



VRRPv3 Protocol for IPv6

Teldat-Dm 821-I

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I Related Documents

Teldat-Dm775-I VRF Lite Facility

Chapter 1 Introduction

1.1 Introducing the VRRPv3 Protocol

Version 3 of the Virtual Router Redundancy Protocol (VRRPv3) is the subject of RFC 5798 “*Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6*”.

It is based on version 2 of VRRP for IPv4, defined in both RFC 3768 and in the “*Virtual Router Redundancy Protocol for IPv6*”.

VRRP specifies an election protocol that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The VRRP router controlling the IPv4 or IPv6 address(es) associated with a virtual router is called the *Master*, and it forwards packets sent to these IPv4 or IPv6 addresses. When the *Master* becomes unavailable, one of the other VRRP routers, called *Backup* routers, takes over the responsibility of routing over the virtual router addresses, thus providing dynamic recovery when failure occurs. This means that any of the IPv4 or IPv6 addresses associated with the virtual router can be used as the first hop address (or default route) for the devices found on the LAN network.

Within a VRRP router, the virtual routers in each of the IPv4 and IPv6 address families are domains themselves and do not overlap.

When it comes to IPv4, the advantage of using VRRP is having a higher-availability default path without having to configure dynamic routing or router discovery protocols in every end-host. In the case of IPv6, the advantage is a quicker switchover to *Backup* routers than that obtained with standard IPv6 Neighbor Discovery mechanisms.

1.2 VRRPv3 Protocol Description

The VRRPv3 protocol provides the *virtual* router function previously described.

This manual will be focusing on the implementation of the VRRPv3 protocol for the IPv6 address family.

1.2.1 Definitions

The following list contains a set of definitions and concepts regarding the VRRPv3 protocol that need to be taken into account:

- **VRRPv3 Router:** Router running the VRRPv3 protocol. A VRRPv3 router may participate on one or more virtual routers.
- **Virtual Router:** An abstract object managed by VRRPv3 routers that acts as a default router for the devices on a LAN. In Teldat routers this consists of a **virtual router identifier** and a **set of IPv6 addresses**. A VRRPv3 router can backup various routers simultaneously.
- **IPv6 address Owner:** Router that has the virtual IPv6 address (associated with the virtual router) as the real address for some of its interfaces.
- **Main IPv6 address:** IPv6 Link-local interface address. The VRRPv3 protocol *Advertisement* messages are always sent using the main IPv6 address as the packet source IPv6 address.
- **Virtual Router MASTER:** VRRPv3 router responsible for processing packets sent through the IPv6 address(es) associated with the virtual router and responding to ND Neighbor Solicitation messages for the virtual IPv6 address(es).



Note

If the virtual IPv6 address OWNER is available and running, this will ALWAYS be the virtual router MASTER.

- **Virtual Router BACKUP:** Set of VRRPv3 routers on the LAN network available to take on the responsibility of the virtual router should the *Master* fail.

1.2.2 Protocol Functionality

VRRPv3 operation is similar to VRRPv2. For more details on the VRRP functionality, see the Teldat- **Dm759-I VRRP Protocol** manual.

1.2.3 Differences between VRRPv2 and VRRPv3

The main differences between version 2 and version 3 of the VRRP protocol are:

- They support different networks. VRRPv3 applies to IPv4 and IPv6 networks, whereas VRRPv2 only applies to the IPv4 network.
- VRRPv3 does not support authentication.
- They use different units for the interval at which VRRP Advertisement packets are sent. VRRPv3 uses centi-seconds, whereas VRRPv2 uses seconds.
- Virtual MAC Address on VRRPv3 for IPv6 is IPv6 00-00-5e-00-02-{VID}.
- IPv6 multicast address assigned by the IANA used as destination on IPv6 VRRP Advertisement packets is FF02:0:0:0:0:0:12.

1.3 References

RFC 5798 “Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6”

S. Nadas. March 2010.

RFC 3768 “Virtual Router Redundancy Protocol (VRRP)”

R.Hinden. April 2004.

RFC 4861 “Neighbor Discovery for IP version 6 (IPv6)”

T. Narten, E. Nordmark. September 2007.

RFC 2460 “Internet Protocol, Version 6 (IPv6) Specification”

S. Deering, R. Hinden. December 1998.

Chapter 2 Configuration

2.1 Configuring VRRPv3 for IPv6

The VRRPv3 for IPv6 global configuration commands must be entered in the configuration menu associated with VRRP for IPv6 (IPv6 VRRP config>). To access this menu, enter the **vrrp** command at the IPv6 configuration menu.

```
Config>protocol ipv6
-- IPv6 user configuration --
IPv6 config>vrrp
-- Virtual Router Redundancy Protocol for IPv6 configuration --
IPv6 VRRP config>
```

Once in the VRRP configuration environment, you can enter the commands listed below:

Command	Function
<i>list</i>	Displays information on the VRRP configuration.
<i>exit</i>	Exits the VRRP configuration menu.

VRRP virtual routers have to be configured from a specific configuration menu assigned to the interface through which the router is connected to the LAN, and where the virtual router is defined.

```
Config>network ethernetX/X
-- Ethernet Interface User Configuration --
ethernetX/X config>ipv6 vrrp <vrId> ?
  advertise-interval  Set the advertisement interval
  ipv6                VRRP virtual IPv6 address
  no-preempt          Disable preemption of lower priority Master routers
  preempt             Enable preemption of lower priority Master routers
  priority            Priority level of this VRRP group
  reload-delay        Delay before VRRP initialization
  standby-delay       Delay before change to Master if lower priority has
                     been received
  track               VRRP tracking
<cr>
```

2.2 VRRP for IPv6 Global Configuration Commands

The VRRP for IPv6 global configuration commands are explained below.

2.2.1 LIST

Displays the VRRP configuration, including both the global parameters and the various virtual routers.

Syntax:

```
IPv6 VRRP config>list
```

Example:

```
IPv6 VRRP config>list
Main VRRP settings:
  VRRP is enabled

Virtual Router [ethernet0/0.101, vrId 5]
  Virtual IPv6: fe80::5
  Virtual Secondary IPv6: 2001:db8:1111::3/64
  Virtual Secondary IPv6: 2001:db8:2222::3/64
  Virtual MAC: 00-00-5e-00-02-05
  Advertisement interval (config) 5000ms
  Priority (config) 120, Preemption enabled
```

```

Tracking ethernet0/1 priority-cost 40

Virtual Router [ethernet0/0.101, vrId 6]
Virtual IPv6: fe80::6
Virtual MAC: 00-00-5e-00-02-06
Advertisement interval (config) 3000ms
Priority (config) 80, Preemption enabled

IPv6 VRRP config>

```

Command history:

Release	Modification
11.00.04	The " <i>list</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>list</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>list</i> " command was introduced as of version 11.01.00.

2.2.2 EXIT

Exits the specific VRRP protocol configuration menu and returns to the IPv6 config> prompt.

Syntax:

```
IPv6 VRRP config>exit
```

Example:

```

IPv6 VRRP config>exit
IPv6 config>

```

Command history:

Release	Modification
11.00.04	The " <i>exit</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>exit</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>exit</i> " command was been introduced as of version 11.01.00.

2.3 Configuring VRRP Virtual Routers for IPv6

As already mentioned, VRRP virtual routers are configured from the specific configuration menu for the interface through which the device connects to the LAN (and through which the virtual routers act). You can only define virtual routers in Ethernet interfaces and subinterfaces.

The first step is to access the configuration menu for the interface itself. Given that each interface is associated with a VRF, you don't need to specify it. For more information, please see the Teldat- **Dm775-I VRF** Lite Facility manual.

Syntax:

```

ethernetX/X config>ipv6 vrrp <vrId> ?
  advertise-interval  Set the advertisement interval
  ipv6                VRRP virtual IPv6 address
  no-preempt          Disable preemption of lower priority Master routers
  standby-delay       Delay before change to Master if lower priority has
                     been received
  preempt             Enable preemption of lower priority Master routers
  reload-delay        Delay before VRRP initialization
  priority            Priority level of this VRRP group
  track               VRRP tracking
  <cr>

```

<vrId> Virtual router identifier. This identifier is unique to each virtual router.

Allowed values for the virtual router identifier (**vrId**) range from 1 to 255. There is no default value.

To eliminate a VRRP virtual router, use the following command:

```
ethernetX/X config>no ipv6 vrrp <vrId>
```


The following sections explain the use and meaning of the various available options when configuring virtual routers on an interface.

2.3.1 ADVERTISE-INTERVAL

Configures the interval between consecutive *Advertisements* sent by the VRRP router acting as *Master*.

Unlike what happens in VRRPv2, VRRP routers in VRRPv3 do not have to have the same configured value for a time interval because those in *Backup* state take the value from the *Master* VRRP router. Also, in VRRPv3 the Advertise interval is always represented in "milliseconds".

Allowed values for this time interval range from 100 to 40950 milliseconds. Default is 1000 milliseconds.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> advertise-interval <interval>
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 advertise-interval 1500
ethernet0/0 config>
```

In this example, the interval between *Advertisements* is set to 1500 milliseconds.

To restore the default value, use the negated form of the command:

```
ethernetX/X config>no ipv6 vrrp <vrId> advertise-interval
```

Command history:

Release	Modification
11.00.04	The " <i>advertise-interval</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>advertise-interval</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>advertise-interval</i> " command was introduced as of version 11.01.00.

2.3.2 IPv6

Specifies one or more virtual IPv6 addresses associated with the virtual router you are configuring. For each virtual router, at least one primary virtual address has to be associated. Optionally, one or more secondary virtual addresses can be associated.

The primary virtual address is a link-local address, while the secondary virtual addresses are Global IPv6 prefix addresses.

The virtual IPv6 addresses must be the same for all VRRP routers participating in the same virtual router (defined by the *vrid*).



Note

You must configure at least one valid primary virtual IPv6 address. Otherwise, the virtual router will remain disabled.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> ipv6 ?
  <a::b>      IPv6 link-local address
  <a::b/l>    Ipv6 prefix
ethernetX/X config>ipv6 vrrp <vrId> ipv6 <a::b> ?
  primary    Primary Address
ethernetX/X config>ipv6 vrrp <vrId> ipv6 <a::b/l> ?
  secondary  Secondary Address
```

Example 1:

```
ethernet0/0 config>ipv6 vrrp 5 ipv6 fe80::5 primary
ethernet0/0 config>
```

The above example configures the primary virtual address fe80::5 for virtual router number 5.

Example 2:

```
ethernet0/0 config>ipv6 vrrp 5 ipv6 2001:db8:1111::3/64 secondary
ethernet0/0 config>
```

The above example configures the secondary virtual address 2001:db8:1111::3/64 for virtual router number 5.

To delete a virtual address, use the negated form of the command.

Example:

```
ethernet0/0 config>no ipv6 vrrp 5 ipv6 2001:db8:1111::3/64 secondary
```

Command history:

Release	Modification
11.00.04	The "ipv6" command was introduced as of version 11.00.04.
11.00.03.01.02	The "ipv6" command was introduced as of version 11.00.03.01.02.
11.01.00	The "ipv6" command was introduced as of version 11.01.00.

2.3.3 PREEMPT| NO-PREEMPT

Enables/disables the preempt mode for a virtual router.

When preempt is enabled, a backup router with a higher priority than the VRRP router currently in *Master* state always takes control of the virtual router. If preempt is disabled, then the current router is left as *Master* (even if it has less priority).

**Note**

If the virtual router has the tracking feature configured and it is active, then the preempt mode runs automatically.

It also activates when the priority received from the current *Master* changes.

Preempt is enabled by default.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> { preempt | no-preempt }
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 no-preempt
ethernet0/0 config>
```

These two commands also have a negated form:

Syntax:

```
ethernetX/X config>no ipv6 vrrp <vrId> { preempt | no-preempt }
```

Example:

```
ethernet0/0 config>no ipv6 vrrp 5 preempt
ethernet0/0 config>
```

The two previous examples have the same effect (they are equivalent).

**Note**

The router that owns the virtual IPv6 address ALWAYS preempts (converts into *Master*) the backup routers, regardless of the preempt mode configured. Therefore, in this case, this command has no effect whatsoever.

Command history:

Release	Modification
11.00.04	These commands were introduced as of version 11.00.04.

Release	Modification
11.00.03.01.02	These commands were introduced as of version 11.00.03.01.02.
11.01.00	These commands were introduced as of version 11.01.00.

2.3.4 PRIORITY

Configures the priority level within the virtual router.

Allowed values range from 1 to 254 (the higher the value, the greater the priority). Default is 100.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> priority <priority-level>
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 priority 200
ethernet0/0 config>
```

To restore the default value, use the negated form of the command:

Syntax:

```
ethernetX/X config>no ipv6 vrrp <vrId> priority
```

Example:

```
ethernet0/0 config>no ipv6 vrrp 5 priority
ethernet0/0 config>
```



Note

The OWNER of the virtual IPv6 address ALWAYS has a priority value of 255 configured, regardless of the configured priority level.

Command history:

Release	Modification
11.00.04	The " <i>priority</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>priority</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>priority</i> " command was introduced as of version 11.01.00.

2.3.5 RELOAD-DELAY

Configures the time the protocol waits to initiate when the device is switched on or when the interface is up.

Default is 30 seconds.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> reload-delay <seconds>
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 reload-delay 40
ethernet0/0 config>
```

To reset the default values, use the negated form of the command:

```
ethernetX/X config>no ipv6 vrrp <vrId> reload-delay
```

Command history:

Release	Modification
11.00.04	The " <i>reload-delay</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>reload-delay</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>reload-delay</i> " command was introduced as of version 11.01.00.

2.3.6 STANDBY-DELAY

Configures the time a virtual router waits before changing to *Master* while the current *Master* is still active.

Default is 10 seconds.



Note

This delay is not applied when the priority received from the current *Master* changes.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> standby-delay <seconds>
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 standby-delay 15
ethernet0/0 config>
```

To reset the default values, use the negated form of the command:

```
ethernetX/X config>no ipv6 vrrp <vrId> standby-delay
```

Command history:

Release	Modification
11.00.04	The " <i>standby-delay</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>standby-delay</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>standby-delay</i> " command was introduced as of version 11.01.00.

2.3.7 TRACK

Executes tracking over the interface status and/or IPv6 destination accessibility for the VRRP router. If the end result of said tracking is negative, then the router priority decreases and the backup router can go on to have greater priority than the current *Master*. This tracking provides a mechanism to ensure that the most appropriate VRRP router is chosen as the virtual router's *Master*.

This command supports two subcommands: one to configure the interfaces that are going to be tracked, and the second to configure the IPv6 destinations you want to track for accessibility.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> track ?
  destination-ipv6  Track an IPv6 destination
  interface         Track an interface
```

You can associate a priority cost with each configured interface and IPv6 destination, which is the value that the priority decreases by in cases where the checking results indicate fail. The sum of these priority costs for all the monitored interfaces and destinations must be lower than, or equal to, the priority configured for the VRRP router.



Note

If you use a priority cost equal to the priority configured for the VRRP router, then the subtraction is 0 (meaning the VRRP router will cede the virtual IPv6 address as soon as possible). This is used, for example, when forming a Fault Tolerant IPsec Recovery system.

Below we are going to describe the two possible tracking configuration options (i.e., *tracking* for interfaces and *tracking* for IPv6 destinations).



Note

You cannot execute TRACKING in a VRRP router when it is the OWNER of the virtual IPv6 address (priority remains set to 255). In this case the TRACKING objects are ignored.

2.3.7.1 TRACK DESTINATION-IPv6

Through this command you can control the state of the routes to different IPv6 destinations. If one of the specified destinations becomes inaccessible (i.e., there is no active route towards it), the VRRP router priority decreases by a quantity preset by the user. As a result, one of the backup routers can take over the control of the virtual router (i.e., become the new *Master*).

Tracking periodically polls the state of the routes to the specified IPv6 destinations to check if they are active or not. If there is an active route, the test is considered OK and the virtual router functionality isn't affected. However, if there isn't a route to the IPv6 destination, the VRRP router priority drops by the amount configured for this destination. This provides a mechanism to ensure that the most appropriate VRRP router is always selected to be the virtual router's *Master*.

The priority cost can range from 1 to 254. By default, the priority cost for IPv6 destination *tracking* is 10.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> track destination-ipv6 <tracked-IPv6> [prio-cost <cost>]
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 track destination-ipv6 2001:db8:7777::5 prio-cost 50
ethernet0/0 config>ipv6 vrrp 5 track destination-ipv6 2001:db8:1111::80
ethernet0/0 config>
```

To cancel *tracking* in an IPv6 destination, use the negative form of the command.

Syntax:

```
ethernetX/X config>no ipv6 vrrp <vrId> track destination-ipv6 <tracked-IPv6>
```

Example:

```
ethernet0/0 config>no ipv6 vrrp 5 track destination-ipv6 2001:db8:1111::80
```

Command history:

Release	Modification
11.00.04	The " <i>track destination-ipv6</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>track destination-ipv6</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>track destination-ipv6</i> " command was introduced as of version 11.01.00.

2.3.7.2 TRACK INTERFACE

Through this command, you can control the state of certain router interfaces (such as access to Internet, main WAN connection, etc.). This way, if one of the specified interfaces drops or becomes unavailable, the VRRP router priority decreases by a quantity preset by the user and one of the other backup routers takes control of the virtual router (becomes *Master*).

Without this type of mechanism, VRRP backup routers can only become *Master* when the main device drops or is incapable of sending *Advertisement* messages. The circumstance could arise if the router that currently behaves as *Master* loses IPv6 connectivity in the main output link but the LAN interface where the virtual router is defined is still active. This means that all packets routed through the virtual router are dropped, even if there are other backup routers with available output links. To avoid this type of situation, *tracking* is used.

Tracking periodically polls the state of any interfaces specified to check their status. If they are routing traffic, the test is considered satisfactory and does not affect the virtual router's functions. However, if there is some error (e.g., the interface is down), then the VRRP router priority is decreased by the amount configured for this interface. This provides a mechanism to ensure that the most appropriate VRRP router is selected as the virtual router's *Master*.

Priority cost can be established in the range of 1 to 254. The tracking priority cost is 10 by default.

Syntax:

```
ethernetX/X config>ipv6 vrrp <vrId> track interface <tracked-ifc> [prio-cost <cost>]
```

Example:

```
ethernet0/0 config>ipv6 vrrp 5 track interface ppp1 prio-cost 50
ethernet0/0 config>ipv6 vrrp 5 track interface ethernet0/1
ethernet0/0 config>
```

To cancel *tracking* in an interface, use the negated form of the command.

Syntax:

```
ethernetX/X config>no ipv6 vrrp <vrId> track interface <tracked-ifc>
```

Example:

```
ethernet0/0 config>no ipv6 vrrp 5 track interface pppl
```

Command history:

Release	Modification
11.00.04	The " <i>track interface</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>track interface</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>track interface</i> " command was introduced as of version 11.01.00.

2.4 Configuration Commands Summary

A summary of the VRRP protocol configuration commands is displayed below:

At a global layer:

```
list
```

For the interface:

```
[no] ipv6 vrrp <vrId> advertise-interval <milliseconds>
[no] ipv6 vrrp <vrId> ipv6 <a::b> primary
[no] ipv6 vrrp <vrId> ipv6 <a::b/l> secondary
[no] ipv6 vrrp <vrId> {preempt | no-preempt}
[no] ipv6 vrrp <vrId> priority <priority-level>
[no] ipv6 vrrp <vrId> reload-delay <seconds>
[no] ipv6 vrrp <vrId> standby-delay <seconds>
[no] ipv6 vrrp <vrId> track destination-ipv6 <tracked-IPv6> [prio-cost <cost>]
[no] ipv6 vrrp <vrId> track interface <tracked-ifc> [prio-cost <cost>]
[no] ipv6 vrrp <vrId>
```

Chapter 3 Monitoring

3.1 Monitoring the VRRPv3 for IPv6

The VRRPv3 for IPv6 monitoring commands must be entered in the monitoring menu associated with the VRRP (IPv6 VRRP+). To access this menu, use the **vrrp** command found in the IPv6 monitoring menu.

```
*monitor
Console Operator
+protocol ipv6

-- IPv6 protocol monitor --

IPv6+vrrp

-- VRRP for IPv6 console --

IPv6 VRRP+
```

You can introduce the following commands in the VRRP monitoring environment.

Command	Function
<i>clear</i>	Deletes the statistics for a specific virtual router or for all existing virtual routers.
<i>list</i>	Displays VRRP monitoring information.
<i>exit</i>	Exits the VRRP monitoring menu.



Note

Additionally, to observe and monitor how the VRRP runs, a specific VRRP events logging system is made available to the user.

3.2 VRRP for IPv6 Monitoring Commands

The following sections focus on the VRRP for IPv6 monitoring commands.

```
IPv6 VRRP+clear ?
  all      Clear all statistics
  vrid     Clear virtual router statistics
IPv6 VRRP+list ?
  all      List all VRRP information
  summary  List a summary of the virtual routers state
  vrid     List virtual router information
```

3.2.1 CLEAR ALL

Deletes the global statistics and those corresponding to all the virtual routers defined on the device.

Example:

```
IPv6 VRRP+clear all
IPv6 VRRP+
```

Command history:

Release	Modification
11.00.04	The " <i>clear all</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>clear all</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>clear all</i> " command was introduced as of version 11.01.00.

3.2.2 CLEAR VRID <vrld>

Deletes the statistics corresponding to a virtual router whose identifier has been specified.

```
IPv6 VRRP+clear vrid ?
<1..255> Virtual router ID
```

Example:

```
IPv6 VRRP+clear vrid 5
IPv6 VRRP+
```

Command history:

Release	Modification
11.00.04	The " <i>clear vrid</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>clear vrid</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>clear vrid</i> " command was introduced as of version 11.01.00.

3.2.3 LIST ALL

Displays all the information relative to the running VRRP.

This includes the global statistics, as well as a complete summary of all virtual routers configured in the device.

Example:

```
IPv6 VRRP+list all
VRRP is enabled

Statistics:
  VRRP packets with Checksum Error  0
  VRRP packets with Version Error   0
  VRRP packets with Invalid VrId    0
  Unknown Errors                     0

Virtual Router [ethernet0/0, vrId 5] - State MASTER
Virtual IPv6: fe80::7, Virtual MAC: 00-00-5e-00-02-05
Virtual Secondary IPv6 Address: 2001:db8:1111::3/64
Virtual Secondary IPv6 Address: 2001:db8:2222::3/64
Priority 120 (configured 120), Preemption enabled, Standby delay 0 msec
Advertisement interval 5000 msec (configured 5000 msec)
Reload delay: 20 seconds
IPv6 addresses count: 3
Primary Address: fe80::5
Master router: fe80::5 (local router)
Transitions to MASTER      1      Priority Zero Pkts Sent      0
Advertisements Rcvd        0      Invalid Type Pkts Rcvd      0
Address List Errors        0      IPv6 Hop Limit Errors       0
Priority Zero Pkts Rcvd    0      Packet Length Errors        0
Tracking ethernet0/1 priority-cost 40, last check OK

IPv6 VRRP+
```

Description of the *global* fields (the virtual router parameters will be explained further on):

VRRP ...

indicates whether the protocol is enabled or disabled.

Global statistics:

VRRP packets with Checksum Error VRRP packets received with checksum error.

VRRP packets with Version Error VRRP packets received with incorrect protocol version.

VRRP packets with Invalid Vrid VRRP packets with unknown virtual router identifier or not configured in the interface where this has been received.

Unknown Errors

Unknown errors (not classified).

Command history:

Release	Modification
11.00.04	The " <i>list all</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>list all</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>list all</i> " command was introduced as of version 11.01.00.

3.2.4 LIST SUMMARY

Displays a summary on the state of the virtual routers.

Example:

```
IPv6 VRRP+list summary
[ethernet0/0, vrid 005], MASTER, prio 120, vIPv6 fe80::7

IPv6 VRRP+
```

The summarized information is as follows:

[<interface>, vrid <vrid>], <state>, prio <priority-level>, vIPv6 <virtual-IPv6-address>	
[<interface>, vrid <vrid>]	Virtual Router (identified through the interface and the vrid).
<state>	Current state of this VRRP router.
<priority-level>	Current VRRP router priority for this virtual router (depending on the <i>tracking</i> , etc.).
<virtual-IPv6-address>	Primary virtual router IPv6 address.

Command history:

Release	Modification
11.00.04	The " <i>list summary</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>list summary</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>list summary</i> " command was introduced as of version 11.01.00.

3.2.5 LIST VRID <vrid>

Displays information on a specific virtual router.

```
IPv6 VRRP+list vrid ?
<1..255> Virtual router ID
```

Example:

```
IPv6 VRRP+list vrid 5
Virtual Router [ethernet0/0, vrid 5] - State MASTER
  Virtual IPv6: fe80::7, Virtual MAC: 00-00-5e-00-02-05
  Virtual Secondary IPv6 Address: 2001:db8:1111::3/64
  Virtual Secondary IPv6 Address: 2001:db8:2222::3/64
  Priority 120 (configured 120), Preemption enabled, Standby delay 0 msec
  Advertisement interval 5000 msec (configured 5000 msec)
  Reload delay: 20 seconds
  IPv6 addresses count: 3
  Primary Address: fe80::5
  Master router: fe80::5 (local router)
  Transitions to MASTER      1          Priority Zero Pkts Sent      0
  Advertisements Rcvd        0          Invalid Type Pkts Rcvd      0
  Address List Errors         0          IPv6 Hop Limit Errors       0
  Priority Zero Pkts Rcvd     0          Packet Length Errors        0
  Tracking ethernet0/1 priority-cost 40, last check OK

IPv6 VRRP+
```

Description of the information for a virtual router:

[<interface>, vrid <vrid>]	Virtual router (identified by the interface and vrid).
----------------------------	--

<i>State</i>	State this VRRP router is in.
<i>Virtual IPv6</i>	Primary virtual router IPv6 address.
<i>Virtual MAC</i>	Virtual router MAC address
<i>Virtual Secondary IPv6 Address</i>	Virtual router secondary IPv6 address.
<i>Priority ... (configured ...)</i>	VRRP router priority for this virtual router (the current one and the one configured).
<i>Preemption</i>	Indicates if preemption is enabled / disabled.
<i>Standby delay</i>	Time waited when the device has to change to <i>Master</i> and the current <i>Master</i> is still active.
<i>Advertisement interval ... (configured ...)</i>	VRRP router advertisement interval for this virtual router (the current one and the one configured).
<i>Reload delay</i>	Time waited to initiate the protocol on device startup.
<i>IPv6 addresses count</i>	Number of IPv6s managed by this VRRP router.
<i>Primary Address</i>	Main IPv6 address (IPv6 link-local address of the interface).
<i>Master router</i>	IPv6 address for the VRRP router acting as the virtual router's <i>Master</i> .
<i>Transitions to MASTER</i>	Number of times this has entered <i>Master</i> state.
<i>Advertisements Rcvd</i>	Number of <i>Advertisements</i> received.
<i>Address List Errors</i>	Errors on checking the virtual IPv6 address list.
<i>Priority Zero Pkts Rcvd</i>	Packets received with zero priority.
<i>Priority Zero Pkts Sent</i>	Packets sent with zero priority.
<i>Invalid Type Pkts Rcvd</i>	Packets received with an invalid VRRP type.
<i>IPv6 Hop Limit</i>	Number of errors in the IPv6 packet Hop Limit.
<i>Packet Length Errors</i>	Errors in the VRRP packet length.

In addition, for each *tracking* element:

Tracking ... priority-cost ..., last check ...

displays the interface or the IPv6 destination being monitored, the cost of the associated priority and the result of the last test.

Command history:

Release	Modification
11.00.04	The " <i>list vrid</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>list vrid</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>list vrid</i> " command was introduced as of version 11.01.00.

3.2.6 EXIT

Exits the specific monitoring menu for the VRRP protocol and returns to the IPv6+ prompt.

Example:

```
IPv6 VRRP+exit
IPv6+
```

Command history:

Release	Modification
11.00.04	The " <i>exit</i> " command was introduced as of version 11.00.04.
11.00.03.01.02	The " <i>exit</i> " command was introduced as of version 11.00.03.01.02.
11.01.00	The " <i>exit</i> " command was introduced as of version 11.01.00.

Chapter 4 Events

4.1 Monitoring through Events

Information relevant to a subsystem or to a specific event can be viewed through the events.

The subsystem relative to VRRPv3 for IPv6 is "VRRP6". To enable/disable events linked to this subsystem, please insert the following commands under the *static* or *dynamic* configuration section:

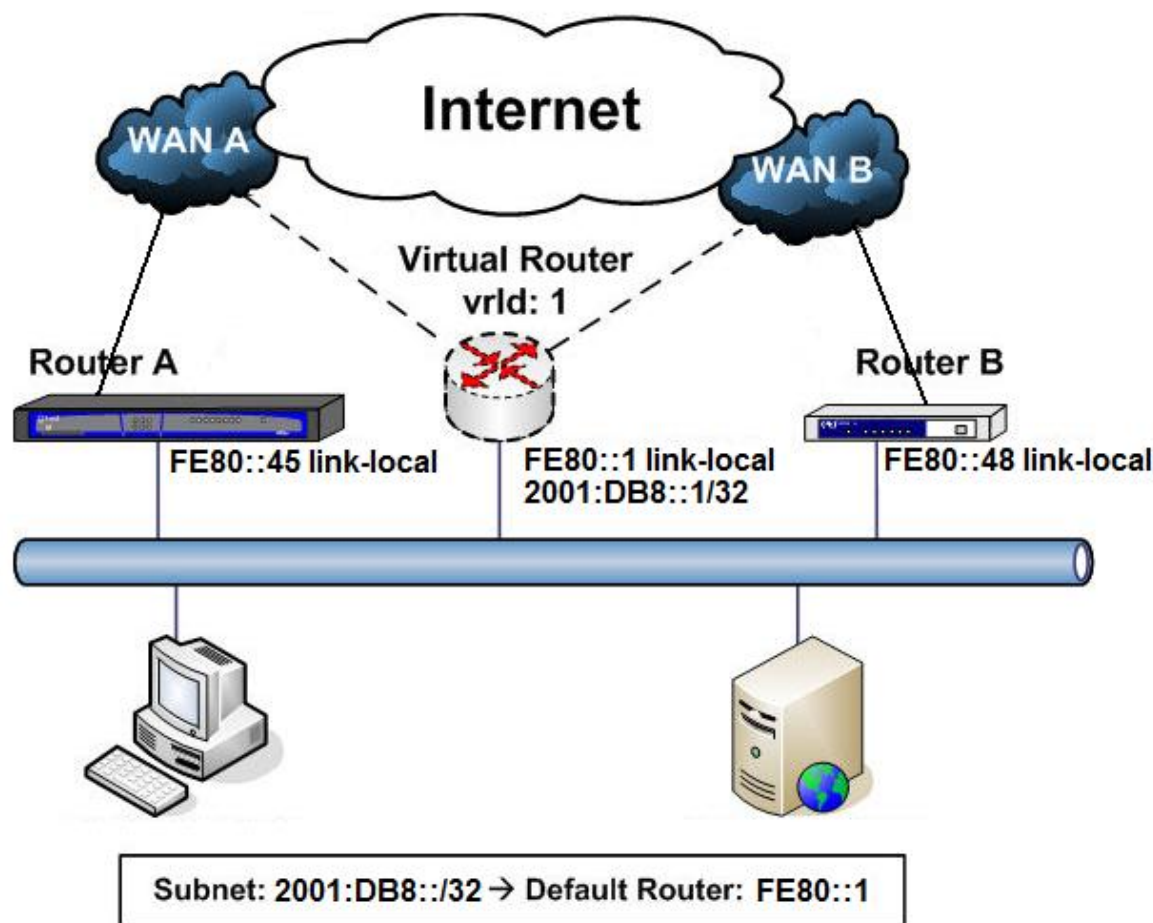
```
Config>event
-- ELS Config --
ELS config>{enable}|{disable} trace subsystem VRRP6 [<level>]
```

Level indicates the threshold from which all events relative to the subsystem specified are displayed. Some of the most common register levels are *standard*, *error*, *info* or *all*.

Chapter 5 Examples

5.1 One Virtual Router

The example given below corresponds to the following scenario:



In this example, devices connected to the LAN have virtual router `fe80::1` as the default router. This VRRP virtual router is defined with a primary virtual IPv6 address [`fe80::1`], a secondary virtual IPv6 address [`2001:db8::1/32`] and `vrid` identifier 1.

Under normal operating conditions, the traffic is routed through **Router A**. Should some error occur, the IPv6 traffic is then routed through **Router B**.

In this example, and under normal conditions, **Router A** has higher priority and acts as *Master* with respect to the virtual router (`fe80::1`, `2001:db8::1/32`, `vrid = 1`). Meanwhile, **Router B** remains as *Backup*.

Tracking on subinterface `ethernet0/1` in **Router A** is also configured so, if connectivity in `ethernet0/1` is lost, then **Router B** becomes the new *Master*.

The *Advertisement interval* is configured to 2000 milliseconds for **Router A** and 3000 milliseconds for **Router B**.

VRRP configuration for **Router A** is as follows:

```
; Showing Menu and Submenus Configuration for access-level 15 ...
;
; Router A / VRRP configuration example 1
;
network ethernet0/0
; -- Ethernet Interface User Configuration --

ipv6 address fe80::45 link-local
ipv6 vrrp 1 ipv6 fe80::1 primary
ipv6 vrrp 1 ipv6 2001:db8::1/32 secondary
ipv6 vrrp 1 advertise-interval 2000
```

```
    ipv6 vrrp 1 priority 105
    ipv6 vrrp 1 track interface ethernet0/1
;
exit
;
```

VRRP configuration for **Router B** is as follows:

```
; Showing Menu and Submenus Configuration for access-level 15 ...
;
; Router B / VRRP configuration example 1
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
    ipv6 address fe80::48 link-local
    ipv6 vrrp 1 ipv6 fe80::1 primary
    ipv6 vrrp 1 ipv6 2001:db8::1/32 secondary
    ipv6 vrrp 1 advertise-interval 3000
;
exit
;
```