Application Performance Measurement MIB
draft-ietf-rmonmib-apm-mib-01.txt
July 12, 2000

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1. Abstract

This memo defines a portion of the Management Information Base
(MIB) for use with network management protocols in TCP/IP-
based internets. In particular, it defines objects for
measuring the application performance as experienced by end-

users.

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five
major components:

o   An overall architecture, described in RFC 2571 [1].

o   Mechanisms for describing and naming objects and
    events for the purpose of management. The first
    version of this Structure of Management Information
    (SMI) is called SMIv1 and described in STD 16, RFC
    1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The
    second version, called SMIv2, is described in STD 58,
    RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].

o   Message protocols for transferring management
    information. The first version of the SNMP message
    protocol is called SNMPv1 and described in STD 15, RFC
    1157 [8]. A second version of the SNMP message
    protocol, which is not an Internet standards track
    protocol, is called SNMPv2c and described in RFC 1901
    [9] and RFC 1906 [10]. The third version of the
    message protocol is called SNMPv3 and described in RFC
    1906 [10], RFC 2572 [11] and RFC 2574 [12].

o   Protocol operations for accessing management
    information. The first set of protocol operations and
    associated PDU formats is described in STD 15, RFC
    1157 [8]. A second set of protocol operations and
    associated PDU formats is described in RFC 1905 [13].

o   A set of fundamental applications described in RFC
    2573 [14] and the view-based access control mechanism
    described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management
Framework can be found in RFC 2570 [22].

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

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

3. **Overview**

This document continues the architecture created in the RMON
MIB [18] by providing analysis of application performance as
experienced by end-users.

Application performance measurement measures the quality of
service delivered to end-users by applications. With this
perspective, a true end-to-end view of the IT infrastrure
results, combining the performance of the application,
desktop, network, and server, as well as any positive or
negative interactions between these components.

Despite all the technically sophisticated ways in which
networking and system resources can be measured, human end-
users perceive only two things about an application:
availability and responsiveness.

   Availability - The percentage of the time that the
   application is ready to give a user service.

   Responsiveness - The speed at which the application
   delivers the requested service.

A transaction is an action initiated by a user that starts and
completes a distributed processing function. A transaction
begins when a user initiates a request for service (i.e.
pushing a submit button) and ends when the work is completed
(i.e. information is provided or a confirmation is delivered).
A transaction is the fundamental unit measured by the APM MIB.

Application protocols implement one of three different types
of transactions: transaction-oriented, throughput-oriented, or
streaming-oriented. While the availability metric is the same
for all three types, the responsiveness metric varies:

   Transaction-Oriented: These transactions have a fairly
   constant workload to perform for all transactions. The
   responsiveness metric for transaction-oriented protocols is
   application response time (from first request to final
   delivery of service) and is measured in tenth's of seconds.
   This is commonly referred to as end-user response time.

   Throughput-Oriented: These transaction have widely varying
   workloads based on the nature of the client request. In

particular, throughput-oriented protocols vary widely in
the amount of data that must be transported to satisfy the
request. The responsiveness metric for throughput-oriented
protocols is seconds per terabit. [Ref: 2Kbps= 500 Million,
1Gbps=1000]. The inverting of the popular bits per second
is done so that for all responsiveness metrics, lower
values are better.

Streaming-Oriented: These transactions deliver data at a
constant metered rate of speed regardless of the
responsiveness of the networking and computing
infrastructure. This constant rate of speed is generally
spec'ed to be below (sometimes well below) the nominal
capability of the infrastructure. However, when the
infrastructure's cannot deliver data at this speed,
interruption of service or degradation of service can
result. The responsiveness metric for streaming-oriented
protocols is the ratio of time that the service is degraded
or interrupted to the total service time. This metric is
measured in parts per million.

[3.1](#). **Report Aggregation**

This MIB provides functions to aggregate measurements into
higher level summaries.

Every transaction is identified by its protocol, server, and
client and has an availability measure as well as a
responsiveness measure. The appropriate responsiveness measure
is context-sensitive depending on whether the protocol is
transaction-oriented, throughput-oriented, or streaming-
oriented. For example, in a 5 minute period several
transactions might be recorded:

Protocol	Client	Server	Successful	Responsiveness
HTTP	Jim	Amazon	1	6 sec.
SAP/R3	Jane	SAP	1	17 sec.
HTTP	Joe	HR	0	-
FTP	Jim	ietf	1	47MspTb (212 Kbps)
HTTP	Joe	HR	1	25 sec.
RealVideo	Joe	CNN	1	100.0%
HTTP	Jane	HR	1	5 sec.

These transactions can be aggregated in several ways,

providing statistical summaries - for example summarizing all
HTTP transactions, or all HTTP transactions to the HR Server.
Note that data from different protocols may not be summarized
because:

   1. The performance characteristics of different protocols
   differ widely enough to render statistical analysis
   meaningless.

   2. The responsiveness metrics of different protocols may be
   different, making a statistical analysis impossible.

Aggregating transactions collected over a period requires
aggregation algorithms. Several are provided:

TransactionCount
     The total number of transactions during this period

SuccessfulTransactions
     The total number of transactions that were successful

ResponsivenessMean
     The average of the responsiveness metric for all aggregated
     transactions that completed successfully

ResponsivenessMin
     The minimum responsiveness metric for all aggregated transactions
     that completed successfully

ResponsivenessMax
     The maximum responsiveness metric for all aggregated transactions
     that completed successfully

ResponsivenessBx
     The count of successful transactions whose responsiveness metric
     fell into the range specified for Bx. There are 7 buckets
     specified. Because the performance of different protocols varies
     widely, the bucket ranges are specified separately for each
     protocol (in the protocolDirExtTable) so that they may be tuned to
     typical performance of each protocol.

For example, when aggregating the previous set of transactions
by protocol we get (for simplicity the example only shows
TransactionCount, SuccessfulTransactions, and
ResponsivenessMean):

Protocol	Count	Successful	ResponsivenessMean
HTTP	4	3	12 sec.
SAP/R3	1	1	17 sec.
FTP	1	1	212 Kbps.
RealVideo	1	1	100.0%

There are four different types of aggregation.

The flows(1) aggregation is the simplest. All transactions
that share common protocol/server/client 3-tuples are
aggregated together, resulting in a set of metrics for all
such unique 3-tuples.

The clients(2) aggregation results in somewhat more
aggregation (i.e. fewer resulting records). All
transactions that share common protocol/client tuples are
aggregated together, resulting in a set of metrics for all
such unique tuples.

The servers(3) aggregation usually results in still more
aggregation (i.e. fewer resulting records). All
transactions that share common protocol/server tuples are
aggregated together, resulting in a set of metrics for all
such unique tuples.

The protocols(4) aggregation results in the most
aggregation (i.e. the fewest resulting records). All
transactions that share a common protocol are aggregated
together, resulting in a set of metrics for all such unique
protocols.

   The apmReportControlTable provides for a historical set of the
   last 'X' Top N reports, combining the historical records found in
   history tables with the list sorting found in TopN tables.
   Conceptually the components are:
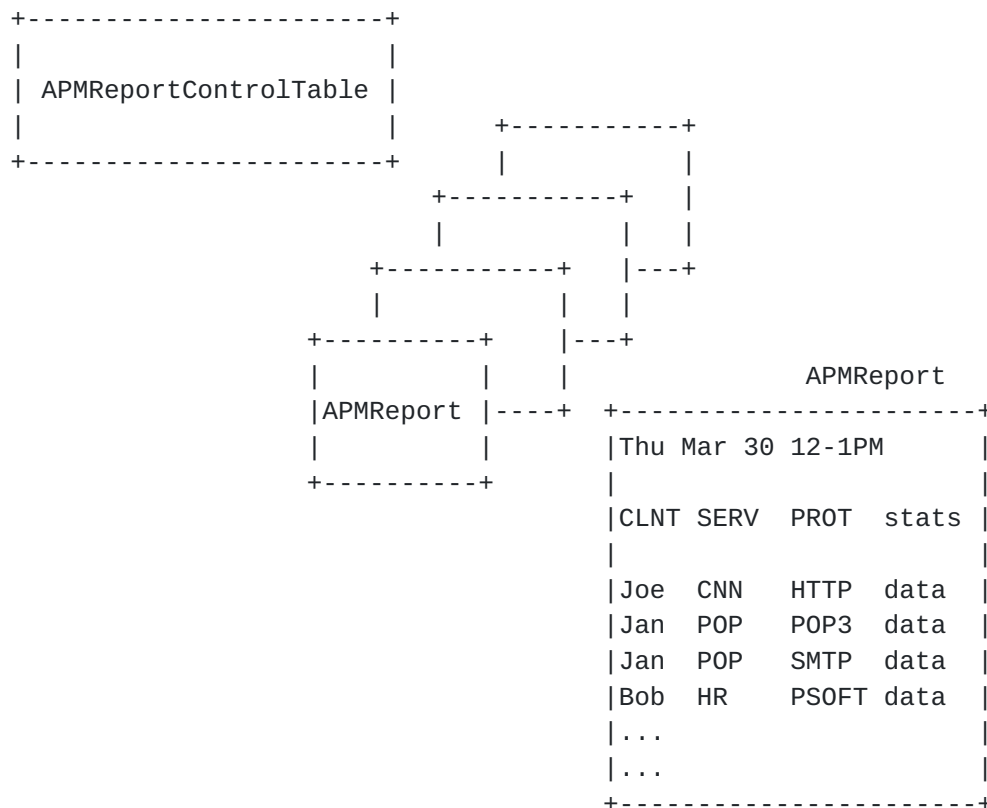
   APMReportControlTable
       Specifies data collection and summarization parameters, including
       the number of reports to keep and the size of each report.

   APMReport
       Each APM Report contains an aggregated and sorted list of records
       that represent data collected during a specific time period.

       An APMReportControlEntry causes a family of APM Reports to be
       created, where each report summarizes different, successive,
       contiguous periods of time.

       While the conceptual model of APM Reports shows them as distinct
       entities, they are all entries in a single apmReportTable, where
       entries in report 'A' are seperated from entries in report 'B'
       by different values of the apmReportIndex.

```
    +-----------------------+
    |                       |
    |  APMReportControlTable |
    |                       |       +-----------+
    +-----------------------+       |           |
                          +-----------+   |
                          |           |   |
                   +-----------+   |---+
                   |           |   |
            +----------+    |---+
            |          |    |              APMReport
            |APMReport |----+  +-----------------------+
            |          |       |Thu Mar 30 12-1PM      |
            +----------+       |                       |
                              |CLNT SERV  PROT  stats |
                              |                       |
                              |Joe   CNN    HTTP  data  |
                              |Jan   POP    POP3  data  |
                              |Jan   POP    SMTP  data  |
                              |Bob   HR     PSOFT data  |
                              |...                    |
                              |...                    |
                              +-----------------------+
```

3.2. **Structure of MIB**

The objects are arranged into the following groups:

        - Protocol Directory Extensions Group

        - APM Report Group

        - APM Current Transaction Group

        - APM Exception Group

        - APM Notification Group

These groups are the basic unit of conformance. If an agent
implements a group, then it must implement all objects in that
group. While this section provides an overview of grouping and
conformance information for this MIB, the authoritative
reference for such information is contained in the MODULE-
COMPLIANCE and OBJECT-GROUP macros later in this MIB.

These groups are defined to provide a means of assigning
object identifiers, and to provide a method for implementors
of managed agents to know which objects they must implement.

3.2.1. **The Protocol Directory Extensions Group**

The RMON2 protocol directory represents a useful registration
mechanism for network protocols of all layers. For application
protocols measured with this MIB, this group contains the
additional configuration objects required. This group consists
of the protocolDirExtTable.

3.2.2. **The APM Report Group**

The APM Report Group is used to prepare regular reports that
aggregate application performance by flow, by client, by
server, or by protocol. This group consists of the
apmReportControlTable and the apmReportTable.

3.2.3. **The APM Current Transaction Group**

The APM Current Transaction Group is used to show the
transactions that are currently in progress, along with their
responsiveness metric.

Because many transactions last a very short time, they will exist in this table for a very short time. Thus, polling this table is not an effective mechanism for retrieving all transactions.

This table is designed to allow a management station to check on the status of long-lived transactions. Because the apmReport and apmException mechanisms act only on transactions that have finished, a network manager may not have visibility for some time into the performance of long-lived transactions such as streaming transactions, large data transfers, or (very) poorly performing transactions. In fact, by their very definition, the apmReport and apmException mechanisms only provide visibility into a problem after nothing can be done about it. The apmCurrentTransactionTable provides visibility into transactions that are currently executing and will allow a management station to find status of long-lived transactions.

3.2.4. The APM Exception Group

The APM Exception Group is used to generate immediate notifications of transactions that cross certain thresholds. The apmExceptionTable is used to configure which thresholds are to be checked for which types of transactions. The apmTransactionResponsivenessAlarm notification is sent when a transaction occurs with a responsiveness that crosses a threshold. The apmTransactionUnsuccessfulAlarm notification is sent when a transaction fails for which exception checking was configured.

3.2.5. The APM Notification Group

The APM Notification Group contains 2 notifications that are sent when thresholds in the APM Exception Table are exceeded.

[4](). **Definitions**

```
APM-MIB DEFINITIONS ::= BEGIN
IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    NOTIFICATION-TYPE,
    Counter32, Integer32, Unsigned32        FROM SNMPv2-SMI
    RowStatus, TimeStamp, TruthValue,
    DateAndTime                             FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP                      FROM SNMPv2-CONF
    SnmpAdminString                         FROM SNMP-FRAMEWORK-MIB
    rmon, OwnerString                       FROM RMON-MIB
    DataSource,
    protocolDirID, protocolDirParameters,
    protocolDirLocalIndex                   FROM RMON2-MIB;

-- Application Performance Measurement MIB

apm MODULE-IDENTITY
    LAST-UPDATED "200007121500Z"  -- July 12, 2000
    ORGANIZATION "IETF RMON MIB Working Group"
    CONTACT-INFO
        "Steve Waldbusser

        Phone: +1-650-948-6500
        Fax:   +1-650-745-0671
        Email: waldbusser@nextbeacon.com"
    DESCRIPTION
        "The MIB module for measuring application performance
        as experienced by end-users. This MIB module
        augments the original RMON MIB as specified in
        RFC 1757 and the RMON2 MIB as specified in RFC 2021."

    REVISION "200007121500Z"    -- July 12, 2000
    DESCRIPTION
        "The original version of this MIB, published as RFCXXXX."
    ::= { rmon 23 }

-- The protocol Directory Extensions Group

protocolDirExtTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ProtocolDirExtEntry
    MAX-ACCESS  not-accessible
    STATUS      current
```

```
    DESCRIPTION
        "The APM MIB extensions to the RMON2 Protocol Directory."
    ::= { apm 1 }

protocolDirExtEntry OBJECT-TYPE
    SYNTAX      ProtocolDirExtEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The APM MIB extensions to the RMON2 Protocol Directory. An
        entry will exist in this table for all application protocols
        for which application performance measuring is supported."
    INDEX { protocolDirID, protocolDirParameters,
            protocolDirExtApmResponsivenessType }
    ::= { protocolDirExtTable 1 }

ProtocolDirExtEntry ::= SEQUENCE {
    protocolDirExtApmResponsivenessType       INTEGER,
    protocolDirExtApmConfig                   INTEGER,
    protocolDirExtApmResponsivenessBoundary1  Integer32,
    protocolDirExtApmResponsivenessBoundary2  Integer32,
    protocolDirExtApmResponsivenessBoundary3  Integer32,
    protocolDirExtApmResponsivenessBoundary4  Integer32,
    protocolDirExtApmResponsivenessBoundary5  Integer32,
    protocolDirExtApmResponsivenessBoundary6  Integer32
}

protocolDirExtApmResponsivenessType OBJECT-TYPE
    SYNTAX      INTEGER {
                    transactionOriented(1),
                    throughputOriented(2),
                    streamingOriented(3)
                }
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object describes and configures the agent's support for
        application performance measurement for this protocol. There
        are 3 types of measurements for different types of protocols:

        Transaction-Oriented protocols have a fairly constant workload
        to perform for all transactions. The responsiveness metric for
        transaction-oriented protocols is application response time
        (from first request to final delivery of service) and is
        measured in tenth's of seconds. This is commonly referred to
```

        as end-user response time.

        Throughput-Oriented protocols have widely varying workloads
        based on the nature of the client request. In particular,
        throughput-oriented protocols vary widely in the amount of
        data that must be transported to satisfy the request. The
        responsiveness metric for throughput-oriented protocols is
        seconds per terabit. [Ref: 2Kbps= 500 Million, 1Gbps=1000].
        The inverting of the popular bits per second is done so that
        for all responsiveness metrics, lower values are better.

        Streaming-Oriented protocols deliver data at a constant
        metered rate of speed regardless of the responsiveness of the
        networking and computing infrastructure. This constant rate of
        speed is generally spec'ed to be below (sometimes well below)
        the nominal capability of the infrastructure. However, when
        the infrastructure's cannot deliver data at this speed,
        interruption of service or degradation of service can
        result. The responsiveness metric for streaming-oriented
        protocols is the ratio of time that the service is degraded or
        interrupted to the total service time. This metric is measured
        in parts per million.

        Note that for some protocols, measuring more than one
        responsiveness type may be interesting. For agents that wish
        to support more than one measurement for a protocol, they will
        populate this table with 2 entries for that protocol, one for
        each type."
    ::= { protocolDirExtEntry 1 }

protocolDirExtApmConfig OBJECT-TYPE
    SYNTAX   INTEGER {
                    notSupported(1),
                    supportedOff(2),
                    supportedOn(3)
                 }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "This object describes and configures support for
        application performance measurement for this protocol. When the
        agent creates entries in this table for all protocols that it
        understands, it will set the entry to notSupported(1) if it
        doesn't have the capability to measure application performance
        for this protocol or if this protocol is not an

        application-level protocol.

        If the value of this object is notSupported(1), the agent
        will not measure application performance metrics for this
        protocol and shall not allow this object to be changed to any
        other value. If the value of this object is supportedOn(3),
        the agent supports measurement of application performance
        metrics for this protocol and is configured to measure such
        metrics for all APM MIB functions and all interfaces.
        If the value of this object is supportedOff(2), the agent
        supports measurement of application performance for this
        protocol but is configured to not measure these metrics
        for any APM MIB functions or interfaces.
        Whenever this value changes from supportedOn(3) to
        supportedOff(2), the agent shall delete all related entries in
        all tables in this MIB."
    ::= { protocolDirExtEntry 2 }

protocolDirExtApmResponsivenessBoundary1 OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "The boundary value between bucket1 and bucket 2. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { protocolDirExtEntry 3 }

protocolDirExtApmResponsivenessBoundary2 OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "The boundary value between bucket2 and bucket 3. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { protocolDirExtEntry 4 }

protocolDirExtApmResponsivenessBoundary3 OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "The boundary value between bucket3 and bucket 4. If this
        value is modified, all entries in the apmReportTable must be

```
        deleted."
    ::= { protocolDirExtEntry 5 }


protocolDirExtApmResponsivenessBoundary4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket4 and bucket 5. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { protocolDirExtEntry 6 }


protocolDirExtApmResponsivenessBoundary5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket5 and bucket 6. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { protocolDirExtEntry 7 }


protocolDirExtApmResponsivenessBoundary6 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket6 and bucket 7. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { protocolDirExtEntry 8 }
```

-- APM HTTP Tracking Table

-- The HTTP Tracking Table creates virtual protocols which measure the
-- performance of certain web pages or sets of web pages. Some
-- circumstances where this is particularly useful are:
--
--   - An Intranet or ASP scenario where a business application is
--   running on one or more web pages or scripts.
--   (i.e. /expense/submit.cgi?employeeID=3426&...)
--   - A web-hosting scenario where one wants to measure the
--   service level for a particular customer
--   - An e-commerce scenario where the performance of certain
--   pages needs to be monitored more closely.
--   (i.e. shopping cart, shipping, credit card authorization)

apmHttpFilterTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApmHttpFilterEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A table that creates virtual protocols which measure the
        performance of certain web pages or sets of web pages."
    ::= { apm 2 }

apmHttpFilterEntry OBJECT-TYPE
    SYNTAX   ApmHttpFilterEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A virtual protocol which measure the performance of certain
        web pages or sets of web pages."
    INDEX { apmHttpFilterIndex }
    ::= { apmHttpFilterTable 1 }

ApmHttpFilterEntry ::= SEQUENCE {
    apmHttpFilterIndex   Integer32,
    apmHttpFilterLocalIndex   Integer32,
    apmHttpFilterServerProtocol Integer32,
    apmHttpFilterServerAddress OCTET STRING,
    apmHttpFilterURLPath   OCTET STRING,
    apmHttpFilterMatchType   INTEGER,
    apmHttpFilterRowStatus   RowStatus
}

apmHttpFilterIndex OBJECT-TYPE

```
    SYNTAX       Integer32 (0..65535)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An index that uniquely identifies an entry in the
        apmHttpFilterTable."
    ::= { apmHttpFilterEntry 1 }

apmHttpFilterLocalIndex OBJECT-TYPE
    SYNTAX       Integer32 (1..2147483647)
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The protocolDirLocalIndex that represents HTTP transactions
        that match this entry.

        This object is read-only. A value is created by the agent from
        an unused protocolDirLocalIndex value when this
        apmHttpFilterEntry is created. No entry in the
        protocolDirTable will be created for the new
        protocolDirLocalIndex."
    ::= { apmHttpFilterEntry 2 }

apmHttpFilterServerProtocol OBJECT-TYPE
    SYNTAX       Integer32 (1..2147483647)
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "The network level protocol of the
        apmHttpFilterServerAddress."
    ::= { apmHttpFilterEntry 3 }

apmHttpFilterServerAddress OBJECT-TYPE
    SYNTAX       OCTET STRING
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "This entry will only represent transactions coming from the
        network address specified in this object.

        This is represented as an octet string with
        specific semantics and length as identified
        by the apmNameProtocolDirLocalIndex component of the index.

        If this object is the zero-length string, then this entry will
```

        match the associated apmHttpFilterURL from address."
    ::= { apmHttpFilterEntry 4 }

apmHttpFilterURLPath OBJECT-TYPE
    SYNTAX   OCTET STRING
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "This entry will only represent HTTP transactions
        whose URL path component matches this value.

        Prior to the matching, the URL is stripped of any server
        address or DNS name and consists solely of the path name on
        that server.

        The value of the associated apmHttpFilterMatchType dictates
        the type of matching that will be attempted."
    ::= { apmHttpFilterEntry 5 }

apmHttpFilterMatchType OBJECT-TYPE
    SYNTAX   INTEGER {
                    exact(1),
                    prefix(2)
                }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The matching algorithm used to compare the URL pathname.

        If the value is exact(1), then the pathname component will be
        compared with the associated apmHttpFilterURLPath and
        will only be associated with this entry if it matches exactly.

        If the value is prefix(2), then the pathname component will be
        compared with the associated apmHttpFilterURLPath and will
        only be associated with this entry if the beginning of the
        pathname matches every octet of this value. Octets that extend
        beyond the length of this value are ignored."
    ::= { apmHttpFilterEntry 6 }

apmHttpFilterRowStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION

```
        "The status of this apmHttpFilterEntry."
    ::= { apmHttpFilterEntry 7 }


apmHttpIgnoreUnregisteredURLs OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "When true, this agent will only monitor URLs registered in
        the apmHttpFilterTable.

        This will be used in environments that wish to monitor only
        targeted URLs and to ignore large volumes of internet web
        browsing traffic."
    ::= { apm 3 }


apmHttp404IsFailure OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "When true, this agent will recognize HTTP 404 Errors and will
        treat them as unavailable transactions. When false or when
        this object isn't supported, they will be treated as
        successful transactions.

        This object allows such error pages to be tracked at the
        possible expense of having user typo's treated as poor service
        on the part of the web server."
     ::= { apm 4 }

-- The APM User-Defined Protocol Table

-- Many application protocols will never be registered with a
-- standards body (and thus included in a protocol directory standard)
-- because they are custom, in-house or proprietary
-- applications. Nevertheless, implementation strategies exist for
-- monitoring the end-user experience of these applications.
--
-- This read-only table provides a means for the agent to advertise
-- which user-defined protocols it is monitoring and to associate each
-- with a protocolDirLocalIndex value. It is an
-- implementation-dependent matter as to how the agent learns how to
-- monitor these protocols.
```

```
apmUserDefinedProtTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApmUserDefinedProtEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table that advertises user-defined protocols that the agent
        is measuring."
    ::= { apm 5 }


apmUserDefinedProtEntry OBJECT-TYPE
    SYNTAX      ApmUserDefinedProtEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A user-defined protocol that the agent is measuring, along
        with its protocolDirLocalIndex assignment."
    INDEX { apmUserDefinedProtIndex }
    ::= { apmUserDefinedProtTable 1 }

ApmUserDefinedProtEntry ::= SEQUENCE {
    apmUserDefinedProtIndex        Integer32,
    apmUserDefinedProtParentIndex  Integer32,
    apmUserDefinedProtApplication  SnmpAdminString
}

apmUserDefinedProtIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The agent-assigned protocolDirLocalIndex value for this
        user-defined protocol."
    ::= { apmUserDefinedProtEntry 1 }

apmUserDefinedProtParentIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The protocolDirLocalIndex value of the highest-layer
        protocol defined in the protocolDirectoryTable that this
        protocol is a child of."
    ::= { apmUserDefinedProtEntry 2 }
```

apmUserDefinedProtApplication OBJECT-TYPE
    SYNTAX   SnmpAdminString
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A human readable descriptive tag for this protocol."
    ::= { apmUserDefinedProtEntry 3 }

-- The APM Name Table

apmNameTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApmNameEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A client machine may have multiple addresses during a period
        of monitoring. The apmNameTable assigns a long-lived
        identifier to a client and records what addresses were
        assigned to that client for periods of time. Various
        implementation techniques exist for tracking this mapping but
        if an agent is unable to track client address mappings, it may
        map client identifiers to client addresses rather than to
        distinct client machines.

        When available, the agent may also record the machine name
        and/or user name which may be valuable for displaying to
        humans."
    ::= { apm 6 }

apmNameEntry OBJECT-TYPE
    SYNTAX   ApmNameEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "An entry in the APM name tale. An entry exists for each
        period of time that a client has been associated with a
        particular address."
    INDEX { apmNameClientID,
            apmNameProtocolDirLocalIndex,
            apmNameClientAddress,
            apmNameMappingStartTime }
    ::= { apmNameTable 1 }

ApmNameEntry ::= SEQUENCE {
    apmNameClientID   Unsigned32,
    apmNameProtocolDirLocalIndex   Integer32,
    apmNameClientAddress   OCTET STRING,
    apmNameMappingStartTime   DateAndTime,
    apmNameMachineName   SnmpAdminString,
    apmNameUserName   SnmpAdminString
}

apmNameClientID OBJECT-TYPE

```
    SYNTAX       Unsigned32 (0..4294967295)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A unique ID assigned to the machine represented by this
        mapping. This ID is assigned by the agent using an
        implementation-specific algorithm."
    ::= { apmNameEntry 1 }

apmNameProtocolDirLocalIndex OBJECT-TYPE
    SYNTAX       Integer32 (1..2147483647)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The network level protocol of this client address."
    ::= { apmNameEntry 2 }

apmNameClientAddress OBJECT-TYPE
    SYNTAX       OCTET STRING
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The network client address for this client when this mapping
        was active.

        This is represented as an octet string with
        specific semantics and length as identified
        by the apmNameProtocolDirLocalIndex component of the index.

        Since this object is an index variable, it is encoded in the
        index according to the index encoding rules.  For example, if
        the apmNameProtocolDirLocalIndex indicates an encapsulation of
        ip, this object is encoded as a length octet of 4, followed by
        the 4 octets of the ip address, in network byte order."
    ::= { apmNameEntry 3 }

apmNameMappingStartTime OBJECT-TYPE
    SYNTAX       DateAndTime
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The time that the agent first discovered this mapping
        as active."
    ::= { apmNameEntry 4 }
```

apmNameMachineName OBJECT-TYPE
    SYNTAX   SnmpAdminString
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The human readable name of the client machine.

        If the client has no machine name or the agent is
        unable to learn the machine name, this object will be
        a zero-length string."
    ::= { apmNameEntry 5 }

apmNameUserName OBJECT-TYPE
    SYNTAX   SnmpAdminString
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The human readable name of a user using the client
        machine.

        If the client has no recorded user name or the agent is
        unable to learn a user name, this object will be
        a zero-length string."
    ::= { apmNameEntry 6 }

-- The APM Report Group

apmReportControlTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApmReportControlEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "Parameters that control the creation of a set of reports that
        aggregate application performance."
    ::= { apm 7 }

apmReportControlEntry OBJECT-TYPE
    SYNTAX   ApmReportControlEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A conceptual row in the apmReportControlTable.

        An example of the indexing of this table is
        apmReportControlDuration.3"
    INDEX { apmReportControlIndex }
    ::= { apmReportControlTable 1 }

ApmReportControlEntry ::= SEQUENCE {
    apmReportControlIndex   Integer32,
    apmReportControlDataSource   DataSource,
    apmReportControlAggregationType INTEGER,
    apmReportControlInterval   Integer32,
    apmReportControlRequestedSize   Integer32,
    apmReportControlGrantedSize   Integer32,
    apmReportControlRequestedReports Integer32,
    apmReportControlGrantedReports   Integer32,
    apmReportControlStartTime   TimeStamp,
    apmReportControlReportNumber   Integer32,
    apmReportControlInsertsDenied   Integer32,
    apmReportControlDroppedFrames   Counter32,
    apmReportControlOwner   OwnerString,
    apmReportControlStatus   RowStatus
}

apmReportControlIndex OBJECT-TYPE
    SYNTAX   Integer32 (1..65535)
    MAX-ACCESS not-accessible
    STATUS   current

    DESCRIPTION
        "An index that uniquely identifies an entry in the
        apmReportControlTable. Each such entry defines a unique
        report whose results are placed in the apmReportTable on
        behalf of this apmReportControlEntry."
    ::= { apmReportControlEntry 1 }

apmReportControlDataSource OBJECT-TYPE
    SYNTAX   DataSource
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The source of the data for APM Reports generated on
        behalf of this apmReportControlEntry.

        This object may not be modified if the associated
        apmReportControlStatus object is equal to active(1)."
    ::= { apmReportControlEntry 2 }

apmReportControlAggregationType OBJECT-TYPE
    SYNTAX   INTEGER {
                  flows(1),   -- Least Aggregation
                  clients(2),
                  servers(3),
                  protocols(4) -- Most Aggregation
                }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The type of aggregation being performed for this set of
        reports.

        The metrics for a single transaction are the responsiveness of
        the transaction and whether the transaction succeeded (a
        boolean). When such metrics are aggregated in this MIB, these
        metrics are replaced by averages and distributions of
        responsiveness and availability. The metrics describing
        aggregates are constant no matter which type of aggregation is
        being performed. These metrics may be found in the
        apmReportTable.

        The flows(1) aggregation is the simplest. All transactions
        that share common protocol/server/client 3-tuples are
        aggregated together, resulting in a set of metrics for all
        such unique 3-tuples.

The clients(2) aggregation results in somewhat more
aggregation (i.e. fewer resulting records). All transactions
that share common protocol/client tuples are aggregated
together, resulting in a set of metrics for all such unique
tuples.

The servers(3) aggregation usually results in still more
aggregation (i.e. fewer resulting records). All transactions
that share common protocol/server tuples are aggregated
together, resulting in a set of metrics for all such unique
tuples.

The protocols(4) aggregation results in the most
aggregation (i.e. the fewest resulting records). All
transactions that share a common protocol are aggregated
together, resulting in a set of metrics for all such unique
protocols.

Note that it is not meaningful to aggregate protocols, as
different protocols have widely varying characteristics. As a
result, this set of aggregations is complete.

This object may not be modified if the associated
apmReportControlStatus object is equal to active(1)."
    ::= { apmReportControlEntry 3 }

apmReportControlInterval OBJECT-TYPE
    SYNTAX   Integer32 (1..86400)
    UNITS   "Seconds"
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The interval in seconds over which data is accumulated before
        being aggregated into a report in the apmReportTable. All
        reports with the same apmReportControlIndex will be based on
        the same interval.

        This object may not be modified if the associated
        apmReportControlStatus object is equal to active(1)."
    DEFVAL { 3600 }
    ::= { apmReportControlEntry 4 }

apmReportControlRequestedSize OBJECT-TYPE
    SYNTAX   Integer32 (0..2147483647)
    MAX-ACCESS read-create

```
    STATUS      current
    DESCRIPTION
        "The number of entries requested to be allocated for each
        report generated on behalf of this entry."
    ::= { apmReportControlEntry 5 }

apmReportControlGrantedSize OBJECT-TYPE
    SYNTAX      Integer32 (0..2147483647)
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
        "The number of entries per report the agent has allocated
        based on the requested amount in apmReportControlRequestedSize.
        Since multiple reports are saved, the total number of entries
        allocated will be this number multiplied by the value of
        apmReportControlGrantedReports, or 1 if that object doesn't
        exist.

        When the associated apmReportControlRequestedSize object is
        created or modified, the agent should set this object as
        closely to the requested value as is possible for the
        particular implementation and available resources. When
        considering resources available, the agent must consider its
        ability to allocate this many entries for all reports.

        Note that while the actual number of entries stored in the
        reports may fluctuate due to changing conditions, the agent
        must continue to have storage available to satisfy the full
        report size for all reports when necessary. Further, the agent
        must not lower this value except as a result of a set to the
        associated apmReportControlRequestedSize object."
    ::= { apmReportControlEntry 6 }

apmReportControlRequestedReports OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS read-create
    STATUS      current
    DESCRIPTION
        "The number of saved reports requested to be allocated on
        behalf of this entry."
    ::= { apmReportControlEntry 7 }

apmReportControlGrantedReports OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS read-only
```

        STATUS   current
    DESCRIPTION
        "The number of saved reports the agent has allocated
        based on the requested amount in
        apmReportControlRequestedReports. Since each report can have
        many entries, the total number of entries allocated will be
        this number multiplied by the value of
        apmReportControlGrantedSize, or 1 if that object doesn't
        exist.

        When the associated apmReportControlRequestedReports object is
        created or modified, the agent should set this object as
        closely to the requested value as is possible for the
        particular implementation and available resources. When
        considering resources available, the agent must consider its
        ability to allocate this many reports each with the number of
        entries represented by apmReportControlGrantedSize, or 1 if
        that object doesn't exist.

        Note that while the storage required for each report may
        fluctuate due to changing conditions, the agemt must continue
        to have storage available to satisfy the full report size for
        all reports when necessary. Further, the agent must not lower
        this value except as a result of a set to the associated
        apmReportControlRequestedSize object."
    ::= { apmReportControlEntry 8 }

apmReportControlStartTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The value of sysUpTime when the system began processing the
        report in progress. Note that the report in progress is not
        available.

        This object may be used by the management station to figure
        out the start time for all previous reports saved for this
        apmReportControlEntry, as reports are started at fixed
        intervals."
    ::= { apmReportControlEntry 9 }

apmReportControlReportNumber OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-only

         STATUS   current
     DESCRIPTION
         "The number of the report in progress. When an
         apmReportControlEntry is activated, the first report will be
         numbered zero."
     ::= { apmReportControlEntry 10 }

apmReportControlInsertsDenied OBJECT-TYPE
     SYNTAX   Integer32
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
         "The number of failed attempts to add an entry to reports for
         this apmReportControlEntry because the number of entries
         would have exceeded apmReportControlGrantedSize.

         This number is valuable in determining if enough entries have
         been allocated for reports in light of fluctuating network
         usage. Note that an entry that is denied will often be
         attempted again, this number will not predict the exact number
         of additional entries needed, but can be used to understand
         the relative magnitude of the problem.

         Also note that there is no ordering specified for the entries
         in the report, thus there are no rules for which entries will
         be omitted when not enough entries are available. As a
         consequence, the agent is not required to delete 'least
         valuable' entries first."
     ::= { apmReportControlEntry 11 }

apmReportControlDroppedFrames OBJECT-TYPE
     SYNTAX   Counter32
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
        "The total number of frames which were received by the agent
         and therefore not accounted for in the *StatsDropEvents, but
         for which the agent chose not to count for this entry for
         whatever reason. Most often, this event occurs when the agent
         is out of some resources and decides to shed load from this
         collection.

         This count does not include packets that were not counted
         because they had MAC-layer errors.

```
          Note that if the alMatrixTables are not implemented or are
          inactive because no protocols are enabled in the protocol
          directory, this value should be 0.

          Note that, unlike the dropEvents counter, this number is the
          exact number of frames dropped."
    ::= { apmReportControlEntry 12 }

apmReportControlOwner OBJECT-TYPE
    SYNTAX     OwnerString
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The entity that configured this entry and is
        therefore using the resources assigned to it."
    ::= { apmReportControlEntry 13 }

apmReportControlStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The status of this apmReportControlEntry.

        An entry may not exist in the active state unless all
        objects in the entry have an appropriate value.

        If this object is not equal to active(1), all
        associated entries in the apmReportTable shall be deleted
        by the agent."
    ::= { apmReportControlEntry 14 }

-- The APM Report Table

apmReportTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApmReportEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The data resulting from aggregated APM reports. Consult the
        definition of apmReportControlAggregationType for the
        definition of the various types of aggregations."
    ::= { apm 8 }

apmReportEntry OBJECT-TYPE
```

```
     SYNTAX      ApmReportEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
         "A conceptual row in the apmReportTable.

         The apmReportControlIndex value in the index identifies the
         apmReportControlEntry on whose behalf this entry was created.
         The apmReportIndex value in the index identifies which report
         (in the series of reports) this entry is a part of.
         The first protocolDirLocalIndex value in the index identifies
         the application layer protocol of the transactions aggregated
         in this entry.
         The second protocolDirLocalIndex value in the index identifies
         the network layer protocol of the apmReportServerAddress.
         When the associated apmReportControlAggregationType value is
         equal to protocol(4), this value will equal 0.
         The apmReportServerAddress value in the index identifies the
         network layer address of the server in transactions aggregated
         in this entry.
         The apmReportClientID value in the index identifies the
         client in transactions aggregated in this entry. It is a
         reference to the clientID recorded in the apmNameTable.
         The apmReportResponsivenessType value in the index identifies
         the type of responsiveness metric reported by this entry and
         uniquely identifies this entry when more than one
         responsiveness metric is measured for a flow.

         Note that the order of protocolDirLocalIndex variables is
         the opposite of that in the RMON2 MIB (application.network
         instead of network.application) so that the report entries are
         sorted by application first, server second and client third.

         An example of the indexing of this entry is
         apmReportTransactionCount.3.15.34.18.4.128.2.6.7.4.128.2.6.6.1"
     INDEX { apmReportControlIndex, apmReportIndex,
             protocolDirLocalIndex, protocolDirLocalIndex,
             apmReportServerAddress, apmReportClientID,
             apmReportResponsivenessType }
     ::= { apmReportTable 1 }

ApmReportEntry ::= SEQUENCE {
    apmReportIndex                  Integer32,
    apmReportServerAddress          OCTET STRING,
    apmReportClientID               Unsigned32,
```

```
    apmReportResponsivenessType      INTEGER,
    apmReportTransactionCount        Integer32,
    apmReportSuccessfulTransactions  Integer32,
    apmReportResponsivenessMean      Integer32,
    apmReportResponsivenessMin       Integer32,
    apmReportResponsivenessMax       Integer32,
    apmReportResponsivenessB1        Integer32,
    apmReportResponsivenessB2        Integer32,
    apmReportResponsivenessB3        Integer32,
    apmReportResponsivenessB4        Integer32,
    apmReportResponsivenessB5        Integer32,
    apmReportResponsivenessB6        Integer32,
    apmReportResponsivenessB7        Integer32
}

apmReportIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The value of apmReportControlReportNumber for the report to
        which this entry belongs."
    ::= { apmReportEntry 1 }

apmReportServerAddress OBJECT-TYPE
    SYNTAX      OCTET STRING
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The network server address for this apmReportEntry.

        This is represented as an octet string with
        specific semantics and length as identified
        by the second protocolDirLocalIndex component of the index.

        Since this object is an index variable, it is encoded in the
        index according to the index encoding rules.  For example, if
        the protocolDirLocalIndex indicates an encapsulation of ip,
        this object is encoded as a length octet of 4, followed by the
        4 octets of the ip address, in network byte order.

        If the associated apmReportControlAggregationType is equal to
        protocol(4) or client(2), then this object will be a null
        string and will be encoded simply as a length octet of 0."
    ::= { apmReportEntry 2 }
```

apmReportClientID OBJECT-TYPE
    SYNTAX   Unsigned32 (0..4294967295)
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "The clientID for the client represented by this
        apmReportEntry.

        If the associated apmReportControlAggregationType is equal to
        protocol(4) or server(3), then this object will be set to 0."
    ::= { apmReportEntry 3 }

apmReportResponsivenessType OBJECT-TYPE
    SYNTAX   INTEGER {
                    transactionOriented(1),
                    throughputOriented(2),
                    streamingOriented(3)
                }
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "The type of measurement that this entry represents. Entries
        will only exist for measurements configured by the
        protocolDirExtApmResponsivenessType object."
    ::= { apmReportEntry 4 }

apmReportTransactionCount OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The total number of transactions aggregated into this record."
    ::= { apmReportEntry 5 }

apmReportSuccessfulTransactions OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The total number of successful transactions aggregated into
        this record."
    ::= { apmReportEntry 6 }

apmReportResponsivenessMean OBJECT-TYPE
    SYNTAX   Integer32

```
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
         "The arithmetic mean of the responsiveness metrics for all
         transactions aggregated into this record."
     ::= { apmReportEntry 7 }

apmReportResponsivenessMin OBJECT-TYPE
     SYNTAX      Integer32
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
         "The minimum of the responsiveness metrics for all
         transactions aggregated into this record."
     ::= { apmReportEntry 8 }

apmReportResponsivenessMax OBJECT-TYPE
     SYNTAX      Integer32
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
         "The maximum of the responsiveness metrics for all
         transactions aggregated into this record."
     ::= { apmReportEntry 9 }


apmReportResponsivenessB1 OBJECT-TYPE
     SYNTAX      Integer32
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
         "The number of transactions aggregated into this record whose
         responsiveness was less than boundary1 value for this
         prococol."
     ::= { apmReportEntry 10 }

apmReportResponsivenessB2 OBJECT-TYPE
     SYNTAX      Integer32
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
         "The number of transactions aggregated into this record whose
         responsiveness was greater than or equal to the boundary1
         value for this protocol and less than the boundary2 value for
         this prococol."
```

```
    ::= { apmReportEntry 11 }

apmReportResponsivenessB3 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of transactions aggregated into this record whose
        responsiveness was greater than or equal to the boundary2
        value for this protocol and less than the boundary3 value for
        this prococol."
    ::= { apmReportEntry 12 }

apmReportResponsivenessB4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of transactions aggregated into this record whose
        responsiveness was greater than or equal to the boundary3
        value for this protocol and less than the boundary4 value for
        this prococol."
    ::= { apmReportEntry 13 }

apmReportResponsivenessB5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of transactions aggregated into this record whose
        responsiveness was greater than or equal to the boundary4
        value for this protocol and less than the boundary5 value for
        this prococol."
    ::= { apmReportEntry 14 }

apmReportResponsivenessB6 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of transactions aggregated into this record whose
        responsiveness was greater than or equal to the boundary5
        value for this protocol and less than the boundary6 value for
        this prococol."
    ::= { apmReportEntry 15 }
```

apmReportResponsivenessB7 OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The number of transactions aggregated into this record whose
        responsiveness was greater than or equal to the boundary6
        value for this protocol."
    ::= { apmReportEntry 16 }

-- APM Current Transaction Table

apmCurrentTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApmCurrentEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table contains all transactions that have been started
        but have not yet finished."
    ::= { apm 9 }

apmCurrentEntry OBJECT-TYPE
    SYNTAX   ApmCurrentEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "A conceptual row in the apmCurrentTable.

        The first protocolDirLocalIndex value in the index identifies
        the application layer protocol of the transactions represented
        by this entry.
        The second protocolDirLocalIndex value in the index identifies
        the network layer protocol of the apmCurrentServerAddress and
        apmCurrentClientAddress.
        The apmCurrentServerAddress value in the index identifies the
        network layer address of the server in the transaction
        represented by this entry.
        The apmCurrentClientID value in the index identifies the
        client in the transaction represented by this entry.
        The apmCurrentResponsivenessType value in the index identifies
        the type of responsiveness metric reported by this entry and
        uniquely identifies this entry when more than one
        responsiveness metric is measured for a transaction.

        Note that the order of protocolDirLocalIndex variables is

        the opposite of that in the RMON2 MIB (application.network
        instead of network.application) so that the report entries are
        sorted by application first, server second and client third.

        An example of the indexing of this entry is
        apmCurrentTransactionCount.34.18.4.128.2.6.7.4.128.2.6.6.23698.1"
    INDEX { protocolDirLocalIndex, protocolDirLocalIndex,
            apmCurrentServerAddress, apmCurrentClientID,
            apmCurrentTransactionID,
            apmCurrentResponsivenessType }
    ::= { apmCurrentTable 1 }

ApmCurrentEntry ::= SEQUENCE {
    apmCurrentServerAddress   OCTET STRING,
    apmCurrentClientID   Unsigned32,
    apmCurrentTransactionID   Integer32,
    apmCurrentResponsivenessType   INTEGER,
    apmCurrentResponsiveness   Integer32,
    apmCurrentSuccess   TruthValue
}

apmCurrentServerAddress OBJECT-TYPE
    SYNTAX   OCTET STRING
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "The network server address for this apmCurrentEntry.

        This is represented as an octet string with
        specific semantics and length as identified
        by the second protocolDirLocalIndex component of the index.

        For example, if the protocolDirLocalIndex indicates an
        encapsulation of ip, this object is encoded as a length
        octet of 4, followed by the 4 octets of the ip address,
        in network byte order."
    ::= { apmCurrentEntry 1 }

apmCurrentClientID OBJECT-TYPE
    SYNTAX   Unsigned32 (0..4294967295)
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "The clientID for the client in this apmCurrentEntry."
    ::= { apmCurrentEntry 2 }

apmCurrentTransactionID OBJECT-TYPE
    SYNTAX   Integer32 (0..2147483647)
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A unique value for this transaction amongst other
        transactions sharing the same application layer protocol and
        server and client addresses. Implementations may choose to use
        the value of the client's source port, when possible."
    ::= { apmCurrentEntry 3 }

apmCurrentResponsivenessType OBJECT-TYPE
    SYNTAX   INTEGER {
                    transactionOriented(1),
                    throughputOriented(2),
                    streamingOriented(3)
                }
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "The type of measurement that this entry represents. Entries
        will only exist for measurements configured by the
        protocolDirExtApmResponsivenessType object."
    ::= { apmCurrentEntry 4 }

apmCurrentResponsiveness OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The current value of the responsiveness metric for this
        transaction.

        Note that this value may change over the lifetime of the
        transaction and it is the final value of this metric that is
        recorded as the responsiveness of the transaction for use in
        other APM MIB functions."
    ::= { apmCurrentEntry 5 }

apmCurrentSuccess OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The success of this transaction up to this time. A

        transaction that has failed may exist in this table until it
        is closed. Once a transaction has been marked as failed, it
        cannot move back into the successful state."
    ::= { apmCurrentEntry 6 }

-- The APM exception table

apmExceptionTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApmExceptionEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table creates filters so that a management station can
        get immediate notification of a transaction that has had poor
        availability or responsiveness.

        Each apmExceptionEntry is associated with a particular type of
        transaction and is applied to all transactions of that
        type. Multiple apmExceptionEntries may be associated with a
        particular type of transaction. A transaction type is
        identified by the combination of protocolDirID and
        protocolDirParameters specified in the index of the
        apmExceptionEntry.

        Because the quality of a transaction is not known until it is
        completed, these thresholds are only applied after the
        transaction has completed."
    ::= { apm 10 }

apmExceptionEntry OBJECT-TYPE
    SYNTAX   ApmExceptionEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "A conceptual row in the apmExceptionTable."
    INDEX { protocolDirID, protocolDirParameters,
            protocolDirExtApmResponsivenessType, apmExceptionIndex }
    ::= { apmExceptionTable 1 }

ApmExceptionEntry ::= SEQUENCE {
    apmExceptionIndex   Integer32,
    apmExceptionResponsivenessComparison   INTEGER,
    apmExceptionResponsivenessThreshold   Integer32,
    apmExceptionUnsuccessfulException   INTEGER,
    apmExceptionOwner   OwnerString,

```
    apmExceptionStatus                      RowStatus
}

apmExceptionIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An index that uniquely identifies an entry in the
        apmExceptionTable.  Each such entry sets up thresholds for a
        particular measurement of a particular protocol.

        Note that even though the index of the apmExceptionTable
        contains other objects (e.g. protocolDirID) that may
        disambiguate apmExceptionEntries, no two apmExceptionEntries
        may have the same value of apmExceptionIndex."
    ::= { apmExceptionEntry 1 }

apmExceptionResponsivenessComparison OBJECT-TYPE
    SYNTAX      INTEGER {
                    none(1),
                    greater(2),
                    less(3)
                }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "If this value is greater(2) or less(3), the associated
        apmExceptionResponsivenessThreshold will be compared to this
        value and an exception will be created if the responsiveness
        is greater than the threshold (greater(2)) or less than the
        threshold (less(3))."
    ::= { apmExceptionEntry 2 }

apmExceptionResponsivenessThreshold OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The threshold that responsiveness metrics are compared to."
    ::= { apmExceptionEntry 3 }

apmExceptionUnsuccessfulException OBJECT-TYPE
    SYNTAX      INTEGER {
                    off(1),
```

```
                    on(2)
                  }
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "If this value is on(2), an exception will be created if "
      ::= { apmExceptionEntry 4 }


  apmExceptionOwner OBJECT-TYPE
      SYNTAX      OwnerString
      MAX-ACCESS read-create
      STATUS      current
      DESCRIPTION
          "The entity that configured this entry and is
          therefore using the resources assigned to it."
      ::= { apmExceptionEntry 5 }


  apmExceptionStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS read-create
      STATUS      current
      DESCRIPTION
          "The status of this apmExceptionEntry."
      ::= { apmExceptionEntry 6 }

  -- APM Notifications

  apmNotifications OBJECT IDENTIFIER ::= { apm 11 }

  apmTransactionResponsivenessAlarm NOTIFICATION-TYPE
      OBJECTS     { apmExceptionResponsivenessThreshold,
                    apmCurrentResponsiveness }
      STATUS      current
      DESCRIPTION
          "Notification sent when a transaction exceeds a threshold
          defined in the apmException table. The index of the
          included apmExceptionResponsivenessThreshold object identifies
          the apmExceptionEntry that specified the threshold. The
          apmCurrentResponsiveness variable identifies the actual
          transaction and its responsiveness."
      ::= { apmNotifications 1 }


  apmTransactionUnsuccessfulAlarm NOTIFICATION-TYPE
      OBJECTS     { apmExceptionResponsivenessThreshold }
      STATUS      current
```

```
    DESCRIPTION
        "Notification sent when a transaction is unsuccessful.
        The index of the included apmExceptionResponsivenessThreshold
        object identifies both the type of the transaction that caused
        this notification as well as the apmExceptionEntry that
        specified the threshold."
    ::= { apmNotifications 2 }


    rmonConformance    OBJECT IDENTIFIER ::= { rmon 20 }
    apmCompliances     OBJECT IDENTIFIER ::= { rmonConformance 11 }
    apmGroups          OBJECT IDENTIFIER ::= { rmonConformance 12 }


apmCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
        "Describes the requirements for conformance to
        the APM MIB"
    MODULE  -- this module
        MANDATORY-GROUPS { apmProtocolDirectoryExtensionsGroup,
                           apmReportGroup }
    ::= { apmCompliances 1 }

apmProtocolDirectoryExtensionsGroup OBJECT-GROUP
    OBJECTS { protocolDirExtApmConfig,
             protocolDirExtApmResponsivenessBoundary1,
             protocolDirExtApmResponsivenessBoundary2,
             protocolDirExtApmResponsivenessBoundary3,
             protocolDirExtApmResponsivenessBoundary4,
             protocolDirExtApmResponsivenessBoundary5,
             protocolDirExtApmResponsivenessBoundary6,
             apmNameMachineName,
             apmNameUserName }
    STATUS  current
    DESCRIPTION
        "The APM MIB extensions to the RMON2 Protocol Directory."
    ::=  { apmGroups 1 }

apmUserDefinedProtocolsGroup OBJECT-GROUP
    OBJECTS {    apmHttpFilterLocalIndex,
                 apmHttpFilterServerProtocol,
                 apmHttpFilterServerAddress, apmHttpFilterURLPath,
                 apmHttpFilterMatchType, apmHttpFilterRowStatus,
                 apmHttpIgnoreUnregisteredURLs, apmHttp404IsFailure,
                 apmUserDefinedProtParentIndex,
```

                         apmUserDefinedProtApplication }
     STATUS   current
     DESCRIPTION
         "Objects used for creating and managing user-defined
         protocols."
     ::= { apmGroups 2 }

apmReportGroup OBJECT-GROUP
     OBJECTS { apmReportControlDataSource,
               apmReportControlAggregationType,
               apmReportControlInterval,
               apmReportControlRequestedSize,
               apmReportControlGrantedSize,
               apmReportControlRequestedReports,
               apmReportControlGrantedReports,
               apmReportControlStartTime,
               apmReportControlReportNumber,
               apmReportControlInsertsDenied,
               apmReportControlDroppedFrames,
               apmReportControlOwner,
               apmReportControlStatus,
               apmReportTransactionCount,
               apmReportSuccessfulTransactions,
               apmReportResponsivenessMean,
               apmReportResponsivenessMin,
               apmReportResponsivenessMax,
               apmReportResponsivenessB1,
               apmReportResponsivenessB2,
               apmReportResponsivenessB3,
               apmReportResponsivenessB4,
               apmReportResponsivenessB5,
               apmReportResponsivenessB6,
               apmReportResponsivenessB7 }
     STATUS   current
     DESCRIPTION
         "The apm report group controls the creation and retrieval of
         reports that aggregate application performance."
     ::= { apmGroups 3 }

apmCurrentTransactionGroup OBJECT-GROUP
     OBJECTS { apmCurrentResponsiveness,
               apmCurrentSuccess }
     STATUS   current
     DESCRIPTION
         "The apm current transaction group contains statistics for

        transactions that have not yet terminated."
    ::= { apmGroups 4 }

apmExceptionGroup OBJECT-GROUP
    OBJECTS { apmExceptionResponsivenessComparison,
             apmExceptionResponsivenessThreshold,
             apmExceptionUnsuccessfulException,
             apmExceptionOwner,
             apmExceptionStatus }
    STATUS current
    DESCRIPTION
        "The apm exception group causes notifications to be sent
        whenever transactions are detected that had poor availability
        or responsiveness."
    ::= { apmGroups 5 }

apmNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { apmTransactionResponsivenessAlarm,
                    apmTransactionUnsuccessfulAlarm }
    STATUS   current
    DESCRIPTION
        "Notifications sent by an APM MIB agent."
    ::= { apmGroups 6 }

END

5. Security Considerations

This MIB contains network addresses, protocol usage
information, and conversation statistics. Data of this nature
may be considered sensitive in some environments. In such
environments the administrator may wish to restrict SNMP
access to the agent.

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

SNMPv1 by itself is not a secure environment. 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.

It is recommended that the implementors consider the security
features as provided by the SNMPv3 framework. Specifically,
the use of the User-based Security Model RFC 2574 [12] and the
View-based Access Control Model RFC 2575 [15] is recommended.

It is then a customer/user responsibility to ensure that the
SNMP entity giving access to an instance of this MIB, 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.

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