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Definitions of Managed Objects for Network Time Protocol Version 4 (NTPv4)

Abstract

The Network Time Protocol (NTP) is used in networks of all types and sizes for time synchronization of servers, workstations, and other networked equipment. As time synchronization is more and more a mission-critical service, standardized means for monitoring and management of this subsystem of a networked host are required to allow operators of such a service to set up a monitoring system that is platform- and vendor-independent. This document provides a standardized collection of data objects for monitoring the NTP entity of such a network participant and it is part of the NTP version 4 standardization effort.

5Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

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1. Introduction

The NTPv4 MIB module is designed to allow Simple Network Management Protocol (SNMP) to be used to monitor and manage local NTP [RFC5905] entities. It provides a collection of data objects that can be queried using the SNMP protocol and represent the current status of the NTP entity. This includes general information about the NTP entity itself (vendor, product, version) as well as connectivity to upstream NTP servers used as sources of reference time and to hardware reference clocks like radio clocks. The most important values are included in order to be able to detect failures before they can have an impact on the overall time synchronization status of the network. There are also a collection of notification objects to inform about state changes in the NTP entity. There are objects to control these notifications as well.

2. Conventions Used in This Document

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

3. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

4. Technical Description

The NTPv4 MIB module is divided into sections for general server information, current NTP entity status, status information of all mobilized associations (e.g., unicast upstream time servers, multicast or broadcast, time references, and hardware clocks), NTP entity control objects, NTP objects used only for notifications, as well as SNMP notification definitions for core events.

The general server information section contains static information and can be queried to identify which NTP implementation is running on a host. This includes the vendor and product name of the running NTP software as well as version information, hardware/os platform identity, and the time resolution of the underlying OS.

Section 2 (current NTP status) includes data objects that represent the current operational status of the NTP entity.

The third section contains data objects that represent the set of time references ("associations") with which the NTP entity is currently working.

The fourth section contains objects that can be used to control the NTP entity. The currently defined objects control how often the heartbeat interval notification is sent out and which notifications are enabled.

The fifth section contains objects that are only used as varbinds in notifications. There is currently only one object in this section -- a message that adds a cleartext event message to notifications.

Certain important events can occur while the NTP entity is running. The notification section defines SNMP notifications for a collection of the most important ones ("core events") and additionally provides a heartbeat notification as well as a test notification to allow management systems to test the reception of NTP-related notifications as well as enable heartbeat-based monitoring systems to assure that the NTP entity is still up and running.

Some values are included both in numeric and in human-readable (string) format. This has been done to simplify the representation of a status information. If the two representations of a certain value differ, the numeric representation takes precedence.

5. MIB Definition

```
-- *****
--
--   The Network Time Protocol Version 4
--   Management Information Base (MIB)
--
--   Authors: Heiko Gerstung (heiko.gerstung@meinberg.de)
--            Chris Elliott (chelliot@pobox.com)
--
--   for the Internet Engineering Task Force (IETF)
--   NTP Working Group (ntpwg)
--
-- *****
--   Rev 1.00
--       Published as RFC 5907
--
-- *****
```

NTPv4-MIB DEFINITIONS ::= BEGIN

IMPORTS

```
MODULE-IDENTITY, OBJECT-TYPE , mib-2, Integer32, NOTIFICATION-TYPE,
Unsigned32, Counter32, TimeTicks
    FROM SNMPv2-SMI -- RFC 2578
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
    FROM SNMPv2-CONF -- RFC 2580
DisplayString, TEXTUAL-CONVENTION
    FROM SNMPv2-TC -- RFC 2579
```

InetAddressType, InetAddress
FROM INET-ADDRESS-MIB -- RFC 4001
Utf8String
FROM SYSAPPL-MIB; -- RFC 2287

ntpSnmpMIB MODULE-IDENTITY

LAST-UPDATED "201005170000Z" -- May 17, 2010
ORGANIZATION "The IETF NTP Working Group (ntpwg)"
CONTACT-INFO

"
WG Email: ntpwg@lists.ntp.isc.org
Subscribe:
<https://lists.ntp.isc.org/mailman/listinfo/ntpwg>

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DESCRIPTION

"The Management Information Base for NTP time entities.

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(<http://trustee.ietf.org/license-info>)."

REVISION "201005170000Z"

DESCRIPTION

"This revision of the MIB module is published as RFC 5907."

::= { mib-2 197 }

ntpSnmpMIBObjects OBJECT IDENTIFIER ::= { ntpSnmpMIB 1 }

-- MIB contains 6 groups

ntpEntInfo OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 1 }
ntpEntStatus OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 2 }
ntpAssociation OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 3 }
ntpEntControl OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 4 }
ntpEntNotifObjects OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 5 }

--

-- Textual Conventions

--

NtpStratum ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The NTP stratum, with 16 representing no stratum."

SYNTAX Unsigned32 (1..16)

NtpDateTime ::= TEXTUAL-CONVENTION

DISPLAY-HINT "4d:4d:4d.4d"

STATUS current

DESCRIPTION

"NTP date/time on the device, in 128-bit
NTP date format. If time is not synchronized, this
field shall be a zero-length string."

This trusted certificate (TC) is not to be used for objects
that are used to set the time of the node querying this
object. NTP should be used for this -- or at least SNTP."

REFERENCE "RFC 5905, section 6"

SYNTAX OCTET STRING (SIZE (0 | 16))

--

-- Section 1: General NTP Entity information objects

--

(relatively static information)

--

ntpEntSoftwareName OBJECT-TYPE

SYNTAX Utf8String

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The product name of the running NTP version, e.g., 'ntpd'."

::= { ntpEntInfo 1 }

ntpEntSoftwareVersion OBJECT-TYPE

SYNTAX Utf8String

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The software version of the installed NTP implementation
as a full version string, e.g., 'ntpd-4.2.0b@1.1433 ...'."

::= { ntpEntInfo 2 }

ntpEntSoftwareVendor OBJECT-TYPE

SYNTAX Utf8String

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The vendor/author of the installed NTP version."

::= { ntpEntInfo 3 }

ntpEntSystemType OBJECT-TYPE

SYNTAX Utf8String

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"General hardware/os platform information,
e.g., 'Linux 2.6.12 / x86'."

-- freely configurable, default is OS Version / Hardware platform

::= { ntpEntInfo 4 }

ntpEntTimeResolution OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time resolution in integer format, where the resolution
is represented as divisions of a second, e.g., a value of 1000
translates to 1.0 ms."

::= { ntpEntInfo 5 }

ntpEntTimePrecision OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The entity's precision in integer format, shows the precision.
A value of -5 would mean $2^{-5} = 31.25$ ms."

::= { ntpEntInfo 6 }

ntpEntTimeDistance OBJECT-TYPE

SYNTAX DisplayString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The distance from this NTP entity to the root time reference
(stratum 0) source including the unit, e.g., '13.243 ms'."

::= { ntpEntInfo 7 }

--

-- Section 2: Current NTP status (dynamic information)

--

ntpEntStatusCurrentMode OBJECT-TYPE

SYNTAX INTEGER {

notRunning(1),
notSynchronized(2),
noneConfigured(3),
syncToLocal(4),
syncToRefclock(5),
syncToRemoteServer(6),
unknown(99)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current mode of the NTP. The definition of each possible
value is:

notRunning(1) - NTP is not running.

notSynchronized(2) - NTP is not synchronized to any time
source (stratum = 16).

noneConfigured(3) - NTP is not synchronized and does not
have a reference configured
(stratum = 16).

syncToLocal(4) - NTP is distributing time based on its
local clock (degraded accuracy and/or
reliability).

syncToRefclock(5) - NTP is synchronized to a local
hardware refclock (e.g., GPS).

syncToRemoteServer(6) - NTP is synchronized to a remote
NTP server ('upstream' server).

unknown(99) - The state of NTP is unknown."

::= { ntpEntStatus 1 }

ntpEntStatusStratum OBJECT-TYPE

SYNTAX NtpStratum

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The NTP entity's own stratum value. Should be a stratum of
syspeer + 1 (or 16 if no syspeer)."

::= { ntpEntStatus 2 }

ntpEntStatusActiveRefSourceId OBJECT-TYPE

SYNTAX Unsigned32 (0..99999)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The association ID of the current syspeer."

::= { ntpEntStatus 3 }

ntpEntStatusActiveRefSourceName OBJECT-TYPE

SYNTAX Utf8String

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The hostname/descriptive name of the current reference source
selected as syspeer, e.g., 'ntp1.ptb.de' or 'GPS' or
'DCFi', ..."

::= { ntpEntStatus 4 }

ntpEntStatusActiveOffset OBJECT-TYPE

SYNTAX DisplayString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The time offset to the current selected reference time source
as a string including unit, e.g., '0.032 ms' or '1.232 s'."

::= { ntpEntStatus 5 }

ntpEntStatusNumberOfRefSources OBJECT-TYPE

SYNTAX Unsigned32 (0..99)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of reference sources configured for NTP."

::= { ntpEntStatus 6 }

ntpEntStatusDispersion OBJECT-TYPE

SYNTAX DisplayString

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The root dispersion of the running NTP entity, e.g., '6.927'."
 ::= { ntpEntStatus 7 }

ntpEntStatusEntityUptime OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The uptime of the NTP entity, (i.e., the time since ntpd was (re-)initialized not sysUptime!). The time is represented in hundreds of seconds since Jan 1, 1970 (00:00:00.000) UTC."
 ::= { ntpEntStatus 8 }

ntpEntStatusDateTime OBJECT-TYPE

SYNTAX NtpDateTime

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current NTP date/time on the device, in 128-bit NTP date format. If time is not synchronized, this field shall be a zero-length string.

This object can be used to timestamp events on this node and allow a management station to correlate different time objects. For example, a management station could query this object and sysUptime in the same operation to be able to relate sysUptime to NTP time.

This object is not to be used to set the time of the node querying this object. NTP should be used for this -- or at least SNTP."

REFERENCE "RFC 5905, section 6"

::= { ntpEntStatus 9 }

ntpEntStatusLeapSecond OBJECT-TYPE

SYNTAX NtpDateTime

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Date the next known leap second will occur. If there is no leap second announced, then this object should be 0."
 ::= { ntpEntStatus 10 }

ntpEntStatusLeapSecDirection OBJECT-TYPE

SYNTAX Integer32 (-1..1)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Direction of next known leap second. If there is no leap second announced, then this object should be 0."

::= { ntpEntStatus 11 }

ntpEntStatusInPkts OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages delivered to the NTP entity from the transport service. Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatus 12 }

ntpEntStatusOutPkts OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages delivered to the transport service by this NTP entity. Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatus 13 }

ntpEntStatusBadVersion OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages that were delivered to this NTP entity and were for an unsupported NTP version."

Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatus 14 }

ntpEntStatusProtocolError OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages that were delivered to this NTP entity and this entity was not able to process due to an NTP protocol error.

Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatus 15 }

ntpEntStatusNotifications OBJECT-TYPE

SYNTAX Counter32

UNITS "notifications"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of SNMP notifications that this NTP entity has generated.

Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatus 16 }

ntpEntStatPktModeTable OBJECT-TYPE

SYNTAX SEQUENCE OF NtpEntStatPktModeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The number of packets sent and received by packet mode. One entry per packet mode."

::= { ntpEntStatus 17 }

ntpEntStatPktModeEntry OBJECT-TYPE

SYNTAX NtpEntStatPktModeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A statistical record of the number of packets sent and received for each packet mode."

INDEX { ntpEntStatPktMode }
 ::= { ntpEntStatPktModeTable 1 }

NtpEntStatPktModeEntry ::= SEQUENCE {
 ntpEntStatPktMode INTEGER,
 ntpEntStatPktSent Counter32,
 ntpEntStatPktReceived Counter32
 }

ntpEntStatPktMode OBJECT-TYPE

SYNTAX INTEGER {
 symetricactive(1),
 symetricpassive(2),
 client(3),
 server(4),
 broadcastserver(5),
 broadcastclient(6)
 }

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The NTP packet mode."

::= { ntpEntStatPktModeEntry 1 }

ntpEntStatPktSent OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of NTP packets sent with this packet mode. Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

::= { ntpEntStatPktModeEntry 2 }

ntpEntStatPktReceived OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of NTP packets received with this packet mode."

Discountinuties in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuties in the value of sysUpTime."

```
::= { ntpEntStatPktModeEntry 3 }
```

```
--
-- Section 3: The status of all currently mobilized associations
--
```

```
ntpAssociationTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF NtpAssociationEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The table of currently mobilized associations."
    ::= { ntpAssociation 1 }
```

```
ntpAssociationEntry OBJECT-TYPE
    SYNTAX          NtpAssociationEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The table entry of currently mobilized associations."
    INDEX          { ntpAssocId }
    ::= { ntpAssociationTable 1 }
```

```
NtpAssociationEntry ::= SEQUENCE {
    ntpAssocId      Unsigned32,
    ntpAssocName    Utf8String,
    ntpAssocRefId   DisplayString,
    ntpAssocAddressType InetAddressType,
    ntpAssocAddress InetAddress,
    ntpAssocOffset  DisplayString,
    ntpAssocStratum NtpStratum,
    ntpAssocStatusJitter DisplayString,
    ntpAssocStatusDelay DisplayString,
    ntpAssocStatusDispersion DisplayString
}
```

```
ntpAssocId OBJECT-TYPE
    SYNTAX      Unsigned32 ( 1..99999 )
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The association ID. This is an internal, unique ID."
    ::= { ntpAssociationEntry 1 }
```

ntpAssocName **OBJECT-TYPE**
SYNTAX Utf8String
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The hostname or other descriptive name for the association."
 ::= { ntpAssociationEntry 2 }

ntpAssocRefId **OBJECT-TYPE**
SYNTAX DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The refclock driver ID, if available."
 -- a refclock driver ID like "127.127.1.0" for non
 -- uni/multi/broadcast associations
 ::= { ntpAssociationEntry 3 }

ntpAssocAddressType **OBJECT-TYPE**
SYNTAX InetAddressType { ipv4(1), ipv6(2), ipv4z(3), ipv6z(4) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The type of address of the association. Can be either IPv4 or
 IPv6 (both with or without zone index) and contains the type of
 address for unicast, multicast, and broadcast associations."
 ::= { ntpAssociationEntry 4 }

ntpAssocAddress **OBJECT-TYPE**
SYNTAX InetAddress (SIZE (4|8|16|20))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The IP address (IPv4 or IPv6, with or without zone index) of
 the association. The type and size depends on the
 ntpAssocAddressType object. Represents the IP address of a
 uni/multi/broadcast association."
 ::= { ntpAssociationEntry 5 }

ntpAssocOffset **OBJECT-TYPE**
SYNTAX DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The time offset to the association as a string."
 -- including unit, e.g., "0.032 ms" or "1.232 s"
 ::= { ntpAssociationEntry 6 }

ntpAssocStratum OBJECT-TYPE
SYNTAX NtpStratum
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The association stratum value."
 ::= { ntpAssociationEntry 7 }

ntpAssocStatusJitter OBJECT-TYPE
SYNTAX DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The jitter in milliseconds as a string."
 ::= { ntpAssociationEntry 8 }

ntpAssocStatusDelay OBJECT-TYPE
SYNTAX DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The network delay in milliseconds as a string."
 ::= { ntpAssociationEntry 9 }

ntpAssocStatusDispersion OBJECT-TYPE
SYNTAX DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The root dispersion of the association."
 -- e.g., "6.927"
 ::= { ntpAssociationEntry 10 }

ntpAssociationStatisticsTable OBJECT-TYPE
SYNTAX SEQUENCE OF NtpAssociationStatisticsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "The table of statistics for current associations."
 ::= { ntpAssociation 2 }

ntpAssociationStatisticsEntry OBJECT-TYPE
SYNTAX NtpAssociationStatisticsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "The table entry of statistics for current associations."
INDEX { ntpAssocId }


```
::= { ntpAssociationStatisticsTable 1 }
```

```
NtpAssociationStatisticsEntry ::= SEQUENCE {  
    ntpAssocStatInPkts      Counter32,  
    ntpAssocStatOutPkts     Counter32,  
    ntpAssocStatProtocolError Counter32  
}
```

ntpAssocStatInPkts OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages delivered to the NTP entity from this association. Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

```
::= { ntpAssociationStatisticsEntry 1 }
```

ntpAssocStatOutPkts OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages delivered to the transport service by this NTP entity for this association. Discontinuities in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuities in the value of sysUpTime."

```
::= { ntpAssociationStatisticsEntry 2 }
```

ntpAssocStatProtocolError OBJECT-TYPE

SYNTAX Counter32

UNITS "packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of NTP messages that were delivered to this NTP entity from this association and this entity was not able to process due to an NTP protocol error."

Discountinuties in the value of this counter can occur upon cold start or reinitialization of the NTP entity, the management system and at other times as indicated by discontinuties in the value of sysUpTime."

```
::= { ntpAssociationStatisticsEntry 3 }
```

```
--
```

```
-- Section 4: Control objects
```

```
--
```

```
ntpEntHeartbeatInterval OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
UNITS       "seconds"
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"The interval at which the ntpEntNotifHeartbeat notification should be sent, in seconds. If set to 0 and the entNotifHeartbeat bit in ntpEntNotifBits is 1, then ntpEntNotifHeartbeat is sent once.

This value is stored persistently and will be restored to its last set value upon cold start or restart."

```
DEFVAL { 60 }
```

```
::= { ntpEntControl 1 }
```

```
ntpEntNotifBits OBJECT-TYPE
```

```
SYNTAX      BITS {
```

```
    notUsed(0), -- Used to sync up bit and notification
                -- indices
```

```
    entNotifModeChange(1),
    entNotifStratumChange(2),
    entNotifSyspeerChanged(3),
    entNotifAddAssociation(4),
    entNotifRemoveAssociation(5),
    entNotifConfigChanged(6),
    entNotifLeapSecondAnnounced(7),
    entNotifHeartbeat(8)
```

```
}
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"A bit for each notification. A 1 for a particular bit enables that particular notification, a 0 disables it.

This value is stored persistently and will be restored to its last set value upon cold start or restart."

```
::= { ntpEntControl 2 }
```

```
--
-- Section 5: Notification objects
--

ntpEntNotifMessage OBJECT-TYPE
    SYNTAX      Utf8String
    MAX-ACCESS   accessible-for-notify
    STATUS       current
    DESCRIPTION
        "Used as a payload object for all notifications. Holds a
         clear text event message."
    DEFVAL { "no event" }
    ::= { ntpEntNotifObjects 1 }

--
-- SNMP notification definitions
--

ntpEntNotifications OBJECT IDENTIFIER ::= { ntpSnmpMIB 0 }

ntpEntNotifModeChange NOTIFICATION-TYPE
    OBJECTS      { ntpEntStatusCurrentMode }
    STATUS       current
    DESCRIPTION
        "The notification to be sent when the NTP entity changes mode,
         including starting and stopping (if possible)."
    ::= { ntpEntNotifications 1 }

ntpEntNotifStratumChange NOTIFICATION-TYPE
    OBJECTS      { ntpEntStatusDateTime, ntpEntStatusStratum,
                  ntpEntNotifMessage }
    STATUS       current
    DESCRIPTION
        "The notification to be sent when stratum level of NTP changes."
    ::= { ntpEntNotifications 2 }

ntpEntNotifSyspeerChanged NOTIFICATION-TYPE
    OBJECTS      { ntpEntStatusDateTime, ntpEntStatusActiveRefSourceId,
                  ntpEntNotifMessage }
    STATUS       current
    DESCRIPTION
        "The notification to be sent when a (new) syspeer has been
         selected."
    ::= { ntpEntNotifications 3 }

ntpEntNotifAddAssociation NOTIFICATION-TYPE
    OBJECTS      { ntpEntStatusDateTime, ntpAssocName, ntpEntNotifMessage }
    STATUS       current
```

DESCRIPTION

"The notification to be sent when a new association is mobilized."

::= { ntpEntNotifications 4 }

ntpEntNotifRemoveAssociation NOTIFICATION-TYPE

OBJECTS { ntpEntStatusDateTime, ntpAssocName, ntpEntNotifMessage }

STATUS current

DESCRIPTION

"The notification to be sent when an association is demobilized."

::= { ntpEntNotifications 5 }

ntpEntNotifConfigChanged NOTIFICATION-TYPE

OBJECTS { ntpEntStatusDateTime, ntpEntNotifMessage }

STATUS current

DESCRIPTION

"The notification to be sent when the NTP configuration has changed, e.g., when the system connected to the Internet and was assigned a new IP address by the ISPs DHCP server."

::= { ntpEntNotifications 6 }

ntpEntNotifLeapSecondAnnounced NOTIFICATION-TYPE

OBJECTS { ntpEntStatusDateTime, ntpEntNotifMessage }

STATUS current

DESCRIPTION

"The notification to be sent when a leap second has been announced."

::= { ntpEntNotifications 7 }

ntpEntNotifHeartbeat NOTIFICATION-TYPE

OBJECTS { ntpEntStatusDateTime, ntpEntStatusCurrentMode, ntpEntHeartbeatInterval, ntpEntNotifMessage }

STATUS current

DESCRIPTION

"The notification to be sent periodically (as defined by ntpEntHeartbeatInterval) to indicate that the NTP entity is still alive."

::= { ntpEntNotifications 8 }

--

-- Conformance/Compliance statements

--

ntpEntConformance OBJECT IDENTIFIER ::= { ntpSnmplib 2 }

ntpEntCompliances OBJECT IDENTIFIER ::= { ntpEntConformance 1 }

ntpEntGroups OBJECT IDENTIFIER ::= { ntpEntConformance 2 }

```
ntpEntNTPCompliance MODULE-COMPLIANCE
  STATUS      current
  DESCRIPTION
    "The compliance statement for SNMP entities that use NTP and
    implement the NTP MIB."
  MODULE -- this module
    MANDATORY-GROUPS {
      ntpEntObjectsGroup1
    }
  ::= { ntpEntCompliances 1 }

ntpEntSNTPCompliance MODULE-COMPLIANCE
  STATUS      current
  DESCRIPTION
    "The compliance statement for SNMP entities that use SNTP and
    implement the NTP MIB."
  MODULE -- this module
    MANDATORY-GROUPS {
      ntpEntObjectsGroup1
    }
    GROUP ntpEntObjectsGroup2
    DESCRIPTION
      "Optional object group."
    GROUP ntpEntNotifGroup
    DESCRIPTION
      "Optional notifications for this MIB."
  ::= { ntpEntCompliances 2 }

ntpEntObjectsGroup1 OBJECT-GROUP
  OBJECTS {
    ntpEntSoftwareName,
    ntpEntSoftwareVersion,
    ntpEntSoftwareVendor,
    ntpEntSystemType,
    ntpEntStatusEntityUptime,
    ntpEntStatusDateTime,
    ntpAssocName,
    ntpAssocRefId,
    ntpAssocAddressType,
    ntpAssocAddress
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects for the NTP MIB."
  ::= { ntpEntGroups 1 }

ntpEntObjectsGroup2 OBJECT-GROUP
  OBJECTS {
```

```

    ntpEntTimeResolution,
    ntpEntTimePrecision,
    ntpEntTimeDistance,
    ntpEntStatusCurrentMode,
    ntpEntStatusStratum,
    ntpEntStatusActiveRefSourceId,
    ntpEntStatusActiveRefSourceName,
    ntpEntStatusActiveOffset,
    ntpEntStatusNumberOfRefSources,
    ntpEntStatusDispersion,
    ntpEntStatusLeapSecond,
    ntpEntStatusLeapSecDirection,
    ntpEntStatusInPkts,
    ntpEntStatusOutPkts,
    ntpEntStatusBadVersion,
    ntpEntStatusProtocolError,
    ntpEntStatusNotifications,
    ntpEntStatPktSent,
    ntpEntStatPktReceived,
    ntpAssocOffset,
    ntpAssocStratum,
    ntpAssocStatusJitter,
    ntpAssocStatusDelay,
    ntpAssocStatusDispersion,
    ntpAssocStatInPkts,
    ntpAssocStatOutPkts,
    ntpAssocStatProtocolError,
    ntpEntHeartbeatInterval,
    ntpEntNotifBits,
    ntpEntNotifMessage
}
STATUS      current
DESCRIPTION
    "A collection of objects for the NTP MIB."
 ::= { ntpEntGroups 2 }

```

```

ntpEntNotifGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        ntpEntNotifModeChange,
        ntpEntNotifStratumChange,
        ntpEntNotifSyspeerChanged,
        ntpEntNotifAddAssociation,
        ntpEntNotifRemoveAssociation,
        ntpEntNotifConfigChanged,
        ntpEntNotifLeapSecondAnnounced,
        ntpEntNotifHeartbeat
    }
STATUS      current

```

DESCRIPTION

"A collection of notifications for the NTP MIB"
 ::= { ntpEntGroups 3 }

END**6. IANA Considerations**

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

Descriptor -----	OBJECT IDENTIFIER value -----
ntpSnmp	{ mib-2 197 }

7. Security Considerations

There are currently two management objects defined in this MIB module with 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. These are the objects and their sensitivity/vulnerability:

ntpEntHeartbeatInterval controls the interval of heartbeat notifications. If set to 1, this will cause the NTP entity to send one notification each second. This is the maximum rate (1/s) that can be generated automatically. If it is set to 0, then one single heartbeat notification will be created and no further automatically generated notification is sent. This functionality can be used to create notifications at a higher rate (as high as the object can be written).

ntpEntNotifBits enables/disables notifications. Could be used to switch off notifications in order to delay or eliminate the notification for critical and important events.

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

ntpEntSoftwareName, ntpEntSoftwareVersion, ntpEntSoftwareVendor, and ntpEntSystemType all can be used to identify software and its version as well as the operating system and hardware platform. This might help a potential attacker to find security problems and therefore can be used in the preparation of an attack.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module. It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see RFC 3410 [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy). Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

8. Acknowledgments

Bert Wijnen provided valuable feedback as the MIB Doctor for this document.

9. References

9.1. Normative References

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9.2. Informative References

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