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BFD Management Information Base draft-ietf-bfd-mib-05

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Abstract

This draft defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling Bidirectional Forwarding Detection (BFD) protocol.

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1. Requirements notation

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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 [\[RFC2119\] \(Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," March 1997.\)](#).

2. The Internet-Standard Management Framework

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For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of [\[RFC3410\] \(Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework," December 2002.\)](#).

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, [\[RFC2578\]](#)

[\(McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 \(SMIV2\)," April 1999.\)](#), STD 58, [\[RFC2579\]](#) (McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIV2," April 1999.) and STD 58, [\[RFC2580\]](#) (McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIV2," April 1999.).

3. Introduction

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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 [\[BFD\]](#) (Katz, D. and D. Ward, "Bidirectional Forwarding Detection," March 2008.) and [\[BFD-MH\]](#) (Katz, D. and D. Ward, "BFD for Multihop Paths," January 2008.), BFD versions 0 and/or 1, on devices supporting this feature.

-- Ed Note: TBA, support for [\[BFD-LSP\]](#) (Aggarwal, R., Kompella, K., Nadeau, T., and G. Swallow, "BFD For MPLS LSPs," June 2008.).

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

4. Terminology

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This document adopts the definitions, acronyms and mechanisms described in [\[BFD\]](#) (Katz, D. and D. Ward, "Bidirectional Forwarding Detection," March 2008.), [\[BFD-MH\]](#) (Katz, D. and D. Ward, "BFD for Multihop Paths," January 2008.) and [\[BFD-LSP\]](#) (Aggarwal, R., Kompella, K., Nadeau, T., and G. Swallow, "BFD For MPLS LSPs," June 2008.). Unless otherwise stated, the mechanisms described therein will not be re-described here.

5. Brief Description of MIB Objects

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This section describes objects pertaining to BFD. The MIB objects are derived from [\[BFD\]](#) (Katz, D. and D. Ward, "Bidirectional Forwarding Detection," March 2008.) and [\[BFD-MH\]](#) (Katz, D. and D. Ward, "BFD for Multihop Paths," January 2008.).

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5.1. General Variables

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

5.2. Session Table (bfdSessionTable)

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

5.3. Session Performance Table (bfdSessionPerfTable)

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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)

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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)

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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

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This MIB module makes references to the following documents. [\[RFC2579\]](#) (McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIV2," April 1999.), [\[RFC2580\]](#) (McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for

[SMIV2," April 1999.\)](#), [\[RFC2863\] \(McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB," June 2000.\)](#), [\[RFC4001\] \(Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses," February 2005.\)](#), and [\[RFC3413\] \(Levi, D., Meyer, P., and B. Stewart, "Simple Network Management Protocol \(SNMP\) Applications," December 2002.\)](#).

```

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 "200808041200Z" -- 4 August 2008 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 "200808041200Z" -- 4 August 2008 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)

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 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-08.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,
bfdSessDestinationUdpPort	InetPortNumber,
bfdSessSourceUdpPort	InetPortNumber,
bfdSessEchoSourceUdpPort	InetPortNumber,
bfdSessAdminStatus	INTEGER,
bfdSessState	INTEGER,
bfdSessRemoteHeardFlag	TruthValue,
bfdSessDiag	BfdDiag,
bfdSessOperMode	INTEGER,
bfdSessDemandModeDesiredFlag	TruthValue,
bfdSessControlPlaneIndepFlag	TruthValue,
bfdSessInterface	InterfaceIndexOrZero,
bfdSessAddrType	InetAddressType,
bfdSessAddr	InetAddress,
bfdSessGTSM	TruthValue,
bfdSessGTSM TTL	Unsigned32,
bfdSessDesiredMinTxInterval	BfdInterval,
bfdSessReqMinRxInterval	BfdInterval,
bfdSessReqMinEchoRxInterval	BfdInterval,
bfdSessDetectMult	Unsigned32,
bfdSessNegotiatedInterval	BfdInterval,
bfdSessNegotiatedEchoInterval	BfdInterval,
bfdSessNegotiatedDetectMult	Unsigned32,
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-08.txt)"

DEFVAL { 1 }

::= { bfdSessEntry 2 }

bfdSessType OBJECT-TYPE

SYNTAX INTEGER {
singleHop(1),
multiHop(2)
}

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 (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-08, Section 6.8.6."

::= { bfdSessEntry 5 }

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-08),
Port 3785 (draft-ietf-bfd-v4v6-1hop-08), and
Port 4784 (draft-ietf-bfd-multihop-06)"

DEFVAL { 0 }

::= { bfdSessEntry 6 }

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-08 and
draft-ietf-bfd-multihop-06"

DEFVAL { 0 }

::= { bfdSessEntry 7 }

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-08 and
draft-ietf-bfd-multihop-06"

DEFVAL { 0 }

::= { bfdSessEntry 8 }

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 session to be brought down to adminDown(1). Care should be used in providing write access to this object without adequate authentication."

DEFVAL { 2 }
::= { bfdSessEntry 9 }

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 10 }

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-08.txt)"

DEFVAL { false }
::= { bfdSessEntry 11 }

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 12 }

bfdSessOperMode OBJECT-TYPE

SYNTAX INTEGER {
 asyncModeWEchoFun(1),
 asynchModeW0EchoFun(2),
 demandModeWEchoFunction(3),
 demandModeW0EchoFunction(4)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies current operating mode that BFD session is operating in."

::= { bfdSessEntry 13 }

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 14 }

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 15 }

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 16 }

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 17 }

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 18 }

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-08, Sec. 5"

DEFVAL { false }

::= { bfdSessEntry 19 }

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-08, Sec. 5"

DEFVAL { 0 }

::= { bfdSessEntry 20 }

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 21 }

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 22 }

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 23 }

bfdSessDetectMult OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object specifies the Detect time multiplier."
::= { bfdSessEntry 24 }

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 25 }

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 26 }

bfdSessNegotiatedDetectMult OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the Detect time multiplier."
::= { bfdSessEntry 27 }

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(2) if not."

REFERENCE

"draft-ietf-bfd-base-08, Sections 4.2 - 4.4"

DEFVAL { false }

::= { bfdSessEntry 28 }

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."

REFERENCE

"draft-ietf-bfd-base-08, Sections 4.2 - 4.4"

::= { bfdSessEntry 29 }

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-08, Sections 4.2 - 4.4"

DEFVAL { -1 }

::= { bfdSessEntry 30 }

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.

Implementations may further restrict the length of this key. When doing so, a SET of this object should return tooBig.

Note that due to the highly sensitive nature of the data managed by this object an implementation may choose to implement this object as 'write-only'. SET operations will succeed normally but GET and GET-BULK operations are permitted to return noSuchName."

REFERENCE

"draft-ietf-bfd-base-08, Sections 4.2 - 4.4"

::= { bfdSessEntry 31 }

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 32 }

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 33 }

-- BFD Session Performance Table

bfdSessPerfTable OBJECT-TYPE

SYNTAX SEQUENCE OF BfdSessPerfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table specifies BFD Session performance counters."

::= { bfdObjects 3 }

bfdSessPerfEntry OBJECT-TYPE

SYNTAX BfdSessPerfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

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

AUGMENTS { bfdSessEntry }

::= { bfdSessPerfTable 1 }

BfdSessPerfEntry ::= SEQUENCE {

bfdSessPerfPktIn	Counter32,
bfdSessPerfPktOut	Counter32,
bfdSessUpTime	TimeStamp,
bfdSessPerfLastSessDownTime	TimeStamp,
bfdSessPerfLastCommLostDiag	BfdDiag,
bfdSessPerfSessUpCount	Counter32,
bfdSessPerfDiscTime	TimeStamp,

-- High Capacity Counters

bfdSessPerfPktInHC	Counter64,
bfdSessPerfPktOutHC	Counter64

}

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

bfdSessPerfPktIn OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of BFD messages received for this BFD session."

::= { bfdSessPerfEntry 1 }

bfdSessPerfPktOut OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of BFD messages sent for this BFD session."

::= { bfdSessPerfEntry 2 }

bfdSessUpTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which the session came up. If no such up event exists this object contains a zero value."

::= { bfdSessPerfEntry 3 }

bfdSessPerfLastSessDownTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which the last time communication was lost with the neighbor. If no such down event exist this object contains a zero value."

::= { bfdSessPerfEntry 4 }

bfdSessPerfLastCommLostDiag OBJECT-TYPE

SYNTAX BfdDiag

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The BFD diag code for the last time communication was lost with the neighbor. If no such down event exists this object contains a zero value."

::= { bfdSessPerfEntry 5 }

bfdSessPerfSessUpCount OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times this session has gone into the Up state since the system 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 }

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 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

```
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,
        bfdSessStorType,
        bfdSessRowStatus,
        bfdSessAuthPresFlag,
        bfdSessAuthenticationType,
        bfdSessAuthenticationKeyID,
        bfdSessAuthenticationKey
    }
    STATUS      current
    DESCRIPTION
        "Collection of objects needed for BFD sessions."
    ::= { bfdGroups 1 }

```

bfdSessionReadOnlyGroup OBJECT-GROUP

```

    OBJECTS {
        bfdSessType,
        bfdSessDiscriminator,
        bfdSessRemoteDiscr,
        bfdSessDestinationUdpPort,
        bfdSessState,
        bfdSessRemoteHeardFlag,
        bfdSessOperMode,
        bfdSessControlPlaneIndepFlag,
        bfdSessNegotiatedInterval,
        bfdSessNegotiatedEchoInterval,
        bfdSessNegotiatedDetectMult,
        bfdSessDiscMapIndex,
        bfdSessIpMapIndex
    }
    STATUS      current
    DESCRIPTION
        "Collection of read-only objects needed for BFD sessions."
    ::= { bfdGroups 2 }

```

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 3 }

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 4 }

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

END

```

7. Security Considerations

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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 allow only write-only access to these objects. Even in such case, SET operations SHOULD be performed with security features.

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 [\[RFC3410\] \(Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework," December 2002.\)](#), 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

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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

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9.1. Normative References

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9.2. Informative References

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Appendix A. Acknowledgments

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