VRRP Protocol

bintec Dm759-I

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Chapter 1 Introduction

1.1 Introducing the VRRP Protocol

An end system can use several methods to determine its first hop router to a specific IP destination. For instance:

• Dynamic routing protocols, such as RIP (*Routing Information Protocol*) or OSPF (*Open Shortest Path First*).

• Using an ICMP router discovery client (*ICMP Router Discovery*).

• ARP Proxy.

• Using a statically configured default route.

It's not always feasible to use a dynamic routing protocol in each device, as this may mean more work for configuration, greater processing, security problems or lack of some specific protocol implementation in a particular platform.

Router discovery protocols require the active participation of all devices in a network, which leads to configuring large timer values (to reduce overload) when there are a large number of devices. This can result in a significant delay in detecting the loss of a router.

The use of a statically configured default route is very common. It minimizes configuration and processing overhead in end systems and is supported by practically any IP implementation. However, this running mode creates a single point of failure. Loss of a default route in a LAN results in a catastrophic event as all devices become isolated in their network, unable to detect any alternative path that may be available.

VRRP (*Virtual Router Redundancy Protocol*) is a protocol, which dynamically assigns the function of a virtual router to a VRRP router on a LAN. A VRRP router controlling the address, associated to the virtual router, is known as *Master* and forwards packets sent through said IP address. When said Master becomes unavailable, one of the other VRRP routers takes over routing over the virtual router address so providing dynamic recovery when failure occurs. This means any IP address associated to the virtual router can be used as first hop address (or default route) for devices on a LAN network.

The main advantage of using VRRP is higher default router availability without needing to configure dynamic routing or router discovery protocols on every end device. VRRP is designed to eliminate the single point of failure inherent in environments configured with static default routes.

VRRP is specified in RFC 3768 *Virtual Router Redundancy Protocol (VRRP)* .

1.2 VRRP Protocol Description

VRRP provides the virtual router function previous described.

1.2.1 Definitions

The following list contains a set of definitions and concepts for VRRP, which need to be taken into consideration:

• **VRRP Router:** Router running VRRP. A VRRP router may participate on one or more virtual routers.

• **Virtual Router:** An abstract object managed by VRRP routers, which acts as default router for devices on a LAN. In bintec routers, this consists of a **virtual router identifier** and a **set of IP addresses**. A VRRP router can backup various routers simultaneously.

• **IP Address Owner:** Router that has virtual IP address(es) (associated with the virtual router) as the real address(es) for some of its interfaces.

• **Main IP address:** IP address selected from a set of real interface addresses. VRRP *Advertisement* messages are always sent using main IP as packet source IP address.

• **Virtual Router MASTER :** VRRP router responsible for processing packets sent through IP address(es) associated to the virtual router and responding to ARP requests for the virtual IP address(es).

> **Note**
>
> If the virtual IP address owner is available and running, this will ALWAYS be the virtual router MASTER

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

1.2.2 Protocol Functionality

VRRP operation is based on the *simulation* of a virtual router among various VRRP routers. A set of virtual IP addresses and a virtual MAC address are associated to said virtual router. These virtual addresses remain unalterable and are independent of the *real* router responsible for routing packets associated with the virtual router

VRRP uses *Advertisement* messages to indicate a Master router is active. These messages are sent to multicast IP address 224.0.0.18 assigned by *Internet Assigned Numbers Authority* (IANA). The IP protocol number established by IANA for VRRP is 112 (decimal). *Advertisements* contain information on the virtual router, its priority, etc.

If, over a given period of time (*Master_Down_Interval*), the backup routers stop receiving messages from the Master, the highest priority backup router will become the new virtual router Master.

By default, a backup device with higher priority than the current Master can take over its functions and become the new Master. This behavior ensures the highest priority router is always Master. However, if for any reason this becomes necessary, virtual router takeover can be administratively disabled.

1.3 References

RFC 3768 Virtual Router Redundancy Protocol (VRRP)

R.Hinden. April 2004.

RFC 1027 Using ARP to implement transparent subnet gateways

S. Carl-Mitchell, J.S. Quarterman. October 1987.

RFC 1256 ICMP Router Discovery Messages

S. Deering. September 1991.

RFC 2328 OSPF Version 2

J. Moy. April 1998.

RFC 2453 RIP Version 2

G. Malkin. November 1998.

Chapter 2 Configuration

2.1 Configuring VRRP Protocol

VRRP global configuration commands must be entered at the configuration menu associated to VRRP (**VRRP config>**). To access this menu, run **vrrp** (IP configuration menu).

```
Config>protocol ip

-- Internet protocol user configuration --
IP config>vrrp

-- Virtual Router Redundancy Protocol configuration --
VRRP config>
```

The following commands can be entered in the VRRP configuration environment:

Command	Function
accept-vip-packets	Enables function as *owner* of the virtual IP address in backup routers.
list	Displays information on the VRRP configuration.
no	Disables function as *owner* of the virtual IP address in the backup routers.
exit	Exits VRRP configuration menu.

VRRP virtual routers must be configured in the specific configuration menu assigned to the interface, over 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>ip vrrp <vrId> ?
  accept-vip-packets    Accept packets with virtual IP destination address
                        (non-owner routers)
  advertise-interval    Set the advertisement interval
  authentication        Set authentication options
  ip                    VRRP virtual IP 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
  report                Report status changes
  priority              Priority level of this VRRP group
  track                 VRRP tracking
  <cr>
```

In previous **router** application software releases, you were able to configure virtual routers from the protocol global configuration menu. Although this method of configuration is still acceptable, a warning message will appear telling the user this is an old command, which may become obsolete in future releases.

Example:

```
VRRP config>virtual-router ethernet0/0 1
CLI Warning: This is a superseded command.
CLI Warning: It may become obsolete in future versions.
CLI Warning: Please use per interface ip vrrp config instead.
VRRP config>
```

We recommend configuring virtual routers from the current configuration menu pertaining to the associated interface. This command is obsolete as of version 11.00.03.

2.2 VRRP Global Configuration Commands

VRRP global configuration commands are explained below.

As a general rule, to eliminate a configuration option or reset a default value, enter the whole command preceded by the word **no** (to negate a command).

2.2.1 ACCEPT-VIP-PACKETS

VRRP specification establishes that backup VRRP routers, which are **NOT** owners of the virtual router IP addresses, **CANNOT** accept packets expressly addressed to said virtual IP addresses even if they are in Master state and routing virtual router traffic (RFC 3768 section 6.4.3). Only the VRRP router virtual IP addresses *owner* should respond to this.

You can modify virtual router behavior by entering **accept-vip packets**, allowing backup VRRP routers to accept IP packets destined to virtual IP addresses as if they were owners. This allows them to respond to *ping, telnet*, etc.

Syntax:

```
VRRP config>accept-vip-packets
```

Default is option disabled.

To disable said mode of processing packets addressed to virtual IP addresses (when the device is not the owner), use the negated form of the command.

> **Note**
>
>   Said command acts at the VRRP global level and affects all virtual routers configured in the device.

If the VRRP router is the virtual IP addresses owner, this command has no effect over virtual router behavior.

If said command is enabled, take the following into consideration:

- Router VRRP configuration does not strictly comply with RFC 3768.
- VRRP clients must be able to process gratuitous **ARP-request**.
- VRRP clients cannot use packets other than **ARP-reply** to update their ARP cache.

2.2.2 LIST

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

Syntax:

```
VRRP config>list
```

Example:

```
VRRP config>list
Main VRRP settings:
  VRRP is enabled
  Non-owner routers DO NOT ACCEPT packets addressed to the virtual IP
Virtual Router [ethernet0/0, vrId 1]
  Virtual IP: 192.168.1.254
  Virtual MAC: 00-00-5e-00-01-01
  Advertisement interval 1s
  Priority (config) 200, Preemption enabled
  Authentication: None
  Do NOT accept packets destined for the (not owned) virtual IP
  Tracking ppp1 priority-cost 110
  Tracking 10.1.1.1 priority-cost 60
  Reporting Master State changes to NSLA filter id 1

Virtual Router [ethernet0/1, vrId 2]
  Virtual IP: 192.168.2.254
  Virtual Secondary IP: 192.168.3.254
  Virtual MAC: 00-00-5e-00-01-02
  Advertisement interval 2s
  Priority (config) 100, Preemption disabled
  Authentication: None
  Do NOT accept packets destined for the (not owned) virtual IP
```

```
VRRP config>
```

Command history:

Release	Modification
11.00.05	The output of this command was modified as of version 11.00.05 to introduce Reports to NSLA filter information.
11.01.01	The output of this command was modified as of version 11.01.01 to introduce Reports to NSLA filter information.

2.2.3 EXIT

Exits a specific VRRP configuration menu and returns to the IP config> prompt.

Syntax:

```
VRRP config>exit
```

Example:

```
VRRP config>exit
IP config>
```

2.3 Configuring VRRP Virtual Routers

As already said, VRRP virtual routers are configured from a specific configuration menu for the interface, which the device connects to the LAN through, and over which said virtual routers act. Virtual routers can only be defined in Ethernet interfaces and sub-interfaces.

Syntax:

```
ethernetX/X config>ip vrrp <vrId> ?
  accept-vip-packets    Accept packets with virtual IP destination address
                        (non-owner routers)
  advertise-interval    Set the advertisement interval
  authentication        Set authentication options
  ip                    VRRP virtual IP 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
  report                Report status changes
  priority              Priority level of this VRRP group
  track                 VRRP tracking
  <cr>
```

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

Permitted values for a virtual router identifier (**vrId**) are from 1 to 255. There is no default value.

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

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

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

2.3.1 ACCEPT-VIP-PACKETS

Modifies the behavior of VRRP routers when it comes to processing IP packets destined for virtual IP addresses. As already said when explaining the meaning of this command at a global level, VRRP protocol specification establishes backup VRRP routers are **NOT** owners of virtual router IP addresses and should **NOT** accept packets expressly addressed to said virtual IP addresses, even if they are in Master mode and forwarding virtual router traffic (RFC 3768, section 6.4.3). Only the VRRP router, which owns the virtual IP addresses, is responsible for this. **accept-vip-packets** allows the backup VRRP router to accept IP packets destined to virtual IP addresses as if they were the owner. This allows them to respond to *ping, telnet*, etc.

Syntax:

```
ethernetX/X config>ip vrrp <vrId> accept-vip-packets
```

Example:

```
ethernet0/0 config>ip vrrp 1 accept-vip-packets
ethernet0/0 config>
```

Default is option disabled (router does not respond to packets destined to virtual IP addresses).

To disable said process for packets destined to virtual IP addresses (when the device is not the owner of this), use the negated form of this command:

```
ethernetX/X config>no ip vrrp <vrId> accept-vip-packets
```

> **Note**
>
> If this command is enabled at a global level, it affects all virtual routers configured in the device and said command has no real effect at the virtual router level.

If the VRRP router is the owner of virtual IP addresses, this command has no effect whatsoever on virtual router behavior.

2.3.2 ADVERTISE-INTERVAL

Configures an interval between consecutive *Advertisements* sent by the VRRP router, which is in Master state.

Permitted values for said time interval is from 100 milliseconds to 255 seconds. Default is 1 second.

You must configure the same interval between *Advertisements* in all VRRP routers participating in a virtual router.

Syntax:

```
ethernetX/X config>ip vrrp <vrId> advertise-interval <interval> [msec]
```

If you don't explicitly specify the interval is in milliseconds, it is considered to be in seconds.

Example:

```
ethernet0/0 config>ip vrrp 1 advertise-interval 2
ethernet0/0 config>
```

The following example shows a 2 second interval configured between *Advertisements*.

Example:

```
ethernet0/0 config>ip vrrp 1 advertise-interval 100 msec
ethernet0/0 config>
```

The following example shows said interval between *Advertisements* has been configured at 100 milliseconds.

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

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

2.3.3 IP

Specifies a virtual IP address associated to the virtual router you are configuring.

Said virtual IP address must be the same for all VRRP routers participating in the same virtual router (defined by *vrId*).

The virtual router must be associated to at least one virtual IP address (known as primary). Optionally, it can be associated to as many secondary IP addresses as desired.

> **Note**
>
> You must configure a valid primary virtual IP address. Otherwise, the virtual router will remain disabled.

Syntax:

```
ethernetX/X config>ip vrrp <vrId> ip <virtual-IP-address> [secondary]
```

Example 1:

```
ethernet0/0 config>ip vrrp 1 ip 192.168.1.254
ethernet0/0 config>
```

Example 2:

```
ethernet0/0 config>ip vrrp 1 ip 192.168.2.254 secondary
ethernet0/0 config>
```

Configuring a *backup* router with a virtual IP address in one of its interfaces creates duplicate IP addresses on the network. Avoid configuring a virtual IP address in any backup routers.

> **Note**
>
> Primary virtual IP address must be the same in all router groups.

To delete a virtual IP address from the VRRP configuration, enter **no** followed by the command.

Syntax:

```
ethernetX/X config>no ip vrrp <vrId> ip <virtual-IP-address>
```

> **Note**
>
> Primary virtual IP address can not be deleted if a secondary virtual IP address is configured.

Command history:

Release	Modification
11.00.04	The primary virtual IP address can be deleted when there is a secondary virtual IP address configured as of version 11.00.04.
11.00.03.01.02	The primary virtual IP address can be deleted when there is a secondary virtual IP address configured as of version 11.00.03.01.02.
11.01.00	The primary virtual IP address can be deleted when there is a secondary virtual IP address configured as of version 11.01.00.

2.3.4 PREEMPT| NO-PREEMPT

Enables/disables preempt mode for a virtual router.

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

> **Note**
>
> If a virtual router has tracking configured and it's active, then preempt mode runs automatically.

This also activates when priority received from the current Master changes.

Default is preempt.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 no-preempt
ethernet0/0 config>
```

These two commands also have a negated form:

Syntax:

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

Example:

```
ethernet0/0 config>no ip vrrp 1 preempt
ethernet0/0 config>
```

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

> **Note**
>
> The OWNER router for the virtual IP address ALWAYS preempts (converts into Master) backup
> routers, regardless of the preempt mode configured, so said command has no effect whatsoever.

2.3.5 STANDBY-DELAY

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

Default is 10 seconds.

> **Note**
>
> Said delay is not applied when the priority received from current Master changes.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 standby-delay 15
ethernet0/0 config>
```

To reset default values, enter **no** in front of the command.

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

2.3.6 RELOAD-DELAY

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

Default is 30 seconds.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 reload-delay 40
ethernet0/0 config>
```

To reset default values, enter **no** in front of the command.

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

2.3.7 REPORT

Configures reporting of state changes (to the virtual router) to an NSLA Generic-input filter. (Please see manual
Dm754-I Network Service Level Advisor for further information).

Currently, said command supports one subcommand: **Report Master status changes**

Syntax:

```
ethernetX/X config>ip vrrp <vrId> report ?
  master-chg    Report Master status changes
```

2.3.7.1 REPORT MASTER-CHG

Use the **report master-chg** command so the device reports to an NSLA generic-input filter, when the virtual router enters or exits master state.

Syntax:

```
ethernetX/X config>ip vrrp <vrId> report master-chg nsla-filter <nsla-id>
```

Example:

```
ethernet0/0 config>ip vrrp 1 report master-chg nsla-filter 1
ethernet0/0 config>
```

To cancel reporting to NSLA filter, use the negated form of the command.

Syntax:

```
ethernetX/X config>no ip vrrp <vrId> report master-chg
```

Example:

```
ethernet0/0 config>no ip vrrp 1 report master-chg
```

Command history:

Release	Modification
11.00.05	This command was introduced as of version 11.00.05.
11.01.01	This command was introduced as of version 11.01.01.

2.3.8 PRIORITY

Configures priority level within a virtual router.

Permitted priority value is between 1 and 254 (the greater the value, the greater the priority). Default is 100.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 priority 200
ethernet0/0 config>
```

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

Syntax:

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

Example:

```
ethernet0/0 config>no ip vrrp 1 priority
ethernet0/0 config>
```

> **Note**
>
> The OWNER of the virtual IP address ALWAYS has special value 255 configured as priority, regardless of the configured priority level.

2.3.9 TRACK

Executes tracking over interface status and/or IP destination accessibility for the VRRP router. If the end result of said tracking is negative, then router priority decreases and a loss in virtual router Master condition may occur (as a backup router has greater priority). This tracking provides a mechanism to ensure the most appropriate VRRP router is chosen as Master virtual router.

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

Syntax:

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

You can associate a priority cost to each configured interface and IP destination, which is the value the priority decreases when checking results indicate fail. The sum of said priority costs for all monitored interfaces and destinations must be less 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 said subtraction is 0, meaning the VRRP router will cede the virtual IP address as soon as possible. This is used, for example, when forming a Fault Tolerant IPSec Recovery system.

The following are two possible configuration options for tracking: **track interface** and **track destination-IP**.

> **Note**
>
> You cannot execute **track** over a VRRP router when this is the OWNER of the virtual IP address (priority remains set to 255): tracked objects are ignored.

2.3.9.1 TRACK INTERFACE

Controls the state of certain router interfaces (such as access to Internet, main WAN connection, etc.) so if one of the specified interfaces drops, or becomes unavailable, the VRRP router priority decreases by a quantity preset by the user, so 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 main device drops or is incapable of sending *Advertisement* messages. A situation could arise where a router currently behaving as Master has lost IP connectivity in the main output link, but the LAN interface, where the virtual router is defined, is still active. This means all packets routed through the virtual router are dropped, even if there are other backup routers with available output links. To avoid this, **track interface** is used.

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

Priority cost can be established from 1 to 254. Default is track priority cost 10.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 track interface ppp1 prio-cost 50
ethernet0/0 config>ip vrrp 1 track interface atm0/0.1
ethernet0/0 config>
```

To cancel **track interface**, use the negated form of the command.

Syntax:

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

Example:

```
ethernet0/0 config>no ip vrrp 1 track interface ppp1
```

2.3.9.2 TRACK DESTINATION-IP

Controls the state of routes to different IP destinations. If a specified destination becomes inaccessible (i.e. there is no active route towards it) VRRP router priority decreases by a quantity preset by the user. As a result, a backup router can take over, i.e. become Master.

Track periodically polls the state of the routes to specified IP 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. Contrariwise, if there isn't a route to the IP destination, VRRP router priority drops by the amount configured for said destination. This provides

a mechanism to ensure the most appropriate VRRP router always becomes Master virtual router.

Priority cost can be established from 1 to 254. Default is priority cost for track destination-IP 10.

Syntax:

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

Example:

```
ethernet0/0 config>ip vrrp 1 track destination-ip 10.1.1.1 prio-cost 50
ethernet0/0 config>ip vrrp 1 track destination-ip 20.1.1.1
ethernet0/0 config>
```

To cancel track destination-IP, enter **no** before said command.

Syntax:

```
ethernetX/X config>no ip vrrp <vrId> track destination-ip <tracked-IP>
```

Example:

```
ethernet0/0 config>no ip vrrp 1 track destination-ip 10.1.1.1
```

2.4 Configuration Commands Summary

The following is a summary of VRRP protocol configuration commands:

At a global layer:

```
[no] accept-vip-packets

    list
```

For an interface:

```
[no] ip vrrp <vrId> accept-vip-packets

[no] ip vrrp <vrId> advertise-interval <seconds>
 no  ip vrrp <vrId> advertise-interval

[no] ip vrrp <vrId> authentication {none | md5 {key-chain | key-string}}
 no  ip vrrp <vrId> authentication

[no] ip vrrp <vrId> ip <virtual-IP-address> [secondary]

[no] ip vrrp <vrId> {preempt | no-preempt}

[no] ip vrrp <vrId> standby-delay <seconds>

[no] ip vrrp <vrId> reload-delay <seconds>

[no] ip vrrp <vrId> priority <priority-level>
 no  ip vrrp <vrId> priority

[no] ip vrrp <vrId> track interface <tracked-ifc> [prio-cost <cost>]
 no  ip vrrp <vrId> track interface <tracked-ifc>

[no] ip vrrp <vrId> track destination-ip <tracked-IP> [prio-cost <cost>]
 no  ip vrrp <vrId> track destination-ip <tracked-IP>

 no  ip vrrp <vrId>
```

Chapter 3 Monitoring

3.1 Monitoring the VRRP Protocol

VRRP monitoring commands must be entered at the monitoring menu associated to VRRP protocol (**VRRP+**). To access said menu, run **vrrp** (IP monitoring menu).

```
*monitor
Console Operator
+protocol ip
IP+vrrp

-- VRRP console --
VRRP+
```

The following commands can be entered at the VRRP monitoring enviroment.

Command	Function
clear	Deletes statistics for a specific virtual router or for all existing virtual routers.
list	Displays information on VRRP monitoring.
exit	Exits VRRP monitoring menu.

Note

Additionally, to observe and control VRRP protocol running, there is a specific VRRP events logging system available to the user.

3.2 VRRP Monitoring Commands

VRRP protocol monitoring commands are described in the following sections.

```
VRRP+clear ?
  all    Clear all statistics
  vrid   Clear virtual router statistics
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 global statistics and those corresponding to all virtual routers defined in the device.

Example:

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

3.2.2 CLEAR VRID <vrId>

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

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

Example:

```
VRRP+clear vrid 1
VRRP+
```

3.2.3 LIST ALL

Displays all information relative to the VRRP running.

This includes global statistics and a complete summary on all virtual routers configured in the device.

Example:

```
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 1] - State MASTER
  Virtual IP: 192.168.1.254, Virtual MAC: 00-00-5e-00-01-01
  Virtual Secondary IP Address: 128.0.0.254
  Virtual Secondary IP Address: 128.1.0.254
  Priority 105 (configured 105), Preemption enabled, Standby delay 10 sec
  Reload delay: 30 seconds
  IP addresses count: 3
  Primary Address: 192.168.1.145
  Authentication: None
  Master router: 192.168.1.145 (local router)
  Packets destined for the (not owned) virtual IP are accepted
  Transitions to MASTER    1          Priority Zero Pkts Sent    0
  Advertisements Rcvd      0          Invalid Type Pkts Rcvd     0
  Advertise Interval Errors 0         Address List Errors        0
  Authentication Failures  0          Invalid Auth Type          0
  IP TTL Errors            0          Auth Type Mismatch         0
  Priority Zero Pkts Rcvd  0          Packet Length Errors       0
  Tracking ppp1 priority-cost 10, last check OK
  Tracking 10.1.1.1 priority-cost 60, last check OK
  Reporting Master State changes to NSLA filter id 1

VRRP+
```

Description of global fields (virtual routers parameters will be explained further on):

VRRP is ...

indicates if the protocol is enabled or not.

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 they have been received.
Unknown Errors	Unknown errors (not classified).

3.2.4 LIST SUMMARY

Displays a summary on the state of the virtual routers.

Example:

```
VRRP+list summary
[ethernet0/0, vrId 007], MASTER, prio 100, vIP 192.168.7.254
[ethernet0/0, vrId 001], BACKUP, prio 95, vIP 192.168.1.254

VRRP+
```

The following is the formate for summarized information:

[<interface>, vrId <vrId>], <state>, prio <priority-level>, vIP <virtual-IP-address>

[<interface>, vrId <vrId>]	Virtual Router (identified through interface and vrId).
<state>	Current state of this VRRP router.
<priority-level>	Current VRRP router priority for this virtual router (depending on track etc.).
<virtual-IP-address>	Primary virtual router IP address.

3.2.5 LIST VRID <vrId>

Displays all information on a specific virtual router.

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

Example:

```
VRRP+list vrid 1
Virtual Router [ethernet0/0, vrId 1] - State BACKUP
  Virtual IP: 192.168.1.254, Virtual MAC: 00-00-5e-00-01-01
  Virtual Secondary IP Address: 128.0.0.254
  Virtual Secondary IP Address: 128.1.0.254
  Priority 95 (configured 105), Preemption enabled, Standby delay 10 sec
  Reload delay: 30 seconds
  IP addresses count: 3
  Primary Address: 192.168.1.145
  Authentication: None
  Master router: 192.168.1.253
  Packets destined for the (not owned) virtual IP are accepted
  Transitions to MASTER     0          Priority Zero Pkts Sent    0
  Advertisements Rcvd       544        Invalid Type Pkts Rcvd     0
  Advertise Interval Errors 0          Address List Errors        0
  Authentication Failures   0          Invalid Auth Type          0
  IP TTL Errors             0          Auth Type Mismatch         0
  Priority Zero Pkts Rcvd   0          Packet Length Errors       0
  Tracking ppp1 priority-cost 10, last check FAILED
  Tracking 10.1.1.1 priority-cost 60, last check OK
  Reporting Master State changes to NSLA filter id 1

VRRP+
```

Description of the information for a virtual router:

[<interface>, vrId <vrId>]	Virtual router (identified by interface and vrId).
State	What state this VRRP router is in.
Virtual IP	Virtual router IP address.
Virtual MAC	Virtual router MAC address.
Virtual Secondary IP Address	Virtual router secondary IP address.
Priority … (configured …)	VRRP router priority for this virtual router (current and that configured).
Preemption	Indicates if preemption is enabled / disabled.
Standby delay	Time waited if the device has to change to Master and the current Master is still active.
Reload delay	Time waited to initiate protocol on device startup.
IP addresses count	Number of IPs said VRRP router manages.
Primary Address	Main IP address.
Authentication	Type of VRRP authentication used.
Master router	IP address for VRRP router acting as virtual router Master.
Packets destined for the (not owned) virtual IP are accepted	Indicates if VRRP routers, not owners of the virtual address, accept (or not) packets destined to said address.
Transitions to MASTER	Number of times this has entered Master state.
Advertisements Rcvd	Number of *Advertisements* received.
Advertise Interval Errors	Errors in interval between *Advertisements*.
Authentication Failures	Number of authentication failures.

IP TTL Errors	Number of errors in IP packet TTL.
Priority Zero Pkts Rcvd	Packets received with zero priority.
Priority Zero Pkts Sent	Packets sent with zero priority.
Invalid Type Pkts Rcvd	Packets received with invalid VRRP type.
Address List Errors	Errors on checking virtual IP address list.
Invalid Auth Type	Packets received with unknown authentication type.
Auth Type Mismatch	Packets received with authentication type different from the locally configured one.
Packet Length Errors	Errors in VRRP packet length.

For each track element there is:

Tracking … priority-cost …, last check …

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

And if there is any report configured:

Reporting Master State changes to NSLA filter id …

displays NSLA Generic-input Filter ID, which receives reports sent when a virtual router reaches or leaves Master state.

Command history:

Release	Modification
11.00.05	The output of this command was modified as of version 11.00.05 to introduce Reports to NSLA filter information.
11.01.01	The output of this command was modified as of version 11.01.01 to introduce Reports to NSLA filter information.

3.2.6 EXIT

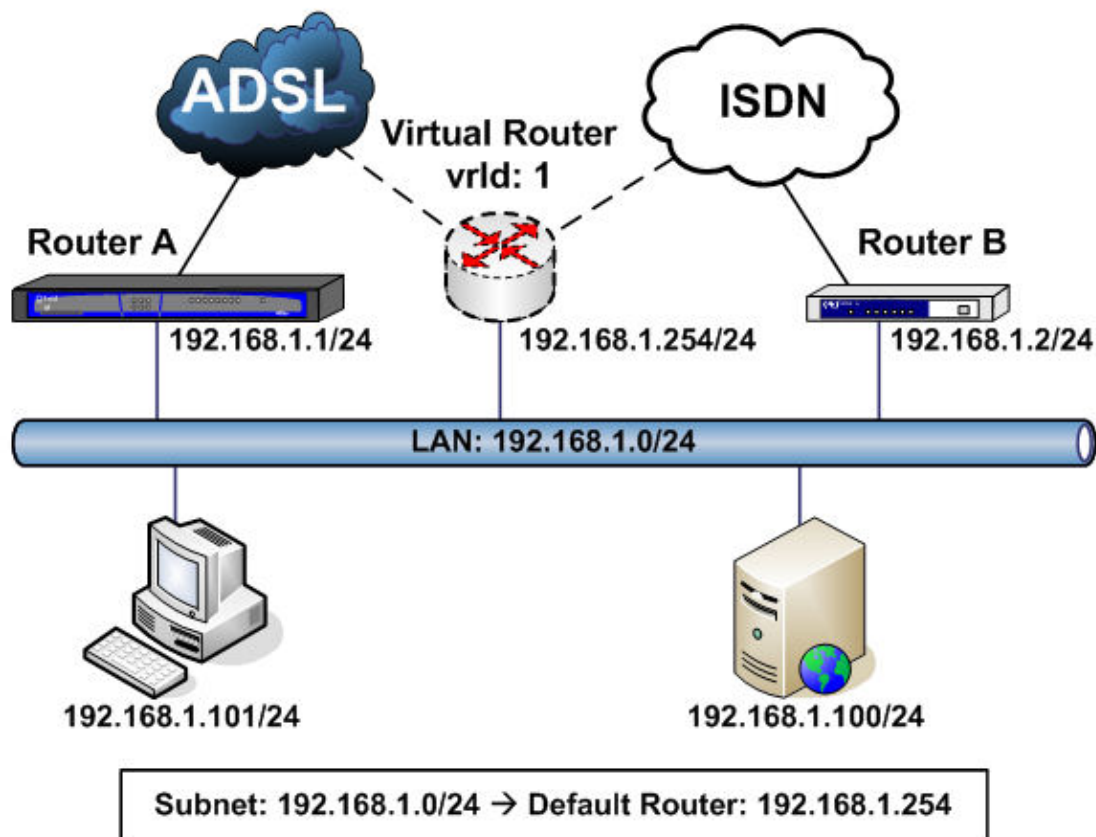Exits the specific monitoring menu for VRRP and returns to IP+ prompt.

Example:

```
VRRP+exit
IP+
```

Chapter 4 Examples

4.1 One Virtual Router

The following example corresponds to the scenario:

In this example, devices on subnet 192.168.1.0/24 have virtual router 192.168.1.254 as default router. Said VRRP virtual router is defined with virtual IP address 192.168.1.254 and *vrId* identifier 1.

Under normal operating conditions, traffic is routed through **Router A** (ADSL connection). If an error occurs, IP traffic is then routed through **Router B** (switched ISDN connection).

In this example, and under normal conditions, **Router A** (connected to the ADSL network through subinterface **atm1/0.1**) has higher priority and acts as Master for a virtual router (192.168.1.254/24, vrId = 1). Meanwhile, **Router B** remains in Backup.

Tracking on subinterface **atm1/0.1** in **Router A** is configured so if connectivity in ADSL is lost, **Router B** becomes Master.

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

```
; Showing System Configuration for access-level 15 ...
;
; Router A / VRRP configuration example 1
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
   ip address 192.168.1.1 255.255.255.0
;
   ip vrrp 1 ip 192.168.1.254
   ip vrrp 1 priority 105
   ip vrrp 1 track interface atm1/0.1
;
exit
;
protocol ip
; -- Internet protocol user configuration --
```

```
    vrrp
; -- Virtual Router Redundancy Protocol configuration --
      accept-vip-packets
;
   exit
;
exit
;
```

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

```
; Showing System Configuration for access-level 15 ...
;
; Router B / VRRP configuration example 1
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
   ip address 192.168.1.2 255.255.255.0
;
   ip vrrp 1 ip 192.168.1.254
;
exit
;
protocol ip
; -- Internet protocol user configuration --
   vrrp
; -- Virtual Router Redundancy Protocol configuration --
      accept-vip-packets
;
   exit
;
exit
;
```

4.2 Two Virtual Routers sharing traffic load

The following example corresponds to the scenario:
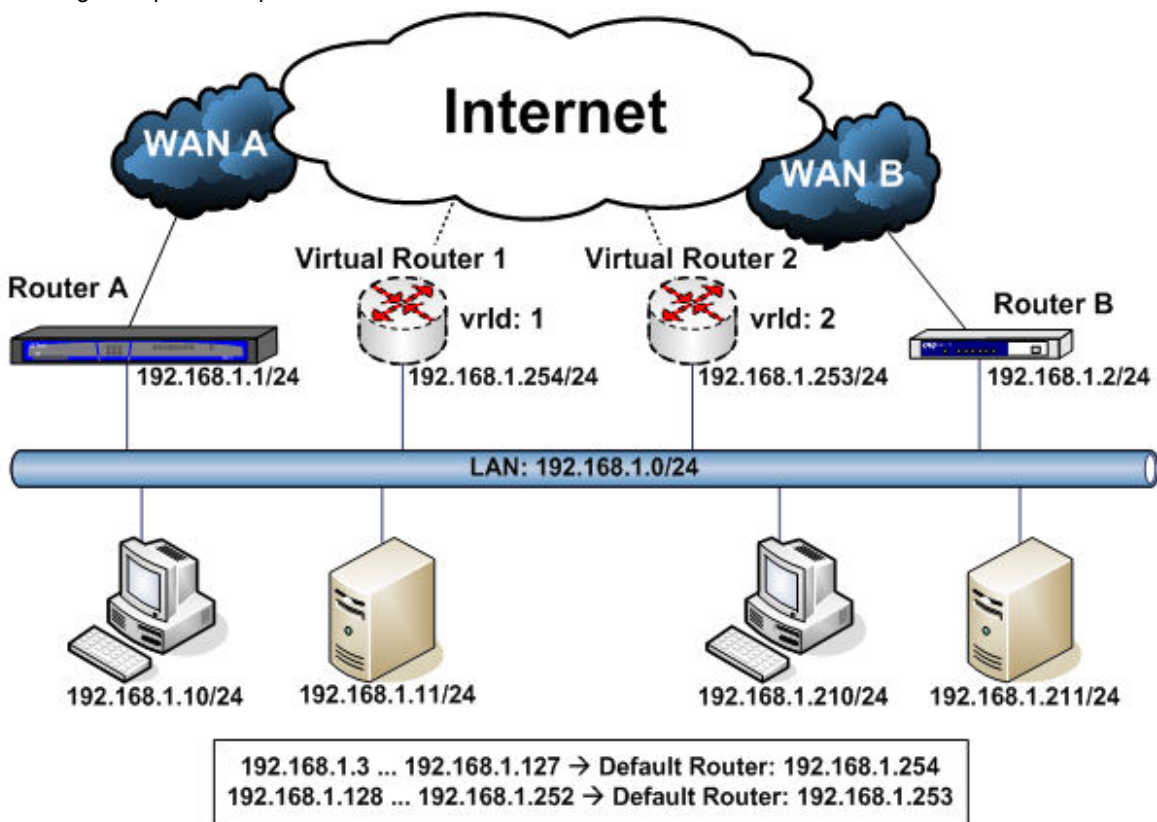
In this example, two virtual routers have been introduced: virtual router 1 (**VR1**: 192.168.1.254/24, *vrId* = 1) and virtu-

al router 2 (**VR2**: 192.168.1.253/24, *vrId* = 2).

To share traffic load, half the devices on subnet 192.168.1.0/24 have **VR1** as their default router and the other half, **VR2**. The network administrator appropriately configures the default router for different devices. For instance, devices with IP addresses from 192.168.1.3 to 192.168.1.127 have address 192.168.1.254 (**VR1**) as their default router, and devices with IP addresses from 192.168.1.128 to 192.168.1.252 have address 192.168.1.253 (**VR2**) as their default router. Obviously, IP addresses for virtual routers and for routers *A* and *B* are excluded.

Under normal conditions, **Router A** will be **VR1** Master and Backup for **VR2** and **Router B** will be **VR2** Master and Backup for **VR1**. This way, traffic from devices with **VR1** as default router will be routed through *WAN A* link (subinterface **atm1/0.1**), while traffic from devices with **VR2** as default router will be routed through *WAN B* link (interface **ppp1**). Should both WAN links fail, or one of the two routers drop, all traffic will be routed through the active router or the one where the WAN link is operative.

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

```
; Showing System Configuration for access-level 15 ...
;
; Router A / VRRP configuration example 2
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
   ip address 192.168.1.1 255.255.255.0
;
   ip vrrp 1 ip 192.168.1.254
   ip vrrp 1 priority 105
   ip vrrp 1 track interface atm1/0.1 prio-cost 20
;
   ip vrrp 2 ip 192.168.1.253
   ip vrrp 2 priority 95
;
exit
;
protocol ip
; -- Internet protocol user configuration --
   vrrp
; -- Virtual Router Redundancy Protocol configuration --
      accept-vip-packets
;
   exit
;
exit
;
```

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

```
; Showing System Configuration for access-level 15 ...
;
; Router B / VRRP configuration example 2
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
   ip address 192.168.1.2 255.255.255.0
;
   ip vrrp 1 ip 192.168.1.254
   ip vrrp 1 priority 95
;
   ip vrrp 2 ip 192.168.1.253
   ip vrrp 2 priority 105
   ip vrrp 2 track interface ppp1 prio-cost 20
;
exit
;
protocol ip
; -- Internet protocol user configuration --
   vrrp
; -- Virtual Router Redundancy Protocol configuration --
      accept-vip-packets
;
   exit
```
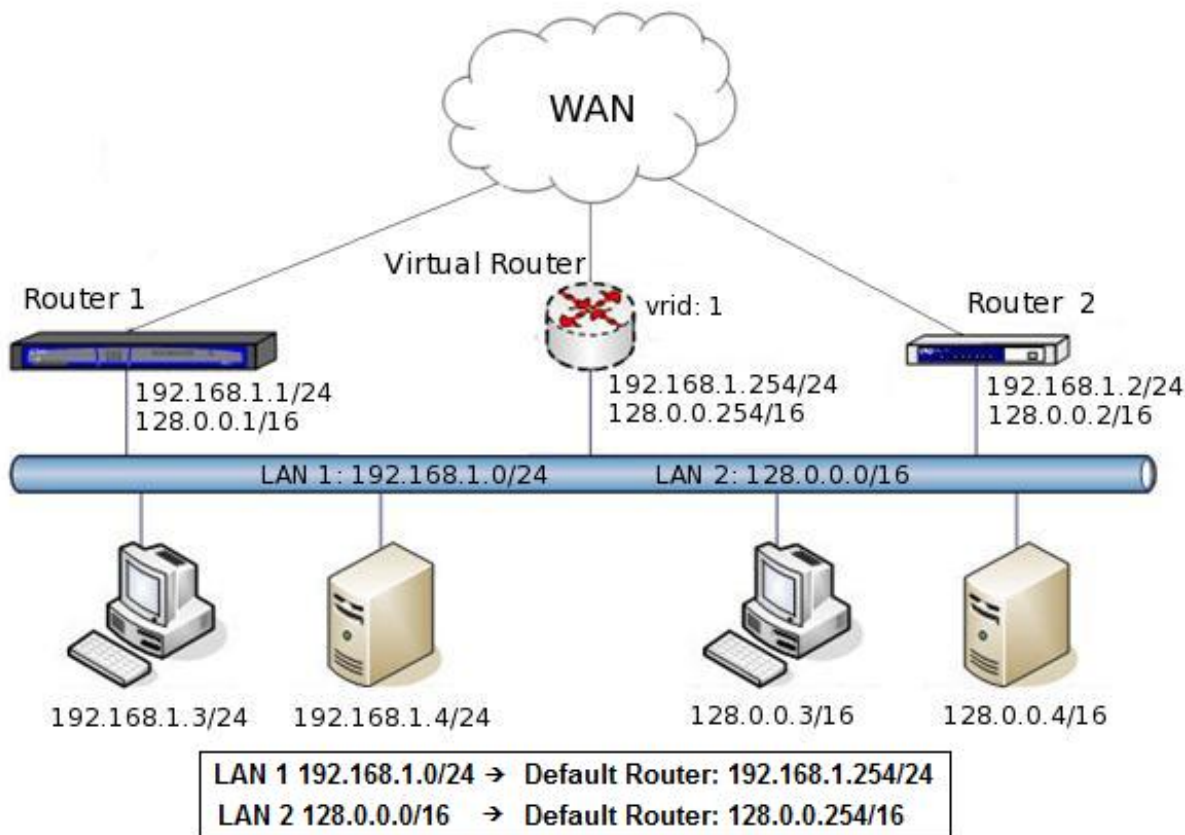
```
;
exit
;
```

4.3 Virtual Router with secondary addressing

The following example corresponds to the scenario:

In this scenario, two IP networks (192.168.1.0/24 & 128.0.0.0/16) coexist and share the same network segment. There are two physical routers in the network, **Router 1** and **Router 2**. Both routers are connected to the network segment by a single interface (**ethernet0/0**), configured with two IP addresses, one primary for **LAN 1** and the other secondary for **LAN 2**. A virtual router (*vrid=1*) is defined, with 192.168.1.254 as a primary IP address and 128.0.0.254 as a secondary one. This virtual router will act as default router for both IP networks. Normally, **Router 1** acts as Master and **Router 2** remains in Backup. If **Router 1** goes down, **Router 2** becomes Master for all virtual router virtual addresses.

In this case, none of the routers owns the virtual addresses. For VRRP protocol to have a Master, both routers are configured with the following priorities: 105 for **Router 1** and 95 for **Router 2**.

VRRP configuration for **Router 1** is as follows:

```
; Showing System Configuration for access-level 15 ...
;
; Router 1 / VRRP configuration example 3
;
   network ethernet0/0
; -- Ethernet Interface User Configuration --
      ip address 192.168.1.1 255.255.255.0
      ip address 128.0.0.1 255.255.0.0 secondary
;
      ip vrrp 1 ip 192.168.1.254
      ip vrrp 1 ip 128.0.0.254 secondary
      ip vrrp 1 priority 105
   exit
;
```

VRRP configuration for **Router 2** is as follows:

```
; Showing System Configuration for access-level 15 ...
```

```
;
; Router 2 / VRRP configuration example 3
;
   network ethernet0/0
; -- Ethernet Interface User Configuration --
     ip address 192.168.1.2 255.255.255.0
     ip address 128.0.0.2 255.255.0.0 secondary
;
     ip vrrp 1 ip 192.168.1.254
     ip vrrp 1 ip 128.0.0.254 secondary
     ip vrrp 1 priority 95
   exit
```