Application Performance Measurement MIB
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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:

- An overall architecture, described in RFC 2571 [1].
- 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].
- 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].
- 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].
- 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 infrastructure 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 item measured by the APM MIB.

A failed transaction is a transaction that fails to provide the service requested by the end user, regardless of whether it is due to a processing failure or transport failure.

An application protocol (e.g. POP3) may implement different commands or application "verbs" (e.g. POP3 Login and POP3 Retrieval). It will often be interesting to monitor these verbs separately because:

1) The verbs may have widely differing performance characteristics (in fact some may be response time oriented while others are throughput oriented)
2) The verbs have varying business significance
3) It provides more granularity of exactly what might be performing poorly

This MIB allows the measurement of a parent application, its component verbs, or both. If monitoring both, one can watch the top-level application and then drill down to the verbs when trouble is spotted to learn which subcomponents are in trouble. Each application verb is registered separately in the Protocol Directory as a child of its parent application.

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 applications is application response time, the elapsed time between the user's request for service (e.g. pushing the submit button) and the completion of the request (e.g. displaying the results) and is measured in milliseconds. This is commonly referred to as end-user response time.

Throughput-Oriented: These transactions have widely varying workloads based on the amount of data requested. The responsiveness metric for throughput-oriented applications is kilobits per second.

Streaming-Oriented: These transactions deliver data at a constant metered rate of speed regardless of excess capacity in the networking and computing 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 applications is the signal quality 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 application, 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 application is transaction-oriented, throughput-oriented, or streaming-oriented. For example, in a 5 minute period several transactions might be recorded:

Application	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	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 applications may not be summarized because:

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

2. The responsiveness metrics of different applications may be different, making a statistical analysis impossible (in other words, one application may be transaction-oriented, while another is throughput-oriented).

Aggregating transactions collected over a period requires an aggregation algorithm. In this MIB, transaction aggregation always results in the following statistics:

TransactionCount
: The total number of transactions during this period

SuccessfulTransactions
: The total number of transactions that were successful. The management station can derive the percent success by dividing SuccessfulTransactions by the TransactionCount.

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 applications varies widely, the bucket ranges are specified separately for each application (in the apmAppDirectoryTable) so that they may be tuned to typical performance of each application.

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

Application	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 application/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 application/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 application/server tuples are aggregated together, resulting in a set of metrics for all such unique tuples.

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

For example, if in a 5 minute period the following transactions occurred:

Actual Transactions:

#	App	Client	Server	Successful	Responsiveness
1	**HTTP**	Jim	CallCtr	N	-
2	**HTTP**	Jim	HR	Y	12 sec.
3	**HTTP**	Jim	Amazon	Y	7 sec.
4	**HTTP**	Jim	CallCtr	Y	5 sec.
5	**Email**	Jim	Pop3	Y	12 sec.
6	**HTTP**	Jane	CallCtr	Y	3 sec.
7	**SAP/R3**	Jane	SAP	Y	19 sec.
8	**Email**	Jane	Pop3	Y	16 sec.
9	**HTTP**	Joe	HR	Y	18 sec.

The flows(1) aggregation results in the following table. Note that the first record (HTTP/Jim/CallCtr) is the aggregation of transactions #1 and #4:

Flow Aggregation:

App	Client	Server	Count	Succe-ssful	Rsp Mean	Rsp Min	Rsp Max	RspB0	RspB1
HTTP	Jim	CallCtr	2	1	5	5	5	1	0
HTTP	Jim	HR	1	1	12	12	12	0	1
HTTP	Jim	Amazon	1	1	7	7	7	1	0
Email	Jim	Pop3	1	1	12	12	12	0	1
HTTP	Jane	CallCtr	1	1	3	3	3	1	0
SAP/R3	Jane	SAP	1	1	19	19	19	0	1
Email	Jane	Pop3	1	1	16	16	16	0	1
HTTP	Joe	HR	1	1	18	18	18	0	1

The clients(2) aggregation results in the following table. Note that the first record (HTTP/Jim) is the aggregate of transactions #1, #2, #3 and #4:

Client Aggregation:

App	Client	Count	Succe-ssful	Rsp Mean	Rsp Min	Rsp Max	RspB0	RspB1 ...
HTTP	Jim	4	3	8	5	12	2	1
Email	Jim	1	1	12	12	12	0	1
HTTP	Jane	1	1	3	3	3	1	0
SAP/R3	Jane	1	1	19	19	19	0	1
Email	Jane	1	1	16	16	16	0	1
HTTP	Joe	1	1	18	18	18	0	1

The servers(3) aggregation results in the following table. Note that the first record (HTTP/CallCtr) is the aggregation of transactions #1, #4 and #6:

Server Aggregation:

App	Server	Count	Succe-ssful	Rsp Mean	Rsp Min	Rsp Max	RspB0	RspB1 ...
HTTP	CallCtr	3	2	4	3	5	2	0
HTTP	HR	2	2	15	12	18	0	2
HTTP	Amazon	1	1	7	7	7	1	0
Email	Pop3	2	2	14	12	16	0	2
SAP/R3	SAP	1	1	19	19	19	0	1

The applications(4) aggregation results in the following table. Note that the first record (HTTP) is the aggregate of transactions #1, #2, #3, #5, #6 and #9:

Application Aggregation:

App	Count	Succe-ssful	Rsp Mean	Rsp Min	Rsp Max	RspB0	RspB1 ...
HTTP	6	5	9	3	18	3	2
Email	2	2	14	12	16	0	2
SAP/R3	1	1	19	19	19	0	1

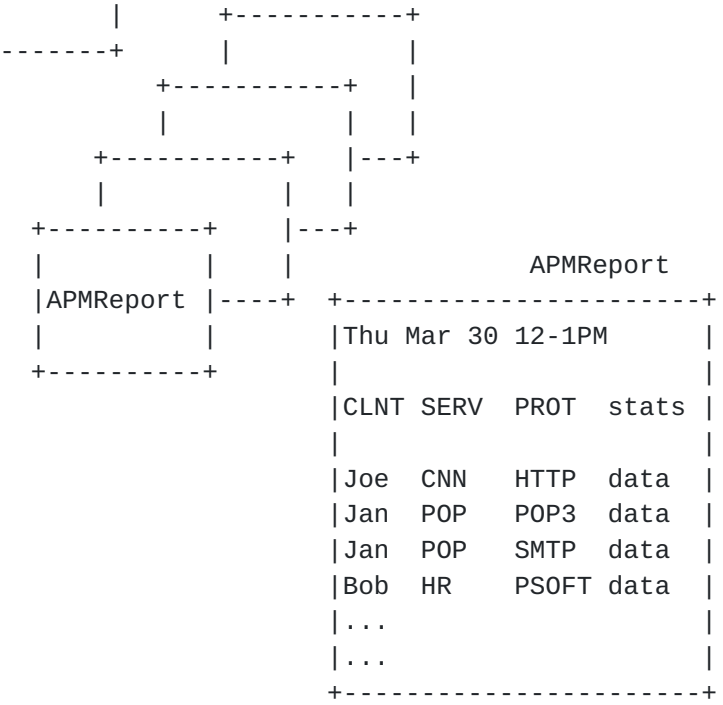
The apmReportControlTable provides for a historical set of the last 'X' reports, combining the historical records found in history tables with the periodic snapshots found in TopN tables. Conceptually the components are:

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 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 separated from entries in report 'B' by different values of the apmReportIndex.



3.2. AppLocalIndex Linkages

The following set of example tables illustrates a few points:

1. How protocolDirEntries, apmHttpFilterEntries and apmUserDefinedAppEntries(not shown) all result in entries in the apmAppDirectoryTable.
2. How a single appLocalIndex may be represented multiple times in the apmAppDirectoryTable and apmReportTable if the agent measures multiple responsiveness types for that application.

```
protocolDirectory (From RMON2)
ID (*)     Parameters   |    LocalIndex ...
WWW        None         |    1
WWW Get    None         |    2
SAP/R3     None         |    3
```

(*) These IDs are represented here symbolically. Consult [20] for more detail in their format

```
ApmHttpFilterTable
Index   |  AppLocalIndex  ServerAddress   URLPath    MatchType ...
5       |  20             hr.corp.com     /expense   prefix(3) ...
```

```
apmAppDirectory
AppLocalIndex  ResponsivenessType       | Config  ...
1              transaction(1)           | On      ...
1              throughput(2)            | On      ...
2              transaction(1)           | On      ...
2              throughput(2)            | On      ...
3              transaction(1)           | On      ...
20             transaction(1)           | On      ...
20             throughput(2)            | On      ...
```

```
(for a report using application aggregation)
apmReportTable
CtlIndex Index AppLocalIdx  ResponsivenessType | TransactionCount ...
1        1     1            transaction(1)     | counters...
1        1     1            throughput(2)      | counters...
1        1     2            transaction(1)     | counters...
1        1     2            throughput(2)      | counters...
1        1     3            transaction(1)     | counters...
1        1     20           transaction(1)     | counters...
1        1     20           throughput(2)      | counters...
```

Note that the index items protocolDirLocalIndex,

apmReportServerAddress and apmReportClientID were omitted from apmReportTable example for brevity because they would have been equal to zero due to the use of the application aggregation in this example.

3.3. Measurement Methodology

There are many different measurement methodologies available for measuring application performance (e.g., probe-based, client-based, synthetic-transaction, etc.). This specification does not mandate a particular methodology - it is open to any that meet the minimum requirements. Conformance to this specification requires that the collected data match the semantics described herein. In particular, a data collection methodology must be able to measure response time, throughput, streaming responsiveness and availability as specified.

Note that in some cases a transaction may run for a long time but ultimately be successful. The measurement software shouldn't prematurely classify lengthy transactions as failures but should wait as long as the client application will wait for a successful response.

3.4. Instrumentation Architectures

Different architectural approaches and deployment strategies may be taken towards implementation of this standard. If a highly distributed approach is desired (e.g.: an agent per desktop), one or both of the two approaches below may be used to make it more practical.

3.4.1. Application Directory Caching

It is necessary for the manager to have a copy of the tables that define the Application Directory in order to interpret APM measurements. It is likely that in a highly distributed network of thousands of APM agents, this Application Directory will be the same on many, if not all of the agents. Repeated downloads of the Application Directory may be inefficient.

The apmAppDirectoryID object is a single object that identifies the configuration of all aspects of the Application

Directory when it is equal to a well-known, registered configuration. Thus, when a manager sees an apmAppDirectoryID value that it recognizes, it need not download the Application Directory from that agent. In fact, the manager may discover a new registered Application Directory configuration on one agent and then re-use that configuration on another agent that shares the same apmAppDirectoryID value.

3.4.2. Push Model

When APM agents are installed on "desktops" (including laptops), a few issues make polling difficult:

1. **Desktops often have dynamically-assigned addresses so there is no long-lived address to poll.**

2. **Desktops are not available as much as infrastructure components due to crashes, user-initiated reboots and** shutdowns and user control over monitoring software. Thus a desktop may not be available to answer a poll at the moment when the manager is scheduled to poll that desktop.

3. **Laptops that are connected via dialup connections are only sporadically connected and will routinely be unreachable** when the manager is scheduled to poll.

As a consequence, a push model is usually more appropriate for desktop-based agents. To achieve this, the agent should follow the following rules in deciding what data to send in notifications.

APM Reports
: If an agent wishes to push APM reports to a manager, it must send:
  - apmAppDirectoryID
  - apmNameTable (any data updated since the last push)

  For each report the agent wishes to upload, it must send the entire apmReportControlEntry associated with that report and the associated entries in the apmReportTable that have changed since the last report.

APM Transactions
: If an agent wishes to push APM transactions to a manager, it must send:

```
            apmAppDirectoryID
            apmNameTable (any data updated since the last push)
            apmTransactionTable (relevant entries)

    APM Exceptions
        The agent must send:
            apmAppDirectoryID
            apmNameTable (any data updated since the last push)
            apmTransactionEntry (of exception transaction)
            apmExceptionEntry (entry that generated exception)
      [Note that this list supercedes the information in the
      OBJECTS clauses of the apmTransactionResponsivenessAlarm
      and apmTransactionUnsuccessfulAlarm when the agent is
      using a push model. This additional information
      eliminates the need for the manager to request additional
      data to understand the exception.]

    The order of varbinds and where to segment varbinds into
    PDUs is at the discretion of the agent.
```

3.5. Structure of MIB

The objects are arranged into the following groups:

- APM Application Directory Group
- APM User Defined Applications Group
- APM Report Group
- APM 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.

3.5.1. The APM Application Directory Group

The APM Application Directory group contains configuration objects for every application or application verb monitored on this system. This group consists of the apmAppDirectoryTable.

3.5.2. The APM User Defined Applications Group

The APM User Defined Applications Group contains objects that allow for the tracking of applications or application verbs that aren't registered in the protocolDirectoryTable. This group consist of the apmHttpFilterTable and the apmUserDefinedAppTable.

3.5.3. 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 application. This group consists of the apmReportControlTable and the apmReportTable.

3.5.4. The APM Transaction Group

The APM Transaction Group is used to show transactions that are currently in progress and ones that have ended recently, 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 applications, 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 apmTransactionTable provides visibility into

transactions that are currently executing and will allow a management station to find status of long-lived transactions.

3.5.5. 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.

3.5.6. 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
    TEXTUAL-CONVENTION, RowStatus, TimeStamp,
    TimeInterval, 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, protocolDirLocalIndex            FROM RMON2-MIB;

--  Application Performance Measurement MIB

apm MODULE-IDENTITY
    LAST-UPDATED "200202271500Z"  -- February 27, 2002
    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."

    REVISION "200202271500Z"    -- February 27, 2002
    DESCRIPTION
        "The original version of this MIB, published as RFCXXXX."
    ::= { rmon 23 }

AppLocalIndex ::= TEXTUAL-CONVENTION
    STATUS       current
    DESCRIPTION
        "A locally arbitrary unique identifier associated with an
        application or application verb.

        All objects of type AppLocalIndex are assigned by the agent
        out of a common number space. In other words, AppLocalIndex
        values assigned to entries in one table must not overlap with
        AppLocalIndex values assigned to entries in another
```

table. Further, every protocolDirLocalIndex value registered by the agent automatically assigns the same value out of the AppLocalIndex number space.

For example, if the protocolDirLocalIndex values { 1, 3, 5, 7 } have been assigned, and the apmHttpFilterAppLocalIndex values { 6, 8, 9 } have been assigned:

- Assignment of new AppLocalIndex values must not use the values { 1, 3, 5, 6, 7, 8, 9 }.
- AppLocalIndex values { 1, 3, 5, 7 } are automatically assigned and are associated with the identical value of protocolDirLocalIndex. In particular, an entry in the apmAppDirectoryTable indexed by a value provides further information about a protocol indexed by the same value in the protocolDirectoryTable of RMON2.

The value for each supported application must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization, except that if an application is deleted and re-created, it must be re-created with a new value that has not been used since the last re-initialization.

The specific value is meaningful only within a given SNMP entity. An AppLocalIndex value must not be re-used until the next agent restart."

SYNTAX Unsigned32 (1..2147483647)

```
-- The APM Application Directory Group

-- The Application Directory Table contains a record for every
-- application monitored by this agent. This table is also used to
-- configure whether or not an application will be measured and which
-- bucket boundaries will be used for the application.
--
-- The bucket boundaries define the break-points between bins of a
-- histogram analysis for that application. As an example of how this
-- works, consider an entry representing response-time for http.
-- If the boundaries are set as follows:
-- Boundary1: 500 milliseconds
-- Boundary2: 1 second
-- Boundary3: 2 seconds
-- Boundary4: 5
-- Boundary5: 15
```

```
-- Boundary6: 60
--
-- If the following measurements are made (all in milliseconds):
-- 377, 8645, 1300, 487, 1405, 775, 1115, 850, 945, 1054, 7745, 9380
--
-- A report run during this interval would report the following
-- counts:
-- Bucket1: 2
-- Bucket2: 3
-- Bucket3: 4
-- Bucket4: 0
-- Bucket5: 3
-- Bucket6: 0
-- Bucket7: 0

apmAppDirectoryTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApmAppDirectoryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The APM MIB directory of applications and application
        verbs. The agent will populate this table with all
        applications/verbs of any responsivenessType it has the
        capability to monitor. Since the agent populates this table
        with every entry it has the capability to monitor, the
        entries in this table are read-write, allowing the management
        station to modify parameters in this table but not to add new
        entries or delete entries (however, entries may be
        disabled). If new entries are added to the apmHttpFilterTable
        or the apmUserDefinedAppTable, the agent will add the
        corresponding entries to this table.

        It is an implementation-dependent matter as to how the agent
        sets these default parameters. For example, it may leave
        certain entries in this table 'off(0)' if the agent developer
        believes that combination will be infrequently used, allowing
        a manager that needs that capability to set it to 'on(1)'.

        Some applications are registered in the RMON2 protocol
        directory and some are registered in other tables in this
        MIB. Regardless of where an application is originally
        registered, it is assigned an AppLocalIndex value that is the
        primary index for this table.

        The contents of this table affect all reports and exceptions
```

```
        generated by this agent. Accordingly, modification of this
        table should be performed by a manager acting in the role of
        administrator. In particular, management software should not
        require or enforce particular configuration of this table - it
        should reflect the preferences of the site administrator, not
        the software author. As a practical matter, this requires
        management software to allow the administrator to configure
        the values it will use so that it can be adapted to the site
        policy."
    ::= { apm 1 }

apmAppDirectoryEntry OBJECT-TYPE
    SYNTAX      ApmAppDirectoryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The APM MIB directory of applications and application
        verbs. An entry will exist in this table for all applications
        for which application performance measurement is supported."
    INDEX { apmAppDirectoryAppLocalIndex,
            apmAppDirectoryResponsivenessType }
    ::= { apmAppDirectoryTable 1 }

ApmAppDirectoryEntry ::= SEQUENCE {
    apmAppDirectoryAppLocalIndex            AppLocalIndex,
    apmAppDirectoryResponsivenessType       INTEGER,
    apmAppDirectoryConfig                   INTEGER,
    apmAppDirectoryResponsivenessBoundary1  Integer32,
    apmAppDirectoryResponsivenessBoundary2  Integer32,
    apmAppDirectoryResponsivenessBoundary3  Integer32,
    apmAppDirectoryResponsivenessBoundary4  Integer32,
    apmAppDirectoryResponsivenessBoundary5  Integer32,
    apmAppDirectoryResponsivenessBoundary6  Integer32
}

apmAppDirectoryAppLocalIndex OBJECT-TYPE
    SYNTAX      AppLocalIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The AppLocalIndex assigned for this application Directory
        entry."
    ::= { apmAppDirectoryEntry 1 }

apmAppDirectoryResponsivenessType 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 application.
        There are 3 types of measurements for different types of
        applications:

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

        Throughput-Oriented applications have widely varying workloads
        based on the nature of the client request. In particular,
        throughput-oriented applications vary widely in the amount of
        data that must be transported to satisfy the request. The
        responsiveness metric for throughput-oriented applications is
        kilobits per second.

        Streaming-Oriented applications 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 specified 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
        applications 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 applications, measuring more than one
        responsiveness type may be interesting. For agents that wish
        to support more than one measurement for a application, they
        will populate this table with multiple entries for that
        application, one for each type."
    ::= { apmAppDirectoryEntry 2 }
```

```
apmAppDirectoryConfig OBJECT-TYPE
    SYNTAX      INTEGER {
                  off(0),
                  on(1)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object describes and configures support for application
        performance measurement for this application.

        If the value of this object is on(1), the agent supports
        measurement of application performance metrics for this
        application and is configured to measure such metrics for all
        APM MIB functions and all interfaces.  If the value of this
        object is off(0), the agent supports measurement of
        application performance for this application but is configured
        to not measure these metrics for any APM MIB functions or
        interfaces.  Whenever this value changes from on(1) to off(0),
        the agent shall delete all related entries in all tables in
        this MIB."
    ::= { apmAppDirectoryEntry 3 }

apmAppDirectoryResponsivenessBoundary1 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket1 and bucket 2. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 4 }

apmAppDirectoryResponsivenessBoundary2 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket2 and bucket 3. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 5 }

apmAppDirectoryResponsivenessBoundary3 OBJECT-TYPE
    SYNTAX      Integer32
```

```
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket3 and bucket 4. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 6 }

apmAppDirectoryResponsivenessBoundary4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket4 and bucket 5. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 7 }

apmAppDirectoryResponsivenessBoundary5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket5 and bucket 6. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 8 }

apmAppDirectoryResponsivenessBoundary6 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The boundary value between bucket6 and bucket 7. If this
        value is modified, all entries in the apmReportTable must be
        deleted."
    ::= { apmAppDirectoryEntry 9 }

-- Scalars related to the Application Directory table

apmBucketBoundaryLastChange OBJECT-TYPE
    SYNTAX     TimeStamp
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
```

```
        "The value of sysUpTime the last time that any bucket boundary
        in any appDirectyEntry was changed. This object can help to
        determine if two managers are both trying to enforce different
        configurations of this table."
    ::= { apm 2 }

apmAppDirectoryID OBJECT-TYPE
    SYNTAX     OBJECT IDENTIFIER
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
        "This object allows managers to avoid downloading application
        directory information when the directory is set to a known
        (usually fixed) configuration.

        If the value of this object isn't 0.0, it signifies
        that the entire contents of the apmAppDirectoryTable,
        apmHttpFilterTable, apmUserDefinedAppTable and
        protocolDirectoryTable are equal to a known state identified
        by the value of this object. If a manager recognizes this
        value as identifying a directory configuration it has a local
        copy of, it may use this local copy rather than downloading
        these tables. Note that it may have downloaded this local copy
        (and the ID) from another agent and used this copy for all
        other agents that advertised the same ID.

        If an agent recognizes that the entire contents of the
        apmAppDirectoryTable, apmHttpFilterTable,
        apmUserDefinedAppTable and protocolDirectoryTable are equal to
        a known state to which an ID has been assigned, it should set
        this object to that ID.

        In many cases when this feature is used, the application
        directory information will be in read-only memory and thus the
        tables may not be modified via SNMP requests. In the event
        that the tables are writable and a modification is made, the
        agent is responsible for setting this object to 0.0 if it
        cannot determine that the state is equal to a known state.

        An agent is not obligated to recognize and advertise all such
        registered states as it may not have knowledge of all states.
        Thus, a manager may encounter agents whose DirectoryID value
        is 0.0 even though the contents of the directory were equal to
        a registered state.
```

```
        Note that the contents of those tables includes the
        protocolDirLocalIndex and appLocalIndex values. In other
        words, these values can't be assigned randomly on each agent,
        but must be equal to values that are part of the known
        state. While it is possible for a manager to download
        application directory details using SNMP and to set the
        appropriate directoryID, the manager would need to have some
        scheme to ensure consistent values of LocalIndex variables
        from agent to agent. Such schemes are outside the scope of
        this specification.

        Application directory registrations are significant within an
        administrative domain.

        Typically these registrations will be made by an agent
        software developer who will set the application directory
        tables to a read-only state and assign a DirectoryID to that
        state. Thus, all agents running this software would share the
        same DirectoryID. As the application directory might change
        from one software release to the next, the developer may
        register different DirectoryID's for each software release.

        A customer could also create a site-wide application directory
        configuration and assign a DirectoryID to that configuration
        as long as consistent values of LocalIndex variables can be
        ensured."
    ::= { apm 3 }
```

```
-- APM HTTP Filter Table

-- The HTTP Filter Table creates virtual applications 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 applications which measure the
        performance of certain web pages or sets of web pages.

        When an entry is added to this table, the agent will
        automatically create one or more entries in the
        apmAppDirectoryTable (one for each responsivenessType it is
        capable of measuring).

        Note that when entries exist in this table some HTTP
        transactions will be summarized twice: in applications
        represented here as well as the HTTP application. If entries
        in this table overlap, these transactions may be summarized
        additional times.

        The contents of this table affect all reports and exceptions
        generated by this agent. Accordingly, modification of this
        table should be performed by a manager acting in the role of
        administrator. In particular, management software should not
        require or enforce particular configuration of this table - it
        should reflect the preferences of the site administrator, not
        the software author."
    ::= { apm 4 }

apmHttpFilterEntry OBJECT-TYPE
    SYNTAX      ApmHttpFilterEntry
```

```
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A virtual application which measure the performance of certain
        web pages or sets of web pages."
    INDEX { apmHttpFilterIndex }
    ::= { apmHttpFilterTable 1 }

ApmHttpFilterEntry ::= SEQUENCE {
    apmHttpFilterIndex              Integer32,
    apmHttpFilterAppLocalIndex      AppLocalIndex,
    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 }

apmHttpFilterAppLocalIndex OBJECT-TYPE
    SYNTAX      AppLocalIndex
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The AppLocalIndex that represents HTTP transactions
        that match this entry.

        This object is read-only. A value is created by the agent from
        an unused AppLocalIndex value when this apmHttpFilterEntry is
        created."
    ::= { apmHttpFilterEntry 2 }

apmHttpFilterServerProtocol OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
```

```
        "The protocolDirLocalIndex value of 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 associated apmHttpFilterServerProtocol object.

        If this object is the zero-length string, then this entry will
        match the associated apmHttpFilterURLPath `from' address."
    ::= { apmHttpFilterEntry 4 }

apmHttpFilterURLPath OBJECT-TYPE
    SYNTAX      OCTET STRING
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "This entry will only represent HTTP transactions
        where the URL path component in the request matches this
        value. This value represents the requested path regardless of
        any substitution that the server might perform.

        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),
                    stripTrailingSlash(2),
                    prefix(3)
                }
    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 stripTrailingSlash(2), then the pathname
        component will be compared with the associated
        apmHttpFilterURLPath and will only be associated with this
        entry if it matches exactly or if the pathname ends with a '/'
        symbol and matches apmHttpFilterURLPath if the '/' symbol is
        removed from the pathname. This option exists for those paths
        where an optional trailing slash is possible but for which a
        prefix match would be too broad.

        If the value is prefix(3), 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-write
    STATUS      current
    DESCRIPTION
        "When true, APM measurements of HTTP transactions will only
        measure transactions relating to URLs that match a filter in
        this table. Thus, measurements for the HTTP application will
        present aggregated statistics for URL-matching HTTP
        transactions and measurements for the HTTP GET application
        verb will present aggregated statistics for URL-matching HTTP
        GET transactions.
```

```
        This will be used in environments that wish to monitor only
        targeted URLs and to ignore large volumes of internet web
        browsing traffic.

        This object affects all APM reports and exceptions generated
        by this agent. Accordingly, modification of this object should
        be performed by a manager acting in the role of
        administrator. In particular, management software should not
        require or enforce particular configuration of this object -
        it should reflect the preferences of the site administrator,
        not the software author."
    ::= { apm 5 }

apmHttp4xxIsFailure OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "When true, this agent will recognize HTTP errors in the range
        of 400 through 499 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.

        This object affects all reports and exceptions generated by
        this agent. Accordingly, modification of this object should be
        performed by a manager acting in the role of administrator. In
        particular, management software should not require or enforce
        particular configuration of this object - it should reflect
        the preferences of the site administrator, not the software
        author."
    ::= { apm 6 }

-- The APM User-Defined Application 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 applications it is monitoring and to associate each
-- with an AppLocalIndex value. It is an implementation-dependent
-- matter as to how the agent learns how to monitor these
-- applications.

apmUserDefinedAppTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApmUserDefinedAppEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table that advertises user-defined applications that the
        agent is measuring.

        The agent will automatically create one or more entries in the
        apmAppDirectoryTable (one for each responsivenessType it is
        capable of measuring) for each entry in this table.

        Note that when entries exist in this table some
        transactions can be summarized more than once if there is
        overlap between applications defined here and applications
        defined in the protocol directory or in the httpFilter table."
    ::= { apm 7 }

apmUserDefinedAppEntry OBJECT-TYPE
    SYNTAX      ApmUserDefinedAppEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A user-defined application that the agent is measuring, along
        with its AppLocalIndex assignment.

        The apmAppDirectoryAppLocalIndex value in the index identifies
        the agent-assigned AppLocalIndex value for this user-defined
        application."
    INDEX { apmAppDirectoryAppLocalIndex }
    ::= { apmUserDefinedAppTable 1 }

ApmUserDefinedAppEntry ::= SEQUENCE {
    apmUserDefinedAppParentIndex    Integer32,
    apmUserDefinedAppApplication    SnmpAdminString
}

apmUserDefinedAppParentIndex 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
        application is a child of."
    ::= { apmUserDefinedAppEntry 1 }

apmUserDefinedAppApplication OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A human readable descriptive tag for this application."
    ::= { apmUserDefinedAppEntry 2 }
```

```
-- 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.

        A particular apmNameClientID should be a constant attribute of
        a particular client. When available, the agent may also record
        the machine name and/or user name which may be valuable for
        displaying to humans. The apmNameMachineName and
        apmNameUserName are relatively constant, changing only if
        these attributes actually change on the client.

        The agent will store a historical log of these entries, aging
        out old entries as the log becomes too large. Since this table
        contains information vital to the interpretation of other
        tables (e.g. the apmReportTable), the agent should ensure that
        the log doesn't age out entries that would be referenced by
        data in those tables.

        Note that an entry for a clientID is active from it's
        StartTime until the StartTime of another entry (for the same
        clientID) that supercedes it, or 'now' if none supercede
        it. Therefore, if a clientID only has a single entry, it is by
        definition very new and should never be aged out. No entry for
        a clientID should be aged out unless it has been updated by a
        new entry for the client (i.e. with an updated address) and
        only if the new entry is 'old' enough.

        To determine how old is old enough, compute the maximum value
        of Interval * (NumReports + 1) of all entries in the
        apmReportControlTable (the '+ 1' is to allow a reasonable
        period of time for the report to be downloaded). Then take the
        larger of this value and the age in seconds of the oldest
        entry in the current transaction table. If an entry for a
```

```
        clientID is superceded by another entry whose StartTime is
        more than this many seconds ago, then the older entry may be
        deleted."
    ::= { apm 8 }

apmNameEntry OBJECT-TYPE
    SYNTAX      ApmNameEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the APM name table. An entry exists for each
        period of time that a client has been associated with a
        particular address.

        The protocolDirLocalIndex value in the index identifies
        the network layer protocol for the ClientAddress for this
        entry."
    INDEX { apmNameClientID,
            protocolDirLocalIndex, apmNameClientAddress,
            apmNameMappingStartTime }
    ::= { apmNameTable 1 }

ApmNameEntry ::= SEQUENCE {
    apmNameClientID                 Unsigned32,
    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 }

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 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 component of the index 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 2 }

apmNameMappingStartTime OBJECT-TYPE
    SYNTAX      DateAndTime
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The time that the agent first discovered this mapping
        as active."
    ::= { apmNameEntry 3 }

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 4 }

apmNameUserName OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The human readable name of a human user using the client
        machine. If more than one user name are available
        simultaneously, it is an implementation-dependent matter as to
        which is used here. However, if the user name changes, this
```

```
        object should change to reflect that change.

        Non-human user names like 'root' or 'administrator' aren't
        intended as values for this object. 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 5 }
```

```
-- 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 9 }

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
        apmReportControlInterval.3"
    INDEX { apmReportControlIndex }
    ::= { apmReportControlTable 1 }

ApmReportControlEntry ::= SEQUENCE {
    apmReportControlIndex           Integer32,
    apmReportControlDataSource      DataSource,
    apmReportControlAggregationType INTEGER,
    apmReportControlInterval        Unsigned32,
    apmReportControlRequestedSize   Unsigned32,
    apmReportControlGrantedSize     Unsigned32,
    apmReportControlRequestedReports Unsigned32,
    apmReportControlGrantedReports  Unsigned32,
    apmReportControlStartTime       TimeStamp,
    apmReportControlReportNumber    Unsigned32,
    apmReportControlInsertsDenied   Unsigned32,
    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.

        If the measurement is being performed by a probe, this should
        be set to interface or port where data was received for
        analysis. If the measurement isn't being performed by a probe,
        this should be set to the primary interface over which the
        measurement is being performed. If the measurement isn't being
        performed by a probe and there is no primary interface or this
        information isn't known, this object should be set to 0.0.

        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),
                  applications(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 application/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 application/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 application/server tuples are aggregated
        together, resulting in a set of metrics for all such unique
        tuples.

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

        Note that it is not meaningful to aggregate applications, as
        different applications 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      Unsigned32
    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 must be greater than zero.
```

```
        Many users desire that these reports be synchronized to within
        seconds of the beginning of the hour because the results may
        be correlated more meaningfully to business behavior and so
        that data from multiple agents is aggregated over the same
        time periods. Thus management software may take extra effort
        to synchronize reports to the beginning of the hour and to one
        another. However, the agent must not allow reports to 'drift'
        over time as they will quickly become unsynchronized. In
        particular, if there is any fixed processing delay between
        reports, the reports should deduct this time from the interval
        so that reports don't drift.

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

apmReportControlRequestedSize OBJECT-TYPE
    SYNTAX      Unsigned32
    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      Unsigned32
    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      Unsigned32 (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      Unsigned32 (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 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 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      Unsigned32
    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      Unsigned32
    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 since 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 apmReportTables are inactive because no
        applications are enabled in the application 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 10 }

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 apmAppDirectoryAppLocalIndex value in the index identifies
        the common application of the transactions aggregated in this
        entry.
        The apmAppDirectoryResponsivenessType 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.
        Entries will only exist in this table for those
        combinations of AppLocalIndex and ResponsivenessType
        that are configured 'on(1)'.
        The protocolDirLocalIndex value in the index identifies
        the network layer protocol of the apmReportServerAddress.
        When the associated apmReportControlAggregationType value is
        equal to application(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 apmNameClientID value in the index identifies the
        client in transactions aggregated in this entry. If the
        associated apmReportControlAggregationType is equal to
        application(4) or server(3), then this object will be set to
        0.

        An example of the indexing of this entry is
        apmReportTransactionCount.3.15.3.1.8.4.192.168.1.2.3232235788"
    INDEX { apmReportControlIndex, apmReportIndex,
            apmAppDirectoryAppLocalIndex,
            apmAppDirectoryResponsivenessType,
            protocolDirLocalIndex, apmReportServerAddress,
            apmNameClientID }
    ::= { apmReportTable 1 }

ApmReportEntry ::= SEQUENCE {
    apmReportIndex                  Integer32,
    apmReportServerAddress          OCTET STRING,
    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 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
        application(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 }

apmReportTransactionCount OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of transactions aggregated into this record."
    ::= { apmReportEntry 3 }

apmReportSuccessfulTransactions OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of successful transactions aggregated into
        this record."
    ::= { apmReportEntry 4 }

apmReportResponsivenessMean OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The arithmetic mean of the responsiveness metrics for all
        successful transactions aggregated into this record."
    ::= { apmReportEntry 5 }
```

```
apmReportResponsivenessMin OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The minimum of the responsiveness metrics for all
        successful transactions aggregated into this record."
    ::= { apmReportEntry 6 }

apmReportResponsivenessMax OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The maximum of the responsiveness metrics for all
        successful transactions aggregated into this record."
    ::= { apmReportEntry 7 }

-- Note that when updating a report entry, a transaction will not be
-- counted in more than 1 bucket in an entry. It will be counted in
-- the first bucket that matches, starting with Bucket 1. Note that if
-- a transaction matches 2 application types, it will update one bucket
-- in each of 2 entries in this table.

apmReportResponsivenessB1 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness was less than boundary1 value for
        this protocol."
    ::= { apmReportEntry 8 }

apmReportResponsivenessB2 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Bucket 1 and was
        greater than or equal to the boundary1 value for this
        application and less than the boundary2 value for this
        application."
    ::= { apmReportEntry 9 }
```

```
apmReportResponsivenessB3 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Bucket 1 or 2
        and as greater than or equal to the boundary2 value for this
        application and less than the boundary3 value for this
        application."
    ::= { apmReportEntry 10 }

apmReportResponsivenessB4 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Buckets 1
        through 3 and was greater than or equal to the boundary3 value
        for this application and less than the boundary4 value for
        this application."
    ::= { apmReportEntry 11 }

apmReportResponsivenessB5 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Buckets 1
        through 4 and was greater than or equal to the boundary4 value
        for this application and less than the boundary5 value for
        this application."
    ::= { apmReportEntry 12 }

apmReportResponsivenessB6 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Buckets 1
        through 5 and was greater than or equal to the
        boundary5 value for this application and less than the
```

```
        boundary6 value for this application."
    ::= { apmReportEntry 13 }

apmReportResponsivenessB7 OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of successful transactions aggregated into this
        record whose responsiveness did not fall into Buckets 1
        through 6 and was greater than or equal to the boundary6 value
        for this application."
    ::= { apmReportEntry 14 }

-- APM Transaction Table

apmTransactionTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApmTransactionEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains transactions that are currently running
        or have recently finished."
    ::= { apm 11 }

apmTransactionEntry OBJECT-TYPE
    SYNTAX      ApmTransactionEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A conceptual row in the apmTransactionTable.

        The apmAppDirectoryAppLocalIndex value in the index identifies
        the application of the transaction represented by this entry.
        The apmAppDirectoryResponsivenessType 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.
        Entries will only exist in this table for those
        combinations of AppLocalIndex and ResponsivenessType
        that are configured 'on(1)'.
        The protocolDirLocalIndex value in the index identifies
        the network layer protocol of the apmTransactionServerAddress.
        The apmTransactionServerAddress value in the index identifies the
        network layer address of the server in the transaction
```

```
        represented by this entry.
        The apmNameClientID value in the index identifies the
        client in the transaction represented by this entry.

        An example of the indexing of this entry is
        apmTransactionCount.3.1.8.4.192.168.1.2.3232235788.2987"
    INDEX { apmAppDirectoryAppLocalIndex,
            apmAppDirectoryResponsivenessType,
            protocolDirLocalIndex, apmTransactionServerAddress,
            apmNameClientID, apmTransactionID }
    ::= { apmTransactionTable 1 }

ApmTransactionEntry ::= SEQUENCE {
    apmTransactionServerAddress      OCTET STRING,
    apmTransactionID                 Integer32,
    apmTransactionResponsiveness     Integer32,
    apmTransactionAge                TimeInterval,
    apmTransactionSuccess            TruthValue
}

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

        This is represented as an octet string with
        specific semantics and length as identified
        by the 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."
    ::= { apmTransactionEntry 1 }

apmTransactionID 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."
    ::= { apmTransactionEntry 2 }

apmTransactionResponsiveness OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current value of the responsiveness metric for this
        transaction. If this transaction has completed, the final
        value of the metric will be available.

        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."
    ::= { apmTransactionEntry 3 }

apmTransactionAge OBJECT-TYPE
    SYNTAX      TimeInterval
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "If this transaction is still executing, this value shall be
        the length of time since it was started. If it has completed,
        this value shall be the lenght of time it was executing."
    ::= { apmTransactionEntry 4 }

apmTransactionSuccess OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The success of this transaction up to this time. Once a
        transaction has been marked as failed, it cannot move back
        into the successful state."
    ::= { apmTransactionEntry 5 }

apmTransactionsHistorySize OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The maximum number of completed transactions desired to be
        retained in the apmTransactionTable. If the agent doesn't have
```

```
        enough resources to retain this many, it will retain as many as
        possible. Regardless of this value, the agent must attempt to
        keep records for all current transactions it is monitoring."
    ::= { apm 12 }

-- The APM Exception table

-- The APM Exception Table creates filters so that a management
-- station can get immediate notification of a transaction that has
-- had poor availability or responsiveness.
--
-- This function is particularly helpful in unaggregated situations
-- where the numbers of agents is relatively high and the transaction
-- rate per agent is relatively low (such as agents for desktops or
-- dedicated to small workgroups). Polling agents in such an
-- environment would either cause scalability problems (high rate) or
-- lead to long notification delays (low rate).


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 value of the apmAppDirectoryAppLocalIndex
        component of the index.

        Because the quality of a transaction is not known until it is
        completed, these thresholds are only applied after the
        transaction has completed."
    ::= { apm 13 }

apmExceptionEntry OBJECT-TYPE
    SYNTAX      ApmExceptionEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
```

```
        "A conceptual row in the apmExceptionTable.

        The apmAppDirectoryAppLocalIndex value in the index identifies
        the application this entry will monitor.
        The apmAppDirectoryResponsivenessType value in the index
        identifies the type of responsiveness metric this entry will
        monitor."
    INDEX { apmAppDirectoryAppLocalIndex,
            apmAppDirectoryResponsivenessType, apmExceptionIndex }
    ::= { apmExceptionTable 1 }

ApmExceptionEntry ::= SEQUENCE {
    apmExceptionIndex                       Integer32,
    apmExceptionResponsivenessComparison    INTEGER,
    apmExceptionResponsivenessThreshold     Integer32,
    apmExceptionUnsuccessfulException       INTEGER,
    apmExceptionResponsivenessEvents        Counter32,
    apmExceptionUnsuccessfulEvents          Counter32,
    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 application.

        Note that even though the index of the apmExceptionTable
        contains other objects (e.g. apmAppDirectoryAppLocalIndex)
        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 a
        transaction of the associated type is unsuccessful."
    ::= { apmExceptionEntry 4 }

apmExceptionResponsivenessEvents OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of responsiveness exceptions generated. This
        counter will be incremented even if no notification was sent
        due to notifications not being configured or due to exceeding
        the apmNotificationMaxRate value."
    ::= { apmExceptionEntry 5 }

apmExceptionUnsuccessfulEvents OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

```
        "The total number of unsuccessful exceptions generated. This
        counter will be incremented even if no notification was sent
        due to notifications not being configured or due to exceeding
        the apmNotificationMaxRate value."
    ::= { apmExceptionEntry 6 }

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 7 }

apmExceptionStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
        "The status of this apmExceptionEntry."
    ::= { apmExceptionEntry 8 }

apmThroughputExceptionMinTime OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "seconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Because the responsiveness for throughput-oriented
        transactions is divided by the elapsed time, it can be very
        sensitive to short-term performance variations for
        transactions that take a short period of time. For example,
        when downloading a very short file, a single dropped packet
        could double or triple the total response time.

        Further, for very short transactions, the fixed transaction
        costs (handshake, setup time, authentication, round-trip time)
        may dominate the total response time for the transaction.

        This object controls the minimum number of seconds that an
        throughput-based transaction must exceed before an exception
        can be generated for it. If this object is set to zero, then
        all throughput-based transactions are candidates for
        exceptions."
```

```
    DEFVAL     { 10 }
    ::= { apm 14 }

apmNotificationMaxRate OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The maximum number of notifications that can be generated
        from this agent by the apmExceptionTable in any 60 second
        period."
    DEFVAL { 1 }
    ::= { apm 15 }

-- APM Notifications

apmNotifications OBJECT IDENTIFIER ::= { apm 0 }

apmTransactionResponsivenessAlarm NOTIFICATION-TYPE
    OBJECTS     { apmExceptionResponsivenessThreshold,
                  apmTransactionResponsiveness }
    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
        apmTransactionResponsiveness variable identifies the actual
        transaction and its responsiveness.

        Agent implementors are urged to include additional data
        objects in the alarm that may explain the reason for the
        alarm. It is helpful to include such data in the alarm because
        it describes the situation at the time the alarm was
        generated, where polls after the fact may not provide
        meaningful information. Examples of such information are CPU
        load, memory utilization, network utilization, and transaction
        statistics."
    ::= { 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.

        Agent implementors are urged to include additional data
        objects in the alarm that may explain the reason for the
        alarm. It is helpful to include such data in the alarm because
        it describes the situation at the time the alarm was
        generated, where polls after the fact may not provide
        meaningful information. Examples of such information are CPU
        load, memory utilization, network utilization, and transaction
        statistics."
    ::= { 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 { apmAppDirectoryGroup, apmReportGroup }
    ::= { apmCompliances 1 }

apmAppDirectoryGroup OBJECT-GROUP
    OBJECTS { apmAppDirectoryConfig,
              apmAppDirectoryResponsivenessBoundary1,
              apmAppDirectoryResponsivenessBoundary2,
              apmAppDirectoryResponsivenessBoundary3,
              apmAppDirectoryResponsivenessBoundary4,
              apmAppDirectoryResponsivenessBoundary5,
              apmAppDirectoryResponsivenessBoundary6,
              apmBucketBoundaryLastChange, apmAppDirectoryID,
              apmNameMachineName, apmNameUserName }
    STATUS  current
    DESCRIPTION
        "The APM MIB directory of applications and application verbs."
    ::=  { apmGroups 1 }

apmUserDefinedApplicationsGroup OBJECT-GROUP
```

```
    OBJECTS {     apmHttpFilterAppLocalIndex,
                  apmHttpFilterServerProtocol,
                  apmHttpFilterServerAddress, apmHttpFilterURLPath,
                  apmHttpFilterMatchType, apmHttpFilterRowStatus,
                  apmHttpIgnoreUnregisteredURLs, apmHttp4xxIsFailure,
                  apmUserDefinedAppParentIndex,
                  apmUserDefinedAppApplication }
    STATUS  current
    DESCRIPTION
        "Objects used for creating and managing user-defined
        applications."
    ::= { 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 }
```

```
apmTransactionGroup OBJECT-GROUP
    OBJECTS { apmTransactionResponsiveness,
              apmTransactionAge, apmTransactionSuccess,
              apmTransactionsHistorySize }
    STATUS  current
    DESCRIPTION
        "The apm transaction group contains statistics for
        individual transactions."
    ::=  { apmGroups 4 }

apmExceptionGroup OBJECT-GROUP
    OBJECTS { apmExceptionResponsivenessComparison,
              apmExceptionResponsivenessThreshold,
              apmExceptionUnsuccessfulException,
              apmExceptionResponsivenessEvents,
              apmExceptionUnsuccessfulEvents,
              apmExceptionOwner, apmExceptionStatus,
              apmThroughputExceptionMinTime, apmNotificationMaxRate }
    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, application 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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