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IP MIB for IP Fast-Reroute  
draft-ietf-rtgwg-ipfrr-ip-mib-08

## 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 relevant for IP routes using IP Fast-Reroute [[RFC5714](#)]

## Requirements Language

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](#)].

## Status of This Memo

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## [1.](#) Introduction

This document defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines the managed objects used for IP routes and interfaces in relation to IP Fast-Reroute. This document uses terminology from [\[RFC5714\]](#) and [\[RFC5286\]](#).

Current work is underway to define mechanisms for determining alternate paths for traffic to use when the original path becomes unavailable due to a local failure. The alternate next-hops can be computed in the context of any IGP.

There are certain configuration attributes for IP Fast-Reroute that should be configured to enable IP Fast Reroute in the context of the IGP. These configuration attributes of IP Fast-Reroute are not covered by this MIB module. Examples include whether IP Fast-Reroute is enabled on a network region (i.e. an OSPF area or IS-IS level) and

the desired local hold-down timer [[RFC5286](#)], whose proper value is dependent upon the size of the network region.

It is possible for traffic other than IP to depend upon and use the alternate next-hops computed by IP Fast-Reroute. An example would be MPLS traffic whose path is configured via LDP [[RFC5036](#)]. The additional details (for example, outgoing MPLS label) pertaining to alternate next-hops that are required by such traffic are not covered by this MIB module.

An IP route may be reachable via multiple primary next-hops which provide equal-cost paths. Where IP Fast-Reroute is enabled, each primary next-hop will be protected by one or more alternate next-hops. Such an alternate next-hop may itself be a primary next-hop.

### [1.1.](#) The SNMP Management Framework

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

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [[RFC2578](#)], STD 58, [[RFC2579](#)] and STD 58, [[RFC2580](#)].

## [2.](#) Brief description of MIB Objects

### [2.1.](#) ipFrrProtectStats Group

The global objects in this group provide summary information related to protection for all IP routes. The information available includes counts of all routes, of all protected routes, of all unprotected

routes, of all routes which are protected against a link failure, and of all routes which are protected against a node failure.

## [2.2.](#) ipFrrInstanceTable

The ipFrrInstanceTable provides information about configuration of IP FRR instantiations on a node. A single node may have multiple instances of IP FRR using different algorithms or protocols. ipFrrInstances cannot be created through the MIB.

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## [2.3.](#) ipFrrIfTable

The ipFrrIfTable provides information about configuration of interfaces for IPFRR. Entries can be created to activate IPFRR on a particular interface or setting the candidate properties.

## [2.4.](#) ipFrrProtectStatsTable

The ipFrrProtectStatsTable complements the ipFrrProtectStats group by providing statistics per IP FRR instance.

## [2.5.](#) ipFrrAltTable

The ipFrrAltTable extends the inetCidrRouteTable [[RFC4292](#)] to provide information about each alternate next-hop associated with a primary next-hop used by a route.

## [2.6.](#) ipFrrNoAltTable

The ipFrrNoAltTable extends the inetCidrRouteTable [[RFC4292](#)] to provide information about the routes which do not have an alternate next-hop associated with any of the route's primary next-hop. The entry provides an explanation for the lack of protection.

## [3.](#) IP Fast-Reroute MIB Module Definitions

```
IPFRR-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```

MODULE-IDENTITY,
OBJECT-TYPE,
Gauge32,
Integer32          FROM SNMPv2-SMI          -- [RFC2578]

RowStatus
                  FROM SNMPv2-TC            -- [RFC2579]

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

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

ifIndex, InterfaceIndex      FROM IF-MIB      -- [RFC2863]

ip                      FROM IP-MIB           -- [RFC4293]

```

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```

inetCidrRouteDestType,
inetCidrRouteDest,
inetCidrRoutePfxLen,
inetCidrRoutePolicy,
inetCidrRouteNextHopType,
inetCidrRouteNextHop FROM IP-FORWARD-MIB
-- [RFC4292]

```

IANAipRouteProtocol FROM IANA-RTPROTO-MIB

;

```

ipFrrMIB MODULE-IDENTITY
LAST-UPDATED "201508040000Z" -- Aug 04, 2015
ORGANIZATION "draft-ietf-ipfrr-ip-mib-06.txt"
CONTACT-INFO
    "

```

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Orange Business Service  
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"

#### DESCRIPTION

"IP MIB module for management of IP Fast-Reroute.

Copyright (C) The Internet Society (date).  
This version of this MIB module is part of  
[draft-ietf-rtgwg-ipfrr-ip-mib-07.txt](#)"

REVISION           "201508040000Z" -- Aug 04, 2015  
DESCRIPTION  
    "Fixing some syntax issues  
      Moved ipFrrInstanceTable to readonly  
      Moved ipFrrAltTable to readonly  
      Modified Readonly conformance

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Deleting ipFrrInstanceRowStatus  
Deleting ipFrrAltStatus  
Added notProtect to ipFrrIfProtectionType  
"

REVISION           "201406141200Z" -- Jun 14, 2014  
DESCRIPTION  
    "[draft-ietf-rtgwg-ipfrr-ip-mib-03.txt](#)"

REVISION           "201406131200Z" -- Jun 13, 2014  
DESCRIPTION  
    "Add ipFrrTunnelType in ipFrrAltEntry  
      Modify ipFrrAltType"

REVISION           "201405261200Z" -- May 26, 2014

DESCRIPTION

"Add ipFrrInstanceTable.  
Add ipFrrIfTable.

ipFrrProtectStatsTable complements ipFrrProtectStat  
Add ipFrrAltMetric2, ipFrrAltMetric3, ipFrrAltBest,  
Add integer values to ipFrrAltType.  
Add integer values to ipFrrAltProtectionAvailable.  
Changed attachment of ipFrrAltStatus in ipFrrAltEnt  
Added IPv6 objects in ipFrrProtectStats."

REVISION "201203131200Z" -- Mar 13, 2012

DESCRIPTION

"Editorial changes. Added new type to ipFrrAltType."

REVISION "200502181200Z" -- February 18, 2005

DESCRIPTION

"Add Set operations on ipFrrAltTable"

REVISION "200502131200Z" -- February 13, 2005

DESCRIPTION

"Initial version."

::= { ip 50 } -- To be assigned by IANA

-- Top level components of this MIB module.

ipFrrMIBObjects OBJECT IDENTIFIER ::= { ipFrrMIB 1 }

ipFrrProtectStats OBJECT IDENTIFIER ::= { ipFrrMIBObjects 1 }

-- the IP FRR MIB-Group

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-- A collection of objects providing summarized information  
-- about the protection availability and type of alternate paths  
-- provided by IP Fast-Reroute mechanisms.

ipFrrTotalRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv4 valid routes known by this entity."  
 ::= { ipFrrProtectStats 1 }

ipFrrUnprotectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv4 valid routes known by this entity  
 which do not have an alternate next-hop associated  
 with any primary next-hop."  
 ::= { ipFrrProtectStats 2 }

ipFrrProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv4 routes known by this entity  
 which have at least one alternate next-hop."  
 ::= { ipFrrProtectStats 3 }

ipFrrLinkProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv4 routes known by this entity  
 for which all alternate next-hops provide link  
 protection for their associated primary next-hops."  
 ::= { ipFrrProtectStats 4 }

ipFrrNodeProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

for which all alternate next-hops provide node  
protection for their associated primary next-hops."  
::= { ipFrrProtectStats 5 }

ipv6FrrTotalRoutes OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of IPv6 valid routes known by this entity."  
::= { ipFrrProtectStats 6 }

ipv6FrrUnprotectedRoutes OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current

DESCRIPTION  
"The number of IPv6 valid routes known by this entity  
which do not have an alternate next-hop associated  
with any primary next-hop."  
::= { ipFrrProtectStats 7 }

ipv6FrrProtectedRoutes OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of IPv6 routes known by this entity  
which have at least one alternate next-hop."  
::= { ipFrrProtectStats 8 }

ipv6FrrLinkProtectedRoutes OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of IPv6 routes known by this entity  
for which all alternate next-hops provide link  
protection for their associated primary next-hops."  
::= { ipFrrProtectStats 9 }

ipv6FrrNodeProtectedRoutes OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current

## DESCRIPTION

"The number of IPv6 routes known by this entity  
for which all alternate next-hops provide node  
protection for their associated primary next-hops."

::= { ipFrrProtectStats 10 }

-- the IP FRR instance MIB-group

--

-- The ipFrrInstanceTable provides detail on current IPFRR  
-- instances activated on the node

## ipFrrInstanceTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpFrrInstanceEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"This entity's IP Fast Reroute Instance table."

::= { ipFrrMIBObjects 4 }

## ipFrrInstanceEntry OBJECT-TYPE

SYNTAX IpFrrInstanceEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"An entry containing information on a particular  
IP FRR instance on the node."

INDEX { ipFrrInstanceId  
}

::= { ipFrrInstanceTable 1 }

IpFrrInstanceEntry ::= SEQUENCE {

ipFrrInstanceId

ipFrrInstanceProtocol

ipFrrInstanceAlgorithm

ipFrrInstancePerPrefixComputation

INTEGER,

IANAipRoutePr

Integer32,

INTEGER

}

## ipFrrInstanceId OBJECT-TYPE

SYNTAX Integer32 (1..255)

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"This object specifies an identifier a of particular IPFRR instance"

```
::= { ipFrrInstanceEntry 1 }
```

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ipFrrInstanceProtocol OBJECT-TYPE

SYNTAX IANAipRouteProtocol

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the protocol used by the IPFRR instance."

```
::= { ipFrrInstanceEntry 2 }
```

ipFrrInstanceAlgorithm OBJECT-TYPE

SYNTAX INTEGER {  
    loopFree(1),  
    loopFreeRemote(2),  
    loopFreeTI(3),  
    mrt(4)  
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies the algorithm used by the IPFRR instance."

```
::= { ipFrrInstanceEntry 3 }
```

ipFrrInstancePerPrefixComputation OBJECT-TYPE

SYNTAX INTEGER {  
    false(0),  
    true(1)  
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object specifies if per prefix computation is used."

```
::= { ipFrrInstanceEntry 4 }
```

-- the IP FRR Interface MIB-Group

--

-- ipFrrIfTable provides information on configuration

-- of interfaces for IPFRR

ipFrrIfTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpFrrIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This entity's IP Fast Reroute Alternates Interface configuration ta

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::= { ipFrrMIBObjects 5 }

ipFrrIfEntry OBJECT-TYPE

SYNTAX IpFrrIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing information on a particular instance of an IPFRR

INDEX { ipFrrInstanceId,  
ifIndex

}

::= { ipFrrIfTable 1 }

IpFrrIfEntry ::= SEQUENCE {

ipFrrIfProtectionType

ipFrrIfCandidate

ipFrrIfRowStatus

BITS,

INTEGER,

RowStatus

}

ipFrrIfProtectionType OBJECT-TYPE

SYNTAX BITS {

nodeProtect(0),

linkProtect(1),

nodeLinkProtect(2),

notProtect(3)

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the scope of protection requested for the prot

nodeProtect means node protection only compared to n  
if available and link protection if not available. "

::= { ipFrrIfEntry 1 }

ipFrrIfCandidate OBJECT-TYPE

SYNTAX INTEGER {  
false (0),  
true (1)  
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the scope of protection requested for the prot  
nodeProtect means node protection only compared to n  
if available and link protection if not available. "

DEFVAL {1}

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::= { ipFrrIfEntry 2 }

ipFrrIfRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"."

::= { ipFrrIfEntry 3 }

-- the IP FRR Stats MIB-Group

--

-- ipFrrProtectStatsTable provides provides

-- protection availability and type of alternate paths

-- provided by IP Fast-Reroute mechanisms per IPFRR instance.

ipFrrProtectStatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpFrrProtectStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This entity's IP Fast Reroute Alternates statistics table."

::= { ipFrrMIBObjects 6 }

ipFrrProtectStatsEntry OBJECT-TYPE

SYNTAX IpFrrProtectStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing information on a particular instance of IPFRR.

."

INDEX { ipFrrInstanceId  
}

::= { ipFrrProtectStatsTable 1 }

IpFrrProtectStatsEntry ::= SEQUENCE {

ipFrrStatsTotalRoutes	Gauge32,
ipFrrStatsUnprotectedRoutes	Gauge32,
ipFrrStatsProtectedRoutes	Gauge32,
ipFrrStatsLinkProtectedRoutes	Gauge32,
ipFrrStatsNodeProtectedRoutes	Gauge32,
ipv6FrrStatsTotalRoutes	Gauge32,
ipv6FrrStatsUnprotectedRoutes	Gauge32,

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ipv6FrrStatsProtectedRoutes	Gauge32,
ipv6FrrStatsLinkProtectedRoutes	Gauge32,
ipv6FrrStatsNodeProtectedRoutes	Gauge32

}

ipFrrStatsTotalRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of valid routes known by this entity."

::= { ipFrrProtectStatsEntry 1 }

ipFrrStatsUnprotectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of valid routes known by this entity

which do not have an alternate next-hop associated  
with any primary next-hop."

::= { ipFrrProtectStatsEntry 2 }

ipFrrStatsProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of routes known by this entity  
which have at least one alternate next-hop."

::= { ipFrrProtectStatsEntry 3 }

ipFrrStatsLinkProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of routes known by this entity  
for which all alternate next-hops provide link  
protection for their associated primary next-hops."

::= { ipFrrProtectStatsEntry 4 }

ipFrrStatsNodeProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of routes known by this entity  
for which all alternate next-hops provide node  
protection for their associated primary next-hops."

::= { ipFrrProtectStatsEntry 5 }

ipv6FrrStatsTotalRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of valid IPv6 routes known by this entity."  
 ::= { ipFrrProtectStatsEntry 6 }

ipv6FrrStatsUnprotectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of valid IPv6 routes known by this entity  
 which do not have an alternate next-hop associated

with any primary next-hop."

::= { ipFrrProtectStatsEntry 7 }

ipv6FrrStatsProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv6 routes known by this entity  
 which have at least one alternate next-hop."

::= { ipFrrProtectStatsEntry 8 }

ipv6FrrStatsLinkProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv6 routes known by this entity  
 for which all alternate next-hops provide link  
 protection for their associated primary next-hops."

::= { ipFrrProtectStatsEntry 9 }

ipv6FrrStatsNodeProtectedRoutes OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IPv6 routes known by this entity  
 for which all alternate next-hops provide node

```

        protection for their associated primary next-hops."
 ::= { ipFrrProtectStatsEntry 10 }

-- the IP FRR Alternate MIB-Group
--
-- The ipFrrAltTable extends the inetCidrRouteTable to indicate
-- the alternate next-hop(s) associated with each primary
-- next-hop. The additional indices (ipFrrAltNextHopType and
-- ipFrrAltNextHop ) allow for multiple alternate paths for a
-- given primary next-hop.

ipFrrAltTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF IpFrrAltEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This entity's IP Fast Reroute Alternates table."
    ::= { ipFrrMIBObjects 2 }

ipFrrAltEntry OBJECT-TYPE
    SYNTAX      IpFrrAltEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing information on a particular route,
        one of its particular (primary) next-hops and one of
        the associated alternate next-hops.

        Implementers need to be aware that if the total
        number of elements (octets or sub-identifiers) in
        inetCidrRouteDest, inetCidrRoutePolicy,
        inetCidrRouteNextHop, and ipFrrAltNextHop exceeds 107
        then OIDs of column instances in this table will have
        more than 128 sub-identifiers and cannot be accessed
        using SNMPv1, SNMPv2c, or SNMPv3."

    INDEX { inetCidrRouteDestType,
            inetCidrRouteDest,
            inetCidrRoutePfxLen,
            inetCidrRoutePolicy,
            inetCidrRouteNextHopType,
            inetCidrRouteNextHop,

```

```
        ipFrrAltNextHopType,
        ipFrrAltNextHop
    }
    ::= { ipFrrAltTable 1 }

IpFrrAltEntry ::= SEQUENCE {
    ipFrrAltNextHopType      InetAddressType,
    ipFrrAltNextHop          InetAddress,
    ipFrrAltIfIndex          InterfaceIndex,
    ipFrrAltType              INTEGER,
    ipFrrTunnelType           INTEGER,
    ipFrrAltProtectionAvailable BITS,
    ipFrrAltMetric1           Integer32,
    ipFrrAltMetric2           Integer32,
    ipFrrAltMetric3           Integer32,
    ipFrrAltBest              INTEGER,
    ipFrrAltNonBestReason     OCTET STRING
}
```

```
ipFrrAltNextHopType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
```

"The type of the ipFrrNextHop address, as defined in the InetAddress MIB.

Only those address types that may appear in an actual routing table are allowed as values of this object."

REFERENCE "[RFC 4001](#)"

```
::= { ipFrrAltEntry 1 }
```

```
ipFrrAltNextHop OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
```

"The address of the next system along the alternate route.

The type of this address is determined by the value of the ipFrrAltNextHopType."

```
::= { ipFrrAltEntry 2 }
```

```
ipFrrAltIfIndex OBJECT-TYPE
```

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MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The ifIndex value which identifies the local interface through which the next hop of this alternate route should be reached."

::= { ipFrrAltEntry 3 }

ipFrrAltType OBJECT-TYPE

SYNTAX INTEGER {

other

(1), -- type not defined

equalCost

(2), -- primary path

loopFree

(3), -- loop free alternate

loopFreeRemote

(4), -- remote loop free alternate

loopFreeNH

(5), -- loop free alternate using a c

loopFreeNNH

(6), -- loop free alternate using a c

loopFreeTI

(7), -- loop free alternate using top

mrt

(8) -- Maximally Redundant Trees

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of alternate which is provided by the alternate next-hop. The supported types are as follows:

equalCost : The alternate next-hop is another primary next-hop.

loopFreeConnected : loop free alternate (LFA as described in [RFC528](#)

loopFreeRemote : remote LFA (as described in [draft-](#)

loopFreeNH : loop free alternate using a configured

loopFreeNNH : loop free alternate using a configure

loopFreeTI : loop free alternate using topology ind

other : The mechanism by which the alternate next-hop can be used is not specified.

MRT : Maximally Redundant Trees, where each destination has two MRTs associated with it. These two trees are referred as blue and red MRTs.

See [draft-ietf-rtgwg-mrt-frr-architecture-00](#).

"

::= { ipFrrAltEntry 4 }

ipFrrTunnelType OBJECT-TYPE

SYNTAX INTEGER {

none

(1), -- No tunnel used

other

(2), -- type not defined

ldp

(3), -- LDP tunnel

ip

(4), -- IP based tunnel (GRE, IPIP, L2TP

srmppls

(5), -- SPRING tunnel using MPLS dataplane

sripv6

(6), -- SPRING tunnel using IPv6 dataplane

rsvpte

(7), -- RSVP-TE tunnel

mtldp

(8) -- LDP tunnel on another topology

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of tunnel used to reach the alternate.

The supported types are as follows:

none : No tunnel used

ldp : use LDP tunnel to reach the alternate (typical

ip : use IP based tunnel to reach the alternate

srmppls or sripv6 : use SPRING based tunnel (typical

rsvpte : use a RSVP-TE LSP to reach the alternate

mtldp : use an LDP tunnel based on another topology

```

        "
 ::= { ipFrrAltEntry 5 }

ipFrrAltProtectionAvailable OBJECT-TYPE
    SYNTAX      BITS {
        nodeProtect(0),
        linkProtect(1),
        srlgProtect(2),
        downstreamProtect(3),
        unknownProtection(4)
    }
    MAX-ACCESS  read-only
    STATUS      current

```

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#### DESCRIPTION

"This object specifies the scope of protection for which this alternate next-hop can provide failure protection. The alternate next-hop should provide one or more of node-protection and link-protection. If the protection provided by the alternate next-hop is unknown, then only unknownProtection should be specified. Specifying unknownProtection with any other type of protection is not supported. "

```
 ::= { ipFrrAltEntry 6 }
```

ipFrrAltMetric1 OBJECT-TYPE

```

SYNTAX      Integer32
MAX-ACCESS  read-only
STATUS      current

```

#### DESCRIPTION

"This is the primary routing metric for this alternate path to the destination IP address. If the alternate path metric is unknown, the value should be set to -1."

```
 ::= { ipFrrAltEntry 7 }
```

ipFrrAltMetric2 OBJECT-TYPE

```

SYNTAX      Integer32
MAX-ACCESS  read-only
STATUS      current

```

DESCRIPTION

"This is the primary routing metric for this alternate path from the PLR to the alternate. If the alternate path metric is unknown, the value

should be set to -1."

::= { ipFrrAltEntry 8 }

ipFrrAltMetric3 OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is the primary routing metric for this alternate path from the alternate to the destination. If the alternate path metric is unknown, the value should be set to -1."

::= { ipFrrAltEntry 9 }

ipFrrAltBest OBJECT-TYPE

SYNTAX INTEGER { false(0), true(1) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object provides information if the alternate is the best one."

::= { ipFrrAltEntry 10 }

ipFrrAltNonBestReason OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (0..255))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object provides reason why an alternate is not the best one."

::= { ipFrrAltEntry 11 }

-- the IP FRR No Alternate MIB-Group

--

-- The ipFrrNoAltTable extends the inetCidrRouteTable

-- to indicate which routes are unprotected and the reason  
-- why. The indices do not include the primary next-hop because  
-- the lack of protection is for the route. This allows easy  
-- access to the set of unprotected routes that would be  
-- affected by a local failure of their primary next-hop.

ipFrrNoAltTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpFrrNoAltEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This entity's IP Fast Reroute Unprotected Routes  
table."

::= { ipFrrMIBObjects 3 }

ipFrrNoAltEntry OBJECT-TYPE

SYNTAX IpFrrNoAltEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry containing the reason why a route does not  
have an alternate next-hop. The existence of an  
entry for a route indicates that there is no  
alternate next-hop."

INDEX { inetCidrRouteDestType,  
inetCidrRouteDest,  
inetCidrRoutePfxLen

}  
::= { ipFrrNoAltTable 1 }

IpFrrNoAltEntry ::= SEQUENCE {  
ipFrrNoAltCause INTEGER  
}

ipFrrNoAltCause OBJECT-TYPE

SYNTAX INTEGER {

ipFrrUnavailable (1), -- No valid alternate(s)

localAddress (2), -- local/internal address

ipFrrDisabled (3), -- Protection not enabled

```

        other                (4)  -- unknown or other cause
    }
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
    "For valid routes without an alternate next-hop, this
    object enumerates the reason why no protection is
    available.  The possibilities are as follows.

    ipFrrUnavailable : The supported IP Fast-Reroute
                        mechanisms could not find a safe
                        alternate next-hop.

    localAddress : The route represents a local address.
                  This system is the destination so no

                        alternate path is possible or necessary.

    ipFrrDisabled : Finding of alternate next-hops is
                   operationally disabled.

    other : The reason is unknown or different from those
            specifically enumerated possible causes."
 ::= { ipFrrNoAltEntry 1 }

```

-- conformance information

```

ipFrrMIBConformance
    OBJECT IDENTIFIER ::= { ipFrrMIB 2 }

ipFrrMIBCompliances
    OBJECT IDENTIFIER ::= { ipFrrMIBConformance 1 }

ipFrrMIBGroups
    OBJECT IDENTIFIER ::= { ipFrrMIBConformance 2 }

```

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-- compliance statements

```

ipFrrMIBCompliance MODULE-COMPLIANCE
    STATUS deprecated
    DESCRIPTION

```

"Minimum requirements to state conformity  
to this MIB. Supporting only IP v4 addresses  
This is deprecated in favor of  
ipFrrMIBInetCompliance

There are a number of INDEX objects that cannot be  
represented in the form of OBJECT clauses in SMIV2,  
but for which there are compliance requirements,  
expressed in OBJECT clause form in this description:

OBJECT       inetCidrRouteDestType  
SYNTAX       InetAddressType { ipv4(1), ipv4z(3) }  
MIN-ACCESS   read-only  
DESCRIPTION  
    A (deprecated) complying implementation at this  
    level is required to support IPv4 addresses only.  
    This compliance level is defined so an  
    implementation only needs to support the addresses  
    it actually supports on the device.

OBJECT       inetCidrRouteNextHopType  
SYNTAX       InetAddressType { ipv4(1), ipv4z(3) }  
MIN-ACCESS   read-only

DESCRIPTION  
    A (deprecated) complying implementation at this  
    level is required to support IPv4 addresses only.  
    This compliance level is defined so an  
    implementation only needs to support the addresses  
    it actually supports on the device.

OBJECT       ipFrrAltNextHopType  
SYNTAX       InetAddressType { ipv4(1), ipv4z(3) }  
MIN-ACCESS   read-only

DESCRIPTION  
    A (deprecated) complying implementation at this  
    level is required to support IPv4 addresses only.  
    This compliance level is defined so an  
    implementation only needs to support the  
    addresses it actually supports on the device.

"

MODULE -- this module

```
MANDATORY-GROUPS { ipFrrBasicGroup }
```

```
::= { ipFrrMIBCompliances 1 }
```

```
ipFrrMIBInetCompliance MODULE-COMPLIANCE
```

```
STATUS current
```

```
DESCRIPTION
```

```
    "Full conformity to this MIB."
```

```
MODULE -- this module
```

```
MANDATORY-GROUPS { ipFrrBasicGroup }
```

```
OBJECT ipFrrIfRowStatus
```

```
SYNTAX INTEGER { active(1) }
```

```
WRITE-SYNTAX INTEGER { createAndGo(4), destroy(6) }
```

```
DESCRIPTION
```

```
    "Support for createAndWait and notInService is not  
    required."
```

```
::= { ipFrrMIBCompliances 2 }
```

```
ipFrrReadOnlyCompliance MODULE-COMPLIANCE
```

```
STATUS current
```

```
DESCRIPTION
```

```
    "When this MIB is implemented without support for  
    read-create (i.e. in read-only mode), then that  
    implementation can claim read-only compliance. In that  
    case, ipFrrAlt group can be monitored but cannot be  
    configured with this MIB."
```

```
MODULE
```

```
MANDATORY-GROUPS { ipFrrBasicGroup }
```

```
OBJECT ipFrrIfProtectionType
```

```
MIN-ACCESS read-only
```

```
DESCRIPTION
```

```
    "Write access is not required."
```

```
OBJECT ipFrrIfCandidate
```

```
MIN-ACCESS read-only
```

```
DESCRIPTION
```

```
    "Write access is not required."
```

```
OBJECT ipFrrIfRowStatus
```

```
MIN-ACCESS read-only
```

```
DESCRIPTION
```

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"Write access is not required."

::= { ipFrrMIBCompliances 3 }

-- units of conformance

ipFrrBasicGroup OBJECT-GROUP

OBJECTS {ipFrrTotalRoutes,  
ipFrrUnprotectedRoutes,  
ipFrrProtectedRoutes,  
ipFrrLinkProtectedRoutes,  
ipFrrNodeProtectedRoutes,  
ipv6FrrTotalRoutes,  
ipv6FrrUnprotectedRoutes,  
ipv6FrrProtectedRoutes,  
ipv6FrrLinkProtectedRoutes,  
ipv6FrrNodeProtectedRoutes,  
ipFrrAltIfIndex,  
ipFrrAltType,  
ipFrrTunnelType,  
ipFrrAltProtectionAvailable,  
ipFrrAltMetric1,  
ipFrrAltMetric2,  
ipFrrAltMetric3,  
ipFrrAltNonBestReason,  
ipFrrAltBest,  
ipFrrNoAltCause,  
ipFrrInstanceAlgorithm,  
ipFrrInstanceProtocol,  
ipFrrInstancePerPrefixComputation,  
ipFrrIfCandidate,  
ipFrrIfProtectionType,  
ipFrrIfRowStatus,  
ipFrrStatsTotalRoutes,  
ipFrrStatsUnprotectedRoutes,  
ipFrrStatsProtectedRoutes,  
ipFrrStatsLinkProtectedRoutes,  
ipFrrStatsNodeProtectedRoutes,  
ipv6FrrStatsTotalRoutes,  
ipv6FrrStatsUnprotectedRoutes,  
ipv6FrrStatsProtectedRoutes,  
ipv6FrrStatsLinkProtectedRoutes,  
ipv6FrrStatsNodeProtectedRoutes

```
}
STATUS    current
DESCRIPTION
    "The entire collection of objects defined in
    this MIB for management of IP Fast Reroute ."
```

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```
::= { ipFrrMIBGroups 1 }
```

END

#### [4.](#) Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. The ipFrrAltTable contains routing and forwarding information that is critical to the operation of the network in the event of a local failure. Allowing unauthenticated write access to this table can compromise the validity of the alternate forwarding information.

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 access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP.

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 the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [\[RFC3410\]](#), [section 8](#)), including full support for the SNMPv3 cryptographic mechanisms (for

authentication and privacy).

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

## [5.](#) Acknowledgements

The authors would like to acknowledge contributions made by Bill Anderson, Don Fedyk, John Flick and Bruno Decraene.

## [6.](#) IANA Considerations

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

The IANA is requested to assign { ip ZZZ } to the IPFRR-MIB MIB module specified in this document.

Editor's Note (to be removed prior to publication): the IANA is requested to assign a value for "ZZZ" under the ip subtree and to record the assignments in the SMI Numbers registry. When the assignments have been made, the RFC Editor is asked to replace "ZZZ" (here and in the MIB modules) with the assigned value and to remove this note.

## [7.](#) References

### [7.1.](#) Normative References

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## 7.2. Informative References

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