubaddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the NBMA subaddress of the next hop. If there
        is no subaddress concept for the NBMA address family, this
        value will be a zero-length OCTET STRING."
    ::= { nhrpNextHopResEntry 8 }
```

```
nhrpNextHopResEntryType OBJECT-TYPE
  SYNTAX     INTEGER {
               register(1),
               resolve(2),
               transit(3),
               staticVolatile(4),
               staticNonVolatile(5),
               atmarp(6),
               scsp(7),
               other(8)
             }
  MAX-ACCESS  read-create
  STATUS     current
  DESCRIPTION
    "An indication of how this Next Hop Resolution Cache entry
    was created. The values are:
      'register(1)' In a server, added based on a client
            registration.

      'resolve(2)'  In a client, added based on receiving an
            NHRP Resolution Reply.

      'transit(3)'  In a transit server, added by examining a
            forwarded NHRP packet.

      'staticVolatile(4)' In a client or server, manually added
            by the administrator. The entry is
            volatile and will not be restored
            after a reset.

      'staticNonVolatile(5)' In a client or server, manually
            added by the administrator. The entry
            is non-volatile and will be restored
            after a reset.

      'atmarp(6)'       The entry was added by ATMARP.

      'scsp(7)'         The entry was added by SCSP.

      'other(8)'        The entry was added by some other
            means.

    When the entry is under creation using the
    nhrpNextHopResRowStatus column, the only values that can be
    specified by the administrator are 'staticVolatile(4)' and
    'staticNonVolatile(5)'. Attempting to set any other value will
    cause an error. This value cannot be modified once the entry
```

```
        is active."
    DEFVAL      { staticVolatile }
    ::= { nhrpNextHopResEntry 9 }

nhrpNextHopResEntryState OBJECT-TYPE
    SYNTAX      INTEGER {
                  incomplete(1),
                  completePos(2),
                  completeNeg(3)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "An indication of the state of this entry. The values are:

          'incomplete(1)' The client has sent a NHRP Resolution
                  Request but has not yet received the NHRP
                  Resolution Reply.

          'completePos(2)' For a client or server, this is a cached
                   valid mapping.

          'completeNeg(3)' For a server, this is a cached negative
                   mapping."
    ::= { nhrpNextHopResEntry 10 }

nhrpNextHopResNegotiatedMtu OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The maximum transmission unit (MTU) that was negotiated or
        registered for this entity. In other words, this is the
        actual MTU being used."
    ::= { nhrpNextHopResEntry 11 }

nhrpNextHopResRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "An object that allows entries in this table to be created
        and deleted using the RowStatus convention."
    REFERENCE
        "Textual Conventions for Version 2 of the Simple Network
        Management Protocol (SNMPv2), RFC1903."
    ::= { nhrpNextHopResEntry 12 }
```

```
--*********************************************************************
-- NHRP Client Objects
--*********************************************************************

nhrpClientObjects OBJECT IDENTIFIER ::= { nhrpObjects 2 }

--
-- The NHRP Client Table
--

nhrpClientTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF NhrpClientEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "Information about NHRP clients (NHCs) managed by this agent."
   ::= { nhrpClientObjects 1 }

nhrpClientEntry OBJECT-TYPE
   SYNTAX      NhrpClientEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "Information about a single NHC."
   INDEX       { nhrpClientIndex }
   ::= { nhrpClientTable 1 }

NhrpClientEntry ::= SEQUENCE {
   nhrpClientIndex                  Integer32,
   nhrpClientInternetworkAddrType       NhrpIANAAddrFamily,
   nhrpClientInternetworkAddr           NhrpGenAddr,
   nhrpClientNbmaAddrType               NhrpIANAAddrFamily,
   nhrpClientNbmaAddr                 NhrpGenAddr,
   nhrpClientNbmaSubaddr                NhrpGenAddr,
   nhrpClientRegistrationState          INTEGER,
   nhrpClientInitialRequestTimeout      Integer32,
   nhrpClientRegistrationRequestRetries Integer32,
   nhrpClientResolutionRequestRetries   Integer32,
   nhrpClientPurgeRequestRetries        Integer32,
   nhrpClientDefaultMtu                 Integer32,
   nhrpClientHoldTime                   Integer32,
   nhrpClientRequestID                  Integer32,
   nhrpClientRowStatus                  RowStatus
}

nhrpClientIndex OBJECT-TYPE
   SYNTAX      Integer32 (1..65535)
```

```
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An identifier for the NHRP client that is unique within the
        scope of this agent."
    ::= { nhrpClientEntry 1 }

nhrpClientInternetworkAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The type of the internetwork layer address of this
        client. This object indicates how the value of
        nhrpClientInternetworkAddr is to be interpreted."
    ::= { nhrpClientEntry 2 }

nhrpClientInternetworkAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the internetwork layer address of this client."
    ::= { nhrpClientEntry 3 }

nhrpClientNbmaAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The type of the NBMA subnetwork address of this client. This
        object indicates how the values of nhrpClientNbmaAddr and
        nhrpClientNbmaSubaddr are to be interpreted."
    ::= { nhrpClientEntry 4 }

nhrpClientNbmaAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The NBMA subnetwork address of this client."
    ::= { nhrpClientEntry 5 }

nhrpClientNbmaSubaddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
```

```
    DESCRIPTION
      "The NBMA subaddress of this client. For NBMA address
      families without a subaddress concept, this will be a
      zero-length OCTET STRING."
    ::= { nhrpClientEntry 6 }

  nhrpClientRegistrationState  OBJECT-TYPE
    SYNTAX      INTEGER {
                  notRegistered(1),
                  registering(2),
                  registered(3),
                  reRegisteringFault(4)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
      "The registration state of this client. The values are:
        'notRegistered(1)'      The client is not attempting to
                                register with any NHSs.

        'registering(2)'        A registration request has been
                                issued and a registration reply
                                is expected.

        'registered(3)'         A positive registration reply
                                has been received.

        'reRegisteringFault(4)' The client has received a negative
                                registration reply (NAK) and is
                                in the process of retrying the
                                registration request.  This implies
                                the value of the Register Retries
                                is greater than zero."
    ::= { nhrpClientEntry 7 }

  nhrpClientInitialRequestTimeout OBJECT-TYPE
    SYNTAX      Integer32 (1..900)
    UNITS       "seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
      "The number of seconds that the client will wait before
      timing out an NHRP initial request.  This object only has
      meaning for the initial timeout period."
    DEFVAL      { 10 }
    ::= { nhrpClientEntry 8 }
```

```
nhrpClientRegistrationRequestRetries OBJECT-TYPE
   SYNTAX      Integer32 (0..65535)
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "The number of times the client will retry the registration
      request before failure. A value of 0 means don't retry. A
      value of 65535 means retry forever."
   DEFVAL      { 3 }
   ::= { nhrpClientEntry 9 }

nhrpClientResolutionRequestRetries OBJECT-TYPE
   SYNTAX      Integer32 (0..65535)
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "The number of times the client will retry the resolution
      request before failure. A value of 0 means don't retry.
      A value of 65535 means retry forever."
   DEFVAL      { 3 }
   ::= { nhrpClientEntry 10 }

nhrpClientPurgeRequestRetries OBJECT-TYPE
   SYNTAX      Integer32 (0..65535)
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "The number of times the client will retry a purge request
      before failure. A value of 0 means don't retry. A value of
      65535 means retry forever."
   DEFVAL      { 3 }
   ::= { nhrpClientEntry 11 }

nhrpClientDefaultMtu OBJECT-TYPE
   SYNTAX      Integer32
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "The default maximum transmission unit (MTU) of the
      client. This will be initialized by the agent to the MTU of
      the LIS/LAG if no value is specified during creation."
   DEFVAL      { 9180 }
   ::= { nhrpClientEntry 12 }

nhrpClientHoldTime OBJECT-TYPE
   SYNTAX      Integer32
   UNITS       "seconds"
```

```
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The hold time the client will register."
    DEFVAL      { 900 }
    ::= { nhrpClientEntry 13 }

nhrpClientRequestID OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The Request ID used to register this client with its server."
    ::= { nhrpClientEntry 14 }

nhrpClientRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "An object that allows entries in this table to be created and
        deleted using the RowStatus convention."
    REFERENCE
        "Textual Conventions for Version 2 of the Simple Network
        Management Protocol (SNMPv2), RFC1903."
    ::= { nhrpClientEntry 15 }

--
-- The NHRP Client->Server Table
--

nhrpClientNhsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NhrpClientNhsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table of NHSes that are available for use by this NHC
        (client). By default, the agent will add an entry to this
        table that corresponds to the client's default router."
    ::= { nhrpClientObjects 2 }

nhrpClientNhsEntry OBJECT-TYPE
    SYNTAX      NhrpClientNhsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An NHS that may be used by an NHC."
```

```
    INDEX       { nhrpClientIndex, nhrpClientNhsIndex }
    ::= { nhrpClientNhsTable 1 }

NhrpClientNhsEntry ::= SEQUENCE {
    nhrpClientNhsIndex          Integer32,
    nhrpClientNhsNbmaAddr       NhrpGenAddr,
    nhrpClientNhsNbmaSubaddr    NhrpGenAddr,
    nhrpClientNhsInUse          TruthValue,
    nhrpClientNhsRowStatus      RowStatus
}

nhrpClientNhsIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An identifier for an NHS available to a NHC."
    ::= { nhrpClientNhsEntry 1 }

nhrpClientNhsNbmaAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The NBMA subnetwork address of the NHS. The type of the
        address is indicated by the corresponding value of
        nhrpClientNbmaAddrType."
    ::= { nhrpClientNhsEntry 2 }

nhrpClientNhsNbmaSubaddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The NBMA subaddress of the NHS. For NMBA address familes
        that do not have the concept of subaddress, this will
        be a zero-length OCTET STRING."
    ::= { nhrpClientNhsEntry 3 }

nhrpClientNhsInUse OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "An indication of whether this NHS is in use by the NHC."
    ::= { nhrpClientNhsEntry 4 }
```

```
nhrpClientNhsRowStatus OBJECT-TYPE
   SYNTAX      RowStatus
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "An object that allows entries in this table to be created and
      deleted using the RowStatus convention."
   REFERENCE
      "Textual Conventions for Version 2 of the Simple Network
      Management Protocol (SNMPv2), RFC1903."
   ::= { nhrpClientNhsEntry 5 }

--
-- The NHRP Client StatisticsTable
--

nhrpClientStatTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF NhrpClientStatEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "This table contains statistics collected by NHRP clients."
   ::= { nhrpClientObjects 3 }

nhrpClientStatEntry OBJECT-TYPE
   SYNTAX      NhrpClientStatEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "Statistics collected by a NHRP client."
   INDEX       { nhrpClientIndex }
   ::= { nhrpClientStatTable 1 }

NhrpClientStatEntry ::= SEQUENCE {
   nhrpClientStatTxResolveReq                 Counter32,
   nhrpClientStatRxResolveReplyAck            Counter32,
   nhrpClientStatRxResolveReplyNakProhibited  Counter32,
   nhrpClientStatRxResolveReplyNakInsufResources Counter32,
   nhrpClientStatRxResolveReplyNakNoBinding   Counter32,
   nhrpClientStatRxResolveReplyNakNotUnique   Counter32,

   nhrpClientStatTxRegisterReq                Counter32,
   nhrpClientStatRxRegisterAck                Counter32,
   nhrpClientStatRxRegisterNakProhibited      Counter32,
   nhrpClientStatRxRegisterNakInsufResources  Counter32,
   nhrpClientStatRxRegisterNakAlreadyReg      Counter32,
```

```
    nhrpClientStatRxPurgeReq                Counter32,
    nhrpClientStatTxPurgeReq                Counter32,
    nhrpClientStatRxPurgeReply              Counter32,
    nhrpClientStatTxPurgeReply              Counter32,

    nhrpClientStatTxErrorIndication         Counter32,
    nhrpClientStatRxErrUnrecognizedExtension  Counter32,
    nhrpClientStatRxErrLoopDetected         Counter32,
    nhrpClientStatRxErrProtoAddrUnreachable   Counter32,
    nhrpClientStatRxErrProtoError           Counter32,
    nhrpClientStatRxErrSduSizeExceeded      Counter32,
    nhrpClientStatRxErrInvalidExtension     Counter32,
    nhrpClientStatRxErrAuthenticationFailure  Counter32,
    nhrpClientStatRxErrHopCountExceeded     Counter32
}

nhrpClientStatTxResolveReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Resolution Requests transmitted by this
        client."
    ::= { nhrpClientStatEntry 1 }

nhrpClientStatRxResolveReplyAck OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of positively acknowledged NHRP Resolution Replies
        received by this client."
    ::= { nhrpClientStatEntry 2 }

nhrpClientStatRxResolveReplyNakProhibited OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies received by this
        client that contained the code indicating 'Administratively
        Prohibited'."
    ::= { nhrpClientStatEntry 3 }

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

```
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies received by this
        client that contained the code indicating 'Insufficient
        Resources'."
    ::= { nhrpClientStatEntry 4 }

nhrpClientStatRxResolveReplyNakNoBinding OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies received by this
        client that contained the code indicating 'No Internetworking
        Layer Address to NBMA Address Binding Exists'."
    ::= { nhrpClientStatEntry 5 }

nhrpClientStatRxResolveReplyNakNotUnique OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies received by this
        client that contained the code indicating 'Binding Exists But
        Is Not Unique'."
    ::= { nhrpClientStatEntry 6 }

nhrpClientStatTxRegisterReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Registration Requests transmitted by this
        client."
    ::= { nhrpClientStatEntry 7 }

nhrpClientStatRxRegisterAck OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of positively acknowledged NHRP Registration
        Replies received by this client."
    ::= { nhrpClientStatEntry 8 }

nhrpClientStatRxRegisterNakProhibited OBJECT-TYPE
    SYNTAX      Counter32
```

```
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Registration Replies received by
        this client that contained the code indicating
        'Administratively Prohibited'."
    ::= { nhrpClientStatEntry 9 }

nhrpClientStatRxRegisterNakInsufResources OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Registration Replies received by
        this client that contained the code indicating
        'Insufficient Resources'."
    ::= { nhrpClientStatEntry 10 }

nhrpClientStatRxRegisterNakAlreadyReg OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Registration Replies received by
        this client that contained the code indicating 'Unique
        Internetworking Layer Address Already Registered'."
    ::= { nhrpClientStatEntry 11 }

nhrpClientStatRxPurgeReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Requests received by this client."
    ::= { nhrpClientStatEntry 12 }

nhrpClientStatTxPurgeReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Requests transmitted by this
        client."
    ::= { nhrpClientStatEntry 13 }

nhrpClientStatRxPurgeReply OBJECT-TYPE
    SYNTAX      Counter32
```

```
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Replies received by this client."
    ::= { nhrpClientStatEntry 14 }

nhrpClientStatTxPurgeReply OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Replies transmitted by this client."
    ::= { nhrpClientStatEntry 15 }

nhrpClientStatTxErrorIndication OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets transmitted by
        this client."
    ::= { nhrpClientStatEntry 16 }

nhrpClientStatRxErrUnrecognizedExtension OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'Unrecognized Extension'."
    ::= { nhrpClientStatEntry 17 }

nhrpClientStatRxErrLoopDetected OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'NHRP Loop Detected'."
    ::= { nhrpClientStatEntry 18 }

nhrpClientStatRxErrProtoAddrUnreachable OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
```

```
        client with the error code 'Protocol Address Unreachable'."
    ::= { nhrpClientStatEntry 19 }

nhrpClientStatRxErrProtoError OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'Protocol Error'."
    ::= { nhrpClientStatEntry 20 }

nhrpClientStatRxErrSduSizeExceeded OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'NHRP SDU Size Exceeded'."
    ::= { nhrpClientStatEntry 21 }

nhrpClientStatRxErrInvalidExtension OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'Invalid Extension'."
    ::= { nhrpClientStatEntry 22 }

nhrpClientStatRxErrAuthenticationFailure OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'Authentication Failure'."
    ::= { nhrpClientStatEntry 23 }

nhrpClientStatRxErrHopCountExceeded OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        client with the error code 'Hop Count Exceeded'."
    ::= { nhrpClientStatEntry 24 }
```

```
--*********************************************************************
-- NHRP Server Objects
--*********************************************************************

nhrpServerObjects OBJECT IDENTIFIER ::= { nhrpObjects 3 }

--
-- The NHRP Next Hop Server Table
--

nhrpServerTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF NhrpServerEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "This table contains information for a set of NHSes associated
      with this agent."
   ::= { nhrpServerObjects 1 }

nhrpServerEntry OBJECT-TYPE
   SYNTAX      NhrpServerEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "Information about a single NHS."
   INDEX       { nhrpServerIndex }
   ::= { nhrpServerTable 1 }

NhrpServerEntry ::= SEQUENCE {
   nhrpServerIndex               Integer32,
   nhrpServerInternetworkAddrType  NhrpIANAAddrFamily,
   nhrpServerInternetworkAddr      NhrpGenAddr,
   nhrpServerNbmaAddrType          NhrpIANAAddrFamily,
   nhrpServerNbmaAddr              NhrpGenAddr,
   nhrpServerNbmaSubaddr           NhrpGenAddr,
   nhrpServerCurrentClients        Gauge32,
   nhrpServerMaxClients            Integer32,
   nhrpServerRowStatus             RowStatus
}

nhrpServerIndex OBJECT-TYPE
   SYNTAX      Integer32 (1..65535)
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "An identifier for the server that is unique within the
      scope of this agent."
```

```
    ::= { nhrpServerEntry 1 }

nhrpServerInternetworkAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The type of the internetwork layer address of this
        server. This object is used to interpret the value of
        nhrpServerInternetworkAddr."
    ::= { nhrpServerEntry 2 }

nhrpServerInternetworkAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the internetwork layer address of this server."
    ::= { nhrpServerEntry 3 }

nhrpServerNbmaAddrType OBJECT-TYPE
    SYNTAX      NhrpIANAAddrFamily
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The type of the NBMA subnetwork address of this server. This
        object is used to interpret the value of nhrpServerNbmaAddr."
    ::= { nhrpServerEntry 4 }

nhrpServerNbmaAddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the NBMA subnetwork address of this server."
    ::= { nhrpServerEntry 5 }

nhrpServerNbmaSubaddr OBJECT-TYPE
    SYNTAX      NhrpGenAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The value of the NBMA subaddress of this server.
        For NBMA address families without a subaddress
        concept, this will be a zero-length OCTET STRING."
    ::= { nhrpServerEntry 6 }
```

```
nhrpServerCurrentClients OBJECT-TYPE
   SYNTAX      Gauge32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of client currently registered with this server."
   ::= { nhrpServerEntry 7 }

nhrpServerMaxClients OBJECT-TYPE
   SYNTAX      Integer32
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "The administrative maximum number of clients that this server
      will allow to register with it."
   ::= { nhrpServerEntry 8 }

nhrpServerRowStatus OBJECT-TYPE
   SYNTAX      RowStatus
   MAX-ACCESS  read-create
   STATUS      current
   DESCRIPTION
      "An object that allows entries in this table to be created and
      deleted using the RowStatus convention."
   REFERENCE
      "Textual Conventions for Version 2 of the Simple Network
      Management Protocol (SNMPv2), RFC1903."
   ::= { nhrpServerEntry 9 }

--
-- The Server Next Hop Resolution Table
--

nhrpServerNextHopResTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF NhrpServerNextHopResEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "This table extends the Next Host Resolution Cache Table for
      NHSes."
   ::= { nhrpServerObjects 2 }

nhrpServerNextHopResEntry OBJECT-TYPE
   SYNTAX      NhrpServerNextHopResEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
```

```
        "Additional information kept by a NHS for each Next Hop
        Resolution Cache entry."
    INDEX       {   ifIndex,
                    nhrpNextHopResIndex,
                    nhrpNextHopResInternetworkAddrType,
                    nhrpNextHopResDestInternetworkAddr
                }
    ::= { nhrpServerNextHopResTable 1 }

NhrpServerNextHopResEntry ::= SEQUENCE {
    nhrpServerNextHopResAuthoritative   TruthValue,
    nhrpServerNextHopResUniqueness      TruthValue
}

nhrpServerNextHopResAuthoritative OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "An indication of whether this Next Hop Resolution Cache entry
        is authoritative, which means the entry was added because of a
        direct registration request with this server or by Server
        Cache Synchronization Protocol (SCSP) from an authoritative
        source."
    ::= { nhrpServerNextHopResEntry 1 }

nhrpServerNextHopResUniqueness OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The Uniqueness indicator for this Next Hop Resolution Cache
        entry used in duplicate address detection. This value cannot
        be changed after the entry is active."
    ::= { nhrpServerNextHopResEntry 2 }

--
-- The Next Hop Server Statistics Table
--

nhrpServerStatTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NhrpServerStatEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Statistics collected by Next Hop Servers."
    ::= { nhrpServerObjects 3 }
```

```
nhrpServerStatEntry OBJECT-TYPE
   SYNTAX      NhrpServerStatEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
      "Statistics for a particular NHS. The statistics are broken
      into received (Rx), transmitted (Tx) and forwarded (Fw).
      Forwarded (Fw) would be done by a transit NHS."
   INDEX       { nhrpServerIndex }
   ::= { nhrpServerStatTable 1 }

NhrpServerStatEntry ::= SEQUENCE {
   nhrpServerStatRxResolveReq                  Counter32,
   nhrpServerStatTxResolveReplyAck             Counter32,
   nhrpServerStatTxResolveReplyNakProhibited   Counter32,
   nhrpServerStatTxResolveReplyNakInsufResources Counter32,
   nhrpServerStatTxResolveReplyNakNoBinding    Counter32,
   nhrpServerStatTxResolveReplyNakNotUnique    Counter32,

   nhrpServerStatRxRegisterReq                 Counter32,
   nhrpServerStatTxRegisterAck                 Counter32,
   nhrpServerStatTxRegisterNakProhibited       Counter32,
   nhrpServerStatTxRegisterNakInsufResources   Counter32,
   nhrpServerStatTxRegisterNakAlreadyReg       Counter32,

   nhrpServerStatRxPurgeReq                    Counter32,
   nhrpServerStatTxPurgeReq                    Counter32,
   nhrpServerStatRxPurgeReply                  Counter32,
   nhrpServerStatTxPurgeReply                  Counter32,

-- Error Indications
   nhrpServerStatRxErrUnrecognizedExtension    Counter32,
   nhrpServerStatRxErrLoopDetected             Counter32,
   nhrpServerStatRxErrProtoAddrUnreachable     Counter32,
   nhrpServerStatRxErrProtoError               Counter32,
   nhrpServerStatRxErrSduSizeExceeded          Counter32,
   nhrpServerStatRxErrInvalidExtension         Counter32,
   nhrpServerStatRxErrInvalidResReplyReceived  Counter32,
   nhrpServerStatRxErrAuthenticationFailure    Counter32,
   nhrpServerStatRxErrHopCountExceeded         Counter32,

   nhrpServerStatTxErrUnrecognizedExtension    Counter32,
   nhrpServerStatTxErrLoopDetected             Counter32,
   nhrpServerStatTxErrProtoAddrUnreachable     Counter32,
   nhrpServerStatTxErrProtoError               Counter32,
   nhrpServerStatTxErrSduSizeExceeded          Counter32,
   nhrpServerStatTxErrInvalidExtension         Counter32,
```

```
    nhrpServerStatTxErrAuthenticationFailure      Counter32,
    nhrpServerStatTxErrHopCountExceeded           Counter32,

-- Transit NHS statistics
    nhrpServerStatFwResolveReq                    Counter32,
    nhrpServerStatFwResolveReply                  Counter32,
    nhrpServerStatFwRegisterReq                   Counter32,
    nhrpServerStatFwRegisterReply                 Counter32,
    nhrpServerStatFwPurgeReq                      Counter32,
    nhrpServerStatFwPurgeReply                    Counter32,
    nhrpServerStatFwErrorIndication               Counter32
}

nhrpServerStatRxResolveReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Resolution Requests received by this
        server."
    ::= { nhrpServerStatEntry 1 }

nhrpServerStatTxResolveReplyAck OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of positively acknowledged NHRP Resolution Replies
        transmitted by this server."
    ::= { nhrpServerStatEntry 2 }

nhrpServerStatTxResolveReplyNakProhibited OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies transmitted by
        this server with the code 'Administratively Prohibited'."
    ::= { nhrpServerStatEntry 3 }

nhrpServerStatTxResolveReplyNakInsufResources OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies transmitted by
        this server with the code 'Insufficient Resources'."
```

```
    ::= { nhrpServerStatEntry 4 }

nhrpServerStatTxResolveReplyNakNoBinding OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies transmitted by
        this server with the code 'No Internetworking Layer Address to
        NBMA Address Binding Exists'."
    ::= { nhrpServerStatEntry 5 }

nhrpServerStatTxResolveReplyNakNotUnique OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Resolution Replies transmitted by
        this server with the code 'Binding Exists But Is Not Unique'."
    ::= { nhrpServerStatEntry 6 }

nhrpServerStatRxRegisterReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Registration Requests received by this
        server."
    ::= { nhrpServerStatEntry 7 }

nhrpServerStatTxRegisterAck OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of positively acknowledge NHRP Registration
        Replies transmitted by this server."
    ::= { nhrpServerStatEntry 8 }

nhrpServerStatTxRegisterNakProhibited OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NAKed NHRP Registration Replies transmitted by
        this server with the code 'Administratively Prohibited'."
    ::= { nhrpServerStatEntry 9 }
```

```
nhrpServerStatTxRegisterNakInsufResources OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NAKed NHRP Registration Replies transmitted by
      this server with the code 'Insufficient Resources'."
   ::= { nhrpServerStatEntry 10 }

nhrpServerStatTxRegisterNakAlreadyReg OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NAKed NHRP Registration Replies transmitted by
      this server with the code 'Unique Internetworking Layer
      Address Already Registered'."
   ::= { nhrpServerStatEntry 11 }

nhrpServerStatRxPurgeReq OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Purge Requests received by this server."
   ::= { nhrpServerStatEntry 12 }

nhrpServerStatTxPurgeReq OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Purge Requests transmitted by this
      server."
   ::= { nhrpServerStatEntry 13 }

nhrpServerStatRxPurgeReply OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Purge Replies received by this server."
   ::= { nhrpServerStatEntry 14 }

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

```
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Replies transmitted by this server."
    ::= { nhrpServerStatEntry 15 }

nhrpServerStatRxErrUnrecognizedExtension OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Unrecognized Extension'."
    ::= { nhrpServerStatEntry 16 }

nhrpServerStatRxErrLoopDetected OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'NHRP Loop Detected'."
    ::= { nhrpServerStatEntry 17 }

nhrpServerStatRxErrProtoAddrUnreachable OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Protocol Address Unreachable'."
    ::= { nhrpServerStatEntry 18 }

nhrpServerStatRxErrProtoError OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Protocol Error'."
    ::= { nhrpServerStatEntry 19 }

nhrpServerStatRxErrSduSizeExceeded OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
```

```
        server with the error code 'NHRP SDU Size Exceeded'."
    ::= { nhrpServerStatEntry 20 }

nhrpServerStatRxErrInvalidExtension OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Invalid Extension'."
    ::= { nhrpServerStatEntry 21 }

nhrpServerStatRxErrInvalidResReplyReceived OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Invalid Resolution Reply Received'."
    ::= { nhrpServerStatEntry 22 }

nhrpServerStatRxErrAuthenticationFailure OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Authentication Failure'."
    ::= { nhrpServerStatEntry 23 }

nhrpServerStatRxErrHopCountExceeded OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets received by this
        server with the error code 'Hop Count Exceeded'."
    ::= { nhrpServerStatEntry 24 }

nhrpServerStatTxErrUnrecognizedExtension OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets transmitted by
        this server with the error code 'Unrecognized Extension'."
    ::= { nhrpServerStatEntry 25 }
```

```
nhrpServerStatTxErrLoopDetected OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Error Indication packets transmitted by
      this server with the error code 'NHRP Loop Detected'."
   ::= { nhrpServerStatEntry 26 }

nhrpServerStatTxErrProtoAddrUnreachable OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Error Indication packets transmitted by
      this server with the error code 'Protocol Address
      Unreachable'."
   ::= { nhrpServerStatEntry 27 }

nhrpServerStatTxErrProtoError OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Error Indication packets transmitted by
      this server with the error code 'Protocol Error'."
   ::= { nhrpServerStatEntry 28 }

nhrpServerStatTxErrSduSizeExceeded OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Error Indication packets transmitted by
      this server with the error code 'NHRP SDU Size Exceeded'."
   ::= { nhrpServerStatEntry 29 }

nhrpServerStatTxErrInvalidExtension OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
      "The number of NHRP Error Indication packets transmitted by
      this server with the error code 'Invalid Extension'."
   ::= { nhrpServerStatEntry 30 }

nhrpServerStatTxErrAuthenticationFailure OBJECT-TYPE
```

```
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets transmitted by
        this server with the error code 'Authentication Failure'."
    ::= { nhrpServerStatEntry 31 }

nhrpServerStatTxErrHopCountExceeded OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets transmitted by
        this server with the error code 'Hop Count Exceeded'."
    ::= { nhrpServerStatEntry 32 }

nhrpServerStatFwResolveReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Resolution Requests forwarded by this
        server acting as a transit NHS."
    ::= { nhrpServerStatEntry 33 }

nhrpServerStatFwResolveReply OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Resolution Replies forwarded by this
        server acting as a transit NHS."
    ::= { nhrpServerStatEntry 34 }

nhrpServerStatFwRegisterReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Registration Requests forwarded by this
        server acting as a transit NHS."
    ::= { nhrpServerStatEntry 35 }

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

```
    STATUS      current
    DESCRIPTION
        "The number of NHRP Registration Replies forwarded by this
        server acting as a transit NHS."
    ::= { nhrpServerStatEntry 36 }

nhrpServerStatFwPurgeReq OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Requests forwarded by this server
        acting as a transit NHS."
    ::= { nhrpServerStatEntry 37 }

nhrpServerStatFwPurgeReply OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Purge Replies forwarded by this server
        acting as a transit NHS."
    ::= { nhrpServerStatEntry 38 }

nhrpServerStatFwErrorIndication OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of NHRP Error Indication packets forwarded by this
        server acting as a transit NHS."
    ::= { nhrpServerStatEntry 39 }


--*****************************************************************
-- Module Compliance Statement
--*****************************************************************

nhrpConformance OBJECT IDENTIFIER ::= { nhrpMIB 2 }

nhrpCompliances
    OBJECT IDENTIFIER ::= { nhrpConformance 1 }

nhrpGroups
    OBJECT IDENTIFIER ::= { nhrpConformance 2 }

nhrpModuleCompliance MODULE-COMPLIANCE
```

```
        STATUS current
        DESCRIPTION
            "The compliance statement for the NHRP MIB."
        MODULE -- this module
            MANDATORY-GROUPS    { nhrpGeneralGroup }

            GROUP nhrpClientGroup
            DESCRIPTION
                "This group must be supported only by stations that are
                NHRP clients."
            OBJECT  nhrpClientRowStatus
                MIN-ACCESS  read-only
                DESCRIPTION
                    "An agent is not required to allow NHRP client
                    functionality to be started and stopped dynamically."

            GROUP nhrpServerGroup
            DESCRIPTION
                "This group must be supported only by stations that are
                NHRP servers."
            OBJECT  nhrpServerRowStatus
                MIN-ACCESS  read-only
                DESCRIPTION
                    "An agent is not required to allow NHRP server
                    functionality to be started and stopped dynamically."
        ::= { nhrpCompliances 1 }

    nhrpGeneralGroup OBJECT-GROUP
        OBJECTS {
            nhrpNextHopResPrefixLength,
            nhrpNextHopResNextHopInternetworkAddr,
            nhrpNextHopResNbmaAddrType,
            nhrpNextHopResNbmaAddr,
            nhrpNextHopResNbmaSubaddr,
            nhrpNextHopResEntryType,
            nhrpNextHopResEntryState,
            nhrpNextHopResNegotiatedMtu,
            nhrpNextHopResRowStatus
        }
        STATUS    current
        DESCRIPTION
            "Objects that apply to both NHRP clients and NHRP servers."
        ::= { nhrpGroups 1 }

    nhrpClientGroup OBJECT-GROUP
        OBJECTS {
            nhrpClientInternetworkAddrType,
```

```
    nhrpClientInternetworkAddr,
    nhrpClientNbmaAddrType,
    nhrpClientNbmaAddr,
    nhrpClientNbmaSubaddr,
    nhrpClientRegistrationState,
    nhrpClientInitialRequestTimeout,
    nhrpClientRegistrationRequestRetries,
    nhrpClientResolutionRequestRetries,
    nhrpClientPurgeRequestRetries,
    nhrpClientDefaultMtu,
    nhrpClientHoldTime,
    nhrpClientRequestID,
    nhrpClientRowStatus,
    nhrpClientNhsNbmaAddr,
    nhrpClientNhsNbmaSubaddr,
    nhrpClientNhsInUse,
    nhrpClientNhsRowStatus,
    nhrpClientStatTxResolveReq,
    nhrpClientStatRxResolveReplyAck,
    nhrpClientStatRxResolveReplyNakProhibited,
    nhrpClientStatRxResolveReplyNakInsufResources,
    nhrpClientStatRxResolveReplyNakNoBinding,
    nhrpClientStatRxResolveReplyNakNotUnique,
    nhrpClientStatTxRegisterReq,
    nhrpClientStatRxRegisterAck,
    nhrpClientStatRxRegisterNakProhibited,
    nhrpClientStatRxRegisterNakInsufResources,
    nhrpClientStatRxRegisterNakAlreadyReg,
    nhrpClientStatRxPurgeReq,
    nhrpClientStatTxPurgeReq,
    nhrpClientStatRxPurgeReply,
    nhrpClientStatTxPurgeReply,
    nhrpClientStatTxErrorIndication,
    nhrpClientStatRxErrUnrecognizedExtension,
    nhrpClientStatRxErrLoopDetected,
    nhrpClientStatRxErrProtoAddrUnreachable,
    nhrpClientStatRxErrProtoError,
    nhrpClientStatRxErrSduSizeExceeded,
    nhrpClientStatRxErrInvalidExtension,
    nhrpClientStatRxErrAuthenticationFailure,
    nhrpClientStatRxErrHopCountExceeded
}
STATUS    current
DESCRIPTION
    "Objects that apply only to NHRP clients."
::= { nhrpGroups 2 }
```

```
nhrpServerGroup OBJECT-GROUP
   OBJECTS {
      nhrpServerInternetworkAddrType,
      nhrpServerInternetworkAddr,
      nhrpServerNbmaAddrType,
      nhrpServerNbmaAddr,
      nhrpServerNbmaSubaddr,
      nhrpServerCurrentClients,
      nhrpServerMaxClients,
      nhrpServerRowStatus,
      nhrpServerNextHopResAuthoritative,
      nhrpServerNextHopResUniqueness,
      nhrpServerStatRxResolveReq,
      nhrpServerStatTxResolveReplyAck,
      nhrpServerStatTxResolveReplyNakProhibited,
      nhrpServerStatTxResolveReplyNakInsufResources,
      nhrpServerStatTxResolveReplyNakNoBinding,
      nhrpServerStatTxResolveReplyNakNotUnique,
      nhrpServerStatRxRegisterReq,
      nhrpServerStatTxRegisterAck,
      nhrpServerStatTxRegisterNakProhibited,
      nhrpServerStatTxRegisterNakInsufResources,
      nhrpServerStatTxRegisterNakAlreadyReg,
      nhrpServerStatRxPurgeReq,
      nhrpServerStatTxPurgeReq,
      nhrpServerStatRxPurgeReply,
      nhrpServerStatTxPurgeReply,
      nhrpServerStatRxErrUnrecognizedExtension,
      nhrpServerStatRxErrLoopDetected,
      nhrpServerStatRxErrProtoAddrUnreachable,
      nhrpServerStatRxErrProtoError,
      nhrpServerStatRxErrSduSizeExceeded,
      nhrpServerStatRxErrInvalidExtension,
      nhrpServerStatRxErrInvalidResReplyReceived,
      nhrpServerStatRxErrAuthenticationFailure,
      nhrpServerStatRxErrHopCountExceeded,
      nhrpServerStatTxErrUnrecognizedExtension,
      nhrpServerStatTxErrLoopDetected,
      nhrpServerStatTxErrProtoAddrUnreachable,
      nhrpServerStatTxErrProtoError,
      nhrpServerStatTxErrSduSizeExceeded,
      nhrpServerStatTxErrInvalidExtension,
      nhrpServerStatTxErrAuthenticationFailure,
      nhrpServerStatTxErrHopCountExceeded,
      nhrpServerStatFwResolveReq,
      nhrpServerStatFwResolveReply,
      nhrpServerStatFwRegisterReq,
```

```
        nhrpServerStatFwRegisterReply,
        nhrpServerStatFwPurgeReq,
        nhrpServerStatFwPurgeReply,
        nhrpServerStatFwErrorIndication
    }
    STATUS    current
    DESCRIPTION
        "Objects that apply only to NHRP servers."
    ::= { nhrpGroups 3 }

END
```

## 4. Acknowledgments

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## 5. References

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## 6. Security Considerations

Managed Objects which would configure/expose the security portion of the NHRP protocol [1] could result in the NHRP protocol being unsecure and vunerable. In other words, since there is very minimal security provided with SNMPv1, and SNMPv3 is at proposed Standard and is not in wide-spread usage, this MIB document does not contain objects which would jeopardize the security of NHRP. Having such objects configurable/visable through SNMP would defeat the purpose of NHRP's security mechanisms.

The following items/objects may be considered when implementing the security aspects of NHRP. Items denoted as (configurable) are those which would need values. Items denoted as (read-only) are those which may provide relevant information or may be useful in debugging.

1. (configurable) enable/disable security
2. (configurable) SPI (security parameter index).
   Depending upon the implementation,
   there may be multiple SPIs, and these would
   be configurable also. For example, if the
   implementation switched to a different SPI
   after a given time.
3. (configurable) algorithm.
   The HMAC-MD5-128 is the default hash algorithm.
4. (configurable) lifetime value in seconds.
5. (read-only) key.
6. (read-only) list of users who have access
   to the above information.

## 7. Authors' Addresses

James V. Luciani
Bay Networks
3 Federal Street
Mail Stop: BL3-03
Billerica, MA 01821
Phone: (978) 916-4734
Email: luciani@baynetworks.com

Maria Greene
Contractor
Xedia, Corp.
119 Russell Dr.
Littleton, MA 01460
Email: maria@xedia.com

Joan Cucchiara

Bay Networks
3 Federal Street
Mail Stop: BL3-03
Billerica, MA 01821
Phone: (978) 916-8555
Email: joanc@baynetworks.com

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