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Abstract

This draft 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 modeling Bidirectional Forwarding Detection (BFD) protocol [BFD].
1. Introduction

This memo defines an portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects to configure and/or monitor Bi-Directional Forwarding Detection on devices supporting this feature.

This document adopts the definitions, acronyms and mechanisms described in [BFD], [BFD-MH] and [BFD-LSP]. Unless otherwise stated, the mechanisms described therein will not be re-described here.

Comments should be made directly to the BFD mailing list at rtg-bfd@ietf.org.

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 [RFC2119].

2. Terminology

This document adopts the definitions, acronyms and mechanisms described in [BFD], [BFD-MH] and [BFD-LSP]. Unless otherwise stated, the mechanisms described therein will not be re-described here.

3. The Internet-Standard Management Framework

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

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

4. Brief Description of MIB Objects

This section describes objects pertaining to BFD. The MIB objects are derived from the BFD document [BFD].

4.1 General Variables

The General Variables are used to identify parameters that are global to the BFD process.

4.2 Session Table (bfdSessionTable)

The session table is used to identify a BFD session between a pair of nodes.

4.3 Session Performance Table (bfdSessionPerfTable)

The session performance table is used for collecting BFD performance counts on a per session basis. This table is an AUGMENT to the bfdSessionTable.

3.4 Session Mapping Table (bfdSessMapTable)

The BFD Session Mapping Table maps the complex indexing of the BFD sessions to the flat BFDIndex used in the BfdSessionTable.

5. BFD MIB Module Definitions

BFD-STD-MIB DEFINITIONS ::= BEGIN
IMPORTS
MODULE-IDENTITY, OBJECT-TYPE,
Unsigned32, Counter32, Counter64,
NOTIFICATION-TYPE, mib-2
FROM SNMPv2-SMI -- [RFC2578]

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

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

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

bfdMIB MODULE-IDENTITY
LAST-UPDATED "200507221200Z" -- 04 July 2005 12:00:00 EST
ORGANIZATION "IETF"
CONTACT-INFO
 " Thomas D. Nadeau
       Cisco Systems, Inc.
       Email: tnadeau@cisco.com
 Zafar Ali
       Cisco Systems, Inc.
       Email: zali@cisco.com
"

DESCRIPTION
"Bidirectional Forwarding Management Information Base."

-- Revision history.
REVISION
"200508221200Z" -- 04 August 2005 12:00:00 EST
DESCRIPTION
"Initial version. Published as RFC xxxx." -- RFC-editor pls fill
-- in xxxx
::= { mib-2 XXX } -- assigned by IANA, see section 18.1 for details

-- Top level components of this MIB module.
bfdNotifications OBJECT IDENTIFIER ::= { bfdMIB 0 }
bfdObjects OBJECT IDENTIFIER ::= { bfdMIB 1 }
bfdConformance OBJECT IDENTIFIER ::= { bfdMIB 3 }
bfdScalarObjects OBJECT IDENTIFIER ::= { bfdObjects 1 }

-- Textual Conventions

BfdSessIndexTC ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS current
DESCRIPTION
"An index used to uniquely identify BFD sessions."
SYNTAX Unsigned32 (1..4294967295)
BfdInterval ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "The BFD interval delay in microseconds."
SYNTAX Unsigned32 (1..4294967295)

BfdDiag ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "A common BFD diagnostic code."
SYNTAX INTEGER { noDiagnostic(1),
controlDetectionTimeExpired(2),
echoFunctionFailed(3),
neighborSignaledSessionDown(4),
forwardingPlaneReset(5),
pathDown(6),
concatenatedPathDown(7),
administrativelyDown(8),
reverseConcatenatedPathDown (9)
}

-- BFD General Variables

-- These parameters apply globally to the Router's
-- BFD Process.

bfdAdminStatus OBJECT-TYPE
SYNTAX INTEGER { enabled(1), disabled(2) }
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The global administrative status of BFD in this router. The value 'enabled' denotes that the BFD Process is active on at least one interface; 'disabled' disables it on all interfaces."
DEFVAL { enabled }
::= { bfdScalarObjects 1 }

bfdVersionNumber OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The current version number of the BFD protocol."
REFERENCE
"BFD Version 0 (draft-katz-ward-bfd-02.txt)"
DEFVAL { 0 }
::= { bfdScalarObjects 3 }

-- BFD Session Table
-- The BFD Session Table specifies BFD session specific
-- information.

bfdSessTable OBJECT-TYPE
SYNTAX SEQUENCE OF BfdSessEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The BFD Session Table describes the BFD sessions."
REFERENCE "BFD Version 0 (draft-katz-ward-bfd-02.txt)"
::= { bfdObjects 2 }

bfdSessEntry OBJECT-TYPE
SYNTAX BfdSessEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The BFD Session Entry describes BFD session."
INDEX { bfdSessIndex }
::= { bfdSessTable 1 }

BfdSessEntry ::= SEQUENCE {
bfdSessIndex                    BfdSessIndexTC,
bfdSessApplicationId            Unsigned32,
bfdSessDiscriminator            Unsigned32,
bfdSessRemoteDiscr              Unsigned32,
bfdSessUdpPort                  InetPortNumber,
bfdSessState                    INTEGER,
bfdSessRemoteHeardFlag          TruthValue,
bfdSessDiag                     Unsigned32,
bfdSessOperMode                 INTEGER,
bfdSessDemandModeDesiredFlag    TruthValue,
bfdSessEchoFuncModeDesiredFlag  TruthValue,
bfdSessCtrlclPlanIndepFlag      TruthValue,
bfdSessAddrType                 InetAddressType,
bfdSessAddr                     InetAddress,
bfdSessDesiredMinTxInterval     BfdInterval,
bfdSessDesiredMinRxInterval     BfdInterval,
bfdSessDesiredMinEchoRxInterval BfdInterval,
bfdSessDetectMult               Unsigned32,
bfdSessStorType                 StorageType,
bfdSessRowStatus      RowStatus,
bfdSessAuthPresFlag   TruthValue,
bfdSessAuthenticationType INTEGER

bfdSessIndex    OBJECT-TYPE
SYNTAX          BfdSessIndexTC
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION     "This object contains an index used to represent a
                unique BFD session on this device."
 ::= { bfdSessEntry 1 }

bfdSessApplicationId OBJECT-TYPE
SYNTAX          Unsigned32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "This object contains an index used to indicate
                a local application which owns or maintains this
                BFD session. For instance, the MPLS VPN process may
                maintain a subset of the total number of BFD
                sessions. This application ID provides a convenient
                way to segregate sessions by the applications which
                maintain them."
 ::= { bfdSessEntry 2 }

bfdSessDiscriminator OBJECT-TYPE
SYNTAX          Unsigned32 (1..4294967295)
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "This object specifies the local discriminator for this BFD
                session, used to uniquely identify it."
 ::= { bfdSessEntry 3 }

bfdSessRemoteDiscr OBJECT-TYPE
SYNTAX          Unsigned32 (1..4294967295)
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "This object specifies the session discriminator chosen
                by the remote system for this BFD session."
 ::= { bfdSessEntry 4 }

bfdSessUdpPort   OBJECT-TYPE
SYNTAX          InetPortNumber
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The UDP Port for BFD. The default value is the well-known value for this port."
REFERENCE
"draft-katz-ward-bfd-02.txt" and "draft-raggarwa-mpls-bfd-00.txt"
DEFVAL { 0 }
::= { bfdSessEntry 5 }

bfdSessState OBJECT-TYPE
SYNTAX INTEGER {
  adminDown(1),
  down(2),
  init(3),
  up(4)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The perceived state of the BFD session."
::= { bfdSessEntry 6 }

bfdSessRemote HeardFlag OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies status of BFD packet reception from the remote system. Specifically, it is set to true(1) if the local system is actively receiving BFD packets from the remote system, and is set to false(0) if the local system has not received BFD packets recently (within the detection time) or if the local system is attempting to tear down the BFD session."
::= { bfdSessEntry 7 }

bfdSessDiag OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"A diagnostic code specifying the local system’s reason for the last transition of the session from up(1) to some other state."
::= { bfdSessEntry 8 }
bfdSessOperMode OBJECT-TYPE
SYNTAX INTEGER { asyncModeWEchoFun(1),
asyncModeWOEchoFun(2),
demandModeWEchoFunction(3),
demandModeWOEchoFunction(4)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies current operating mode that BFD
session is operating in.

A value of AsyncModeWEchoFun(1) ...
A value of AsyncModeWOEchoFun(2) ...
A value of DemandModeWEchoFunction(3) ...
A value of DemandModeWOEchoFunction(4) ...
"
::= { bfdSessEntry 9 }

bfdSessDemandModeDesiredFlag OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates that the local system’s
desire to use Demand mode. Specifically, it is set
to true(1) if the local system wishes to use
Demand mode or false(0) if not"
DEFVAL { false }
::= { bfdSessEntry 10 }

bfdSessEchoFuncModeDesiredFlag OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates that the local system’s
desire to use Echo mode. Specifically, it is set
to true(1) if the local system wishes to use
Echo mode or false(0) if not"
DEFVAL { false }
::= { bfdSessEntry 11 }

bfdSessControlPlanIndepFlag OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates that the local system’s ability to continue to function through a disruption of the control plane. Specifically, it is set to true(1) if the local system BFD implementation is independent of the control plane. Otherwise, the value is set to false(0)."

DEFVAL { false }
::= { bfdSessEntry 12 }

bfdSessAddrType  OBJECT-TYPE
SYNTAX        InetAddressType
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
  "This object specifies IP address of the interface associated with this BFD session.

  Only values unknown(0), ipv4(1) or ipv6(2) have to be supported.

  A value of unknown(0) is allowed only when the outgoing interface is of type point-to-point, or when the BFD session is not associated with a specific interface.

  If any other unsupported values are attempted in a set operation, the agent MUST return an inconsistentValue error."

::= { bfdSessEntry 13 }

bfdSessAddr OBJECT-TYPE
SYNTAX        InetAddress
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
  "This object specifies IP address of the interface associated with this BFD session.

  It can also be used to enabled BFD on a specific interface. The value is set to zero when BFD session is not associated with a specific interface."

::= { bfdSessEntry 14 }

bfdSessDesiredMinTxInterval OBJECT-TYPE
SYNTAX        BfdInterval
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION
"This object specifies the minimum interval, in microseconds, that the local system would like to use when transmitting BFD Control packets."

::= { bfdSessEntry 15 }

bfdSessDesiredMinRxInterval OBJECT-TYPE
SYNTAX    BfdInterval
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"This object specifies the minimum interval, in microseconds, between received BFD Control packets the local system is capable of supporting."

::= { bfdSessEntry 16 }

bfdSessDesiredMinEchoRxInterval OBJECT-TYPE
SYNTAX    BfdInterval
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"This object specifies the minimum interval, in microseconds, between received BFD Echo packets that this system is capable of supporting."

::= { bfdSessEntry 17 }

bfdSessDetectMult OBJECT-TYPE
SYNTAX    Unsigned32
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"This object specifies the Detect time multiplier."

::= { bfdSessEntry 18 }

bfdSessStorType OBJECT-TYPE
SYNTAX    StorageType
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"This variable indicates the storage type for this object. Conceptual rows having the value 'permanent' need not allow write-access to any columnar objects in the row."

::= { bfdSessEntry 19 }

bfdSessRowStatus OBJECT-TYPE
SYNTAX    RowStatus
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"This variable is used to create, modify, and/or delete a row in this table. When a row in this table has a row in the active(1) state, no objects in this row can be modified except the bfdSessRowStatus and bfdSessStorageType."
::= { bfdSessEntry 20 }

bfdSessAuthPresFlag OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates that the local system’s desire to use Authentication. Specifically, it is set to true(1) if the local system wishes the session to be authenticated or false(0) if not"
DEFVAL { false }
::= { bfdSessEntry 21 }

bfdSessAuthenticationType OBJECT-TYPE
SYNTAX INTEGER { simplePassword(1), keyedMD5(2), meticulousKeyedMD5(3), keyedSHA1(4), meticulousKeyedSHA1(5) }
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The Authentication Type used for this BFD session. This field is valid only when the Authentication Present bit is set"
::= { bfdSessEntry 22 }

-- BFD Session Performance Table

bfdSessPerfTable OBJECT-TYPE
SYNTAX SEQUENCE OF BfdSessPerfEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table specifies BFD Session performance counters."
::= { bfdObjects 3 }

bfdSessPerfEntry OBJECT-TYPE
SYNTAX BfdSessPerfEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"An entry in this table is created by a BFD-enabled node for every BFD Session. bfdCounterDiscontinuityTime is used to indicate potential discontinuity for all counter objects in this table."

AUGMENTS { bfdSessEntry }
 ::= { bfdSessPerfTable 1 }

BfdSessPerfEntry ::= SEQUENCE {
  bfdSessPerfPktIn          Counter32,
  bfdSessPerfPktOut         Counter32,
  bfdSessUpTime             TimeStamp,
  bfdSessPerfLastSessDownTime TimeStamp,
  bfdSessPerfLastCommLostDiag BfdDiag,
  bfdSessPerfSessUpCount    Counter32,
  bfdSessPerfDiscTime       TimeStamp,

  -- High Capacity Counters
  bfdSessPerfPktInHC        Counter64,
  bfdSessPerfPktOutHC       Counter64
}

-- Ed Note: should we add per-diag code counts here,

bfdSessPerfPktIn OBJECT-TYPE
SYNTAX         Counter32
MAX-ACCESS     read-only
STATUS         current
DESCRIPTION
 "The total number of BFD messages received for this BFD session."
 ::= { bfdSessPerfEntry 1 }

bfdSessPerfPktOut OBJECT-TYPE
SYNTAX         Counter32
MAX-ACCESS     read-only
STATUS         current
DESCRIPTION
 "The total number of BFD messages sent for this BFD session."
 ::= { bfdSessPerfEntry 2 }

bfdSessUpTime OBJECT-TYPE
SYNTAX         TimeStamp
MAX-ACCESS     read-only
STATUS         current
DESCRIPTION
 "The value of sysUpTime on the most recent occasion at which the session came up. If no such up event exists this object
contains a zero value."
::= { bfdSessPerfEntry 3 }

bfdSessPerfLastSessDownTime OBJECT-TYPE
SYNTAX       TimeStamp
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"The value of sysUpTime on the most recent occasion at which
the last time communication was lost with the neighbor. If
no such down event exist this object contains a zero value."
::= { bfdSessPerfEntry 4 }

bfdSessPerfLastCommLostDiag  OBJECT-TYPE
SYNTAX       BfdDiag
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"The BFD diag code for the last time communication was lost
with the neighbor. If no such down event exists this object
contains a zero value."
::= { bfdSessPerfEntry 5 }

bfdSessPerfSessUpCount OBJECT-TYPE
SYNTAX       Counter32
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"The number of times this session has gone into the Up
state since the router last rebooted."
::= { bfdSessPerfEntry 6 }

bfdSessPerfDiscTime OBJECT-TYPE
SYNTAX       TimeStamp
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
"The value of sysUpTime on the most recent occasion at
which any one or more of the session counters suffered
a discontinuity.

The relevant counters are the specific instances associated
with this BFD session of any Counter32 object contained in
the BfdSessPerfTable. If no such discontinuities have occurred
since the last re-initialization of the local management
subsystem, then this object contains a zero value."
::= { bfdSessPerfEntry 7 }
bfdSessPerfPktInHC OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This value represents the total number of BFD messages received for this BFD session. It MUST be equal to the least significant 32 bits of bfdSessPerfPktIn if bfdSessPerfPktInHC is supported according to the rules spelled out in RFC2863."
::= { bfdSessPerfEntry 8 }

bfdSessPerfPktOutHC OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This value represents the total number of total number of BFD messages transmitted for this BFD session. It MUST be equal to the least significant 32 bits of bfdSessPerfPktIn if bfdSessPerfPktOutHC is supported according to the rules spelled out in RFC2863."
::= { bfdSessPerfEntry 9 }

-- BFD Session Mapping Table

bfdSessMapTable OBJECT-TYPE
SYNTAX SEQUENCE OF BfdSessMapEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The BFD Session Mapping Table maps the complex indexing of the BFD sessions to the flat BFDIndex used in the BfdSessionTable.

Implementors need to be aware that if the value of the bfdSessAddr (an OID) has more that 111 sub-identifiers, then OIDs of column instances in this table will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3.
"
REFERENCE
"BFD Version 0 (draft-katz-ward-bfd-02.txt)"
::= { bfdObjects 4 }
bfdSessMapEntry OBJECT-TYPE
SYNTAX  BfdSessMapEntry
MAX-ACCESS not-accessible
STATUS   current
DESCRIPTION
"The BFD Session Entry describes BFD session that is mapped to this index.

Implementors need to be aware that if the value of the mplsInSegmentMapLabelPtrIndex (an OID) has more that 111 sub-identifiers, then OIDs of column instances in this table will have more than 128 sub-identifiers and cannot be accessed using SNMPv1, SNMPv2c, or SNMPv3."
INDEX { bfdSessApplicationId,
    bfdSessDiscriminator,
    bfdSessAddrType,
    bfdSessAddr
}
 ::= { bfdSessMapTable 1 }

BfdSessMapEntry ::= SEQUENCE {
    bfdSessMapBfdIndex BfdSessIndexTC
}

bfdSessMapBfdIndex OBJECT-TYPE
SYNTAX  BfdSessIndexTC
MAX-ACCESS read-only
STATUS   current
DESCRIPTION
"This object specifies the BfdIndex referred to by the indexes of this row. In essence, a mapping is provided between these indexes and the BfdSessTable."
 ::= { bfdSessMapEntry 1 }

-- Notification Configuration

bfdSessNotificationsEnable OBJECT-TYPE
SYNTAX    TruthValue
MAX-ACCESS read-write
STATUS    current
DESCRIPTION
"If this object is set to true(1), then it enables the emission of bfdSessUp and bfdSessDown notifications; otherwise these notifications are not emitted."
REFERENCE
"See also RFC3413 for explanation that
notifications are under the ultimate control of the
MIB modules in this document.

DEFVAL { false }
::= { bfdScalarObjects 4 }

bfdSessUp NOTIFICATION-TYPE
OBJECTS     { bfdSessDiag, -- low range value
              bfdSessDiag -- high range value
          }
STATUS      current
DESCRIPTION
"This notification is generated when the
bfdSessState object for one or more contiguous
entries in bfdSessTable are about to enter the up(2)
state from some other state. The included values of
dfdSessDiag MUST both be set equal to this
new state (i.e: up(1)). The two instances of
dfdSessDiag in this notification indicate the range
of indexes that are affected. Note that all the indexes
of the two ends of the range can be derived from the
instance identifiers of these two objects. For the
cases where a contiguous range of sessions
have transitioned into the up(1) state at roughly
the same time, the device SHOULD issue a single
notification for each range of contiguous indexes in
an effort to minimize the emission of a large number
of notifications. If a notification has to be
issued for just a single bfdSessEntry, then
the instance identifier (and values) of the two
bfdSessDiag objects MUST be the identical."
::= { bfdNotifications 1 }

bfdSessDown NOTIFICATION-TYPE
OBJECTS     { bfdSessDiag, -- low range value
              bfdSessDiag -- high range value
          }
STATUS      current
DESCRIPTION
"This notification is generated when the
 bfdSessState object for one or more contiguous
 entries in bfdSessTable are about to enter the down(4)
 or adminDown(5) states from some other state. The included
 values of bfdSessDiag MUST both be set equal to this
 new state (i.e: down(4) or adminDown(5)). The two instances
 of bfdSessDiag in this notification indicate the range
 of indexes that are affected. Note that all the indexes
 of the two ends of the range can be derived from the
 instance identifiers of these two objects. For
cases where a contiguous range of sessions have transitioned into the down(4) or adminDown(5) states at roughly the same time, the device SHOULD issue a single notification for each range of contiguous indexes in an effort to minimize the emission of a large number of notifications. If a notification has to be issued for just a single bfdSessEntry, then the instance identifier (and values) of the two bfdSessDiag objects MUST be the identical.

::= { bfdNotifications 2 }

-- Ed Note: We need to add notification for changes when the two ends automatically negotiate to a new detection time value or when detection multiplier changes.
-- Similarly, changes in the operating mode (bfdSessOperMode) also need to be notified.

-- Module compliance.

bfdGroups
OBJECT IDENTIFIER ::= { bfdConformance 1 }

bfdCompliances
OBJECT IDENTIFIER ::= { bfdConformance 2 }

-- Compliance requirement for fully compliant implementations.

bfdModuleFullCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION "Compliance statement for agents that provide full support for BFD-MIB. Such devices can then be monitored and also be configured using this MIB module."

MODULE -- This module.
MANDATORY-GROUPS {
   bfdSessionGroup,
   bfdSessionPerfGroup,
   bfdSessionPerfHCGroup,
   bfdNotificationGroup
}

GROUP bfdSessionPerfHCGroup
DESCRIPTION "This group is mandatory for those bfdPerfTable entries for which any of the objects bfdSessPerfPktInHC or bfdSessPerfPktOutHC wraps around too quickly based on the criteria specified in RFC 2863 for
GROUP bfdNotificationGroup
DESCRIPTION "This group is only mandatory for those implementations which can efficiently implement the notifications contained in this group."

OBJECT bfdSessAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION "Only unknown(0), ipv4(1) and ipv6(2) support is required."

OBJECT bfdSessAddr
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION "An implementation is only required to support unknown(0), ipv4(1) and ipv6(2) sizes."

::= { bfdCompliances 1 }

-- Read-Only Conformance TBD...

-- Units of conformance.

bfdSessionGroup OBJECT-GROUP
OBJECTS {
  bfdSessNotificationsEnable,
  bfdAdminStatus,
  bfdVersionNumber,
  bfdSessApplicationId,
  bfdSessDiscriminator,
  bfdSessAddrType,
  bfdSessAddr,
  bfdSessRemoteDiscr,
  bfdSessUdpPort,
  bfdSessState,
  bfdSessRemoteHeardFlag,
  bfdSessDiag,
  bfdSessOperMode,
  bfdSessDemandModeDesiredFlag,
  bfdSessEchoFuncModeDesiredFlag,
  bfdSessControlPlanIndepFlag,
  bfdSessDesiredMinTxInterval,
  bfdSessDesiredMinRxInterval,
  bfdSessDesiredMinEchoRxInterval,
  bfdSessDetectMult,
  bfdSessStorType,
  bfdSessRowStatus,
bfdSessMapBfdIndex,
bfdSessAuthPresFlag,
bfdSessAuthenticationType
}

STATUS current

DESCRIPTION
"Collection of objects needed for BFD sessions."

::= { bfdGroups 1 }

bfdSessionPerfGroup OBJECT-GROUP

OBJECTS {
     bfdSessPerfPktIn,
bfdSessPerfPktOut,
bfdSessUpTime,
bfdSessPerfLastSessDownTime,
bfdSessPerfLastCommLostDiag,
bfdSessPerfSessUpCount,
bfdSessPerfDiscTime
}

STATUS current

DESCRIPTION
"Collection of objects needed to monitor the
performance of BFD sessions."

::= { bfdGroups 2 }

bfdSessionPerfHCGroup OBJECT-GROUP

OBJECTS {
     bfdSessPerfPktInHC,
bfdSessPerfPktOutHC
}

STATUS current

DESCRIPTION
"Collection of objects needed to monitor the
performance of BFD sessions for which the
values of bfdSessPerfPktIn, bfdSessPerfPktOut
wrap around too quickly."

::= { bfdGroups 3 }

bfdNotificationGroup NOTIFICATION-GROUP

NOTIFICATIONS {
     bfdSessUp,
bfdSessDown
}

STATUS current

DESCRIPTION
"Set of notifications implemented in this
module."
6. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP.

- The bfdSessTable may be used to directly configure BFD sessions. The bfdSessMapTable can be used indirectly in the same way. Unauthorized access to objects in this table could result in disruption of traffic on the network. This is especially true if an unauthorized user configures enough tables to invoke a denial of service attack on the device where they are configured, or on a remote device where the sessions terminate.

- Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:
  
  - The bfdSessPerfTable both allows access to the performance characteristics of BFD sessions. Network administrators not wishing to show this information should consider this table sensitive.
  
  SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure "for example by using IPSec", even then, there is no control as to who on the secure network is allowed to access and GET/SET "read/change/create/delete" the objects in these MIB modules.

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

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

7. Acknowledgements

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8. References

8.1 Normative References


8.2 Informative References


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9. Authors’ Addresses

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11. IANA Considerations

There is one MIB module contained in this document. The following "IANA Considerations" subsection requests IANA for a new assignment under the mib-2 subtree. New assignments can only be made via a Standards Action as specified in [RFC2434].

11.1. IANA Considerations for BFD-STD-MIB
The IANA is requested to assign \{ mib-2 XXX \} to the MPLS-L3VPN-STD-MIB module specified in this document.

12. Intellectual Property Statement

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