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D. Zinman
D. Walker
J. Jiang
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Management Information Base
for Telephony Routing over IP (TRIP)

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) module for use with network management protocols in the Internet community. In particular, it describes a set of managed objects that are used to manage Telephony Routing over IP (TRIP) devices.

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1. 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 module objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in this MIB module 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].

2. 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 a set of managed objects that are used to schedule management operations periodically or at specified dates and times. Since TRIP [RFC3219] is modeled after the Border Gateway Protocol (BGP-4) [RFC1771], the managed objects for TRIP are also modeled after RFC1657 - Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2 [RFC1657].

3. Conventions used in this document

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 BCP 14, RFC 2119 [RFC2119].

4. Overview

This MIB module provides managed objects for TRIP devices defined in Telephony Routing over IP [RFC3219]. TRIP is an inter-domain application-layer control protocol that exchanges information between TRIP location servers (LS) to provide efficient IP telephony routing.

5. Structure of TRIP MIB

This MIB module utilizes the framework described in RFC 2788 [RFC2788] for management of multiple instances of TRIP from a single entity. The Network Services Monitoring MIB module applTable will be populated with entries corresponding to each TRIP Location Server

in the system. Each TRIP Location Server will then have an applIndex associated with it. The value assigned to applIndex will represent the distinct instance of TRIP.

The TRIP MIB module contains the following groups of objects with each group as part of the management of a singular TRIP entity. Each group covers a section of functionality of TRIP:

- o The tripConfigGroup contains the common configuration objects applicable to all TRIP applications referenced by the applIndex.
- o The tripPeerTableConfigGroup contains the configuration objects applicable to all TRIP peers of the Location Server referenced by the applIndex.
- o The tripRouteGroup contains the configuration objects related to the routes of all TRIBs of this Location Server.
- o The tripItadTopologyGroup contains information about the topology of the TRIP ITADs concerning this Location Server.
- o The tripPeerTableStatsGroup contains the statistical objects applicable to all TRIP peers of the Location Server referenced by the applIndex.
- o The tripNotificationGroup contains notifications that the TRIP application can generate.
- o The tripNotifObjectGroup contains the objects needed by one or more of the notifications.

5.1. Textual Conventions

The data types TripItad and TripId are used as textual conventions in this document. A TRIP ITAD (IP Telephony Administrative Domain) is described in [RFC3219]. A TRIP ID is used as a distinct identifier for a TRIP Location Server. A TripAppProtocol is used to identify an application protocol. A TripAddressFamily is used to define an address family. TripCommunityId is used as a distinct identifier for a TRIP community. TripProtocolVersion depicts the version number of the TRIP protocol. TripSendReceiveMode describes the operational mode of the TRIP application.

6. Definitions

6.1. TRIP Textual Conventions

```
TRIP-TC-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY,  
    Unsigned32,  
    Integer32,  
    mib-2  
        FROM SNMPv2-SMI           -- [RFC2578]
```

```
TEXTUAL-CONVENTION  
    FROM SNMPv2-TC;           -- [RFC2579]
```

```
tripTC MODULE-IDENTITY
```

```
LAST-UPDATED      "200409020000Z" -- Sep 02, 2004  
ORGANIZATION     "IETF IPTel Working Group.
```

```
    Mailing list: iptel@lists.bell-labs.com"
```

```
CONTACT-INFO
```

```
    "Co-editor  David Zinman  
     postal:   265 Ridley Blvd.  
                Toronto ON, M5M 4N8  
                Canada  
     email:    dzinman@rogers.com  
     phone:    +1 416 433 4298
```

```
    Co-editor: David Walker  
              Sedna Wireless Inc.  
     postal:  495 March Road, Suite 500  
              Ottawa, ON K2K 3G1  
              Canada  
     email:   david.walker@sedna-wireless.com  
     phone:   +1 613 878 8142
```

```
    Co-editor  Jianping Jiang  
              Syndesis Limited  
     postal:  30 Fulton Way  
              Richmond Hill, ON L4B 1J5  
              Canada
```

```
     email:   jjiang@syndesis.com  
     phone:   +1 905 886-7818 x2515  
     "
```

```
DESCRIPTION
```

```
    "Initial version of TRIP (Telephony Routing Over IP)  
     MIB Textual Conventions module used by other
```

TRIP-related MIB Modules.

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REVISION "200409020000Z" -- Sep 02, 2004

DESCRIPTION

"The initial version, Published as RFC 3872."

::= { mib-2 115 }

--

-- Textual Conventions

--

TripItad ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The values for identifying the IP Telephony Administrative Domain (ITAD)."

SYNTAX Unsigned32 (0..4294967295)

TripId ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The TRIP Identifier uniquely identifies a LS within its ITAD. It is a 4 octet unsigned integer that may, but not necessarily, represent the IPv4 address of a Location Server. Where bytes 1-4 of the Unsigned32 represent 1-4 bytes of the IPv4 address in network-byte order. For an IPv6 network, TripId will not represent the IPv6 address."

SYNTAX Unsigned32 (0..4294967295)

TripAddressFamily ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A type of address for a TRIP route. Address families defined within this MIB module are:

Code	Address Family
1	Decimal Routing Numbers
2	PentaDecimal Routing Numbers
3	E.164 Numbers
255	An other type of address family"

SYNTAX INTEGER

{ decimal(1), pentadecimal(2), e164(3), other(255) }

```
TripAppProtocol ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION
    "The application protocol used for communication with TRIP
     Location Servers. Protocols defined in this MIB Module
     are:
      Code          Protocol
      1             SIP
      2             H.323-H.225.0-Q.931
      3             H.323-H.225.0-RAS
      4             H.323-H.225.0-Annex-G
      255           An other type of application protocol"

  SYNTAX INTEGER
    { sip(1), q931(2), ras(3), annexG(4), other(255) }

TripCommunityId ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION
    "The range of legal values for a TRIP Community
     Identifier."
  SYNTAX Unsigned32 (0..4294967295)

TripProtocolVersion ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION
    "The version number of the TRIP protocol."
  SYNTAX Integer32 (1..255)

TripSendReceiveMode ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION
    "The operational mode of the TRIP application. Possible
     values are:
      1 - Send Receive mode
      2 - Send only mode
      3 - Receive Only mode"
  SYNTAX INTEGER { sendReceive(1), sendOnly(2), receiveOnly(3) }

END
```

6.2. TRIP MIB

```
TRIP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY,
    OBJECT-TYPE,
    NOTIFICATION-TYPE,
    Unsigned32,
    Integer32,
    Counter32,
    mib-2
        FROM SNMPv2-SMI          -- [RFC2578]

    DateAndTime,
    TimeInterval,
    TruthValue,
   TimeStamp,
    StorageType,
    RowStatus
        FROM SNMPv2-TC          -- [RFC2579]

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

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

    applIndex,
    applRFC2788Group
        FROM NETWORK-SERVICES-MIB -- [RFC2788]

    TripItad,
    TripId,
    TripAppProtocol,
    TripAddressFamily,
    TripCommunityId,
    TripProtocolVersion,
    TripSendReceiveMode
        FROM TRIP-TC-MIB          -- [RFC3872]

tripMIB MODULE-IDENTITY
LAST-UPDATED "200409020000Z" -- Sep 02, 2004
ORGANIZATION "IETF IPTel Working Group."
```

Mailing list: iptel@lists.bell-labs.com"

CONTACT-INFO

"Co-editor David Zinman
postal: 265 Ridley Blvd.
Toronto ON, M5M 4N8
Canada
email: dzinman@rogers.com
phone: +1 416 433 4298

Co-editor: David Walker
Sedna Wireless Inc.
postal: 495 March Road, Suite 500
Ottawa, ON K2K 3G1
Canada
email: david.walker@sedna-wireless.com
phone: +1 613 878 8142

Co-editor Jianping Jiang
Syndesis Limited
postal: 30 Fulton Way
Richmond Hill, ON L4B 1J5
Canada

email: jjiang@syndesis.com
phone: +1 905 886-7818 x2515
"

DESCRIPTION

"The MIB module describing Telephony Routing over IP (TRIP). TRIP is a policy driven inter-administrative domain protocol for advertising the reachability of telephony destinations between location servers (LS), and for advertising attributes of the routes to those destinations.

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REVISION "200409020000Z" -- Sep 02, 2004

DESCRIPTION

"The initial version, Published as RFC 3872."

::= { mib-2 116 }

tripMIBNotifications OBJECT IDENTIFIER ::= { tripMIB 0 }
tripMIBObjects OBJECT IDENTIFIER ::= { tripMIB 1 }
tripMIBConformance OBJECT IDENTIFIER ::= { tripMIB 2 }
tripMIBNotifObjects OBJECT IDENTIFIER ::= { tripMIB 3 }

```

tripMIBCompliances      OBJECT IDENTIFIER ::= { tripMIBConformance 1 }
tripMIBGroups           OBJECT IDENTIFIER ::= { tripMIBConformance 2 }

--
-- tripCfgTable
--
tripCfgTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripCfgEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains the common configuration objects
         applicable to all TRIP applications referenced by the
         applIndex. Each row represents those objects for a
         particular TRIP LS present in this system. The
         instances of TRIP LS's are uniquely identified by the
         applIndex. The objects in this table SHOULD be
         nonVolatile and survive a reboot."
    ::= { tripMIBObjects 1 }

tripCfgEntry OBJECT-TYPE
    SYNTAX      TripCfgEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A row of common configuration."
    INDEX { applIndex }
    ::= { tripCfgTable 1 }

TripCfgEntry ::= SEQUENCE {
    tripCfgProtocolVersion      TripProtocolVersion,
    tripCfgItad                 TripItad,
    tripCfgIdentifier          TripId,
    tripCfgAdminStatus          INTEGER,
    tripCfgOperStatus           INTEGER,
    tripCfgAddrIAddrType       InetAddressType,
    tripCfgAddr                 InetAddress,
    tripCfgPort                 InetPortNumber,
    tripCfgMinItadOriginationInterval Unsigned32,
    tripCfgMinRouteAdvertisementInterval Unsigned32,
    tripCfgMaxPurgeTime         Unsigned32,
    tripCfgDisableTime          Unsigned32,
    tripCfgSendReceiveMode      TripSendReceiveMode,
    tripCfgStorage               StorageType
}

```

```

tripCfgProtocolVersion      OBJECT-TYPE
    SYNTAX      TripProtocolVersion
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object will reflect the version of TRIP
         supported by this system. It follows the same
         format as TRIP version information contained
         in the TRIP messages generated by this TRIP entity."
    REFERENCE
        "RFC 3219, section 4.2."
    ::= { tripCfgEntry 1 }

tripCfgItad      OBJECT-TYPE
    SYNTAX      TripItad
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The Internet Telephony Administrative domain (ITAD)
         of this LS."
    ::= { tripCfgEntry 2 }

tripCfgIdentifier   OBJECT-TYPE
    SYNTAX      TripId
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The object that identifies this TRIP Client."
    ::= { tripCfgEntry 3 }

tripCfgAdminStatus OBJECT-TYPE
    SYNTAX      INTEGER {
        up(1),
        down(2)
    }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The desired TRIP state.

        up(1) : Set the application to normal operation.

        down(2): Set the application to a state where it will
                  not process TRIP messages.

        Setting this object should be reflected in
        tripCfgOperStatus. If an unknown error occurs
        tripCfgOperStatus will return unknown(0)."

```

```

 ::= { tripCfgEntry 4 }

tripCfgOperStatus OBJECT-TYPE
  SYNTAX      INTEGER {
                unknown(0),
                up(1),
                down(2),
                faulty(3)
              }
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The current operational state of the TRIP protocol.

    unknown(0): The operating status of the application is
                 unknown.

    up(1):       The application is operating normally, and
                 is ready to process (receive and issue) TRIP
                 requests and responses.

    down(2):     The application is currently not processing
                 TRIP messages. This occurs if the TRIP
                 application is in an initialization state or
                 if tripCfgAdminStatus is set to down(2).

    faulty(3):   The application is not operating normally due
                 to a fault in the system.

  If tripCfgAdminStatus is down(2) then tripOperStatus SHOULD
  be down(2). If tripAdminStatus is changed to up(1) then
  tripOperStatus SHOULD change to up(1) if there is no
  fault that prevents the TRIP protocol from moving to the
  up(1) state."
 ::= { tripCfgEntry 5 }

tripCfgAddrIAddrType OBJECT-TYPE
  SYNTAX      InetAddressType
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The type of Inet Address of the tripAddr."
  REFERENCE
    "RFC 3291, section 3."
 ::= { tripCfgEntry 6 }

tripCfgAddr OBJECT-TYPE
  SYNTAX      InetAddress

```

```

MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The network address of the local LS that the peer
     connects to. The type of address depends on the object
     tripCfgAddrIAddrType. The type of this address is
     determined by the value of the
     tripCfgAddrIAddrType object."
REFERENCE
    "RFC 3291, section 3."
::= { tripCfgEntry 7 }

tripCfgPort OBJECT-TYPE
SYNTAX      InetPortNumber
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The local tcp/udp port on the local LS that the peer
     connects to."
::= { tripCfgEntry 8 }

tripCfgMinItadOriginationInterval OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
UNITS       "Seconds"
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The minimum amount of time that MUST elapse between
     advertisement of the update message that reports changes
     within the LS's own ITAD."
DEFVAL { 30 }
::= { tripCfgEntry 9 }

tripCfgMinRouteAdvertisementInterval OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
UNITS       "Seconds"
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "Specifies minimal interval between successive
     advertisements to a particular destination from an LS."
DEFVAL { 30 }
::= { tripCfgEntry 10 }

tripCfgMaxPurgeTime OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
UNITS       "Seconds"
MAX-ACCESS  read-write

```

```

STATUS      current
DESCRIPTION
    "Indicates the interval that the LS MUST maintain routes
     marked as withdrawn in its database."
DEFVAL { 10 }
 ::= { tripCfgEntry 11 }

tripCfgDisableTime OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
UNITS       "Seconds"
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "Indicates the interval that the TRIP module of the
     LS MUST be disabled while routes originated by this
     LS with high sequence numbers can be removed."
DEFVAL { 180 }
 ::= { tripCfgEntry 12 }

tripCfgSendReceiveMode OBJECT-TYPE
SYNTAX TripSendReceiveMode
MAX-ACCESS read-only
STATUS      current
DESCRIPTION
    "The operational mode of the TRIP entity running on this
     system."
 ::= { tripCfgEntry 13 }

tripCfgStorage OBJECT-TYPE
SYNTAX      StorageType
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The storage type for this conceptual row. Conceptual rows
     having the value 'permanent' need not allow write-access
     to any columnar objects in the row."
DEFVAL { nonVolatile }
 ::= { tripCfgEntry 14 }

-- 
-- TripRouteTypeTable
--

tripRouteTypeTable OBJECT-TYPE
SYNTAX      SEQUENCE OF TripRouteTypeEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

```

"The TRIP peer Route Type table contains one entry per
supported protocol - address family pair. The objects in
this table are volatile and are refreshed after a reboot."
 ::= { tripMIBObjects 2 }

tripRouteTypeEntry OBJECT-TYPE
  SYNTAX      TripRouteTypeEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "An entry containing information about the route type
     that a particular TRIP entity supports. Each entry
     represents information about either the local or a remote
     LS peer. The object tripRouteTypePeer is used to
     distinguish this. In the case of a local LS, the
     address/port information will reflect the values
     configured in tripCfgTable. In the case of a remote
     peer, the address/port information will reflect the
     values of an entry in the tripPeerTable.

Implementation need to be aware that if the size of
tripRouteTypeAddr exceeds 111 sub-IDs, then OIDs of column
instances in this table will have more than 128 sub-IDs
and cannot be accessed using SNMPv1, SNMPv2c, or snmpv3."
INDEX { applIndex,
         tripRouteTypeAddrInetType,
         tripRouteTypeAddr,
         tripRouteTypePort,
         tripRouteTypeProtocolId,
         tripRouteTypeAddrFamilyId }
 ::= { tripRouteTypeTable 1 }

TripRouteTypeEntry ::= SEQUENCE {
  tripRouteTypeAddrInetType      InetAddressType,
  tripRouteTypeAddr             InetAddress,
  tripRouteTypePort              InetPortNumber,
  tripRouteTypeProtocolId       TripAppProtocol,
  tripRouteTypeAddrFamilyId     TripAddressFamily,
  tripRouteTypePeer              INTEGER
}

tripRouteTypeAddrInetType OBJECT-TYPE
  SYNTAX      InetAddressType
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The type of Inet Address of the tripRouteTypeAddr."
  REFERENCE

```

```

"RFC 3291, section 3."
 ::= { tripRouteTypeEntry 1 }

tripRouteTypeAddr OBJECT-TYPE
  SYNTAX          InetAddress
  MAX-ACCESS     not-accessible
  STATUS         current
  DESCRIPTION
    "The network address of this entry's TRIP peer LS. The
     type of this address is determined by the value of the
     tripRouteTypeAddrInetType object."
  REFERENCE
    "RFC 3291, section 3."
  ::= { tripRouteTypeEntry 2 }

tripRouteTypePort OBJECT-TYPE
  SYNTAX          InetPortNumber
  MAX-ACCESS     not-accessible
  STATUS         current
  DESCRIPTION
    "The port for the TCP connection between this and
     an associated TRIP peer."
  ::= { tripRouteTypeEntry 3 }

tripRouteTypeProtocolId OBJECT-TYPE
  SYNTAX          TripAppProtocol
  MAX-ACCESS     not-accessible
  STATUS         current
  DESCRIPTION
    "The object identifier of a protocol that the associated
     peer is using."
  ::= { tripRouteTypeEntry 4 }

tripRouteTypeAddrFamilyId OBJECT-TYPE
  SYNTAX          TripAddressFamily
  MAX-ACCESS     not-accessible
  STATUS         current
  DESCRIPTION
    "The object identifier of an address family that the
     associated peer belongs to."
  ::= { tripRouteTypeEntry 5 }

tripRouteTypePeer OBJECT-TYPE
  SYNTAX          INTEGER { local(1), remote(2) }
  MAX-ACCESS     read-only
  STATUS         current
  DESCRIPTION
    "This object identifies whether this entry is

```

```

        associated with a 'local' or 'remote' LS peer."
 ::= { tripRouteTypeEntry 6 }

--  

-- tripSupportedCommunityTable  

--  

tripSupportedCommunityTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripSupportedCommunityEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The list of TRIP communities that this LS supports. A
         TRIP community is a group of destinations that share
         common properties.

The TRIP Supported Communities entry is used to group
destinations so that the routing decision can be based
on the identity of the group."
REFERENCE
    "RFC 3219, section 5.9"
 ::= { tripMIBObjects 3 }

tripSupportedCommunityEntry OBJECT-TYPE
    SYNTAX      TripSupportedCommunityEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Entry containing information about a community. A TRIP
         community is a group of destinations that share some
         common property. This attribute is used so that routing
         decisions can be based on the identity of the group."
INDEX { applIndex, tripSupportedCommunityId }
 ::= { tripSupportedCommunityTable 1 }

TripSupportedCommunityEntry ::= SEQUENCE {
    tripSupportedCommunityId          TripCommunityId,
    tripSupportedCommunityItad        TripItad,
    tripSupportedCommunityStorage     StorageType,
    tripSupportedCommunityRowStatus   RowStatus
}

tripSupportedCommunityId OBJECT-TYPE
    SYNTAX      TripCommunityId
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The identifier of the supported Community."

```

```

 ::= { tripSupportedCommunityEntry 1 }

tripSupportedCommunityItad OBJECT-TYPE
    SYNTAX      TripItad
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The ITAD of the community."
    ::= { tripSupportedCommunityEntry 2 }

tripSupportedCommunityStorage OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The storage type for this conceptual row. Conceptual
         rows having the value 'permanent' need not allow write-
         access to any columnar objects in the row. It is not a
         requirement that this storage be non volatile."
    DEFVAL { nonVolatile }
    ::= { tripSupportedCommunityEntry 3 }

tripSupportedCommunityRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The row status of the entry. This object is REQUIRED
         to create or delete rows by a manager. A value for
         tripSupportedCommunityItad MUST be set for row creation
         to be successful. If the instance already exists for a
         particular applIndex, the row create operation will
         fail.

        The value of this object has no effect on whether
        other objects in this conceptual row can be modified."
    ::= { tripSupportedCommunityEntry 4 }

-- 
-- TripPeerTable
--
tripPeerTable   OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripPeerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The TRIP peer table. This table contains one entry per
         TRIP peer, and information about the connection with

```

```

        the peer."
 ::= { tripMIBObjects 4 }

tripPeerEntry OBJECT-TYPE
    SYNTAX      TripPeerEntry
    MAX-ACCESS  not-accessible
    STATUS     current
    DESCRIPTION
        "Entry containing information about the connection with
         a TRIP peer.

Implementation need to be aware that if the size of
tripPeerRemoteAddr exceeds 113 sub-IDs, then OIDs of
column instances in this table will have more than 128
sub-IDs and cannot be accessed using SNMPv1, SNMPv2c, or
snmpv3."
INDEX { applIndex,
        tripPeerRemoteAddrInetType,
        tripPeerRemoteAddr,
        tripPeerRemotePort }
 ::= {tripPeerTable 1}

TripPeerEntry ::= SEQUENCE {
    tripPeerRemoteAddrInetType          InetAddressType,
    tripPeerRemoteAddr                 InetAddress,
    tripPeerRemotePort                InetPortNumber,
    tripPeerIdentifier               TripId,
    tripPeerState                     INTEGER,
    tripPeerAdminStatus              INTEGER,
    tripPeerNegotiatedVersion        TripProtocolVersion,
    tripPeerSendReceiveMode          TripSendReceiveMode,
    tripPeerRemoteItad               TripItad,
    tripPeerConnectRetryInterval     Unsigned32,
    tripPeerMaxRetryInterval         Unsigned32,
    tripPeerHoldTime                 Unsigned32,
    tripPeerKeepAlive                Unsigned32,
    tripPeerHoldTimeConfigured       Unsigned32,
    tripPeerKeepAliveConfigured      Unsigned32,
    tripPeerMaxPurgeTime             Unsigned32,
    tripPeerDisableTime              Unsigned32,
    tripPeerLearned                  TruthValue,
    tripPeerStorage                  StorageType,
    tripPeerRowStatus                RowStatus
}

tripPeerRemoteAddrInetType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible

```

```
STATUS      current
DESCRIPTION
    "The type of Inet Address of the tripPeerRemoteAddr."
REFERENCE
    "RFC 3291, section 3."
::= { tripPeerEntry 1 }

tripPeerRemoteAddr OBJECT-TYPE
SYNTAX      InetAddress
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The IP address of this entry's TRIP peer LS. The type of
this address is determined by the value of the
tripPeerRemoteAddrInetType object."
REFERENCE
    "RFC 3291, section 3."
::= { tripPeerEntry 2 }

tripPeerRemotePort OBJECT-TYPE
SYNTAX      InetPortNumber
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The remote port for the TCP connection between the
TRIP peers."
::= { tripPeerEntry 3 }

tripPeerIdentifier OBJECT-TYPE
SYNTAX      TripId
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "TRIP identifier of the peer."
::= { tripPeerEntry 4 }

tripPeerState OBJECT-TYPE
SYNTAX      INTEGER {
            idle(1),
            connect(2),
            active(3),
            openSent(4),
            openConfirm(5),
            established(6)
        }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

```

"TRIP Peer Finite State Machine state.

idle(1)      : The initial state. Local LS refuses all
                incoming connections. No application
                resources are allocated to processing
                information about the remote peer.

connect(2)    : Local LS waiting for a transport
                protocol connection to be completed to
                the peer, and is listening for inbound
                transport connections from the peer.

active(3)     : Local LS is listening for an inbound
                connection from the peer, but is not in
                the process of initiating a connection
                to the remote peer.

openSent(4)   : Local LS has sent an OPEN message to its
                peer and is waiting for an OPEN message
                from the remote peer.

openConfirm(5): Local LS has sent an OPEN message to the
                remote peer, received an OPEN message from
                the remote peer, and sent a KEEPALIVE
                message in response to the OPEN. The local
                LS is now waiting for a KEEPALIVE message
                or a NOTIFICATION message in response to
                its OPEN message.

established(6): LS can exchange UPDATE, NOTIFICATION, and
                KEEPALIVE messages with its peer."
::= { tripPeerEntry 5 }

tripPeerAdminStatus OBJECT-TYPE
  SYNTAX      INTEGER {
                up(1),
                down(2)
            }
  MAX-ACCESS  read-create
  STATUS      current
  DESCRIPTION
    "This object is used to affect the TRIP connection
     state.

  up(1)      : Allow a connection with the peer LS.

  down(2)    : disconnect the connection from the peer LS and
               do not allow any further connections to this

```

peer.

If this value is set to down(2) then tripPeerState will have the value of idle(1)."

DEFVAL { up }
 ::= { tripPeerEntry 6 }

tripPeerNegotiatedVersion OBJECT-TYPE
 SYNTAX TripProtocolVersion
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The negotiated version of TRIP running between this local entity and this peer."
 ::= { tripPeerEntry 7 }

tripPeerSendReceiveMode OBJECT-TYPE
 SYNTAX TripSendReceiveMode
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The operational mode of this peer."
 ::= { tripPeerEntry 8 }

tripPeerRemoteItad OBJECT-TYPE
 SYNTAX TripItad
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The Internet Telephony Administrative domain of this peer."
 ::= { tripPeerEntry 9 }

tripPeerConnectRetryInterval OBJECT-TYPE
 SYNTAX Unsigned32 (0..2147483647)
 UNITS "Seconds"
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "Specifies the initial amount of time that will elapse between connection retry. This value SHOULD double after each attempt up to the value of tripPeerMaxRetryInterval. This value MUST always be less than or equal to the value of tripPeerMaxRetryInterval. Attempts to set this value higher than the max retry will not be allowed."
 DEFVAL { 120 }
 ::= { tripPeerEntry 10 }

```
tripPeerMaxRetryInterval OBJECT-TYPE
    SYNTAX      Unsigned32 (0..2147483647)
    UNITS       "Seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "Specifies the maximum amount of time that will elapse
         between connection retries. Once the value of
         tripPeerConnectRetryInterval has reached this value, no
         more retries will be attempted. Attempts to set this
         value lower than the retry interval SHOULD not be
         allowed."
    DEFVAL     { 360 }
    ::= { tripPeerEntry 11 }

tripPeerHoldTime OBJECT-TYPE
    SYNTAX      Unsigned32 (1..2147483647)
    UNITS       "Seconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The time interval in seconds for the hold timer that
         is established with the peer. The value of this object
         is the smaller of the values in
         tripPeerHoldTimeConfigured and the hold time received
         in the open message."
    ::= { tripPeerEntry 12 }

tripPeerKeepAlive OBJECT-TYPE
    SYNTAX      Unsigned32 (1..2147483647)
    UNITS       "Seconds"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Specifies the amount of time that MUST elapse between
         keep alive messages. This value is negotiated with the
         remote when a connection is established."
    ::= { tripPeerEntry 13 }

tripPeerHoldTimeConfigured OBJECT-TYPE
    SYNTAX      Unsigned32 (0 | 3..65535)
    UNITS       "Seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "Specifies the maximum time that MAY elapse between the
         receipt of successive keepalive or update message. A value
         of 0 means that keepalive or update messages will not be
```

```
        sent."
DEFVAL { 240 }
 ::= { tripPeerEntry 14 }

tripPeerKeepAliveConfigured OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
UNITS       "Seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "Specifies the amount of time that MUST elapse between
     keep alive messages."
DEFVAL { 30 }
 ::= { tripPeerEntry 15 }

tripPeerMaxPurgeTime OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
UNITS       "Seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "Indicates the interval that the LS MUST maintain routes
     marked as withdrawn in its database."
DEFVAL { 10 }
 ::= { tripPeerEntry 16 }

tripPeerDisableTime OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
UNITS       "Seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "Indicate the interval that the TRIP module of the remote
     peer LS MUST be disabled while routes originated by the
     local LS with high sequence numbers can be removed."
DEFVAL { 180 }
 ::= { tripPeerEntry 17 }

tripPeerLearned OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Indicates whether this entry was learned or
     configured."
DEFVAL { false }
 ::= { tripPeerEntry 18 }
```

```

tripPeerStorage OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The storage type for this conceptual row. Conceptual
         rows having the value 'permanent' need not allow write-
         access to any columnar objects in the row. It is not a
         requirement that this storage be non volatile."
    DEFVAL { nonVolatile }
    ::= { tripPeerEntry 19 }

tripPeerRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The row status of the entry. This object is REQUIRED to
         create or delete rows remotely by a manager. If the
         instance already exists for a particular applIndex, the
         row create operation will fail.

        The value of this object has no effect on whether
        other objects in this conceptual row can be modified.

        Entries in this table can be learned by the TRIP
        application, or provisioned through this table."
    ::= { tripPeerEntry 20 }

-- 
-- TripPeerStatisticsTable
--

tripPeerStatisticsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripPeerStatisticsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The TRIP peer stats table. This table contains one
         entry per remote TRIP peer, and statistics related to the
         connection with the remote peer. The objects in this
         table are volatile."
    ::= { tripMIBObjects 5 }

tripPeerStatisticsEntry OBJECT-TYPE
    SYNTAX      TripPeerStatisticsEntry
    MAX-ACCESS  not-accessible
    STATUS      current

```

```

DESCRIPTION
    "Entry containing information about the connection with
     a TRIP peer."
AUGMENTS { tripPeerEntry }
 ::= { tripPeerStatisticsTable 1 }

TripPeerStatisticsEntry ::= SEQUENCE {
    tripPeerInUpdates                  Counter32,
    tripPeerOutUpdates                 Counter32,
    tripPeerInTotalMessages            Counter32,
    tripPeerOutTotalMessages           Counter32,
    tripPeerFsmEstablishedTransitions Counter32,
    tripPeerFsmEstablishedTime        DateAndTime,
    tripPeerInUpdateElapsedTime       TimeInterval,
    tripPeerStateChangeTime           TimeStamp
}

tripPeerInUpdates OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of TRIP update messages received from this
         remote peer since the last restart of this location
         server."
    ::= { tripPeerStatisticsEntry 1 }

tripPeerOutUpdates OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of TRIP update messages sent to this remote
         peer since the last restart of this LS."
    ::= { tripPeerStatisticsEntry 2 }

tripPeerInTotalMessages OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of TRIP messages received from the
         remote peer on this connection since the last restart
         of this LS."
    ::= { tripPeerStatisticsEntry 3 }

tripPeerOutTotalMessages OBJECT-TYPE
    SYNTAX      Counter32

```

```

MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The total number of outgoing TRIP messages sent to the
     remote peer since the last restart of this LS."
 ::= { tripPeerStatisticsEntry 4 }

tripPeerFsmEstablishedTransitions OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of times the remote peer has transitioned
         into the established state since the last restart of this
         LS."
 ::= { tripPeerStatisticsEntry 5 }

tripPeerFsmEstablishedTime OBJECT-TYPE
    SYNTAX      DateAndTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the time and date that this remote peer entered
         the 'established' state."
 ::= { tripPeerStatisticsEntry 6 }

tripPeerInUpdateElapsedTime OBJECT-TYPE
    SYNTAX      TimeInterval
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Elapsed time in hundredths of seconds since the last
         TRIP update message was received from this remote peer."
 ::= { tripPeerStatisticsEntry 7 }

tripPeerStateChangeTime OBJECT-TYPE
    SYNTAX      TimeStamp
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of sysUpTime when the last state change of
         tripPeerState took place."
 ::= { tripPeerStatisticsEntry 8 }

-- TRIP Received Route Table. This table contains
-- all routes from all sources. Each entry consists
-- of a route and its associated path attributes.

```

```

tripRouteTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripRouteEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The TRIP route table containing information about
        reachable routes that are to be added to service by the
        receiving LS. The objects in this table are volatile
        and are refreshed when this LS rediscovers its route
        table."
 ::= { tripMIBObjects 6 }

tripRouteEntry OBJECT-TYPE
    SYNTAX      TripRouteEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a route to a called destination."
    INDEX { applIndex,
            tripRouteAppProtocol,
            tripRouteAddressFamily,
            tripRouteAddress,
            tripRoutePeer
        }
 ::= { tripRouteTable 1 }

TripRouteEntry ::= SEQUENCE {
    tripRouteAppProtocol          TripAppProtocol,
    tripRouteAddressFamily         TripAddressFamily,
    tripRouteAddress               OCTET STRING,
    tripRoutePeer                  TripId,
    tripRouteTRIBMask              BITS,
    tripRouteAddressSequenceNumber Unsigned32,
    tripRouteAddressOriginatorId   TripId,
    tripRouteNextHopServerIAddrType InetAddressType,
    tripRouteNextHopServer         InetAddress,
    tripRouteNextHopServerPort     InetPortNumber,
    tripRouteNextHopServerItad     TripItad,
    tripRouteMultiExitDisc         Unsigned32,
    tripRouteLocalPref              Unsigned32,
    tripRouteAdvertisementPath     OCTET STRING,
    tripRouteRoutedPath             OCTET STRING,
    tripRouteAtomicAggregate       TruthValue,
    tripRouteUnknown                OCTET STRING,
    tripRouteWithdrawn              TruthValue,
    tripRouteConverted              TruthValue,
    tripRouteReceivedTime           TimeStamp
}

```

```

tripRouteAppProtocol OBJECT-TYPE
  SYNTAX      TripAppProtocol
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The protocol for which this entry of the routing table
     is maintained."
 ::= { tripRouteEntry 1 }

tripRouteAddressFamily OBJECT-TYPE
  SYNTAX      TripAddressFamily
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "Specifies the type of address for the destination
     route."
 ::= { tripRouteEntry 2 }

tripRouteAddress OBJECT-TYPE
  SYNTAX      OCTET STRING (SIZE(1..105))
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "This is the address (prefix) of the family type given
     by Address Family of the destination. It is the prefix
     of addresses reachable from this gateway via the next
     hop server. The SIZE value of 105 has been assigned due
     to the sub identifier of object types length limitation
     as defined in SMIV2."
  REFERENCE
    "RFC 3219, section 5.1.1.1."
 ::= { tripRouteEntry 3 }

tripRoutePeer OBJECT-TYPE
  SYNTAX      TripId
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The identifier of the peer where the route information
     was learned."
 ::= { tripRouteEntry 4 }

tripRouteTRIBMask OBJECT-TYPE
  SYNTAX      BITS {
    adjTribIns(0),
    extTrib(1),
    locTrib(2),
    adjTribOut(3)
}

```

```

        }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Indicates which Telephony Routing Information Base (TRIB)
this entry belongs to. This is
a bit-map of possible types. If the bit has a value of
1, then the entry is a member of the corresponding TRIB
type. If the bit has a value of 0 then the entry is not
a member of the TRIP type. The various bit positions
are:

0    adjTribIns      The entry is of type adj-TRIBs-ins,
                      stores routing information that has
                      been learned from inbound UPDATE
                      messages.
1    extTrib          The entry is of type ext-TRIB, the
                      best route for a given destination.
2    locTrib          The entry is of type loc-TRIB contains
                      the local TRIP routing information
                      that the LS has selected.
3    adjTribOut       The entry is of type adj-TRIBs-out,
                      stores the information that the local
                      LS has selected for advertisement to
                      its external peers."
REFERENCE
    "RFC 3291, section 3.5."
::= { tripRouteEntry 5 }

tripRouteAddressSequenceNumber OBJECT-TYPE
    SYNTAX      Unsigned32 (1..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the version of the destination route
originated by the LS identified by
tripRouteAddressOriginatorId intra-domain attribute."
::= { tripRouteEntry 6 }

tripRouteAddressOriginatorId OBJECT-TYPE
    SYNTAX      TripId
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This is an intra-domain attribute indicating the
internal LS that originated the route into the ITAD."
::= { tripRouteEntry 7 }

```

```
tripRouteNextHopServerIAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of Inet Address of the tripRouteNextHopServer."
    REFERENCE
        "RFC 3291, section 3."
    ::= { tripRouteEntry 8 }

tripRouteNextHopServer OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the next hop that messages of a given protocol
         destined for tripRouteAddress SHOULD be sent to. The type
         of this address is determined by the value of the
         tripRouteNextHopServerIAddrType object."
    ::= { tripRouteEntry 9 }

tripRouteNextHopServerPort OBJECT-TYPE
    SYNTAX      InetPortNumber
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The port of the next hop server that this route
         will use."
    ::= { tripRouteEntry 10 }

tripRouteNextHopServerItad OBJECT-TYPE
    SYNTAX      TripItad
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the domain of the next hop."
    ::= { tripRouteEntry 11 }

tripRouteMultiExitDisc OBJECT-TYPE
    SYNTAX      Unsigned32 (0..4294967295)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The Multiple Exit Discriminator allows an LS to
         discriminate between, and indicate preference for,
         otherwise similar routes to a neighbouring domain.
         A higher value represents a more preferred routing
         object."
```

```
REFERENCE
    "RFC 3219, section 5.8"
 ::= { tripRouteEntry 12 }

tripRouteLocalPref OBJECT-TYPE
SYNTAX      Unsigned32 (0..4294967295)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Indicated the local LS's degree of preference for an
     advertised route destination."
REFERENCE
    "RFC 3219, section 4.3.4.7"
 ::= { tripRouteEntry 13 }

tripRouteAdvertisementPath OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(4..252))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Identifies the sequence of domains through which this
     advertisement has passed.

This object is probably best represented as sequence of
TripItads. For SMI compatibility, though, it is
represented as an OCTET STRING. This object is a sequence
of ITADs where each set of 4 octets corresponds to a TRIP
ITAD in network byte order."
REFERENCE
    "RFC 3219, section 4.3.4.4"
 ::= { tripRouteEntry 14 }

tripRouteRoutedPath OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(4..252))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Identifies the ITADs through which messages sent using
     this route would pass. These are a subset of
     tripRouteAdvertisementPath.

This object is probably best represented as sequence of
TripItads. For SMI compatibility, though, it is
represented as OCTET STRING. This object is a sequence
of ITADs where each set of 4 octets corresponds to a TRIP
ITAD in network byte order."
REFERENCE
    "RFC 3219, section 4.3.4.5"
```

```
::= { tripRouteEntry 15 }

tripRouteAtomicAggregate OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates that a route MAY traverse domains not listed
         in tripRouteRoutedPath. If an LS selects the less
         specific route from a set of overlapping routes, then
         this value returns TRUE."
    REFERENCE
        "RFC 3219, section 4.3.4.6"
    ::= { tripRouteEntry 16 }

tripRouteUnknown OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE(0..255))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object contains one or more attributes that were not
         understood, and because they were transitive, were dropped
         during aggregation. They take the format of a triple
         <attribute type, attribute length, attribute value>, of
         variable length. If no attributes were dropped, this
         returns an OCTET STRING of size 0."
    REFERENCE
        "RFC 3219, sections 4.3.1, 4.3.2.3"
    ::= { tripRouteEntry 17 }

tripRouteWithdrawn OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates if this route is to be removed from service
         by the receiving LS."
    ::= { tripRouteEntry 18 }

tripRouteConverted OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates if this route has been converted to a
         different application protocol than it had originally."
    ::= { tripRouteEntry 19 }
```

```

tripRouteReceivedTime OBJECT-TYPE
  SYNTAX      TimeStamp
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The value of sysUpTime when this route was received."
  ::= { tripRouteEntry 20 }

--
-- TRIP Received Route Community Table.
--

tripRouteCommunityTable OBJECT-TYPE
  SYNTAX      SEQUENCE OF TripRouteCommunityEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "A table containing a list of TRIP communities associated
     with a route. Each instance of tripRouteTypeEntry that has
     the tripRouteTypePeer object set to remote(2) has an
     instance in the tripRouteTable as a parent. The objects
     in this table are volatile and are refreshed after a
     reboot."
  REFERENCE
    "RFC 3219, section 5.9."
  ::= { tripMIBObjects 7 }

tripRouteCommunityEntry OBJECT-TYPE
  SYNTAX      TripRouteCommunityEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "Information about communities associated with a route.
     An entry with a tripRouteAddress of 00 and a
     tripRoutePeer of 0 refers to the local LS."
  INDEX { applIndex,
          tripRouteAppProtocol,
          tripRouteAddressFamily,
          tripRouteAddress,
          tripRoutePeer,
          tripRouteCommunityId
        }
  ::= { tripRouteCommunityTable 1 }

TripRouteCommunityEntry ::= SEQUENCE {
  tripRouteCommunityId      TripCommunityId,
  tripRouteCommunityItad   TripItad
}

```

```

tripRouteCommunityId OBJECT-TYPE
    SYNTAX      TripCommunityId
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The community identifier."
    ::= { tripRouteCommunityEntry 1 }

tripRouteCommunityItad OBJECT-TYPE
    SYNTAX      TripItad
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The ITAD associated with this community."
    ::= { tripRouteCommunityEntry 2 }

-- 
-- tripItadTopologyTable
--

tripItadTopologyTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripItadTopologyEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The sequence of link connections between peers within an
         ITAD. The objects in this table are volatile and are
         refreshed after a reboot."
    ::= { tripMIBObjects 8 }

tripItadTopologyEntry OBJECT-TYPE
    SYNTAX      TripItadTopologyEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a peer of the LS identified by
         tripItadTopologyOrigId."
    INDEX { applIndex, tripItadTopologyOrigId }
    ::= { tripItadTopologyTable 1 }

TripItadTopologyEntry ::= SEQUENCE {
    tripItadTopologyOrigId      TripId,
    tripItadTopologySeqNum      Unsigned32
}

tripItadTopologyOrigId OBJECT-TYPE
    SYNTAX      TripId
    MAX-ACCESS  not-accessible

```

```

STATUS      current
DESCRIPTION
    "Indicates the internal LS that originated the ITAD
     topology information into the ITAD."
::= { tripItadTopologyEntry 1 }

tripItadTopologySeqNum OBJECT-TYPE
    SYNTAX      Unsigned32 (1..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the version of the ITAD topology originated
         by the LS identified by tripItadTopologyOrigId."
::= { tripItadTopologyEntry 2 }

--
-- tripItadTopologyIdTable
--

tripItadTopologyIdTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF TripItadTopologyIdEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The list of other LS's within the ITAD domain that the
         LS identified by tripItadTopologyOrigId is currently
         peering. Each instance of tripItadTopologyIdEntry has an
         instance in the tripItadTopologyTable as a parent. The
         objects in this table are volatile and are refreshed
         after a reboot."
::= { tripMIBObjects 9 }

tripItadTopologyIdEntry OBJECT-TYPE
    SYNTAX      TripItadTopologyIdEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a peer to the LS identified by
         tripItadTopologyOrigId."
INDEX { applIndex,
        tripItadTopologyOrigId,
        tripItadTopologyId }
::= { tripItadTopologyIdTable 1 }

TripItadTopologyIdEntry ::= SEQUENCE {
    tripItadTopologyId          TripId
}

```

```

tripItadTopologyId OBJECT-TYPE
  SYNTAX      TripId
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The index into this entry. Indicates the other location
     servers within the ITAD domain that this LS identified
     by tripItadTopologyOrigId is currently peering."
  ::= { tripItadTopologyIdEntry 1 }

--
-- Notification objects
--

tripNotifApplIndex   OBJECT-TYPE
  SYNTAX      Integer32 (1..2147483647)
  MAX-ACCESS  accessible-for-notify
  STATUS      current
  DESCRIPTION
    "This object contains the application Index. It is used
     to bind this notification with a specific instance of
     TRIP entity."
  REFERENCE
    "RFC 2788, section 3."
  ::= { tripMIBNotifObjects 1 }

tripNotifPeerAddrInetType OBJECT-TYPE
  SYNTAX      InetAddressType
  MAX-ACCESS  accessible-for-notify
  STATUS      current
  DESCRIPTION
    "The type of Inet Address of the tripNotifPeerAddr."
  REFERENCE
    "RFC 3291, section 3."
  ::= { tripMIBNotifObjects 2 }

tripNotifPeerAddr OBJECT-TYPE
  SYNTAX      InetAddress
  MAX-ACCESS  accessible-for-notify
  STATUS      current
  DESCRIPTION
    "The IP address of this entry's TRIP peer LS. This object
     contains the value of tripPeerRemoteAddr. The type of this
     address is determined by the value of the
     tripNotifPeerAddrInetType object."
  REFERENCE
    "RFC 3291, section 3."
  ::= { tripMIBNotifObjects 3 }

```

```

tripNotifPeerErrCode OBJECT-TYPE
SYNTAX      INTEGER {
                  messageHeader(1),
                  openMessage(2),
                  updateMessage(3),
                  holdTimerExpired(4),
                  finiteStateMachine(5),
                  cease(6),
                  tripNotification(7)
}
MAX-ACCESS  accessible-for-notify
STATUS      current
DESCRIPTION
    "Notification message of TRIP error. The meaning of this
     value is applicable to the following functions:

messageHeader(1)
- All errors detected while processing the TRIP message
  header.

openMessage(2)
- All errors detected while processing the OPEN message.

updateMessage(3)
- All errors detected while processing the UPDATE
  message.

holdTimerExpired(4)
- A notification generated when the hold timer expires.

finiteStateMachine(5)
- All errors detected by the TRIP Finite State Machine.

cease(6)
- Any fatal error condition that the rest of the values
  do not cover.

tripNotification(7)
- Any error encountered while sending a notification
  message."
::= { tripMIBNotifObjects 4 }

tripNotifPeerErrSubcode OBJECT-TYPE
SYNTAX      Unsigned32 (1..2147483647)
MAX-ACCESS  accessible-for-notify
STATUS      current
DESCRIPTION
    "The sub error code associated with error code. The

```

meaning of this value is dependent on the value of tripNotifPeerErrCode.

Message Header (1) Error Subcodes:
 1 - Bad Message Length.
 2 - Bad Message Type.

OPEN Message (2) Error Subcodes:
 1 - Unsupported Version Number.
 2 - Bad Peer ITAD.
 3 - Bad TRIP Identifier.
 4 - Unsupported Optional Parameter.
 5 - Unacceptable Hold Time.
 6 - Unsupported Capability.
 7 - Capability Mismatch.

UPDATE Message (3) Error Subcodes:

1 - Malformed Attribute List.
 2 - Unrecognized Well-known Attribute.
 3 - Missing Well-known Mandatory Attribute.
 4 - Attribute Flags Error.
 5 - Attribute Length Error.
 6 - Invalid Attribute."

::= { tripMIBNotifObjects 5 }

--

-- Notifications

--

tripConnectionEstablished NOTIFICATION-TYPE
 OBJECTS { tripNotifApplIndex,
 tripNotifPeerAddrInetType,
 tripNotifPeerAddr
 }
 STATUS current
 DESCRIPTION
 "The TRIP Connection Established event is generated when
 the TRIP finite state machine enters the ESTABLISHED
 state."
 ::= { tripMIBNotifications 1 }

tripConnectionDropped NOTIFICATION-TYPE
 OBJECTS { tripNotifApplIndex,
 tripNotifPeerAddrInetType,
 tripNotifPeerAddr
 }
 STATUS current
 DESCRIPTION
 "The TRIP Connection Dropped event is generated when the

```
        TRIP finite state machine leaves the ESTABLISHED state."
        ::= { tripMIBNotifications 2 }

tripFSM NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex,
          tripNotifPeerAddrInetType,
          tripNotifPeerAddr,
          tripNotifPeerErrCode,
          tripNotifPeerErrSubcode,
          tripPeerState
        }
STATUS current
DESCRIPTION
        "The trip FSM Event is generated when any error is
         detected by the TRIP Finite State Machine."
        ::= { tripMIBNotifications 3 }

tripOpenMessageError NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex,
          tripNotifPeerAddrInetType,
          tripNotifPeerAddr,
          tripNotifPeerErrCode,
          tripNotifPeerErrSubcode,
          tripPeerState
        }
STATUS current
DESCRIPTION
        "Errors detected while processing the OPEN message."
        ::= { tripMIBNotifications 4 }

tripUpdateMessageError NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex,
          tripNotifPeerAddrInetType,
          tripNotifPeerAddr,
          tripNotifPeerErrCode,
          tripNotifPeerErrSubcode,
          tripPeerState
        }
STATUS current
DESCRIPTION
        "Errors detected while processing the UPDATE message."
        ::= { tripMIBNotifications 5 }

tripHoldTimerExpired NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex,
          tripNotifPeerAddrInetType,
          tripNotifPeerAddr,
          tripNotifPeerErrCode,
```

```

        tripNotifPeerErrSubcode,
        tripPeerState
    }
STATUS current
DESCRIPTION
    "The system does not receive successive messages within
     the period specified by the negotiated Hold Time."
::= { tripMIBNotifications 6 }

tripConnectionCollision NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex }
STATUS current
DESCRIPTION
    "A pair of LSS tried to simultaneously to establish a
     transport connection to each other."
::= { tripMIBNotifications 7 }

tripCease NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex,
          tripNotifPeerAddrInetType,
          tripNotifPeerAddr,
          tripNotifPeerErrCode,
          tripNotifPeerErrSubcode,
          tripPeerState
      }
STATUS current
DESCRIPTION
    "A TRIP peer MAY choose at any given time to close its TRIP
     connection by sending this notification message. However,
     the Cease notification message MUST NOT be used when a
     fatal error occurs."
::= { tripMIBNotifications 8 }

tripNotificationErr NOTIFICATION-TYPE
OBJECTS { tripNotifApplIndex }
STATUS current
DESCRIPTION
    "Generated if there is an error detected in a TRIP
     notification message sent with another cause. Note that
     the TRIP notification referred to in this object is not
     an SNMP notification, it is a specific message described
     in the TRIP specification."
REFERENCE
    "RFC 3219, section 6.4."
::= { tripMIBNotifications 9 }

--
```

```

-- Compliance Statements
--

tripMIBFullCompliance MODULE-COMPLIANCE
  STATUS      current
  DESCRIPTION
    "The compliance statement for TRIP entities that
     implement this MIB module in read-write mode, such
     that it can be used for both monitoring and configuring
     the TRIP entity.

There is one INDEX object that cannot be represented in
the form of OBJECT clauses in SMIv2, but for which there
is a compliance requirement, expressed in OBJECT clause
form in this description:

-- OBJECT      tripRouteTypeAddrInetType
-- SYNTAX      InetAddressType (ipv4(1), ipv6(2),
--                           ipv4z(3), ipv6z(4))
-- DESCRIPTION
--   This MIB requires support for global and
--   non-global ipv4 and ipv6 addresses.
--
-- OBJECT      tripRouteTypeAddr
-- SYNTAX      InetAddress (SIZE (4 | 8 | 16 | 20))
-- DESCRIPTION
--   This MIB requires support for global and
--   non-global IPv4 and IPv6 addresses.
--
"

MODULE -- this module
  MANDATORY-GROUPS { tripConfigGroup,
                     tripPeerTableConfigGroup,
                     tripRouteGroup,
                     tripItadTopologyGroup,
                     tripPeerTableStatsGroup }

GROUP tripNotificationGroup
DESCRIPTION
  "This group is OPTIONAL. A TRIP entity can choose not to
   send any notifications. If this group is implemented,
   the tripNotifObjectGroup MUST also be implemented."

GROUP tripNotifObjectGroup
DESCRIPTION
  "This group is OPTIONAL. A TRIP entity can choose not to
   send any notifications. If this group is implemented,

```

the `tripNotificationGroup` MUST also be implemented."

```
OBJECT          tripSupportedCommunityRowStatus
SYNTAX         RowStatus { active(1) }
WRITE-SYNTAX   RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION    "Support for createAndWait and notInService is not
```

```
OBJECT          tripPeerRowStatus
SYNTAX         RowStatus { active(1) }
WRITE-SYNTAX   RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for createAndWait and notInService is not
     required."
```

```
MODULE NETWORK-SERVICES-MIB
    MANDATORY-GROUPS { applRFC2788Group }
```

```
 ::= { tripMIBCompliances 1 }
tripMIBReadOnlyCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for TRIP entities that
         implement this MIB module in read only mode. Such TRIP
         entities can then only be monitored, but not be
         configured via this MIB module."
```

In read-only mode, the manager will not be able to add, remove or modify rows to any table, however the TRIP application may modify, remove or add rows to a table.

There is one INDEX object that cannot be represented in the form of OBJECT clauses in SMIV2, but for which there is a compliance requirement, expressed in OBJECT clause form in this description:

```
-- OBJECT          tripRouteTypeAddrInetType
-- SYNTAX         InetAddressType (ipv4(1), ipv6(2),
--                                ipv4z(3), ipv6z(4))
-- DESCRIPTION
--       This MIB requires support for global and
--       non-global ipv4 and ipv6 addresses.
--
-- OBJECT          tripRouteTypeAddr
-- SYNTAX         InetAddress (SIZE (4 | 8 | 16 | 20))
-- DESCRIPTION
--       This MIB requires support for global and
```

```
--      non-global IPv4 and IPv6 addresses.  
--  
"  
  
MODULE -- this module  
MANDATORY-GROUPS { tripConfigGroup,  
                   tripPeerTableConfigGroup,  
                   tripRouteGroup,  
                   tripItadTopologyGroup,  
                   tripPeerTableStatsGroup }  
  
GROUP tripNotificationGroup  
DESCRIPTION  
        "This group is OPTIONAL. A TRIP entity can choose not to  
        send any notifications. If this group is implemented,  
        the tripNotifObjectGroup MUST also be implemented."  
  
GROUP tripNotifObjectGroup  
DESCRIPTION  
        "This group is OPTIONAL. A TRIP entity can choose not to  
        send any notifications. If this group is implemented,  
        the tripNotificationGroup MUST also be implemented."  
OBJECT      tripCfgItad  
MIN-ACCESS  read-only  
DESCRIPTION  
        "Write access is not required."  
  
OBJECT      tripCfgAdminStatus  
MIN-ACCESS  not-accessible  
DESCRIPTION  
        "Object is not needed when implemented in read-only mode."  
  
OBJECT      tripCfgPort  
MIN-ACCESS  read-only  
DESCRIPTION  
        "Write access is not required."  
  
OBJECT      tripCfgMinItadOriginationInterval  
MIN-ACCESS  read-only  
DESCRIPTION  
        "Write access is not required."  
  
OBJECT      tripCfgMinRouteAdvertisementInterval  
MIN-ACCESS  read-only  
DESCRIPTION  
        "Write access is not required."  
  
OBJECT      tripCfgMaxPurgeTime
```

```
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripCfgDisableTime
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripCfgStorage
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripSupportedCommunityItad
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripSupportedCommunityStorage
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripSupportedCommunityRowStatus
SYNTAX        RowStatus { active(1) }
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required, and active is the only
     status that needs to be supported."

OBJECT        tripPeerAdminStatus
MIN-ACCESS    not-accessible
DESCRIPTION
    "Object is not needed when implemented in read-only mode."

OBJECT        tripPeerConnectRetryInterval
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripPeerMaxRetryInterval
MIN-ACCESS    read-only
DESCRIPTION
    "Write access is not required."

OBJECT        tripPeerHoldTimeConfigured
MIN-ACCESS    read-only
```

```
DESCRIPTION
    "Write access is not required."

OBJECT      tripPeerKeepAliveConfigured
MIN-ACCESS   read-only
DESCRIPTION
    "Write access is not required."

OBJECT      tripPeerMaxPurgeTime
MIN-ACCESS   read-only
DESCRIPTION
    "Write access is not required."

OBJECT      tripPeerDisableTime
MIN-ACCESS   read-only
DESCRIPTION
    "Write access is not required."

OBJECT      tripPeerStorage
MIN-ACCESS   read-only
DESCRIPTION
    "Write access is not required."

OBJECT      tripPeerRowStatus
SYNTAX      RowStatus { active(1) }
MIN-ACCESS   read-only
DESCRIPTION
    "Write access is not required, and active is the only
     status that needs to be supported."
MODULE NETWORK-SERVICES-MIB
MANDATORY-GROUPS { applRFC2788Group }

 ::= { tripMIBCompliances 2 }

-- Object and event conformance groups
--

tripConfigGroup OBJECT-GROUP
OBJECTS {
    tripCfgProtocolVersion,
    tripCfgItad,
    tripCfgIdentifier,
    tripCfgOperStatus,
    tripCfgAdminStatus,
    tripCfgAddrIAddrType,
    tripCfgAddr,
    tripCfgPort,
```

```
    tripCfgMinItadOriginationInterval,
    tripCfgMinRouteAdvertisementInterval,
    tripCfgMaxPurgeTime,
    tripCfgDisableTime,
    tripCfgSendReceiveMode,
    tripCfgStorage,
    tripSupportedCommunityItad,
    tripSupportedCommunityStorage,
    tripRouteTypePeer,
    tripSupportedCommunityRowStatus
}
STATUS current
DESCRIPTION
  "The global objects for configuring trip."
 ::= { tripMIBGroups 1 }

tripPeerTableConfigGroup OBJECT-GROUP
OBJECTS {
    tripPeerIdentifier,
    tripPeerState,
    tripPeerAdminStatus,
    tripPeerNegotiatedVersion,
    tripPeerSendReceiveMode,
    tripPeerRemoteItad,
    tripPeerConnectRetryInterval,
    tripPeerMaxRetryInterval,
    tripPeerHoldTime,
    tripPeerKeepAlive,
    tripPeerHoldTimeConfigured,
    tripPeerKeepAliveConfigured,
    tripPeerMaxPurgeTime,
    tripPeerDisableTime,
    tripPeerLearned,
    tripPeerStorage,
    tripPeerRowStatus
}

STATUS current
DESCRIPTION
  "The global objects for configuring the TRIP peer
  table."
 ::= { tripMIBGroups 2 }

tripPeerTableStatsGroup OBJECT-GROUP
OBJECTS {
    tripPeerInUpdates,
    tripPeerOutUpdates,
    tripPeerInTotalMessages,
```

```
    tripPeerOutTotalMessages,
    tripPeerFsmEstablishedTransitions,
    tripPeerFsmEstablishedTime,
    tripPeerInUpdateElapsedTime,
    tripPeerStateChangeTime
}
STATUS current
DESCRIPTION
  "The global statistics the TRIP peer table."
 ::= { tripMIBGroups 3 }

tripRouteGroup OBJECT-GROUP
OBJECTS {
    tripRouteTRIBMask,
    tripRouteAddressSequenceNumber,
    tripRouteAddressOriginatorId,
    tripRouteNextHopServerIAddrType,
    tripRouteNextHopServer,
    tripRouteNextHopServerPort,
    tripRouteNextHopServerItad,
    tripRouteMultiExitDisc,
    tripRouteLocalPref,
    tripRouteAdvertisementPath,
    tripRouteRoutedPath,
    tripRouteAtomicAggregate,
    tripRouteUnknown,
    tripRouteWithdrawn,
    tripRouteConverted,
    tripRouteReceivedTime,
    tripRouteCommunityItad
}

STATUS current
DESCRIPTION
  "The global objects for configuring route attribute."
 ::= { tripMIBGroups 4 }
tripItadTopologyGroup OBJECT-GROUP
OBJECTS {
    tripItadTopologySeqNum,
    tripItadTopologyId
}
STATUS current
DESCRIPTION
  "The objects that define the TRIP ITAD topology."
 ::= { tripMIBGroups 5 }

tripNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS {
```

```
    tripConnectionEstablished,
    tripConnectionDropped,
    tripFSM,
    tripOpenMessageError,
    tripUpdateMessageError,
    tripHoldTimerExpired,
    tripConnectionCollision,
    tripCease,
    tripNotificationErr
}
STATUS current
DESCRIPTION
    "A collection of notifications defined for TRIP."
::= { tripMIBGroups 6 }

tripNotifObjectGroup OBJECT-GROUP
OBJECTS {
    tripNotifApplIndex,
    tripNotifPeerAddrInetType,
    tripNotifPeerAddr,
    tripNotifPeerErrCode,
    tripNotifPeerErrSubcode
}
STATUS current
DESCRIPTION
    "The collection of objects that specify information for
    TRIP notifications."
::= { tripMIBGroups 7 }

END
```

7. Security Considerations

The managed objects in this MIB module contain sensitive information since, collectively, they allow tracing and influencing of connections in TRIP devices and provide information of their connection characteristics. As such, improper manipulation of the objects represented by this MIB module MAY result in denial of service to a large number of available routes.

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 objects include:

tripCfgItad:

Improper setting of tripCfgItad value can make all peer connections drop and not be re-established.

tripCfgAdminStatus:

Improper setting of tripCfgAdminStatus from up to down will cause the TRIP Location Server stop processing TRIP messages.

tripCfgPort:

Improper setting of tripCfgPort can cause the failure of a peer establishing a connection.

tripCfgMinItadOriginationInterval,**tripCfgMinRouteAdvertisementInterval:**

Improper configuration of these values MAY adversely affect local and global convergence of the routes advertised by this TRIP Location Server.

tripPeerAdminStatus:

Improper setting of tripPeerAdminStatus from up to down can cause significant disruption of the connectivity to the destination via the applicable remote TRIP Location Server peer.

tripPeerConnectRetryInterval, tripPeerMaxRetryInterval:

Improper configuration of these values can cause connections to be disrupted for extremely long time periods when otherwise they would be restored in a relatively short period of time.

tripPeerHoldTimeConfigured, tripPeerKeepAliveConfigured:

Improper configuration of these value can make TRIP peer sessions more fragile and less resilient to denial of service attacks.

There are a number of managed objects in this MIB module that contain sensitive information regarding the operation of a network. For example, a TRIP Location Server peer's local and remote addresses might be sensitive for ISPs who want to keep interface addresses on TRIP Location Server confidential so as to prevent TRIP Location Server addresses used for a denial of service attack or address spoofing.

Therefore, 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 module.

It is RECOMMENDED that the 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.

8. References

8.1. Normative References

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8.2. Informative References

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10. Authors' Addresses

David Zinman
Editor
265 Ridley Blvd
Toronto ON M5M 4N8
Canada

Phone: +1 416 433 4298
EMail: dzinman@rogers.com

David Walker
Sedna Wireless Inc.
495 March Road, Suite 500
Ottawa, ON K2K 3G1
Canada

Phone: +1 613 878 8142
EMail: david.walker@sedna-wireless.com

Jianping Jiang
Syndesis Limited
30 Fulton Way
Richmond Hill, ON L4B 1J5
Canada

Phone: +1 905 886-7818 x2515
EMail: jjiang@syndesis.com

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