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T. Nadeau
BT
Z. Ali
Cisco Systems, Inc.
N. Akiya
Cisco Systems G.K.
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BFD Management Information Base
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Status of this Memo

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.

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1. Requirements notation

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. 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 [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, [RFC2578], STD 58, [RFC2579] and STD 58, [RFC2580].

3. 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 for [BFD], [BFD-1HOP] and [BFD-MH], BFD versions 0 and/or 1, on devices supporting this feature.

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

4. Terminology

This document adopts the definitions, acronyms and mechanisms described in [BFD], [BFD-1HOP] and [BFD-MH]. Unless otherwise stated, the mechanisms described therein will not be re-described here.

5. Brief Description of MIB Objects

This section describes objects pertaining to BFD. The MIB objects are derived from [BFD] and [BFD-MH].

5.1. General Variables

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

5.2. Session Table (bfdSessionTable)

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

5.3. 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.

5.4. BFD Session Discriminator Mapping Table (bfdSessDiscMapTable)

The BFD Session Discriminator Mapping Table maps a local discriminator value to associated BFD sessions' BfdSessIndexTC used in the bfdSessionTable.

5.5. BFD Session IP Mapping Table (bfdSessIpMapTable)

The BFD Session IP Mapping Table maps, given bfdSessInterface, bfdSessAddrType, and bfdSessAddr, to an associated BFD sessions' BfdSessIndexTC used in the bfdSessionTable. This table SHOULD contains those BFD sessions are of IP type.

6. BFD MIB Module Definitions

This MIB module makes references to the following documents. [RFC2579], [RFC2580], [RFC2863], [RFC4001], and [RFC3413].

```
 BFD-STD-MIB DEFINITIONS ::= BEGIN

 IMPORTS
     MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
         mib-2, Integer32, Unsigned32, Counter32, Counter64
         FROM SNMPv2-SMI

     TEXTUAL-CONVENTION, TruthValue, RowStatus,
         StorageType, TimeStamp
         FROM SNMPv2-TC

     MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
```

```
            FROM SNMPv2-CONF

        InterfaceIndexOrZero
            FROM IF-MIB

        InetAddress, InetAddressType, InetPortNumber
            FROM INET-ADDRESS-MIB;

    bfdMib MODULE-IDENTITY
        LAST-UPDATED "201003031200Z" -- 3 March 2010 12:00:00 EST
        ORGANIZATION "IETF Bidirectional Forwarding Detection
                      Working Group"
        CONTACT-INFO
            "Thomas D. Nadeau
             BT
             Email:  tom.nadeau@bt.com

             Zafar Ali
             Cisco Systems, Inc.
             Email:  zali@cisco.com

             Nobo Akiya
             Cisco Systems, G.K.
             Email:  nobo@cisco.com"
        DESCRIPTION
            "Bidirectional Forwarding Management Information Base."
        REVISION "201003031200Z" -- 3 March 2010 12:00:00 EST
        DESCRIPTION
            "Initial version. Published as RFC xxxx."
 -- RFC Ed.: RFC-editor pls fill in xxxx
        ::= { mib-2 XXX }
 -- RFC Ed.: assigned by IANA, see section 7.1 for details

 -- Top level components of this MIB module.

    bfdNotifications OBJECT IDENTIFIER ::= { bfdMIB 0 }

    bfdObjects       OBJECT IDENTIFIER ::= { bfdMIB 1 }

    bfdConformance   OBJECT IDENTIFIER ::= { bfdMIB 2 }

    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
    DISPLAY-HINT   "d"
    STATUS         current
    DESCRIPTION
        "The BFD interval delay in microseconds."
    SYNTAX Unsigned32 (0..4294967295)

    BfdMultiplier ::= TEXTUAL-CONVENTION
    DISPLAY-HINT   "d"
    STATUS         current
    DESCRIPTION
        "The BFD failure detection multiplier."
    SYNTAX Unsigned32 (1..255)

    BfdDiag ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION
        "A common BFD diagnostic code."
    SYNTAX INTEGER {
        noDiagnostic(0),
        controlDetectionTimeExpired(1),
        echoFunctionFailed(2),
        neighborSignaledSessionDown(3),
        forwardingPlaneReset(4),
        pathDown(5),
        concatenatedPathDown(6),
        administrativelyDown(7),
        reverseConcatenatedPathDown(8)
    }

 -- BFD General Variables

 -- These parameters apply globally to the Systems'
 -- 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 }

    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 2 }

 -- 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) and
              BFD Version 1 (draft-ietf-bfd-base-11.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,
```

```
        bfdSessVersionNumber            Unsigned32,
        bfdSessType                     INTEGER,
        bfdSessMultiHopUniLinkMode      INTEGER,
        bfdSessDiscriminator            Unsigned32,
        bfdSessRemoteDiscr              Unsigned32,
        bfdSessDestinationUdpPort       InetPortNumber,
        bfdSessSourceUdpPort            InetPortNumber,
        bfdSessEchoSourceUdpPort        InetPortNumber,
        bfdSessAdminStatus              INTEGER,
        bfdSessState                    INTEGER,
        bfdSessRemoteHeardFlag          TruthValue,
        bfdSessDiag                     BfdDiag,
        bfdSessOperMode                 INTEGER,
        bfdSessDemandModeDesiredFlag    TruthValue,
        bfdSessControlPlaneIndepFlag    TruthValue,
        bfdSessMultipointFlag           TruthValue,
        bfdSessInterface                InterfaceIndexOrZero,
        bfdSessAddrType                 InetAddressType,
        bfdSessAddr                     InetAddress,
        bfdSessGTSM                     TruthValue,
        bfdSessGTSMTTL                  Unsigned32,
        bfdSessDesiredMinTxInterval     BfdInterval,
        bfdSessReqMinRxInterval         BfdInterval,
        bfdSessReqMinEchoRxInterval     BfdInterval,
        bfdSessDetectMult               BfdMultiplier,
        bfdSessNegotiatedInterval       BfdInterval,
        bfdSessNegotiatedEchoInterval   BfdInterval,
        bfdSessNegotiatedDetectMult     BfdMultiplier,
        bfdSessAuthPresFlag             TruthValue,
        bfdSessAuthenticationType       INTEGER,
        bfdSessAuthenticationKeyID      Integer32,
        bfdSessAuthenticationKey        OCTET STRING,
        bfdSessStorType                 StorageType,
        bfdSessRowStatus                RowStatus
    }

    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 }

    bfdSessVersionNumber OBJECT-TYPE
        SYNTAX     Unsigned32 (0..7)
        MAX-ACCESS read-create
```

```
        STATUS     current
        DESCRIPTION
            "The version number of the BFD protocol that this session
             is running in. Write access is available for this object
             to provide ability to set desired version for this
             BFD session."
        REFERENCE
            "BFD Version 0 (draft-katz-ward-bfd-02.txt) and
             BFD Version 1 (draft-ietf-bfd-base-11.txt)"
        DEFVAL { 1 }
        ::= { bfdSessEntry 2 }

    bfdSessType OBJECT-TYPE
        SYNTAX     INTEGER {
            singleHop(1),
            multiHopTotallyArbitraryPaths(2),
            multiHopOutOfBandSignaling(3),
            multiHopUnidirectionalLinks(4)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the type of this BFD session."
        REFERENCE
            "draft-ietf-bfd-v4v6-1hop-11 and
             draft-ietf-bfd-multihop-09"
        ::= { bfdSessEntry 3 }

    bfdSessMultiHopUniLinkMode OBJECT-TYPE
        SYNTAX     INTEGER {
            none(1),
            active(2),
            passive(3)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "For bfdSessType of multiHopUnidirectionalLinks(4), this
             object specifies whether this BFD session is running in
             active(2) mode or passive(3) mode. For all other BFD
             bfdSessType BFD sessions, none(1) MUST be specified."
        REFERENCE
            "draft-ietf-bfd-multihop-09, Section 3.3"
        ::= { bfdSessEntry 4 }

    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 5 }

    bfdSessRemoteDiscr OBJECT-TYPE
        SYNTAX     Unsigned32 (0 | 1..4294967295)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the session discriminator chosen
             by the remote system for this BFD session.  The value may
             be zero(0) if the remote discriminator is not yet known
             or if the session is in the down or adminDown(1) state."
        REFERENCE
            "draft-ietf-bfd-base-11, Section 6.8.6."
        ::= { bfdSessEntry 6 }

    bfdSessDestinationUdpPort OBJECT-TYPE
        SYNTAX     InetPortNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the destination UDP port used for
             this BFD session. The value maybe zero(0) if the session
             is in adminDown(1) state."
        REFERENCE
            "Port 3784 (draft-ietf-bfd-v4v6-1hop-11),
             Port 3785 (draft-ietf-bfd-v4v6-1hop-11), and
             Port 4784 (draft-ietf-bfd-multihop-09)"
        DEFVAL { 0 }
        ::= { bfdSessEntry 7 }

    bfdSessSourceUdpPort OBJECT-TYPE
        SYNTAX     InetPortNumber
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object specifies the source UDP port of BFD control
             packets for this BFD session. The value maybe zero(0) if
             the session is in adminDown(1) state."
        REFERENCE
            "draft-ietf-bfd-v4v6-1hop-11 and
             draft-ietf-bfd-multihop-09"
        DEFVAL { 0 }
        ::= { bfdSessEntry 8 }
```

```
    bfdSessEchoSourceUdpPort OBJECT-TYPE
        SYNTAX     InetPortNumber
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object specifies the source UDP port of BFD echo
             packets for this BFD session. The value maybe zero(0) if
             the session is not running in the echo mode, or the
             session is in adminDown(1) state."
        REFERENCE
            "draft-ietf-bfd-v4v6-1hop-11 and
             draft-ietf-bfd-multihop-09"
        DEFVAL { 0 }
        ::= { bfdSessEntry 9 }

    bfdSessAdminStatus OBJECT-TYPE
        SYNTAX     INTEGER {
                             stop(1),
                             start(2)
                   }
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
                "A transition from 'stop' to 'start' will start
                 the BFD state machine for the session. The state
                 machine will have an initial state of down.
                 A transition from 'start' to 'stop' will cause
                 the BFD sesssion to be brought down to
                 adminDown(1). Care should be used in providing
                 write access to this object without adequate
                 authentication."
        DEFVAL { 2 }
        ::= { bfdSessEntry 10 }

    bfdSessState OBJECT-TYPE
        SYNTAX     INTEGER {
            adminDown(1),
            down(2),
            init(3),
            up(4),
            failing(5)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The perceived state of the BFD session.
             BFD State failing(5) is only applicable if this BFD
             session is running version 0.
```

```
            Upon creation of a new BFD session via this MIB, the
            suggested initial state is down(2)."
        DEFVAL { 2 }
        ::= { bfdSessEntry 11 }

    bfdSessRemoteHeardFlag 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(2) 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."
        REFERENCE
            "BFD Version 0 (draft-katz-ward-bfd-02.txt) and
             BFD Version 1 (draft-ietf-bfd-base-11.txt)"
        DEFVAL { false }
        ::= { bfdSessEntry 12 }

    bfdSessDiag OBJECT-TYPE
        SYNTAX     BfdDiag
        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(4)
             to some other state."
        ::= { bfdSessEntry 13 }

    bfdSessOperMode OBJECT-TYPE
        SYNTAX     INTEGER {
            asyncModeWEchoFunction(1),
            asynchModeWOEchoFunction(2),
            demandModeWEchoFunction(3),
            demandModeWOEchoFunction(4)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies current operating mode that BFD
             session is operating in."
        ::= { bfdSessEntry 14 }

    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(2) if not"
        DEFVAL { false }
        ::= { bfdSessEntry 15 }

    bfdSessControlPlaneIndepFlag OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        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(2)"
        DEFVAL { false }
        ::= { bfdSessEntry 16 }

    bfdSessMultipointFlag OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object indicates the Multipoint (M) bit for this
             session. It is set to true(1) if Multipoint (M) bit is
             set to 1. Otherwise, the value is set to false(2)"
        DEFVAL { false }
        ::= { bfdSessEntry 17 }

    bfdSessInterface OBJECT-TYPE
        SYNTAX     InterfaceIndexOrZero
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object contains an interface index used to indicate
             the interface which this BFD session is running on. This
             value can be zero if there is no interface associated
             with this BFD session."
        ::= { bfdSessEntry 18 }

    bfdSessAddrType OBJECT-TYPE
```

```
        SYNTAX     InetAddressType
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object specifies IP address type of the neighboring IP
             address which is being monitored with this BFD session.

             Only values unknown(0), ipv4(1), ipv6(2), or ipv6z(4)
             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 19 }

    bfdSessAddr OBJECT-TYPE
        SYNTAX     InetAddress
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object specifies the neighboring IP address which is
             being monitored 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 20 }

    bfdSessGTSM OBJECT-TYPE
        SYNTAX  TruthValue
        MAX-ACCESS read-create
        STATUS current
        DESCRIPTION
           "Setting the value of this object to true(1) will enable GTSM
            protection of the BFD session.  GTSM MUST be enabled on a
            singleHop(1) session if no authentication is in use."
        REFERENCE
           "RFC 5082 - The Generalized TTL Security Mechanism (GTSM).
            draft-ietf-bfd-v4v6-1hop-11, Sec. 5"
        DEFVAL { false }
        ::= { bfdSessEntry 21 }

    bfdSessGTSMTTL OBJECT-TYPE
        SYNTAX Unsigned32 (0..255)
```

```
        MAX-ACCESS read-create
        STATUS current
        DESCRIPTION
            "This object is valid only when bfdSessGTSM protection is
             enabled on the system. This object specifies the minimum
             allowed TTL for received BFD control packets. For
             singleHop(1) session, if GTSM protection is enabled,
             this object SHOULD be set to maximum TTL allowed for
             single hop."
        REFERENCE
           "RFC 5082 - The Generalized TTL Security Mechanism (GTSM).
            draft-ietf-bfd-v4v6-1hop-11, Sec. 5"
        DEFVAL { 0 }
        ::= { bfdSessEntry 22 }

    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 23 }

    bfdSessReqMinRxInterval 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 24 }

    bfdSessReqMinEchoRxInterval 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 25 }

    bfdSessDetectMult OBJECT-TYPE
        SYNTAX     BfdMultiplier
        MAX-ACCESS read-create
```

```
        STATUS     current
        DESCRIPTION
            "This object specifies the Detect time multiplier."
        ::= { bfdSessEntry 26 }

    bfdSessNegotiatedInterval OBJECT-TYPE
        SYNTAX     BfdInterval
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the negotiated interval, in
             microseconds, that the local system is transmitting
             BFD Control packets."
        ::= { bfdSessEntry 27 }

    bfdSessNegotiatedEchoInterval OBJECT-TYPE
        SYNTAX     BfdInterval
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the negotiated interval, in
             microseconds, that the local system is transmitting
             BFD echo packets. Value is expected to be zero if
             the sessions is not running in echo mode."
        ::= { bfdSessEntry 28 }

    bfdSessNegotiatedDetectMult OBJECT-TYPE
        SYNTAX     BfdMultiplier
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object specifies the Detect time multiplier."
        ::= { bfdSessEntry 29 }

    bfdSessAuthPresFlag OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        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(2) if not."
        REFERENCE
            "draft-ietf-bfd-base-11, Sections 4.2 - 4.4"
        DEFVAL { false }
        ::= { bfdSessEntry 30 }
```

```
    bfdSessAuthenticationType OBJECT-TYPE
        SYNTAX     INTEGER {
            reserved(0),
            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. Max-access to this object as well as
             other authentication related objects are set to
             read-create in order to support management of a single
             key ID at a time, key rotation is not handled. Key update
             in practice must be done by atomic update using a set
             containing all affected objects in the same varBindList
             or otherwise risk the session dropping."
        REFERENCE
            "draft-ietf-bfd-base-11, Sections 4.2 - 4.4"
        ::= { bfdSessEntry 31 }

    bfdSessAuthenticationKeyID OBJECT-TYPE
        SYNTAX     Integer32 (-1 | 0..255)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The authentication key ID in use for this session.  This
             object permits multiple keys to be active simultaneously.

             When bfdSessAuthPresFlag is false(2), then the value
             of this object MUST be -1.  The value -1 indicates that
             no Authentication Key ID will be present in the optional
             BFD Authentication Section."
        REFERENCE
            "draft-ietf-bfd-base-11, Sections 4.2 - 4.4"
        DEFVAL { -1 }
        ::= { bfdSessEntry 32 }

    bfdSessAuthenticationKey OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE (0..252))
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The authentication key.  When the
```

```
            bfdSessAuthenticationType is simplePassword(1), the value
            of this object is the password present in the BFD packets.

            When the bfdSessAuthentication type is one of the keyed
            authentication types, this value is used in the
            computation of the key present in the BFD authentication
            packet."
        REFERENCE
            "draft-ietf-bfd-base-11, Sections 4.2 - 4.4"
        ::= { bfdSessEntry 33 }

    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 33 }

    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 34 }

 -- 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 {
       bfdSessPerfCtrlPktIn           Counter32,
       bfdSessPerfCtrlPktOut          Counter32,
       bfdSessPerfCtrlPktDrop         Counter32,
       bfdSessPerfCtrlPktDropLastTime Timestamp,
       bfdSessPerfEchoPktIn           Counter32,
       bfdSessPerfEchoPktOut          Counter32,
       bfdSessPerfEchoPktDrop         Counter32,
       bfdSessPerfEchoPktDropLastTime Timestamp,
       bfdSessUpTime                  TimeStamp,
       bfdSessPerfLastSessDownTime    TimeStamp,
       bfdSessPerfLastCommLostDiag    BfdDiag,
       bfdSessPerfSessUpCount         Counter32,
       bfdSessPerfDiscTime            TimeStamp,

       -- High Capacity Counters
       bfdSessPerfCtrlPktInHC         Counter64,
       bfdSessPerfCtrlPktOutHC        Counter64,
       bfdSessPerfCtrlPktDropHC       Counter64,
       bfdSessPerfEchoPktInHC         Counter64,
       bfdSessPerfEchoPktOutHC        Counter64,
       bfdSessPerfEchoPktDropHC       Counter64
    }

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

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

    bfdSessPerfCtrlPktOut OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
```

```
            "The total number of BFD control messages sent for this BFD
             session."
        ::= { bfdSessPerfEntry 2 }

    bfdSessPerfCtrlPktDrop OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of BFD control messages received for this
             session yet dropped for being invalid."
        ::= { bfdSessPerfEntry 3 }

    bfdSessPerfCtrlPktDropLastTime OBJECT-TYPE
        SYNTAX     TimeStamp
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of sysUpTime on the most recent occasion at
             which received BFD control message for this session was
             dropped. If no such up event exists, this object contains
             a zero value."
        ::= { bfdSessPerfEntry 4 }

    bfdSessPerfEchoPktIn OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of BFD echo messages received for this
             BFD session."
        ::= { bfdSessPerfEntry 5 }

    bfdSessPerfEchoPktOut OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of BFD echo messages sent for this BFD
             session."
        ::= { bfdSessPerfEntry 6 }

    bfdSessPerfEchoPktDrop OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of BFD echo messages received for this
```

```
            session yet dropped for being invalid."
        ::= { bfdSessPerfEntry 7 }

    bfdSessPerfEchoPktDropLastTime OBJECT-TYPE
        SYNTAX     TimeStamp
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of sysUpTime on the most recent occasion at
             which received BFD echo message for this session was
             dropped. If no such up event exists, this object contains
             a zero value."
        ::= { bfdSessPerfEntry 8 }

    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 9 }

    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 10 }

    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 11 }

    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 system last rebooted."
        ::= { bfdSessPerfEntry 12 }

    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 13 }

    bfdSessPerfCtrlPktInHC OBJECT-TYPE
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of BFD control
             messages received for this BFD session. It MUST be equal
             to the least significant 32 bits of bfdSessPerfCtrlPktIn
             if bfdSessPerfCtrlPktInHC is supported according to
             the rules spelled out in RFC2863."
        ::= { bfdSessPerfEntry 14 }

    bfdSessPerfCtrlPktOutHC OBJECT-TYPE
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of
             total number of BFD control messages transmitted for this
             BFD session. It MUST be equal to the
             least significant 32 bits of bfdSessPerfCtrlPktOut
             if bfdSessPerfCtrlPktOutHC is supported according to
             the rules spelled out in RFC2863."
        ::= { bfdSessPerfEntry 15 }

    bfdSessPerfCtrlPktDropHC OBJECT-TYPE
```

```
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of BFD control
             messages received for this BFD session yet dropped for
             being invalid. It MUST be equal to the least significant
             32 bits of bfdSessPerfCtrlPktDrop if
             bfdSessPerfCtrlPktDropHC is supported according to the
             rules spelled out in RFC2863."
        ::= { bfdSessPerfEntry 16 }

    bfdSessPerfEchoPktInHC OBJECT-TYPE
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of BFD echo messages
             received for this BFD session. It MUST be equal to the
             least significant 32 bits of bfdSessPerfEchoPktIn
             if bfdSessPerfEchoPktInHC is supported according to
             the rules spelled out in RFC2863."
        ::= { bfdSessPerfEntry 17 }

    bfdSessPerfEchoPktOutHC OBJECT-TYPE
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of
             total number of BFD echo messages transmitted for this
             BFD session. It MUST be equal to the
             least significant 32 bits of bfdSessPerfEchoPktOut
             if bfdSessPerfEchoPktOutHC is supported according to
             the rules spelled out in RFC2863."
        ::= { bfdSessPerfEntry 18 }

    bfdSessPerfEchoPktInDropHC OBJECT-TYPE
        SYNTAX     Counter64
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the total number of BFD echo
             messages received for this BFD session yet dropped
             for being invalid. It MUST be equal to the least
             significant 32 bits of bfdSessPerfEchoPktDrop if
             bfdSessPerfEchoPktDropHC is supported according to
             the rules spelled out in RFC2863."
```

```
        ::= { bfdSessPerfEntry 19 }

 -- BFD Session Discriminator Mapping Table

    bfdSessDiscMapTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BfdSessDiscMapEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BFD Session Discriminator Mapping Table maps a
             local discriminator value to associated BFD sessions'
             BfdSessIndexTC used in the bfdSessionTable."
        ::= { bfdObjects 4 }

    bfdSessDiscMapEntry OBJECT-TYPE
        SYNTAX     BfdSessDiscMapEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BFD Session Discriminator Map Entry describes
             BFD session that is mapped to this BfdSessIndexTC."
        INDEX { bfdSessDiscriminator }
        ::= { bfdSessDiscMapTable 1 }

    BfdSessDiscMapEntry ::= SEQUENCE {
        bfdSessDiscMapIndex            BfdSessIndexTC
    }

    bfdSessDiscMapIndex 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."
        ::= { bfdSessDiscMapEntry 1 }

 -- BFD Session IP Mapping Table

    bfdSessIpMapTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BfdSessIpMapEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BFD Session IP Mapping Table maps given
             bfdSessInterface, bfdSessAddrType, and bfdSessAddr
             to an associated BFD sessions' BfdSessIndexTC used in
```

```
             the bfdSessionTable. This table SHOULD contains those
             BFD sessions of singleHop(1) type."
        ::= { bfdObjects 5 }

    bfdSessIpMapEntry OBJECT-TYPE
        SYNTAX     BfdSessIpMapEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
           "The BFD Session IP Map Entry describes
            BFD session that is mapped to this BfdSessIndexTC."
        INDEX {
            bfdSessInterface,
            bfdSessAddrType,
            bfdSessAddr
        }
        ::= { bfdSessIpMapTable 1 }

    BfdSessIpMapEntry ::= SEQUENCE {
        bfdSessIpMapIndex            BfdSessIndexTC
    }

    bfdSessIpMapIndex 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."
        ::= { bfdSessIpMapEntry 1 }

 -- Notification Configuration

    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(4)
             state from some other state. The included values of
             bfdSessDiag MUST both be set equal to this
             new state (i.e: up(4)).  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 the
             cases where a contiguous range of sessions
             have transitioned into the up(4) 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(2)
              or adminDown(1) states from some other state. The included
              values of bfdSessDiag MUST both be set equal to this new
              state (i.e: down(2) or adminDown(1)).  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(2) or adminDown(1) 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,
            bfdSessionReadOnlyGroup,
            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
                     high-capacity counters."

        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),
                         ipv6z(4)
                     }
        DESCRIPTION "Only unknown(0), ipv4(1), ipv6(2) and ipv6z(4)
                     support are required."
```

```
        OBJECT       bfdSessAddr
        SYNTAX       InetAddress (SIZE (0|4|16|20))
        DESCRIPTION "An implementation is only required to support
                     unknown(0), ipv4(1), ipv6(2) and ipv6z(4) sizes."

        ::= { bfdCompliances 1 }

 -- Units of conformance.

    bfdSessionGroup OBJECT-GROUP
        OBJECTS {
            bfdSessNotificationsEnable,
            bfdAdminStatus,
            bfdSessVersionNumber,
            bfdSessSourceUdpPort,
            bfdSessEchoSourceUdpPort,
            bfdSessAdminStatus,
            bfdSessDiag,
            bfdSessDemandModeDesiredFlag,
            bfdSessInterface,
            bfdSessAddrType,
            bfdSessAddr,
            bfdSessGTSM,
            bfdSessGTSMTTL,
            bfdSessDesiredMinTxInterval,
            bfdSessReqMinRxInterval,
            bfdSessReqMinEchoRxInterval,
            bfdSessDetectMult,
            bfdSessAuthPresFlag,
            bfdSessAuthenticationType,
            bfdSessAuthenticationKeyID,
            bfdSessAuthenticationKey,
            bfdSessStorType,
            bfdSessRowStatus
        }
        STATUS     current
        DESCRIPTION
            "Collection of objects needed for BFD sessions."
        ::= { bfdGroups 1 }

    bfdSessionReadOnlyGroup OBJECT-GROUP
        OBJECTS {
            bfdSessType,
            bfdSessMultiHopUniLinkMode,
            bfdSessDiscriminator,
            bfdSessRemoteDiscr,
            bfdSessDestinationUdpPort,
            bfdSessState,
```

```
            bfdSessRemoteHeardFlag,
            bfdSessOperMode,
            bfdSessControlPlaneIndepFlag,
            bfdSessMultipointFlag,
            bfdSessNegotiatedInterval,
            bfdSessNegotiatedEchoInterval,
            bfdSessNegotiatedDetectMult,
            bfdSessDiscMapIndex,
            bfdSessIpMapIndex
        }
        STATUS     current
        DESCRIPTION
            "Collection of read-only objects needed for BFD sessions."
        ::= { bfdGroups 2 }

    bfdSessionPerfGroup OBJECT-GROUP
        OBJECTS {
            bfdSessPerfCtrlPktIn,
            bfdSessPerfCtrlPktOut,
            bfdSessPerfCtrlPktDrop,
            bfdSessPerfCtrlPktDropLastTime,
            bfdSessPerfEchoPktIn,
            bfdSessPerfEchoPktOut,
            bfdSessPerfEchoPktDrop,
            bfdSessPerfEchoPktDropLastTime,
            bfdSessUpTime,
            bfdSessPerfLastSessDownTime,
            bfdSessPerfLastCommLostDiag,
            bfdSessPerfSessUpCount,
            bfdSessPerfDiscTime
        }
        STATUS     current
        DESCRIPTION
            "Collection of objects needed to monitor the
             performance of BFD sessions."
        ::= { bfdGroups 3 }

    bfdSessionPerfHCGroup OBJECT-GROUP
        OBJECTS {
            bfdSessPerfCtrlPktInHC,
            bfdSessPerfCtrlPktOutHC,
            bfdSessPerfCtrlPktDropHC,
            bfdSessPerfEchoPktInHC,
            bfdSessPerfEchoPktOutHC,
            bfdSessPerfEchoPktDropHC
        }
        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 4 }

    bfdNotificationGroup NOTIFICATION-GROUP
        NOTIFICATIONS {
            bfdSessUp,
            bfdSessDown
        }
        STATUS     current
        DESCRIPTION
            "Set of notifications implemented in this
             module."
        ::= { bfdGroups 5 }

    END
```

7. Security Considerations

As BFD may be tied into the stability of the network infrastructure (such as routing protocols), the effects of an attack on a BFD session may be very serious. This ultimately has denial-of-service effects, as links may be declared to be down (or falsely declared to be up.) As such, improper manipulation of the objects represented by this MIB may result in denial of service to a large number of end-users.

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

- bfdSessAdminStatus - Improper change of bfdSessAdminStatus, from start to stop, can cause significant disruption of the connectivity to those portions of the Internet reached via the applicable remote BFD peer.

- bfdSessDesiredMinTxInterval, bfdSessReqMinRxInterval, bfdSessReqMinEchoRxInterval, bfdSessDetectMult - Improper change of this object can cause connections to be disrupted for extremely long time periods when otherwise they would be restored in a

relatively short period of time.

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.

The bfdSessAuthenticationType, bfdSessAuthenticationKeyID, and bfdSessAuthenticationKey objects hold security methods and associated security keys of BFD sessions. These objects SHOULD be considered highly sensitive objects. In order for these sensitive information from being improperly accessed, implementors MAY wish to disallow read and create access to these objects.

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.

8. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
bfdMib	{ mib-2 XXX }

[Editor's Note (to be removed prior to publication): the IANA is requested to assign a value for "XXX" under the 'mib-2' subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "XXX" (here and in the MIB module) with the assigned value and to remove this note.]

This document also requests IANA to manage the registry for the BfdDiag object.

9. References

9.1. Normative References

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9.2. Informative References

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Appendix A. Acknowledgments

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Authors' Addresses

Thomas D. Nadeau
BT
BT Centre
81 Newgate Street
London EC1A 7AJ
United Kingdom

Email: tom.nadeau@bt.com

Zafar Ali
Cisco Systems, Inc.
2000 Innovation Drive
Kanata, Ontario K2K 3E8
Canada

Email: zali@cisco.com

Nobo Akiya
Cisco Systems G.K.
Shinjuku Mitsui Building
2-1-1 Nishi-Shinjuku, Shinjuku-Ku
Tokyo 163-0409
Japan

Email: nobo@cisco.com