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Definitions of Managed Objects for the General Switch Management Protocol (GSMP)

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines a portion of the Management Information Base (MIB) for the use with the network management protocols in the Internet community. In particular, it describes managed objects for the General Switch Management Protocol (GSMP).

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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 describes managed objects for the General Switch Management Protocol (GSMP).

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 SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

* An overall architecture, described in RFC 2571 [RFC2571].

* Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and is described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212], and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], RFC 2579 [RFC2579], and RFC 2580[RFC2580].

* Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and is described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and is described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and is described in RFC 1906 [RFC1906], RFC 2572 [RFC2572], and RFC 2574 [RFC2574].

* Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats are described in STD 15, RFC 1157 [RFC1157]. A second set of operations and associated PDU formats are described in 1905 [RFC1905].

- A set of fundamental applications described in RFC 2573 [RFC2573], and the view-based access control mechanism is described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

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

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

3. Structure of the MIB

This memo defines a portion of the Management Information Base (MIB) for the use with network management protocols in the Internet community. In particular, it describes managed objects for the General Switch Management Protocol (GSMP), as defined in [RFC3292].

3.1 Overview

The General Switch Management Protocol (GSMP) is a general purpose protocol to control a label switch. GSMP allows a controller to establish and release connections across the switch, to manage switch ports and to request configuration information or statistics. It also allows the switch to inform the controller of asynchronous events such as a link going down.

The GSMP protocol is asymmetric, the controller being the master and the switch being the slave. Multiple switches may be controlled by a single controller using multiple instantiations of the protocol over separate control connections. Also a switch may be controlled by more than one controller by using the technique of partitioning.

Each instance of a (switch controller, switch partition) adjacency is a session between one switch controller entity and one switch entity. The MIB provides objects to configure/setup these entities to form the GSMP sessions. It also provide objects to monitor these GSMP sessions.

3.2 Scope

The GSMP mib is a protocol mib. It contains objects to configure, monitor, and maintain the GSMP protocol entity. It does not provide any information learned via the protocol, such as "all ports config" information.

The relationships between virtual entities, such as Virtual Switch Entities, and "physical" entities, such as Switch Entities, falls outside of the management of GSMP. This also applies for the management of switch partitions. So this is excluded from the GSMP mib.

It is possible to configure which, and how many Switch Controllers are controlling one Switch since every potential session with the switch has to be represented with an Switch entity. It is, however, not possible to define that one Switch Controller shouldn’t allow other Switch controllers to control the same switch or partition on the switch. It is assumed that there are mechanisms that synchronise controllers and the configuration of them. This is outside the scope of this mib.

3.3 MIB guideline

Two tables are used to configure potential GSMP sessions depending if you are acting as a GSMP switch controller or a GSMP switch. Each row in these tables initiates a GSMP session.

The entity ID is a 48-bit name that is unique within the operational context of the device. A 48-bit IEEE 802 MAC address, if available, MAY be used for the entity ID. If the Ethernet encapsulation is used, the entity ID MUST be the IEEE 802 MAC address of the interface on which the GSMP session is to be setup.

First, the encapsulation of the potential GSMP session shall be defined. If ATM is used, a row in the gsmpAtmEncapTable has to be created with the index set to the entity ID. The specified resources should be allocated to GSMP. If TCP/IP is used, a row in the gsmpTcpIpEncapTable has to be created with the index set to the entity ID. The specified port shall be allocated to GSMP. No special action is needed if ethernet encapsulation is used.

Then the entity information shall be defined. To create a Switch Entity, an entry in the gsmpSwitchTable is created with the index set to the entity ID. To create a Switch Controller Entity, an entry in the gsmpControllerTable is created with the index set to the entity ID.

When the row status of the GsmpControllerEntry or GsmpSwitchEntry is set to active (e.g., in the case with ATM or TCP/IP there are active rows with a corresponding entity ID), the adjacency protocol of GSMP is started.

Another table, the gsmpSessionTable, shows the actual sessions that are established or are in the process of being established. Each row represents a specific session between an Entity and a peer. This table carries information about the peer, the session, and parameters that were negotiated by the adjacency procedures. The gsmpSessionTable also contains statistical information regarding the session.

This creation order SHOULD be used by all GSMP managers. This is to avoid clash situations in multiple SNMP manager scenarios where different managers may create competing entries in the different tables.

Entities may very well be configured by other means than SNMP, e.g., the cli command. Such configured entities SHOULD be represented as entries in the tables of this mib and SHOULD be possible to query, and MAY be possible to alter with SNMP.

3.4 MIB groups

3.4.1 GSMP Switch Controller group

The controller group is used to configure a potential GSMP session on a Switch Controller. A row in the gsmpControllerTable is created for each such session. If ATM or TCP/IP encapsulation is used, a corresponding row has to be created in these tables before the session adjacency protocol is initiated.

If ATM or TCP/IP is used, encapsulation data is defined in the corresponding encapsulation tables. If ethernet is used, the MAC address of the interface defined for the session is set by the Controller ID object.

The adjacency parameters are defined; such as

- Max supported GSMP version.
- Time between the periodic adjacency messages.
- Controller local port number and instance number.
- Whether partitions are being used and the partition ID for the specific partitions this controller is concerned with if partitions are used.
- The resynchronisation strategy for the session is specified.

The notification mapping is set to specify for with events the corresponding SNMP notifications are sent.

3.4.2 GSMP Switch group

The switch group is used to configure a potential GSMP session on a Switch. A row in the gsmpSwitchTable is created for each such session. If ATM or TCP/IP encapsulation is used, a corresponding row has to be created in these tables before the session adjacency protocol is initiated.

If ATM or TCP/IP is used, encapsulation data is defined in the corresponding encapsulation tables. If ethernet is used the MAC address of the interface defined for the session is set by the Switch ID object.

The adjacency parameters are defined; such as

- Max supported GSMP version
- Time between the periodic adjacency messages
- Switch Name, local port number, and instance number.
- Whether partitions are being used and the partition ID for this specific partition if partitions are used.
- The switch type could be set.
- The suggested maximum window size for unacknowledged request messages.

Also, a notification mapping is set to specify for with events the corresponding SNMP notifications are sent.

3.4.3 GSMP Encapsulation groups

The ATM Encapsulation Table and the TCP/IP Encapsulation Table provides a way to configure information that are encapsulation specific. The encapsulation data is further specified in [RFC3293].

If ATM encapsulation is used, the interface and the virtual channel are specified.

If TCP/IP is used, the IP address and the port number are specified.

No special config data needed if Ethernet encapsulation is used.

This mib MAY be extended with new, standard or proprietary, GSMP encapsulation types. If a new encapsulation type needs to be added, it SHOULD be done in the form of a new table with the entity ID as an index. A row in that encapsulation table SHOULD be created before any row in a GSMP entity table is created that is using this new GSMP encapsulation.

3.4.4 GSMP General group

The GSMP session table provides a way to monitor and maintain GSMP sessions.

The session is defined by a Switch Controller Entity and Switch Entity pair.

3.4.5 The GSMP Notifications Group

The GSMP Notification Group defines notifications for GSMP entities. These notifications provide a mechanism for a GSMP device to inform the management station of status changes. Also a notification is defined for each type of GSMP events.

The group of notifications consists of the following notifications:

- gsmpSessionDown

This notification is generated when a session is terminating and also reports the final accounting statistics of the session.

- gsmpSessionUp

This notification is generated when a new session is established.

- gsmpSendFailureInd

This notification is generated when a message with a failure indication was sent. This means that this notification identifies a change to the gsmpSessionStatFailureInds object in a row of the gsmpSessionTable.

- gsmpReceivedFailureInd

This notification is generated when a message with a failure indication received. This means that this notification identifies a change to the gsmpSessionStatReceivedFailures object in a row of the gsmpSessionTable.

- gsmpPortUpEvent

This notification is generated when a Port Up Event is either received or sent.

- gsmpPortDownEvent

This notification is generated when a Port Down Event is either received or sent.

- gsmpInvalidLabelEvent

This notification is generated when an Invalid Label Event is either received or sent.

- gsmpNewPortEvent

This notification is generated when New Port Event either is received or sent.

- gsmpDeadPortEvent

This notification is generated when a Dead Port Event is either received or sent.

- gsmpAdjacencyUpdateEvent

This notification is generated when an Adjacency Update Event is either received or sent.

To disable or enable the sending of each notification, the bits in the bitmap are set to 0 or 1 in the Notification mapping objects in the Controller Entitiy or Switch Entity tables.

The GSMP notification map capability should not be seen as a duplication of the filter mechanism in the snmp notification originator application [RFC2573], but as a compliment, to configure the relation between GSMP events and the SNMP notifications already in the GSMP agent. SNMP notifications and GSMP events operate sometimes on a different timescale, and it may in some applications be devastating for a SNMP application to receive events for each GSMP events. E.g. the invalid label event in a ATM switch scenario may cause mass SNMP notification flooding if mapped to a SNMP notification.

3.5 Textual Conventions

The datatypes GsmpNameType, GsmpLabelType, GsmpVersion, GsmpPartitionType, and GsmpPartitionIdType are used as textual conventions in this document. These textual conventions are used for the convenience of humans reading the MIB. Objects defined using these conventions are always encoded by means of the rules that define their primitive type. However, the textual conventions have special semantics associated with them. Hence, no changes to the SMI or the SNMP are necessary to accommodate these textual conventions which are adopted merely for the convenience of readers.

4. GSMP MIB Definitions

```
GSMP-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE,
        Unsigned32, Integer32, mib-2
               FROM SNMPv2-SMI                            -- [RFC2578]
        RowStatus, TruthValue, TimeStamp,
        StorageType, TEXTUAL-CONVENTION
               FROM SNMPv2-TC                             -- [RFC2579]
        MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
               FROM SNMPv2-CONF                           -- [RFC2580]
        ZeroBasedCounter32
               FROM RMON2-MIB                             -- [RFC2021]
        InterfaceIndex
               FROM IF-MIB                                -- [RFC2863]
        AtmVcIdentifier, AtmVpIdentifier
               FROM ATM-TC-MIB                            -- [RFC2514]
        InetAddressType, InetAddress, InetPortNumber
               FROM INET-ADDRESS-MIB ;                    -- [RFC3291]

    gsmpMIB MODULE-IDENTITY
        LAST-UPDATED "200205310000Z" -- May 31, 2002
        ORGANIZATION "General Switch Management Protocol (gsmp)
                      Working Group, IETF"
        CONTACT-INFO
               "WG Charter:
               http://www.ietf.org/html.charters/gsmp-charter.html

               WG-email:          gsmp@ietf.org
               Subscribe:         gsmp-request@ietf.org
               Email Archive:
               ftp://ftp.ietf.org/ietf-mail-archive/gsmp/

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        DESCRIPTION
            "This MIB contains managed object definitions for the
            General Switch Management Protocol, GSMP, version 3"

        REVISION       "200205310000Z"
        DESCRIPTION "Initial Version, published as RFC 3295"

    ::= { mib-2 98 }

    gsmpNotifications              OBJECT IDENTIFIER ::= { gsmpMIB 0 }
    gsmpObjects                    OBJECT IDENTIFIER ::= { gsmpMIB 1 }
    gsmpNotificationsObjects       OBJECT IDENTIFIER ::= { gsmpMIB 2 }
    gsmpConformance                OBJECT IDENTIFIER ::= { gsmpMIB 3 }

    --****************************************************************
    -- GSMP Textual Conventions
    --****************************************************************

    GsmpNameType ::= TEXTUAL-CONVENTION
        STATUS         current
        DESCRIPTION
            "The Name is a 48-bit quantity.
            A 48-bit IEEE 802 MAC address, if
            available, may be used."
        SYNTAX           OCTET STRING (SIZE(6))

    GsmpPartitionType ::= TEXTUAL-CONVENTION
       STATUS           current
       DESCRIPTION
           "Defining if partitions are used and how the partition id
           is negotiated. "
       SYNTAX           INTEGER {
                                  noPartition(1),
                                  fixedPartitionRequest(2),
                                  fixedPartitionAssigned(3)
                                  }

    GsmpPartitionIdType ::= TEXTUAL-CONVENTION
        STATUS         current
        DESCRIPTION
            "A 8-bit quantity. The format of the Partition ID is not
            defined in GSMP. If desired, the Partition ID can be
            divided into multiple sub-identifiers within a single
            partition. For example: the Partition ID could be
            subdivided into a 6-bit partition number and a 2-bit
            sub-identifier which would allow a switch to support 64
            partitions with 4 available IDs per partition."
          SYNTAX        OCTET STRING (SIZE(1))

    GsmpVersion ::= TEXTUAL-CONVENTION
          STATUS         current
          DESCRIPTION
             "The version numbers defined for the GSMP protocol.
              The version numbers used are defined in the
              specifications of the respective protocol,
              1 - GSMPv1.1 [RFC1987]
              2 - GSMPv2.0 [RFC2397]
              3 - GSMPv3   [RFC3292]
              Other numbers may be defined for other versions
              of the GSMP protocol."
          SYNTAX         Unsigned32

    GsmpLabelType ::= TEXTUAL-CONVENTION
          STATUS        current
          DESCRIPTION
             "The label is structured as a TLV, a tuple, consisting of
             a Type, a Length, and a Value. The structure is defined
             in [RFC 3292]. The label TLV is encoded as a 2 octet type
             field, followed by a 2 octet Length field, followed by a
             variable length Value field.
             Additionally, a label field can be composed of many stacked
             labels that together constitute the label."
          SYNTAX         OCTET STRING

    --****************************************************************
    -- GSMP Entity Objects
    --****************************************************************

    --
    -- Switch Controller Entity table
    --

    gsmpControllerTable OBJECT-TYPE
          SYNTAX         SEQUENCE OF GsmpControllerEntry
          MAX-ACCESS     not-accessible
          STATUS         current
          DESCRIPTION
             "This table represents the Switch Controller
             Entities. An entry in this table needs to be configured
             (created) before a GSMP session might be started."
          ::= { gsmpObjects 1 }
```

```
   gsmpControllerEntry OBJECT-TYPE
         SYNTAX          GsmpControllerEntry
       MAX-ACCESS      not-accessible
       STATUS          current
       DESCRIPTION
             "An entry in the table showing
             the data for a specific Switch Controller
             Entity. If partitions are used, one entity
             corresponds to one specific switch partition.
             Depending of the encapsulation used,
             a corresponding row in the gsmpAtmEncapTable or the
             gsmpTcpIpEncapTable may have been created."
       INDEX { gsmpControllerEntityId }
       ::= { gsmpControllerTable 1 }

   GsmpControllerEntry ::= SEQUENCE {
       gsmpControllerEntityId                     GsmpNameType,
       gsmpControllerMaxVersion                   GsmpVersion,
       gsmpControllerTimer                        Unsigned32,
       gsmpControllerPort                         Unsigned32,
       gsmpControllerInstance                     Unsigned32,
       gsmpControllerPartitionType                GsmpPartitionType,
       gsmpControllerPartitionId                  GsmpPartitionIdType,
       gsmpControllerDoResync                     TruthValue,
       gsmpControllerNotificationMap              BITS,
       gsmpControllerSessionState                 INTEGER,
       gsmpControllerStorageType                  StorageType,
       gsmpControllerRowStatus                    RowStatus
       }

   gsmpControllerEntityId OBJECT-TYPE
       SYNTAX          GsmpNameType
       MAX-ACCESS      not-accessible
       STATUS          current
       DESCRIPTION
             "The Switch Controller Entity Id is unique
             within the operational context of the device."
       ::= { gsmpControllerEntry 1 }

  gsmpControllerMaxVersion OBJECT-TYPE
      SYNTAX          GsmpVersion
      MAX-ACCESS      read-create
      STATUS          current
      DESCRIPTION
            "The max version number of the GSMP protocol being used
            in this session. The version is negotiated by the
            adjacency protocol."
      DEFVAL { 3 }
```

```
       ::= { gsmpControllerEntry 2 }

   gsmpControllerTimer OBJECT-TYPE
       SYNTAX          Unsigned32(1..255)
       UNITS           "100ms"
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "The timer specifies the nominal time between
           periodic adjacency protocol messages. It is a constant
           for the duration of a GSMP session. The timer is
           specified in units of 100ms."
       DEFVAL { 10 }
       ::= { gsmpControllerEntry 3 }

   gsmpControllerPort OBJECT-TYPE
       SYNTAX          Unsigned32
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "The local port number for the Switch Controller
           Entity."
       REFERENCE
          "General Switch Management Protocol V3: Section 3.1.2"
       ::= { gsmpControllerEntry 4 }

   gsmpControllerInstance OBJECT-TYPE
       SYNTAX          Unsigned32(1..16777215)
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "The instance number for the Switch Controller
           Entity. The Instance number is a 24-bit number
           that should be guaranteed to be unique within
           the recent past and to change when the link
           or node comes back up after going down. Zero is
           not a valid instance number. "
       ::= { gsmpControllerEntry 5 }

   gsmpControllerPartitionType OBJECT-TYPE
       SYNTAX          GsmpPartitionType
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
          "A controller can request the specific partition identifier
          to the session by setting the Partition Type to
          fixedPartitionRequest(2). A controller can let the switch
          decide whether it wants to assign a fixed partition ID or
          not, by setting the Partition Type to noPartition(1)."
       ::= { gsmpControllerEntry 6 }

   gsmpControllerPartitionId OBJECT-TYPE
       SYNTAX           GsmpPartitionIdType
       MAX-ACCESS       read-create
       STATUS           current
       DESCRIPTION
           "The Id for the specific switch partition that this
           Switch Controller is concerned with.
           If partitions are not used or if the controller lets the
           switch assigns Partition ID, i.e Partition Type =
           noPartition(1), then this object is undefined."
       ::= { gsmpControllerEntry 7 }

   gsmpControllerDoResync OBJECT-TYPE
       SYNTAX           TruthValue
       MAX-ACCESS       read-create
       STATUS           current
       DESCRIPTION
           "This object specifies whether the controller should
           resynchronise or reset in case of loss of synchronisation.
           If this object is set to true then the Controller should
           resync with PFLAG=2 (recovered adjacency)."
       DEFVAL { true }
       ::= { gsmpControllerEntry 8 }

   gsmpControllerNotificationMap OBJECT-TYPE
       SYNTAX           BITS {
                                   sessionDown(0),
                                   sessionUp(1),
                                   sendFailureIndication(2),
                                   receivedFailureIndication(3),
                                   portUpEvent(4),
                                   portDownEvent(5),
                                   invalidLabelEvent(6),
                                   newPortEvent(7),
                                   deadPortEvent(8),
                                   adjacencyUpdateEvent(9)
                             }
       MAX-ACCESS       read-create
       STATUS           current
       DESCRIPTION
           "This bitmap defines whether a corresponding SNMP
           notification should be sent if a GSMP event is received
           by the Switch Controller. If the bit is set to 1 a
           notification should be sent. The handling and filtering of
           the SNMP notifications are then further specified in the
```

```
           SNMP notification originator application. "
       DEFVAL {{ sessionDown, sessionUp,
              sendFailureIndication, receivedFailureIndication }}
       ::= { gsmpControllerEntry 9 }

   gsmpControllerSessionState OBJECT-TYPE
          SYNTAX          INTEGER {
                                    null(1),
                                    synsent(2),
                                    synrcvd(3),
                                    estab(4)
                                   }
          MAX-ACCESS      read-only
          STATUS          current
          DESCRIPTION
             "The state for the existing or potential session that
             this entity is concerned with.
             The NULL state is returned if the proper encapsulation
             data is not yet configured, if the row is not in active
             status or if the session is in NULL state as defined in
             the GSMP specification."
          ::= { gsmpControllerEntry 10}

   gsmpControllerStorageType OBJECT-TYPE
           SYNTAX         StorageType
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "The storage type for this controller entity.
             Conceptual rows having the value 'permanent' need not allow
             write-access to any columnar objects in the row."
          DEFVAL { nonVolatile }
          ::= { gsmpControllerEntry 11 }

   gsmpControllerRowStatus OBJECT-TYPE
           SYNTAX         RowStatus
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "An object that allows entries in this table to
              be created and deleted using the
              RowStatus convention.
              While the row is in active state it's not
              possible to modify the value of any object
              for that row except the gsmpControllerNotificationMap
              and the gsmpControllerRowStatus objects."
          ::= { gsmpControllerEntry 12 }
```

```
    --
    -- Switch Entity table
    --

    gsmpSwitchTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF GsmpSwitchEntry
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
             "This table represents the Switch
             Entities. An entry in this table needs to be configured
             (created) before a GSMP session might be started."
        ::= { gsmpObjects 2 }

    gsmpSwitchEntry OBJECT-TYPE
        SYNTAX         GsmpSwitchEntry
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
             "An entry in the table showing
             the data for a specific Switch
             Entity. If partitions are used, one entity
             corresponds to one specific switch partition.
             Depending of the encapsulation used,
             a corresponding row in the gsmpAtmEncapTable or the
             gsmpTcpIpEncapTable may have been created."
        INDEX { gsmpSwitchEntityId }
        ::= { gsmpSwitchTable 1 }

    GsmpSwitchEntry ::= SEQUENCE {
        gsmpSwitchEntityId                GsmpNameType,
        gsmpSwitchMaxVersion              GsmpVersion,
        gsmpSwitchTimer                   Unsigned32,
        gsmpSwitchName                    GsmpNameType,
        gsmpSwitchPort                    Unsigned32,
        gsmpSwitchInstance                Unsigned32,
        gsmpSwitchPartitionType           GsmpPartitionType,
        gsmpSwitchPartitionId             GsmpPartitionIdType,
        gsmpSwitchNotificationMap         BITS,
        gsmpSwitchSwitchType              OCTET STRING,
        gsmpSwitchWindowSize              Unsigned32,
        gsmpSwitchSessionState            INTEGER,
        gsmpSwitchStorageType             StorageType,
        gsmpSwitchRowStatus               RowStatus
        }

    gsmpSwitchEntityId OBJECT-TYPE
        SYNTAX         GsmpNameType
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
             "The Switch Entity Id is unique
             within the operational context of the device. "
        ::= { gsmpSwitchEntry 1 }

   gsmpSwitchMaxVersion OBJECT-TYPE
       SYNTAX          GsmpVersion
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "The max version number of the GSMP protocol being
           supported by this Switch. The version is negotiated by
           the adjacency protocol."
       DEFVAL { 3 }
       ::= { gsmpSwitchEntry 2 }

   gsmpSwitchTimer OBJECT-TYPE
       SYNTAX          Unsigned32(1..255)
       UNITS           "100ms"
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "The timer specifies the nominal time between
           periodic adjacency protocol messages. It is a constant
           for the duration of a GSMP session. The timer is
           specified in units of 100ms."
       DEFVAL { 10 }
       ::= { gsmpSwitchEntry 3 }

   gsmpSwitchName OBJECT-TYPE
       SYNTAX          GsmpNameType
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "The name of the Switch. The first three octets must be an
           Organisationally Unique Identifier (OUI) that identifies
           the manufacturer of the Switch. This is by default set to
           the same value as the gsmpSwitchId object if not
           separately specified. "
       ::= {gsmpSwitchEntry 4 }

   gsmpSwitchPort OBJECT-TYPE
       SYNTAX          Unsigned32
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
```

```
           "The local port number for this Switch Entity."
       REFERENCE
          "General Switch Management Protocol V3: Section 3.1.2"
       ::= { gsmpSwitchEntry 5 }

   gsmpSwitchInstance OBJECT-TYPE
       SYNTAX          Unsigned32(1..16777215)
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The instance number for the Switch Entity.
           The Instance number is a 24-bit number
           that should be guaranteed to be unique within
           the recent past and to change when the link
           or node comes back up after going down. Zero is
           not a valid instance number."
       ::= { gsmpSwitchEntry 6 }

   gsmpSwitchPartitionType OBJECT-TYPE
       SYNTAX         GsmpPartitionType
       MAX-ACCESS     read-create
       STATUS         current
       DESCRIPTION
           "A switch can assign the specific partition identifier to
           the session by setting the Partition Type to
           fixedPartitionAssigned(3). A switch can specify
           that no partitions are handled in the session by setting
           the Partition Type to noPartition(1)."
       ::= { gsmpSwitchEntry 7 }

   gsmpSwitchPartitionId OBJECT-TYPE
       SYNTAX         GsmpPartitionIdType
       MAX-ACCESS     read-create
       STATUS         current
       DESCRIPTION
           "The Id for this specific switch partition that the switch
           entity represents. If partitions are not used, i.e.
           Partition Type = noPartition(1), then this object is
           undefined."
       ::= { gsmpSwitchEntry 8 }

   gsmpSwitchNotificationMap OBJECT-TYPE
       SYNTAX         BITS {
                               sessionDown(0),
                               sessionUp(1),
                               sendFailureIndication(2),
                               receivedFailureIndication(3),
                               portUpEvent(4),
                             portDownEvent(5),
                             invalidLabelEvent(6),
                             newPortEvent(7),
                             deadPortEvent(8),
                             adjacencyUpdateEvent(9)
                          }
       MAX-ACCESS     read-create
       STATUS         current
       DESCRIPTION
           "This bitmap defines whether a corresponding SNMP
           notification should be sent if an GSMP event is sent
           by the Switch Entity. If the bit is set to 1 a
           notification should be sent. The handling and filtering of
           the SNMP notifications are then further specified in the
           SNMP notification originator application. "
       DEFVAL {{ sessionDown, sessionUp,
              sendFailureIndication, receivedFailureIndication }}
       ::= { gsmpSwitchEntry 9 }

   gsmpSwitchSwitchType OBJECT-TYPE
       SYNTAX           OCTET STRING (SIZE(2))
       MAX-ACCESS       read-create
       STATUS           current
       DESCRIPTION
           "A 16-bit field allocated by the manufacturer
           of the switch. The Switch Type
           identifies the product. When the Switch Type is combined
           with the OUI from the Switch Name the product is
           uniquely identified. "
       ::= { gsmpSwitchEntry 10 }

   gsmpSwitchWindowSize OBJECT-TYPE
       SYNTAX           Unsigned32(1..65535)
       MAX-ACCESS       read-create
       STATUS           current
       DESCRIPTION
           "The maximum number of unacknowledged request messages
           that may be transmitted by the controller without the
           possibility of loss. This field is used to prevent
           request messages from being lost in the switch because of
           overflow in the receive buffer. The field is a hint to
           the controller."
       ::= { gsmpSwitchEntry 11 }

   gsmpSwitchSessionState OBJECT-TYPE
       SYNTAX           INTEGER {
                                  null(1),
                                  synsent(2),
                                   synrcvd(3),
                                   estab(4)
                                  }
       MAX-ACCESS       read-only
       STATUS           current
       DESCRIPTION
           "The state for the existing or potential session that
           this entity is concerned with.
           The NULL state is returned if the proper encapsulation
           data is not yet configured, if the row is not in active
           status or if the session is in NULL state as defined in
           the GSMP specification."
          ::= { gsmpSwitchEntry 12}

   gsmpSwitchStorageType OBJECT-TYPE
           SYNTAX         StorageType
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "The storage type for this switch entity.
             Conceptual rows having the value 'permanent' need not allow
             write-access to any columnar objects in the row."
          DEFVAL { nonVolatile }
          ::= { gsmpSwitchEntry 13 }

   gsmpSwitchRowStatus OBJECT-TYPE
           SYNTAX         RowStatus
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "An object that allows entries in this table to
              be created and deleted using the
              RowStatus convention.
              While the row is in active state it's not
              possible to modify the value of any object
              for that row except the gsmpSwitchNotificationMap
              and the gsmpSwitchRowStatus objects."
          ::= { gsmpSwitchEntry 14 }

    --***************************************************************
    -- GSMP Encapsulation Objects
    --***************************************************************

    --
    -- GSMP ATM Encapsulation Table
    --

    gsmpAtmEncapTable OBJECT-TYPE
```

```
          SYNTAX           SEQUENCE OF GsmpAtmEncapEntry
          MAX-ACCESS       not-accessible
          STATUS           current
          DESCRIPTION
              "This table contains the atm encapsulation data
              for the Controller or Switch that uses atm aal5 as
              encapsulation. "
          ::= { gsmpObjects 3 }

    gsmpAtmEncapEntry OBJECT-TYPE
        SYNTAX          GsmpAtmEncapEntry
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
             "An entry in the table showing
             the encapsulation data for a specific
             Switch Controller entity or Switch entity."
        INDEX { gsmpAtmEncapEntityId }
        ::= { gsmpAtmEncapTable 1 }

    GsmpAtmEncapEntry ::= SEQUENCE {
        gsmpAtmEncapEntityId              GsmpNameType,
        gsmpAtmEncapIfIndex               InterfaceIndex,
        gsmpAtmEncapVpi                   AtmVpIdentifier,
        gsmpAtmEncapVci                   AtmVcIdentifier,
        gsmpAtmEncapStorageType           StorageType,
        gsmpAtmEncapRowStatus             RowStatus
        }

    gsmpAtmEncapEntityId OBJECT-TYPE
        SYNTAX          GsmpNameType
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
             "The Controller Id or Switch Id that is unique
             within the operational context of the device. "
        ::= { gsmpAtmEncapEntry 1 }

    gsmpAtmEncapIfIndex OBJECT-TYPE
        SYNTAX         InterfaceIndex
        MAX-ACCESS     read-create
        STATUS         current
        DESCRIPTION
             "The interface index for the virtual channel over which
             the GSMP session is established, i.e., the GSMP control
             channel for LLC/SNAP encapsulated GSMP messages on an
             ATM data link layer."
        ::= { gsmpAtmEncapEntry 2 }
    gsmpAtmEncapVpi OBJECT-TYPE
        SYNTAX         AtmVpIdentifier
        MAX-ACCESS     read-create
        STATUS         current
        DESCRIPTION
             " The VPI value for the virtual channel over which the
             GSMP session is established, i.e., the GSMP control
             channel for LLC/SNAP encapsulated GSMP messages on an
             ATM data link layer."
        DEFVAL { 0 }
           ::= { gsmpAtmEncapEntry 3 }

    gsmpAtmEncapVci OBJECT-TYPE
           SYNTAX         AtmVcIdentifier
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              " The VCI value for the virtual channel over which the
              GSMP session is established, i.e., the GSMP control
              channel for LLC/SNAP encapsulated GSMP messages on an
              ATM data link layer."
           DEFVAL { 15 }
           ::= { gsmpAtmEncapEntry 4 }

   gsmpAtmEncapStorageType OBJECT-TYPE
           SYNTAX         StorageType
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "The storage type for this entry. It should have the same
              value as the StorageType in the referring Switch
              Controller entity or Switch entity."
          DEFVAL { nonVolatile }
          ::= { gsmpAtmEncapEntry 5 }

   gsmpAtmEncapRowStatus OBJECT-TYPE
           SYNTAX         RowStatus
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "An object that allows entries in this table to
              be created and deleted using the
              RowStatus convention.
              While the row is in active state it’s not
              possible to modify the value of any object
              for that row except the gsmpAtmEncapRowStatus object."
          ::= { gsmpAtmEncapEntry 6 }
    --
    -- GSMP TCP/IP Encapsulation Table
    --

    gsmpTcpIpEncapTable OBJECT-TYPE
          SYNTAX           SEQUENCE OF GsmpTcpIpEncapEntry
          MAX-ACCESS       not-accessible
          STATUS           current
          DESCRIPTION
              "This table contains the encapsulation data
              for the Controller or Switch that uses TCP/IP as
              encapsulation."
        ::= { gsmpObjects 4 }

    gsmpTcpIpEncapEntry OBJECT-TYPE
        SYNTAX          GsmpTcpIpEncapEntry
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
             "An entry in the table showing
             the encapsulation data for a specific
             Switch Controller entity or Switch entity."
        INDEX { gsmpTcpIpEncapEntityId }
        ::= { gsmpTcpIpEncapTable 1 }

    GsmpTcpIpEncapEntry ::= SEQUENCE {
        gsmpTcpIpEncapEntityId             GsmpNameType,
        gsmpTcpIpEncapAddressType          InetAddressType,
        gsmpTcpIpEncapAddress              InetAddress,
        gsmpTcpIpEncapPortNumber           InetPortNumber,
        gsmpTcpIpEncapStorageType          StorageType,
        gsmpTcpIpEncapRowStatus            RowStatus
        }

    gsmpTcpIpEncapEntityId OBJECT-TYPE
        SYNTAX          GsmpNameType
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
             "The Controller or Switch Id is unique
             within the operational context of the device. "
        ::= { gsmpTcpIpEncapEntry 1 }

    gsmpTcpIpEncapAddressType OBJECT-TYPE
        SYNTAX         InetAddressType
        MAX-ACCESS     read-create
        STATUS         current
        DESCRIPTION
```

```
             "The type of address in gsmpTcpIpEncapAddress."
        ::= { gsmpTcpIpEncapEntry 2 }

    gsmpTcpIpEncapAddress OBJECT-TYPE
        SYNTAX         InetAddress
        MAX-ACCESS     read-create
        STATUS         current
        DESCRIPTION
             "The IPv4 or IPv6 address used for
             the GSMP session peer."
        ::= { gsmpTcpIpEncapEntry 3 }

    gsmpTcpIpEncapPortNumber OBJECT-TYPE
           SYNTAX         InetPortNumber
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "The TCP port number used for the TCP session
              establishment to the GSMP peer."
           DEFVAL { 6068 }
           ::= { gsmpTcpIpEncapEntry 4 }

   gsmpTcpIpEncapStorageType OBJECT-TYPE
           SYNTAX         StorageType
           MAX-ACCESS     read-create
           STATUS         current
           DESCRIPTION
              "The storage type for this entry. It should have the same
              value as the StorageType in the referring Switch
              Controller entity or Switch entity."
          DEFVAL { nonVolatile }
          ::= { gsmpTcpIpEncapEntry 5 }

    gsmpTcpIpEncapRowStatus OBJECT-TYPE
          SYNTAX          RowStatus
          MAX-ACCESS      read-create
          STATUS          current
          DESCRIPTION
              "An object that allows entries in this table to
              be created and deleted using the
              RowStatus convention.
              While the row is in active state it’s not
              possible to modify the value of any object
              for that row except the gsmpTcpIpEncapRowStatus object."
           ::= { gsmpTcpIpEncapEntry 6 }

    --**************************************************************
    -- GSMP Session Objects
    --**************************************************************

    --
    -- GSMP Session table
    --

    gsmpSessionTable OBJECT-TYPE
           SYNTAX          SEQUENCE OF GsmpSessionEntry
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "This table represents the sessions between
              Controller and Switch pairs. "
        ::= { gsmpObjects 5 }

    gsmpSessionEntry OBJECT-TYPE
        SYNTAX         GsmpSessionEntry
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
             "An entry in the table showing
             the session data for a specific Controller and
             Switch pair. Also, statistics for this specific
             session is shown."
        INDEX { gsmpSessionThisSideId, gsmpSessionFarSideId }
        ::= { gsmpSessionTable 1 }

    GsmpSessionEntry ::= SEQUENCE {
        gsmpSessionThisSideId                    GsmpNameType,
        gsmpSessionFarSideId                     GsmpNameType,
        gsmpSessionVersion                       GsmpVersion,
        gsmpSessionTimer                         Integer32,
        gsmpSessionPartitionId                   GsmpPartitionIdType,
        gsmpSessionAdjacencyCount                Unsigned32,
        gsmpSessionFarSideName                   GsmpNameType,
        gsmpSessionFarSidePort                   Unsigned32,
        gsmpSessionFarSideInstance               Unsigned32,
        gsmpSessionLastFailureCode               Unsigned32,
        gsmpSessionDiscontinuityTime             TimeStamp,
        gsmpSessionStartUptime                   TimeStamp,
        gsmpSessionStatSentMessages              ZeroBasedCounter32,
        gsmpSessionStatFailureInds               ZeroBasedCounter32,
        gsmpSessionStatReceivedMessages          ZeroBasedCounter32,
        gsmpSessionStatReceivedFailures          ZeroBasedCounter32,
        gsmpSessionStatPortUpEvents              ZeroBasedCounter32,
        gsmpSessionStatPortDownEvents            ZeroBasedCounter32,
        gsmpSessionStatInvLabelEvents            ZeroBasedCounter32,
        gsmpSessionStatNewPortEvents             ZeroBasedCounter32,
        gsmpSessionStatDeadPortEvents             ZeroBasedCounter32,
        gsmpSessionStatAdjUpdateEvents            ZeroBasedCounter32
        }

    gsmpSessionThisSideId OBJECT-TYPE
        SYNTAX         GsmpNameType
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
             "This side ID uniquely identifies the entity that this
             session relates to within the operational
             context of the device. "
        ::= { gsmpSessionEntry 1 }

    gsmpSessionFarSideId OBJECT-TYPE
        SYNTAX         GsmpNameType
        MAX-ACCESS     not-accessible
        STATUS         current
        DESCRIPTION
            "The Far side ID uniquely identifies the entity that this
            session is established against. "
        ::= { gsmpSessionEntry 2 }

   gsmpSessionVersion OBJECT-TYPE
       SYNTAX          GsmpVersion
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "The version number of the GSMP protocol being used in
           this session. The version is the result of the
           negotiation by the adjacency protocol."
       ::= { gsmpSessionEntry 3 }

   gsmpSessionTimer OBJECT-TYPE
       SYNTAX          Integer32
       UNITS           "100ms"
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "The timer specifies the time remaining until the
           adjacency timer expires. The object could take negative
           values since if no valid GSMP messages are
           received in any period of time in excess of three times
           the value of the Timer negotiated by the adjacency
           protocol loss of synchronisation may be declared. The
           timer is specified in units of 100ms."
       ::= { gsmpSessionEntry 4 }
   gsmpSessionPartitionId OBJECT-TYPE
       SYNTAX          GsmpPartitionIdType
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "The Partition Id for the specific switch partition that
           this session is concerned with."
       ::= { gsmpSessionEntry 5 }

   gsmpSessionAdjacencyCount OBJECT-TYPE
       SYNTAX          Unsigned32(1..255)
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "This object specifies the current number of adjacencies
           that are established with controllers and the switch
           partition that is used for this session. The value
           includes this session."
       ::= { gsmpSessionEntry 6 }

   gsmpSessionFarSideName OBJECT-TYPE
       SYNTAX              GsmpNameType
       MAX-ACCESS          read-only
       STATUS              current
       DESCRIPTION
           "The name of the far side as advertised in the adjacency
           message."
       ::= {gsmpSessionEntry 7}

   gsmpSessionFarSidePort OBJECT-TYPE
       SYNTAX           Unsigned32
       MAX-ACCESS       read-only
       STATUS           current
       DESCRIPTION
           "The local port number of the link across which the
           message is being sent."
       REFERENCE
          "General Switch Management Protocol V3: Section 3.1.2"
       ::= { gsmpSessionEntry 8 }

   gsmpSessionFarSideInstance OBJECT-TYPE
       SYNTAX           Unsigned32(1..16777215)
       MAX-ACCESS       read-only
       STATUS           current
       DESCRIPTION
           "The instance number used for the link during this
           session. The Instance number is a 24-bit number
           that should be guaranteed to be unique within
           the recent past and to change when the link
           or node comes back up after going down. Zero is not
           a valid instance number."
       ::= { gsmpSessionEntry 9 }

   gsmpSessionLastFailureCode OBJECT-TYPE
       SYNTAX           Unsigned32(0..255)
       MAX-ACCESS       read-only
       STATUS           current
       DESCRIPTION
           "This is the last failure code that was received over
           this session. If no failure code have been received, the
           value is zero."
       ::= { gsmpSessionEntry 10 }

   gsmpSessionDiscontinuityTime OBJECT-TYPE
       SYNTAX         TimeStamp
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The value of sysUpTime on the most recent occasion at
           which one or more of this session’s counters
           suffered a discontinuity. If no such discontinuities have
           occurred since then, this object contains the same
           timestamp as gsmpSessionStartUptime ."
        ::= { gsmpSessionEntry 11 }

   gsmpSessionStartUptime OBJECT-TYPE
       SYNTAX         TimeStamp
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           " The value of sysUpTime when the session came to
           established state."
       ::= { gsmpSessionEntry 12 }

   gsmpSessionStatSentMessages OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of messages that have been sent in this
           session. All GSMP messages pertaining to this session after
           the session came to established state SHALL
           be counted, also including adjacency protocol messages
           and failure response messages.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
```

```
            happened."
        ::= { gsmpSessionEntry 13 }

    gsmpSessionStatFailureInds OBJECT-TYPE
        SYNTAX         ZeroBasedCounter32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of messages that have been sent with a
            failure indication in this session. Warning messages
            SHALL NOT be counted.
            When the counter suffers any discontinuity, then
            the gsmpSessionDiscontinuityTime object indicates when it
            happened."
        REFERENCE
           "General Switch Management Protocol V3: Section 12.1"
        ::= { gsmpSessionEntry 14 }

    gsmpSessionStatReceivedMessages OBJECT-TYPE
        SYNTAX         ZeroBasedCounter32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of messages that have been received in
            this session. All legal GSMP messages pertaining to this
            session after the session came to established state SHALL
            be counted, also including adjacency protocol messages
            and failure response messages.
            When the counter suffers any discontinuity, then
            the gsmpSessionDiscontinuityTime object indicates when it
            happened."
        ::= { gsmpSessionEntry 15 }

    gsmpSessionStatReceivedFailures OBJECT-TYPE
        SYNTAX         ZeroBasedCounter32
        MAX-ACCESS     read-only
        STATUS         current
        DESCRIPTION
            "The number of messages that have been received in
            this session with a failure indication. Warning messages
            SHALL NOT be counted.
            When the counter suffers any discontinuity, then
            the gsmpSessionDiscontinuityTime object indicates when it
            happened."
        REFERENCE
           "General Switch Management Protocol V3: Section 12.1"
        ::= { gsmpSessionEntry 16 }
```

```
   gsmpSessionStatPortUpEvents OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of Port Up events that have been sent or
           received on this session.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
           happened."
       REFERENCE
          "General Switch Management Protocol V3: Section 9.1"
       ::= { gsmpSessionEntry 17 }

   gsmpSessionStatPortDownEvents OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of Port Down events that have been sent or
           received on this session.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
           happened."
       REFERENCE
          "General Switch Management Protocol V3: Section 9.2"
       ::= { gsmpSessionEntry 18 }

   gsmpSessionStatInvLabelEvents OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of Invalid label events that have been sent
           or received on this session.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
           happened."
       REFERENCE
          "General Switch Management Protocol V3: Section 9.3"
       ::= { gsmpSessionEntry 19 }

   gsmpSessionStatNewPortEvents OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of New Port events that have been sent or
           received on this session.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
           happened."
       REFERENCE
          "General Switch Management Protocol V3: Section 9.4"
       ::= { gsmpSessionEntry 20 }

   gsmpSessionStatDeadPortEvents OBJECT-TYPE
       SYNTAX         ZeroBasedCounter32
       MAX-ACCESS     read-only
       STATUS         current
       DESCRIPTION
           "The number of Dead Port events that have been sent or
           received on this session.
           When the counter suffers any discontinuity, then
           the gsmpSessionDiscontinuityTime object indicates when it
           happened."
       REFERENCE
           "General Switch Management Protocol V3: Section 9.5"
         ::= { gsmpSessionEntry 21 }

   gsmpSessionStatAdjUpdateEvents OBJECT-TYPE
         SYNTAX         ZeroBasedCounter32
         MAX-ACCESS     read-only
         STATUS         current
         DESCRIPTION
            "The number of Adjacency Update events that have been sent
            or received on this session.
            When the counter suffers any discontinuity, then
            the gsmpSessionDiscontinuityTime object indicates when it
            happened."
         REFERENCE
           "General Switch Management Protocol V3: Section 9.6"
         ::= { gsmpSessionEntry 22 }


   -- **************************************************************
   -- GSMP Notifications
   -- **************************************************************

   --
   -- Notification objects
   --

   gsmpEventPort OBJECT-TYPE
         SYNTAX         Unsigned32
         MAX-ACCESS     accessible-for-notify
         STATUS         current
         DESCRIPTION
            "This object specifies the Port Number that is
            carried in this event."
         ::= { gsmpNotificationsObjects 1 }

   gsmpEventPortSessionNumber OBJECT-TYPE
         SYNTAX         Unsigned32
         MAX-ACCESS     accessible-for-notify
         STATUS         current
         DESCRIPTION
            "This object specifies the Port Session Number that is
            carried in this event."
         ::= { gsmpNotificationsObjects 2 }

   gsmpEventSequenceNumber OBJECT-TYPE
         SYNTAX         Unsigned32
         MAX-ACCESS     accessible-for-notify
         STATUS         current
         DESCRIPTION
            "This object specifies the Event Sequence Number that is
            carried in this event."
         ::= { gsmpNotificationsObjects 3 }

   gsmpEventLabel OBJECT-TYPE
         SYNTAX          GsmpLabelType
         MAX-ACCESS      accessible-for-notify
         STATUS          current
         DESCRIPTION
            "This object specifies the Label that is
            carried in this event."
         ::= { gsmpNotificationsObjects 4 }


   --
   -- Notifications
   --

    gsmpSessionDown NOTIFICATION-TYPE
         OBJECTS {
                   gsmpSessionStartUptime,
                   gsmpSessionStatSentMessages,
                   gsmpSessionStatFailureInds,
                   gsmpSessionStatReceivedMessages,
                   gsmpSessionStatReceivedFailures,
                   gsmpSessionStatPortUpEvents,
                   gsmpSessionStatPortDownEvents,
                   gsmpSessionStatInvLabelEvents,
                   gsmpSessionStatNewPortEvents,
                   gsmpSessionStatDeadPortEvents,
                   gsmpSessionStatAdjUpdateEvents
                   }
          STATUS current
          DESCRIPTION
              "When it has been enabled, this notification is
              generated whenever a session is taken down, regardless
              of whether the session went down normally or not.
              Its purpose is to allow a management application
              (primarily an accounting application) that is
              monitoring the session statistics to receive the final
              values of these counters, so that the application can
              properly account for the amounts the counters were
              incremented since the last time the application polled
              them. The gsmpSessionStartUptime object provides the
              total amount of time that the session was active.

              This notification is not a substitute for polling the
              session statistic counts. In particular, the count
              values reported in this notification cannot be assumed
             to be the complete totals for the life of the session,
             since they may have wrapped while the
             session was up.

             The session to which this notification
             applies is identified by the gsmpSessionThisSideId and
             gsmpSessionFarSideId which could be inferred from the
             Object Identifiers of the objects contained in the
             notification.
             An instance of this notification will contain exactly
             one instance of each of its objects, and these objects
             will all belong to the same conceptual row of the
             gsmpSessionTable."
    ::= { gsmpNotifications 1 }

    gsmpSessionUp NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionFarSideInstance
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when new session is established.

            The new session is identified by the gsmpSessionThisSideId
            and gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionFarSideInstance object
            contained in the notification."
    ::= { gsmpNotifications 2 }

    gsmpSentFailureInd NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionLastFailureCode,
                  gsmpSessionStatFailureInds
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when a message with a failure indication was
            sent.

            The notification indicates a change in the value of
            gsmpSessionStatFailureInds. The
            gsmpSessionLastFailureCode contains the failure
            reason.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifiers of the objects contained in the
            notification."
    ::= { gsmpNotifications 3 }

    gsmpReceivedFailureInd NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionLastFailureCode,
                  gsmpSessionStatReceivedFailures
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generate when a message with a failure indication
            is received.

            The notification indicates a change in the value of
            gsmpSessionStatReceivedFailures. The
            gsmpSessionLastFailureCode contains the failure
            reason.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifiers of the objects contained in the
            notification."
    ::= { gsmpNotifications 4 }
    gsmpPortUpEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionStatPortUpEvents,
                  gsmpEventPort,
                  gsmpEventPortSessionNumber,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when a Port Up Event occurs.

            The notification indicates a change in the value of
            gsmpSessionStatPortUpEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionStatPortUpEvents
            object contained in the notification."
    ::= { gsmpNotifications 5 }

    gsmpPortDownEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionStatPortDownEvents,
                  gsmpEventPort,
                  gsmpEventPortSessionNumber,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when a Port Down Event occurs.

            The notification indicates a change in the value of
            gsmpSessionStatPortDownEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionStatPortDownEvents
            object contained in the notification."
    ::= { gsmpNotifications 6 }

    gsmpInvalidLabelEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionStatInvLabelEvents,
                  gsmpEventPort,
                  gsmpEventLabel,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when an Invalid Label Event occurs.

            The notification indicates a change in the value of
            gsmpSessionStatInvLabelEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionStatInvLabelEvents
            object contained in the notification."
    ::= { gsmpNotifications 7 }

    gsmpNewPortEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionStatNewPortEvents,
                  gsmpEventPort,
                  gsmpEventPortSessionNumber,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when a New Port Event occurs.

            The notification indicates a change in the value of
            gsmpSessionStatNewPortEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionStatNewPortEvents
            object contained in the notification."
    ::= { gsmpNotifications 8 }

    gsmpDeadPortEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionStatDeadPortEvents,
                  gsmpEventPort,
                  gsmpEventPortSessionNumber,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when a Dead Port Event occurs.

            The notification indicates a change in the value of
            gsmpSessionStatDeadPortEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionStatDeadPortEvents
            object contained in the notification."
    ::= { gsmpNotifications 9 }

    gsmpAdjacencyUpdateEvent NOTIFICATION-TYPE
        OBJECTS {
                  gsmpSessionAdjacencyCount,
                  gsmpSessionStatAdjUpdateEvents,
                  gsmpEventSequenceNumber
                  }
        STATUS current
        DESCRIPTION
            "When it has been enabled, this notification is
            generated when an Adjacency Update Event occurs.

            The gsmpSessionAdjacencyCount contains the new value of
            the number of adjacencies
            that are established with controllers and the switch
            partition that is used for this session.

            The notification indicates a change in the value of
            gsmpSessionStatAdjUpdateEvents.

            The session to which this notification
            applies is identified by the gsmpSessionThisSideId and
            gsmpSessionFarSideId which could be inferred from the
            Object Identifier of the gsmpSessionAdjacencyCount
            or the gsmpSessionStatAdjUpdateEvents object contained
            in the notification."
    ::= { gsmpNotifications 10 }
    --**************************************************************
    -- GSMP Compliance
    --**************************************************************

    gsmpGroups            OBJECT IDENTIFIER ::= { gsmpConformance 1 }
    gsmpCompliances       OBJECT IDENTIFIER ::= { gsmpConformance 2 }

    gsmpModuleCompliance MODULE-COMPLIANCE
        STATUS current
        DESCRIPTION
            "The compliance statement for agents that support
            the GSMP MIB."
        MODULE -- this module
        MANDATORY-GROUPS { gsmpGeneralGroup
                            }
        GROUP gsmpControllerGroup
        DESCRIPTION
            "This group is mandatory for all Switch
            Controllers"

        GROUP gsmpSwitchGroup
        DESCRIPTION
            "This group is mandatory for all Switches"

        GROUP gsmpAtmEncapGroup
        DESCRIPTION
            "This group must be supported if ATM is used for GSMP
            encapsulation. "

        GROUP gsmpTcpIpEncapGroup
        DESCRIPTION
            "This group must be supported if TCP/IP is used for GSMP
            encapsulation. "

        OBJECT gsmpTcpIpEncapAddressType
        SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2),
                                 ipv4z(3), ipv6z(4) }
        DESCRIPTION
           "An implementation is only required to support
            ’unknown(0)’, and IPv4 addresses. Supporting addresses with
            zone index or IPv6 addresses are optional. Defining
            Internet addresses by using DNS domain names are not
            allowed."

        OBJECT gsmpTcpIpEncapAddress
        SYNTAX InetAddress (SIZE(0|4|8|16|20))
        DESCRIPTION
           "An implementation is only required to support
```

```
              IPv4 addresses. Supporting addresses with zone index or IPv6
              addresses are optional."

           GROUP gsmpNotificationObjectsGroup
           DESCRIPTION
               "This group must be supported if notifications
               are supported. "

           GROUP gsmpNotificationsGroup
           DESCRIPTION
               "This group must be supported if notifications
               are supported. "

           ::= { gsmpCompliances 1 }

       -- units of conformance

       gsmpGeneralGroup OBJECT-GROUP
           OBJECTS {
           gsmpSessionVersion,
           gsmpSessionTimer,
           gsmpSessionPartitionId,
           gsmpSessionAdjacencyCount,
           gsmpSessionFarSideName,
           gsmpSessionFarSidePort,
           gsmpSessionFarSideInstance,
           gsmpSessionLastFailureCode,
           gsmpSessionDiscontinuityTime,
           gsmpSessionStartUptime,
           gsmpSessionStatSentMessages,
           gsmpSessionStatFailureInds,
           gsmpSessionStatReceivedMessages,
           gsmpSessionStatReceivedFailures,
           gsmpSessionStatPortUpEvents,
           gsmpSessionStatPortDownEvents,
           gsmpSessionStatInvLabelEvents,
           gsmpSessionStatNewPortEvents,
           gsmpSessionStatDeadPortEvents,
           gsmpSessionStatAdjUpdateEvents
           }
           STATUS current
           DESCRIPTION
                "Objects that apply to all GSMP implementations."
           ::= { gsmpGroups 1 }

       gsmpControllerGroup OBJECT-GROUP
           OBJECTS {
           gsmpControllerMaxVersion,
           gsmpControllerTimer,
           gsmpControllerPort,
           gsmpControllerInstance,
           gsmpControllerPartitionType,
           gsmpControllerPartitionId,
           gsmpControllerDoResync,
           gsmpControllerNotificationMap,
           gsmpControllerSessionState,
           gsmpControllerStorageType,
           gsmpControllerRowStatus
           }
          STATUS       current
          DESCRIPTION
                "Objects that apply GSMP implementations of
                Switch Controllers."
          ::= { gsmpGroups 2 }

       gsmpSwitchGroup OBJECT-GROUP
           OBJECTS {
           gsmpSwitchMaxVersion,
           gsmpSwitchTimer,
           gsmpSwitchName,
           gsmpSwitchPort,
           gsmpSwitchInstance,
           gsmpSwitchPartitionType,
           gsmpSwitchPartitionId,
           gsmpSwitchNotificationMap,
           gsmpSwitchSwitchType,
           gsmpSwitchWindowSize,
           gsmpSwitchSessionState,
           gsmpSwitchStorageType,
           gsmpSwitchRowStatus
           }
          STATUS       current
          DESCRIPTION
                "Objects that apply GSMP implementations of
                Switches."
          ::= { gsmpGroups 3 }

       gsmpAtmEncapGroup OBJECT-GROUP
           OBJECTS {
           gsmpAtmEncapIfIndex,
           gsmpAtmEncapVpi,
           gsmpAtmEncapVci,
           gsmpAtmEncapStorageType,
           gsmpAtmEncapRowStatus
           }
          STATUS       current
          DESCRIPTION
                "Objects that apply to GSMP implementations that
                supports ATM for GSMP encapsulation."
          ::= { gsmpGroups 4 }

       gsmpTcpIpEncapGroup OBJECT-GROUP
           OBJECTS {
           gsmpTcpIpEncapAddressType,
           gsmpTcpIpEncapAddress,
           gsmpTcpIpEncapPortNumber,
           gsmpTcpIpEncapStorageType,
           gsmpTcpIpEncapRowStatus
           }
          STATUS       current
          DESCRIPTION
                "Objects that apply to GSMP implementations that
                supports TCP/IP for GSMP encapsulation."
          ::= { gsmpGroups 5 }

        gsmpNotificationObjectsGroup OBJECT-GROUP
           OBJECTS {
           gsmpEventPort,
           gsmpEventPortSessionNumber,
           gsmpEventSequenceNumber,
           gsmpEventLabel
           }
          STATUS       current
          DESCRIPTION
                "Objects that are contained in the notifications."
          ::= { gsmpGroups 6 }

       gsmpNotificationsGroup NOTIFICATION-GROUP
           NOTIFICATIONS {
           gsmpSessionDown,
           gsmpSessionUp,
           gsmpSentFailureInd,
           gsmpReceivedFailureInd,
           gsmpPortUpEvent,
           gsmpPortDownEvent,
           gsmpInvalidLabelEvent,
           gsmpNewPortEvent,
           gsmpDeadPortEvent,
           gsmpAdjacencyUpdateEvent
           }
          STATUS current
          DESCRIPTION
                "The notifications which indicate specific changes
                in the value of objects gsmpSessionTable"
          ::= { gsmpGroups 7 }

   END
```

5. Acknowledgments

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6. References

[RFC1155] Rose, M. and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.

[RFC1212] Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.

[RFC1215] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

[RFC1157] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

[RFC1901] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.

[RFC1905] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.

[RFC1906] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.

[RFC1987] Newman, P, Edwards, W., Hinden, R., Hoffman, E., Ching Liaw, F., Lyon, T. and Minshall, G., "Ipsilon’s General Switch Management Protocol Specification," Version 1.1, RFC 1987, August 1996.

[RFC2021] Waldbusser, S., "Remote Network Monitoring Management Information Base Version 2 using SMIv2", RFC 2021, January 1997.

[RFC2026] Bradner, S., "The Internet Standards Process - Revision 3", BCP 9, RFC 2026, October 1996.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2397] Newman, P, Edwards, W., Hinden, R., Hoffman, E., Ching Liaw, F., Lyon, T. and Minshall, G., "Ipsilon’s General Switch Management Protocol Specification," Version 2.0, RFC 2397, March 1998.

[RFC2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs.", BCP 26, RFC 2434, October 1998.

[RFC2514] Noto, M., E. Spiegel, K. Tesink, "Definition of Textual Conventions and OBJECT-IDENTITIES for ATM Management", RFC 2514, February 1999.

[RFC2570] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction to Version 3 of the Internet-standard Network Management Framework", RFC 2570, April 1999.

[RFC2571] Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.

[RFC2572] Case, J., Harrington D., Presuhn R. and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.

[RFC2573] Levi, D., Meyer, P. and B. Stewart, "SNMP Applications", RFC 2573, April 1999.

[RFC2574] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

[RFC2575] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB" RFC 2863, June 2000.

[RFC3291] Daniele, M., Haberman, B., Routhier, S. and J., Schoenwaelder "Textual Conventions for Internet Network Addresses", RFC 3291, May 2002.

[RFC3292] Doria, A., Hellstrand, F., Sundell, K. and T. Worster, "General Switch Management Protocol V3", RFC 3292, June 2002.

[RFC3293] Worster, T., Doria, A. and J. Buerkle, "General Switch Management Protocol (GSMP) Packet Encapsulations for Asynchronous Transfer Mode (ATM), Ethernet and Transmission Control Protocol (TCP)", RFC 3293, June 2002.

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8. Security Considerations

Assuming that secure network management (such as SNMP v3) is implemented, the objects represented in this MIB do not pose a threat to the security of the network.

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

There are a number of managed objects in this MIB that may contain sensitive information. They are contained in the gsmpControllerTable and gsmpSwitchTable. 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.

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects, only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

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