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Definitions of Managed Objects for VRRPv3
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Abstract

This specification defines a portion of the Management Information Base (MIB) for use with SNMP-based network management. In particular, it defines objects for configuring, monitoring, and controlling routers that employ the Virtual Router Redundancy Protocol Version 3 for both IPv4 and IPv6 as defined in [RFC 5798](#). This memo obsoletes [RFC 2787](#).

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1. 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](#)].

2. Introduction

This specification defines a portion of the Management Information Base (MIB) for use with SNMP-based network management. In particular, it defines objects for configuring, monitoring, and controlling routers that employ the Virtual Router Redundancy Protocol Version 3 for both IPv4 and IPv6 as defined in [RFC 5798](#) [[RFC5798](#)].

3. Terminology

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 [RFC 2119](#) [[RFC2119](#)].

4. Relationship to [RFC 2787](#)

This document obsoletes [RFC2787](#) [[RFC2787](#)]. The major changes in this

document reflect changes in VRRP protocol between [RFC 2338](#) [[RFC2338](#)] and [RFC 5798](#) [[RFC5798](#)]. This document is also updated to conform to current MIB conventions.

[5.](#) Relation to Interface Group (IF-MIB)

Since a router can be participating in VRRP on one or more interfaces, "ifIndex" is used as an index into the tables defined in the VRRP MIB. This MIB module imports ifIndex from the IF-MIB. At this time, the latest version of IF-MIB is from [RFC2863](#) [[RFC2863](#)].

[6.](#) Multi-Stack Implementations

This MIB module is designed to support Multi-Stack implementations

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that run VRRP over IPv4 and IPv6. IP version, VRID and ifIndex are used to uniquely identify rows in a multi stack implementation.

[7.](#) Interpretation of [RFC5798](#)

During the review of this document, It emerged that there are different possible interpretations of [[RFC5798](#)]. The Authors of that document and the VRRP working group were unable to reach consensus on which interpretation is correct. This document makes the following assumption.

IPv4 and IPv6 virtual routers are treated as two separate logical entities and represented as two separate entries in the vrrpv3operationsTable. This is required due to the undefined behavior of the protocol in [[RFC5798](#)] in a Multi-Stack scenario.

[8.](#) VRRP MIB Structure and Design

This MIB module contains three tables:

- (1) The vrrpv3operationsTable, which contains objects that define the operational characteristics of a VRRP router. Rows in this table correspond to instances of virtual routers.

- (2) The `vrpv3StatisticsTable` which contains the operating statistics for a VRRP router.
- (3) The `vrpv3AssociatedIpAddrTable`, contains the addresses of the virtual router(s) that a given VRRP router is backing up.

Tables are indexed on `ifIndex`, `VRID` and the IP version to uniquely identify a VRRP router.

Notifications in this MIB module are controlled using the mechanisms defined in [[RFC3413](#)].

9. VRRP Multistack Scenario

The following section provides examples of how some of the objects in this MIB are instantiated.

KEY:

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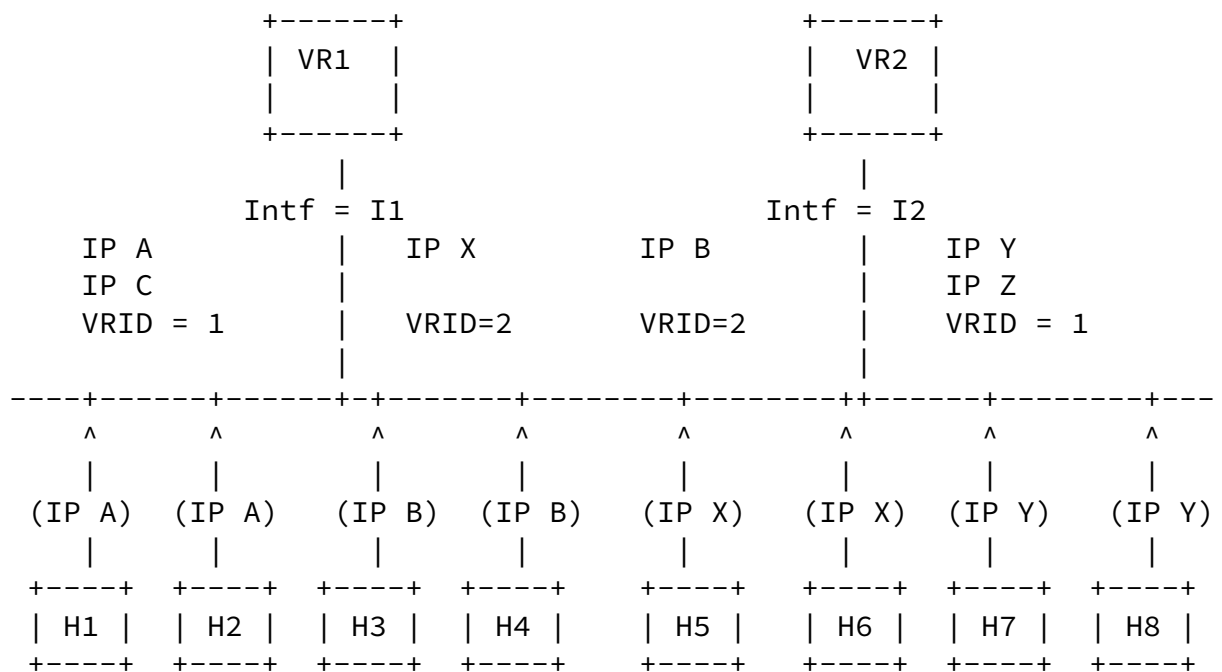
The labels in the following tables and diagrams correspond to the actual MIB objects as follows:

```

if          = IfIndex
AddrType=   vrrpv3operationsInetAddrType
VrId        = vrrpv3operationsVrId
State       = vrrpv3operationsStatus
Prior       = vrrpv3operationsPriority
IpAddr      = vrrpv3operationsMasterIpAddr

```

The following figure shows a hypothetical network with two VRRP routers VR1 & VR2, configured with two virtual routers. Addresses in '()' indicate the address of the default gateway for a given host, H1 to H4 are IPv4 hosts and H5 to H8 are IPv6 hosts. A, B and C are IPv4 addresses and X, Y and Z are IPv6 addresses. In the diagram, "Interface" is used in the context defined in IF-MIB.



----- MIB Tables For VRRP Router "VR1": -----

vrrpv3OperationsTable

if	VrId	AddrType	State	Prior	IpAddr	
I1	01	1	M	255	A	(..)
I1	01	2	B	1-254	Y	(..)
I1	02	1	B	1-254	B	(..)
I1	02	2	M	255	X	(..)

vrrpv3AssociatedIpAddrTable

if	VrId	AddrType	IP	RowStat
+-----+	+-----+	+-----+	+-----+	+-----+
I1	01	1	A	active
+-----+	+-----+	+-----+	+-----+	+-----+
I1	01	1	C	active
+-----+	+-----+	+-----+	+-----+	+-----+
I1	01	2	Y	active
+-----+	+-----+	+-----+	+-----+	+-----+
I1	01	2	Z	active
+-----+	+-----+	+-----+	+-----+	+-----+
I1	02	1	B	active
+-----+	+-----+	+-----+	+-----+	+-----+
I1	02	2	X	active
+-----+	+-----+	+-----+	+-----+	+-----+

----- MIB Tables For VRRP Router "VR2": -----

vrrpv3OperationsTable

if	VrId	AddrType	State	Prior	IpAddr	
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	(..)--+
I2	01	1	B	1-254	A	
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	(..)--+
I2	01	2	M	255	Y	
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	(..)--+
I2	02	1	M	255	B	
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	(..)--+
I2	02	2	B	1-254	X	
+-----+	+-----+	+-----+	+-----+	+-----+	+-----+	+-----+

vrrpv3AssociatedIpAddrTable

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if	VrId	AddrType	IP	RowStat
+-----+	+-----+	+-----+	+-----+	+-----+
I2	01	1	A	active
+-----+	+-----+	+-----+	+-----+	+-----+
I2	01	1	C	active
+-----+	+-----+	+-----+	+-----+	+-----+

I2	01	2	Y	active
+-----+	+-----+	+-----+	+-----+	+-----+
I2	01	2	Z	active
+-----+	+-----+	+-----+	+-----+	+-----+
I2	02	1	B	active
+-----+	+-----+	+-----+	+-----+	+-----+
I2	02	2	X	active
+-----+	+-----+	+-----+	+-----+	+-----+

NOTES:

1) For "State": M = Master; B = Backup.
In the vrrpv3operationsTable, a "priority" of 255 indicates that the respective router owns the IP address, e.g., this IP address is native to the router (i.e., "the IP Address Owner").

10. Definitions

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

VRRPV3-MIB DEFINITIONS ::= BEGIN

IMPORTS

```

    MODULE-IDENTITY, OBJECT-TYPE,
    NOTIFICATION-TYPE, Counter32,
    Integer32, mib-2, Unsigned32,
    Counter64, TimeTicks
        FROM SNMPv2-SMI
        -- RFC2578

    TEXTUAL-CONVENTION, RowStatus,
    MacAddress, TruthValue, TimeStamp,
    TimeInterval
        FROM SNMPv2-TC
        -- RFC2579

    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP
        FROM SNMPv2-CONF
        -- RFC2580

    ifIndex
        FROM IF-MIB
        -- RFC2863

    InetAddressType, InetAddress

```


FROM INET-ADDRESS-MIB; -- [RFC4001](#)

vrrpv3MIB MODULE-IDENTITY

LAST-UPDATED "201104220000Z" -- Apr 22, 2011

ORGANIZATION "IETF VRRP Working Group"

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DESCRIPTION

"This MIB describes objects used for managing Virtual Router Redundancy Protocol version 3 (VRRPv3).

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This version of MIB module is part of RFC YYYY.
Please see the RFC for full legal notices."

REVISION "201104220000Z" -- Apr 22, 2011

DESCRIPTION "Initial version as published in RFC YYYY."

-- EdNote: Please replace YYYY with actual RFC number for
-- this draft and remove this note.

::= { mib-2 ZZZ }

-- EdNote: Please replace ZZZ with IANA assigned number
-- and remove this note.

-- Textual Conventions

Vrrpv3VrIdTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The value of the virtual router identifier noted as (VRID) in [RFC5798](#). This along with interface index (ifIndex) and IP version, serves to uniquely identify a virtual router on a given VRRP router."

REFERENCE " [RFC 5798](#) (Sections [3](#) and [5.2.3](#))"

SYNTAX Integer32 (1..255)

-- VRRPv3 MIB Groups

vrrpv3Notifications OBJECT IDENTIFIER ::= { vrrpv3MIB 0 }

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```
vrrpv3Objects      OBJECT IDENTIFIER ::= { vrrpv3MIB 1 }
vrrpv3Conformance  OBJECT IDENTIFIER ::= { vrrpv3MIB 2 }
```

-- VRRPv3 MIB Objects

```
vrrpv3Operations  OBJECT IDENTIFIER ::= { vrrpv3Objects 1 }
vrrpv3Statistics  OBJECT IDENTIFIER ::= { vrrpv3Objects 2 }
```

-- VRRPv3 Operations Table

vrrpv3OperationsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Vrrpv3OperationsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Unified Operations table for a VRRP router which consists of a sequence (i.e., one or more conceptual rows) of 'vrrpv3OperationsEntry' items each of which describe the operational characteristics of a virtual router."

::= { vrrpv3Operations 1 }

vrrpv3OperationsEntry OBJECT-TYPE

SYNTAX Vrrpv3OperationsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the vrrpv3OperationsTable containing the operational characteristics of a virtual router. On a VRRP router, a given virtual router is identified by a combination of ifIndex, VRID and the IP version. ifIndex represents a interface of the router.

A row must be created with vrrpv3OperationsStatus set to initialize(1) and cannot transition to backup(2) or master(3) until vrrpv3OperationsRowStatus is transitioned to active(1).

The information in this table is persistent and when written the entity SHOULD save the change to non-volatile storage."


```

INDEX      { ifIndex, vrrpv3OperationsVrId,
              vrrpv3OperationsInetAddrType
            }
 ::= { vrrpv3OperationsTable 1 }

```

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Vrrpv3OperationsEntry ::=

```

SEQUENCE {
    vrrpv3OperationsVrId
        Vrrpv3VrIdTC,
    vrrpv3OperationsInetAddrType
        InetAddressType,
    vrrpv3OperationsMasterIpAddress
        InetAddress,
    vrrpv3OperationsPrimaryIpAddress
        InetAddress,
    vrrpv3OperationsVirtualMacAddr
        MacAddress,
    vrrpv3OperationsStatus
        INTEGER,
    vrrpv3OperationsPriority
        Unsigned32,
    vrrpv3OperationsAddrCount
        Integer32,
    vrrpv3OperationsAdvInterval
        TimeInterval,
    vrrpv3OperationsPreemptMode
        TruthValue,
    vrrpv3OperationsAcceptMode
        TruthValue,
    vrrpv3OperationsUpTime
        TimeTicks,
    vrrpv3OperationsRowStatus
        RowStatus
}
vrrpv3OperationsVrId OBJECT-TYPE
    SYNTAX      Vrrpv3VrIdTC
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION

```


"This object contains the Virtual Router Identifier (VRID)."
REFERENCE "[RFC 4001](#)"
::= { vrrpv3OperationsEntry 1 }

vrrpv3OperationsInetAddrType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The IP address type of Vrrpv3OperationsEntry and Vrrpv3AssociatedIpAddrEntry. This value determines the type for vrrpv3OperationsMasterIpAddr,

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vrrpv3OperationsPrimaryIpAddr and
vrrpv3AssociatedIpAddrAddress.

ipv4(1) and ipv6(2) are the only two values supported in this MIB module."

REFERENCE "[RFC 4001](#)"
::= { vrrpv3OperationsEntry 2 }

vrrpv3OperationsMasterIpAddr OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The master router's real IP address. Master router would set this address to vrrpv3OperationsPrimaryIpAddr while transitioning to master state. For backup routers, this is the IP address listed as the source in VRRP advertisement last received by this virtual router."
REFERENCE "[RFC 5798](#)"
::= { vrrpv3OperationsEntry 3 }

vrrpv3OperationsPrimaryIpAddr OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"In the case where there is more than one IP Address (associated IP addresses) for a given

`ifIndex', this object is used to specify the IP address that will become the
vrrpv30operationsMasterIpAddr', should the virtual router transition from backup state to master."
::= { vrrpv30operationsEntry 4 }

vrrpv30operationsVirtualMacAddr OBJECT-TYPE

SYNTAX MacAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The virtual MAC address of the virtual router. Although this object can be derived from the 'vrrpv30operationsVrId' object, it is defined so that it is easily obtainable by a management application and can be included in VRRP-related SNMP notifications."

::= { vrrpv30operationsEntry 5 }

vrrpv30operationsStatus OBJECT-TYPE

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SYNTAX INTEGER {
 initialize(1),
 backup(2),
 master(3)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current state of the virtual router. This object has three defined values:

- `initialize', which indicates that the virtual router is waiting for a startup event.
- `backup', which indicates the virtual router is monitoring the availability of the master router.
- `master', which indicates that the virtual router is forwarding packets for IP addresses that are associated with this router."

REFERENCE " [RFC 5798](#)"


```
::= { vrrpv3OperationsEntry 6 }
```

vrrpv3OperationsPriority OBJECT-TYPE

SYNTAX Unsigned32 (0..255)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object specifies the priority to be used for the virtual router master election process. Higher values imply higher priority.

A priority of '0', although not settable, is sent by the master router to indicate that this router has ceased to participate in VRRP and a backup virtual router should transition to become a new master.

A priority of 255 is used for the router that owns the associated IP address(es) for VRRP over IPv4 and hence not settable.

A 'badValue(3)' should be returned when a user tries to set 0 or 255 for this object. "

REFERENCE " [RFC 5798 section 6.1](#)"

DEFVAL { 100 }

```
::= { vrrpv3OperationsEntry 7 }
```

vrrpv3OperationsAddrCount OBJECT-TYPE

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SYNTAX Integer32 (0..255)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of IP addresses that are associated with this virtual router. This number is equal to the number of rows in the vrrpv3AssociatedAddrTable that correspond to a given ifIndex/VRID/IP version."

REFERENCE "[RFC 5798 Section 6.1](#)"

```
::= { vrrpv3OperationsEntry 8 }
```

vrrpv3OperationsAdvInterval OBJECT-TYPE

SYNTAX TimeInterval (1..4095)

UNITS "centiseconds"

MAX-ACCESS read-create

STATUS current
 DESCRIPTION
 "The time interval, in centiseconds, between sending advertisement messages. Only the master router sends VRRP advertisements."
 REFERENCE " [RFC 5798 section 6.1](#)"
 DEFVAL { 100}
 ::= { vrrpv30operationsEntry 9 }

vrrpv30operationsPreemptMode OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "Controls whether a higher priority virtual router will preempt a lower priority master."
 REFERENCE " [RFC 5798 section 6.1](#)"
 DEFVAL { true }
 ::= { vrrpv30operationsEntry 10 }

vrrpv30operationsAcceptMode OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "Controls whether a virtual router in Master state will accept packets addressed to the address owner's IPv6 address as its own if it is not the IPv6 address owner. Default is false(2).
 This object is not relevant for rows representing VRRP over IPv4 and should be set to false(2)."
 DEFVAL { false }
 ::= { vrrpv30operationsEntry 11 }

vrrpv30operationsUpTime OBJECT-TYPE

SYNTAX TimeTicks
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "This value represents the amount of time, in TimeTicks (hundredth of a second), since this virtual router (i.e., the `vrrpv30operationsStatus')"

transitioned out of `initialize'."
REFERENCE " [RFC 5798 section 6.1](#)"
 ::= { vrrpv3operationsEntry 12 }

vrrpv3operationsRowStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"The RowStatus variable should be used in accordance to installation and removal conventions for conceptual rows.

To create a row in this table, a manager sets this object to either createAndGo(4) or createAndWait(5). Until instances of all corresponding columns are appropriately configured, the value of the Corresponding instance of the `vrrpv3operationsRowStatus' column will be read as notReady(3).

In particular, a newly created row cannot be made active(1) until (minimally) the corresponding instance of vrrpv3operationsInetAddrType, vrrpv3operationsVrId and vrrpv3operationsPrimaryIpAddr has been set and there is at least one active row in the `vrrpv3AssociatedIpAddrTable' defining an associated IP address.

notInService(2) should be used to administratively bring the row down.

A typical order of operation to add a row is:

1. Create a row in vrrpv3operationsTable with createAndWait(5).
2. Create one or more corresponding rows in vrrpv3AssociatedIpAddrTable.
3. Populate the vrrpv3operationsEntry.
4. set vrrpv3operationsRowStatus to active(1).

A typical order of operation to delete an entry is:

1. Set vrrpv3operationsRowStatus to notInService(2).


```

        2. Set the corresponding rows in
        vrrpv3AssociatedIpAddrTable to destroy(6) to delete the
        entry.
        3. set vrrpv3OperationsRowStatus to destroy(6) to
        delete the entry."
 ::= { vrrpv3OperationsEntry 13 }

-- VRRP Associated Address Table

vrrpv3AssociatedIpAddrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Vrrpv3AssociatedIpAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The table of addresses associated with each virtual
        router."
 ::= { vrrpv3Operations 2 }

vrrpv3AssociatedIpAddrEntry OBJECT-TYPE
    SYNTAX      Vrrpv3AssociatedIpAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An entry in the table contains an IP address that is
        associated with a virtual router. The number of rows
        for a given IP version, VrID and ifIndex will equal the
        number of IP addresses associated (e.g., backed up) by
        the virtual router (equivalent to
        'vrrpv3OperationsIpAddrCount')."

        Rows in the table cannot be modified unless the value
        of 'vrrpv3OperationsStatus' for the corresponding entry
        in the vrrpv3OperationsTable has transitioned to
        initialize(1).

        The information in this table is persistent and when
        written the entity SHOULD save the change to non-
        volatile storage."

    INDEX      { ifIndex, vrrpv3OperationsVrId,
                  vrrpv3OperationsInetAddrType,
                  vrrpv3AssociatedIpAddrAddress }

 ::= { vrrpv3AssociatedIpAddrTable 1 }

Vrrpv3AssociatedIpAddrEntry ::=
    SEQUENCE {
        vrrpv3AssociatedIpAddrAddress

```



```
        InetAddress,
        vrrpv3AssociatedIpAddrRowStatus
        RowStatus
    }
```

vrrpv3AssociatedIpAddrAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE (0|4|16))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The assigned IP addresses that a virtual router is responsible for backing up.

The IP address type is determined by the value of vrrpv3OperationsInetAddrType in the index of this row"

REFERENCE " [RFC 5798](#) "

::= { vrrpv3AssociatedIpAddrEntry 1 }

vrrpv3AssociatedIpAddrRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The row status variable, used according to installation and removal conventions for conceptual rows. To create a row in this table, a manager sets this object to either createAndGo(4) or createAndWait(5). Setting this object to active(1) results in the addition of an associated address for a virtual router. Setting this object to notInService(2) results in administratively bringing down the row.

Destroying the entry or setting it to destroy(6) removes the associated address from the virtual router. The use of other values is implementation-dependent.

Implementations should not allow deletion of the last row corresponding to an active row in vrrpv3OperationsTable.

Refer to description of vrrpv3OperationsRowStatus for a typical row creation and deletion scenarios."

::= { vrrpv3AssociatedIpAddrEntry 2 }

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of VRRP packets received with an invalid VRRP checksum value.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3GlobalStatisticsDiscontinuityTime."

REFERENCE " [RFC 5798 Section 5.2.8](#)"

::= { vrrpv3Statistics 1 }

vrrpv3RouterVersionErrors OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of VRRP packets received with an unknown or unsupported version number.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3GlobalStatisticsDiscontinuityTime."

REFERENCE " [RFC 5798 Section 5.2.1](#)"

::= { vrrpv3Statistics 2 }

vrrpv3RouterVrIdErrors OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of VRRP packets received with a VRID that is not valid for any virtual router on this router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3GlobalStatisticsDiscontinuityTime."

REFERENCE " [RFC 5798 Section 5.2.3](#)"
 ::= { vrrpv3Statistics 3 }

vrrpv3GlobalStatisticsDiscontinuityTime OBJECT-TYPE

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SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The value of sysUpTime on the most recent occasion at which one of vrrpv3RouterChecksumErrors, vrrpv3RouterVersionErrors and vrrpv3RouterVrIdErrors suffered a discontinuity.

If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { vrrpv3Statistics 4 }

-- VRRP Router Statistics Table

vrrpv3StatisticsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Vrrpv3StatisticsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"Table of virtual router statistics."

::= { vrrpv3Statistics 5 }

vrrpv3StatisticsEntry OBJECT-TYPE

SYNTAX Vrrpv3StatisticsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"An entry in the table, containing statistics information about a given virtual router."


```

AUGMENTS      { vrrpv3OperationsEntry }
 ::= { vrrpv3StatisticsTable 1 }

```

```

Vrrpv3StatisticsEntry ::=
  SEQUENCE {
    vrrpv3StatisticsMasterTransitions
      Counter32,
    vrrpv3StatisticsNewMasterReason
      INTEGER,
    vrrpv3StatisticsRcvdAdvertisements
      Counter64,
    vrrpv3StatisticsAdvIntervalErrors
      Counter64,
    vrrpv3StatisticsIpTtlErrors
      Counter64,
    vrrpv3StatisticsProtoErrReason
      INTEGER,

```

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```

    vrrpv3StatisticsRcvdPriZeroPackets
      Counter64,
    vrrpv3StatisticsSentPriZeroPackets
      Counter64,
    vrrpv3StatisticsRcvdInvalidTypePackets
      Counter64,
    vrrpv3StatisticsAddressListErrors
      Counter64,
    vrrpv3StatisticsPacketLengthErrors
      Counter64,
    vrrpv3StatisticsRowDiscontinuityTime
      TimeStamp,
    vrrpv3StatisticsRefreshRate
      Unsigned32
  }

```

vrrpv3StatisticsMasterTransitions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of times that this virtual router's
state has transitioned to MASTER.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 1 }

vrrpv3StatisticsNewMasterReason OBJECT-TYPE

SYNTAX INTEGER {
notMaster (0),
priority (1),
preempted (2),
masterNoResponse (3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This indicates the reason for the virtual router to transition to MASTER state. If the virtual router never transitioned to master state, this SHOULD be set to notmaster(0). Otherwise this indicates the reason this virtual router transitioned to master state the last time. Used by vrrpv3NewMaster notification."

::= { vrrpv3StatisticsEntry 2 }

vrrpv3StatisticsRcvdAdvertisements OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of VRRP advertisements received by this virtual router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 3 }

vrpv3StatisticsAdvIntervalErrors OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of VRRP advertisement packets received for which the advertisement interval is different from the vrrpv3OperationsAdvInterval configured on this virtual router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 4 }

vrpv3StatisticsIpTtlErrors OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of VRRP packets received by the Virtual router with IPv4 TTL (for VRRP over IPv4) or IPv6 Hop Limit (for VRRP over IPv6) not equal to 255.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

REFERENCE "[RFC 5798 Section 5.1.1.3](#)"

::= { vrrpv3StatisticsEntry 5 }

vrpv3StatisticsProtoErrReason OBJECT-TYPE

SYNTAX INTEGER {
noError (0),
ipTtlError (1),
versionError (2),
checksumError (3),
vrIdError(4)
}
MAX-ACCESS read-only

STATUS current
 DESCRIPTION
 "This indicates the reason for the last protocol error.
 This SHOULD be set to noError(0) when no protocol
 errors are encountered. Used by vrrpv3ProtoError
 notification."
 ::= { vrrpv3StatisticsEntry 6 }

vrrpv3StatisticsRcvdPriZeroPackets OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The total number of VRRP packets received by the
 virtual router with a priority of '0'.

Discontinuities in the value of this counter can occur
 at re-initialization of the management system, and at
 other times as indicated by the value of
 vrrpv3StatisticsRowDiscontinuityTime."

REFERENCE "[RFC 5798 Section 5.2.4](#)"
 ::= { vrrpv3StatisticsEntry 7 }

vrrpv3StatisticsSentPriZeroPackets OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The total number of VRRP packets sent by the virtual
 router with a priority of '0'.

Discontinuities in the value of this counter can occur
 at re-initialization of the management system, and at
 other times as indicated by the value of
 vrrpv3StatisticsRowDiscontinuityTime."

REFERENCE "[RFC 5798 Section 5.3.4](#)"
 ::= { vrrpv3StatisticsEntry 8 }

vrrpv3StatisticsRcvdInvalidTypePackets OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of VRRP packets received by the virtual router with an invalid value in the 'type' field.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 9 }

vrrpv3StatisticsAddressListErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of packets received for which the address list does not match the locally configured list for the virtual router.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 10 }

vrrpv3StatisticsPacketLengthErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of packets received with a packet length less than the length of the VRRP header.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of vrrpv3StatisticsRowDiscontinuityTime."

::= { vrrpv3StatisticsEntry 11 }

vrrpv3StatisticsRowDiscontinuityTime 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 this entry's counters suffered a discontinuity.

If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { vrrpv3StatisticsEntry 12 }

vrrpv3StatisticsRefreshRate OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milli-seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum reasonable polling interval for this entry. This object provides an indication of the minimum Amount of time required to update the counters in this entry."

::= { vrrpv3StatisticsEntry 13 }

-- Notification Definitions

-- Notifications may be controlled using SNMP-NOTIFICATION-MIB

vrrpv3NewMaster NOTIFICATION-TYPE

OBJECTS {
 vrrpv3OperationsMasterIpAddress,
 vrrpv3StatisticsNewMasterReason
}

STATUS current

DESCRIPTION

"The newMaster notification indicates that the sending agent has transitioned to 'Master' state."

::= { vrrpv3Notifications 1 }

vrrpv3ProtoError NOTIFICATION-TYPE

OBJECTS {
 vrrpv3StatisticsProtoErrReason
}

STATUS current

DESCRIPTION

"The notification indicates that the sending agent has encountered the protocol error indicated by


```
        vrrpv3StatisticsProtoErrReason."  
 ::= { vrrpv3Notifications 2 }
```

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```
-- Conformance Information
```

```
vrrpv3Compliances  OBJECT IDENTIFIER ::= { vrrpv3Conformance 1 }  
vrrpv3Groups       OBJECT IDENTIFIER ::= { vrrpv3Conformance 2 }
```

```
-- Compliance Statements
```

```
vrrpv3FullCompliance MODULE-COMPLIANCE  
    STATUS current  
    DESCRIPTION  
        "The compliance statement"  
    MODULE -- this module  
    MANDATORY-GROUPS {  
        vrrpv3OperationsGroup,  
        vrrpv3StatisticsGroup,  
        vrrpv3InfoGroup,  
        vrrpv3NotificationsGroup  
    }  
    OBJECT            vrrpv3OperationsPriority  
    WRITE-SYNTAX      Unsigned32 (1..254)  
    DESCRIPTION       "Setable values are from 1 to 254."  
    ::= { vrrpv3Compliances 1 }
```

```
vrrpv3ReadOnlyCompliance MODULE-COMPLIANCE  
    STATUS current  
    DESCRIPTION  
        "When this MIB module is implemented without support for  
        read-create (i.e. in read-only mode), then such an  
        implementation can claim read-only compliance. Such a  
        device can then be monitored but can not be configured  
        with this MIB."  
  
    MODULE -- this module  
    MANDATORY-GROUPS {  
        vrrpv3OperationsGroup,  
        vrrpv3StatisticsGroup,  
        vrrpv3StatisticsDiscontinuityGroup,
```



```

        vrrpv3InfoGroup,
        vrrpv3NotificationsGroup
    }

```

```

OBJECT      vrrpv3operationsPriority
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT      vrrpv3operationsPrimaryIpAddr

```

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```

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

```

```

OBJECT      vrrpv3operationsAdvInterval
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT      vrrpv3operationsPreemptMode
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT      vrrpv3operationsAcceptMode
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT      vrrpv3operationsRowStatus
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

OBJECT      vrrpv3AssociatedIpAddrRowStatus
MIN-ACCESS  read-only
DESCRIPTION "Write access is not required."

```

```

 ::= { vrrpv3Compliances 2 }

```

-- Conformance Groups

```

vrrpv3operationsGroup  OBJECT-GROUP
    OBJECTS {
        vrrpv3operationsVirtualMacAddr,
        vrrpv3operationsStatus,
        vrrpv3operationsPriority,

```



```

        vrrpv3OperationsMasterIpAddr,
        vrrpv3OperationsAdvInterval,
        vrrpv3OperationsPreemptMode,
        vrrpv3OperationsAcceptMode,
        vrrpv3OperationsUpTime,
        vrrpv3OperationsRowStatus,
        vrrpv3OperationsAddrCount,
        vrrpv3OperationsPrimaryIpAddr,
        vrrpv3AssociatedIpAddrRowStatus
    }
    STATUS current
    DESCRIPTION
        "Conformance group for VRRPv3 operations."
    ::= { vrrpv3Groups 1 }

```

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```

vrrpv3StatisticsGroup OBJECT-GROUP
    OBJECTS {
        vrrpv3RouterChecksumErrors,
        vrrpv3RouterVersionErrors,
        vrrpv3RouterVrIdErrors,
        vrrpv3StatisticsMasterTransitions,
        vrrpv3StatisticsNewMasterReason,
        vrrpv3StatisticsRcvdAdvertisements,
        vrrpv3StatisticsAdvIntervalErrors,
        vrrpv3StatisticsRcvdPriZeroPackets,
        vrrpv3StatisticsSentPriZeroPackets,
        vrrpv3StatisticsRcvdInvalidTypePackets,
        vrrpv3StatisticsIpTtlErrors,
        vrrpv3StatisticsProtoErrReason,
        vrrpv3StatisticsAddressListErrors,
        vrrpv3StatisticsPacketLengthErrors,
        vrrpv3StatisticsRowDiscontinuityTime,
        vrrpv3StatisticsRefreshRate
    }
    STATUS current
    DESCRIPTION
        "Conformance group for VRRPv3 statistics."
    ::= { vrrpv3Groups 2 }

vrrpv3StatisticsDiscontinuityGroup OBJECT-GROUP
    OBJECTS {

```



```

        vrrpv3GlobalStatisticsDiscontinuityTime
    }
    STATUS current
    DESCRIPTION
        "Objects providing information statistics counter
        discontinuities."
    ::= { vrrpv3Groups 3 }

vrrpv3InfoGroup OBJECT-GROUP
    OBJECTS {
        vrrpv3StatisticsProtoErrReason,
        vrrpv3StatisticsNewMasterReason
    }
    STATUS current
    DESCRIPTION
        "Conformance group for objects contained in VRRPv3
        notifications."
    ::= { vrrpv3Groups 4 }

vrrpv3NotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        vrrpv3NewMaster,

```

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```

        vrrpv3ProtoError
    }
    STATUS current
    DESCRIPTION
        "The VRRP MIB Notification Group."
    ::= { vrrpv3Groups 5 }

END

```

11. 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. These are the tables and objects and their sensitivity/vulnerability:

The objects `vrpv3OperationsPriority`, `vrpv3OperationsPrimaryIpAddress`, `vrpv3OperationsAdvInterval`, `vrpv3OperationsPreemptMode`, `vrpv3OperationsAcceptMode`, `vrpv3OperationsRowStatus` and `vrpv3AssociatedIpAddressRowStatus` possess the read-create attribute. Manipulation of these objects is capable of affecting the operation of a virtual router.

Specific examples of this include, but are not limited to:

- o The `vrpv3OperationsRowStatus` object which could be used to disable a virtual router. While there are other columns that, if changed, could disrupt operations, they can not be changed without first changing the `RowStatus` object.

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 [\[RFC3410\]](#), [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.

[12.](#) IANA Considerations

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

Descriptor	OBJECT IDENTIFIER value
-----	-----
vrrpv3MIB	{ mib-2 ZZZ }

[Editor's Note (to be removed prior to publication): The IANA is requested to assign a value for "ZZZ" 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 "ZZZ" (here and in the MIB module) with the assigned value.]

This document obsoletes [RFC 2787](#) and the IANA is requested to deprecate the value 68 under 'mib-2' assigned to VRRP-MIB.]

[13.](#) Normative References

- [RFC2119] Bradner S., "Key words for use in RFCs to Indicate Requirement Levels", [RFC 2119](#), March 1997.
- [[RFC2578](#)] McCloghrie, K., D. Perkins, J. Schoenwaelder, J. Case, M. Rose, S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [[RFC2579](#)] McCloghrie, K., D. Perkins, J. Schoenwaelder, J. Case, M. Rose, S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [[RFC2580](#)] McCloghrie, K., D. Perkins, J. Schoenwaelder, J. Case, M. Rose, S. Waldbusser, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [[RFC5798](#)] S. Nadas, Ed., "Virtual Router Redundancy Protocol Version 3 for IPv4 and IPv6 ", [RFC 5798](#), Mar 2010.
- [[RFC2787](#)] Jewell, B., D. Chuang, "Definitions of Managed Objects for the Virtual Router Redundancy Protocol", [RFC 2787](#), March 2000.
- [[RFC2863](#)] McCloghrie, K., Kastenholz, F., "The Interfaces Group MIB" [RFC2863](#), June 2000.
- [[RFC4001](#)] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", [RFC 4001](#), February 2005.

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[14.](#) Informative References

- [RFC3410] Case, J., R. Mundy, D. Partain, B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.
- [RFC2338] S.Knight, D.Weaver, D.Whipple, R.Hinden, D.Mitzel, P.Hunt, P.Higginson, M.Shand, A.Lindem, "Virtual Router Redundancy Protocol", [RFC 2338](#), April 1998.

[15.](#) Acknowledgments

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