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

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for the Next Hop Resolution Protocol (NHRP) as defined in RFC 2332.
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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for the Next Hop Resolution Protocol (NHRP) as defined in RFC 2332 [16].

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 RFC 2119 [20].

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2271 [1].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in RFC 1155 [2], RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in RFC 1902 [5], RFC 1903 [6] and RFC 1904 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2272 [11] and RFC 2274 [12].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- A set of fundamental applications described in RFC 2273 [14] and the view-based access control mechanism described in RFC 2275 [15].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically
equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Structure of the MIB

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

3.1. The NHRP General Group

The General Group contains objects that apply to both clients and servers -- in particular the nhrpNextIndex scalar object, the NHRP Next Hop Resolution Cache Table and the NHRP Purge Request Table.

The nhrpNextIndex scalar object is used to provide unique indices for the nhprClientIndex in the nhrpClientTable and the nhprServerIndex in the nhrpServerTable. If used, this object should reduce or eliminate multiple managers creating rows simultaneously in the same table.

3.1.1. The NHRP Next Hop Resolution Cache Table

The NHRP Next Hop Resolution Cache Table represents the internetwork layer address to NBMA address cache that is maintained by both NHRP clients and NHRP servers.

The NHRP Next Hop Resolution Cache Table contains an ifIndex as part of the Index Clause. This ifIndex represents the use of a generic ifIndex, such that the value of this ifIndex SHOULD reflect a specific NBMA subnetwork related interface as determined by an implementation. For example, assuming that the NBMA subnetwork is ATM, then it is up to the implementors of this MIB to determine their own ATM interface layering (assuming compliance with the IF-MIB, RFC 2233 [17] and the ATM-MIB, RFC 2515 [18]. In other words, assuming that the NBMA subnetwork is ATM, the ifIndex in the NHRP Cache Table would represent the ifIndex containing or consisting of the VC (or shortcut) denoted by this Table entry.

3.1.2. The NHRP Purge Request Table

The NHRP Purge Request Table is a way to track Purge Request Information.
3.2. The NHRP Client Group

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

3.2.1. The NHRP Client Table

The NHRP Client Table contains entries for NHRP Next Hop Clients (NHCs) associated with this agent. Each row in the table represents a single NHC. The RequestID used in Registration requests needs to be saved to non-volatile storage. Depending upon the implementation, this may or may not impact how the StorageType is used. For a complete description of how the Registration RequestID is used, see Section 5.2.3 of [16].

3.2.2. The NHRP Client Registration Table

The NHRP Client Registration Table contains information on registration requests which need to be maintained by the Clients. Each entry in this table represents a single registration request. Note: since the NHRP specification does not mandate a refresh algorithm, this table omits refresh information, however, this table does contain information for all the registration requests which need to be maintained by the NHRP Clients.

3.2.3. The NHRP Client NHS Table

The NHRP Client NHS Table contains the NBMA subnetwork addresses of servers configured for use by the client. By default, the agent will add an entry to this table which corresponds to the client’s default router.

3.2.4. The NHRP Client Statistics Table

The NHRP Client Statistics Table contains NHRP statistics maintained by a client. These statistics include counters on requests and replies, as well as counters for errors which are encountered by the Clients.

3.3. The NHRP Server Group

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

The NHRP Server Table contains entries for each server associated with this agent.

3.3.2. The NHRP Server Next Hop Resolution Cache Table

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.

3.3.3. The NHRP Server NHC Table

This table contains information about all the Clients known to the Servers.

3.3.4. The NHRP Server Statistics Table

The NHRP Server Statistics Table contains NHRP statistics maintained by a server. These statistics include counters on requests and replies, as well as counters for errors which are encountered by the Servers.

4. NBMA Next Hop Resolution Protocol MIB Definitions

NHRP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    OBJECT-TYPE, MODULE-IDENTITY, experimental, Integer32,
    Counter32, Unsigned32
    FROM SNMPv2-SMI
    MODULE-COMPLIANCE, OBJECT-GROUP
    FROM SNMPv2-CONF
    TEXTUAL-CONVENTION, TruthValue, RowStatus, StorageType,
    TimeStamp
    FROM SNMPv2-TC
    ifIndex
    FROM IF-MIB
    AddressFamilyNumbers
    FROM IANA-ADDRESS-FAMILY-NUMBERS-MIB

nhrpMIB MODULE-IDENTITY
    LAST-UPDATED "9904191200Z" -- April 19, 1999
    ORGANIZATION "Internetworking Over NBMA (ion) Working Group"
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DESCRIPTION
"This MIB contains managed object definitions for the Next Hop Resolution Protocol, NHRP, as defined in RFC 2332 [16]."

::= { experimental XXX } -- to be assigned

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

NhrpGenAddr ::= TEXTUAL-CONVENTION
STATUS      current
DESCRIPTION
"The value of an internetwork layer or NBMA address."
SYNTAX      OCTET STRING (SIZE (0..64))

nhrpObjects OBJECT IDENTIFIER ::= { nhrpMIB 1 }

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

nhrpGeneralObjects OBJECT IDENTIFIER ::= { nhrpObjects 1 }

-- The following scalar is to be used to
-- provided indices for the
-- nhrpClientTable, and/or the nhrpServerTable.
--

nhrpNextIndex   OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This scalar is used for creating rows in the nhrpClientTable
and the nhrpServerTable.
The value of this variable is a currently unused value
for nhrpClientId and nhrpServerId.

The value returned when reading this variable must be unique
for the NHC’s and NHS’s indices associated with this row. Subsequent attempts to read this variable must return different values.

NOTE: this object exists in the General Group because it is to be used in establishing rows in the nhrpClientTable and the nhrpServerTable. In other words, the value retrieved from this object could become the value of nhrpClientIndex and nhprServerIndex.

In the situation of an agent re-initialization the value of this object must be saved in non-volatile storage.

This variable will return the special value 0 if no new rows can be created."

::= { nhrpGeneralObjects 1 }
INDEX  
{  
nhrpNextHopResInternetworkAddrType,  
nhrpNextHopResDestInternetworkAddr,  
ifIndex,  
nhrpNextHopResIndex  
}  
::= { nhrpNextHopResTable 1 }  

NhrpNextHopResEntry ::= SEQUENCE {  
nhrpNextHopResInternetworkAddrType    AddressFamilyNumbers,  
nhrpNextHopResDestInternetworkAddr    NhrpGenAddr,  
nhrpNextHopResIndex                   Unsigned32,  
nhrpNextHopResPrefixLength            Integer32,  
nhrpNextHopResNextHopInternetworkAddr NhrpGenAddr,  
nhrpNextHopResNbmaAddrType            AddressFamilyNumbers,  
nhrpNextHopResNbmaAddr                 NhrpGenAddr,  
nhrpNextHopResNbmaSubaddr              NhrpGenAddr,  
nhrpNextHopResEntryType                INTEGER,  
nhrpNextHopResEntryStorageType        StorageType,  
nhrpNextHopResEntryHoldingTimeValid    TruthValue,  
nhrpNextHopResEntryHoldingTime         Unsigned32,  
nhrpNextHopResNegotiatedMtu            Integer32,  
nhrpNextHopResPreference               Integer32,  
nhrpNextHopResRowStatus                RowStatus  
}  

nhrpNextHopResInternetworkAddrType OBJECT-TYPE  
SYNTAX AddressFamilyNumbers  
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 1 }  

nhrpNextHopResDestInternetworkAddr OBJECT-TYPE  
SYNTAX NhrpGenAddr  
MAX-ACCESS not-accessible  
STATUS current  
DESCRIPTION  
"The value of the internetwork address of the destination."  
::= { nhrpNextHopResEntry 2 }  

nhrpNextHopResIndex OBJECT-TYPE  
SYNTAX Unsigned32 (1..4294967295)  
MAX-ACCESS not-accessible  
STATUS current
DESCRIPTION
"An identifier for this entry that has local
significance within the scope of the General
Group. This identifier is used here to
uniquely identify this row, and also used
in the 'nhrpPurgeTable' for the value of
the 'nhrpPurgeNextHopResEntryIdentifier'."
::= { nhrpNextHopResEntry 3 }

nhrpNextHopResPrefixLength OBJECT-TYPE
SYNTAX Integer32 (0..255)
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 AddressFamilyNumbers
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 {
    other(1),
    register(2),
    resolveAuthoritative(3),
    resolveNonauthoritative(4),
    transit(5),
    administrativelyAdded(6),
    atmarp(7),
    scsp(8)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "An indication of how this Next Hop Resolution Cache entry was created. The values are:
'other(1)' The entry was added by some other means.
'register(2)' In a server, added based on a client registration.
'resolveAuthoritative(3)' In a client, added based on receiving an Authoritative NHRP Resolution Reply.
'resolveNonauthoritative(4)' In a client, added based on receiving a Nonauthoritative NHRP Resolution Reply.
'transit(5)' In a transit server, added by examining a forwarded NHRP packet.
'administrativelyAdded(6)' In a client or server, manually added by the administrator. The StorageType of this entry is reflected in 'nhrpNextHopResStorageType'.
'atmarp(7)' The entry was added due to an ATMARP.
'scsp(8)' The entry was added due to SCSP."
When the entry is under creation using the
nhrpNextHopResRowStatus column, the only value that can be
specified by the administrator is ‘administrativelyAdded’. Attempting to set any other value will cause an
‘inconsistentValue’ error.

The value cannot be modified once the entry
is active."
::= { nhrpNextHopResEntry 9 }

nhrpNextHopResEntryStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This value only has meaning when the ‘nhrpNextHopResEntryType’
has the value of ‘administrativelyAdded’.

When the row is created due to being ‘administrativelyAdded’
this object reflects whether this row is kept in volatile storage and lost upon reboot or if this row is backed up by
non-volatile or permanent storage.

If the value of ‘nhrpNextHopResEntryType’ has a value which
is not ‘administrativelyAdded, then the value of this object
is ‘other(1)’.’"
DEFVAL { nonVolatile }
 ::= { nhrpNextHopResEntry 10 }

nhrpNextHopResEntryState OBJECT-TYPE
SYNTAX INTEGER {
incomplete(1),
ackReply(2),
nakReply(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.

‘ackReply(2)’ For a client or server, this is a cached
valid mapping.

’nakReply(3)’ For a client or server, this is a cached
NAK mapping."
::= { nhrpNextHopResEntry 11 }

nhrpNextHopResEntryHoldingTimeValid OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"True(1) is returned if the value of
'nhrpNextHopResEntryType' is not
'administrativelyAdded'. Since the
value of 'nhrpNextHopResEntryType' was not
configured by a user, the value of
'nhrpNextHopResEntryHoldingTime' is
considered valid. In other words, the value of
'nhrpNextHopResEntryHoldingTime' represents
the Holding Time for the cache Entry.

If 'nhrpNextHopResEntryType has been configured by a
user, (i.e. the value of 'nhrpNextHopResEntryType' is
'administrativelyAdded') then false (2) will be returned.
This indicates that the value of
'nhrpNextHopResEntryHoldingTime' is undefined because
this row could possibly be backed up in nonvolatile storage."
::= { nhrpNextHopResEntry 12 }

nhrpNextHopResEntryHoldingTime OBJECT-TYPE
SYNTAX      Unsigned32(0..65535)
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"If the value of 'nhrpNextHopResHoldingTimeValid is
ture(1) then this object represents the number
of seconds that the cache entry will remain in this
table. When this value reaches 0 (zero) the row should
be deleted.

If the value of 'nhrpNextHopResHoldingTimeValid is
false(2) then this object is undefined."
::= { nhrpNextHopResEntry 13 }

nhrpNextHopResNegotiatedMtu OBJECT-TYPE
SYNTAX      Integer32 (0..65535)
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 14 }
nhrpNextHopResPreference OBJECT-TYPE
SYNTAX      Integer32 (0..255)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
 "An object which reflects the Preference value of the Client
 Information Entry (CIE).
Zero or more Client Information Entries (CIEs) may be included
 in the NHRP Packet. One of the fields in the CIE
 is the Preference. For a complete description of the CIE,
 refer to Section 5.2.0.1 of RFC 2332 [16]."
REFERENCE
 "Section 5.2.0.1 Mandatory Part Format, RFC 2332 [16]."
::= { nhrpNextHopResEntry 15 }

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), RFC 1903 [6]."
::= { nhrpNextHopResEntry 16 }

--
-- The NHRP Purge Request Table
--

nhrpPurgeReqTable OBJECT-TYPE
SYNTAX      SEQUENCE OF NhrpPurgeReqEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table will track Purge Request Information."
::= { nhrpGeneralObjects 3 }

nhrpPurgeReqEntry OBJECT-TYPE
SYNTAX      NhrpPurgeReqEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "Information regarding a Purge Request."
INDEX       { nhrpPurgeIndex }
::= { nhrpPurgeReqTable 1 }

NhrpPurgeReqEntry ::= SEQUENCE {
nhrpPurgeIndex OBJECT-TYPE
SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An identifier for this entry that has local significance
within the scope of this table."
 ::= { nhrpPurgeReqEntry 1 }

nhrpPurgeNextHopResEntryIdentifier OBJECT-TYPE
SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An identifier for the 'nhrpNextHopResCacheEntry' which
is being purged. This object should have the same value as
'nhrpNextHopResIndex' in the 'nhrpNextHopResTable'."
 ::= { nhrpPurgeReqEntry 2 }

nhrpPurgePrefixLength OBJECT-TYPE
SYNTAX Integer32 (0..255)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"In the case of NHRP Purge Requests, this specifies the
equivalence class of addresses which match the first
'Prefix Length' bit positions of the Client Protocol
Address specified in the Client Information Entry (CIE)."
 ::= { nhrpPurgeReqEntry 3 }

nhrpPurgeRequestID OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Request ID used in the purge request."
 ::= { nhrpPurgeReqEntry 4 }

nhrpPurgeReplyExpected OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An indication of whether this Purge Request has the 'N' Bit cleared (off)."
::= { nhrpPurgeReqEntry 5 }

nhrpPurgeRowStatus 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
::= { nhrpPurgeReqEntry 6 }

--********************************************************************
-- 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                      Unsigned32,
    nhrpClientInternetworkAddrType       AddressFamilyNumbers,
    nhrpClientInternetworkAddr           NhrpGenAddr,
    nhrpClientNbmaAddrType               AddressFamilyNumbers,
    nhrpClientNbmaAddr                   NhrpGenAddr,

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nhrpClientNbmaSubaddr  NhrpGenAddr,
nhrpClientInitialRequestTimeout  Integer32,
nhrpClientRegistrationRequestRetries  Integer32,
nhrpClientResolutionRequestRetries  Integer32,
nhrpClientPurgeRequestRetries  Integer32,
nhrpClientDefaultMtu  Unsigned32,
nhrpClientHoldTime  Unsigned32,
nhrpClientRequestID  Unsigned32,
nhrpClientStorageType  StorageType,
nhrpClientRowStatus  RowStatus

nhrpClientIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An identifier for the NHRP client that is unique within the
scope of this agent. The 'nhrpNextIndex' value should be
consulted (read), prior to creating a row in this table,
and the value returned from reading 'nhrpNextIndex' should be
used as this object's value."
::= { nhrpClientEntry 1 }

nhrpClientInternetworkAddrType OBJECT-TYPE
SYNTAX      AddressFamilyNumbers
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      AddressFamilyNumbers
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 }

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 7 }

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 8 }

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 9 }

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 10 }

nhrpClientDefaultMtu OBJECT-TYPE
SYNTAX Unsigned32 (0..65535)
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 11 }

nhrpClientHoldTime OBJECT-TYPE
SYNTAX Unsigned32 (0..65535)
UNITS "seconds"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The hold time the client will register."
DEFVAL { 900 }
::= { nhrpClientEntry 12 }

nhrpClientRequestID OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Request ID used to register this client with its server. According to Section 5.2.3 of the NHRP Specification, RFC 2332 [16], the Request ID must be kept in non-volatile storage, so that if an NHC crashes and re-initializes, it will use a different Request ID during the registration process when registering with the same NHS."
REFERENCE
"Section 5.2.3 NHRP Registration Request, RFC 2332 [16]."
::= { nhrpClientEntry 13 }
nhrpClientStorageType OBJECT-TYPE
SYNTAX      StorageType
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "This object defines whether this row is kept in volatile storage and lost upon a Client crash or reboot situation, or if this row is backed up by nonvolatile or permanent storage."
DEFVAL      { nonVolatile }
::= { nhrpClientEntry 15 }

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
::= { nhrpClientEntry 16 }

--
-- The NHRP Client Registration Table
--

nhrpClientRegistrationTable OBJECT-TYPE
SYNTAX      SEQUENCE OF NhrpClientRegistrationEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "A table of Registration Request Information that needs to be maintained by the NHCs (clients)."
REFERENCE
  "Section 5.2.3 NHRP Registration Request, RFC 2332 [16]."
::= { nhrpClientObjects 2 }

nhrpClientRegistrationEntry OBJECT-TYPE
SYNTAX      NhrpClientRegistrationEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "An NHC needs to maintain registration request information between the NHC and the NHS. An entry in this table represents information for a single registration request."
INDEX       { nhrpClientIndex,
                       nhrpClientRegIndex
          }
NhrpClientRegistrationEntry ::= SEQUENCE {
    nhrpClientRegIndex          Unsigned32,
    nhrpClientRegUniqueness     INTEGER,
    nhrpClientRegState          INTEGER,
    nhrpClientRegRowStatus      RowStatus
}

nhrpClientRegIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An identifier for this entry such that it identifies a specific Registration Request from the NHC represented by the nhrpClientIndex."
::= { nhrpClientRegistrationEntry 1 }

nhrpClientRegUniqueness OBJECT-TYPE
SYNTAX      INTEGER {
    requestUnique(1),
    requestNotUnique(2)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The Uniqueness indicator for this Registration Request. If this object has the value of requestUnique(1), then the Uniqueness bit is set in the the NHRP Registration Request represented by this row. The value cannot be changed once the row is created."
::= { nhrpClientRegistrationEntry 2 }

nhrpClientRegState  OBJECT-TYPE
SYNTAX      INTEGER {
    other(1),
    registering(2),
    ackRegisterReply(3),
    nakRegisterReply(4)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The registration state of this client. The values are: 'other(1)' The state of the registration request is not one of 'registering', 'ackRegisterReply' or 'nakRegisterReply'.

Expires October 1999
A registration request has been issued and a registration reply is expected.

A positive registration reply has been received.

The client has received a negative registration reply (NAK).

nhrpClientRegRowStatus 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
::= { nhrpClientRegistrationEntry 3 }

--
-- 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 3 }

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                  Unsigned32,
    nhrpClientNhsInternetworkAddrType   AddressFamilyNumbers,
    nhrpClientNhsDestInternetworkAddr   NhrpGenAddr,
}
nhrpClientNhsNbmaAddrType AddressFamilyNumbers,
nhrpClientNhsNbmaAddr NhrpGenAddr,
nhrpClientNhsNbmaSubaddr NhrpGenAddr,
nhrpClientNhsInUse TruthValue,
nhrpClientNhsRowStatus RowStatus

nhrpClientNhsIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An identifier for an NHS available to an NHC."
::= { nhrpClientNhsEntry 1 }

nhrpClientNhsInternetworkAddrType OBJECT-TYPE
SYNTAX      AddressFamilyNumbers
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The type of the internetwork layer address of the
NHRP server represented in this entry. This object
indicates how the value of nhrpClientNhsDestInternetworkAddr
is to be interpreted."
::= { nhrpClientNhsEntry 2 }

nhrpClientNhsDestInternetworkAddr OBJECT-TYPE
SYNTAX      NhrpGenAddr
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The value of the destination internetwork layer address of
the NHRP server represented by this entry. If this value is
not known, this will be a zero-length OCTET STRING."
::= { nhrpClientNhsEntry 3 }

nhrpClientNhsNbmaAddrType OBJECT-TYPE
SYNTAX      AddressFamilyNumbers
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The type of the NBMA subnetwork address of the NHRP Server
represented by this entry. This object indicates how the
values of nhrpClientNhsNbmaAddr and nhrpClientNhsNbmaSubaddr
are to be interpreted."
::= { nhrpClientNhsEntry 4 }

nhrpClientNhsNbmaAddr OBJECT-TYPE
SYNTAX      NhrpGenAddr
MAX-ACCESS  read-create
nhrpClientNhsNbmaSubaddr 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 nhrpClientNhsEntry.nbmaAddrType."
::= { nhrpClientNhsEntry 5 }

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 6 }

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  
::= { nhrpClientNhsEntry 7 }

nhrpClientStatTable OBJECT-TYPE
SYNTAX      SEQUENCE OF NhrpClientStatEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  
"This table contains statistics collected by NHRP clients."
::= { nhrpClientObjects 4 }

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,
    nhrpClientStatDiscontinuityTime               TimeStamp
}

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

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
::= { 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.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
::= { 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
::= { 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
::= { 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
 ::= { 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
 ::= { nhrpClientStatEntry 6 }

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

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Client re-initialization and at
other times as indicated by the value of
nhrpClientStatDiscontinuityTime."
 ::= { nhrpClientStatEntry 7 }

nhrpClientStatRxRegisterAck OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
The number of positively acknowledged NHRP Registration Replies received by this client.

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

::= { 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' .

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

::= { 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' .

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

::= { 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’.

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

::= { nhrpClientStatEntry 11 }

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

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

::= { nhrpClientStatEntry 12 }

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

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

::= { nhrpClientStatEntry 13 }

nhrpClientStatRxPurgeReply OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of NHRP Purge Replies received by this client.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of
nhrpClientStatDiscontinuityTime.
::= { nhrpClientStatEntry 14 }

nhrpClientStatTxPurgeReply OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of NHRP Purge Replies transmitted by this client.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
::= { 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.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Client re-initialization and at other times as indicated by the value of nhrpClientStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at
NHRP Client re-initialization and at other times as indicated by the value of
nhrpClientStatDiscontinuityTime." 
REFERENCE    "Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
 ::= { nhrpClientStatEntry 24 }

nhrpClientStatDiscontinuityTime OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The value of sysUpTime on the most recent occasion at
which any one or more of this Client’s counters
suffered a discontinuity. If no such discontinuities
have occurred since the last re-initialization of the
local management subsystem or the NHRP Client re-initialization
associated with this entry, then this object contains
a zero value."
REFERENCE    "RFC 2233 [17]."
 ::= { nhrpClientStatEntry 25 }

--********************************************************************
--  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                 Unsigned32,
    nhrpServerInternetworkAddrType  AddressFamilyNumbers,
    nhrpServerInternetworkAddr      NhrpGenAddr,
    nhrpServerNbmaAddrType          AddressFamilyNumbers,
    nhrpServerNbmaAddr              NhrpGenAddr,
    nhrpServerNbmaSubaddr           NhrpGenAddr,
    nhrpServerStorageType           StorageType,
    nhrpServerRowStatus             RowStatus
}

nhrpServerIndex OBJECT-TYPE
SYNTAX    Unsigned32 (1..4294967295)
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    AddressFamilyNumbers
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 AddressFamilyNumbers
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 }

nhrpServerStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object defines whether this row is kept in volatile storage and lost upon a Server crash or reboot situation, or if this row is backed up by nonvolatile or permanent storage."
DEFVAL { nonVolatile }
::= { nhrpServerEntry 7 }

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
::= { nhrpServerEntry 8 }
### The Server Next Hop Resolution Table

**nhrpServerNextHopResTable**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SEQUENCE OF NhrpServerNextHopResEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max-Access</td>
<td>not-accessible</td>
</tr>
<tr>
<td>Status</td>
<td>current</td>
</tr>
<tr>
<td>Description</td>
<td>This table extends the Next Hop Resolution Cache Table for NHSes. If the nhrpNextHopResCacheTable has a row added due to an NHS or based on information regarding an NHS then a row is also added in this table. The rows in this table will be created when rows in the nhrpNextHopCacheTable are created. However, there may be rows created in the nhrpNextHopCacheTable which do not have corresponding rows in this table. For example, if the nhrpNextHopResCacheTable has a row added due to a Next Hop Client which is co-resident on the same device as the NHS, a row will not be added to this table.</td>
</tr>
</tbody>
</table>

::= { nhrpServerObjects 2 }

**nhrpServerNextHopResEntry**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>NhrpServerNextHopResEntry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max-Access</td>
<td>not-accessible</td>
</tr>
<tr>
<td>Status</td>
<td>current</td>
</tr>
<tr>
<td>Description</td>
<td>Additional information kept by a NHS for a relevant Next Hop Resolution Cache entry.</td>
</tr>
</tbody>
</table>

INDEX

{ nhrpNextHopResInternetworkAddrType, nhrpNextHopResDestInternetworkAddr, ifIndex, nhrpNextHopResIndex }

::= { nhrpServerNextHopResTable 1 }

**NhrpServerNextHopResEntry**

::= SEQUENCE {
  nhrpServerNextHopResAuthoritative TruthValue,
  nhrpServerNextHopResUniqueness TruthValue
}

**nhrpServerNextHopResAuthoritative**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>TruthValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max-Access</td>
<td>read-only</td>
</tr>
<tr>
<td>Status</td>
<td>current</td>
</tr>
</tbody>
</table>
| Description  | An indication of whether this Next Hop Resolution Cache entry is authoritative, which means the entry was added because of a

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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 NHRP Server->Client Table
--

nhrpServerNhcTable OBJECT-TYPE
SYNTAX      SEQUENCE OF NhrpServerNhcEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A table of NHCs that are available for use by this NHS
(Server)."
REFERENCE
"Section 4 Configuration (Next Hop Servers),
RFC 2332 [16]."
::= { nhrpServerObjects 3 }

nhrpServerNhcEntry OBJECT-TYPE
SYNTAX      NhrpServerNhcEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An NHC that may be used by an NHS."
INDEX       { nhrpServerIndex, nhrpServerNhcIndex }
::= { nhrpServerNhcTable 1 }

NhrpServerNhcEntry ::= SEQUENCE {
  nhrpServerNhcIndex                  Unsigned32,
nhrpServerNhcPrefixLength           Integer32,
nhrpServerNhcInternetworkAddrType   AddressFamilyNumbers,
nhrpServerNhcInternetworkAddr       NhrpGenAddr,
nhrpServerNhcNbmaAddrType           AddressFamilyNumbers,
nhrpServerNhcNbmaAddr               NhrpGenAddr,
nhrpServerNhcNbmaSubaddr            NhrpGenAddr,
nhrpServerNhcInUse                  TruthValue,
nhrpServerNhcRowStatus              RowStatus}
nhrpServerNhcIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  "An identifier for an NHC available to an NHS."
::= { nhrpServerNhcEntry 1 }

nhrpServerNhcPrefixLength OBJECT-TYPE
SYNTAX      Integer32 (0..255)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The number of bits that define the internetwork layer prefix associated with the nhrpServerNhcSrcIternetworkAddr."
::= { nhrpServerNhcEntry 2 }

nhrpServerNhcInternetworkAddrType OBJECT-TYPE
SYNTAX      AddressFamilyNumbers
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The type of the internetwork layer address of the NHRP Client represented in this entry. This object indicates how the value of nhrpServerNhcInternetworkAddr is to be interpreted."
::= { nhrpServerNhcEntry 3 }

nhrpServerNhcInternetworkAddr OBJECT-TYPE
SYNTAX      NhrpGenAddr
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The value of the internetwork layer address of the NHRP Client represented by this entry. If this value is not known, this will be a zero-length OCTET STRING."
::= { nhrpServerNhcEntry 4 }

nhrpServerNhcNbmaAddrType OBJECT-TYPE
SYNTAX      AddressFamilyNumbers
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The type of the NBMA subnetwork address of the NHRP Client represented by this entry. This object indicates how the values of nhrpServerNhcNbmaAddr and nhrpServerNhcNbmaSubaddr are to be interpreted."
::= { nhrpServerNhcEntry 5 }
nhrpServerNhcNbmaAddr OBJECT-TYPE
SYNTAX NhrpGenAddr
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The NBMA subnetwork address of the NHC. The type of the address is indicated by the corresponding value of nhrpServerNbmaAddrType."
::= { nhrpServerNhcEntry 6 }

nhrpServerNhcNbmaSubaddr OBJECT-TYPE
SYNTAX NhrpGenAddr
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The NBMA subaddress of the NHC. For NMBA address families that do not have the concept of subaddress, this will be a zero-length OCTET STRING."
::= { nhrpServerNhcEntry 7 }

nhrpServerNhcInUse OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"An indication of whether this NHC is in use by the NHS."
::= { nhrpServerNhcEntry 8 }

nhrpServerNhcRowStatus 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
::= { nhrpServerNhcEntry 9 }

-- 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."

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::= { nhrpServerObjects 4 }

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,
nhrpServerStatTxErrInvalidResReplyReceived    Counter32,
nhrpServerStatTxErrAuthenticationFailure      Counter32,
nhrpServerStatTxErrHopCountExceeded Counter32,

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

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

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
::= { 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.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
::= { 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'.

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

::= { 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'.

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

::= { 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'.

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

::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of..."
nhrpServerStatDiscontinuityTime.
::= { nhrpServerStatEntry 6 }

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

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
::= { 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.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
::= { 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’.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
::= { 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= ( 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’.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= ( nhrpServerStatEntry 11 )

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

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= ( nhrpServerStatEntry 12 )

nhrpServerStatTxPurgeReq OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of NHRP Purge Requests transmitted by this
server."
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime.

::= { nhrpServerStatEntry 13 }

nhrpServerStatRxPurgeReply OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of NHRP Purge Replies received by this server. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

::= { nhrpServerStatEntry 14 }

nhrpServerStatTxPurgeReply OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of NHRP Purge Replies transmitted by this server. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

::= { 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'. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

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

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REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."  
REFERENCE  
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
REFERENCE
"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
::= { 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'.

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

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

::= { 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’. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

::= { 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’. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

::= { 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’. Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime."

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."
Discontinuities in the value of this counter can occur at re-initialization of the management system, at NHRP Server re-initialization and at other times as indicated by the value of nhrpServerStatDiscontinuityTime.

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

::= { 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'.

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

REFERENCE

"Section 5.2.7 NHRP Error Indication, RFC 2332 [16]."

::= { 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.

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

::= { 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.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= { 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.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= { 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.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= { 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.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, at
NHRP Server re-initialization and at
other times as indicated by the value of
nhrpServerStatDiscontinuityTime."
 ::= { 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.

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

::= { 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.

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

::= { nhrpServerStatEntry 39 }

nhrpServerStatDiscontinuityTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime on the most recent occasion at which any one or more of this Server’s counters suffered a discontinuity. If no such discontinuities have occurred since the last re-initialization of the local management subsystem or the NHRP Server re-initialization associated with this entry, then this object contains a zero value.

REFERENCE
"RFC 2233 [17]."

::= { nhrpServerStatEntry 40 }

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

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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."

GROUP nhrpServerGroup
  DESCRIPTION "This group must be supported only by stations that are NHRP servers."
  ::= { nhrpCompliances 1 }

nhrpGeneralGroup OBJECT-GROUP
  OBJECTS {
    nhrpNextIndex,
    nhrpNextHopResPrefixLength,
    nhrpNextHopResNextHopInternetworkAddr,
    nhrpNextHopResNbmaAddrType,
    nhrpNextHopResNbmaAddr,
    nhrpNextHopResNbmaSubaddr,
    nhrpNextHopResEntryType,
    nhrpNextHopResEntryStorageType,
    nhrpNextHopResEntryState,
    nhrpNextHopResEntryHoldingTimeValid,
    nhrpNextHopResEntryHoldingTime,
    nhrpNextHopResNegotiatedMtu,
    nhrpNextHopResPreference,
    nhrpNextHopResRowStatus,
    nhrPurgeNextHopResEntryIdentifier,
    nhrPurgePrefixLength,
    nhrPurgeRequestID,
    nhrPurgeReplyExpected,
    nhrPurgeRowStatus
  }
  STATUS current
  DESCRIPTION

Expires October 1999
"Objects that apply to both NHRP clients and NHRP servers."
::= { nhrpGroups 1 }

nhrpClientGroup OBJECT-GROUP
OBJECTS {
nhrpClientInternetworkAddrType,
nhrpClientInternetworkAddr,
nhrpClientNbmaAddrType,
nhrpClientNbmaAddr,
nhrpClientNbmaSubaddr,
nhrpClientInitialRequestTimeout,
nhrpClientRegistrationRequestRetries,
nhrpClientResolutionRequestRetries,
nhrpClientPurgeRequestRetries,
nhrpClientDefaultMtu,
nhrpClientHoldTime,
nhrpClientRequestID,
nhrpClientStorageType,
nhrpClientRowStatus,
nhrpClientRegUniqueness,
nhrpClientRegState,
nhrpClientRegRowStatus,
nhrpClientNhsInternetworkAddrType,
nhrpClientNhsDestInternetworkAddr,
nhrpClientNhsNbmaAddrType,
nhrpClientNhsNbmaAddr,
nhrpClientNhsNbmaSubaddr,
nhrpClientNhsInUse,
nhrpClientNhsRowStatus,
nhrpClientStatTxResolveReq,
nhrpClientStatRxResolveReplyAck,
nhrpClientStatRxResolveReplyNakProhibited,
nhrpClientStatRxResolveReplyNakInsufResources,
nhrpClientStatRxResolveReplyNakNoBinding,
nhrpClientStatRxResolveReplyNakNotUnique,
nhrpClientStatTxRegisterReq,
nhrpClientStatRxRegisterAck,
nhrpClientStatRxRegisterNakProhibited,
nhrpClientStatRxRegisterNakInsufResources,
nhrpClientStatRxRegisterNakAlreadyReg,
nhrpClientStatRxPurgeReq,
nhrpClientStatTxPurgeReply,
nhrpClientStatRxPurgeReply,
nhrpClientStatTxErrorIndication,
nhrpClientStatRxErrUnrecognizedExtension,
nhrpClientStatRxErrLoopDetected,
nhrpClientStatRxErrProtoAddrUnreachable,
nhrpClientStatRxErrProtoError,
nhrpClientStatRxErrSduSizeExceeded,
nhrpClientStatRxErrInvalidExtension,
nhrpClientStatRxErrAuthenticationFailure,
nhrpClientStatRxErrHopCountExceeded,
nhrpClientStatDiscontinuityTime

)  

STATUS    current
DESCRIPTION  
"Objects that apply only to NHRP clients."
::= { nhrpGroups 2 }

nhrpServerGroup OBJECT-GROUP
OBJECTS {
  nhrpServerInternetworkAddrType,
nhrpServerInternetworkAddr,
nhrpServerNbmaAddrType,
nhrpServerNbmaAddr,
nhrpServerNbmaSubaddr,
nhrpServerStorageType,
nhrpServerRowStatus,
nhrpServerNextHopResAuthoritative,
nhrpServerNextHopResUniqueness,
nhrpServerNhcPrefixLength,
nhrpServerNhcInternetworkAddrType,
nhrpServerNhcInternetworkAddr,
nhrpServerNhcNbmaAddrType,
nhrpServerNhcNbmaAddr,
nhrpServerNhcNbmaSubaddr,
nhrpServerNhcInUse,
nhrpServerNhcRowStatus,
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,  
nhrpServerStatDiscontinuityTime
}

STATUS current

DESCRIPTION

"Objects that apply only to NHRP servers."

::= { nhrpGroups 3 }
5. IANA Considerations

The Internet Assigned Numbers Authority (IANA) has been and continues to be responsible for maintaining the ADDRESS FAMILY NUMBERS (http://www.isi.edu/in-notes/iana/assignments/address-family-numbers) name space assignments. The request made here is for the IANA to place this list in a MIB module, such that it may be imported into other MIBs. The motivation for doing this is to allow MIBs to not have to change when a new assignment is made to the ADDRESS FAMILY NUMBERS. This is very similar to the motivation behind the IANAifType-MIB.

An example of what the MIB would look like is included in this document.

Any additions or changes to the list of ADDRESS FAMILY NUMBERS registered via IANA will be done as they have in the past and this document does not propose any changes to the ADDRESS FAMILY NUMBERS other than to place them into a MIB, of which an example is given in this document (see IANA Address Family Numbers MIB).

6. Security

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

The NHRP Protocol, RFC 2332 [16], Section 5.2.4.4 discusses security. There is an authentication option which should be utilized to authenticate the source and also provide data integrity to the NHRP payload. This MIB does not contain any managed objects which configure or expose security information such as that needed for NHRP authentication or data integrity.

The following items were deemed to jeopardize security and thus, were NOT added to this MIB. Items denoted as (configurable) are those which would need values. Items denoted as (read-only) are those which would provide information. Although the NHRP Protocol [16], requires or has this information, exposing it in a MIB would jeopardize the entire NBMA domain where NHRP was being used. Therefore, these items have been omitted from the MIB.

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. Intellectual Property

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8. Acknowledgments

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9. References


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12. IANA Address Family Numbers MIB

This appendix defines the initial content of the IANA-ADDRESS-FAMILY-NUMBERS-MIB. This section should be removed from this document prior to its approval, at which time this MIB will be administered by IANA.

The branch for this MIB needs to be determined, and an appropriate number should be added where XXX is currently.

IANA-ADDRESS-FAMILY-NUMBERS-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, mib-2 FROM SNMPv2-SMI
   TEXTUAL-CONVENTION FROM SNMPv2-TC;

ianaAddressFamilyNumbers MODULE-IDENTITY
   LAST-UPDATED "9904191200Z"
   ORGANIZATION "IANA"
   CONTACT-INFO
      "Postal: Internet Assigned Numbers Authority
       USC/Information Sciences Institute
       4676 Admiralty Way
       Marina del Rey, CA 90292-6695
       USA
       Tel: +1  310-822-1511
       E-Mail: iana@isi.edu"

   DESCRIPTION
      "The MIB module defines the AddressFamilyNumbers textual convention."
   ::= { mib-2 XXX } -- to be assigned

AddressFamilyNumbers ::= TEXTUAL-CONVENTION
   STATUS current

Expires October 1999
DESCRIPTION

"The definition of this textual convention with the
addition of newly assigned values is published
periodically by the IANA, in either the Assigned
Numbers RFC, or some derivative of it specific to
Internet Network Management number assignments. (The
latest arrangements can be obtained by contacting the
IANA.)

The enumerations are described as:

other(0), -- none of the following
ipV4(1), -- IP Version 4
ipV6(2), -- IP Version 6
nsap(3), -- NSAP
hdlc(4), -- (8-bit multidrop)
bbn1822(5),
all802(6), -- (includes all 802 media
--   plus Ethernet 'canonical format')
e163(7),
e164(8), -- (SMDS, Frame Relay, ATM)
f69(9), -- (Telex)
x121(10), -- (X.25, Frame Relay)
ipx(11), -- IPX (Internet Protocol Exchange)
appletalk(12), -- Apple Talk
decnetIV(13), -- DEC Net Phase IV
banyanVines(14), -- Banyan Vines
e164withNsap(15),
   -- (E.164 with NSAP format subaddress)

reserved(65535)

Requests for new values should be made to IANA via
email (iana@isi.edu)."

SYNTAX  INTEGER {

other(0),
ipV4(1),
ipV6(2),
nsap(3),
hdlc(4),
bbn1822(5),
all802(6),
e163(7),
e164(8),
f69(9),
x121(10),
ipx(11),
appletalk(12),
decnetIV(13),
banyanVines(14),
e164withNsap(15),
reserved(65535)