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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for monitoring selectable performance metrics and statistics derived from the monitoring of network packets and sub-application level transactions. The metrics can be defined through reference to existing IETF, ITU
and other standards organizations’ documents. The monitoring covers both passive and active traffic generation sources.
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2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

3. Overview

This document continues the architecture created in the RMON2-MIB [RFC2021] by providing a major feature upgrade, primarily by providing new metrics and studies to assist in the analysis of performance for sub-application transaction flows in the network, in direct relationship to the transporting of application layer protocols.

Performance monitoring agents have been widely used to analyze the parameters and metrics related to the perceived performance of distributed applications and services in networks. The metrics collected by these agents have ranged from basic response time to a combination of metrics related to the loss and re-transmission of datagrams and PDUs. While the metrics are becoming more useful in the implementation of service level monitoring and troubleshooting tools, the lack of a standard method to report these has limited the deployment to very specific customer needs and areas.

This document is intended to create a general framework for the collection and reporting of performance related metrics on sub-application level transaction flows in a network. The MIB in this document in directly linked to the current RMON2-MIB [RFC2021] and uses the Protocol Directory as a key component in reporting the layering involved in the sub-application level transaction flows.

The specific objectives of this document are to:

+ Provide a drill-down capability to compliment the user-perceived monitoring defined within the APM-MIB [RFC3729]. This capability is intended to support trouble resolution, further characterization of performance, and a finer granularity of
monitoring capabilities. The APM-MIB provides a method for retrieving aggregated measurement data of the end-user’s perception of application-level performance. APM additionally provides thresholding and associated alarms in the event the end-user perceived performance degrades below defined thresholds. The TPM-MIB compliments the APM-MIB capabilities by monitoring sub-application level transaction aspects not typically perceived by the end-user. As an example, APM-MIB provides response time statistics of a typical web-browser application. This application typically consists of DNS transactions, TCP connection establishment (or multiple establishments), HTTP download of the base page and multiple downloads of the various embedded objects. Ideally TPM-MIB would provide statistics on the performance aspects of these multiple sub-application level transactions.

+ Provide additional performance metrics and related statistics. For trouble shooting and a finer granularity of performance monitoring, it is useful to provide measurements of additional metrics beyond those supported by the APM-MIB.

+ Support standards based metrics and associated statistical aggregation by defining methods to reference those standards. The TPM-MIB provides a capability to describe metrics by reference to appropriate IETF, ITU or other, including enterprise specific, standards bodies defining metrics. This capability is provided through the tpmMetricsDefTable.

Specifically, this MIB itself does not make references to such IETF, ITU and other organization’s metric specifications. What it does do is to allow for the setup of the tpmMetricDefTable that does reference such IETF, ITU and other metric specifications, and it allows to (dynamically) list pointers to such specifications in this table. The following objects do allow for that, and the DESCRIPTION clauses (of the below objects) explain how such is done:

```plaintext
  tpmMetricDefName OBJECT-TYPE
  tpmMetricDefReference OBJECT-TYPE
  tpmMetricDefGlobalID OBJECT-TYPE
```

The tpmMetricDefGlobalID object contains a reference to the Object ID in a metrics registration MIB being developed in the IPPM Working Group at the IETF, e.g., the IPPM-REGISTRY-MIB [RFCXXX3], which defines the metric. For metrics defined within the IPPM Working Group, which are included in the IPPM-REGISTRY-MIB, this object is used to reference those metrics directly. For metrics not included within the IPPM-REGISTRY-MIB, the value of this object is set to 0.0 for none.
Examples of appropriate references include the ITU-T Recommendation Y.1540 [Y.1540] on IP packet transfer performance metrics or the IETF documents from the IPPM WG, e.g., RFC2681 on the round trip delay metric [RFC2681] or RFC3393 on the delay variation metric [RFC3393] or others, including RFC2679 [RFC2679], RFC2680 [RFC2680], and RFC3432 [RFC3432]. While no specific metric is mandatory, implementations should, at a minimum, support a round trip delay and a round trip loss metric.

+ Provide (as an option) a table storing the measurements of the metrics on a transaction by transaction basis. There are times when it is useful to have access to the raw measurements. The tpmCurReportTable optionally provides access to this capability.

While this document outlines the basic measurements of performance in regard to the transporting of application flows, it does not attempt to measure or provide a means to measure the actual perceived performance of the application transactions or quality. The detailed measurements of end-user perceived performance is directly related to this document and may be found in the APM-MIB [RFC3729].

The objects defined in this document are intended as an interface between an RMON agent and an RMON management application and are not intended for direct manipulation by humans. While some users may tolerate the direct display of some of these objects, few will tolerate the complexity of manually manipulating objects to accomplish row creation. These functions should be handled by the management application.

3.1. Terms

This document uses some terms that need introduction:

DataSource
A source of data for monitoring purposes. This term is used exactly as defined in the RMON2-MIB [RFC2021].

protocol
A specific protocol encapsulation, as identified for monitoring purposes. This term is used exactly as defined in the RMON Protocol Identifiers document [RFC2895].

performance metric
A specific, measured reporting metric, as identified for monitoring purposes. There can be several metrics reported by an agent in the same implementation. The metrics are extensible based on the agent implementation.
application
A network-based, high-level protocol performing useful work to an end-user of end-system. Typically the application performs multiple request/response transactions to complete its work. E.g., a web-application downloading a web page completes DNS, TCP-connect and multiple HTTP GET transactions prior to completing its task.

transactions
Elemental request/response transactions comprising more complex network-based applications. E.g., a transaction may include an ftp get request and the file download in response.

3.2. Report Aggregation

This MIB module provides functions to aggregate measurements into higher level summaries identical to the aggregation defined in the APM-MIB [RFC3729]. In addition to temporal aggregation of data, the Textual Convention, TransactionAggregationType, is imported from the APM-MIB, which specifies the nature of the spatial aggregation employed.

3.3. Structure of the MIB

The objects are arranged in the following groups:

-- tpmCapabilitiesGroup
-- tpmAggregateReportsGroup
-- tpmCurrentReportsGroup
-- tpmExceptionReportsGroup

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 module, the authoritative reference for such information is contained in the MODULE-COMPLIANCE and OBJECT-GROUP macros later in this MIB module.

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

The tpmCapabilitiesGroup contains objects and tables which show the measurement protocol and metric capabilities of the agent. This group primarily consists of the tpmTransMetricDirTable and the tpmMetricDefTable.

3.3.2. The tpmAggregateReportsGroup

The tpmAggregateReportsGroup is used to provide the collection of aggregated statistical measurements for the configured report intervals. The tpmAggregateReportsGroup consists of the tpmAggrReportCntrlTable and the tpmAggrReportTable.

3.3.3. The tpmCurrentReportsGroup

The tpmCurrentReportsGroup is used to provide the collection of uncompleted measurements for the current configured report for those transactions caught in progress. A history of these transactions is also maintained once the current transaction has completed. The tpmCurrentReportsGroup consists of the tpmCurReportTable and the tpmCurReportSize object.

3.3.4. The tpmExceptionReportsGroup

The tpmExceptionReportsGroup is used to link immediate notifications of transactions that exceed certain thresholds defined in the apmExceptionGroup [RFC3729]. This group reports the aggregated sub-application measurements for those applications exceeding thresholds. The tpmExceptionReportsGroup consists of the tpmExcpReportTable.

3.4. Statistics for Aggregation of Data – Conventions

In order to measure the performance of traffic flows in a network, the proper analysis of a set of statistics is required. Since a large majority of the statistics have a basis of time, the use of a simple statistical model is feasible. Therefore, the MIB definitions within this document all use a basic set of statistical computed values to assist in further analysis by a management application.

The remaining subsections in this section detail the common structured features that are applied to the performance metrics in the statistical format described above. The tpmMetricsDefTable (discussed below) describes the set of metrics supported in this MIB module.

3.5. Relationship to the Remote Monitoring MIB
This document describes the implementation of an additional MIB for the support of performance related metrics within the framework of the RMON2-MIB [RFC2021]. The objects and table defined in this MIB module are an extension to the existing framework for the support of both Client/Server and Server push related applications and services.

3.6. Relationship to RMON2-MIB Protocol Identifier Reference

This document uses the Protocol Identifiers outlined in the current Protocol Identifier Reference document, RFC 2895 [RFC2895]. The protocol index values throughout the document are a direct reference to the same relationship that exists between the RMON2-MIB [RFC2021] and the Protocol Identifier Reference document, RFC 2895 [RFC2895]. An important extension of the Protocol Identification to application-level verbs is found in RFC 3395 [RFC3395].

3.7. Relationship to Standards-Based Performance Metrics

This document uses the tpmMetricsDefTable to describe the metrics supported by an instance of the TPM-MIB. The performance metric index values throughout the document are a direct reference to the metrics defined in that table. The table defines metrics by directly referencing other standards that provide definitive descriptions of the metric.

3.8. Relationship to Application Performance Measurement MIB

This document uses the apmReportControlIndex, appLocalIndex and apmReportIndex as outlined in the current Application Performance Measurement MIB [RFC3729]. These objects are used to create a reference link for the purpose of reporting transaction flow details on application level measurements. As such, the TPM-MIB is designed to provide a drill-down extension to the APM-MIB. Further, it draws heavily on the ideas and designs laid out in the APM-MIB.

4. Statistics Perspective

When dealing with time based measurements on application data packets it would be ideal if all the timestamps and related data could be stored and forwarded for later analysis. However when faced with thousands of conversations per second on ever faster networks, storing all the data, even if compressed, would take too much processing, memory, and manager download time to be practical.

It is important to note that in dealing with network data we will be dealing with statistical populations and not samples. Statistics books deal with both because the math is similar. In collecting agent data a population, i.e., all the data, must be processed.
Because of the nature of application protocols just sampling some of the packets will not give good results. Missing just one critical packet, such as one that specified an ephemeral port on which data will be transmitted, or what application will be run, can cause much valid data to be lost.

The time-based measurements the agent collects will come from examining the entire group of data, i.e., the population. The population will be finite. The agent will seek only to provide information that will describe the actual data. Analysis of that data will be left to the management station.

The simplest form of representing a group of data is by frequency distributions, i.e., buckets. Statistics provides a great many ways of analyzing this type of data and there are some rules in creating the buckets. First the range needs to be known. Second a bucket size needs to be determined. Fixed bucket sizes are best, while variable may be used if needed. However the statistics texts tend to only refer to operations of fixed size buckets. This method of describing data is expensive for a agent to implement. First the agent must process a great amount of data at a time. In storing the data, determine the range, then locating the buckets and then fill in the data after the fact, takes a fair amount of storage and time. Fixing the range and bucket sizes in the beginning can be problematical as the agent may have to adjust the values for each of the applications it collects data on. Such numbers can be in the thousands. Additional complexity arises in adding new protocols and even in describing the buckets themselves to the management application. This is the approach taken in the APM-MIB.

A complimentary approach is to provide frequency distribution statistics. Frequency distribution statistics describes aggregation such as mean and standard deviation that can be obtained by summation functions on the individual data elements in a population. Analysis of the data described by these functions has been greatly studied and interpretation of these values is available to anyone with an introduction to statistics. In fact, frequency distributions are routinely analyzed to generate these varied numbers which are then used for further analysis. Also note that frequency distributions by their very nature provide an exact characterization of the data. Whereas buckets, will introduce error factors that are not present with direct analysis by a summation type formulas. Because the TPM-MIB provides a drill-down capability to the APM MIB it has to measure and store much more information than the APM-MIB. For this reason, and to compliment the APM-MIB, the TPM-MIB relies on statistical descriptions rather than a bucket description of the measurement data.
The agent will provide data that can be used to calculate the most basic and useful statistical aggregates. The agent will not perform the calculations and provide the statistical measurement directly. There are several reasons why this is not desired. The first is that to find the final measurement can be expensive in terms of computation and representation. There are divisions and square roots and the measurements are expressed as floating point values. The second is that by providing the variables to the statistical functions, those variables are scalable. It is possible to combine smaller intervals into larger ones.

An example is the arithmetic mean or average. This is the sum of the data divided by the number of data elements. The agent will provide the sum of the x and the number of elements N. The management station can perform the division to obtain the average. Given two samples, they can be combined by adding the sum of the x’s and by adding the number of elements to get a combined sum and number of elements. The average formula then works just the same. Also the sum of the x and the number of element variables are used in calculating other statistical measurement values as well.

4.1. Statistics Structure

The data statistical elements, datum, of the metric have been chosen to maximize the amount of data available while minimizing the amount of memory needed to store the statistic and minimizing the CPU processing requirement needed to generate the statistic.

The statistic data structure contains five unsigned integer datum.

- N: count of the number of data points for the metric
- S(X): sum of all the data point values for the metric
- S(X^2): sum of all the data point values squared for the metric
- Xmax: maximum data point value for the metric
- Xmin: minimum data point value for the metric
- S(I*X): sum of the data points multiplied by their order, i.e.,
  \[ S(I*X) = \sum_{i=1}^{N} (i*X_i) \]

A performance metric is used to describe events over a time interval. The measurement points can be processed immediately into the statistic and do not have to be stored for later processing. For example, to count the number of events in a time interval it is sufficient to increment a counter for each event. It is not necessary to cache all the events and then count them at the end of the interval. The statistic is also designed to be easily scalable in terms of combining adjacent intervals. For example if an agent created a specific statistic every 30 seconds and a user table interval was set to 60 seconds, the 60 second statistic could be...
obtained by combining the two 30 second statistics. The following rules will be applied when combining adjacent statistics.

\[
\begin{align*}
N & \quad S(N) \\
S(X) & \quad S(S(X)) \\
S(X_2) & \quad S(S(X_2)) \\
X_{\text{max}} & \quad \text{MAX}(X_{\text{max}}) \\
X_{\text{min}} & \quad \text{MIN}(X_{\text{min}}) \\
S(I \times X) & \quad S(I \times X) + N \times S(X) + S(I \times X)
\end{align*}
\]

where the last two terms refer to the statistics from the later 30 second period and \( N \) is the count from the former 30 second period.

This structure gives a generic framework upon which the actual performance statistics will be defined. Each specific statistical definition must address the specific significance, if any, given to each of the metric datum. While a specific metric definition should try to conform to the generic framework, it is acceptable for a metric datum to not be used, and to have no meaning, for a specific metric. In such cases the datum will default to a 0 value.

4.2. Statistics Analysis

The actual meaning of a specific statistical datum is determined by the definition of the specific statistic. The following is a discussion of the operations and observations that can be performed on a generic metric. This means that the following may or may not apply and/or have meaning when applied to any specific metric.

The following observations and analysis techniques are not all inclusive. Rather these are the ones we have come up with at the time of writing this document.

+ Number.

+ Frequency.

+ The time interval is the time interval specified in the control table. It is not a metric datum, but it is associated with the metric sample.

+ Maximum

+ Minimum

+ Range
+ Arithmetic Mean
+ Root Mean Square
+ Variance
+ Standard Deviation
+ Slope of a least-squares line

These are accessible from the statistical datum provided by this MIB module.

5. Definitions

--
-- RMON2-MIB Extensions for the Monitoring metrics related to the
-- performance of transporting traffic in networks.
--
-- TPM Metric Collection
--   * Application-to-Protocol transaction linkage
--   * Metric-to-Protocol linkage
--   * Metric study control
--   * Metrics for Client/Server Conversations
--

TPM-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE,
Counter32, Unsigned32 FROM SNMPv2-SMI --[RFC2578]

MODULE-COMPLIANCE,
OBJECT-GROUP FROM SNMPv2-CONF --[RFC2580]

SnmpAdminString FROM SNMP-FRAMEWORK-MIB --[RFC3411]

RowStatus, TEXTUAL-CONVENTION, TimeStamp,
StorageType FROM SNMPv2-TC --[RFC2579]

rmon, OwnerString FROM RMON-MIB --[RFC2819]

protocolDirLocalIndex,
ZeroBasedCounter32 FROM RMON2-MIB --[RFC2021]

ZeroBasedCounter64 FROM HCNUM-TC --[RFC2856]
ApplLocalIndex, TransactionAggregationType, 
RmonClientID, DataSourceOrZero, 
apmAppDirAppLocalIndex, apmExceptionIndex, 
apmReportGroup, apmExceptionGroup, 
apmAppDirResponsivenessType FROM APM-MIB --[RFC3729] 

SspmClockSource, SspmClockMaxSkew, 
SspmMicroSeconds FROM SSPM-MIB;  --[RFCXXX2]

-- Transaction Performance Monitoring MIB

tpmMIB MODULE-IDENTITY
LAST-UPDATED "200406281500Z" -- 28 June 2004
ORGANIZATION "IETF RMON MIB Working Group"
CONTACT-INFO
"E-mail: rmonmib@ietf.org
Subscribe: rmonmib-request@ietf.org
w/ msg body: subscribe rmonmib

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DESCRIPTION
"This module defines extensions to the RMON2-MIB module for the collection of Performance Metrics related to application traffic in a network. In particular, it describes managed objects used for monitoring selectable performance metrics and statistics derived from the monitoring of network packets and sub-application level transactions.

In order to maintain the RMON 'look-and-feel', some of the text from the RMON2 [RFC2021] and HC-RMON [RFC3273]
MIBs by Steve Waldbusser have been used in this MIB module.

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REVISION "200406281500Z" -- 28 June 2004
DESCRIPTION
"The original version of this MIB module, published as RFCXXXX."
-- RFC-Editor assigns XXXX
::= { rmon nn } -- To be assigned by IANA
-- We suggest a value of 30 for nn

--
-- Object Identifier Assignments
--

tpmCapabilities OBJECT IDENTIFIER ::= { tpmMIB 1 }
tpmReports OBJECT IDENTIFIER ::= { tpmMIB 2 }
tpmConformance OBJECT IDENTIFIER ::= { tpmMIB 3 }

-- tpmAggrReportCntrlTable OBJECT IDENTIFIER ::= { tpmReports 1 }
-- tpmAggrReportTable OBJECT IDENTIFIER ::= { tpmReports 2 }
-- tpmCurReportTable OBJECT IDENTIFIER ::= { tpmReports 3 }
-- tpmCurReportSize OBJECT IDENTIFIER ::= { tpmReports 4 }
-- tpmExcpReportTable OBJECT IDENTIFIER ::= { tpmReports 5 }

--
-- Textual Conventions
--

TpmTransactionMetricIndex ::= TEXTUAL-CONVENTION
   DISPLAY-HINT "d"
   STATUS current
   DESCRIPTION
   "An index used to uniquely identify an entry in the tpmTransMetricDir table. Each such entry defines the protocol transaction and metric instance to be monitored for a specific application."
   SYNTAX Unsigned32 (1..65535)

TpmMetricDefID ::= TEXTUAL-CONVENTION
   DISPLAY-HINT "d"
   STATUS current
DESCRIPTION

"An index that identifies through reference to a specific performance metric. The metrics are referenced through their type (connect, delay, loss, etc.), their directional characteristics (one-way, round trip, etc.), their name, their reference to a documented definition."

SYNTAX    Unsigned32 (1..2147483647)

--
-- The tpmCapabilitiesGroup
--

tpmClockResolution OBJECT-TYPE
SYNTAX    SspmMicroSeconds
MAX-ACCESS read-only
STATUS    current
-- UNITS    Microseconds
DESCRIPTION

"A read only variable indicating the resolution of the measurements possible by this device."

::= { tpmCapabilities 1 }

tpmClockMaxSkew OBJECT-TYPE
SYNTAX    SspmClockMaxSkew
MAX-ACCESS read-only
STATUS    current
-- UNITS    Seconds
DESCRIPTION

"A read only variable indicating the maximum offset error due to skew of the local clock over the time interval 86400 seconds, in seconds."

::= { tpmCapabilities 2 }

tpmClockSource OBJECT-TYPE
SYNTAX    SspmClockSource
MAX-ACCESS read-only
STATUS    current
DESCRIPTION

"A read only variable indicating the source of the clock. This is provided to allow a user to determine how accurate the timing mechanism is compared with other devices."

::= { tpmCapabilities 3 }

tpmTransMetricDirLastChange OBJECT-TYPE
SYNTAX    TimeStamp
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"The value of sysUpTime at the time the
tpmTransMetricDirTable was last modified, through
modifications of the tpmTransMetricDirConfig object."
::= { tpmCapabilities 4 }

tpmTransMetricDirTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TpmTransMetricDirEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table is used to describe and link sets of
performance metrics and protocols to an entry in
the application directory. This table, with the
tpmMetricDefTable, describes the capability of
the agent to collection sub-application level
data related to each entry in the
apmAppDirectoryTable.

This table lists the protocol transactions and their
corresponding performance metrics that this agent
has the capability to compute and collect, for the specified
application. There is one entry in this table for each such
application, protocol transaction and metric combination
supported by this agent. The entries in this
table represent the metrics that are collected for each
protocol transaction that comprise the application.
The agent should boot up with this table pre-configured
with those combinations of applications, protocol
transactions and metrics that it knows about and wishes to
monitor. Implementations must populate the table with all
possible application, protocol transaction and metric
combinations and have the default configuration
objects set to supportedOff(2). This table
does not support the creation of new
combinations by the management application.

The deletion of an entry in the apmAppDirectoryTable will cause
the removal of entries from this table. These entries must
be removed because the appLocalIndex value will no
longer be visible in the apmAppDirectoryTable. When an entry
is created in the apmAppDirectoryTable and the agent has the
ability to support metrics for these protocol transactions,
the appropriate entries must be made in the
tpmTransMetricDefTable."
::= { tpmCapabilities 5 }
tpmTransMetricDirEntry OBJECT-TYPE
  SYNTAX TpmTransMetricDirEntry
  MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION "A conceptual row in the tpmTransMetricDirTable.

  An example of the indexing of this entry is
  tpmTransMetricDirConfig.5.2  where 5 is the
  value of a valid and visible appLocalIndex object in
  the appLocalDir table. The entries describe the
  the transaction and metric pairs monitored for this
  application. The tpmTransMetricProtocolIndex
  identifies the protocol transaction and the
  tpmMetricDefIndex describes the metric monitored."

  INDEX { tpmTransMetricAppLocalIndex, -- Application Index
           tpmTransMetricIndex    -- (Protocol,Metric) Index
  }
  ::= { tpmTransMetricDirTable 1 }

TpmTransMetricDirEntry ::= SEQUENCE {
  tpmTransMetricAppLocalIndex   AppLocalIndex,
  tpmTransMetricIndex           TpmTransactionMetricIndex,
  tpmTransMetricProtocolIndex   Unsigned32,
  tpmTransMetricMetricIndex     Unsigned32,
  tpmTransMetricDirConfig       INTEGER
}

tpmTransMetricAppLocalIndex OBJECT-TYPE
  SYNTAX       AppLocalIndex
  MAX-ACCESS   not-accessible
  STATUS       current
  DESCRIPTION  "An index used to uniquely identify the application
                which the entries in the tpmTransMetricDir
                table are associated."
  ::= { tpmTransMetricDirEntry 1 }

tpmTransMetricIndex OBJECT-TYPE
  SYNTAX       TpmTransactionMetricIndex
  MAX-ACCESS   not-accessible
  STATUS       current
  DESCRIPTION  "An index used to uniquely identify an entry in the
                tpmTransMetricDir table. Each such entry defines
                protocol transaction and metric instance
                to be monitored for a specific application."
  ::= { tpmTransMetricDirEntry 2 }

tpmTransMetricProtocolIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The protocolDirLocalIndex of the particular transaction to
be analyzed when computing and generating the selected metric
for a specific application."
::= { tpmTransMetricDirEntry 3 }

tpmTransMetricMetricIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The tpmMetricDefinitionID of the particular metric to be
generated."
::= { tpmTransMetricDirEntry 4 }

tpmTransMetricDirConfig OBJECT-TYPE
SYNTAX      INTEGER {
    notSupported(1),
    supportedOff(2),
    supportedOn(3)
}
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
"This object describes and configures the probe’s support
for this performance metric in relationship to the
specified transaction and application. The agent
creates entries in this table for all metric
and transaction combinations that it can generate.
Because the probe will only populate this table with supported
entries, and the table cannot have entries added, the
notSupported(1) setting is only used to signify that other
configuration parameters are causing the agent to currently not
support the generation and collection of this metric for the
specified protocol and application. Also, the status of
this object will not change to notSupported(1) due to a
change to supportedOff(2) in the tpmMetricDir table.

If the value of this object is notSupported(1), the probe
will not perform computations for this performance metric and
transaction combination and shall not allow this object to be
changed to any other value. If the value of this object is
supportedOn(3), the probe supports computations for this
performance metric and protocol and is configured to perform
the computations for this performance metric and protocol combination for the application for all interfaces. If the value of this object is supportedOff(2), the probe supports computations for this performance metric for the specified protocol, but is configured to not perform the computations for this performance metric and protocol for the application for any interfaces. Whenever this value changes from supportedOn(3) to supportedOff(2), the probe shall cause the deletion of all entries in the tpmReportGroup tables, for all appropriate studies configured in the tpmAggrReportCntrlTable.

The value of this object must persist across reboots.

::= { tpmTransMetricDirEntry 5 }

--
-- TPM Metric Definitions Table
--

tpmMetricDefTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TpmMetricDefEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The tpmMetricDefTable describes the metrics available to the TPM-MIB. The tpmMetricDefTable can define metrics by referencing existing IETF, ITU and other standards organizations’ documents, including enterprise specific documents.

Examples of appropriate references include the ITU-T Recommendation Y.1540 [Y.1540] on IP packet transfer performance metrics or the IETF documents from the IPPM WG, e.g., RFC2681 on the round trip delay metric [RFC2681] or RFC3393 on the delay variation metric [RFC3393] or others, including RFC2679 [RFC2679], RFC2680 [RFC2680], and RFC3432 [RFC3432]. While no specific metric is mandatory, implementations should, at a minimum, support a round trip delay and a round trip loss metric.

This table contains one row per metric supported by this agent, and should be populated during system initialization."

::= { tpmCapabilities 6 }
tpmMetricDefEntry OBJECT-TYPE
SYNTAX TpmMetricDefEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information about a particular metric."
INDEX  { tpmMetricDefinitionID }
::= { tpmMetricDefTable 1 }

TpmMetricDefEntry ::= SEQUENCE {
  tpmMetricDefinitionID              TpmMetricDefID,
  tpmMetricDefType                   INTEGER,
  tpmMetricDefDirType                INTEGER,
  tpmMetricDefName                   SnmpAdminString,
  tpmMetricDefReference              SnmpAdminString,
  tpmMetricDefGlobalID               OBJECT IDENTIFIER
}

tpmMetricDefinitionID OBJECT-TYPE
SYNTAX TpmMetricDefID
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The index for this entry. This object identifies the particular metric in this MIB module."
::= { tpmMetricDefEntry 1 }

tpmMetricDefType OBJECT-TYPE
SYNTAX INTEGER {
  other(1),
  connectMetric(2),
  delayMetric(3),
  lossMetric(4)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The basic type of metric indicated by this entry.

The value ‘other(1)’ indicates that this metric cannot be characterized by any of the remaining enumerations specified for this object.

The value ‘connectMetric(2)’ indicates that this metric measures connectivity characteristics.

The value ‘delayMetric(3)’ indicates that this metric measures delay characteristics."
The value ‘lossMetric(4)’ indicates that this metric measures loss characteristics.

::= { tpmMetricDefEntry 2 }

tpmMetricDefDirType OBJECT-TYPE
SYNTAX INTEGER {
  oneWay(1),
  twoWay(2),
  multiWay(3)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The directional characteristics of the this metric.

The value ‘oneWay(1)’ indicates that this metric is measured with some sort of unidirectional test.

The value ‘twoWay(2)’ indicates that this metric is measured with some sort of bidirectional test.

The value ‘multiWay(3)’ indicates that this metric is measured with some combination of unidirectional and/or bidirectional tests."

::= { tpmMetricDefEntry 3 }

tpmMetricDefName OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The textual name of this metric. For example, if this tpmMetricDefEntry identified the IPPM metric for round trip delay, then this object should contain the value, e.g., 'Type-P-Round-Trip-Delay'."

::= { tpmMetricDefEntry 4 }

tpmMetricDefReference OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object contains a reference to the document which defines this metric. If this document is available online via electronic download, then a dereferencable URL should be specified in this object. The implementation must support an HTTP URL type and may support additional types of dereferencable URLs such as an FTP type."
For example, if this tpmMetricDefName identified the IPPM metric ‘Type-P-Round-Trip-Delay’, then this object should contain the value, e.g., 'http://www.ietf.org/rfc/rfc2681.txt'."

::= { tpmMetricDefEntry 5 }

tpmMetricDefGlobalID OBJECT-TYPE
SYNTAX     OBJECT IDENTIFIER
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
  "This object contains a reference to the Object ID in a metrics registration MIB being developed in the IPPM WG at the IETF, e.g., the IPPM-REGISTRY-MIB [RFCXXX3], which defines the metric. In the event that this metric has no corresponding OID or until the IPPM-REGISTRY-MIB is defined, then the value should be set to 0.0 for none."

::= { tpmMetricDefEntry 6 }

--
-- The tpmAggregateReportsGroup
--

tpmAggrReportCntrlTable OBJECT-TYPE
SYNTAX     SEQUENCE OF TpmAggrReportCntrlEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
  "The tpmAggrReportCntrlTable is the controlling entry to manage the population of studies in the Transport Aggregate Report for selected interfaces, metrics and transaction protocols and applications.

Note that this is not like the typical RMON controlTable and dataTable in which each entry creates its own data table. Each entry in this table enables the creation of multiple data tables on a study basis. For each interval, the study is updated in place and the current data content of the table becomes invalid.

The control table entries are persistent across system reboots."

::= { tpmReports 1 }

tpmAggrReportCntrlEntry OBJECT-TYPE
SYNTAX     TpmAggrReportCntrlEntry
A conceptual row in the tpmAggrReportCntrlTable.

An example of the indexing of this entry is
tpmAggrReportCntrlDataSource.1

INDEX { tpmAggrReportCntrlIndex }
::= { tpmAggrReportCntrlTable 1 }

TpmAggrReportCntrlEntry ::= SEQUENCE {
  tpmAggrReportCntrlIndex               Unsigned32,
  tpmAggrReportCntrlApmCntrlIndex       Unsigned32,
  tpmAggrReportCntrlDataSource          DataSourceOrZero,
  tpmAggrReportCntrlAggrType            TransactionAggregationType,
  tpmAggrReportCntrlInterval            Unsigned32,
  tpmAggrReportCntrlReqSize             Unsigned32,
  tpmAggrReportCntrlGrantedSize         Unsigned32,
  tpmAggrReportCntrlReqReports          Unsigned32,
  tpmAggrReportCntrlGrantedReports      Unsigned32,
  tpmAggrReportCntrlStartTime           TimeStamp,
  tpmAggrReportCntrlReportNumber        Unsigned32,
  tpmAggrReportCntrlInsertsDenied       Counter32,
  tpmAggrReportCntrlDroppedFrames       Counter32,
  tpmAggrReportCntrlOwner               OwnerString,
  tpmAggrReportCntrlStorageType         StorageType,
  tpmAggrReportCntrlStatus              RowStatus
}

tpmAggrReportCntrlIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  
"An index that uniquely identifies an entry in the
tpmAggrReportCntrlTable. Each such entry defines a unique
report whose results are placed in the tpmAggrReportTable on
behalf of this tpmAggrReportCntrlEntry."
::= { tpmAggrReportCntrlEntry 1 }

tpmAggrReportCntrlApmCntrlIndex OBJECT-TYPE
SYNTAX      Unsigned32 (0..65535)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  
"This index associates this TpmAggrReportCntrlEntry directly
with an existing ApmReportControlEntry. This link is used
to synchronize reports in the associated tpmAggrReportTable.

A value of 0 (zero) enables an independent control table that will report entries to tpmAggrReportTable based only on the other objects in this table.

A non-zero value indicates that this row is defined through the APM-MIB. In this case, all row objects are set to their corresponding values in the APM-MIB. In the event that a SET is issued to a row object, while the value of the tpmAggrReportCntrlApmCntrlIndex is non-zero, the agent MUST respond as if the object of the SET command had MAX-ACCESS of read-only.

This object may not be modified if the associated tpmAggrReportCntrlStatus object is equal to active(1).

DEFVAL { 0 }
::= { tpmAggrReportCntrlEntry 2 }

tpmAggrReportCntrlDataSource OBJECT-TYPE
SYNTAX     DataSourceOrZero
MAX-ACCESS read-create
STATUS      current
DESCRIPTION
"The source of the data for TPM Reports generated on behalf of this tpmAggrReportCntrlEntry.

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.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object is set to the corresponding apmReportControlTable object in the APM-MIB [RFC3729].

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

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

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlAggregationType object.

This object may not be modified if the associated tpmAggrReportCntrlStatus object is equal to active(1)."
::= { tpmAggrReportCntrlEntry 4 }

tpmAggrReportCntrlInterval 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 tpmAggrReportTable. All reports with the same tpmAggrReportCntrlIndex will be based on the same interval.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlControlInterval object.

This object may not be modified if the associated tpmReportAggregateCntrlStatus object is equal to active(1)."
DEFVAL { 3600 }
::= { tpmAggrReportCntrlEntry 5 }

tpmAggrReportCntrlReqSize OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The maximum number of Client and Server combination entries requested for this report.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlRequestedSize object."
When this object is created or modified, the probe should set tpmReportCntrlGrantedSize as closely to this object as is possible for the particular probe implementation and available resources.

It is important to note that this value is the number of requested entries in the tpmAggrReportTable only. Since the probe can derive this table from the apmReportTable, the probe must make sure that sufficient resources exist to support the creation of the apmReportTable plus any additional resources required to convert or support this table.

This object may not be modified if the associated tpmReportAggregateCntrlStatus object is equal to active(1)."

::= { tpmAggrReportCntrlEntry 6 }

tpmAggrReportCntrlGrantedSize OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The maximum number of performance entries in this report.

When the associated tpmAggrReportCntrlReqSize object is created or modified, the probe should set this object as closely to the requested value as is possible for the particular implementation and available resources. The probe must not lower this value except as a result of a set to the associated tpmAggrReportCntrlReqSize object.

It is an implementation-specific matter as to whether or not zero-valued entries are available."

::= { tpmAggrReportCntrlEntry 7 }

tpmAggrReportCntrlReqReports OBJECT-TYPE
SYNTAX Unsigned32 (1..65535)
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The number of saved reports requested to be allocated on behalf of this entry.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlcwRequestedReportsDataSource object.

This object may not be modified if the associated
tpmReportAggregateCntrlStatus object is equal to active(1).

::= { tpmAggrReportCntrlEntry 8 }

tpmAggrReportCntrlGrantedReports 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 tpmAggrReportCntrlReqReports. Since each report can have many entries, the total number of entries allocated will be this number multiplied by the value of tpmAggrReportCntrlGrantedSize, or 1 if that object doesn’t exist.

When the associated tpmAggrReportCntrlReqReports 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 tpmAggrReportCntrlGrantedSize, 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 tpmAggrReportCntrlReqSize object."

::= { tpmAggrReportCntrlEntry 9 }

tpmAggrReportCntrlStartTime 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 tpmAggrReportCntrlEntry, as reports are started at fixed intervals.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object is set to the corresponding
apmReportControlTable object in the APM-MIB defined in the IETF’s RMONMIB WG.
::= { tpmAggrReportCntrlEntry 10 }

tpmAggrReportCntrlReportNumber OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of the report in progress. When an tpmAggrReportCntrlEntry is activated, the first report will be numbered zero.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlReportNumber object."
 ::= { tpmAggrReportCntrlEntry 11 }

tpmAggrReportCntrlInsertsDenied OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of failed attempts to add an entry to reports for this TpmAggrReportCntrlEntry because the number of entries would have exceeded tpmAggrReportCntrlGrantedSize.

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

Also note that there is no ordering specified for the entries in the report, thus there are no rules for which entries will be omitted when not enough entries are available. As a consequence, the agent is not required to delete ‘least valuable’ entries first."
 ::= { tpmAggrReportCntrlEntry 12 }

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

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

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

Note that, unlike the dropEvents counter, this number is the exact number of frames dropped.

::= {tpmAggrReportCntrlEntry 13}

tpmAggrReportCntrlOwner 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.

If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlReportNumber object.

This object may not be modified if the associated tpmReportAggregateCntrlStatus object is equal to active(1)."

::= {tpmAggrReportCntrlEntry 14}

tpmAggrReportCntrlStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The storage type of this tpmAggrReportCntrlEntry. If the value of this object is ‘permanent’, no objects in this row need to be writable."

::= {tpmAggrReportCntrlEntry 15}

tpmAggrReportCntrlStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The status of this performance control entry.

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

If the tpmAggrReportCtrlApmCtrlIndex is non-zero, then this object should be set by the agent to the value of the apmReportControlReportNumber object.

Once this object is set to active(1), no objects in the tpmAggrReportCtrlTable can be changed.

If this object is not equal to active(1), all associated entries in the tpmAggrReportTable shall be deleted."

::= { tpmAggrReportCtrlEntry 16 }

--

-- Transport Aggregate Report Table
--

tpmAggrReportTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TpmAggrReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table contains transport performance metric studies for each of the control table entries in tpmAggrReportCtrlTable. These studies are provided based on the selections and parameters found for the entry in the tpmAggregateReportCtrlTable.

The performance statistics are specified in the tpmTransMetricDirTable associated with the application in question and indexed by appLocalIndex and tpmTransMetricIndex."

::= { tpmReports 2 }

tpmAggrReportEntry OBJECT-TYPE
SYNTAX      TpmAggrReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A conceptual row in the tpmAggrReportTable.

The tpmAggrReportCtrlIndex value in the index identifies the tpmAggrReportCtrlEntry on whose behalf this entry was created."
The tpmAggrReportIndex value in the index identifies which report (in the series of reports) this entry is a part of.
The tpmAggrReportAppLocalIndex value in the index identifies the application protocol that is being reported.
The tpmTransMetricIndex value in the index identifies the transaction protocol-metric pair for the traffic flows aggregated in this entry.
The protocolDirLocalIndex value in the index identifies the network layer protocol of the tpmAggrReportServerAddress. When the associated tpmAggrReportCntrlAggrType value is equal to applications(4) or clients(2), this value will equal 0.
The tpmAggrReportServerAddress value in the index identifies the network layer address of the server in traffic flows aggregated in this entry.
The tpmAggrReportApmNameClientID value in the index identifies the client in traffic flows aggregated in this entry. If the associated tpmAggrReportCntrlAggrType is equal to applications(4) or servers(3), then this object will be set to 0.

An example of the indexing of this entry is:
tpmAggrReportStatN.3.15.34.262.18.4.128.2.6.7.3256521"  INDEX { tpmAggrReportCntrlIndex,
        tpmAggrReportIndex,
        tpmAggrReportAppLocalIndex, -- Application Layer
        tpmAggrReportTransMetricIndex, -- Metric and Protocol
        protocolDirLocalIndex, -- Network Layer
        tpmAggrReportServerAddress,
        tpmAggrReportApmNameClientID
      }::= { tpmAggrReportTable 1 }
tpmAggrReportHCStatSumSq  ZeroBasedCounter64,
tpmAggrReportStatSumIX    ZeroBasedCounter32,
tpmAggrReportOverflowStatSumIX  ZeroBasedCounter32,
tpmAggrReportHCStatSumIX    ZeroBasedCounter64,
tpmAggrReportStatSumIXSq   ZeroBasedCounter32,
tpmAggrReportOverflowStatSumIXSq  ZeroBasedCounter32,
TPmAggrReportHCStatSumIXSq  ZeroBasedCounter64

}  


tpmAggrReportIndex  OBJECT-TYPE
SYNTAX   Unsigned32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The value of tpmAggrReportCntrlNumber for the report to
which this entry belongs."
::= { tpmAggrReportEntry 1 }


tpmAggrReportAppLocalIndex  OBJECT-TYPE
SYNTAX   AppLocalIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The common application of the transactions aggregated
in this entry."
::= { tpmAggrReportEntry 2 }


tpmAggrReportTransMetricIndex OBJECT-TYPE
SYNTAX   TpmTransactionMetricIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "A unique index that identifies the transaction and
metric associated with the statistics reported here."
::= { tpmAggrReportEntry 3 }


tpmAggrReportServerAddress OBJECT-TYPE
SYNTAX   OCTET STRING (SIZE (0..108))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The network layer address of the server host in this
conversation.
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 IPv4, this object is encoded as a length octet of 4, followed by the 4 octets of the IPv4 address, in network byte order.

If the associated tpmAggrReportCtrlAggrType 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.

```::= { tpmAggrReportEntry 4 }
```

**tpmAggrReportApmNameClientID OBJECT-TYPE**
- **SYNTAX** RmonClientID
- **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."

```::= { tpmAggrReportEntry 5 }
```

**tpmAggrReportStatN OBJECT-TYPE**
- **SYNTAX** ZeroBasedCounter32
- **MAX-ACCESS** read-only
- **STATUS** current
- **DESCRIPTION**
  "The count of the total number of data points for the specified metric. This number always represents the total size of the statistical datum analyzed. Each metric specifies the exact meaning of this object.

This value represents the results for one metric and is related directly to the specific parameters of the metric and the Server and Client addresses involved."

```::= { tpmAggrReportEntry 6 }
```

**tpmAggrReportOverflowStatN OBJECT-TYPE**
- **SYNTAX** ZeroBasedCounter32
- **MAX-ACCESS** read-only
- **STATUS** current
- **DESCRIPTION**
  "The number of times the associated tpmAggrReportStatN counter has overflowed. Note that this object will only be instantiated if the associated tpmAggrReportHCStatN object is also instantiated for a particular dataSource."

```::= { tpmAggrReportEntry 7 }
```
tpmAggrReportHCStatN OBJECT-TYPE
SYNTAX ZeroBasedCounter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The high-capacity version of tpmAggrReportStatN.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmAggrReportEntry 8 }

tpmAggrReportStatSumX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The sum of all the data point values for the specified
metric. This number always represents the total values
of the statistical datum analyzed. Each metric
specifies the exact meaning of this object.

This value represents the results of one metric and is
related directly to the specific parameters of the metric
and the Server and Client addresses involved."
::= { tpmAggrReportEntry 9 }

tpmAggrReportOverflowStatSumX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of times the associated
tpmAggrReportStatSumX counter has overflowed.
Note that this object will only be instantiated if the
associated tpmAggrReportHCStatSumX object is also
instantiated for a particular dataSource."
::= { tpmAggrReportEntry 10 }

tpmAggrReportHCStatSumX OBJECT-TYPE
SYNTAX ZeroBasedCounter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The high-capacity version of tpmAggrReportStatSumX.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmAggrReportEntry 11 }
tpmAgrrReportStatMaximum

OBJECT-TYPE
SYNTAX    ZeroBasedCounter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"The single maximum data point value observed during the
study period for the specified metric. This number always
represents the maximum value of any single statistical
datum analyzed. Each metric specifies the exact meaning
of this object.

This value represents the results of one metric and is
related directly to the specific parameters of the metric
and the Server and Client addresses involved."
::= { tpmAgrgrReportEntry 12 }

tpmAgrrReportStatMinimum

OBJECT-TYPE
SYNTAX    ZeroBasedCounter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"The single minimum data point value observed during the
study period for the specified metric. This number always
represents the minimum value of any single statistical
datum analyzed. Each metric specifies the exact meaning
of this object.

This value represents the results of one metric and is
related directly to the specific parameters of the metric
and the Server and Client addresses involved."
::= { tpmAgrgrReportEntry 13 }

tpmAgrrReportStatSumSq

OBJECT-TYPE
SYNTAX    ZeroBasedCounter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"The sum of all the squared data point values for the
specified metric. This number always represents the
total of the squared values of the statistical datum
analyzed. Each metric specifies the exact meaning of
this object.

This value represents the results of one metric and is
related directly to the specific parameters of the metric
and the Server and Client addresses involved."
::= { tpmAgrgrReportEntry 14 }
tpmAggrReportOverflowStatSumSq OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of times the associated tpmAggrReportStatSumSq counter has overflowed. Note that this object will only be instantiated if the associated tpmAggrReportHCStatSumSq object is also instantiated for a particular dataSource."
::= { tpmAggrReportEntry 15 }

tpmAggrReportHCStatSumSq OBJECT-TYPE
SYNTAX ZeroBasedCounter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The high-capacity version of tpmAggrReportStatSumSq. Note that this object will only be instantiated if the agent supports High Capacity monitoring for a particular dataSource."
::= { tpmAggrReportEntry 16 }

tpmAggrReportStatSumIX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "For each interval, each data point is associated with a value I, I = 1..N where N is the number of data points, tpmAggrReportStatN. IX is the multiplication of the data point value with the current I. This value along with the other statistics values allow the calculation of the slope of the least-squares line through the data points."
::= { tpmAggrReportEntry 17 }

tpmAggrReportOverflowStatSumIX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of times the associated tpmAggrReportStatSumIX counter has overflowed. Note that this object will only be instantiated if the associated tpmAggrReportHCStatSumIX object is also instantiated for a particular dataSource."
::= { tpmAggrReportEntry 18 }
tpmAggrReportHCStatSumIX OBJECT-TYPE
SYNTAX      ZeroBasedCounter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The high-capacity version of tpmAggrReportStatSumIX.
 Note that this object will only be instantiated if the
 agent supports High Capacity monitoring for a particular
dataSource."
 ::= { tpmAggrReportEntry 19 }

tpmAggrReportStatSumIXSq OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "For each interval, each data point is associated with a
value I, I = 1..N where N is the number of data points,
tpmAggrReportStatN. IX is the multiplication
of the data point value with the current I.
This value along with the other statistics
values allow the calculation of the slope of
the least-squares line through the data points."
 ::= { tpmAggrReportEntry 20 }

tpmAggrReportOverflowStatSumIXSq OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The number of times the associated
tpmAggrReportStatSumIXSq counter has overflowed.
Note that this object will only be instantiated if the
associated tpmAggrReportHCStatSumIXSq object is also
instantiated for a particular dataSource."
 ::= { tpmAggrReportEntry 21 }

tpmAggrReportHCStatSumIXSq OBJECT-TYPE
SYNTAX      ZeroBasedCounter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The high-capacity version of
tpmAggrReportStatSumIXSq.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
 ::= { tpmAggrReportEntry 22 }
-- The tpmCurrentReportsGroup

tpmCurReportTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TpmCurReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table will contain entries associated with an 
apmReportControlEntry which are a current 'snapshot' 
of the metrics being collected in association with 
a set of TPM related application transactions. 
This table contains all sub-flow metrics for transactions 
that have been started but have not yet finished, i.e., 
current, and a history of those that have finished, i.e., 
completed. It may not always be obvious from the context 
whether a transaction is currently in-progress or has 
completed. Therefore, the completion status of a 
transaction is indicated by the value of 
the tpmCurReportCompletion object."
 ::= { tpmReports 3 }

tpmCurReportEntry OBJECT-TYPE
SYNTAX      TpmCurReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "A conceptual row in the tpmCurReportTable. 

The tpmAggrReportControlIndex value in the index identifies 
the tpmAggrReportCntrlEntry on whose behalf this entry was 
created. The tpmCurReportAppLocalIndex value in the 
index identifies the application protocol that is begin 
reported. The protocolDirLocalIndex value in the 
index identifies the network layer protocol 
of the tpmAggrReportServerAddress. When the associated 
tpmAggrReportCntrlAggrType value is 
equal to applications(4), this value will equal 0. 
The tpmCurReportServerAddress value in the 
index identifies the network layer address of the 
server in traffic flows aggregated in this entry. 
The tpmCurReportCurrentApmNameClientID value in the 
index identifies the network layer address of the 
client in traffic flows aggregated in this entry. 
The tpmCurReportCurrentMetricIndex value in the 
index identifies the transported application protocol.
of the traffic flows aggregated in this entry.

Note that the order of protocolDirLocalIndex variables is the opposite of that in the RMON2 MIB (application.network instead of network.application) so that the report entries are sorted by application first, server second and client third. The tpmCurReportCntrIndex value in the index identifies the tpmAggrReportCntrlEntry on whose behalf this entry was created. The tpmCurReportMetricIndex value in the index identifies the metric and protocol of the tpmCurReportServerAddress, via the tpmTransMetricDir table.

An example of the indexing of this table is
tpmCurReportStatisticN.3.34.262.18.4.128.2.6.6.3256521.29667"
INDEX { tpmAggrReportCntrlIndex,
  tpmCurReportAppLocalIndex,           -- Application Layer
  tpmCurReportTransMetricIndex,        -- Metric and Protocol
  protocolDirLocalIndex,               -- Network Layer
  tpmCurReportServerAddress,
  tpmCurReportApmNameClientID,
  tpmCurReportApmTransactionID
}
::= { tpmCurReportTable 1 }

TpmCurReportEntry ::= SEQUENCE {
  tpmCurReportAppLocalIndex               AppLocalIndex,
  tpmCurReportTransMetricIndex            TpmTransactionMetricIndex,
  tpmCurReportServerAddress               OCTET STRING,
  tpmCurReportApmNameClientID             RmonClientID,
  tpmCurReportApmTransactionID            Unsigned32,
  tpmCurReportMetricValue                 ZeroBasedCounter32,
  tpmCurReportCompletion                  INTEGER
}

tpmCurReportAppLocalIndex  OBJECT-TYPE
SYNTAX      AppLocalIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The common application of the transactions reported in this entry."
::= { tpmCurReportEntry 1 }

tpmCurReportTransMetricIndex OBJECT-TYPE
SYNTAX      TpmTransactionMetricIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A unique index that identifies the transaction and metric associated with the statistics reported here."
::= { tpmCurReportEntry 2 }

tpmCurReportServerAddress OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE (0..108))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The network server address for this tpmCurReportEntry. 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 IPv4, this object is encoded as a length octet of 4, followed by the 4 octets of the IPv4 address, in network byte order."
::= { tpmCurReportEntry 3 }

tpmCurReportApmNameClientID OBJECT-TYPE
SYNTAX      RmonClientID
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."
::= { tpmCurReportEntry 4 }

tpmCurReportApmTransactionID OBJECT-TYPE
SYNTAX      Unsigned32 (0..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A unique value for this transaction amongst other transactions sharing the same application, transaction-layer protocol and metric and server and client addresses. Implementations may choose to use the value of the client’s source port, when possible.
If the tpmAggrReportCntrlApmCntrlIndex is non-zero, then this object is set to the corresponding apmTransactionID object in the APM-MIB developed in the IETF’s RMONMIB WG."
::= { tpmCurReportEntry 5 }
tpmCurReportMetricValue OBJECT-TYPE
SYNTAX      ZeroBasedCounter32  
MAX-ACCESS  read-only  
STATUS      current  
DESCRIPTION
"The current value of the metric being evaluated.
For some transaction types this value may be 0, e.g.,
the current round trip time for a DNS query. For
other transaction types this will represent the
current value of a continuously measured metric, e.g.,
the current throughput of an FTP transaction."
::= { tpmCurReportEntry 6 }

tpmCurReportCompletion OBJECT-TYPE
SYNTAX      INTEGER {
                           current(1),
                           completed(2)
                     }  
MAX-ACCESS  read-only  
STATUS      current  
DESCRIPTION
"The status of this transaction. It is not always obvious
from context whether a transaction is on-going or
completed. E.g., an ftp-GET transaction may last several
minutes or hours and a value found in the
tpmCurReportMetricValue object lists to observed throughput
for the transaction up to this point in time. The value
of the tpmCurReportCompletion indicates whether the
transaction has completed."
::= { tpmCurReportEntry 7 }

tpmCurReportSize OBJECT-TYPE
SYNTAX      Unsigned32  
MAX-ACCESS  read-write  
STATUS      current  
DESCRIPTION
"The maximum number of completed transactions desired to be
retained in the tpmCurReportTable. 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.

The agent should consider this value to give a hint as to
how many transactions to save. This is not a hard limit,
just a hint to a maximum value of interest. If this value is
reduced by the management station, the agent can take note,
it may free some records, or it may do nothing."
The value of this object must persist across reboots.

::= { tpmReports 4 }

--
-- The tpmExceptionReportsGroup
--

tpmExcpReportTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TpmExcpReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table contains all sub-flow metrics for transactions
that have been tagged by the apmExceptionTable filter
as having had poor performance."
::= { tpmReports 5 }

tpmExcpReportEntry OBJECT-TYPE
SYNTAX      TpmExcpReportEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A conceptual row in the tpmExcpReportTable. This table
contains aggregated information associated with
exceptions counted in the apmExceptionTable. The
information is aggregated in a manner identical to the
aggregation in the tpmAggrReportTable, with the exception
that data only from transactions associated with a
flagged application is included.

The indexing into this table follows the indexing in the
APM-MIB but adds the tpmTransMetricIndex to identify the
sub-application transaction and metric pair."
INDEX { apmAppDirAppLocalIndex, -- Application
         apmAppDirResponsivenessType, -- Responsiveness Type
         apmExceptionIndex, -- Linkage to ApmExceptions
         tpmExcpReportTransMetricIndex -- Metric and Protocol
 }
::= { tpmExcpReportTable 1 }

TpmExcpReportEntry ::= SEQUENCE {
  tpmExcpReportTransMetricIndex         TpmTransactionMetricIndex,
  tpmExcpReportStatN                    ZeroBasedCounter32,
  tpmExcpReportOverflowStatN            ZeroBasedCounter32,
  tpmExcpReportHCStatN                  ZeroBasedCounter64,
  tpmExcpReportStatSumX                 ZeroBasedCounter32,
  tpmExcpReportOverflowStatSumX         ZeroBasedCounter32,
}
tpmExcpReportHCStatSumX ZeroBasedCounter64,
tpmExcpReportStatMaximum ZeroBasedCounter32,
tpmExcpReportStatMinimum ZeroBasedCounter32,
tpmExcpReportStatSumSq ZeroBasedCounter32,
tpmExcpReportOverflowStatSumSq ZeroBasedCounter32,
tpmExcpReportHCStatSumSq ZeroBasedCounter64,
tpmExcpReportOverflowStatSumIX ZeroBasedCounter32,
tpmExcpReportHCStatSumIX ZeroBasedCounter64,
tpmExcpReportOverflowStatSumIXSq ZeroBasedCounter32,
tpmExcpReportHCStatSumIXSq ZeroBasedCounter64
}

tpmExcpReportTransMetricIndex OBJECT-TYPE
SYNTAX     TpmTransactionMetricIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A unique index that identifies the transaction and
metric associated with the data reported here."
::= { tpmExcpReportEntry 1 }

tpmExcpReportStatN OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The count of the total number of data points for the
specified metric. This number always represents the
total size of the statistical datum analyzed. Each
metric specifies the exact meaning of this object.

This value represents the results of one metric and is
related directly to the specific parameters of the metric
and the Server and Client addresses involved."
::= { tpmExcpReportEntry 2 }

tpmExcpReportOverflowStatN OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The number of times the associated tpmExcpReportStatN
counter has overflowed. Note that this object will only
be instantiated if the associated tpmExcpReportHCStatN
object is also instantiated for a particular dataSource."
::= { tpmExcpReportEntry 3 }

tpmExcpReportHCStatN OBJECT-TYPE
SYNTAX      ZeroBasedCounter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The high-capacity version of tpmExcpReportStatN.
  Note that this object will only be instantiated if the
  agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmExcpReportEntry 4 }

tpmExcpReportStatSumX OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The sum of all the data point values for the specified
  metric. This number always represents the total values
  of the statistical datum analyzed. Each metric
  specifies the exact meaning of this object.

  This value represents the results of one metric and is
  related directly to the specific parameters of the metric
  and the Server and Client addresses involved."
::= { tpmExcpReportEntry 5 }

tpmExcpReportOverflowStatSumX OBJECT-TYPE
SYNTAX      ZeroBasedCounter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The number of times the associated
  tpmExcpReportStatSumX counter has overflowed.
  Note that this object will only be instantiated if
  the associated tpmExcpReportHCStatSumX object is also
  instantiated for a particular dataSource."
::= { tpmExcpReportEntry 6 }

tpmExcpReportHCStatSumX OBJECT-TYPE
SYNTAX      ZeroBasedCounter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The high-capacity version of tpmExcpReportStatSumX.
  Note that this object will only be instantiated if the
  agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmExcpReportEntry 7 }
tpmExcpReportStatMaximum OBJECT-TYPE  
SYNTAX ZeroBasedCounter32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The single maximum data point value observed during the study period for the specified metric. This number always represents the maximum value of any single statistical datum analyzed. Each metric specifies the exact meaning of this object.

This value represents the results of one metric and is related directly to the specific parameters of the metric and the Server and Client addresses involved."

::= { tpmExcpReportEntry 8 }

tpmExcpReportStatMinimum OBJECT-TYPE  
SYNTAX ZeroBasedCounter32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The single minimum data point value observed during the study period for the specified metric. This number always represents the minimum value of any single statistical datum analyzed. Each metric specifies the exact meaning of this object.

This value represents the results of one metric and is related directly to the specific parameters of the metric and the Server and Client addresses involved."

::= { tpmExcpReportEntry 9 }

tpmExcpReportStatSumSq OBJECT-TYPE  
SYNTAX ZeroBasedCounter32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The sum of all the squared data point values for the specified metric. This number always represents the total of the squared values of the statistical datum analyzed. Each metric specifies the exact meaning of this object.

This value represents the results of one metric and is related directly to the specific parameters of the metric and the Server and Client addresses involved."

::= { tpmExcpReportEntry 10 }
tpmExcpReportOverflowStatSumSq OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of times the associated
tpmExcpReportStatSumSq counter has overflowed.
Note that this object will only be instantiated if the
associated tpmExcpReportHCStatSumSq object is also
instantiated for a particular dataSource."
::= { tpmExcpReportEntry 11 }

tpmExcpReportHCStatSumSq OBJECT-TYPE
SYNTAX ZeroBasedCounter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The high-capacity version of
tpmExcpReportStatSumSq.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmExcpReportEntry 12 }

tpmExcpReportStatSumIX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"For each interval, each data point is associated with a
value I, I = 1..N where N is the number of data points,
tpmExcpReportStatSumIX is the multiplication of the
data point value with the current I. This value along with
the other statistics values allow the calculation of the slope
of the least-squares line through the data points."
::= { tpmExcpReportEntry 13 }

tpmExcpReportOverflowStatSumIX OBJECT-TYPE
SYNTAX ZeroBasedCounter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of times the associated
tpmExcpReportStatSumIX counter has overflowed.
Note that this object will only be instantiated if the
associated tpmExcpReportHCStatSumIX object is also
instantiated for a particular dataSource."
::= { tpmExcpReportEntry 14 }
tpmExcpReportHCStatSumIX OBJECT-TYPE
SYNTAX  ZeroBasedCounter64
MAX-ACCESS read-only
STATUS   current
DESCRIPTION
"The high-capacity version of tpmExcpReportStatSumIX.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmExcpReportEntry 15 }

tpmExcpReportStatSumIXSq OBJECT-TYPE
SYNTAX  ZeroBasedCounter32
MAX-ACCESS read-only
STATUS   current
DESCRIPTION
"For each interval, each data point is associated with a
value I, I = 1..N where N is the number of data points,
tpmExcpReportStatN. IX is the multiplication of the data
point value with the current I. This value along with the
other statistics values allow the calculation of the slope of
the least-squares line through the data points."
::= { tpmExcpReportEntry 16 }

tpmExcpReportOverflowStatSumIXSq OBJECT-TYPE
SYNTAX  ZeroBasedCounter32
MAX-ACCESS read-only
STATUS   current
DESCRIPTION
"The number of times the associated
tpmExcpReportStatSumIXSq counter has overflowed.
Note that this object will only be instantiated if the
associated tpmExcpReportHCStatSumIXSq object is also
instantiated for a particular dataSource."
::= { tpmExcpReportEntry 17 }

tpmExcpReportHCStatSumIXSq OBJECT-TYPE
SYNTAX  ZeroBasedCounter64
MAX-ACCESS read-only
STATUS   current
DESCRIPTION
"The high-capacity version of
tpmExcpReportStatSumIXSq.
Note that this object will only be instantiated if the
agent supports High Capacity monitoring for a particular
dataSource."
::= { tpmExcpReportEntry 18 }
tpmMIBCompliances OBJECT IDENTIFIER ::= { tpmConformance 1 }
tpmGroups OBJECT IDENTIFIER ::= { tpmConformance 2 }

-- TPM Compliance Statement --

tpmMIBCompliance MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
    "Describes the requirements for conformance to the TPM-MIB.

    This compliance statement defines the following TPM-MIB implementation:

    - tpmCapabilitiesGroup (minimum)
    - tpmAggregateReportsGroup (minimum)
    - tpmCurrentReportsGroup (optional)
    - tpmExceptionReportsGroup (optional).

    In order to implement the (optional) tpmExceptionReportsGroup, it is necessary
to implement pieces of the APM-MIB as described in the tpmApmMIBCompliance MODULE
below. Further, in the event that the TPM-MIB be used to provide a drill-down capability,
which is the true value of this MIB, then the tpmApmReportControlGroup must be implemented."

  MODULE -- this module

  MANDATORY-GROUPS
    { tpmCapabilitiesGroup,
      tpmAggregateReportsGroup }

  GROUP tpmCurrentReportsGroup
  DESCRIPTION
    "The implementation of this group is optional."

  GROUP tpmExceptionReportsGroup
  DESCRIPTION
    "The implementation of this group is optional. However, because the control for this
    reporting group resides with the APM-MIB module, the apmReportGroup
and the `apmExceptionGroup` must also be implemented.

```markdown
::= { tpmMIBCompliances 1 }
```

```markdown
--
-- tpmCurrentReportsGroup Compliance
--

```markdown
tpmCurrentReportsCompliance MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
  "This defines the Current Reports compliance.
   This is useful when information on in-progress
   and historical transaction-level data is
   desired."
  MODULE -- this module

MANDATORY-GROUPS
  { tpmCapabilitiesGroup,
    tpmAggregateReportsGroup,
    tpmCurrentReportsGroup }

::= { tpmMIBCompliances 2 }
```

```markdown
--
-- tpmExceptionReportsGroup Compliance
--

```markdown
tpmExceptionReportsCompliance MODULE-COMPLIANCE
  STATUS current
  DESCRIPTION
  "This defines the Exception Reports compliance.
   This is useful when information on
   transactions whose performance is deemed
   out-of-bounds."
  MODULE -- this module

MANDATORY-GROUPS
  { tpmCapabilitiesGroup,
    tpmAggregateReportsGroup,
    tpmExceptionReportsGroup }

MODULE APM-MIB

MANDATORY-GROUPS
  { apmReportGroup,
    msdsReportGroup,
    scheduleReportGroup,
    messageReportGroup,
    configurationReportGroup,
    displayReportGroup,
    tmReportGroup,
    tpmCurrentReportsGroup,
    tpmExceptionReportsGroup 
  }

::= { tpmMIBCompliances 3 }
```
apmExceptionGroup }:
::= { tpmMIBCompliances 3 }

--
-- TPM-MIB Groups
--

tpmCapabilitiesGroup OBJECT-GROUP
OBJECTS { tpmClockResolution,
          tpmClockMaxSkew,
          tpmClockSource,
          tpmTransMetricDirLastChange,
          tpmTransMetricProtocolIndex,
          tpmTransMetricMetricIndex,
          tpmTransMetricDirConfig,
          tpmMetricDefType,
          tpmMetricDefDirType,
          tpmMetricDefName,
          tpmMetricDefReference,
          tpmMetricDefGlobalID }
STATUS  current
DESCRIPTION
"The tpmCapabilitiesGroup specify various capabilities
associated with the monitoring agent."
::= { tpmGroups 1 }

tpmAggregateReportsGroup OBJECT-GROUP
OBJECTS { tpmAggrReportCntrlApmCntrlIndex,
          tpmAggrReportCntrlDataSource,
          tpmAggrReportCntrlAggrType,
          tpmAggrReportCntrlInterval,
          tpmAggrReportCntrlReqSize,
          tpmAggrReportCntrlGrantedSize,
          tpmAggrReportCntrlReqReports,
          tpmAggrReportCntrlGrantedReports,
          tpmAggrReportCntrlStartTime,
          tpmAggrReportCntrlReportNumber,
          tpmAggrReportCntrlInsertsDenied,
          tpmAggrReportCntrlDroppedFrames,
          tpmAggrReportCntrlOwner,
          tpmAggrReportCntrlStorageType,
          tpmAggrReportCntrlStatus,
          tpmAggrReportStatN,
          tpmAggrReportOverflowStatN,
tpmAggrReportHCStatN,
  tpmAggrReportStatSumX,
  tpmAggrReportOverflowStatSumX,
  tpmAggrReportHCStatSumX,
  tpmAggrReportStatMaximum,
  tpmAggrReportStatMinimum,
  tpmAggrReportStatSumSq,
  tpmAggrReportOverflowStatSumSq,
  tpmAggrReportHCStatSumSq,
  tpmAggrReportStatSumIX,
  tpmAggrReportOverflowStatSumIX,
  tpmAggrReportHCStatSumIX,
  tpmAggrReportStatSumIXSq,
  tpmAggrReportOverflowStatSumIXSq,
  tpmAggrReportHCStatSumIXSq }

STATUS current
DESCRIPTION
  "The tpmAggregateReportsGroup provides control and reporting of aggregate measurement statistics."
 ::= { tpmGroups 2 }

tpmCurrentReportsGroup OBJECT-GROUP
  OBJECTS { tpmCurReportMetricValue,
            tpmCurReportCompletion,
            tpmCurReportSize }
  STATUS current
  DESCRIPTION
  "The tpmCurrentReportsGroup contains metric information relating to on-going measurements as well as historical values."
  ::= { tpmGroups 3 }

tpmExceptionReportsGroup OBJECT-GROUP
  OBJECTS { tpmExcpReportStatN,
            tpmExcpReportOverflowStatN,
            tpmExcpReportHCStatN,
            tpmExcpReportStatSumX,
            tpmExcpReportOverflowStatSumX,
            tpmExcpReportHCStatSumX,
            tpmExcpReportStatMaximum,
            tpmExcpReportStatMinimum,
            tpmExcpReportStatSumSq,
            tpmExcpReportOverflowStatSumSq,
            tpmExcpReportHCStatSumSq,
            tpmExcpReportStatSumIX,
            tpmExcpReportOverflowStatSumIX,
            tpmExcpReportHCStatSumIX, \n
tpmExcpReportOverflowStatSumIX,
  tpmExcpReportHCStatSumIX,
  tpmExcpReportStatSumIXSq,
  tpmExcpReportOverflowStatSumIXSq,
  tpmExcpReportHCStatSumIXSq }

STATUS  current
DESCRIPTION
  "The tpmExceptionReportsGroup reports
  sub-application level statistics associated
  with errant applications."
 ::= { tpmGroups 4 }

END
6. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF’s procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF Secretariat."

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

7. Acknowledgements

This memo has been produced with a great deal of assistance from David Craver, Joseph Maixner and John Metzger of Hifn, Inc. The authors also gratefully acknowledge the beneficial discussions they have had with Carter Bullard of QoSient, LLC. The tpmMetricDefTable was taken from Andy Bierman’s performance management capabilities draft, which was a draft proposed early on in the RMON WG during the formation of the TPM and APM MIB work. Finally, this MIB module draws heavily from the work of Steve Waldbusser and his APM-MIB [RFC3729].
8. Normative References


9. Informative References


10. Security Considerations

This MIB relates to a system which provides a passive monitoring capability of a broadcast subnet, a switched subnet or point-to-point subnets. As such, it collects information relating to network layer addresses, traffic statistics relating to conversations and to application-level activities. These statistics could be deemed sensitive in certain networking environments.

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

+ The tpmTransMetricDirConfig object describes and configures the probe’s support for a given performance metric in relationship to a specified transaction and application. The agent creates entries in this table for all metric and transaction combinations that it can generate and this object controls the on/off switch for this capability. If certain statistics for a supported transaction are deemed sensitive, then access to SET operations on this object should be protected.

+ The tpmAggrReportCntrlDataSource sets the interface on which the network addresses, conversational and application-level statistics will be collected.

+ The tpmAggrReportCntrlAggrType object controls the level of data aggregation implemented in the report tables. For example, this object could set to allow client-level information to be exposed.

In order to implement this MIB module, an agent must make certain management information available about protocols and network addresses used within a managed system, which may be considered sensitive in some network environments. Therefore some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

+ The tpmAggrReportTable contains the statistical studies which
the probe was configured to generate. These tables contain the historical, aggregated data providing information on the network address and traffic statistics related to their conversations.

+ The tpmCurReportTable contains information on current transaction flows. This table provides a view of the current activity on a subnet or a client machine.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.
11. Author’s Address

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********* Note to the RFC Editor (to be removed prior to publication) *********
* 1) The reference to RFCXXXX within the DESCRIPTION clauses of the MIB module point to this draft and are to be assigned by the RFC Editor.
* 2) The reference to RFCXXXX2 throughout this document point to the current <draft-ietf-rmonmib-sspm-mib-12.txt>. This MIB module imports TCs from this draft. Once the SSPM MIB draft is published as an RFC, then the RFCXXXX2 references need to be replaced with the SSPM MIB RFC number.
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