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Bidirectional Forwarding Detection (BFD) Management Information Base

Abstract

This document 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 the Bidirectional Forwarding Detection (BFD) protocol.

Status of This Memo

This is an Internet Standards Track document.

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1. Introduction

This memo defines a portion of the MIB for use with network management protocols in the Internet community. In particular, it describes managed objects to configure and/or monitor Bidirectional Forwarding Detection for [RFC5880], [RFC5881], [RFC5883], and [RFC7130], BFD versions 0 and/or 1, on devices supporting this feature.

This memo does not define a compliance requirement for a system that only implements BFD version 0. This is a reflection of a considered and deliberate decision by the BFD WG because the BFD version 0 protocol is primarily of historical interest by comparison to the widespread deployment of the BFD version 1 protocol.

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 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](#)].

As with all MIB modules, an attempt to SET or CREATE an object to a value that is not supported by the implementation will result in a failure using a return code that indicates that the value is not supported.

3. Terminology

This document adopts the definitions, acronyms, and mechanisms described in [[RFC5880](#)], [[RFC5881](#)], [[RFC5883](#)], and [[RFC7130](#)]. Unless otherwise stated, the mechanisms described therein will not be redescribed here.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#), [RFC 2119](#) [[RFC2119](#)].

4. Brief Description of MIB Objects

This section describes objects pertaining to BFD. The MIB objects are derived from [[RFC5880](#)], [[RFC5881](#)], [[RFC5883](#)], and [[RFC7130](#)], and also include textual conventions defined in [[RFC7330](#)].

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 counters 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 provides a mapping between a local discriminator value to the associated BFD session found in the bfdSessionTable.

4.5. BFD Session IP Mapping Table (bfdSessIpMapTable)

Given bfdSessInterface, bfdSessSrcAddrType, bfdSessSrcAddr, bfdSessDstAddrType, and bfdSessSrcAddrType, the BFD Session IP Mapping Table maps to an associated BFD session found in the bfdSessionTable. This table SHOULD contain those BFD sessions that are of type "IP".

5. BFD MIB Module Definitions

This MIB module makes references to the following documents:
[RFC2578], [RFC2579], [RFC2580], [RFC2863], [RFC3289], [RFC3413],
[RFC5082], [RFC5880], and [RFC5881].

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

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,  
        mib-2, Integer32, Unsigned32, Counter32, Counter64  
    FROM SNMPv2-SMI -- RFC 2578
```

```
    TruthValue, RowStatus, StorageType, TimeStamp  
    FROM SNMPv2-TC -- RFC 2579
```

```
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP  
    FROM SNMPv2-CONF -- RFC 2580
```

```
    InterfaceIndexOrZero  
    FROM IF-MIB -- RFC 2863
```

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

```
    IndexIntegerNextFree  
    FROM DIFFSERV-MIB -- RFC 3289
```

```
    BfdSessIndexTC, BfdIntervalTC, BfdMultiplierTC,  
    BfdCtrlDestPortNumberTC, BfdCtrlSourcePortNumberTC  
    FROM BFD-TC-STD-MIB
```

```
    IANAbfdDiagTC, IANAbfdSessTypeTC, IANAbfdSessOperModeTC,  
    IANAbfdSessStateTC, IANAbfdSessAuthenticationTypeTC,  
    IANAbfdSessAuthenticationKeyTC  
    FROM IANA-BFD-TC-STD-MIB;
```

bfdMIB MODULE-IDENTITY

LAST-UPDATED "201408120000Z" -- 12 August 2014 00:00:00 GMT

ORGANIZATION "IETF Bidirectional Forwarding Detection
Working Group"

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directly to the BFD Working Group mailing list
at rtg-bfd@ietf.org"

DESCRIPTION

"Bidirectional Forwarding Management Information Base.

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(<http://trustee.ietf.org/license-info>)."

REVISION "201408120000Z" -- 12 August 2014 00:00:00 GMT

DESCRIPTION

"Initial version. Published as RFC 7331."

::= { mib-2 222 }

-- 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 }

```
-- BFD General Variables
-- These parameters apply globally to the system's
-- BFD process.
```

```
bfdAdminStatus OBJECT-TYPE
```

```
    SYNTAX      INTEGER {
        enabled(1),
        disabled(2),
        adminDown(3),
        down(4)
    }
```

```
    MAX-ACCESS read-write
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "The desired global administrative status of the
        BFD system in this device."
```

```
    ::= { bfdScalarObjects 1 }
```

```
bfdOperStatus OBJECT-TYPE
```

```
    SYNTAX      INTEGER {
        up(1),
        down(2),
        adminDown(3)
    }
```

```
    MAX-ACCESS read-only
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Indicates the actual operational status of the
        BFD system in this device.  When this value is
        down(2), all entries in the bfdSessTable MUST have
        their bfdSessOperStatus as down(2) as well.  When
        this value is adminDown(3), all entries in the
        bfdSessTable MUST have their bfdSessOperStatus
        as adminDown(3) as well."
```

```
    ::= { bfdScalarObjects 2 }
```

```
bfdNotificationsEnable 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 [RFC 3413](#), Simple Network Management Protocol (SNMP) Applications, for explanation that notifications are under the ultimate control of the MIB modules in this document."

DEFVAL { false }

::= { bfdScalarObjects 3 }

bfdSessIndexNext OBJECT-TYPE

SYNTAX IndexIntegerNextFree (0..4294967295)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object contains an unused value for bfdSessIndex that can be used when creating entries in the table. A zero indicates that no entries are available, but it MUST NOT be used as a valid index. "

::= { bfdScalarObjects 4 }

-- 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

"[RFC 5880](#), Bidirectional Forwarding Detection (BFD)."

::= { bfdObjects 2 }

bfdSessEntry OBJECT-TYPE

SYNTAX BfdSessEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The BFD Session Entry describes the BFD session."

INDEX { bfdSessIndex }

::= { bfdSessTable 1 }

BfdSessEntry ::= SEQUENCE {

bfdSessIndex	BfdSessIndexTC,
bfdSessVersionNumber	Unsigned32,
bfdSessType	IANA bfdSessTypeTC,
bfdSessDiscriminator	Unsigned32,

```

bfdSessRemoteDiscr          Unsigned32,
bfdSessDestinationUdpPort   BfdCtrlDestPortNumberTC,
bfdSessSourceUdpPort        BfdCtrlSourcePortNumberTC,
bfdSessEchoSourceUdpPort    InetPortNumber,
bfdSessAdminStatus          INTEGER,
bfdSessOperStatus           INTEGER,
bfdSessState                IANAbfdSessStateTC,
bfdSessRemoteHeardFlag      TruthValue,
bfdSessDiag                 IANAbfdDiagTC,
bfdSessOperMode             IANAbfdSessOperModeTC,
bfdSessDemandModeDesiredFlag TruthValue,
bfdSessControlPlaneIndepFlag TruthValue,
bfdSessMultipointFlag       TruthValue,
bfdSessInterface           InterfaceIndexOrZero,
bfdSessSrcAddrType          InetAddressType,
bfdSessSrcAddr              InetAddress,
bfdSessDstAddrType          InetAddressType,
bfdSessDstAddr              InetAddress,
bfdSessGTSM                 TruthValue,
bfdSessGTSMTTL              Unsigned32,
bfdSessDesiredMinTxInterval BfdIntervalTC,
bfdSessReqMinRxInterval     BfdIntervalTC,
bfdSessReqMinEchoRxInterval BfdIntervalTC,
bfdSessDetectMult           BfdMultiplierTC,
bfdSessNegotiatedInterval   BfdIntervalTC,
bfdSessNegotiatedEchoInterval BfdIntervalTC,
bfdSessNegotiatedDetectMult BfdMultiplierTC,
bfdSessAuthPresFlag         TruthValue,
bfdSessAuthenticationType   IANAbfdSessAuthenticationTypeTC,
bfdSessAuthenticationKeyID  Integer32,
bfdSessAuthenticationKey    IANAbfdSessAuthenticationKeyTC,
bfdSessStorageType          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. Managers should obtain new values for row creation in this table by reading bfdSessIndexNext."

::= { 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 the ability to set the desired version for this BFD session."

REFERENCE

"[RFC 5880](#), Bidirectional Forwarding Detection (BFD)."

DEFVAL { 1 }

::= { bfdSessEntry 2 }

bfdSessType OBJECT-TYPE

SYNTAX IANAbfdSessTypeTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the type of this BFD session."

::= { bfdSessEntry 3 }

bfdSessDiscriminator OBJECT-TYPE

SYNTAX Unsigned32 (1..4294967295)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the local discriminator for this BFD session, which is 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

"[Section 6.8.6 of RFC 5880](#), Bidirectional Forwarding Detection (BFD)."

::= { bfdSessEntry 5 }

bfdSessDestinationUdpPort OBJECT-TYPE

SYNTAX BfdCtrlDestPortNumberTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the destination UDP port number used for this BFD session's Control packets. The value may be zero(0) if the session is in adminDown(1) state."

DEFVAL { 0 }

::= { bfdSessEntry 6 }

bfdSessSourceUdpPort OBJECT-TYPE

SYNTAX BfdCtrlSourcePortNumberTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the source UDP port number used for this BFD session's Control packets. The value may be zero(0) if the session is in adminDown(1) state. Upon creation of a new BFD session via this MIB, the value of zero(0) specified would permit the implementation to choose its own source port number."

DEFVAL { 0 }

::= { bfdSessEntry 7 }

bfdSessEchoSourceUdpPort OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the source UDP port number used for this BFD session's Echo packets. The value may be zero(0) if the session is not running in the Echo mode, or the session is in adminDown(1) state. Upon creation of a new BFD session via this MIB, the value of zero(0) would permit the implementation to choose its own source port number."

DEFVAL { 0 }

::= { bfdSessEntry 8 }

bfdSessAdminStatus OBJECT-TYPE

SYNTAX INTEGER {
enabled(1),
disabled(2),
adminDown(3),
down(4)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Denotes the desired operational status of the BFD session.

A transition to enabled(1) will start the BFD state machine for the session. The state machine will have an initial state of down(2).

A transition to disabled(2) will stop the BFD state machine for the session. The state machine may first transition to adminDown(1) prior to stopping.

A transition to adminDown(3) will cause the BFD state machine to transition to adminDown(1) and will cause the session to remain in this state.

A transition to down(4) will cause the BFD state machine to transition to down(2) and will cause the session to remain in this state.

Care should be used in providing write access to this object without adequate authentication."

::= { bfdSessEntry 9 }

bfdSessOperStatus OBJECT-TYPE

SYNTAX INTEGER {
up(1),
down(2),
adminDown(3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Denotes the actual operational status of the BFD session. If the value of bfdOperStatus is down(2), this value MUST eventually be down(2) as well. If the value of bfdOperStatus is adminDown(3), this value MUST eventually be adminDown(3) as well."

::= { bfdSessEntry 10 }

bfdSessState OBJECT-TYPE

SYNTAX IANAbfdSessStateTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Configured BFD session state."

::= { bfdSessEntry 11 }

bfdSessRemoteHeardFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the 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

"RFC 5880, Bidirectional Forwarding Detection (BFD)."

::= { bfdSessEntry 12 }

bfdSessDiag OBJECT-TYPE

SYNTAX IANAbfdDiagTC

MAX-ACCESS read-only

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 IANAbfdSessOperModeTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the operational mode of this BFD session."

::= { bfdSessEntry 14 }

bfdSessDemandModeDesiredFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object indicates 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-create

STATUS current

DESCRIPTION

"This object indicates 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-create

STATUS current

DESCRIPTION

"This object indicates the Multipoint (M) bit for this session. It is set to true(1) if the 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 that this BFD session is running on. This value can be zero if there is no interface associated with this BFD session."

::= { bfdSessEntry 18 }

bfdSessSrcAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the IP address type of the source IP address of this BFD session. The value of unknown(0) is allowed only when the session is singleHop(1) and the source IP address of this BFD session is derived from the outgoing interface, 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 }

bfdSessSrcAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the source IP address of this BFD session. The format of this object is controlled by the bfdSessSrcAddrType object."

::= { bfdSessEntry 20 }

bfdSessDstAddrType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the IP address type of the neighboring IP address that is being monitored with this BFD session. The value of unknown(0) is allowed only when the session is singleHop(1) and 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 21 }

bfdSessDstAddr OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the neighboring IP address that is being monitored with this BFD session. The format of this object is controlled by the bfdSessDstAddrType object."

::= { bfdSessEntry 22 }

bfdSessGTSM OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Setting the value of this object to false(2) will disable 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).
Section 5 of RFC 5881, Bidirectional Forwarding Detection
(BFD) for IPv4 and IPv6 (Single Hop)."

DEFVAL { true }

::= { bfdSessEntry 23 }

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 indicates the minimum allowed Time to Live (TTL) for received BFD Control packets. For a singleHop(1) session, if GTSM protection is enabled, this object SHOULD be set to the maximum TTL value allowed for a single hop.

By default, GTSM is enabled and the TTL value is 255. For a multihop session, updating of the maximum TTL value allowed is likely required."

REFERENCE

"RFC 5082, The Generalized TTL Security Mechanism (GTSM).
Section 5 of RFC 5881, Bidirectional Forwarding Detection
(BFD) for IPv4 and IPv6 (Single Hop)."

DEFVAL { 255 }

::= { bfdSessEntry 24 }

bfdSessDesiredMinTxInterval OBJECT-TYPE

SYNTAX BfdIntervalTC

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. The value of zero(0) is reserved in this case and should not be used."

REFERENCE

"Section 4.1 of RFC 5880, Bidirectional Forwarding
Detection (BFD)."

::= { bfdSessEntry 25 }

bfdSessReqMinRxInterval OBJECT-TYPE

SYNTAX BfdIntervalTC

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. The value of zero(0) can be specified when the transmitting system does not want the remote system to send any periodic BFD Control packets."

REFERENCE

"[Section 4.1 of RFC 5880](#), Bidirectional Forwarding Detection (BFD)."

::= { bfdSessEntry 26 }

bfdSessReqMinEchoRxInterval OBJECT-TYPE

SYNTAX BfdIntervalTC

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. The value must be zero(0) if this is a multihop BFD session."

::= { bfdSessEntry 27 }

bfdSessDetectMult OBJECT-TYPE

SYNTAX BfdMultiplierTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the Detect time multiplier."

::= { bfdSessEntry 28 }

bfdSessNegotiatedInterval OBJECT-TYPE

SYNTAX BfdIntervalTC

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 29 }

bfdSessNegotiatedEchoInterval OBJECT-TYPE

SYNTAX BfdIntervalTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the negotiated interval, in microseconds, that the local system is transmitting

BFD Echo packets. The value is expected to be zero if the sessions are not running in Echo mode."
 ::= { bfdSessEntry 30 }

bfdSessNegotiatedDetectMult OBJECT-TYPE

SYNTAX BfdMultiplierTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the Detect time multiplier."

::= { bfdSessEntry 31 }

bfdSessAuthPresFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object indicates 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

"Sections 4.2 - 4.4 of RFC 5880, Bidirectional Forwarding Detection (BFD)."

DEFVAL { false }

::= { bfdSessEntry 32 }

bfdSessAuthenticationType OBJECT-TYPE

SYNTAX IANAbfdSessAuthenticationTypeTC

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

"Sections 4.2 - 4.4 of RFC 5880, Bidirectional Forwarding Detection (BFD)."

DEFVAL { noAuthentication }

::= { bfdSessEntry 33 }

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. The value -1 indicates that no authentication key ID will be present in the optional BFD Authentication Section."

REFERENCE

"Sections 4.2 - 4.4 of RFC 5880, Bidirectional Forwarding Detection (BFD)."

DEFVAL { -1 }

::= { bfdSessEntry 34 }

bfdSessAuthenticationKey OBJECT-TYPE

SYNTAX IANAbfdSessAuthenticationKeyTC

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 bfdSessAuthenticationType is one of the keyed authentication types, this value is used in the computation of the key present in the BFD authentication packet."

REFERENCE

"Sections 4.2 - 4.4 of RFC 5880, Bidirectional Forwarding Detection (BFD)."

::= { bfdSessEntry 35 }

bfdSessStorageType 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 36 }

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 37 }

-- 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. bfdSessPerfDiscTime 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	IANA bfdDiagTC,
bfdSessPerfSessUpCount	Counter32,
bfdSessPerfDiscTime	TimeStamp,

-- High Capacity Counters

bfdSessPerfCtrlPktInHC	Counter64,
bfdSessPerfCtrlPktOutHC	Counter64,

```
    bfdSessPerfCtrlPktDropHC      Counter64,  
    bfdSessPerfEchoPktInHC       Counter64,  
    bfdSessPerfEchoPktOutHC      Counter64,  
    bfdSessPerfEchoPktDropHC     Counter64  
}
```

bfdSessPerfCtrlPktIn OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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

It MUST be equal to the least significant 32 bits of bfdSessPerfCtrlPktInHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { 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.

It MUST be equal to the least significant 32 bits of bfdSessPerfCtrlPktOutHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { 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.

It MUST be equal to the least significant 32 bits of bfdSessPerfCtrlPktDropHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { 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 the 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.

It MUST be equal to the least significant 32 bits of bfdSessPerfEchoPktInHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."
::= { 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.

It MUST be equal to the least significant 32 bits of bfdSessPerfEchoPktOutHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."
::= { 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.

It MUST be equal to the least significant 32 bits of bfdSessPerfEchoPktDropHC if supported, and MUST do so with the rules spelled out in [RFC 2863](#)."
::= { 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 the BFD Echo message for this session was dropped. If no such up event has been issued, 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 event has been issued, 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 down event has been issued, this object contains a zero value."

::= { bfdSessPerfEntry 10 }

bfdSessPerfLastCommLostDiag OBJECT-TYPE

SYNTAX IANAbfdDiagTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The BFD diag code for the last time communication was lost with the neighbor. If such an event has not been issued, 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 reinitialization 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.

The least significant 32 bits MUST be equal to bfdSessPerfCtrlPktIn, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { bfdSessPerfEntry 14 }

bfdSessPerfCtrlPktOutHC OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This value represents the total number of BFD control messages transmitted for this BFD session.

The least significant 32 bits MUST be equal to bfdSessPerfCtrlPktOut, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { 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.

The least significant 32 bits MUST be equal to bfdSessPerfCtrlPktDrop, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { 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.

The least significant 32 bits MUST be equal to bfdSessPerfEchoPktIn, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { bfdSessPerfEntry 17 }

bfdSessPerfEchoPktOutHC OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This value represents the total number of BFD Echo messages transmitted for this BFD session.

The least significant 32 bits MUST be equal to bfdSessPerfEchoPktOut, and MUST do so with the rules spelled out in [RFC 2863](#)."

::= { bfdSessPerfEntry 18 }

bfdSessPerfEchoPktDropHC 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.


```

        The least significant 32 bits MUST be equal to
        bfdSessPerfEchoPktDrop, and MUST do so with
        the rules spelled out in RFC 2863."
 ::= { 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 the associated BFD session's
        bfdSessIndex found in the bfdSessionTable."
 ::= { bfdObjects 4 }

bfdSessDiscMapEntry OBJECT-TYPE
    SYNTAX      BfdSessDiscMapEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The BFD Session Discriminator Mapping Entry
        specifies a mapping between a local discriminator
        and a BFD session."
    INDEX { bfdSessDiscriminator }
 ::= { bfdSessDiscMapTable 1 }

BfdSessDiscMapEntry ::= SEQUENCE {
    bfdSessDiscMapIndex          BfdSessIndexTC
}

bfdSessDiscMapIndex OBJECT-TYPE
    SYNTAX      BfdSessIndexTC
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object specifies a mapping between a
        local discriminator and a BFD session in
        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, bfdSessSrcAddrType, bfdSessSrcAddr,
bfdSessDstAddrType, and bfdSessDstAddr
to an associated BFD session found in the
bfdSessionTable."

::= { bfdObjects 5 }

bfdSessIpMapEntry OBJECT-TYPE

SYNTAX BfdSessIpMapEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The BFD Session IP Map Entry contains a mapping
from the IP information for a session to the session
in the bfdSessionTable."

INDEX {

bfdSessInterface,
bfdSessSrcAddrType,
bfdSessSrcAddr,
bfdSessDstAddrType,
bfdSessDstAddr

}

::= { bfdSessIpMapTable 1 }

BfdSessIpMapEntry ::= SEQUENCE {

bfdSessIpMapIndex BfdSessIndexTC

}

bfdSessIpMapIndex OBJECT-TYPE

SYNTAX BfdSessIndexTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the BfdSessIndexTC 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 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 identical."

```

 ::= { bfdNotifications 2 }

-- 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 the BFD-MIB module. Such devices can
    then be monitored and also be configured using
    this MIB module."

  MODULE -- This module.

  MANDATORY-GROUPS {
    bfdSessionGroup,
    bfdSessionReadOnlyGroup,
    bfdSessionPerfGroup,
    bfdNotificationGroup
  }

  GROUP          bfdSessionPerfHCGroup
  DESCRIPTION    "This group is mandatory for all systems that
                  are able to support the Counter64 date type."

  OBJECT         bfdSessSrcAddrType
  SYNTAX         InetAddressType { unknown(0), ipv4(1),
                                   ipv6(2), ipv6z(4) }
  DESCRIPTION    "Only unknown(0), ipv4(1), ipv6(2), and ipv6z(4)
                  support are required. ipv4z(3) is not required,
                  and dns(16) is not allowed."

  OBJECT         bfdSessSrcAddr
  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."

  OBJECT         bfdSessDstAddrType
  SYNTAX         InetAddressType { unknown(0), ipv4(1),
                                   ipv6(2), ipv6z(4) }

```

DESCRIPTION "Only unknown(0), ipv4(1), ipv6(2), and ipv6z(4) support are required. ipv4z(3) is not required, and dns(16) is not allowed."

OBJECT bfdSessDstAddr
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."

OBJECT bfdSessRowStatus
SYNTAX RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2), createAndGo(4), destroy(6) }
DESCRIPTION "Support for createAndWait and notReady is not required."

::= { bfdCompliances 1 }

bfdModuleReadOnlyCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"Compliance requirement for implementations that only provide read-only support for BFD-MIB. Such devices can then be monitored but cannot be configured using this MIB module."

MODULE -- This module.

MANDATORY-GROUPS {
 bfdSessionGroup,
 bfdSessionReadOnlyGroup,
 bfdSessionPerfGroup,
 bfdNotificationGroup
}

GROUP bfdSessionPerfHCGroup

DESCRIPTION "This group is mandatory for all systems that are able to support the Counter64 data type."

OBJECT bfdSessVersionNumber

MIN-ACCESS read-only

DESCRIPTION "Write access is not required."

OBJECT bfdSessType

MIN-ACCESS read-only

DESCRIPTION "Write access is not required."

OBJECT	bfdSessDiscriminator
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessDestinationUdpPort
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessSourceUdpPort
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessEchoSourceUdpPort
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessAdminStatus
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessOperMode
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessDemandModeDesiredFlag
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessControlPlaneIndepFlag
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessMultipointFlag
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessInterface
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessSrcAddrType
SYNTAX	InetAddressType { unknown(0), ipv4(1), ipv6(2), ipv6z(4) }
MIN-ACCESS	read-only
DESCRIPTION	"Only unknown(0), ipv4(1), ipv6(2), and ipv6z(4) support are required. ipv4z(3) is not required, and dns(16) is not allowed."

OBJECT	bfdSessSrcAddr
SYNTAX	InetAddress (SIZE (0 4 16 20))
MIN-ACCESS	read-only
DESCRIPTION	"An implementation is only required to support unknown(0), ipv4(1), ipv6(2), and ipv6z(4) sizes."
OBJECT	bfdSessDstAddrType
SYNTAX	InetAddressType { unknown(0), ipv4(1), ipv6(2), ipv6z(4) }
MIN-ACCESS	read-only
DESCRIPTION	"Only unknown(0), ipv4(1), ipv6(2), and ipv6z(4) support are required. ipv4z(3) is not required, and dns(16) is not allowed."
OBJECT	bfdSessDstAddr
SYNTAX	InetAddress (SIZE (0 4 16 20))
MIN-ACCESS	read-only
DESCRIPTION	"An implementation is only required to support unknown(0), ipv4(1), ipv6(2), and ipv6z(4) sizes."
OBJECT	bfdSessGTSM
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessGTSMttl
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessDesiredMinTxInterval
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessReqMinRxInterval
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessReqMinEchoRxInterval
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessDetectMult
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."
OBJECT	bfdSessAuthPresFlag
MIN-ACCESS	read-only
DESCRIPTION	"Write access is not required."

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

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

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

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

OBJECT      bfdSessRowStatus
SYNTAX      RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

::= { bfdCompliances 2 }
```

-- Units of conformance.

```
bfdSessionGroup OBJECT-GROUP
  OBJECTS {
    bfdAdminStatus,
    bfdOperStatus,
    bfdNotificationsEnable,
    bfdSessVersionNumber,
    bfdSessType,
    bfdSessIndexNext,
    bfdSessDiscriminator,
    bfdSessDestinationUdpPort,
    bfdSessSourceUdpPort,
    bfdSessEchoSourceUdpPort,
    bfdSessAdminStatus,
    bfdSessOperStatus,
    bfdSessOperMode,
    bfdSessDemandModeDesiredFlag,
    bfdSessControlPlaneIndepFlag,
    bfdSessMultipointFlag,
    bfdSessInterface,
    bfdSessSrcAddrType,
    bfdSessSrcAddr,
    bfdSessDstAddrType,
    bfdSessDstAddr,
```



```
    bfdSessGTSM,
    bfdSessGTSMTTL,
    bfdSessDesiredMinTxInterval,
    bfdSessReqMinRxInterval,
    bfdSessReqMinEchoRxInterval,
    bfdSessDetectMult,
    bfdSessAuthPresFlag,
    bfdSessAuthenticationType,
    bfdSessAuthenticationKeyID,
    bfdSessAuthenticationKey,
    bfdSessStorageType,
    bfdSessRowStatus
}
STATUS      current
DESCRIPTION
    "Collection of objects needed for BFD sessions."
 ::= { bfdGroups 1 }

bfdSessionReadOnlyGroup OBJECT-GROUP
OBJECTS {
    bfdSessRemoteDiscr,
    bfdSessState,
    bfdSessRemoteHeardFlag,
    bfdSessDiag,
    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 and 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
```

6. 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:

- o bfdAdminStatus -- Improper change of bfdAdminStatus, to disabled(2), adminDown(3), or down(4), can cause significant disruption of the connectivity to those portions of the Internet reached via all the applicable remote BFD peers.
- o bfdSessAdminStatus -- Improper change of bfdSessAdminStatus, to disabled(2), adminDown(3), or down(4), can cause significant disruption of the connectivity to those portions of the Internet reached via all the applicable remote BFD peers.
- o 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.
- o Some management objects define the BFD session whilst other management objects define the parameter of the BFD session. It is particularly important to control the support for SET access to those management objects that define the BFD session, as changes to them can be disruptive. Implementation SHOULD NOT allow changes to following management objects when bfdSessState is up(4):
 - * bfdSessVersionNumber
 - * bfdSessType
 - * bfdSessDestinationUdpPort

- * bfdSessMultipointFlag
- * bfdSessInterface
- * bfdSessSrcAddrType
- * bfdSessSrcAddr
- * bfdSessDstAddrType
- * bfdSessDstAddr

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 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 are highly sensitive. In order to prevent this sensitive information from being improperly accessed, implementers SHOULD disallow 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 this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410]), 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

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER value recorded in the "SMI Network Management MGMT Codes" registry:

Descriptor	OBJECT IDENTIFIER value
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bfdMIB	{ mib-2 222 }

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9. References

9.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC5082] Gill, V., Heasley, J., Meyer, D., Savola, P., and C. Pignataro, "The Generalized TTL Security Mechanism (GTSM)", [RFC 5082](#), October 2007.
- [RFC5880] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD)", [RFC 5880](#), June 2010.
- [RFC5881] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop)", [RFC 5881](#), June 2010.
- [RFC5883] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD) for Multihop Paths", [RFC 5883](#), June 2010.
- [RFC7130] Bhatia, M., Chen, M., Boutros, S., Binderberger, M., and J. Haas, "Bidirectional Forwarding Detection (BFD) on Link Aggregation Group (LAG) Interfaces", [RFC 7130](#), February 2014.
- [RFC7330] Nadeau, T., Ali, Z., and N. Akiya, "Definitions of Textual Conventions (TCs) for Bidirectional Forwarding Detection (BFD) Management", [RFC 7330](#), August 2014.

9.2. Informative References

- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", [RFC 2863](#), June 2000.
- [RFC3289] Baker, F., Chan, K., and A. Smith, "Management Information Base for the Differentiated Services Architecture", [RFC 3289](#), May 2002.
- [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., and B. Stewart, "Simple Network Management Protocol (SNMP) Applications", STD 62, [RFC 3413](#), December 2002.

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