Configuring VRRP Services

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Preface

This guide describes the Virtual Router Redundancy Protocol (VRRP) and what you do to start and customize VRRP services on a Nortel Networks™ router.

You can use the Bay Command Console (BCC™) or Site Manager to configure VRRP services on a router. In this guide, you will find instructions for using both the BCC and Site Manager.

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

• Install the router (see the installation guide that came with your router).

• Connect the router to the network and create a pilot configuration file (see *Quick-Starting Routers*, *Configuring BayStack Remote Access*, or *Connecting ASN Routers to a Network)*.

Make sure that you are running the latest version of Nortel Networks BayRS™ and Site Manager software. For information about upgrading BayRS and Site Manager, see the upgrading guide for your version of BayRS.

Text Conventions

This guide uses the following text conventions:

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is: **ping** <*ip_address*>, you enter: **ping 192.32.10.12**
bold text	Indicates command names and options and text that you need to enter. Example: Enter **show ip** {**alerts** │ **routes**}. Example: Use the **dinfo** command.
brackets ([ ])	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is: **show ip interfaces** [**-alerts**], you can enter either: **show ip interfaces** or **show ip interfaces -alerts**.
italic text	Indicates file and directory names, new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore. Example: If the command syntax is: **show at** <*valid_route*> *valid_route* is one variable and you substitute one value for it.
screen text	Indicates system output, for example, prompts and system messages. Example: `Set Trap Monitor Filters`

separator (>)   Shows menu paths.

                            Example: Protocols > IP identifies the IP option on the
                            Protocols menu.

vertical line (|)   Separates choices for command keywords and
                            arguments. Enter only one of the choices. Do not type
                            the vertical line when entering the command.

                            Example: If the command syntax is:
                            show ip {**alerts** | **routes**}, you enter either:
                            show ip alerts or **show ip routes**, but not both.

Acronyms

This guide uses the following acronyms:

ARP   Address Resolution Protocol

IGMP   Internet Group Management Protocol

IP   Internet Protocol

IPX   Internetwork Packet Exchange

LAN   local area network

MAC   media access control

MIB   management information base

VRID   virtual router identifier

VRRP   Virtual Router Redundancy Protocol

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- The "CD ROMs" section lists available CDs.

- The "Guides/Books" section lists books on technical topics.

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If you purchased a Nortel Networks service program, contact one of the following Nortel Networks Technical Solutions Centers:

Technical Solutions Center	Telephone Number
Billerica, MA	800-2LANWAN (800-252-6926)
Santa Clara, CA	800-2LANWAN (800-252-6926)
Valbonne, France	33-4-92-96-69-68
Sydney, Australia	61-2-9927-8800
Tokyo, Japan	81-3-5402-7041

This chapter describes VRRP concepts you need to know before you begin configuring a VRRP router.

About VRRP

The Virtual Router Redundancy Protocol (VRRP), which runs over IP, enables you to configure router redundancy to protect a network from the irrecoverable failure of one or more IP interfaces. VRRP manages a virtual router, which is a software-defined object that corresponds to an IP address on a LAN segment. A virtual router typically exists on multiple routers running VRRP (known as VRRP routers). One of the VRRP routers acts as the master virtual router for an IP address, while other VRRP routers act as backup virtual routers.

You identify each virtual router using a virtual router identifier (VRID) and a virtual router IP address. All VRRP routers on a LAN segment must have the same VRID and IP address. You can, however, use a VRID on more than one LAN as long as you pair it with a different virtual router IP address. Each virtual router is restricted to a single LAN.

Master Virtual Router

The master virtual router is responsible for forwarding the traffic destined for the MAC address associated with the virtual router IP address. A VRRP router with the highest priority assumes the responsibilities of the master virtual router. When the master virtual router fails, one of the backup virtual routers becomes the master virtual router.

Backup Virtual Routers

If the master virtual router becomes unavailable or if it is not functioning normally, VRRP dynamically switches over to one of the backup virtual routers, in the order of the priority you set.

If more than one backup virtual router has the same priority, the VRRP router with the greater primary IP address becomes the new master virtual router.

Critical IP Interfaces

You can establish a critical IP address, which is a physical IP interface on a local router that is not running VRRP. If that critical IP interface fails, then VRRP switches to another VRRP router. Refer to for a sample VRRP configuration using a critical IP interface.

VRRP Messaging

VRRP generates VRRP advertisement messages as IP multicast datagrams, enabling VRRP to operate over a variety of multiaccess LAN technologies that support IP multicasting. Only the master virtual router transmits VRRP advertisements.

Planning Your Network

You can use VRRP to target stub networks with hosts having default gateway addresses to provide redundancy for IP addresses. To avoid a single point of failure, you should configure the default gateway IP address as the virtual router IP address on multiple IP interfaces on different physical routers. Refer to the following sample configurations when determining how to configure VRRP in your network.

Sample Configurations

The configuration in Figure 1-1 shows a simple VRRP scenario in which both router A and router B are running VRRP. The end hosts install a default route to the IP address of router A, which serves as the master virtual router for virtual router 1. If router A fails, then router B becomes the master virtual router for virtual router 1.
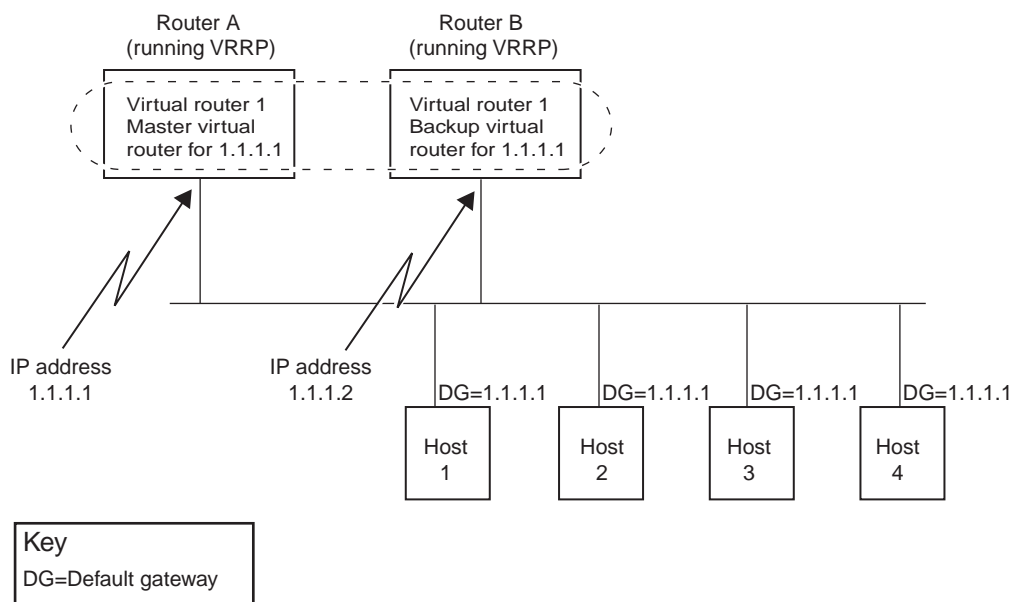
Figure 1-1.   Using VRRP with One Master and One Backup Virtual Router

The configuration in Figure 1-2 shows that half of the hosts install a default route to VRRP router A's IP address (1.1.1.1), and the other half install a default route to VRRP router B's IP address (1.1.1.2). Using two different default routes balances the load for outgoing traffic, and also provides full redundancy.

Router A
(running VRRP)

Router B
(running VRRP)

Virtual router 1
Master virtual
router for 1.1.1.1

Virtual router 1
Backup virtual
router for 1.1.1.1

Virtual router 2
Backup virtual
router for 2.2.2.2

Virtual Router 2
Master virtual
router for 2.2.2.2

IP address
1.1.1.1

IP address
1.1.1.2

DG=1.1.1.1 | DG=1.1.1.1 | DG=1.1.1.2 | DG=1.1.1.2

Host 1 | Host 2 | Host 3 | Host 4

Key
DG=Default gateway
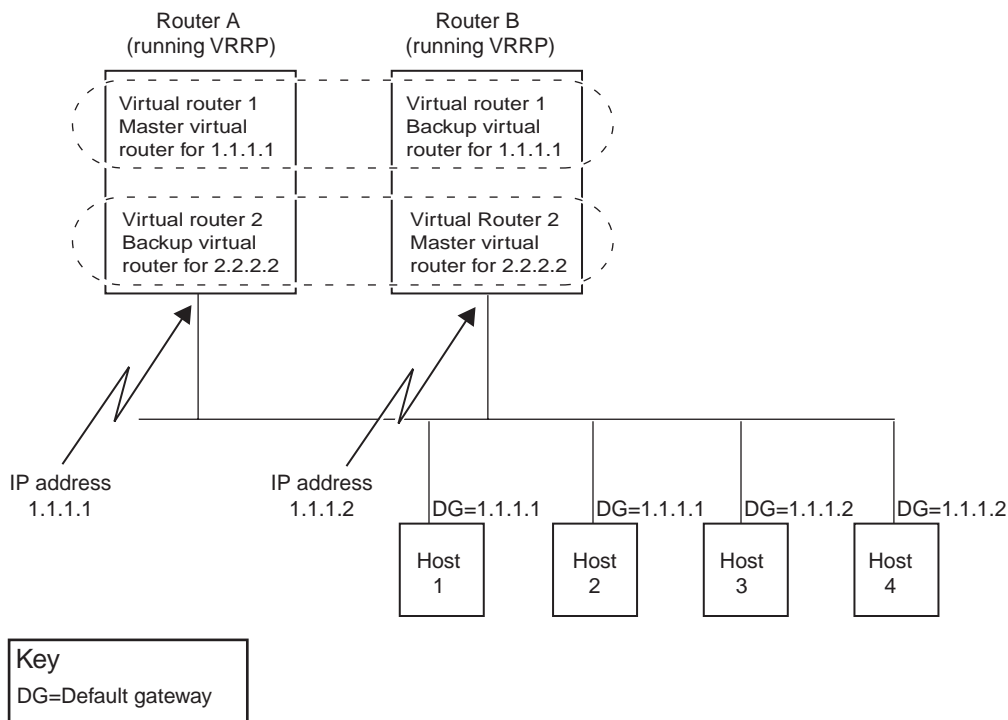
VR0002A

Figure 1-2.   Using VRRP and Performing Load-Balancing

The configuration in Figure 1-3 shows that IP address 1.1.1.1 connects to external networks. If that connection fails and the virtual router 1 on router B continues to forward traffic, you still lose connectivity to external networks. However, if you designate IP address 1.1.1.1 as the critical IP address for virtual router 1 on router B, and IP address 1.1.1.1 fails, then virtual router 1 on router A becomes the master virtual router and begins forwarding traffic.
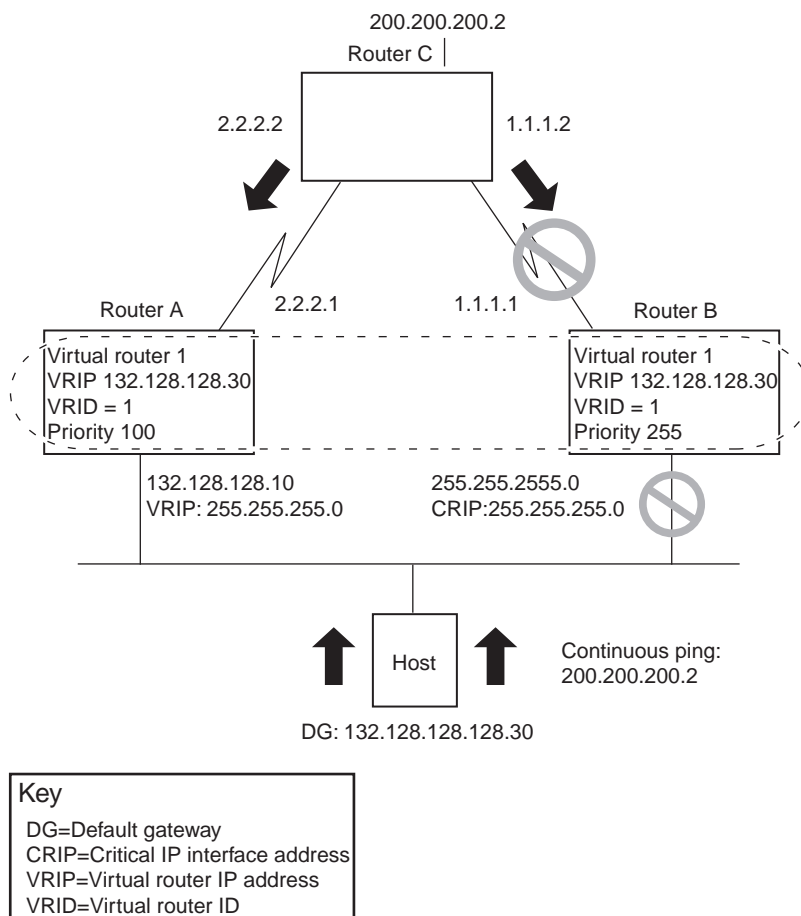
Figure 1-3.   Using VRRP with a Critical IP Interface

Figure 1-4 shows an invalid VRRP configuration; that is, the virtual router with primary IP address 1.1.1.1 is not configured on a VRRP router that has a physical interface with IP address 1.1.1.1. You must always configure a virtual router whose IP address physically exists on the LAN. For example, you must configure virtual router 1 on router A, because the IP address of virtual router 1 is the same as the physical address of router A.
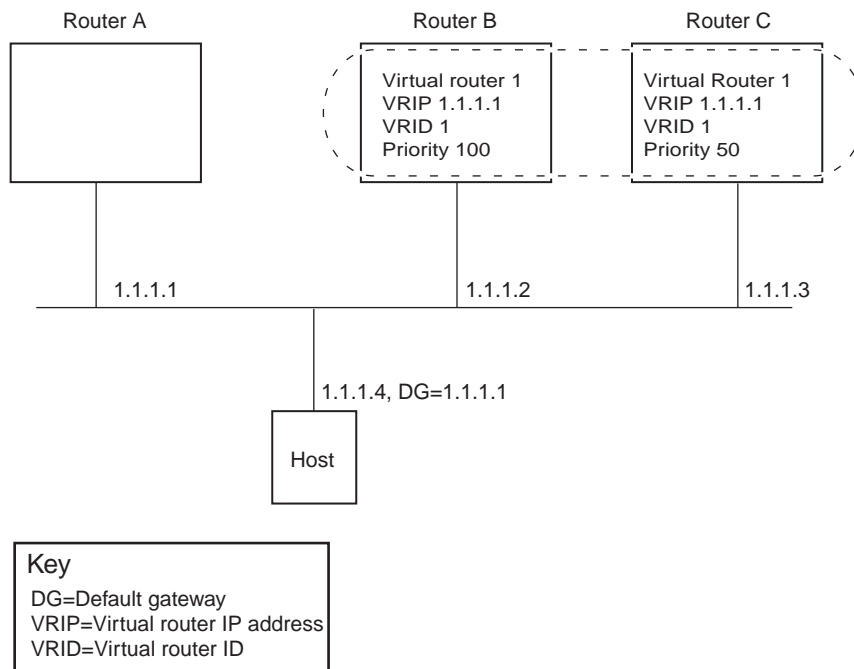
VR0004A

Figure 1-4.   Sample Invalid Virtual Router Configuration

Chapter 2
Starting VRRP Services

You must configure IP services on a router before you can configure VRRP. See *Configuring IP, ARP, RIP, and OSPF Services* for information about how to configure IP.

You can create a basic virtual router configuration by supplying only the required configuration information and accepting the default values for all other parameters.

Starting Configuration Tools

Before configuring VRRP, refer to the following user guides for instructions on how to start and use the Nortel Networks configuration tool of your choice.

Configuration Tool	User Guide
Bay Command Console (BCC)	*Using the Bay Command Console (BCC)*
Site Manager	*Configuring and Managing Routers with Site Manager*

These guides also describe generically how to create and modify a device configuration.

Configuring a Virtual Router

When configuring a virtual router, you must supply the following:

• Primary IP address

The primary IP address associates a virtual router with the IP address of the physical interface. You cannot change the primary IP address after you configure a virtual router. If this primary IP address matches the virtual router IP address, the virtual router will have the highest priority (255) and become the master virtual router.

Caution: You should not configure an Ethernet interface as the master virtual router on an ANH™ router. The Ethernet interface does not go down if you remove the Ethernet cable. As a result, it remains in the master state.

• Virtual router ID

The virtual router ID (VRID) identifies the virtual router. VRRP uses the virtual router ID to calculate the virtual router's virtual MAC address. If the virtual router is in the primary virtual router state, it responds to all Address Resolution Protocol (ARP) requests using the IP address of the virtual router with its virtual MAC address, not its physical MAC address. You cannot change the virtual router ID after you configure a virtual router.

• Virtual router IP address

The virtual router IP address identifies the IP address that the virtual router will use.

You can configure as many as 50 virtual routers. You can use the BCC or Site Manager to configure a virtual router.

Using the BCC

To configure a virtual router using the BCC:

Beginning at the top-level box prompt, enter:

ip

The IP global prompt appears. Note that you can configure a virtual router on an IP interface that does not exist.

At the IP global prompt, enter the following:

vrrp primary-ip-address <*primary_ip_address*> **vr-id** <*vr_id*> **vr-ip-address** **<**<*vr_ip_address*>**>**

primary_ip_address is the IP address of the physical interface with which the virtual router is associated.

vr_id is the virtual router identifier configured in the range of 1 to 255.

vr_ip_address is the IP address that the virtual router uses.

The primary IP address and the virtual router IP address must form a unique pair and must also be on the same subnet.

➡️ **Note:** You can also configure a virtual router using the shortened command format:

vrrp <*primary_ip_address*>**/**<*vr_id*> **vr-ip-address** <*vr_ip_address*>

For example, to configure a virtual router with a primary IP address of 192.41.31.21, a virtual router ID of 2, and a virtual router IP address of 192.41.31.22, enter the following:

```
box# ip
ip# vrrp primary-ip-address 192.41.31.21 vr-id 2 vr-ip-address 192.41.31.22
vrrp/192.41.31.21/2#
```

Using Site Manager

> **Caution:** If you are configuring virtual routers on the IP interface used as the Site Manager management console, do not add or modify a backup virtual router before you create a master virtual router. Otherwise, you can lose connectivity to the router when dynamically configuring virtual routers. To prevent this, use local or remote mode when configuring a virtual router.

To configure a virtual router using Site Manager, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on **Add**.	The Add Virtual Router window opens.
5. Set the following parameters: • **Primary IP Address** • **Virtual Router ID** • **Virtual Router IP Address** Click on **Help** or see the parameter descriptions starting on page A-3.	
6. Click on **OK**.	You return to the IP VRRP Configuration Parameters window.

Chapter 3
Customizing VRRP

To customize VRRP, use the information in the following sections:

Caution: If you are configuring virtual routers on the IP interface used as the Site Manager management console, do not add or modify a backup virtual router before you create a master virtual router. Otherwise, you can lose connectivity to the router when dynamically configuring virtual routers. To prevent this, use local or remote mode when configuring a virtual router.

Disabling and Reenabling a Virtual Router

When you first configure a virtual router, the virtual router is enabled by default. You can use the BCC or Site Manager to disable or reenable a virtual router.

Using the BCC

To disable a virtual router, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

state disabled

To enable a virtual router, access the virtual router and enter:

state enabled

For example, to disable a virtual router, enter the following command:

```
vrrp/192.41.31.21/2#  state disabled
vrrp/192.41.31.21/2#
```

Using Site Manager

To disable or reenable a virtual router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted virtual router appears.
5. Set the **Enable** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Changing the IP Address Backed Up by a Virtual Router

When you first configure a virtual router, you must supply an IP address that the virtual router backs up. This IP address must be on the same subnet as the primary IP address. You can change the IP address to be backed up by a virtual router.

Using the BCC

To change the IP address to be backed up by a virtual router, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

vr-ip-address *<vr_ip_address>*

For example, to change the IP address, enter the following command:

```
vrrp/192.41.31.21/2# vr-ip-address 192.41.31.25
vrrp/192.41.31.21/2#
```

Using Site Manager

To change the IP address to be backed up by a virtual router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted virtual router appears.
5. Set the **Virtual Router IP Address** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Setting the Priority of the Virtual Router

You can set the priority of the virtual router in relation to all virtual routers that have the same virtual router ID and are on the same subnet. The higher you set the value, the higher the priority of the virtual router, and the more likely it will become primary if the master fails.

When you initially configure a virtual router, if the primary IP address is the same as the virtual router IP address, the priority is automatically set to the highest priority (255) and the virtual router becomes the master virtual router as soon as it comes up.

The default priority for all backup virtual routers is 100. You can set the priority for backup virtual routers from 1 to 254. If you assign more than one backup virtual router the same priority, the VRRP router with the greater primary IP address takes precedence.

Using the BCC

To change a virtual router's priority, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

priority *<integer>*

integer is the priority from 1 to 255. (The priority values 0 and 255 are reserved for the master virtual router; the master uses priority 0 to indicate that it is releasing responsibility for the virtual router.)

For example, to change the priority to 254, enter the following command:

```
vrrp/192.41.31.21/2# priority 254
vrrp/192.41.31.21/2#
```

Using Site Manager

To set a virtual router's priority, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted virtual router appears.
5. Set the **Priority** parameter. Click on **Help** or see the parameter description on page A-6.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Setting the Advertisement Interval

The advertisement interval is the number of seconds between transmissions of VRRP advertisements from the master virtual router notifying all backup routers that it is currently the master virtual router and is forwarding all traffic. You must set the same advertisement interval for all VRRP routers having the same VRID on the same LAN. The default advertisement interval is 1 second; however, you can change the interval to a value from 1 through 255.

Using the BCC

To change a virtual router's advertisement interval, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

advertisement-interval *<integer>*

integer is the interval, in seconds, from 1 to 255.

For example, to change the advertisement interval to 60, enter the following command:

```
vrrp/192.41.31.21/2# advertisement-interval 60
vrrp/192.41.31.21/2#
```

Using Site Manager

To set the advertisement interval, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted router appears.
5. Set the **Advertisement Interval** parameter. Click on **Help** or see the parameter description on page A-6.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Setting the Critical IP Interface Address

The critical IP interface resides on the same router as a physical interface. The state of the critical IP interface determines the state of the virtual router. If the critical interface fails, the virtual router fails and the VRRP router with the next highest priority becomes the master virtual router and begins routing traffic to its destination.

Using the BCC

To specify a critical IP interface address, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

critical-ip-interface *<critical_ip_address>*

For example, to set the critical IP interface address, enter the following command:

```
vrrp/192.41.31.21/2# critical-ip-interface 192.41.31.76
vrrp/192.41.31.21/2#
```

Using Site Manager

To specify the critical IP interface address, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted router appears.
5. Set the **Critical IP Interface** parameter. Click on **Help** or see the parameter description on page A-7.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Enabling or Disabling IPX Backup

When the Internetwork Packet Exchange (IPX) protocol is configured on the same physical interface as VRRP, you can enable IPX backup. When enabled, this feature provides IPX backup when the virtual router is in the master state. In this case, IPX configured on the physical interface uses the VRRP MAC address instead of the physical MAC address. If the virtual router is in the backup state, IPX is disabled. You can enable or disable IPX backup. By default, IPX backup is disabled.

You can enable IPX Backup for one virtual router per interface.

Using the BCC

To enable IPX backup, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

ipx-backup enabled

To disable IPX backup, access the virtual router and enter:

ipx-backup disabled

For example, to enable IPX backup, enter the following command:

```
vrrp/192.41.31.21/2# ipx-backup enabled
vrrp/192.41.31.21/2#
```

Using Site Manager

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted router appears.
5. Set the **IPX Backup** parameter. Click on **Help** or see the parameter description on page A-7.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Enabling or Disabling IGMP Backup

When the Internet Group Management Protocol (IGMP) is configured on the same physical interface as VRRP, you can enable IGMP backup. When enabled, this feature provides IGMP backup when the virtual router is in the master state. In this case, IGMP configured on the physical interface is enabled. If the virtual router is in the backup state, IGMP is disabled. By default, IGMP backup is disabled.

You can enable IGMP Backup for one virtual router per interface.

Using the BCC

To enable IGMP backup, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

igmp-backup enabled

To disable IGMP backup, access the virtual router and enter:

igmp-backup disabled

For example, to enable IGMP backup, enter the following command:

```
vrrp/192.41.31.21/2# igmp-backup enabled
vrrp/192.41.31.21/2#
```

Using Site Manager

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted router appears.
5. Set the **IGMP Backup** parameter. Click on **Help** or see the parameter description on page A-8.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

Setting the Token Ring Address

If you are running VRRP on a token ring network, VRRP uses the token ring functional address you provide instead of a virtual router MAC address. The token ring address setting identifies the token ring functional address for the virtual router MAC address that is configured on an IP interface over token ring.

However, if you are running VRRP on a token ring LANE network, packets with functional addresses are sent to the BUS and treated as multicast or broadcast frames, which causes the BUS to overload with user data frames. Since the BUS has limited packet throughput, you must supply a virtual router MAC address instead of a token ring functional address.

VRRP virtual MAC addresses have the following format:

00-00-5E-00-01-*XX*

where *XX* is the virtual router ID.

For instructions on supplying a token ring address, see "Configuring a Virtual Router" on page 2-2.

Caution: For virtual routers running over token ring, you must supply token ring functional addresses for virtual router MAC addresses, or VRRP will fail. However, for token ring LANE networks, you must supply virtual router MAC addresses.

Using the BCC

To set the token ring address, access the virtual router (for example, **box; ip; vrrp 192.41.31.21/2 vr-ip-address 192.41.31.22**) and enter:

token-ring-address <*address*>

address is one of the following unused token ring functional addresses:

- **03-00-02-00-00-00**
- **03-00-04-00-00-00**
- **03-00-08-00-00-00**
- **03-00-10-00-00-00**
- **03-00-20-00-00-00**
- **03-00-40-00-00-00**

- **03-00-80-00-00-00**
- **03-00-00-01-00-00**
- **03-00-00-02-00-00**
- **03-00-00-04-00-00**
- **03-00-00-08-00-00**

For example, to set the token ring address, enter the following command:

```
vrrp/192.41.31.21/2# token-ring-address 03-00-80-00-00-00
vrrp/192.41.31.21/2#
```

Using Site Manager

To set the token ring address, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted router appears.
5. Set the **Token Ring Address** parameter. Click on **Help** or see the parameter description on page A-8.	
6. Click on **Apply**.	
7. Click on **Done**.	You return to the Configuration Manager window.

This appendix contains the Site Manager parameter descriptions for VRRP services. You can display the same information using Site Manager online Help. For information about the IP parameters you must set so that you can configure VRRP, see *Configuring IP, ARP, RIP, and OSPF Services*.

For each parameter, this appendix provides the following information:

- Parameter name
- Configuration Manager menu path
- Default setting
- Valid parameter options
- Parameter function
- Instructions for setting the parameter
- Management information base (MIB) object ID

The Technician Interface allows you to modify parameters by issuing **set** and **commit** commands with the MIB object ID. This process is equivalent to modifying parameters using Site Manager. For more information about using the Technician Interface to access the MIB, see *Using Technician Interface Software*.

Caution: The Technician Interface does not verify the validity of your parameter values. Entering an invalid value can corrupt your configuration.

Add Virtual Router Parameters

The VRRP parameters in the Add Virtual Router window (Figure A-1) let you establish a virtual router on an IP interface.
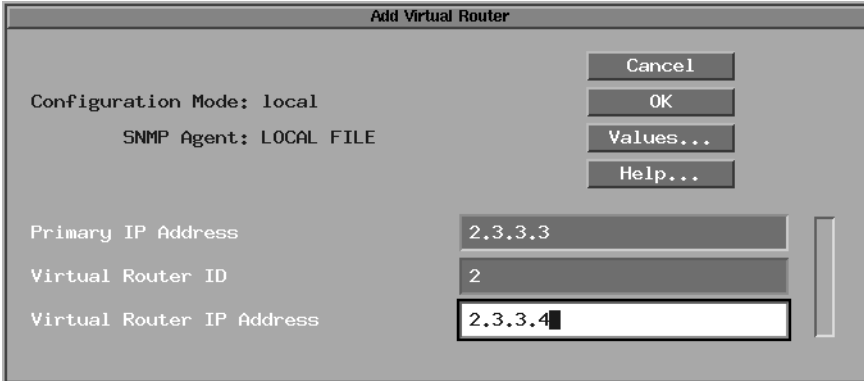

Figure A-1. **Add Virtual Router Window**

To access the Add Virtual Router window, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on **Add**.	The Add Virtual Router window opens.

The parameter descriptions follow.

Parameter: **Primary IP Address**

Path: Configuration Manager > Protocols > IP > VRRP > Add

Default: None

Options: Any valid IP address in dotted-decimal notation

Function: Identifies the IP address of the physical interface. The router lists this IP address as the source in VRRP advertisements sent by the virtual router.

Instructions: Ensure that the primary IP address and the virtual router IP address are on the same subnet.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.25.1.1.4

Parameter: **Virtual Router ID**

Path: Configuration Manager > Protocols > IP > VRRP > Add

Default: None

Options: 1 to 255

Function: Identifies the virtual router's ID (VRID). The router uses this number to calculate the MAC address. The VRID must be unique on the LAN segment.

Instructions: Enter the ID of the virtual router.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.25.1.1.5

Parameter: **Virtual Router IP Address**

Path: Configuration Manager > Protocols > IP > VRRP > Add

Default: None

Options: Any valid IP address in dotted-decimal notation

Function: Identifies the IP address that the virtual router backs up.

Instructions: Ensure that the primary IP address and the virtual router IP address are on the same subnet. If the virtual router IP address is the same as the primary IP address, then this VRRP router, when operating, will always be the master virtual router.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.25.1.1.6

VRRP Configuration Parameters

The VRRP configuration parameters let you customize a virtual router. You access these parameters from the IP VRRP Configuration Parameters window (Figure A-2).

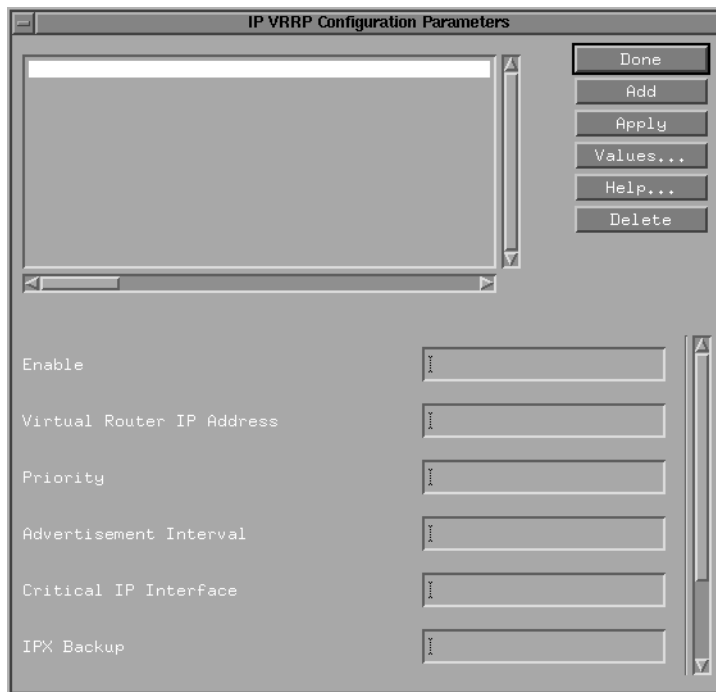**Figure A-2.   IP VRRP Configuration Parameters Window**

To access the IP VRRP Configuration Parameters window, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.

Site Manager Procedure *(continued)*	
You do this	**System responds**
3. Choose **VRRP**.	The IP VRRP Configuration Parameters window opens.
4. Click on a virtual router instance ID to highlight it in the list of virtual routers.	The configuration that pertains to the highlighted virtual router appears.

The parameter descriptions follow.

Parameter: Enable

Path: Configuration Manager > Protocols > IP > VRRP
Default: Enable
Options: Enable │ Disable
Function: Enables or disables a virtual router on an interface.
Instructions: Select Enable to enable a virtual router on an interface. Select Disable to disable a virtual router on an interface.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.25.1.1.2

Parameter: Virtual Router IP Address

Path: Configuration Manager > Protocols > IP > VRRP
Default: None
Options: Any valid IP address in dotted-decimal notation
Function: Identifies the IP address of the interface that the virtual router backs up.
Instructions: Enter the IP address that you want the virtual router to back up. Ensure that the primary IP address and the virtual router IP address are on the same subnet. If the virtual router IP address is the same as the primary IP address, Site Manager automatically sets the priority to 255 so that this VRRP router will always be the master virtual router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.25.1.1.6

Parameter:	**Priority**
Path:	Configuration Manager > Protocols > IP > VRRP
Default:	100
Options:	1 to 255
Function:	Specifies the priority of the virtual router with respect to all virtual routers on the IP interface.
Instructions:	Enter a priority from 1 to 254. The higher the value you specify, the higher the priority of the virtual router. Site Manager automatically supplies a priority of 100 for all backup virtual routers. If you set the primary IP address to the IP address of the physical interface, Site Manager sets the priority to 255.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.25.1.1.8

Parameter:	**Advertisement Interval**
Path:	Configuration Manager > Protocols > IP > VRRP
Default:	1 (s)
Options:	1 to 255
Function:	Specifies the interval, in seconds, between the transmission of VRRP advertisements from the primary virtual router.
Instructions:	Enter a value from 1 to 255 seconds.
MIB Object ID:	1.3.6.1.4.1.18.3.5.53.25.1.1.9

Parameter: **Critical IP Interface**

Path: Configuration Manager > Protocols > IP > VRRP

Default: 0.0.0.0 (none)

Options: Any valid IP address in dotted-decimal notation

Function: Identifies an IP address that determines whether the virtual router assumes the role of the master virtual router and is responsible for forwarding traffic. If the critical IP address is operating, then the virtual router forwards traffic. If the critical IP address is down, then a backup virtual router assumes the responsibilities of the master virtual router and forwards traffic. The critical IP address must be on the same router as the primary IP address.

Instructions: Specify an IP address on the same router where the primary IP address resides.

MIB Object ID: 1.3.6.1.4.1.18.3.5.53.25.1.1.10

Parameter: **IPX Backup**

Path: Configuration Manager > Protocols > IP > VRRP

Default: Disable

Options: Enable | Disable

Function: Enables or disables IPX backup when IPX is configured on the same physical interface as VRRP. When enabled, this feature provides IPX backup when the virtual router is in the master state. In this case, IPX configured on the physical interface uses the VRRP MAC address instead of the physical MAC address. If the virtual router is in the backup state, IPX is disabled.

Instructions: Select Enable to enable IPX backup on the virtual router. Select Disable to disable IPX backup on the virtual router.

MIB Object ID: 1.3.6.1.4.1.18.3.5.53.25.1.1.11

Parameter: **IGMP Backup**

Path: Configuration Manager > Select Protocols > IP > VRRP

Default: Disable

Options: Enable | Disable

Function: Enables or disables IGMP backup when IGMP is configured on the same physical interface as VRRP. When enabled, this feature provides IGMP backup when the virtual router is in the master state. In this case, IGMP configured on the physical interface is enabled. If the virtual router is in the backup state, IGMP is disabled.

Instructions: Select Enable to enable IGMP backup on the virtual router. Select Disable to disable IGMP backup on the virtual router.

MIB Object ID: 1.3.6.1.4.1.18.3.5.53.25.1.1.12

Parameter: **Token Ring Address**

Path: Configuration Manager > Select Protocols > IP > VRRP

Default: None

Options: Use one of the following unused token ring functional addresses:

03-00-02-00-00-00
03-00-04-00-00-00
03-00-08-00-00-00
03-00-10-00-00-00
03-00-20-00-00-00
03-00-40-00-00-00
03-00-80-00-00-00
03-00-00-01-00-00
03-00-00-02-00-00
03-00-00-04-00-00
03-00-00-08-00-00

Function: Identifies the token ring functional address for the virtual router ID MAC address that is configured on an IP interface over token ring.

Instructions: Specify a unique functional token ring address. You must specify a token ring functional address for virtual routers on an IP interface over token ring; otherwise, VRRP will not function.

MIB Object ID: 1.3.6.1.4.1.18.3.5.53.25.1.1.13

Appendix B
Monitoring VRRP Using the BCC show Commands

This appendix describes how to use the BCC **show** command to obtain VRRP statistical data from the management information base (MIB). The type and amount of data displayed depend on the specific settings you want to view. This appendix includes descriptions of the following **show** commands:

Command	Page
show vrrp critical-ip-addresses	B-2
show vrrp mac-addresses	B-2
show vrrp summary	B-3

Online Help for show Commands

To display a list of command options, enter **show vrrp ?** at any BCC prompt. To learn more about any **show vrrp** command option and its syntax, use the question mark (**?**) command as follows:

Example

```
bcc> show vrrp?
critical-ip-addresses   mac-addresses           summary
bcc> show vrrp critical-ip-addresses?
show vrrp critical-ip-addresses [-vrid <arg>] [-primary-ip-address <arg>]
bcc>
```

show vrrp critical-ip-addresses

The **show vrrp critical-ip-addresses** command displays the local IP interface (critical IP address) associated with a specific VRRP virtual router or all VRRP virtual routers. This command allows for the following command filters (flags) and filter arguments:

-primary-ip-address *<primary_ip_address>*	Displays information about the virtual router associated with the IP address of the physical interface.
-vrid *<vrid>*	Displays information about the virtual router associated with the specified virtual router identifier.

The output includes the following information:

Primary IP Address	IP address of the physical interface with which the virtual router is associated.
VRID	Virtual router identifier configured in the range of 1 to 255.
Virtual IP Address	IP address that the virtual router backs up.
Critical IP Address	IP address that determines whether the virtual router assumes the role of the master virtual router and is responsible for forwarding traffic. If the critical IP address is operating, then the virtual router forwards traffic. If the critical IP address is down, then a backup virtual router assumes the responsibilities of the master virtual router and forwards traffic.

show vrrp mac-addresses

The **show vrrp mac-addresses** command displays the virtual media access control (MAC) address and token ring address associated with a specific VRRP virtual router or all VRRP virtual routers.

This command allows for the following command filters (flags) and filter arguments:

-primary-ip-address *<primary_ip_address>*	Displays information about the virtual router associated with the IP address of the physical interface.
-vrid *<vrid>*	Displays information about the virtual router that corresponds to the specified virtual router identifier.

The output includes the following information:

Primary IP Address	IP address of the physical interface with which the virtual router is associated.
VRID	Virtual router identifier configured in the range of 1 to 255.
Virtual IP Address	IP address that the virtual router backs up.
VRRP Virtual MAC Address	Virtual router MAC address that is configured on an IP interface over token ring
Token Ring Func. Address	Token ring functional address for the VRRP virtual MAC address.

show vrrp summary

The **show vrrp summary** command displays the state, advertisement interval, and priority for a specific VRRP virtual router or all VRRP virtual routers. This command allows for the following command filters (flags) and filter arguments:

-primary-ip-address *<primary_ip_address>*	Displays information about the virtual router associated with the IP address of the physical interface.
-vrid *<vrid>*	Displays information about the virtual router that corresponds to the specified virtual router identifier.

The output includes the following information:

Primary IP Address	IP address of the physical interface with which the virtual router is associated.
VRID	Virtual router identifier configured in the range of 1 to 255.
Virtual IP Address	IP address that the virtual router backs up.
VRRP Operational State	Current state of the virtual router: initialize, master, or backup.
Advertisement Interval	The interval, in seconds, between the transmission of VRRP advertisements from the primary virtual router.
Priority	The priority (from 1 to 255) of the virtual router with respect to all virtual routers on the IP interface.

Glossary

advertisement
An IP packet periodically broadcast by the master virtual router to prevent a backup virtual router from becoming the master virtual router.

backup virtual router
One of a set of VRRP routers available to become the master virtual router. A router may be either the master virtual router or the backup virtual router for many virtual routers.

critical IP interface
A local IP interface associated with a virtual router. When the state of this interface changes, the virtual router switches roles. For example, if you designate IP address 1.1.1.1 as the critical IP address for virtual router 1 on router B, and IP address 1.1.1.1 fails, then virtual router 1 on router B is no longer the master virtual router, and a backup virtual router becomes the master virtual router.

master virtual router
The VRRP router that both assumes responsibility for forwarding data packets received at the MAC address associated with its virtual router, and also answers ARP requests for its IP address. A router may be the master virtual router or the backup virtual router for many virtual routers.

primary IP address
The real IP interface address used as the source IP address for the IP packets carrying advertisements.

priority
The value that determines whether a virtual router serves as the master or backup virtual router. The VRRP router with the highest priority becomes the master virtual router. The value 255 is reserved for the router that owns the IP address associated with the virtual router. The value 0 is reserved for the master virtual router to indicate that it is releasing responsibility for the virtual router. The values 1 through 254 are available for VRRP routers backing up the virtual router. The default priority is 100.

virtual MAC address
A unicast MAC address associated with each virtual router and used as the source MAC address for VRRP advertisements. The master virtual router uses this address instead of its physical MAC address in all communication.

virtual router   A software-defined object managed by VRRP that corresponds to an IP address on a LAN segment. A virtual router typically exists on multiple VRRP routers. One VRRP router acts as the master virtual router for this IP address, and the others act as backup virtual routers.

VRID   The virtual router identifier configured in the range of 1 through 255. The VRID must be unique within the subnet.

VRRP router   A router running the Virtual Router Redundancy Protocol. A VRRP router may participate in one or more virtual routers.

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