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Internet-Draft	Meinberg	
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Definitions of Managed Objects for Network Time Protocol Version 4 (NTPv4)
draft-ietf-ntp-ntpv4-mib-03

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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 setup a monitoring system that is platform- and vendor-independant. This Internet draft 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.

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1. The Internet-Standard Management Framework

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For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC3410 (Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework," December 2002.) [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 (McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)," April 1999.) [RFC2578], RFC2579 (McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2," April 1999.) [RFC2579] and RFC2580 (McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2," April 1999.) [RFC2580].

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2. Introduction

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The NTPv4 MIB Module is designed to allow SNMP to be used to monitor and manage local NTP 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.

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3. Technical Description

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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 sixth 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.

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4. MIB Definition

```
-- ********************************************************************
--
--$Id: draft-ietf-ntp-ntpv4-mib-03.xml 1.12 2007/11/28 00:00:00Z chelliot $
--$Name: SUBMIT_1 $
--
--    The Network Time Protocol Version 4
--    Management Information Base (MIB)
--
--    Authors: Heiko Gerstung (heiko.gerstung@meinberg.de)
--             Chris Elliott (chelliot@cisco.com)
--
--    for the Internet Engineering Task Force (IETF)
--    NTP Working Group (ntpwg)
--
--
-- ********************************************************************
--
--  $Log: draft-ietf-ntp-ntpv4-mib-03.xml $
--  Revision 1.12  2007/11/28 00:00:00Z chelliot
--  MIB:
--    - Added protocol statistics at the entity and association level
--  XML/RFC:
--    - Changed a couple of instances of "instance" to "entity" and "srv"
--      to "ent".
--    - Changed Meinberg address and Heiko's phone number.
--  Revision 1.11  2007/07/23 00:00:00Z chelliot
--  MIB:
--    - Modified Contact Info
--    - Added Stratum and NTP time TCs
--    - Changed ntpEntNotifNotInSync to ntpEntNotifCurrentMode and
--      deleted ntpEntNotifEntityStarted and ntpEntNotifEntityStopped
--    - Added compliance for SNTP entities
--    - Changed ntpTime to ntpDateTime
--  Revision 1.10  2007/07/09 00:00:00Z chelliot
--  XML/RFC:
--    - Changed RFC to Internet
--    - Changed service and service instance* to entity/entities
--    - Revised the Security Considerations to include read-write object
--      security considerations
--    - Added Chris Elliott as an author
--    - Fixed several lines to be 72 characters long or less
--  MIB:
--    - Changed "service" and "service instance" to "entity",
--      and Srv to Ent
--    - Changed status to mode
--    - Added association status object
--    - Added leap second objects
--  Revision 1.9  2007/03/04 06:59:44Z  chelliot
```

```
--  MIB:
--    - Added time objects, comments, changed notifications
--    - Changed server to service
--  Revision 1.8  2006/10/23 03:37:44Z  chelliot
--  MIB:
--    - Changed various object types, added notification control object
--  Revision 1.7  2006/06/16 07:13:50Z  heiko
--  XML/RFC:
--    - Added/changed comments about the to-be-done IANA SMI assignment
--  Revision 1.6  2006/06/16 07:04:43Z  heiko
--  RFC/XML:
--    - phone number corrected
--    - removed unused references
--  MIB:
--    - added ntpSrvTimePrecision
--    - changed INTEGER objects to Integer32
--    - changed default value for ntpSrvStatusStratum from 99 to 16
--    - changed default value for ntpSrvStatusActiveRefclockId from 99-0
--    - changed object names to ntpSrvStatusActiveRefSourceName
--      (from ntpSrvStatusActiveRefclockName) and to
--      ntpSrvStatusNumberOfRefSources (from
--      ntpSrvStatusNumberOfRefclocks)
--    - removed ntpSrvStatusAuthKeyId object
--    - added ntpSrvStatusDispersion to provide the current root
--      dispersion
--    - major rework of section 3 (Status of associations) to compile
--      cleanly,including:
--      - added dispersion to the association dataset
--      - renaming of objects
--      - added an index to the association table
--      - formal changes
--    - traps are now reverse mappable
--    - traps are now define with payload where applicable
--    - added compliance statements
--  Revision 1.5  2006/02/27 08:28:16Z  heiko
--    - changed to RFC format and added header as well as
--      introduction and technical description
--    - added other necessary RFC components (copyright statement etc.)
--  Revision 1.4  2006/02/27 07:06:49Z  heiko
--    - removed all objects with data type REAL
--    - everything that needs to be floating point is now defined as
--      DisplayString
--  Revision 1.2  2006/01/23 08:58:11Z  heiko
--    - changed the datatype of offset, jitter and delay objects from
--      Integer32 to REAL
--
-- ****************************************************************

NTPv4-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE , mib-2, Integer32, NOTIFICATION-TYPE,
    Unsigned32
        FROM SNMPv2-SMI
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF
    DisplayString, TEXTUAL-CONVENTION
        FROM SNMPv2-TC
    InetAddressType, InetAddress
        FROM INET-ADDRESS-MIB;

ntpSnmpMIB MODULE-IDENTITY
    LAST-UPDATED "200712050000Z" -- December 5, 2007
    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

                  Heiko Gerstung
                  Meinberg Funkuhren Gmbh & Co. KG
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                  Bad Pyrmont  31812
                  Germany

                  Phone: +49 5281 9309 25
                  Email: heiko.gerstung@meinberg.de

                  Chris Elliott
                  Cisco Systems, Inc.
                  7025 Kit Creek Rd., P.O. Box 14987
                  Research Triangle Park  27709
                  USA

                  Phone: +1 919-392-2146
                  Email: chelliot@cisco.com"
     DESCRIPTION
        "The Management Information Base for NTP time entities."
    REVISION     "200712050000Z"
    DESCRIPTION
        "Multiple proposed changes for IETF 70"
    REVISION     "200707230000Z"
    DESCRIPTION
        "Multiple proposed changes for IETF 69"
    REVISION     "200707090000Z"
    DESCRIPTION
        "Multiple changes from IETF 68"
```

```
    REVISION     "200703040000Z"
    DESCRIPTION
        "More MIB review modifications."
    REVISION     "200610230000Z"
    DESCRIPTION
        "Modifications from MIB review."
    REVISION     "200606190000Z"
    DESCRIPTION
        "First Draft Version"
    REVISION     "200512190000Z"
    DESCRIPTION
        "revised edition (added traps and stuff)"
    REVISION     "200511160000Z"
    DESCRIPTION
        "Initial draft"
    ::= { mib-2 XXX }


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 }
ntpEntNotifPrefix  OBJECT IDENTIFIER ::= { ntpSnmpMIBObjects 6 }

--
-- 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. Ref: draft-ietf-ntp-ntpv4-proto-06,
         section 6:
          It includes a 64-bit signed seconds field
          spanning 584 billion years and a 64-bit fraction
```

```
           field resolving .05 attosecond (i.e. 0.5e-18).
           For convenience in mapping between formats, the
           seconds field is divided into a 32-bit era field
           and a 32-bit timestamp field.

          If time is not syncronized 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."
    SYNTAX      OCTET STRING (SIZE (0 | 16))

--
-- Section 1: General NTP Entity information objects
--            (relatively static information)
--

ntpEntSoftwareName OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The product name of the installed NTP version."
    -- the product name of the running ntp implementation, e.g. "ntpd"
    ::= { ntpEntInfo  1 }

ntpEntSoftwareVersion OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The software version of the installed NTP implementation."
    -- full version string, e.g. "ntpd-4.2.0b@1.1433 ..."
    ::= { ntpEntInfo  2 }

ntpEntSoftwareVersionVal OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Software version of installed NTP as an unsigned integer
         value."
    -- e.g. if version string is "4.2.0b" this could be translated into
    --  4202. This could be useful to find out if version of entity on a
    --  is newer or older than version of the entity on b (without too
    --  much string parsing trouble)
    ::= { ntpEntInfo 3 }
```

```
ntpEntSoftwareVendor OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The vendor/author of the installed NTP version."
    ::= { ntpEntInfo  4 }

ntpEntSystemType OBJECT-TYPE
    SYNTAX      DisplayString
    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  5 }

ntpEntTimeResolution OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A string describing the time resolution of the running NTP
         implementation."
    -- e.g. "100 ns"
    -- depends on the NTP implementation and the underlying OS. The
    --  current resolution should be used, so if the OS only supports
    --  10ms and ntpd is capable of 1ns, the 10ms should be advertised
    ::= { ntpEntInfo  6 }

ntpEntTimeResolutionVal OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The time resolution in integer format."
    -- ntpEntTimeResolution in Integer format
    -- shows the resolution based on 1 second, e.g. "1ms" translates to
    --  1000
    ::= { ntpEntInfo  7 }

ntpEntTimePrecision OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A string describing the precision with which the NTP entity
         implementation/OS manages its time base."
```

```
    -- e.g. "-18" means 2^-18 = 0.000003814697265625 seconds
    --      "-5" means 2^-5 = 0.03125 seconds
    -- depends on the NTP implementation and the underlying OS.
    ::= { ntpEntInfo  8 }

ntpEntTimePrecisionVal OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The entity's precision in integer format."
    -- ntpEntTimePrecision in signed Integer format
    -- shows the precision. A value of -5 would mean 2^-5 = 31.25 ms
    ::= { ntpEntInfo  9 }

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  10 }

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

ntpEntStatusCurrentMode OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The actual mode of NTP as a string"
    --- possible strings:
    --- "not running" : NTP is not running
    --- "not synchronized" : NTP is not synchronized to any time source
    ---   (stratum = 16)
    --- "none configured" : NTP is not synchronized and does not have a
    ---                     server configured
    ---   (stratum = 16)
    --- "sync to local" : NTP is synchronized to own local clock
    ---   (degraded reliability)
    --- "sync to refclock" : NTP is synchronized to a local hardware
    ---   refclock (e.g. GPS)
    --- "sync to remote server" : NTP is synchronized to a remote NTP
    ---   server ("upstream" server)
```

```
    --- "unknown" : The state of NTP is unknown.
    ::= { ntpEntStatus 1 }

ntpEntStatusCurrentModeVal 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 as integer value."
    -- see ntpEntStatusCurrentMode
    DEFVAL { 99 }
    ::= { ntpEntStatus 2 }

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)
    DEFVAL { 16 }
    ::= { ntpEntStatus 3 }

ntpEntStatusActiveRefSourceId OBJECT-TYPE
    SYNTAX      Unsigned32 ( 0..99999 )
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The association ID of the current syspeer."
    DEFVAL { 0 }
    ::= { ntpEntStatus 4 }

ntpEntStatusActiveRefSourceName OBJECT-TYPE
    SYNTAX      DisplayString
    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" ...
    -- maybe something like "RefClk(8)"="hardware clock using driver 8"
```

```
    -- would be nice
    ::= { ntpEntStatus 5 }

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 6 }

ntpEntStatusNumberOfRefSources OBJECT-TYPE
    SYNTAX      Unsigned32 (0..99)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of reference sources configured for NTP."
    DEFVAL { 0 }
    ::= { ntpEntStatus 7 }

ntpEntStatusDispersion OBJECT-TYPE
    SYNTAX      DisplayString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The root dispersion of the running NTP entity."
    -- e.g. "6.927"
    DEFVAL { "n/a" }
    ::= { ntpEntStatus 8 }

ntpEntStatusEntityUptime OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The uptime of the NTP entity in seconds."
    -- time since ntpd was (re-)started (not sysUptime!)
    DEFVAL { 0 }
    ::= { ntpEntStatus 9 }

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. Ref: draft-ietf-ntp-ntpv4-proto-06,
```

```
            section 6:
             It includes a 64-bit signed seconds field
             spanning 584 billion years and a 64-bit fraction
             field resolving .05 attosecond (i.e. 0.5e-18).
             For convenience in mapping between formats, the
             seconds field is divided into a 32-bit era field
             and a 32-bit timestamp field.

            If time is not syncronized 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 coorelate
            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."
        ::= { ntpEntStatus 10 }

    ntpEntStatusLeapSecond OBJECT-TYPE
        SYNTAX      Integer32
        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."
        DEFVAL { 0 }
        ::= { ntpEntStatus 11 }

    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."
        DEFVAL { 0 }
        ::= { ntpEntStatus 12 }

    ntpEntStatusInPkts OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The total number of NTP messages delivered to the
```

```
         NTP entity from the transport service."
    ::= { ntpEntStatus 13 }

ntpEntStatusOutPkts OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of NTP messages delivered to the
         transport service by this NTP entity."
    ::= { ntpEntStatus 14 }

ntpEntStatusBadVersion OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of NTP messages which were delivered
         to this NTP entity and were for an unsupported NTP
         version."
    ::= { ntpEntStatus 15 }

ntpEntStatusProtocolError OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "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."
    ::= { ntpEntStatus 16 }

ntpEntStatusNotifications OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of SNMP notifications which this NTP
         entity has generated."
    ::= { ntpEntStatus 17 }

--
-- 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                DisplayString,
        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      DisplayString
    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
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of address of the association."
    -- contains the type of address for uni/multi/broadcast associations
    ::= { ntpAssociationEntry 4 }

ntpAssocAddress OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The IP address (IPv4 or IPv6) of the association."
    -- contains IP address of uni/multi/broadcast associations
    ::= { 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
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of NTP messages delivered to the
         NTP entity from this association."
    ::= { ntpAssocStatisticsEntry 1 }

ntpAssocStatOutPkts OBJECT-TYPE
    SYNTAX      Counter32
    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."
    ::= { ntpAssocStatisticsEntry 2 }

ntpAssocStatProtocolError OBJECT-TYPE
    SYNTAX      Counter32
    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."
    ::= { ntpAssocStatisticsEntry 3 }

--
-- Section 4: Control objects
--

ntpEntHeartbeatInterval OBJECT-TYPE
    SYNTAX      Unsigned32
    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."
    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."
    ::= { ntpEntControl 2 }

--
-- Section 5: Notification objects
--

ntpEntNotifMessage OBJECT-TYPE
    SYNTAX      DisplayString
    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 ::= { ntpEntNotifPrefix 0 }

ntpEntNotifModeChange NOTIFICATION-TYPE
    OBJECTS     { ntpEntStatusCurrentModeVal }
    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, ntpEntStatusCurrentModeVal,
                  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 6 }
```

```
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,
                          ntpEntObjectsGroup2,
                          ntpEntNotifPrefixGroup
        }
        ::= { 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
        }
        ::= { ntpEntCompliances 2 }

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

ntpEntObjectsGroup2 OBJECT-GROUP
    OBJECTS {
```

```
                ntpEntTimeResolution,
                ntpEntTimeResolutionVal,
                ntpEntTimePrecision,
                ntpEntTimePrecisionVal,
                ntpEntTimeDistance,
                ntpEntStatusCurrentMode,
                ntpEntStatusCurrentModeVal,
                ntpEntStatusStratum,
                ntpEntStatusActiveRefSourceId,
                ntpEntStatusActiveRefSourceName,
                ntpEntStatusActiveOffset,
                ntpEntStatusNumberOfRefSources,
                ntpEntStatusDispersion,
                ntpEntStatusLeapSecond,
                ntpEntStatusLeapSecDirection,
                ntpEntStatusInPkts,
                ntpEntStatusOutPkts,
                ntpEntStatusBadVersion,
                ntpEntStatusProtocolError,
                ntpEntStatusNotifications,
                ntpAssocOffset,
                ntpAssocStratum,
                ntpAssocStatusJitter,
                ntpAssocStatusDelay,
                ntpAssocStatusDispersion,
                ntpAssocStatInPkts,
                ntpAssocStatOutPkts,
                ntpAssocStatProtocolError,
                ntpEntHeartbeatInterval,
                ntpEntNotifBits,
                ntpEntNotifMessage
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for the NTP MIB that are optional
         for NTP or SNTP entities to implement."
    ::= { ntpEntGroups 2 }

ntpEntNotifPrefixGroup 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
```

---

5. IANA Considerations

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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 XXX }

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.

---

6. Security Considerations

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Most data objects in this MIB are read-only. The two read-write objects control notifications. The security provided by the implementation of the SNMP agent providing the data objects in this MIB will be sufficient, although it is recommended that a security level of at least SNMPv3 AuthNoPriv be used. The general access management methods used for SNMP agents apply.

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7. References

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7.1. Normative References

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[RFC2578]

	McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)," STD 58, RFC 2578, April 1999 (TXT).
[RFC2579]	McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2," STD 58, RFC 2579, April 1999 (TXT).
[RFC2580]	McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2," STD 58, RFC 2580, April 1999 (TXT).

7.2. Informative References

TOC

[RFC3410]	Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework," RFC 3410, December 2002 (TXT).

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