Abstract

RFC Ed. : This draft refers to itself with RFC YYYY. When this draft is published as an RFC, the RFC Editor is asked to replace "YYYY" (in the RFC, including the MIB module part) with the assigned RFC number and to remove this note. This draft also refers to draft-ietf-ntp-ntpv4,proto. When this draft is published as an RFC, the RFC Editor is asked to replace "draft-ietf-ntp-ntpv4,proto" (in the RFC, including the MIB module part) with "RFC ZZZZ" (where ZZZZ is the assigned RFC number) and to remove this note.

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 setup 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.

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

The NTPv4 MIB Module is designed to allow SNMP to be used to monitor and manage local NTP [I-D.ietf-ntp-ntpv4-proto] 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 RFC3410 [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 RFC2578 [RFC2578], RFC2579 [RFC2579] and RFC2580 [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") the NTP entity is currently working with.

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 clear text 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)
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--    for the Internet Engineering Task Force (IETF)
--    NTP Working Group (ntpwg)
NTPv4-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE, mib-2, Integer32, NOTIFICATION-TYPE,
  Unsigned32, Counter32, TimeTicks
  FROM SNMPv2-SMI -- RFC2578
  MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
  FROM SNMPv2-CONF -- RFC2580
  DisplayString, TEXTUAL-CONVENTION
  FROM SNMPv2-TC -- RFC2579
  InetAddressType, InetAddress
  FROM INET-ADDRESS-MIB -- RFC4001
  Utf8String
  FROM SYSAPPL-MIB; -- RFC2287

ntpSnmpMIB MODULE-IDENTITY
  LAST-UPDATED "201003050000Z" -- March 5, 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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REVISION     "201003050000Z"
DESCRIPTION

"This revision of the MIB module is published as RFC YYY."
"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 synchronize this field shall be a zero-length string.
This 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 "draft-ietf-ntp-ntpv4 proto, 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 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. 'ntpl.ptb.de' or 'GPS' or 'DCF1' ..."
::= { 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 "draft-ietf-ntp-ntpv4-proto, 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
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 }

The total number of NTP messages which 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 }

The total number of NTP messages which 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 }

The total number of SNMP notifications which this NTP entity has generated.
Discountinuities 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 {
    symmetricactive(1),
    symmetricpassive(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. 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 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 ::= SEQUENCE {

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 miliseconds as a string."
::= { ntpAssociationEntry 8 }

ntpAssocStatusDelay OBJECT-TYPE
SYNTAX  DisplayString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The network delay in miliseconds 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. Discountinuities 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 which were delivered to this NTP entity from this association and this entity was not able to process due to an NTP protocol error. Discountinuities 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 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 ::= { ntpSnmpMIB 2 }

ntpEntCompliances OBJECT IDENTIFIER ::= { ntpEntConformance 1 }
ntpEntGroups      OBJECT IDENTIFIER ::= { ntpEntConformance 2 }

ntpEntNTPCompliance MODULE-COMPLIANCE
STATUS      current
DESCRIPTION
         "The compliance statement for SNMP entities which 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 which 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,
6. IANA Considerations

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

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>OBJECT IDENTIFIER value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ntpSnmp</td>
<td>{ mib-2 XXX }</td>
</tr>
</tbody>
</table>

RFC Ed. : the IANA is requested to assign a value for "XXX" under the
'mib-2' subtree and to record the assignment in the SMI Numbers
registry. When the assignment has been made, the RFC Editor is asked
to replace "XXX" (here and in the MIB module) with the assigned value
and to remove this note.

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 RFC3410 [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy). Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.
8. References

8.1. Normative References


8.2. Informative References


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