

HiOS: HTML - How to Configure the Virtual Router Redundancy Protocol (VRRP) on Layer 3 Switches

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How to Configure the Virtual Router Redundancy Protocol (VRRP) on Hirschmann Layer 3 Switches with HiOS-3S & 3A and Firmware Version 07.0.00 or Higher

This article describes the basic steps required to configure the Virtual Router Redundancy Protocol (VRRP) on Hirschmann Platform V Layer 3 switches running the HiOS firmware version 07.0.00 or higher and the new HTMLv5 Graphical User Interface (GUI).

HiOS-3S or 3A & Firmware 07.0.00

With the introduction of the HiOS firmware version 07.0.00, the switch agent's Graphical User Interface (GUI) has been changed from a Java based interface to a HTML v5 interface.

Configuration Tasks:

The configuration of the routing function usually contains the following steps:

1. Draw a Network Plan

Create a picture of your network so that you can clearly see the division into subnetworks and the related distribution of the IP addresses.

This step is very important. Good planning of the subnetworks with the corresponding network masks makes the router configuration much easier.

2. Router Basic Settings

Along with enabling the global routing function, the router basic settings also contain the assignment of IP addresses and network masks to the router interfaces, and then enabling the routing function on that specific interface.

3. Configure VRRP setting

- a. Enable VRRP globally
- b. Enable VRRP on the port

- c. Create the virtual router ID (VRID)
- d. Assign the virtual router IP address
- e. Enable the virtual router
- f. Assign the VRRP priority

Virtual Router Redundancy Protocol:

VRRP is a type of “gateway redundancy”. VRRP describes a process that groups multiple routers into 1 virtual router. End devices always address the virtual router, and VRRP helps to ensure that a physical router belonging to the virtual router takes over the data transmission. Even if a physical router fails, VRRP helps to ensure that another physical router takes over the distribution tasks as part of the virtual router.

VRRP has a typical failover time of 3 to 4 seconds when a physical router fails.

The routers within a network on which VRRP is active specify among themselves which router is the master. The master router controls the IP and MAC address of the virtual router interface. The devices in the network that have entered this virtual IP address as the default gateway use the master as the default gateway.

If the master fails, then the remaining backup routers use VRRP to specify a new master. The backup router that wins the election process then takes over control of the IP address and MAC address of the virtual router. Thus, the devices find their route through their default gateway, as before. The devices see solely the master router with the virtual MAC and IP addresses, regardless of which physical router is actually behind this virtual address.

VRRP Terms:

Virtual router - A virtual router is a physical router or group of physical routers that act as the default gateway in a network using the Virtual Router Redundancy Protocol.

VRRP router - A VRRP router is a physical router with VRRP enabled. The VRRP router is part of 1 or more virtual routers.

Master router - The master router is the physical router within a virtual domain that is responsible for forwarding data packets and responding to ARP queries. The master router periodically sends messages (advertisements) to the backup routers in the virtual domain to inform them about its existence. The backup routers save the advertisement interval and VRRP priority contained in the master router advertisements to calculate the master down time and skew time.

IP address owner - The IP address owner is the VRRP router whose IP address is identical to the IP address of the virtual router. By definition, it has the VRRP priority of 255 and is

thus automatically the master router.

Backup router - The backup router is a VRRP router providing a stand-by route for the master router. The backup router is ready to take over the master role, if the master router fails.

VRRP priority - The VRRP priority is a number from 1 through 255. VRRP uses the priority number to determine the master router. VRRP reserves the priority value 255 for the IP address owner.

VRID - The virtual router ID (VRID) uniquely identifies a virtual router.

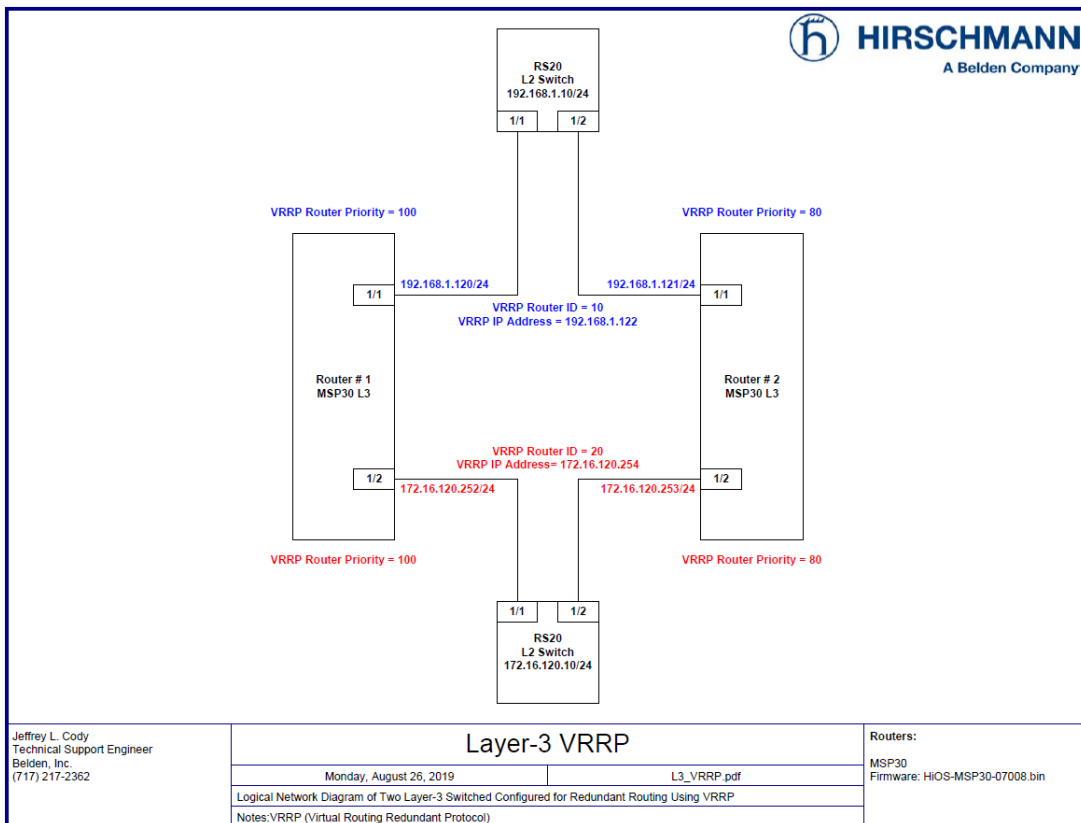
Virtual router IP address - The IP address of the virtual router instance.

The Network Design:

In this article, we are using Two MSP30 switches with Layer 3 Advanced features to configure two Physical Router Interfaces on each MSP30.

We have configured interface Port 1/1 and Port 1/2 as the physical router interfaces using IP Address in the two separate subnets.

	Router # 1	Router # 2
Port 1/1	192.168.1.120/24	192.168.1.121/24
Port 1/2	172.16.120.252/24	172.16.120.253/24



After having the basic routing functions configured and tested on the routers shown above, we will configure Router # 1 to function as the “Master” and Router # 2 to function as the “Backup” VRRP Routers for both the 192.168.1.0/24 and 172.16.12.0/24 networks.

The Configuration Steps:

Log into the Router # 1’s GUI with a user ID that has administrative privileges. In the switch’s default configuration, this would be accomplished using the User ID of “ admin “ and a password of “ public “.

HiOS-3S-07.0.07


User: admin

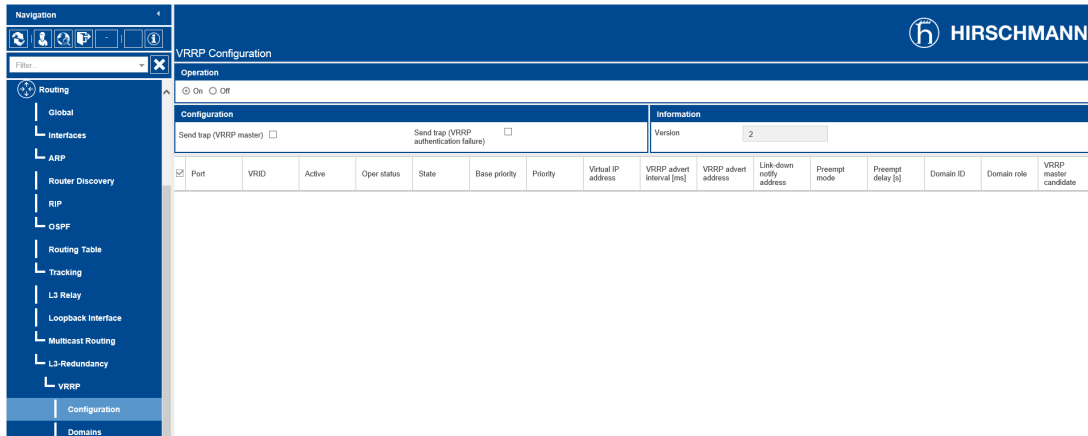
Password: [masked]

Login

Navigate to the Routing - Layer3-Redundancy-VRRP-Configuration page of the GUI.

Enable the VRRP Configuration operation by selecting the On Operation option radial button and then click the


Write button () at the bottom of the page.

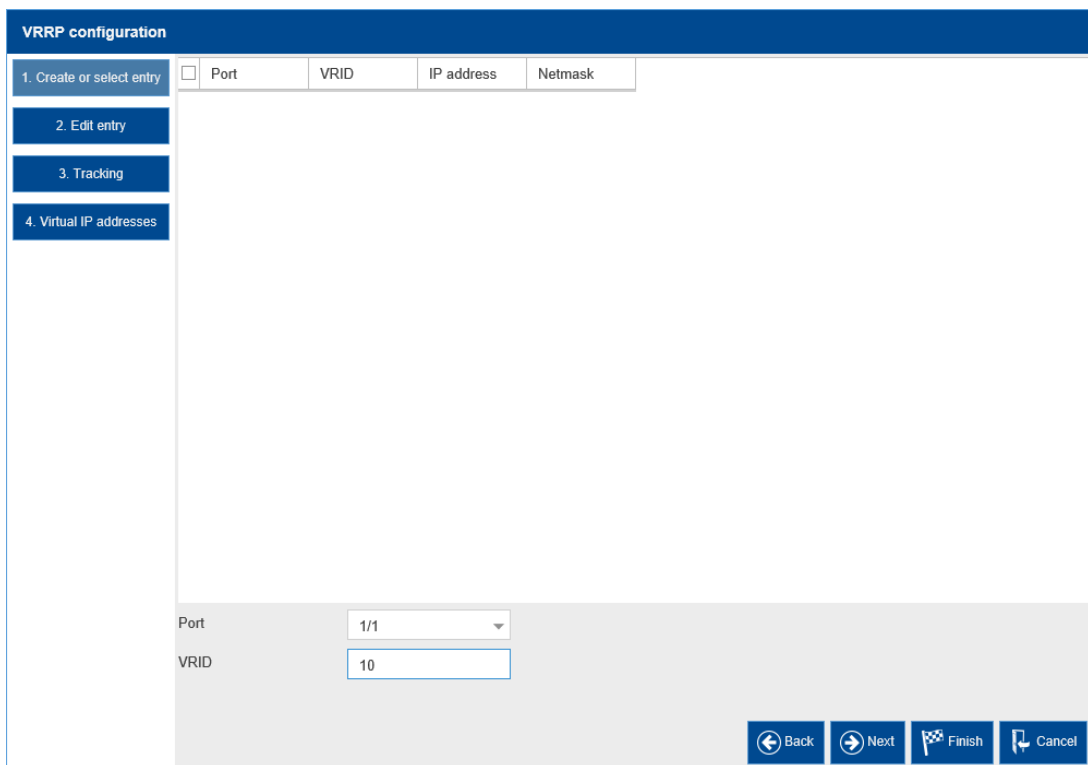


The screenshot shows the 'VRRP Configuration' page in the Hirschmann network management interface. The page is divided into several sections:

- Navigation:** A sidebar on the left with a tree view showing 'Routing' > 'VRRP' > 'Configuration' selected.
- Header:** 'VRRP Configuration' and the Hirschmann logo.
- Operation:** A section with 'On' and 'Off' radio buttons.
- Configuration:** A section with 'Send trap (VRRP master)' and 'Send trap (VRRP authentication failure)' checkboxes.
- Information:** A section with a 'Version' dropdown set to '2'.
- Table:** A table with columns: Port, VRID, Active, Oper status, State, Base priority, Priority, Virtual IP address, VRRP advert interval [ms], VRRP advert address, Link-down notify address, Preempt mode, Preempt delay [s], Domain ID, Domain role, and VRRP master candidate.
- Buttons:** A 'Wizard' button (represented by a pencil icon) is located at the bottom right of the page.

Click the Wizard button () at the bottom of the page.

Select Port 1/1 for the Port entry and enter " 10 " for the VRID (Virtual Router ID), then click the Next button () at the bottom of the page.



The screenshot shows the 'VRRP configuration' wizard. The wizard is titled 'VRRP configuration' and has a progress bar with four steps:

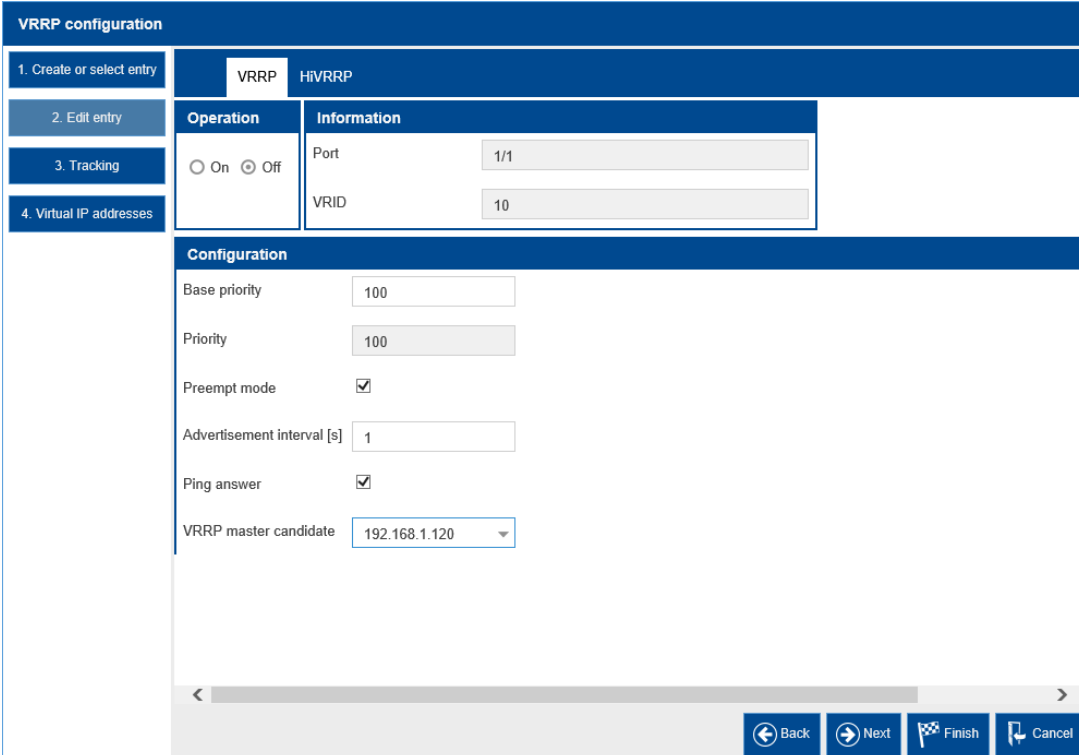
1. Create or select entry
2. Edit entry
3. Tracking
4. Virtual IP addresses


The 'Port' field is set to '1/1' and the 'VRID' field is set to '10'. The 'Next' button is highlighted.


Ensure that the VRRP tab is visible, and then enable the VRRP Operation by selecting the On Operation option radial button.

Drop down the VRRP master candidate box and select " 192.168.1.120 " , then click the Next button

() at the bottom of the page.



VRRP configuration	
1. Create or select entry	VRRP HiVRRP
2. Edit entry	Operation Information
3. Tracking	<input type="radio"/> On <input checked="" type="radio"/> Off
4. Virtual IP addresses	Port 1/1 VRID 10
Configuration	
Base priority	100
Priority	100
Preempt mode	<input checked="" type="checkbox"/>
Advertisement interval [s]	1
Ping answer	<input checked="" type="checkbox"/>
VRRP master candidate	192.168.1.120
	

Click the Next button () at the bottom of the page, we will skip over the tracking options since that will be covered in another article and technically is not required for the operation of VRRP.

Enter " 192.168.1.122 " in the Virtual IP Address field and then click the ADD button.

Then. Click the Finish button () at the bottom of the page.

VRRP configuration

1. Create or select entry
 2. Edit entry
 3. Tracking
 4. Virtual IP addresses

Information

IP address

Multinetting

	Additional IP address	Additional netmask
<input type="checkbox"/>		

Virtual IP addresses

	IP address
<input checked="" type="checkbox"/>	192.168.1.122


IP address

Add
Remove

← Back
Next →
🚩 Finish
↶ Cancel

We then repeat the same steps to configure the VRRP configuration for the router interface configured on Port 1/2.

Click the Wizard button () at the bottom of the page.

Select Port 1/2 for the Port entry and enter " 20 " for the VRID (Virtual Router ID), then click the Next button () at the bottom of the page.

VRRP configuration

1. Create or select entry	Port	VRID	IP address	Netmask
<input type="checkbox"/>	1/1	10	192.168.1...	255.255.25...

2. Edit entry

3. Tracking

4. Virtual IP addresses

Port


VRID

Ensure that the VRRP tab is visible, and then enable the VRRP Operation by selecting the On Operation option radial button.

Drop down the VRRP master candidate box and select " 172.16.120.252 " , then click the Next button

() at the bottom of the page.

VRRP configuration			
1. Create or select entry	VRRP	HIVRRP	
2. Edit entry	Operation	Information	
3. Tracking	<input checked="" type="radio"/> On <input type="radio"/> Off	Port	1/2
4. Virtual IP addresses		VRID	20
Configuration			
	Base priority	100	
	Priority	100	
	Preempt mode	<input checked="" type="checkbox"/>	
	Advertisement interval [s]	1	
	Ping answer	<input checked="" type="checkbox"/>	
	VRRP master candidate	172.16.120.252	
<input type="button" value="Back"/> <input checked="" type="button" value="Next"/> <input type="button" value="Finish"/> <input type="button" value="Cancel"/>			

Click the Next button () at the bottom of the page, we will skip over the tracking options since that will be covered in another article and technically is not required for the operation of VRRP.

Enter "172.16.120.254 " in the Virtual IP Address field and then click the ADD button.

Then. Click the Finish button () at the bottom of the page.

VRRP configuration

1. Create or select entry
 2. Edit entry
 3. Tracking
 4. Virtual IP addresses

Information

IP address

Multinetting

	Additional IP address	Additional netmask
<input type="checkbox"/>		

Virtual IP addresses


	IP address
<input checked="" type="checkbox"/>	172.16.120...

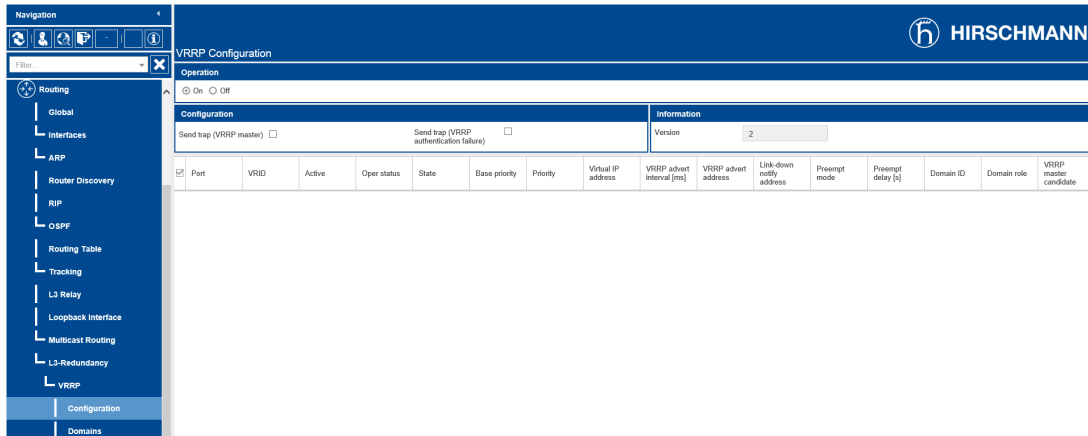
IP address

Add
Remove

← Back
Next →
🚩 Finish
↶ Cancel


Back on the VRRP Configuration page, ensure that both of the entries are Active. If they are not click the Load button (🔄). If they still are not Active, then click the Active check boxes for each of the VRRP entries, and then click Write button (✅) at the bottom of the page.

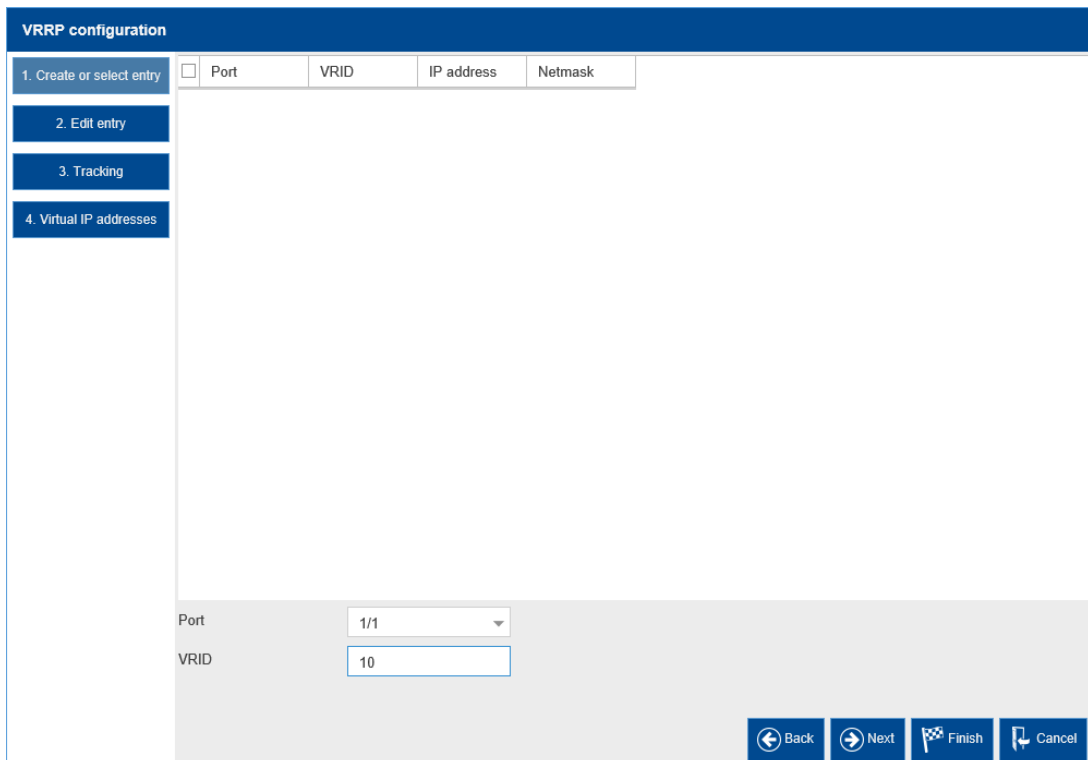
Enable the VRRP Configuration operation by selecting the On Operation option radial button and then click the Write button () at the bottom of the page.



The screenshot shows the 'VRRP Configuration' page in the Hirschmann network management interface. The 'Operation' section is set to 'On'. Below this, there are configuration options for 'Send trap (VRRP master)' and 'Send trap (VRRP authentication failure)', both with checkboxes. The 'Version' is set to '2'. A table with columns for Port, VRID, Active, Oper status, State, Base priority, Priority, Virtual IP address, VRRP advert interval [ms], VRRP advert address, Link-down notify address, Preempt mode, Preempt delay [s], Domain ID, Domain role, and VRRP master candidate is visible.

Click the Wizard button () at the bottom of the page.

Select Port 1/1 for the Port entry and enter " 10 " for the VRID (Virtual Router ID), then click the Next button () at the bottom of the page.



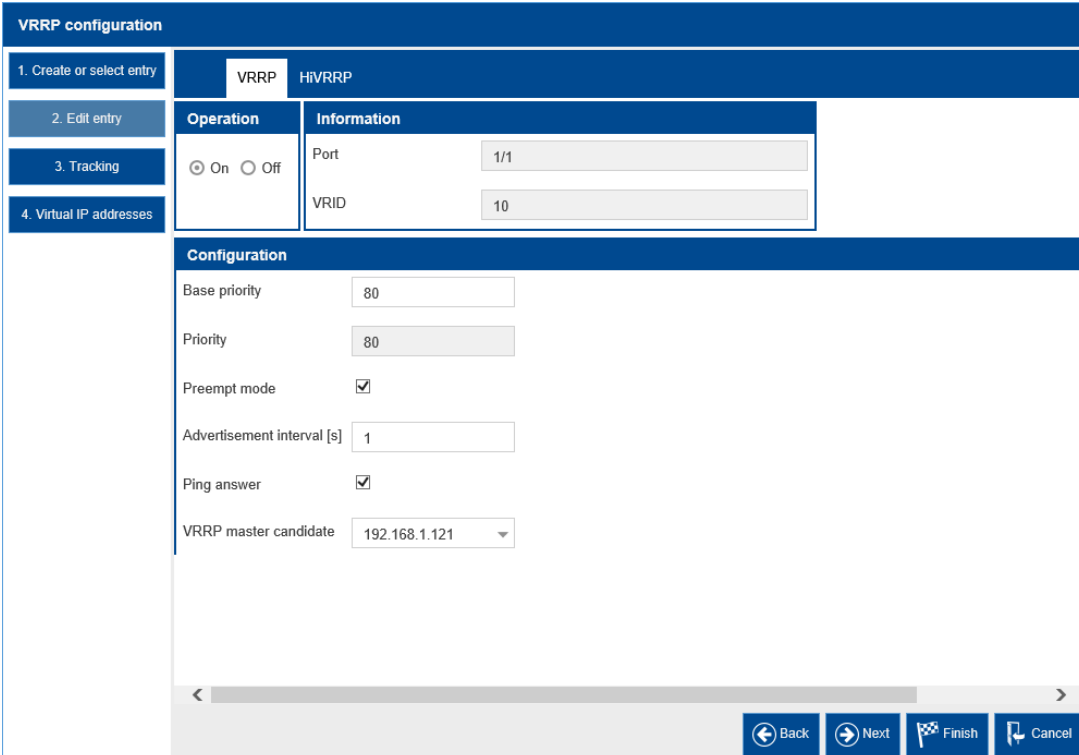
The screenshot shows the 'VRRP configuration' wizard. The wizard is at step 1, 'Create or select entry'. It shows a table with columns for Port, VRID, IP address, and Netmask. Below the table, the 'Port' is set to '1/1' and the 'VRID' is set to '10'. At the bottom, there are buttons for Back, Next, Finish, and Cancel.

Ensure that the VRRP tab is visible, and then enable the VRRP Operation by selecting the On Operation option radial button.


One slight difference from the way we configured Router # 1, now we want to enter a lower Base Priority so that this router functions as the Backup VRRP router. Enter " 80 " for the Base priority field.

Drop down the VRRP master candidate box and select " 192.168.1.121 " , then click the Next button

() at the bottom of the page.

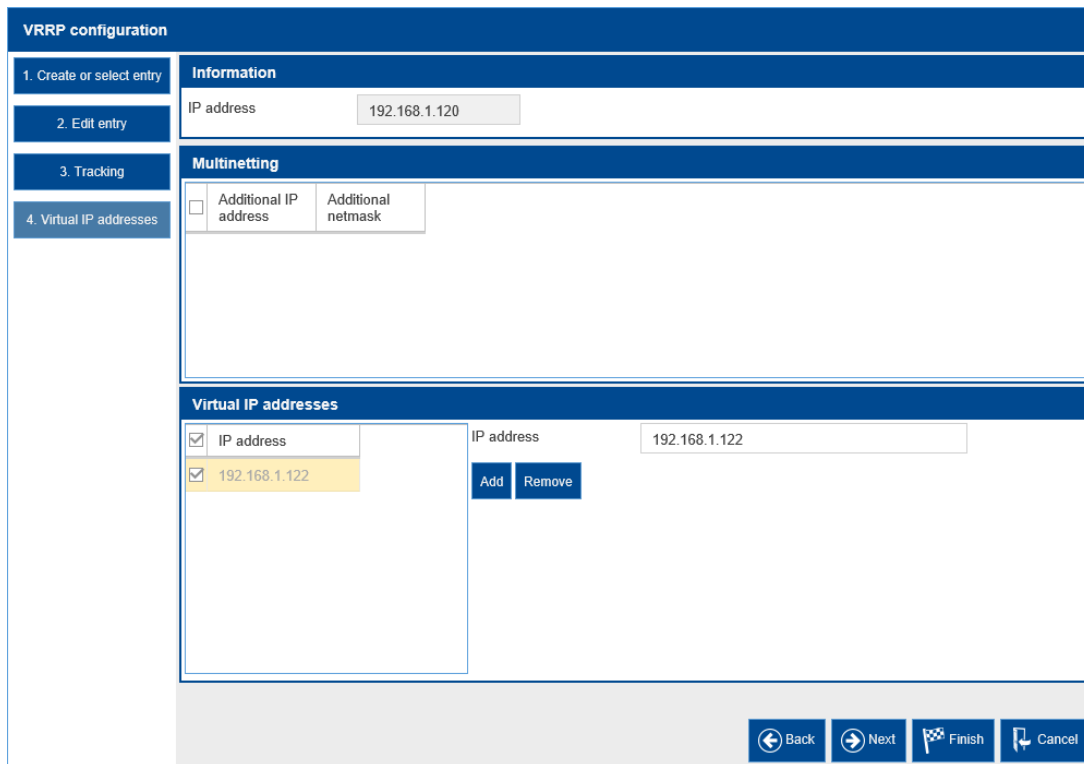


The screenshot displays the VRRP configuration interface. On the left, a vertical navigation pane contains four steps: "1. Create or select entry", "2. Edit entry", "3. Tracking", and "4. Virtual IP addresses". The main area is titled "VRRP configuration" and has two tabs: "VRRP" (selected) and "HIVRRP". Below the tabs, there are two sections: "Operation" and "Information". The "Operation" section has two radio buttons, "On" (selected) and "Off". The "Information" section contains two input fields: "Port" with the value "1/1" and "VRID" with the value "10". Below these is a "Configuration" section with several fields: "Base priority" (80), "Priority" (80), "Preempt mode" (checked), "Advertisement interval [s]" (1), "Ping answer" (checked), and "VRRP master candidate" (192.168.1.121). At the bottom right, there are four buttons: "Back", "Next" (highlighted), "Finish", and "Cancel".

Click the Next button () at the bottom of the page, we will skip over the tracking options since that will be covered in another article and technically is not required for the operation of VRRP.

Enter " 192.168.1.122 " in the Virtual IP Address field and then click the ADD button.

Then. Click the Finish button () at the bottom of the page.




The screenshot shows the VRRP configuration wizard interface. On the left, there is a vertical navigation menu with four steps: "1. Create or select entry", "2. Edit entry", "3. Tracking", and "4. Virtual IP addresses". The main content area is divided into three sections: "Information", "Multinetting", and "Virtual IP addresses".

- Information:** Contains a text input field for "IP address" with the value "192.168.1.120".
- Multinetting:** Contains a table with two columns: "Additional IP address" and "Additional netmask". There is an unchecked checkbox to the left of the table.
- Virtual IP addresses:** Contains a table with two columns: "IP address" and "Add/Remove". The "IP address" column has a checked checkbox and a list item "192.168.1.122" which is highlighted in yellow. To the right of this table is another "IP address" text input field with the value "192.168.1.122" and two buttons: "Add" and "Remove".

At the bottom right of the interface, there are four navigation buttons: "Back", "Next", "Finish", and "Cancel".

We then repeat the same steps to configure the VRRP configuration for the router interface configured on Port 1/2.

Click the Wizard button () at the bottom of the page.

Select Port 1/2 for the Port entry and enter " 20 " for the VRID (Virtual Router ID), then click the Next button () at the bottom of the page.

VRRP configuration

1. Create or select entry	<input type="checkbox"/>	Port	VRID	IP address	Netmask
2. Edit entry	<input type="checkbox"/>	1/1	10	192.168.1...	255.255.25...
3. Tracking					
4. Virtual IP addresses					

Port

VRID


Ensure that the VRRP tab is visible, and then enable the VRRP Operation by selecting the On Operation option radial button.

Again, we want to enter a lower Base Priority so that this router functions as the Backup VRRP router. Enter " 80 " for the Base priority field.

Drop down the VRRP master candidate box and select " 172.16.120.253 " , then click the Next button

() at the bottom of the page.

VRRP configuration			
1. Create or select entry	VRRP	HiVRRP	
2. Edit entry	Operation	Information	
3. Tracking	<input checked="" type="radio"/> On <input type="radio"/> Off	Port	1/2
4. Virtual IP addresses		VRID	20
Configuration			
	Base priority	80	
	Priority	100	
	Preempt mode	<input checked="" type="checkbox"/>	
	Advertisement interval [s]	1	
	Ping answer	<input checked="" type="checkbox"/>	
	VRRP master candidate	172.16.120.253	
<input type="button" value="Back"/> <input type="button" value="Next"/> <input type="button" value="Finish"/> <input type="button" value="Cancel"/>			

Click the Next button () at the bottom of the page, we will skip over the tracking options since that will be covered in another article and technically is not required for the operation of VRRP.

Enter "172.16.120.254 " in the Virtual IP Address field and then click the ADD button.

Then. Click the Finish button () at the bottom of the page.

VRRP configuration

1. Create or select entry
 2. Edit entry
 3. Tracking
 4. Virtual IP addresses

Information

IP address

Multinetting

	Additional IP address	Additional netmask
<input type="checkbox"/>		

Virtual IP addresses


	IP address
<input checked="" type="checkbox"/>	172.16.120...

IP address

Add
Remove

← Back
Next →
🚩 Finish
↶ Cancel

Back on the VRRP Configuration page, ensure that both of the entries are Active. If they are not click the Load button (🔄). If they still are not Active, then click the Active check boxes for each of the VRRP entries, and then click Write button (✅) at the bottom of the page.








VRRP Configuration


Operation
 On Off

Configuration Information

Send trap (VRRP master) Send trap (VRRP authentication failure) Version

Port	VRID	Active	Oper status	State	Base priority	Priority	Virtual IP address	VRRP advert interval [ms]	VRRP advert address	Link-down notify address	Preempt mode	Preempt delay [s]	Domain ID	Domain role	VRRP candid
<input type="checkbox"/> 1/1	10	<input checked="" type="checkbox"/>	active	backup	80	80	192.168.1.122	1,000	224.0.0.18	0.0.0.0	<input checked="" type="checkbox"/>	0	0	none	192.168.1.122
<input type="checkbox"/> 1/2	20	<input checked="" type="checkbox"/>	active	backup	80	80	172.16.120.254	1,000	224.0.0.18	0.0.0.0	<input checked="" type="checkbox"/>	0	0	none	0.0.0.0









You should now see both of the VRRP instances configured on this router are Active, and the state of each instance is Backup. You may need to click the Load button () one final time.

This completes the steps required to configure Router # 2 as the VRRP Backup for both the 192.168.1.0/24 and 172.16.120.0/24 networks.


Verifying the Configuration:


Once we have completed the steps required to configure Ports 1/1 and 1/2 as Virtual Router Redundant Interfaces, we should ensure that VRRP Protocol functions properly in the event of a failure.


On Router # 1's Routing - L3 - Redundancy - VRRP - Configuration page of the GUI, click the Reload button (). Notice that both ports are in the Master state.

Disconnect the cable on Port 1/2, and then click the Reload button (). Notice that Port 1/2 is in the " initialize " state, and the Oper status is " notReady ".

HIRSCHMANN															
VRRP Configuration															
Operation															
<input checked="" type="radio"/> On <input type="radio"/> Off															
Configuration										Information					
Send trap (VRRP master) <input type="checkbox"/> Send trap (VRRP authentication failure) <input type="checkbox"/>										Version <input type="text" value="2"/>					
<input type="checkbox"/> Port	VRID	Active	Oper status	State	Base priority	Priority	Virtual IP address	VRRP advert interval [ms]	VRRP advert address	Link-down notify address	Preempt mode	Preempt delay [s]	Domain ID	Domain role	VRRP candi
<input type="checkbox"/> 1/1	10	<input checked="" type="checkbox"/>	active	master	100	100	192.168.1.122	1,000	224.0.0.18	0.0.0.0	<input checked="" type="checkbox"/>	0	0	none	192.1
<input type="checkbox"/> 1/2	20	<input checked="" type="checkbox"/>	notReady	initialize	100	100	172.16.120.254	1,000	224.0.0.18	0.0.0.0	<input checked="" type="checkbox"/>	0	0	none	172.1

On Router # 2's Routing - L3-Redundancy - VRRP - Configuration page of the GUI, click the Reload button (). Notice that port 1/2 is in the Master state.

On Router # 1, reconnect the cable on Port 1/2, and then click the Reload button (). Notice that Port 1/2 is back in the " master " state, and the Oper status is " active ".

On Router # 2, click the Reload button (). Notice that Port 1/2 is back in the " backup " state.

You can perform the same tests for Port 1/1 on Router # 1, but you will want to access both switch's GUI from the 172.16.120.0 side of the network. Otherwise, when you disconnect the cable on port 1/1 of Router # 1, you will lose connection to the router.

These routers can now provide router redundancy for the 192.168.1.0/24 and 172.16.120.0/24 networks using the Virtual Router Redundancy Protocol (VRRP) in the event of a single complete router failure.

NOTE: It is highly advisable to configure some appropriate tracking options for these redundant routers so that if only a single router interface fails, and not the entire router, routing can still function between these two networks without human intervention.

Additional Information

Command Line Interface (CLI) Commands:

The following CLI commands can be used in lieu of the HTMLv5 GUI to configure the Virtual Router Redundancy settings to meet the same configuration requirements.

On Router # 1:

```
Tera Term Web 3.1 - COM4 VT
File Edit Setup Web Control Window Help

Copyright (c) 2011-2019 Hirschmann Automation and Control GmbH
All rights reserved
MSP30 Release HiOS-3A-07.0.08
(Build date 2019-07-24 08:47)

System Name : MSP-ECE555926160
Management IP : 0.0.0.0
Subnet Mask : 0.0.0.0
1. Router IP : 172.16.120.252
Base MAC : EC:E5:55:92:61:60
System Time : 2019-08-26 03:45:29

User:admin
Password:*****

NOTE: Enter '?' for Command Help. Command help displays all options
that are valid for the particular mode.
For the syntax of a particular command form, please
consult the documentation.

!(MSP)>enable
!(MSP)#configure
!(MSP)(Config)#ip vrrp operation
!(MSP)(Config)#interface 1/1
!(MSP)((Interface)1/1)#ip vrrp add 10
!(MSP)((Interface)1/1)#ip vrrp virtual-address add 10 192.168.1.222
!(MSP)((Interface)1/1)#ip vrrp modify 10 priority 100
!(MSP)((Interface)1/1)#ip vrrp enable 10
!*(MSP)((Interface)1/1)#exit
!*(MSP)(Config)#interface 1/2
!*(MSP)((Interface)1/2)#ip vrrp add 20
!*(MSP)((Interface)1/2)#ip vrrp virtual-address add 20 172.16.120.254
!*(MSP)((Interface)1/2)#ip vrrp modify 20 priority 100
!*(MSP)((Interface)1/2)#ip vrrp enable 20
!*(MSP)((Interface)1/2)#exit
!*(MSP)(Config)#exit
!*(MSP)#exit
!*(MSP)>
```

On Router # 2:

```
Tera Term Web 3.1 - COM4 VT
File Edit Setup Web Control Window Help

Copyright (c) 2011-2019 Hirschmann Automation and Control GmbH
All rights reserved
MSP30 Release HiOS-3A-07.0.08
(Build date 2019-07-24 08:47)

System Name      : MSP-ECE5559262E0
Management IP    : 0.0.0.0
Subnet Mask      : 0.0.0.0
1. Router IP     : 172.16.120.253
Base MAC         : EC:E5:55:92:62:E0
System Time      : 2019-08-26 20:16:48

User:admin
Password:*****

NOTE: Enter '?' for Command Help. Command help displays all options
      that are valid for the particular mode.
      For the syntax of a particular command form, please
      consult the documentation.

!(MSP)>enable
!(MSP)#configure
!(MSP)(Config)#ip vrrp operation
!(MSP)(Config)#interface 1/1
!(MSP)((Interface)1/1)#ip vrrp add 10
!(MSP)((Interface)1/1)#ip vrrp virtual-address add 10 192.168.1.222
!(MSP)((Interface)1/1)#ip vrrp modify 10 priority 80
!(MSP)((Interface)1/1)#ip vrrp enable 10
!(MSP)((Interface)1/1)#exit
!(MSP)(Config)#interface 1/2
!(MSP)((Interface)1/2)#ip vrrp add 20
!(MSP)((Interface)1/2)#ip vrrp virtual-address add 20 172.16.120.254
!(MSP)((Interface)1/2)#ip vrrp modify 20 priority 80
!(MSP)((Interface)1/2)#ip vrrp enable 20
!(MSP)((Interface)1/2)#exit
!(MSP)(Config)#exit
!*(MSP)#exit
!*(MSP)>
```