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Definition of Managed Objects for Synthetic Sources for Performance Monitoring Algorithms

Status of This Memo

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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 objects for configuring Synthetic Sources for Performance Monitoring (SSPM) algorithms.

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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community.

In particular, it defines a method of describing Synthetic Sources for Performance Monitoring (SSPM). This is useful within the Remote Monitoring (RMON) framework [RFC3577] for performance monitoring in the cases where it is desirable to inject packets into the network for the purpose of monitoring their performance with the other MIBs in that framework.

This memo also includes a MIB module.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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 defines a MIB module for the purpose of remotely controlling synthetic sources (or 'active' probes) and sinks in order to enhance remote performance monitoring capabilities within IP networks and services. Much work within the IETF exists related to performance monitoring. One interesting aspect of this body of work is that it does not explicitly define an 'active' probe capability. An active probe capability is complimentary to existing capabilities, and this MIB module is developed to fill this void.

3.1. Terms

The following definitions apply throughout this document:

- 'Performance monitoring' is the act of monitoring traffic for the purpose of evaluating a statistic of a metric related to the performance of the system. A performance monitoring system is comprised of a) traffic generators, b) measurement, c) data reduction, and d) reporting. The traffic generators may be natural sources, synthetic sources, or intrusive sources.

  - A 'synthetic source' is a device or an embedded software program that generates a data packet (or packets) and injects it (or them) onto the path to a corresponding probe or existing server solely in support of a performance monitoring function. A synthetic source may talk intrusively to existing application servers.

The design goals for this MIB module are:

- Complementing the overall performance management architecture being defined within the RMONMIB WG; refer to the RMONMIB framework document [RFC3577]. This MIB module is defined within the context of the APM-MIB [RFC3729].

- Extensibility: the MIB module should be easily extended to include a greater set of protocols and applications for performance monitoring purposes.

- o Flexibility: the module should support both round-trip and one-way measurements.

- o Security: the control of the source and sink of traffic is handled by a management application, and communication is recommended via SNMPv3.

This document is organized as follows. The next section discusses the relationship of this MIB module to others from the RMONMIB and Distributed Management (DISMAN) working groups. Then the structure of the MIB module is discussed. Finally, the MIB module definitions are given.

4. Relationship to Other MIB modules

This MIB module is designed to be used in conjunction with the RMON MIB Working Group's two other MIB modules for application performance measurement: Application Performance Measurement MIB [RFC3729] and Transport Performance Metrics MIB [RFC4150]. These MIB modules define reporting capabilities for that framework. The intent of this MIB module is to define a method for injecting packets into the network utilizing probe capabilities defined in the base MIB modules and measured with the reporting MIB modules. Other reporting MIB modules may be used as well.

Specifically, this MIB module uses the AppLocalIndex as defined in the APM-MIB to map measurement configuration information to definition and reporting structures defined in the APM-MIB.

5. Relationship to Other Work

Much work has already been done within the IETF that has a direct bearing on the development of active performance probe definitions. This body of work has been addressed in various working groups over the years. In this section, we focus on the work of a) the IP Performance Metrics (IPPM) working group, b) the DISMAN working group, c) the RMON working group, d) the Application MIB (ApplMIB) working group, and e) the Realtime Traffic Flow Measurement (RTFM) working group.

5.1. IPPM

The IPPM working group has defined in detail a set of performance metrics, sampling techniques, and associated statistics for transport-level or connectivity-level measurements. The IPPM framework document [RFC2330] discusses numerous issues concerning sampling techniques, clock accuracy, resolution and skew, wire time versus host time, error analysis, etc. Many of these are

considerations for configuration and implementation issues discussed below. The IPPM working group has defined several metrics and their associated statistics, including

+ a connectivity metric [RFC2678],

+ one-way delay metric [RFC2679],

+ one-way loss metric [RFC2680],

+ round-trip delay and loss metrics [RFC2681],

+ delay variation metric [RFC3393],

+ a streaming media metric [RFC3432],

+ a throughput metric [EBT] and [TBT], and

+ others are under development.

These (or a subset) could form the basis for a set of active, connectivity-level, probe types designed for monitoring the quality of transport services. A consideration of some of these metrics may form a set of work activities and a set of early deliverables for a group developing an active probe capability.

During the early development of the SSPM-MIB, it became apparent that a one-way measurement protocol was required in order for the SSPM-MIB to control a one-way measurement. This led to the current work with the IPPM WG on the development of the One-Way Measurement Protocol (OWDP) [ODP]. This work includes both the measurement protocol itself, as well as the development of a separate control protocol. This later control protocol is redundant with the current work on the SSPM-MIB. The SSPM-MIB could be used as an alternative to the one-way delay control protocol.

5.2. DISMAN

The DISMAN working group has defined a set of 'active' tools for remote management. Of relevance to this document are:

+ the pingMIB [RFC2925],

+ the DNS Lookup MIB [RFC2925],

+ the traceroute MIB [RFC2925],

+ the scriptMIB [RFC3165], and

+ the expressionMIB [RFC2982].

The pingMIB and tracerouteMIB define an active probe capability, primarily for the remote determination of path and path connectivity. There are some performance-related metrics collected from the pingMIB, and one could conceivably use these measurements for the evaluation of a limited set of performance statistics. But there is a fundamental difference between determining connectivity and determining the quality of that connectivity. However, in the context of performance monitoring, a fault can be viewed as not performing at all. Therefore, both should be monitored with the same probes to reduce network traffic.

The DNS Lookup MIB also includes some probe-like capabilities and performance time measurements for the DNS lookup. This could be used to suggest details of a related session-level, active probe.

The scriptMIB allows a network management application to distribute and manage scripts to remote devices. Conceivably, these scripts could be designed to run a set of active probe monitors on remote devices.

5.3. RMON

The RMON working group has developed an extensive, passive monitoring capability defined in RFC 2819 [RFC2819] and RFC 2021 [RFC2021] as well as additional MIB modules. Initially, the monitors collected statistics at the MAC layer, but the capability has now been extended to higher-layer statistics. Higher-layer statistics are identified through the definition of a Protocol Directory [RFC2021]. See the RMONMIB framework document [RFC3577] for an overview of the RMONMIB capabilities.

Within this context, the development of an active traffic source for performance monitoring fits well within the overall performance monitoring architecture being defined within the RMON WG.

5.4. ApplMIB

The ApplMIB working group defined a series of MIB modules that monitor various aspects of applications, processes, and services.

The System Application MIB [RFC2287] describes a basic set of managed objects for fault, configuration, and performance management of applications from a systems perspective. More specifically, the managed objects it defines are restricted to information that can be

determined from the system itself and that does not require special instrumentation within the applications to make the information available.

The Application MIB [RFC2564] complements the System Application MIB, providing for the management of applications' common attributes, which could not typically be observed without the cooperation of the software being managed. There are attributes that provide information on application and communication performance.

The WWW MIB [RFC2594] describes a set of objects for managing networked services in the Internet Community, particularly World Wide Web (WWW) services. Performance attributes are available for the information about each WWW service, each type of request, each type of response, and top-accessed documents.

In the development of synthetic application-level probes, consideration should be given to the relationship of the application MIB modules to the measurements being performed through a synthetic application-level probe. Similar, cross-indexing issues arise within the context of the RMON monitoring and synthetic application-level active probes.

5.5. SNMPCONF

The Configuration Management with SNMP (SNMPCONF) working group has created the informational RFC 3512 [RFC3512], which outlines the most effective methods for using the SNMP Framework to accomplish configuration management. This work includes recommendations for device-specific as well as network-wide (Policy) configuration. The group is also chartered to write any MIB modules necessary to facilitate configuration management. Specifically, they will write a MIB module that describes a network entity's capabilities and capacities, which can be used by management entities making policy decisions at a network level or device-specific level.

Currently, the SNMPCONF working group is focused on the SNMP Configuration MIB for policy [RFC4011]. It is conceivable that one would want to monitor the performance of newly configured policies as they are implemented within networks. This would require correlation of the implemented policy and a related performance monitoring policy that would specify synthetic probe definitions. For synthetic probes, there would be a need for a configuration of a) a single probe, b) several probes, c) source and destination probes, and d) intermediate probes. In addition, it may be necessary to configure any or all of these combinations simultaneously. It is hoped that the work of SNMPCONF will suffice. The scripting language defined by the SNMP Configuration MIB could allow for active monitoring to be

activated and configured from a policy management script. Further, the results of active monitoring could become arguments in further policy decisions. This notion is reflected in the decision flow outlined in Figure 1 below.

5.6. RTFM

The Realtime Traffic Flow Measurement (RTFM) working group is concerned with issues relating to traffic flow measurements and usage reporting for network traffic and Internet accounting. Various documents exist that describe requirements [RFC1272], traffic flow measurement architectures [RFC2722], and a traffic flow MIB [RFC2720]. The work in this group is focused on passive measurements of user traffic. As such, its work is related to the monitoring work within the RMON WG. Fundamentally, their attention has not been concerned with methods of active traffic generation.

5.7. Relationship to Other Work: Summary

In summary, the development of an active traffic generation capability (primarily for the purpose of performance monitoring) should draw upon various activities, both past and present, within the IETF. Figure 1 shows the relationship of the various work activities briefly touched upon in this section.

Horizontally, across the top of the figure are overall control functions, which would coordinate the various aspects of the performance monitoring systems. Vertically at the bottom of the figure are the functions which comprise the minimum performance monitoring capability; i.e., traffic generation, monitoring and measurements, and data reduction. Traffic generation is addressed in this MIB module. Monitoring and measurement is addressed in the APM-MIB [RFC3729] and TPM-MIB [RFC4150] modules. Data reduction is not yet addressed within the IETF. But data reduction could include both spatial and temporal aggregations at different levels of reduction. This is indicated in the figure by the arrow labeled "Various levels and span".

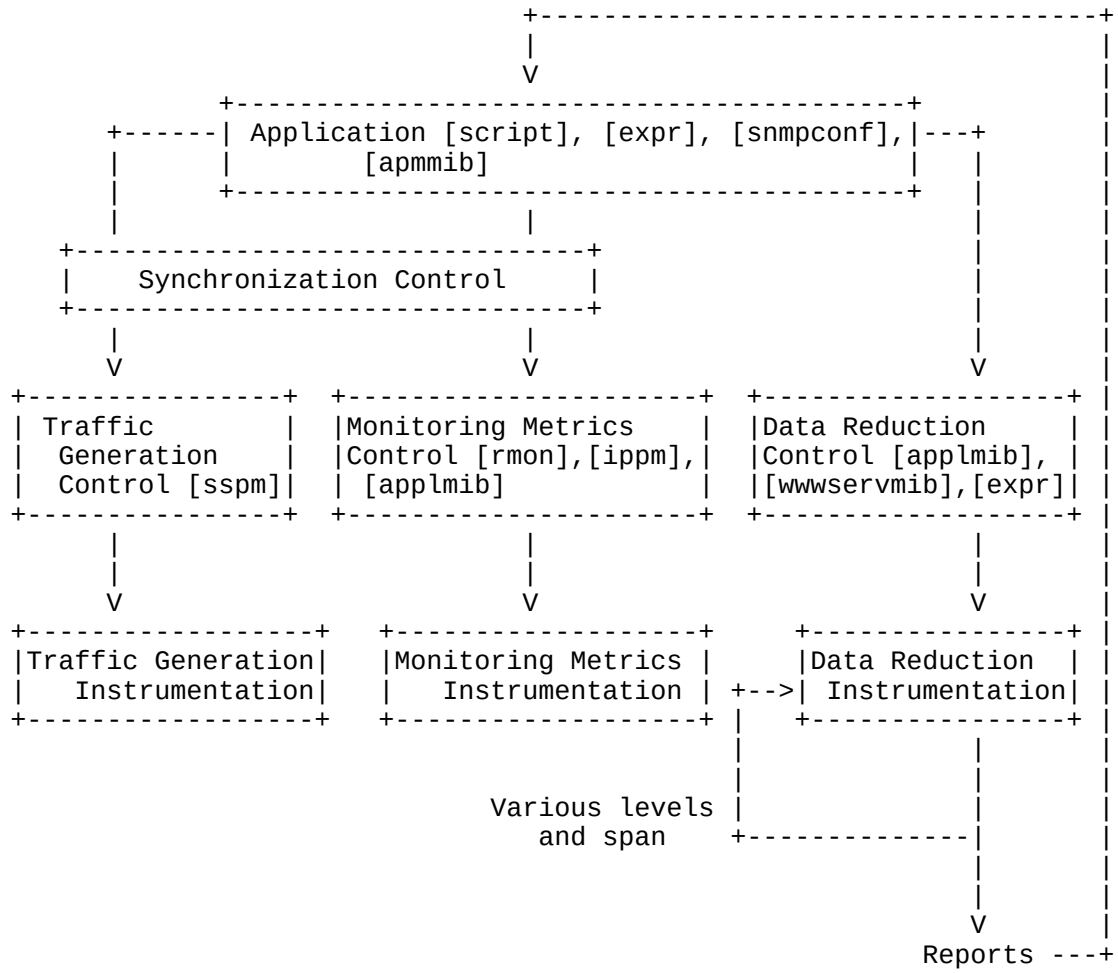

Figure 1: Coverage for an overall performance monitoring system

6. MIB Structure

This section presents the structure of the MIB module. The objects are arranged into the following groups:

- o general information
- o source configuration
- o sink configuration

6.1. General Information

This section provides general information about the capabilities of the probe. Currently, this information is related to the resolution of the probe clock and its source.

6.2. Source Configuration

The source is configured with a pair of tables. The first, sspmSourceProfileTable, defines a set of profiles for monitoring. These profiles are then used by the second table, sspmSourceControlTable, to instantiate a specific measurement. This MIB module takes an IP-centric view of the configuration of the measurement.

6.3. Sink Configuration

Configures the sink for measurements. If the test is round-trip, then this table is on the same probe as the source configuration. If the test is one-way, then the table is on a different probe. The sspmSinkInstance is a unique identifier for the entry per probe. Additional attributes are provided for test type and test source to identify entries in the table uniquely.

7. Definitions

```
SSPM-MIB DEFINITIONS ::= BEGIN

   IMPORTS

       MODULE-IDENTITY, OBJECT-TYPE,
       Counter32, Integer32, Unsigned32
                                FROM SNMPv2-SMI  --[RFC2578]

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

       MODULE-COMPLIANCE, OBJECT-GROUP
                                FROM SNMPv2-CONF --[RFC2578,
                                                 -- RFC2579,
                                                 -- RFC2580]
       OwnerString, rmon
                                FROM RMON-MIB  --[RFC2819]

       InetAddressType, InetAddress
                                FROM INET-ADDRESS-MIB  --[RFC3291]
```

```
        InterfaceIndexOrZero
                                    FROM IF-MIB  --[RFC2863]

        AppLocalIndex
                                    FROM APM-MIB  --[RFC3729]

        Utf8String
                                    FROM SYSAPPL-MIB;  --[RFC2287]

    sspmMIB MODULE-IDENTITY
        LAST-UPDATED "200507280000Z"  -- July 28, 2005
        ORGANIZATION "IETF RMON MIB working group"
        CONTACT-INFO
            "        Carl W. Kalbfleisch
                     Consultant

             E-mail: ietf@kalbfleisch.us

             Working group mailing list: rmonmib@ietf.org
             To subscribe send email to rmonmib-request@ietf.org"
        DESCRIPTION
            "This SSPM MIB module is applicable to probes
             implementing Synthetic Source for Performance
             Monitoring functions.

             Copyright (C) The Internet Society (2005).  This version
             of this MIB module is part of RFC 4149; see the RFC
             itself for full legal notices."

          -- revision history

          REVISION    "200507280000Z"   -- July 28, 2005
          DESCRIPTION
              "The original version of this MIB module,
              was published as RFC4149."
          ::= { rmon 28 }

--
-- Object Identifier Assignments
--
sspmMIBObjects       OBJECT IDENTIFIER ::= { sspmMIB 1 }
sspmMIBNotifications OBJECT IDENTIFIER ::= { sspmMIB 2 }
sspmMIBConformance   OBJECT IDENTIFIER ::= { sspmMIB 3 }

--
-- Textual Conventions
--
```

```
   SspmMicroSeconds ::= TEXTUAL-CONVENTION
       DISPLAY-HINT "d"
       STATUS current
       DESCRIPTION
           "A unit of time with resolution of MicroSeconds."
       SYNTAX Unsigned32

   SspmClockSource ::= TEXTUAL-CONVENTION
       DISPLAY-HINT "d"
       STATUS current
       DESCRIPTION
           "An indication of the source of the clock as defined by the
            NTP specification RFC1305 [RFC1305] definition of stratum:

            Stratum (sys.stratum, peer.stratum, pkt.stratum): This is
            an integer indicating the stratum of the local clock,
            with values defined as follows:

            0      unspecified

            1      primary reference (e.g., calibrated atomic clock,
                   radio clock)

            2-255  secondary reference (via NTP)."
       REFERENCE
           "RFC1305."
       SYNTAX Integer32 (0..255)

   SspmClockMaxSkew ::= TEXTUAL-CONVENTION
       DISPLAY-HINT "d"
       STATUS current
       -- UNITS "Seconds"
       DESCRIPTION
           "An indication of the accuracy of the clock as defined by
            RFC1305.  This variable indicates the maximum offset
            error due to skew of the local clock over the
            time interval 86400 seconds, in seconds."
       REFERENCE
           "RFC1305."
       SYNTAX Integer32 (1..65535)

   --
   -- sspmGeneral
   --
   sspmGeneral           OBJECT IDENTIFIER ::= { sspmMIBObjects 1 }
   sspmGeneralClockResolution 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."
        ::= { sspmGeneral 1 }

    sspmGeneralClockMaxSkew 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."
        ::= { sspmGeneral 2 }


    sspmGeneralClockSource 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.  This
             is needed for the coordination of time values
             between probes for one-way measurements."
        ::= { sspmGeneral 3 }

    sspmGeneralMinFrequency OBJECT-TYPE
        SYNTAX     SspmMicroSeconds
        MAX-ACCESS read-only
        -- units   MicroSeconds
        STATUS     current
        DESCRIPTION
             "A read-only variable that indicates the devices'
              capability for the minimum supported
              sspmSourceFrequency.  If sspmSourceFrequency is
              set to a value lower than the value reported
              by this attribute, then the set of sspmSourceFrequency
              will fail with an inconsistent value error."
        ::= { sspmGeneral 4 }

    --
    -- sspmCapabilities
    --
```

```
   -- Describes the capabilities of the SSPM device.
   --
   sspmCapabilitiesTable OBJECT-TYPE
       SYNTAX       SEQUENCE OF SspmCapabilitiesEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "The table of SSPM capabilities."
       ::= { sspmGeneral 5 }

   sspmCapabilitiesEntry OBJECT-TYPE
       SYNTAX      SspmCapabilitiesEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "Details about a particular SSPM capability."
       INDEX { sspmCapabilitiesInstance }
       ::= { sspmCapabilitiesTable 1 }

   SspmCapabilitiesEntry ::= SEQUENCE {
       sspmCapabilitiesInstance AppLocalIndex
       }

   sspmCapabilitiesInstance OBJECT-TYPE
       SYNTAX      AppLocalIndex
       MAX-ACCESS  read-only
       STATUS      current
       DESCRIPTION
           "Indicates whether SSPM configuration of the corresponding
            AppLocalIndex is supported by this device.  Generally,
            entries in this table are only made by the device when the
            configuration of the measurement is available."
        ::= { sspmCapabilitiesEntry 1 }

   --
   -- sspmSource
   --
   -- Contains the details of the source of the
   -- Synthetic Sources for Performance Monitoring algorithms.
   -- This information is split into two tables.  The first defines
   -- profiles that can be applied to specific sources in the
   -- control table.
   --
   sspmSource           OBJECT IDENTIFIER ::= { sspmMIBObjects 2 }

   --
   -- sspmSourceProfileTable
   -- Defines template profiles for measurements.
```

```
   --
   sspmSourceProfileTable OBJECT-TYPE
       SYNTAX       SEQUENCE OF SspmSourceProfileEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "The table of SSPM Source Profiles configured."
       ::= { sspmSource 1 }

   sspmSourceProfileEntry OBJECT-TYPE
       SYNTAX      SspmSourceProfileEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "Details about a particular SSPM Source Profile
            configuration.  Entries must exist in this table
            in order to be referenced by rows in the
            sspmSourceControlTable."
       INDEX { sspmSourceProfileInstance }
       ::= { sspmSourceProfileTable 1 }

   SspmSourceProfileEntry ::= SEQUENCE {
       sspmSourceProfileInstance           Unsigned32,
       sspmSourceProfileType               AppLocalIndex,
       sspmSourceProfilePacketSize         Unsigned32,
       sspmSourceProfilePacketFillType     INTEGER,
       sspmSourceProfilePacketFillValue    OCTET STRING,
       sspmSourceProfileTOS                Integer32,
       sspmSourceProfileFlowLabel          Integer32,
       sspmSourceProfileLooseSrcRteFill    OCTET STRING,
       sspmSourceProfileLooseSrcRteLen     Integer32,
       sspmSourceProfileTTL                Integer32,
       sspmSourceProfileNoFrag             TruthValue,
       sspmSourceProfile8021Tagging        Integer32,
       sspmSourceProfileUsername           Utf8String,
       sspmSourceProfilePassword           Utf8String,
       sspmSourceProfileParameter          OCTET STRING,
       sspmSourceProfileOwner              OwnerString,
       sspmSourceProfileStorageType        StorageType,
       sspmSourceProfileStatus             RowStatus
   }

   sspmSourceProfileInstance OBJECT-TYPE
       SYNTAX      Unsigned32 (1..65535)
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "An arbitrary index."
```

```
        ::= { sspmSourceProfileEntry 1 }

   sspmSourceProfileType OBJECT-TYPE
       SYNTAX      AppLocalIndex
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The AppLocalIndex value that uniquely identifies the
            measurement per the APM-MIB.  In order to create a row
            in this table, there must be a corresponding row in the
            sspmCapabilitiesTable.

            When attempting to set this object, if no
            corresponding row exists in the sspmCapabilitiesTable,
            then the agent should return a 'badValue' error."
       ::= { sspmSourceProfileEntry 2}

   sspmSourceProfilePacketSize OBJECT-TYPE
       SYNTAX      Unsigned32
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The size of packet to be transmitted in bytes.  The
            size accounts for all data within the IPv4 or IPv6
            payloads, excluding the IP headers, IP header options
            and link-level protocol headers.

            If the size is set smaller than the minimum allowed
            packet size or greater than the maximum allowed
            packet size, then the set should fail, and the agent
            should return a 'badValue' error."
       ::= { sspmSourceProfileEntry 3 }

   sspmSourceProfilePacketFillType OBJECT-TYPE
       SYNTAX      INTEGER {
                           random (1),
                           pattern (2),
                           url(3)
                   }
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "Indicates how the packet is filled.

            'random' indicates that the packet contains random
            data patterns.  This is probe and implementation
            dependent.
```

```
            'pattern' indicates that the pattern defined in the
            sspmSourceProfilePacketFillValue attribute is used to
            fill the packet.

            'url' indicates that the value of
            sspmSourceProfilePacketFillValue should
            contain a URL.  The contents of the document
            at that URL are retrieved when sspmSourceStatus becomes
            active and utilized in the packet.  If the attempt to
            access that URL fails, then the row status is set to
            'notReady', and the set should fail with
            'inconsistentValue'.  This value must contain a
            dereferencable URL of the type 'http:', 'https:', or
            'ftp:' only."
        ::= { sspmSourceProfileEntry 4 }

    sspmSourceProfilePacketFillValue OBJECT-TYPE
        SYNTAX      OCTET STRING (SIZE(0..255))
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The string value with which to fill the packet.  If
             sspmSourceProfilePacketFillType is set to 'pattern',
             then this pattern is repeated until the packet is
             sspmSourcePacketSize in bytes.  Note that if the
             length of the octet string specified for this
             value does not divide evenly into the packet
             size, then an incomplete last copy of this data
             may be copied into the packet.  If the value of
             sspmSourceProfilePacketFillType is set to 'random', then
             this attribute is unused.  If the value of the
             sspmSourceProfilePacketFillType is set to 'url', then
             the URL specified in this attribute is retrieved
             and used by the probe.  In the case of a URL, this value
             must contain a dereferencable URL of the type
             'http:', 'https:', or 'ftp:' only."
        ::= { sspmSourceProfileEntry 5 }

    sspmSourceProfileTOS OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Represents the TOS field in the IP packet header.  The
            value of this object defaults to zero if not set."
        DEFVAL { 0 }
        ::= { sspmSourceProfileEntry 6 }
```

```
   sspmSourceProfileFlowLabel OBJECT-TYPE
       SYNTAX      Integer32 (0..1048575) -- 20-bit range (0 to 0xfffff)
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "This object is used to specify the Flow Label in a IPv6
            packet (RFC 2460) to force special handling by the IPv6
            routers; e.g., non-default quality-of-service handling.

            This object is meaningful only when the object
            sspmSourceDestAddressType is IPv6(2).
            The value of this object defaults to zero if not set."
       DEFVAL { 0 }
       ::= { sspmSourceProfileEntry 7 }

   sspmSourceProfileLooseSrcRteFill OBJECT-TYPE
       SYNTAX      OCTET STRING (SIZE(0..240))
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "In the event that the test should run over a
            specific route, the intent is to force the route using the
            Loose Source Route option in IPv4 [RFC791] and
            IPv6 [RFC2460].  This object contains a
            series of IP addresses along the path that would be
            put into the loose source route option in the IP header.

            The IPv4 addresses are to be listed as 32-bit
            address values, and the IPv6 addresses are to be
            listed as a string of 128-bit addresses.  The
            maximum length allowed within the IPv4 source route
            option is 63 addresses.  To simply account for
            IPv6 addresses as well, the maximum length of the
            octet string is 240.  This allows up to 60
            IPv4 addresses or up to 15 IPv6 addresses in the
            string."
       ::= { sspmSourceProfileEntry 8 }

   sspmSourceProfileLooseSrcRteLen OBJECT-TYPE
       SYNTAX      Integer32(0..240)
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "In the event that the test should run over a
            specific route, the intent is to force the route.
            This attribute specifies the length of data to
            be copied from the sspmSourceProfileLooseSrcRteFill
            into the route data fields of the loose source route
```

```
            options in the IPv4 or IPv6 headers."
        ::= { sspmSourceProfileEntry 9 }

    sspmSourceProfileTTL OBJECT-TYPE
        SYNTAX      Integer32(1..255)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "If non-zero, this specifies the value to place into
            the TTL field on transmission."
        ::= { sspmSourceProfileEntry 10 }

    sspmSourceProfileNoFrag OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "When true, the 'Don't Fragment Bit' should be set
            on the packet header."
        ::= { sspmSourceProfileEntry 11 }

    sspmSourceProfile8021Tagging OBJECT-TYPE
        SYNTAX      Integer32 (-1..65535)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "IEEE 802.1Q tagging used in IEEE 802.1D bridged
            environments.

            A value of -1 indicates that the packets are untagged.

            A value of 0 to 65535 is the value of the tag to be
            inserted in the tagged packets.

            Note that according to IEEE 802.1Q, VLAN-ID tags with
            a value of 4095 shall not be transmitted on the wire.
            As the VLAN-ID is encoded in the 12 least significant
            bits on the tag, values that translate in a binary
            representation of all 1's in the last 12 bits
            SHALL NOT be configured.  In this case, the set should
            fail, and return an error-status of 'inconsistentValue'."
        ::= { sspmSourceProfileEntry 12 }

    sspmSourceProfileUsername OBJECT-TYPE
        SYNTAX      Utf8String
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
```

```
            "An optional username used by the application protocol."
        ::= { sspmSourceProfileEntry 13 }

    sspmSourceProfilePassword OBJECT-TYPE
        SYNTAX      Utf8String
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "An optional password used by the application protocol."
        ::= { sspmSourceProfileEntry 14 }

    sspmSourceProfileParameter OBJECT-TYPE
        SYNTAX      OCTET STRING (SIZE(0..65535))
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
             "An optional parameter used by the application protocol.
             For DNS, this would be the hostname or IP.  For HTTP,
             this would be the URL.  For nntp, this would be the
             news group.  For TCP, this would be the port number.
             For SMTP, this would be the recipient (and could
             assume the message is predefined)."
        ::= { sspmSourceProfileEntry 15 }

    sspmSourceProfileOwner OBJECT-TYPE
        SYNTAX      OwnerString
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Name of the management station/application that
            set up the profile."
        ::= { sspmSourceProfileEntry 16 }

    sspmSourceProfileStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The storage type of this sspmSourceProfileEntry.  If the
            value of this object is 'permanent', no objects in this row
            need to be writable."
        ::= { sspmSourceProfileEntry 17 }

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

```
            "Status of this profile.

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

            Once this object is set to active(1), no objects in the
            sspmSourceProfileTable can be changed."
        ::= { sspmSourceProfileEntry 18 }

    --
    -- sspmSourceControlTable
    -- Defines specific measurement instances based on template
    -- profiles in the sspmSourceProfileTable which must be
    -- pre-configured.
    --

    sspmSourceControlTable OBJECT-TYPE
        SYNTAX       SEQUENCE OF SspmSourceControlEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The table of SSPM measurements configured."
        ::= { sspmSource 2 }

    sspmSourceControlEntry OBJECT-TYPE
        SYNTAX      SspmSourceControlEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Details about a particular SSPM configuration."
        INDEX { sspmSourceControlInstance }
        ::= { sspmSourceControlTable 1 }

    SspmSourceControlEntry ::= SEQUENCE {
        sspmSourceControlInstance          Unsigned32,
        sspmSourceControlProfile           Integer32,
        sspmSourceControlSrc               InterfaceIndexOrZero,
        sspmSourceControlDestAddrType      InetAddressType,
        sspmSourceControlDestAddr          InetAddress,
        sspmSourceControlEnabled           TruthValue,
        sspmSourceControlTimeOut           SspmMicroSeconds,
        sspmSourceControlSamplingDist      INTEGER,
        sspmSourceControlFrequency         SspmMicroSeconds,
        sspmSourceControlFirstSeqNum       Unsigned32,
        sspmSourceControlLastSeqNum        Unsigned32,
        sspmSourceControlOwner             OwnerString,
        sspmSourceControlStorageType       StorageType,
        sspmSourceControlStatus            RowStatus
```

```
   }

   sspmSourceControlInstance OBJECT-TYPE
       SYNTAX      Unsigned32 (1..65535)
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
           "An arbitrary index."
        ::= { sspmSourceControlEntry 1 }

   sspmSourceControlProfile OBJECT-TYPE
       SYNTAX      Integer32 (1..65535)
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "A pointer to the profile (sspmSourceProfileEntry) that
            this control entry uses to define the test being
            performed."
        ::= { sspmSourceControlEntry 2 }

   sspmSourceControlSrc OBJECT-TYPE
       SYNTAX      InterfaceIndexOrZero
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The ifIndex where the packet should originate from the
            probe (if it matters).  A value of zero indicates that
            it does not matter and that the device decides."
       ::= { sspmSourceControlEntry 3 }

   sspmSourceControlDestAddrType OBJECT-TYPE
       SYNTAX      InetAddressType
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The type of Internet address by which the destination
            is accessed."
       ::= { sspmSourceControlEntry 4 }

   sspmSourceControlDestAddr OBJECT-TYPE
       SYNTAX      InetAddress
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
           "The Internet address for the destination.  The formatting
           of this object is controlled by the
           sspmSourceControlDestAddrType object above.
```

```
            When this object contains a DNS name, then the name is
            resolved to an address each time measurement is to be made.
            Further, the agent should not cache this address,
            but instead should perform the resolution prior to each
            measurement."
        ::= { sspmSourceControlEntry 5 }

    sspmSourceControlEnabled OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "When set to 'true', this test is enabled.  When set to
             'false', it is disabled."
        ::= { sspmSourceControlEntry 6 }

    sspmSourceControlTimeOut OBJECT-TYPE
        SYNTAX      SspmMicroSeconds
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Timeout value for the measurement response.  If no
             response is received in the time specified, then
             the test fails."
        ::= { sspmSourceControlEntry 7 }

    sspmSourceControlSamplingDist OBJECT-TYPE
        SYNTAX      INTEGER {
                                deterministic(1),
                                poisson(2)
                    }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "When this attribute is set to 'deterministic', then
             packets are generated at with a fixed inter-packet
             injection time specified by sspmSourceFrequency.

             When this attribute is set to 'Poisson', then packets
             are generated with inter-packet injection times sampled
             from an exponential distribution with the single
             distributional parameter determined by the inverse
             frequency)."
        ::= { sspmSourceControlEntry 8 }

    sspmSourceControlFrequency OBJECT-TYPE
        SYNTAX      SspmMicroSeconds
        MAX-ACCESS  read-create
```

```
        STATUS      current
        DESCRIPTION
            "The inverse of this value is the rate at which packets
             are generated.  Refer to sspmSourceSamplingDistribution.
             If the value set is less than the value of
             sspmGeneralMinFrequency, then the set will fail with an
             error-status of 'inconsistentValue'."
        ::= { sspmSourceControlEntry 9 }

    sspmSourceControlFirstSeqNum OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The first sequence number of packets to be transmitted."
        ::= { sspmSourceControlEntry 10 }

    sspmSourceControlLastSeqNum OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The last sequence number transmitted.  This value is updated
             by the agent after packet generation."
        ::= { sspmSourceControlEntry 11 }

    sspmSourceControlOwner OBJECT-TYPE
        SYNTAX      OwnerString
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Name of the management station/application that set
            up the test."
        ::= { sspmSourceControlEntry 12 }

    sspmSourceControlStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The storage type of this sspmSourceControlEntry.  If the
            value of this object is 'permanent', no objects in this row
            need to be writable."
        ::= { sspmSourceControlEntry 13 }

    sspmSourceControlStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
```

```
        STATUS      current
        DESCRIPTION
            "Status of this source control entry.

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

            When this attribute has the value of
            'active', none of the read-write or read-create attributes
            in this table may be modified, with the exception of
            sspmSourceControlEnabled."
        ::= { sspmSourceControlEntry 14 }

    --
    -- sspmSinkTable
    --
    -- Contains attributes for configuration of Synthetic
    -- Sources for Performance Monitoring sinks, i.e.,
    -- sinks for receipt of one-way delay measurements.
    --
    sspmSink           OBJECT IDENTIFIER ::= { sspmMIBObjects 5 }

    sspmSinkTable OBJECT-TYPE
        SYNTAX       SEQUENCE OF SspmSinkEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A table configuring the sink for measurements."
        ::= { sspmSink 1 }

    sspmSinkEntry OBJECT-TYPE
        SYNTAX      SspmSinkEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The details of a particular sink entry.  If the measurement
             is a round-trip type, then the sink entry will be on the
             same probe as the corresponding sspmSourceEntry.  If the
             measurement is a one-way, type then the sink entry will be
             on a different probe."
        INDEX { sspmSinkInstance }
        ::= { sspmSinkTable 1}

    SspmSinkEntry ::= SEQUENCE {
        sspmSinkInstance                        Unsigned32,
        sspmSinkType                            AppLocalIndex,
        sspmSinkSourceAddressType               InetAddressType,
        sspmSinkSourceAddress                   InetAddress,
```

```
        sspmSinkExpectedRate                    SspmMicroSeconds,
        sspmSinkEnable                          TruthValue,
        sspmSinkExpectedFirstSequenceNum        Unsigned32,
        sspmSinkLastSequenceNumber              Unsigned32,
        sspmSinkLastSequenceInvalid             Counter32,
        sspmSinkStorageType                     StorageType,
        sspmSinkStatus                          RowStatus
    }

    sspmSinkInstance OBJECT-TYPE
        SYNTAX      Unsigned32 (1..65535)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An index.  When the measurement is for a round-trip
             measurement, then this table entry is on the same probe as
             the corresponding sspmSourceEntry, and the value of this
             attribute should correspond to the value of
             sspmSourceInstance.  Management applications configuring
             sinks for one-way measurements could define some
             scheme whereby the sspmSinkInstance is unique across
             all probes.  Note that the unique key to this entry is
             also constructed with sspmSinkType,
             sspmSinkSourceAddressType, and sspmSinkSourceAddress.
             To make the implementation simpler, those other
             attributes are not included in the index but uniqueness
             is still needed to receive all the packets."
         ::= { sspmSinkEntry 1 }

    sspmSinkType OBJECT-TYPE
        SYNTAX      AppLocalIndex
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The AppLocalIndex value that uniquely identifies the
             measurement per the APM-MIB.  In order to create a row
             in this table, there must be a corresponding row in the
             sspmCapabilitiesTable.  If there is no corresponding
             row in the sspmCapabilitiestable, then the agent will
             return an error-status of 'inconsistentValue'."
        ::= { sspmSinkEntry 2}

    sspmSinkSourceAddressType OBJECT-TYPE
        SYNTAX      InetAddressType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The type of Internet address of the source."
```

```
        ::= { sspmSinkEntry 3 }

    sspmSinkSourceAddress OBJECT-TYPE
        SYNTAX      InetAddress
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The Internet address of the source.  The formatting
            of this object is controlled by the sspmSinkSourceAddressType
            object above.

            This object should be set only to a valid device address
            that has been administratively configured into the
            device.  If a set attempts to set this object to an
            address that does not belong (i.e., is not administratively
            configured into the device), the set should fail, and the
            agent should return a error-status of 'inconsistentValue'."
        ::= { sspmSinkEntry 4 }

    sspmSinkExpectedRate OBJECT-TYPE
        SYNTAX      SspmMicroSeconds
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The expected rate at which packets will arrive."
        ::= { sspmSinkEntry 5 }

    sspmSinkEnable OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Indicates if the sink is enabled or not."
        ::= { sspmSinkEntry 6 }

    sspmSinkExpectedFirstSequenceNum OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The expected first sequence number of packets.
             This is used by the sink to determine if packets
             were lost at the initiation of the test."
        ::= { sspmSinkEntry 7 }

    sspmSinkLastSequenceNumber OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
```

```
        STATUS      current
        DESCRIPTION
            "The last sequence number received."
        ::= { sspmSinkEntry 8 }

    sspmSinkLastSequenceInvalid OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of packets that arrived whose
             sequence number was not one plus the value of
             sspmSinkLastSequenceNumber."
        ::= { sspmSinkEntry 9 }

    sspmSinkStorageType OBJECT-TYPE
        SYNTAX      StorageType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The storage type of this sspmSinkEntry.  If the value
            of this object is 'permanent', no objects in this row
            need to be writable."
        ::= { sspmSinkEntry 10 }

    sspmSinkStatus OBJECT-TYPE
        SYNTAX       RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
             "Status of this conceptual row.
             An entry may not exist in the active state unless all
             objects in the entry have an appropriate value.

             Once this object is set to active(1), no objects with
             MAX-ACCESS of read-create in the sspmSinkTable can
             be changed."
        ::= { sspmSinkEntry 11 }

    --
    -- Notifications
    --

    --
    -- Conformance information
    --
    sspmCompliances OBJECT IDENTIFIER ::= { sspmMIBConformance 1 }
    sspmGroups      OBJECT IDENTIFIER ::= { sspmMIBConformance 2 }
```

```
   -- Compliance Statements
   sspmGeneralCompliance MODULE-COMPLIANCE
     STATUS current
     DESCRIPTION
       "A general compliance that allows all things to be optional."
     MODULE -- this module

     MANDATORY-GROUPS { sspmGeneralGroup }

     GROUP sspmSourceGroup
     DESCRIPTION
       "The SSPM Source Group is optional."

     GROUP sspmSinkGroup
     DESCRIPTION
       "The SSPM Sink Group is optional."

     GROUP sspmUserPassGroup
     DESCRIPTION
       "The SSPM User Pass Group is optional."

     ::= { sspmCompliances 1 }

   --
   -- SSPM Source Compliance
   --
   sspmSourceFullCompliance MODULE-COMPLIANCE
     STATUS current
     DESCRIPTION
       "A source compliance.  Use this compliance when implementing
        a traffic-source-only device.  This is useful for implementing
        devices that probe other devices for intrusive application
        monitoring.  It is also useful for implementing the source
        of one-way tests used with a sink-only device."
     MODULE -- this module

     MANDATORY-GROUPS { sspmGeneralGroup, sspmSourceGroup }

     GROUP sspmUserPassGroup
     DESCRIPTION
       "The SSPM User Pass Group is optional."
     ::= { sspmCompliances 2 }

   --
   -- SSPM Sink Compliance
   --
   sspmSinkFullCompliance MODULE-COMPLIANCE
     STATUS current
```

```
      DESCRIPTION
        "A sink-only compliance.  Use this compliance when implementing a
         sink-only device.  This is useful for devices to receive one-way
         measurements."
      MODULE -- this module

      MANDATORY-GROUPS { sspmGeneralGroup, sspmSinkGroup }

      ::= { sspmCompliances 3 }

   --
   -- Groups
   --
   sspmGeneralGroup OBJECT-GROUP
       OBJECTS {
       sspmGeneralClockResolution,
       sspmGeneralClockMaxSkew,
       sspmGeneralClockSource,
       sspmGeneralMinFrequency,
       sspmCapabilitiesInstance
       }
       STATUS      current
       DESCRIPTION
           "The objects in the SSPM General Group."
       ::= { sspmGroups 1 }

   sspmSourceGroup OBJECT-GROUP
       OBJECTS {
       sspmSourceProfileType,
       sspmSourceProfilePacketSize,
       sspmSourceProfilePacketFillType,
       sspmSourceProfilePacketFillValue,
       sspmSourceProfileTOS,
       sspmSourceProfileFlowLabel,
       sspmSourceProfileLooseSrcRteFill,
       sspmSourceProfileLooseSrcRteLen,
       sspmSourceProfileTTL,
       sspmSourceProfileNoFrag,
       sspmSourceProfile8021Tagging,
       sspmSourceProfileUsername,
       sspmSourceProfilePassword,
       sspmSourceProfileParameter,
       sspmSourceProfileOwner,
       sspmSourceProfileStorageType,
       sspmSourceProfileStatus,
       sspmSourceControlProfile,
       sspmSourceControlSrc,
       sspmSourceControlDestAddrType,
```

```
        sspmSourceControlDestAddr,
        sspmSourceControlEnabled,
        sspmSourceControlTimeOut,
        sspmSourceControlSamplingDist,
        sspmSourceControlFrequency,
        sspmSourceControlFirstSeqNum,
        sspmSourceControlLastSeqNum,
        sspmSourceControlOwner,
        sspmSourceControlStorageType,
        sspmSourceControlStatus
        }
        STATUS      current
        DESCRIPTION
            "The objects in the SSPM Source Group."
        ::= { sspmGroups 2 }

    sspmUserPassGroup OBJECT-GROUP
        OBJECTS {
        sspmSourceProfileUsername,
        sspmSourceProfilePassword
        }
        STATUS      current
        DESCRIPTION
            "The objects in the SSPM Username and password group."
        ::= { sspmGroups 3 }

    sspmSinkGroup OBJECT-GROUP
        OBJECTS {
        sspmSinkType,
        sspmSinkSourceAddressType,
        sspmSinkSourceAddress,
        sspmSinkExpectedRate,
        sspmSinkEnable,
        sspmSinkExpectedFirstSequenceNum,
        sspmSinkLastSequenceNumber,
        sspmSinkLastSequenceInvalid,
        sspmSinkStorageType,
        sspmSinkStatus
        }
        STATUS      current
        DESCRIPTION
            "The objects in the SSPM Sink Group."
        ::= { sspmGroups 4 }

    END
```

8. Security Considerations

This MIB module defines objects that allow packets to be injected into the network for the purpose of measuring some performance characteristics. As such, the MIB module may contain sensitive network and application data; e.g., user IDs and passwords. Further, if security is compromised, this MIB module could provide a source for denial-of-service, and potential other, attacks. These issues will be addressed within this section.

There are a number of management objects defined in this MIB module 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. These are the tables and objects and their sensitivity/vulnerability:

+ The sspmSourceProfileTable contains objects that configure link-level, IP, and application-level data used within test suites. These objects with a MAX-ACCESS clause of read-write and/or read- create are:

  - o sspmSourcePacketSize - configures the overall size of the test packets,
  - o sspmSourceProfileTOS - sets the TOS field in the IPv4 and IPv6 headers,
  - o sspmSourceProfileLooseSrcRteFill and sspmSourceProfileLooseSrcRteLen - give a list of IPv4 or IPv6 addresses for the loose source route options in the IP headers,
  - o sspmSourceProfileFlowLabel - sets the Flow Label in the IPv6 header,
  - o sspmSourceProfileTTL - sets the TTL field in the packet headers,
  - o sspmSourceProfileNoFrag - sets the No Fragment bit in the packet headers,
  - o sspmSourceProfile8021Tagging - sets the Tag field in the 802.1 headers, and

- o sspmSourceProfileUsername and sspmSourceProfilePassword - these hold the ID and passwords specific to an application test profile.,

+ The sspmSourceControlTable contains objects that configure IP and application-level data used within a given test. These objects with a MAX-ACCESS clause of read-write and/or read-create are:

  - o sspmSourceControlSrc - controls the source IP address used on the test packets,

  - o sspmSourceControlDestAddr - holds the destination address for the specific test packet,

  - o sspmSourceControlTimeout, sspmSourceControlSamplingDist, and sspmSourceControlFrequency - control the nature and frequency of the test packet injection onto the network, and

  - o sspmSourceControlFirstSeqNum and sspmSourceControlLastSeqNum - set the first and last sequence numbers for the specific test.

+ The sspmSinkTable contains objects that configure the recipient of the test packets. As such, the objects in this table have no security issues related to them.

Some attributes configure username and password information for some application-level protocols as indicated above. Access to these attributes may provide unauthorized use of resources. These attributes are: sspmSourceProfileUsername and sspmSourceProfilePassword.

Some attributes configure the size and rate of traffic flows for the purpose of performance measurements. Access to these attributes may exacerbate the use of this MIB module in denial-of-service attacks. It is possible to define a maximum packet rate on the device and to indicate this rate through the sspmSourceFrequency object. This object reflects the maximum acceptable packet rate that a device supporting this MIB module is willing to generate. This places a bound on setting the test packet rate through the sspmSourceControlFrequency object. Other objects that control aspects of the test packets related to packet size and rate are sspmSourceControlTimeOut, sspmSourceControlSamplingDist and sspmSourceControlFrequency.

The objects sspmSourceControlSrc, sspmSourceControlDestAddr, sspmSourceControlLooseSrcRteFill, and sspmSourceControlLooseSrcRteLen control the setting of the source and destination addresses on the packet headers and the routing of the packets. The device should not allow the setting of source addresses on the test packets other than those that are administratively configured onto the device. This is controlled by using the syntax InterfaceIndexOrZero for the control of the source address through the sspmSourceControlSrc object.

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

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.

9. Acknowledgements

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