Management of the Network Time Protocol (NTP) with SNMP [1]

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1 Introduction

The Network Time Protocol (NTP) is a protocol used to synchronize timekeeping among a set of distributed time servers and clients [1]. NTP has undergone significant evolution over the years since it was first proposed, culminating in the most recent NTP Version 3 described in RFC-1305. NTP is built on the Internet Protocol (IP) [2] and the User Datagram Protocol (UDP) [3], which provide a connectionless transport mechanism. It is specifically designed to maintain accuracy and robustness, even when used over typical Internet paths involving multiple gateways, highly dispersive delays, and unreliable nets.

The Simple Network Management Protocol (SNMP) is a management protocol widely used over the Internet for monitoring and control activities. SNMP also runs over UDP and IP. At a time when a wide variety of hardware and software components are becoming SNMP-capable, the lack of such capability in NTP prevents it from being integrated with other management applications. This report describes two SNMP MIBs developed for use with NTP that provide this sorely-needed management capability. The first is a regular MIB that allows any NTP server that implements this MIB to be managed by SNMP. The second is a Proxy MIB that allows access to all NTP servers regardless of whether or not they are SNMP-capable. The Proxy MIB permits the universal set of NTP servers all around the world to be available for SNMP access without any additional software deployment.

2 NTP System Architecture

The typical system architecture used by NTP consists of a number of primary reference sources, synchronized by wire or radio to national standards, and operated as primary time servers. Additional hosts or gateways run NTP with one or more of the primary servers and act as secondary time servers. The synchronization subnet is a connected network of primary and secondary time servers together with clients and interconnecting transmission paths. Under normal circumstances, it is intended that the synchronization subnet of primary and secondary servers assumes a hierarchical master-slave configuration with the primary servers at the root and secondary servers of decreasing accuracy at successive levels toward the leaves. The secondary servers distribute time via NTP to clients on the remaining local-net hosts.

An NTP client sends NTP messages to one or more servers and processes the replies received. Information included in the NTP message allows the client to determine the server time with respect to the local time and adjust the local clock accordingly. In addition, the message includes information to calculate the expected timekeeping accuracy and reliability, as well as select the best from possibly several servers.

An NTP association is formed between a client/server pair or between two peers when they exchange messages and one or both of them create and maintain an instantiation of the protocol machine. The association can operate in one of five modes: symmetric active, symmetric passive, client, server, and broadcast. The modes determine how and when the peers communicate with each other.

NTP Version 3 introduced an NTP Control Message format that can be used to perform NTP control and monitoring functions, such as setting the leap-indicator bits at the primary servers, adjusting the various system parameters and monitoring regular operations. Most control functions involve sending a command and receiving a response, perhaps involving several fragments. Commands can read or write system variables, peer variables for a specified association, or variables associated with a radio clock or other device directly connected to a source of primary synchronization information.

3 The SNMP Network Management Framework

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

- the SMI (Structure of Management Information), described in RFC 1902 [4], which specifies the mechanisms used for describing and naming objects for the purpose of management.
- the MIB-II, in RFC 1213 [5], which constitutes the core set of managed objects for the Internet suite of protocols.
- the protocol called SNMP, in RFC 1157 and/or RFC 1905 [6, 7], the protocol for accessing managed information.

In addition, Textual Conventions are defined in RFC 1903 [8], and conformance statements are defined in RFC 1904 [9].

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

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

4 A Framework for Managing NTP with SNMP

Until now NTP did not have an SNMP MIB defined for it, so the control and monitoring functions described in Section 2 could not be performed by traditional management protocols such as SNMP. As the standard management protocol for the Internet, SNMP has become widely implemented, deployed, and used for most routine management tasks. SNMP MIBs have been written and implemented for a wide variety of devices including routers, hubs, modems, network interfaces, hosts, printers, etc. NTP provides a service that is vital to the health of the Internet and therefore of crucial importance from the point of view of management. It is necessary that NTP be made SNMP-manageable so that this important gap can be filled.

This report describes two different approaches that we have developed for making NTP be SNMP-manageable. The first is a straightforward approach of designing and implementing an SNMP MIB for NTP. In this approach, an SNMP MIB is provided for each NTP server. The MIB is designed to contain all the management and control information available at this server. Access to the MIB for management purposes is provided via an SNMP agent running at the same location as the NTP server. The SNMP agent communicates with the NTP server using NTP. To reduce the load imposed on the NTP server because of this communication, our implementation uses a caching mechanism to store some of the variables for short periods of time in the SNMP agent. Subsequent manager requests, if any, for these variables that are received within this time are satisfied using the cached values.

While the straightforward approach of having an SNMP MIB for each NTP server provides a long-term solution to the problem of managing NTP, it is not a viable short-term approach. There is a large existing infrastructure of thousands of NTP servers deployed worldwide on many different platforms in various administrative domains. It is unlikely that an SNMP MIB and agent will be implemented on many of these servers for the foreseeable future. As a result, the usefulness of the NTP MIB (and of the applications that use it) will be severely limited.

Our second approach overcomes this problem by providing a Proxy MIB for NTP. An SNMP agent that implements the NTP Proxy MIB establishes an NTP association with any NTP server, not just the local server. This server can be specified by the managing application by setting appropriate variables in the MIB. More than one server can be chosen for concurrent management. All communication between the SNMP agent and the NTP servers uses NTP. This scheme is thus not dependent on the availability of SNMP agents and MIBs on all NTP servers, yet the universal set of NTP servers becomes available to the SNMP community.

Because of the well-known security weaknesses of SNMP, no read-write access to NTP variables has been provided in the current designs of these MIBs. This is a particularly sensitive issue with the Proxy MIB because it potentially opens up all NTP servers worldwide to SNMP control creating a dangerous vulnerability to attack. As security issues are addressed and resolved in the SNMPv3 effort currently under way, the MIBs can be augmented with appropriate read-write variables.

5 The NTP MIB

The complete definition of the NTP MIB is provided in Appendix A. This MIB defines two new Textual Conventions and consists of three groups of variables.

The Textual Conventions are NTPTimeStamp and NTPLeapIndicator. NTPTimeStamp is an 8-byte string that represents an NTP timestamp as defined in RFC-1305. The DISPLAY-HINT clause allows the timestamp to be displayed as a 32-bit integer part followed by a decimal point and a 32-bit fractional part. NTPLeapIndicator is an enumerated integer used to code the two bits of the NTP Leap Indicator also defined in RFC-1305.

The ntpSystem group represents the System Variables of an NTP server. All of these are scalar variables.

The ntpPeers group represents the Peer Variables of an NTP server. These variables are maintained by the server for each NTP peer with which it currently has an association. The ntpPeers group contains only one table variable called ntpPeersVarTable. There is a separate row in this table for each peer. The table is indexed by the column ntpPeersAssocId which contains the association ID used by NTP to uniquely label each active association.

The third group in the NTP MIB is the ntpFilter group. Implementation of this group is optional. It must be implemented when the filter and selection algorithms described in Section 4 of RFC-1305 are used. This group contains two tables ntpFilterPeersVarTable and ntpFilterRegisterTable. The first table, ntpFilterPeersVarTable, is an extension of the ntpPeersVarTable and provides an additional column called ntpFilterValidEntries that contains the number of valid entries in the ntpFilterRegisterTable for each peer.

The ntpFilterRegisterTable implements the Clock-Filter variables described in RFC-1305. These variables are maintained as a shift register for each peer with each stage of the shift register containing values associated with a single observation. As each new observation arrives, older values are shifted down in the register while the oldest value disappears. Each observation corresponds to a row in the ntpFilterRegisterTable and is indexed by ntpPeersAssocId and ntpFilterIndex.

6 The NTP Proxy MIB

The NTP Proxy MIB is completely specified in Appendix B. This MIB uses the two Textual Conventions defined in the NTP MIB and also defines an additional Textual Convention called NTPRowStatus. NTPRowStatus is similar to the RowStatus Textual Convention of RFC-1903 except that it only allows one create operation (the create-and-go of RowStatus) and does not allow row deletion. This is used in this MIB to create rows in the ntpProxyControlTable to ask the agent to start an association with a specified NTP server. As a result of this association, the agent then monitors the variables of the server and provides them in the various tables of this MIB. A management application is not allowed to delete the conceptual row; deletion is carried out by the agent in an autonomous manner when there is no management activity for the server for some period of time. The ntpProxyControlTable is indexed by the server's IP address.

The System variables are made available in the ntpProxyServerSystemTable which contains one row for each server being monitored. This table is also indexed by ntpProxyServerIPAddr.

The Peer variables are provided in the table ntpProxyPeersVarTable which is indexed by both ntpProxyServerIPAddr and ntpProxyPeersAssocId. This way there are multiple rows in this table for each server, with one row for each peer with which the server has an association.

The final table in this MIB is the ntpProxyFilterRegisterTable. This table is indexed by three variables, ntpProxyServerIPAddr, ntpProxyPeersAssocId, and ntpProxyFilterIndex. It has multiple rows for each server-peer combination, with each row holding one observation. The number of rows in this table used for each server-peer tuple is contained in the variable ntpProxyPeersFilterValidEntries which is a column of the ntpProxyPeersVarTable.

7 Implementation

This section is still under construction.

8 Conclusions

NTP is an important protocol for the Internet community as it regulates the clocks in myriads of hosts across the world. Until now, NTP has not been open to management and control with the Internet's standard management protocol, SNMP. This report contains a description of two proposed SNMP MIBs for managing NTP with SNMP. The first is a regular MIB for managing NTP servers, while the second is a proxy MIB. The proxy MIB provides the capability of managing any NTP servers even if those servers are not SNMP capable. We have implemented these MIBs in SNMP agents that will be shortly available for public access. These MIBs and agents form valuable tools for experimentation with management of NTP servers and using the data collected for a wide variety of interesting studies.

References

[1] D.L. Mills. *Network Time Protocol Version 3 Specification, Implementation and Analysis (RFC 1305)*, March 1992.

[2] J.B. Postel (ed.). *Internet Protocol (RFC 791)*, September 1981.

[3] J. B. Postel. *User Datagram Protocol (RFC 768)*, August 1980.

[4] J. Case, K. McCloghrie, M. Rose, and S. Waldbusser. *Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2) (RFC 1902)*, January 1996.

[5] M. T. Rose and K. McCloghrie. *Management Information Base for Network Management of TCP/IP based internets: MIB-II (RFC 1213)*, March 1991.

[6] J. D. Case, M. S. Fedor, M. L. Schoffstall, and C. Davin. *Simple Network Management Protocol (RFC 1157)*, May 1990.

[7] J. Case, K. McCloghrie, M. Rose, and S. Waldbusser. *Protocol Operations for Version 2 of the Simple Network Managem ent Protocol (SNMPv2) (RFC 1905)*, January 1996.

[8] J. Case, K. McCloghrie, M. Rose, and S. Waldbusser. *Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2) (RFC 1903)*, January 1996.

[9] J. Case, K. McCloghrie, M. Rose, and S. Waldbusser. *Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2) (RFC 1904)*, January 1996.

A Formal Definition of the NTP MIB

```
--
-- NTP MIB, Revision 0.2, 7/25/97
--

NTP-MIB DEFINITIONS ::= BEGIN

IMPORTS
     MODULE-IDENTITY, OBJECT-TYPE,
     enterprises,
     Integer32, Unsigned32
        FROM SNMPv2-SMI

     TEXTUAL-CONVENTION, TruthValue
        FROM SNMPv2-TC ;

 --
 -- The position within the OID hierarchy of this MIB:
 --

udel OBJECT IDENTIFIER ::= { enterprises 1277}
ntpMIB MODULE-IDENTITY
     LAST-UPDATED "9707251530Z"
     ORGANIZATION "University of Delaware"
     CONTACT-INFO
         "Adarsh Sethi
          Department of Computer & Information Sciences
          University of Delaware
          Newark, DE 19716
          Tel: +1 302 831 1945
          E-mail: sethi@cis.udel.edu

          David Mills
          Department of Electrical Engineering
          University of Delaware
          Newark, DE 19716
          Tel: +1 302 831 ????
          E-mail: mills@ee.udel.edu"
     DESCRIPTION
         "This MIB module defines a MIB which provides mechanisms to
          monitor and control an NTP server."
     ::= { udel 3 }

 --
 -- The various groups defined within this MIB definition:
```

```
 --

ntpSystem  OBJECT IDENTIFIER ::= { ntpMIB 1 }

ntpPeers   OBJECT IDENTIFIER ::= { ntpMIB 2 }

ntpFilter  OBJECT IDENTIFIER ::= { ntpMIB 3 }

 --
 -- Textual Conventions:
 --

NTPTimeStamp ::= TEXTUAL-CONVENTION
     DISPLAY-HINT "4d.4d"
     STATUS      current
     DESCRIPTION ""
     SYNTAX      OCTET STRING (SIZE (8))


NTPLeapIndicator ::= TEXTUAL-CONVENTION
     STATUS      current
     DESCRIPTION ""
     SYNTAX      INTEGER {
                    noWarning(0),
                    addSecond(1),
                    subtractSecond(2),
                    alarm(3)
                 }


 --
 -- System Group
 --

ntpSysLeap OBJECT-TYPE
    SYNTAX     NTPLeapIndicator
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " two-bit code warning of an impending leap
        second to be inserted in the NTP timescale."
    ::= { ntpSystem  1 }

ntpSysStratum OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " indicating the stratum of the local clock.
```

```
        0, unspecified
        1, primary reference (e.g.,, calibrated atomic clock,
           radio clock)
        2-255, secondary reference (via NTP)"
    ::= { ntpSystem  2 }

ntpSysPrecision OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "signed integer indicating the precision
       of the various clocks, in seconds to the nearest power
       of two."
    ::= { ntpSystem  3 }

ntpSysRootDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the total roundtrip delay to the primary
       reference source at the root of the synchronization
       subnet, in seconds"
    ::= { ntpSystem  4 }

ntpSysRootDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the maximum error relative to the primary
       reference source at the root of the synchronization
       subnet, in seconds. Only positive values greater
       than zero are possible"
    ::= { ntpSystem  5 }

ntpSysRefId OBJECT-TYPE
    SYNTAX    OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the particular reference clock. In the case of
       stratum 0 (unspecified) or stratum 1 (primary reference
       source), this is a four-octet, left-justified,zero-padded
       ASCII string.In the case of stratum 2 and greater (secondary
       reference) this is the four-octet Internet address of the
       peer selected for synchronization."
    ::= { ntpSystem 6  }

ntpSysRefTime OBJECT-TYPE
```

```
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the local time when the local clock was last
       updated. If the local clock has neverbeen synchronized,
       the value is zero."
    ::= { ntpSystem 7 }

ntpSysPoll   OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the minimum interval between transmitted
       messages, in seconds as a power of two. For instance,
       a value of six indicates a minimum interval of 64 seconds."
    ::= { ntpSystem 8 }

ntpSysPeer  OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the current synchronization source. Usually
       this will be a pointer to a structure containing the peer
       variables. The special value NULL indicates there is no
       currently valid synchronization source."
    ::= { ntpSystem 9 }

ntpSysPhase OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpSystem  10 }


ntpSysFreq OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpSystem  11 }

ntpSysError OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
```

```
    ::= { ntpSystem  12 }

ntpSysClock OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the current local time. Local time is derived
       from the hardware clock of the particular machine and
       increments at intervals depending on the design used."
    ::= { ntpSystem  13 }

ntpSysSystem OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the type of the local Operating System"
    ::= { ntpSystem  14 }

ntpSysProcessor OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the type of the local Processor"
    ::= { ntpSystem  15 }



 --
 -- Peers Group
 --

 --
 -- Peer Variables Table
 --

ntpPeersVarTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpPeers 1}

ntpPeersVarEntry OBJECT-TYPE
    SYNTAX      NtpPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
```

```
    DESCRIPTION ""
    INDEX       { ntpPeersAssocId }
    ::= { ntpPeersVarTable 1 }

NtpPeersVarEntry ::= SEQUENCE {
    ntpPeersAssocId Unsigned32,
    ntpPeersConfigured TruthValue,
    ntpPeersPeerAddress IpAddress,
    ntpPeersPeerPort Unsigned32,
    ntpPeersHostAddress IpAddress,
    ntpPeersHostPort Unsigned32,
    ntpPeersLeap NTPLeapIndicator,
    ntpPeersMode INTEGER,
    ntpPeersStratum Integer32,
    ntpPeersPeerPoll Integer32,
    ntpPeersHostPoll Integer32,
    ntpPeersPrecision Integer32,
    ntpPeersRootDelay OCTET STRING,
    ntpPeersRootDispersion OCTET STRING,
    ntpPeersRefId OCTET STRING,
    ntpPeersRefTime NTPTimeStamp,
    ntpPeersOrgTime NTPTimeStamp,
    ntpPeersReceiveTime NTPTimeStamp,
    ntpPeersTransmitTime NTPTimeStamp,
    ntpPeersUpdateTime NTPTimeStamp,
    ntpPeersReach Unsigned32,
    ntpPeersTimer Integer32,
    ntpPeersOffset OCTET STRING,
    ntpPeersDelay OCTET STRING,
    ntpPeersDispersion OCTET STRING
}

ntpPeersAssocId OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION ""
    ::= { ntpPeersVarEntry 1 }

ntpPeersConfigured OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " This is a bit indicating that the association
       was created from configuration information and should not
       be demobilized if the peer becomes unreachable."
    ::= { ntpPeersVarEntry 2 }
```

```
ntpPeersPeerAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the Internet address of the peer"
    ::= { ntpPeersVarEntry 3 }

ntpPeersPeerPort OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " 16-bit port number of the peer."
    ::= { ntpPeersVarEntry 4 }

ntpPeersHostAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the Internet address of the host"
    ::= { ntpPeersVarEntry 5 }

ntpPeersHostPort OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " 16-bit port number of the host"
    ::= { ntpPeersVarEntry 6 }

ntpPeersLeap OBJECT-TYPE
    SYNTAX     NTPLeapIndicator
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " two-bit code warning of an impending leap
        second to be inserted in the NTP timescale."
    ::= { ntpPeersVarEntry 7 }

ntpPeersMode OBJECT-TYPE
    SYNTAX     INTEGER {
                  unspecified (0),
                  symmetricActive (1),
                  symmetricPassive (2),
                  client (3),
                  server (4),
                  broadcast (5),
                  reservedControl (6),
                  reservedPrivate (7)
```

```
            }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the association mode,with values coded as
       follows:
         0, unspecified
         1, symmetric active
         2, symmetric passive
         3, client
         4, server
         5, broadcast
         6, reserved for NTP control messages
         7, reserved for private use
       "
    ::= { ntpPeersVarEntry 8 }

ntpPeersStratum OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " indicating the stratum of the peer clock.
        0, unspecified
        1, primary reference (e.g.,, calibrated atomic clock,
           radio clock)
        2-255, secondary reference (via NTP)"
    ::= { ntpPeersVarEntry 9 }

ntpPeersPeerPoll OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "poll interval of the peer"
    ::= { ntpPeersVarEntry 10 }

ntpPeersHostPoll OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "poll interval of the host"
    ::= { ntpPeersVarEntry 11 }

ntpPeersPrecision OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the same as the systemPrecision except this is
       for the peer"
```

```
    ::= { ntpPeersVarEntry 12 }

ntpPeersRootDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the same as the systemRootDealy except this is for
       the peer"
    ::= { ntpPeersVarEntry 13 }

ntpPeersRootDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the same as the systemDispersion except this is for
       the peer"
    ::= { ntpPeersVarEntry 14 }

ntpPeersRefId OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the same as the systemRefid except this is for
       the peer"
    ::= { ntpPeersVarEntry 15 }

ntpPeersRefTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the same as the systemRefTime except this is for
       the peer"
    ::= { ntpPeersVarEntry 16 }

ntpPeersOrgTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " the local time at the peer when its latest
       NTP message was sent. If the peer becomes unreachable the
       value is set to zero."
    ::= { ntpPeersVarEntry 17 }

ntpPeersReceiveTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
```

```
    DESCRIPTION "the local time when the latest NTP message
       from the peer arrived. If the peer becomes unreachable the
       value is set to zero."
    ::= { ntpPeersVarEntry 18 }

ntpPeersTransmitTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the local time at which the NTP message
       departed the sender."
    ::= { ntpPeersVarEntry 19 }

ntpPeersUpdateTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION " "
    ::= { ntpPeersVarEntry 20 }

ntpPeersReach OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "a shift register of NTP.WINDOW bits used to determine
       the reachability status of the peer, with bits entering
       from the least significant (rightmost) end. A peer is
       considered reachable if at least one bit in this register is
       set to one."
    ::= { ntpPeersVarEntry 21 }

ntpPeersTimer OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpPeersVarEntry 22 }

ntpPeersOffset OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpPeersVarEntry 23 }

ntpPeersDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
```

```
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpPeersVarEntry 24 }

ntpPeersDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpPeersVarEntry 25 }


 --
 -- Filter Group
 --
 -- Implementation of this group is optional. It must be implemented
 -- when the filter and selection algorithms described in Section 4
 -- of RFC 1305 are used.
 --


 --
 -- Filter Group Peer Variables Table
 --
ntpFilterPeersVarTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpFilterPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table is an extension of the Peer Variables Table
         in the Peer Group."
    ::= { ntpFilter 1}

ntpFilterPeersVarEntry OBJECT-TYPE
    SYNTAX      NtpFilterPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    AUGMENTS    { ntpPeersVarEntry }
    ::= { ntpFilterPeersVarTable 1 }

NtpFilterPeersVarEntry ::= SEQUENCE {
    ntpFilterValidEntries Integer32
}

ntpFilterValidEntries OBJECT-TYPE
```

```
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The number of valid entries for a peer in the Filter Register Table."
    ::= { ntpFilterPeersVarEntry 1 }


 --
 -- Filter Register Table
 --

ntpFilterRegisterTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpFilterRegisterEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpFilter 2}

ntpFilterRegisterEntry OBJECT-TYPE
    SYNTAX      NtpFilterRegisterEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    INDEX       { ntpPeersAssocId, ntpFilterIndex }
    ::= { ntpFilterRegisterTable 1 }

NtpFilterRegisterEntry ::= SEQUENCE {
    ntpFilterIndex Unsigned32,
    ntpFilterPeersOffset OCTET STRING,
    ntpFilterPeersDelay OCTET STRING,
    ntpFilterPeersDispersion OCTET STRING
}


ntpFilterIndex OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION ""
    ::= { ntpFilterRegisterEntry 1 }

ntpFilterPeersOffset OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the offset of the peer clock relative to the
```

```
       local clock in seconds"
    ::= { ntpFilterRegisterEntry 2 }

ntpFilterPeersDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "roundtrip delay of the peer clock relative to the
       local clock over the network path between them, in seconds.
       this variable can take on both positive and negative values,
       depending on clock precision and skew-error accumulation."
    ::= { ntpFilterRegisterEntry 3 }

ntpFilterPeersDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION "the maximum error of the peer clock relative to the
       local clock over the network path between them, in seconds.
       Only positive values greater than zero are possible."
    ::= { ntpFilterRegisterEntry 4 }


END
```

B Formal Definition of the NTP Proxy MIB

```
--
-- NTP Proxy MIB, Revision 0.2, 7/25/97
--

NTP-PROXY-MIB DEFINITIONS ::= BEGIN

IMPORTS
     MODULE-IDENTITY, OBJECT-TYPE,
     enterprises,
     Integer32, Unsigned32
        FROM SNMPv2-SMI

     TEXTUAL-CONVENTION, TruthValue
        FROM SNMPv2-TC

     NTPTimeStamp, NTPLeapIndicator
        FROM NTP-MIB;

--
-- The position within the OID hierarchy of this MIB:
--

udel OBJECT IDENTIFIER ::= { enterprises 1277}

ntpProxyMIB MODULE-IDENTITY
     LAST-UPDATED "9707251540Z"
     ORGANIZATION "University of Delaware"
     CONTACT-INFO
         "Adarsh Sethi
          Department of Computer & Information Sciences
          University of Delaware
          Newark, DE 19716
          Tel: +1 302 831 1945
          E-mail: sethi@cis.udel.edu

          David Mills
          Department of Electrical Engineering
          University of Delaware
          Newark, DE 19716
          Tel: +1 302 831 ????
          E-mail: mills@ee.udel.edu"
     DESCRIPTION
         "This MIB module defines a MIB which provides mechanisms to
          monitor and control many NTP servers via a Proxy Agent."
```

```
     ::= { udel 4 }

--
-- The various groups defined within this MIB definition:
--

ntpProxyControl OBJECT IDENTIFIER ::= { ntpProxyMIB 1 }


--
-- Textual Conventions:
--

NTPRowStatus ::= TEXTUAL-CONVENTION
     STATUS      current
     DESCRIPTION
             "The NTPRowStatus textual convention is modeled after the
             RowStatus textual convention of RFC 1903, but is simpler
             because it only allows one create operation (the create-
             and-go of RowStatus) and does not allow row deletion. If
             the state of the status column is 'notInService' and the
             management station tries to set it to 'create', the
             corresponding row is created and the operation is successful.
             If the set to 'create' is attempted when the status column
             is in state 'active', the operation fails and inconsistentValue
             is returned. A management station is not permitted to delete
             the conceptual row; deletion is carried out by the agent
             in an autonomous manner."
     SYNTAX      INTEGER {
                    -- the following values are states:
                    -- these values may be read, but not written
                    active(1),
                    notInService(2),
                    -- the following value is an action:
                    -- this value may be written, but is never read
                    create(3)
                 }



--
-- Control Group
--


--
-- ProxyControl Table
```

```
--

ntpProxyControlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpProxyControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpProxyControl 1}

ntpProxyControlEntry OBJECT-TYPE
    SYNTAX      NtpProxyControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    INDEX       { ntpProxyServerIPAddr }
    ::= { ntpProxyControlTable 1 }

NtpProxyControlEntry ::= SEQUENCE {
    ntpProxyServerIPAddr IpAddress,
    ntpProxyControlStatus NTPRowStatus
}

ntpProxyServerIPAddr OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyControlEntry 1 }

ntpProxyControlStatus OBJECT-TYPE
    SYNTAX     NTPRowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyControlEntry  2 }


--
-- Proxy Server System Table
--

ntpProxyServerSystemTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpProxyServerSystemEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpProxyControl 2}
```

```
ntpProxyServerSystemEntry OBJECT-TYPE
    SYNTAX      NtpProxyServerSystemEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    INDEX       { ntpProxyServerIPAddr }
    ::= { ntpProxyServerSystemTable 1 }

NtpProxyServerSystemEntry ::= SEQUENCE {
    ntpProxyServerSysLeap NTPLeapIndicator,
    ntpProxyServerSysStratum Integer32,
    ntpProxyServerSysPrecision Integer32,
    ntpProxyServerSysRootDelay OCTET STRING,
    ntpProxyServerSysRootDispersion OCTET STRING,
    ntpProxyServerSysRefId OCTET STRING,
    ntpProxyServerSysRefTime NTPTimeStamp,
    ntpProxyServerSysPoll Integer32,
    ntpProxyServerSysPeer Unsigned32,
    ntpProxyServerSysPhase OCTET STRING,
    ntpProxyServerSysFreq OCTET STRING,
    ntpProxyServerSysError OCTET STRING,
    ntpProxyServerSysClock NTPTimeStamp,
    ntpProxyServerSysSystem OCTET STRING,
    ntpProxyServerSysProcessor OCTET STRING
}


ntpProxyServerSysLeap OBJECT-TYPE
    SYNTAX     NTPLeapIndicator
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  1 }

ntpProxyServerSysStratum OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  2 }

ntpProxyServerSysPrecision OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
```

```
    ::= { ntpProxyServerSystemEntry  3 }

ntpProxyServerSysRootDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  4 }

ntpProxyServerSysRootDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  5 }

ntpProxyServerSysRefId OBJECT-TYPE
    SYNTAX    OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  6 }

ntpProxyServerSysRefTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry 7 }

ntpProxyServerSysPoll   OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry 8 }

ntpProxyServerSysPeer  OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry 9 }

ntpProxyServerSysPhase OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
```

```
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  10 }

ntpProxyServerSysFreq OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  11 }

ntpProxyServerSysError OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  12 }

ntpProxyServerSysClock OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  13 }

ntpProxyServerSysSystem OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  14 }

ntpProxyServerSysProcessor OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyServerSystemEntry  15 }



--
-- Proxy Peer Variables Table
--


ntpProxyPeersVarTable OBJECT-TYPE
```

```
    SYNTAX      SEQUENCE OF NtpProxyPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpProxyControl 3}

ntpProxyPeersVarEntry OBJECT-TYPE
    SYNTAX      NtpProxyPeersVarEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    INDEX       { ntpProxyServerIPAddr, ntpProxyPeersAssocId }
    ::= { ntpProxyPeersVarTable 1 }

NtpProxyPeersVarEntry ::= SEQUENCE {
    ntpProxyPeersAssocId Unsigned32,
    ntpProxyPeersConfigured TruthValue,
    ntpProxyPeersPeerAddress IpAddress,
    ntpProxyPeersPeerPort Unsigned32,
    ntpProxyPeersHostAddress IpAddress,
    ntpProxyPeersHostPort Unsigned32,
    ntpProxyPeersLeap NTPLeapIndicator,
    ntpProxyPeersMode INTEGER,
    ntpProxyPeersStratum Integer32,
    ntpProxyPeersPeerPoll Integer32,
    ntpProxyPeersHostPoll Integer32,
    ntpProxyPeersPrecision Integer32,
    ntpProxyPeersRootDelay OCTET STRING,
    ntpProxyPeersRootDispersion OCTET STRING,
    ntpProxyPeersRefId OCTET STRING,
    ntpProxyPeersRefTime NTPTimeStamp,
    ntpProxyPeersOrgTime NTPTimeStamp,
    ntpProxyPeersReceiveTime NTPTimeStamp,
    ntpProxyPeersTransmitTime NTPTimeStamp,
    ntpProxyPeersUpdateTime NTPTimeStamp,
    ntpProxyPeersReach Unsigned32,
    ntpProxyPeersTimer Integer32,
    ntpProxyPeersOffset OCTET STRING,
    ntpProxyPeersDelay OCTET STRING,
    ntpProxyPeersDispersion OCTET STRING,
    ntpProxyPeersFilterValidEntries Integer32
}

ntpProxyPeersAssocId OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS not-accessible
    STATUS     current
```

```
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 1 }

ntpProxyPeersConfigured OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 2 }

ntpProxyPeersPeerAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 3 }

ntpProxyPeersPeerPort OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 4 }

ntpProxyPeersHostAddress OBJECT-TYPE
    SYNTAX     IpAddress
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 5 }

ntpProxyPeersHostPort OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 6 }

ntpProxyPeersLeap OBJECT-TYPE
    SYNTAX     NTPLeapIndicator
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 7 }

ntpProxyPeersMode OBJECT-TYPE
    SYNTAX     INTEGER {
```

```
                  unspecified (0),
                  symmetricActive (1),
                  symmetricPassive (2),
                  client (3),
                  server (4),
                  broadcast (5),
                  reservedControl (6),
                  reservedPrivate (7)
               }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 8 }

ntpProxyPeersStratum OBJECT-TYPE
    SYNTAX     Integer32 (0..255)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 9 }

ntpProxyPeersPeerPoll OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 10 }

ntpProxyPeersHostPoll OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 11 }

ntpProxyPeersPrecision OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 12 }

ntpProxyPeersRootDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
```

```
    ::= { ntpProxyPeersVarEntry 13 }

ntpProxyPeersRootDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 14 }

ntpProxyPeersRefId OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 15 }

ntpProxyPeersRefTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 16 }

ntpProxyPeersOrgTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 17 }

ntpProxyPeersReceiveTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 18 }

ntpProxyPeersTransmitTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 19 }

ntpProxyPeersUpdateTime OBJECT-TYPE
    SYNTAX     NTPTimeStamp
    MAX-ACCESS read-only
```

```
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 20 }

ntpProxyPeersReach OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 21 }

ntpProxyPeersTimer OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 22 }

ntpProxyPeersOffset OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 23 }

ntpProxyPeersDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 24 }

ntpProxyPeersDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyPeersVarEntry 25 }

ntpProxyPeersFilterValidEntries OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "The number of valid entries for a peer in the Proxy Filter
              Register Table. This number can be zero."
    ::= { ntpProxyPeersVarEntry 26 }
```

```
--
-- Proxy Filter Register Table
--


ntpProxyFilterRegisterTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF NtpProxyFilterRegisterEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    ::= { ntpProxyControl 4}

ntpProxyFilterRegisterEntry OBJECT-TYPE
    SYNTAX      NtpProxyFilterRegisterEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION ""
    INDEX       { ntpProxyServerIPAddr, ntpProxyPeersAssocId,
                          ntpProxyFilterIndex }
    ::= { ntpProxyFilterRegisterTable 1 }

NtpProxyFilterRegisterEntry ::= SEQUENCE {
    ntpProxyFilterIndex Unsigned32,
    ntpProxyFilterPeersOffset OCTET STRING,
    ntpProxyFilterPeersDelay OCTET STRING,
    ntpProxyFilterPeersDispersion OCTET STRING
}


ntpProxyFilterIndex OBJECT-TYPE
    SYNTAX     Unsigned32
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyFilterRegisterEntry 1 }

ntpProxyFilterPeersOffset OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyFilterRegisterEntry 2 }

ntpProxyFilterPeersDelay OBJECT-TYPE
    SYNTAX     OCTET STRING
```

```
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyFilterRegisterEntry 3 }

ntpProxyFilterPeersDispersion OBJECT-TYPE
    SYNTAX     OCTET STRING
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION ""
    ::= { ntpProxyFilterRegisterEntry 4 }


END
```