

BFD Working Group
INTERNET-DRAFT
Intended status: Standards Track

Thomas D. Nadeau
BT
Zafar Ali
Cisco Systems, Inc.
Nobo Akiya
Cisco Systems, G.K.

Expires: August 24, 2008

February 25, 2008

Bidirectional Forwarding Detection Management Information Base
draft-ietf-bfd-mib-04.txt

Status of this Memo

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with [Section 6 of BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/lid-abstracts.txt>.

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>.

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](#)].

Contents

1.	Introduction.....	2
2.	Terminology.....	2
3.	The Internet-Standard Management Framework.....	2

4.	Brief Description of MIB Objects.....	3
4.1	General Variables.....	3
4.2	Session Table (bfdSessionTable).....	3

4.3	Session Performance Table (bfdSessionPerfTable).....	3
4.4	BFD Session Discriminator Mapping Table (bfdSessDiscMapTable).	3
4.5	BFD Session IP Mapping Table (bfdSessIpMapTable).....	3
5.	BFD MIB Module Definitions.....	4
6.	Security Considerations.....	23
7.	IANA Considerations.....	24
7.1	IANA Considerations for BFD-STD-MIB.....	24
8.	References.....	24
8.1	Normative References.....	24
8.2	Informative References.....	25
9.	Acknowledgements.....	25
10.	Authors' Addresses.....	25
11.	Intellectual Property Statement.....	26
12.	Full Copyright Statement.....	26

[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 for [\[BFD\]](#) and [\[BFD-MH\]](#), BFD versions 0 and/or 1, on devices supporting this feature.

-- Ed Note: TBA, support for [\[BFD-LSP\]](#).

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 [\[BFD\]](#) and [\[BFD-MH\]](#).

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.

[4.4](#) 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.

[4.5](#) 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.

[5.](#) BFD MIB Module Definitions

This MIB module makes references to the following documents. [\[RFC2578\]](#), [\[RFC2579\]](#), [\[RFC2580\]](#), [\[RFC2863\]](#), [\[RFC4001\]](#), and [\[RFC3413\]](#).

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

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,  
    Unsigned32, Counter32, Counter64,  
    NOTIFICATION-TYPE, mib-2
```

```
        FROM SNMPv2-SMI -- \[RFC2578\]
```

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

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

```
    InterfaceIndex
```

```

FROM IF-MIB -- [RFC2863]

InetAddress, InetAddressType, InetPortNumber
FROM INET-ADDRESS-MIB -- [RFC4001]
;

bfdMIB MODULE-IDENTITY
LAST-UPDATED "200802231200Z" -- 23 February 2008 12:00:00 EST
ORGANIZATION "IETF"
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 history.
REVISION
    "200802231200Z" -- 23 February 2008 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 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 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 }

-- 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-07.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,
    bfdSessDiscriminator         Unsigned32,
    bfdSessRemoteDiscr          Unsigned32,

```

```

bfdSessUdpPort          InetPortNumber,
bfdSessState            INTEGER,
bfdSessRemoteHeardFlag TruthValue,
bfdSessDiag            BfdDiag,
bfdSessOperMode        INTEGER,
bfdSessDemandModeDesiredFlag TruthValue,
bfdSessEchoFuncModeDesiredFlag TruthValue,
bfdSessControlPlanIndepFlag TruthValue,
bfdSessInterface       InterfaceIndex,
bfdSessAddrType        InetAddressType,
bfdSessAddr            InetAddress,
bfdSessDesiredMinTxInterval BfdInterval,
bfdSessReqMinRxInterval BfdInterval,
bfdSessReqMinEchoRxInterval 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 }

```

```

bfdVersionNumber OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The version number of the BFD protocol that this session
    is running in."
REFERENCE
    "BFD Version 0 (draft-katz-ward-bfd-02.txt) and
    BFD Version 1 (draft-ietf-bfd-base-07.txt)"
DEFVAL { 0 }
 ::= { bfdSessEntry 2 }

```

```

bfdSessType OBJECT-TYPE
    SYNTAX      INTEGER {
        singleHop(1),
        multiHop(2)
    }
}

```


BFD MIB

February 25, 2008

```
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The type of this BFD session."
 ::= { bfdSessEntry 3 }
```

```
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 4 }
```

```
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 5 }
```

```
bfdSessUdpPort OBJECT-TYPE
SYNTAX            InetPortNumber
MAX-ACCESS        read-create
STATUS            current
DESCRIPTION
    "The destination UDP Port for BFD. The default value is
    the well-known value for this port. BFD State failing(5)
    is only applicable if this BFD session is running
    version 0"
REFERENCE
    "draft-katz-ward-bfd-02.txt and
    draft-raggarwa-mpls-bfd-00.txt"
DEFVAL { 0 }
 ::= { bfdSessEntry 6 }
```

```
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."
 ::= { bfdSessEntry 7 }
```

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(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. Value placed in this object is valid only if this session is running in BFD version 0."

REFERENCE

"BFD Version 0 ([draft-katz-ward-bfd-02.txt](#)) and BFD Version 1 ([draft-ietf-bfd-base-07.txt](#))"

```
DEFVAL { 0 }
 ::= { bfdSessEntry 8 }
```

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 9 }
```

```
bfdSessOperMode OBJECT-TYPE
```

```
    SYNTAX      INTEGER { asyncModeWEchoFun(1),
                          asynchModeWOEchoFun(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 AsynchModeWOEchoFun(2) ...
        A value of DemandModeWEchoFunction(3) ...
        A value of DemandModeWOEchoFunction(4) ...
```

```
    "
```

```
 ::= { bfdSessEntry 10 }
```

```
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 11 }
```

```
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 12 }

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 13 }

bfdSessInterface OBJECT-TYPE

SYNTAX InterfaceIndex
MAX-ACCESS read-only
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 are no interface associated with this BFD session"

::= { bfdSessEntry 14 }

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) 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 15 }

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 16 }

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 17 }

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 18 }

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 19 }

bfdSessDetectMult OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "This object specifies the Detect time multiplier."
 ::= { bfdSessEntry 20 }

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 21 }

```

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 22 }

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 23 }

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 24 }

-- 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 }

BFD MIB

February 25, 2008

```
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 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 }
```

```
BfdSessDiscrMapEntry ::= 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 are of IP type: SingleHop(1) and MultiHop(2)."

::= { 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

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(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,
        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) }
```

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,
 bfdSessVersionNumber,
 bfdSessType,
 bfdSessDiscriminator,
 bfdSessRemoteDiscr,
 bfdSessUdpPort,
 bfdSessState,
 bfdSessRemoteHeardFlag,
 bfdSessDiag,
 bfdSessOperMode,
 bfdSessDemandModeDesiredFlag,
 bfdSessEchoFuncModeDesiredFlag,
 bfdSessControlPlanIndepFlag,
 bfdSessInterface,
 bfdSessAddrType,
 bfdSessAddr,
 bfdSessDesiredMinTxInterval,
 bfdSessReqMinRxInterval,
 bfdSessReqMinEchoRxInterval,
 bfdSessDetectMult,
 bfdSessStorType,
 bfdSessRowStatus,
 bfdSessAuthPresFlag,


```
        bfdSessAuthenticationType,
        bfdSessDiscMapIndex,
        bfdSessIpMapIndex
    }
    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."
 ::= { bfdGroups 4 }

END
```

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.

- o 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:

- o 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. 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 [\[RFC2434\]](#).

[7.1.](#) IANA Considerations for BFD-STD-MIB

The IANA is requested to assign { mib-2 XXX } to the BFD-STD-MIB module specified in this document.

[8.](#) References

[8.1](#) Normative References

- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [BFD] Katz, D., and Ward, D., "Bidirectional Forwarding Detection", [draft-ietf-bfd-base-07.txt](#).

- [BFD-MH] Katz, D., and Ward, D., "BFD for Multihop Paths", [draft-ietf-bfd-multihop-06.txt](#).
- [BFD-LSP] Aggarwal, R., Kompella, K., T. D. Nadeau, and G. Swallow BFD For MPLS LSPs, [draft-ietf-bfd-mpls-05.txt](#).

[8.2](#) Informative References

- [RFC2863] McCloghrie, K., Kastenholz, F., "The Interfaces Group MIB", STD 58, [RFC 2863](#), June 2000.
- [RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet

Network Addresses", [RFC 4001](#), Feb. 2005.

- [RFC2119] Bradner, S., "Key Words for use in RFCs to Indicate Requirement Levels", [RFC 2119](#), [BCP 14](#), April 1997.
- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.
- [RFC3413] Levi, D., Meyer, P., Stewart, B., "SNMP Applications", [RFC 3413](#), December 2002.
- [RFC2434] Narten, T. and H. Alvestrand., "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 2434](#), October 1998.

9. Acknowledgements

We would like to thank David Ward, Reshad Rahman, David Toscano, Sylvain Masse, Mark Tooker, and Kiran Koushik Agrahara Sreenivasa for their comments and suggestions.

10. Authors' Addresses

Thomas D. Nadeau
BT
BT Centre
81 Newgate Street
London, EC1A 7AJ
United Kingdom
Email: tom.nadeau@bt.com

Zafar Ali
2000 Innovation Drive
Kanata, Ontario, K2K 3E8, Canada.
Phone: 734-276-2459
Email: zali@cisco.com

Nishi-Shinjuku, Shinjuku-Ku,
Tokyo 163-0409, Japan
Phone: +81 3 5324 4096
Email: nobo@cisco.com

11. Intellectual Property Statement

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in [BCP 78](#) and [BCP 79](#).

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

12. Full Copyright Statement

Copyright (C) The IETF Trust (2008). This document is subject to the rights, licenses and restrictions contained in [BCP 78](#), and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

Funding for the RFC Editor function is provided by the IETF Administrative Support Activity (IASA).