NetCommWireless

Virtual Router Redundancy Protocol (VRRP)

Technical Support Guide

Please note: This document is subject to change without notice.

DOCUMENT VERSION	DATE
1.0 - Initial document release	28 July 2015

Table 1 - Document Revision History

Note: Before performing the instructions in this guide, please ensure that you have the latest firmware version installed on your router. Visit http://www.netcommwireless.com to download the latest firmware.

Table of contents

Applicable devices

This document is applicable to the following NetComm Wireless devices:

- NTC-6908
- NTC-6908-02
- NTC-6520
- NTC-6200
- NTC-30WV
- NTC-30WV-02
- NTC-40WV
- NTC-140W
- NWL-11
- NWL-15

Introduction

What is VRRP?

VRRP (Virtual Router Redundancy Protocol) is a non-proprietary redundancy protocol designed to increase the availability of the default gateway servicing hosts on the same subnet. The Virtual Router Redundancy Protocol is a standards-based alternative to Cisco's proprietary Hot Standby Router Protocol (HSRP) concept defined in IETF standard RFC 3768. The two technologies are similar in concept, but are not compatible. The advantage of using VRRP is that you gain a higher availability for the default path without requiring configuration of dynamic routing or router discovery protocols on every end host.

VRRP routers, viewed as a "redundancy group", share the responsibility for forwarding packets as if they "owned" the IP address corresponding to the default gateway configured on the hosts. At any time, one of the VRRP routers acts as the master, and other VRRP routers act as backups. If the master router fails, a backup router becomes the new master. In this way, router redundancy is always provided, allowing traffic on the LAN to be routed without relying on a single router.

The physical router that is currently forwarding data on behalf of the virtual router is called the master router. There is always a master for the shared IP address. If the master goes down, the remaining VRRP routers elect a new master VRRP router. The new master forwards packets on behalf of the owner by taking over the virtual MAC address used by the owner.

Master routers have a priority of 255 and backup router(s) can have priority between 1 and 254. A virtual router must use 00-00-5E-00-01-XX as its (MAC) address. The last byte of the address (XX) is the Virtual Router Identifier (VRID), which is different for each virtual router in the network. This address is used by only one physical router at a time, and is the only way that other physical routers can identify the master router within a virtual router.

VRRP Terminology

Virtual Router

A single router image created through the operation of one or more routers running VRRP.

VRRP Instance

A program, implementing VRRP, running on a router. A single VRRP instance can provide VRRP capability for more than one virtual router.

Virtual Router ID

Also called VRID, this is a numerical identification of a particular virtual router. VRIDs must be unique on a given network segment.

Virtual Router IP

An IP address associated with a VRID that other hosts can use to obtain network service from. The VRIP is managed by the VRRP instances belonging to a VRID.

Virtual MAC address

For media that use MAC addressing (such as Ethernet), VRRP instances use predefined MAC addresses for all VRRP actions instead of the real adapter MAC addresses. This isolates the operation of the virtual router from the real router providing the routing function. The VMAC is derived from the VRID.

Master

The one VRRP instance that performs the routing function for the virtual router at a given time. Only one master is active at a time for a given VRID. Also refers to the state of the VRRP FSM when the VRRP instance is operating as master (that is, “master state”).

Backup

VRRP instances for a VRID that are active but not in the master state. Any number of backups can exist for a VRID. Backups are ready to take on the role of master if the current master fails. Also refers to the state of the VRRP FSM when the VRRP instance is operating as backup (that is, “backup state”).

Priority

Different VRRP instances are assigned a priority value, as a way of determining which router will take on the role of master if the current master fails. *Priority is a number from 1 to 254 (0 and 255 are reserved)*. Larger numbers have higher priority.

Owner

If the virtual IP address is the same as any of the IP addresses configured on an interface of a router, that router is the owner of the virtual IP address. The priority of the VRRP instance when it is the VIP owner is 255, the highest (and reserved) value.

Router VRRP Configuration Page

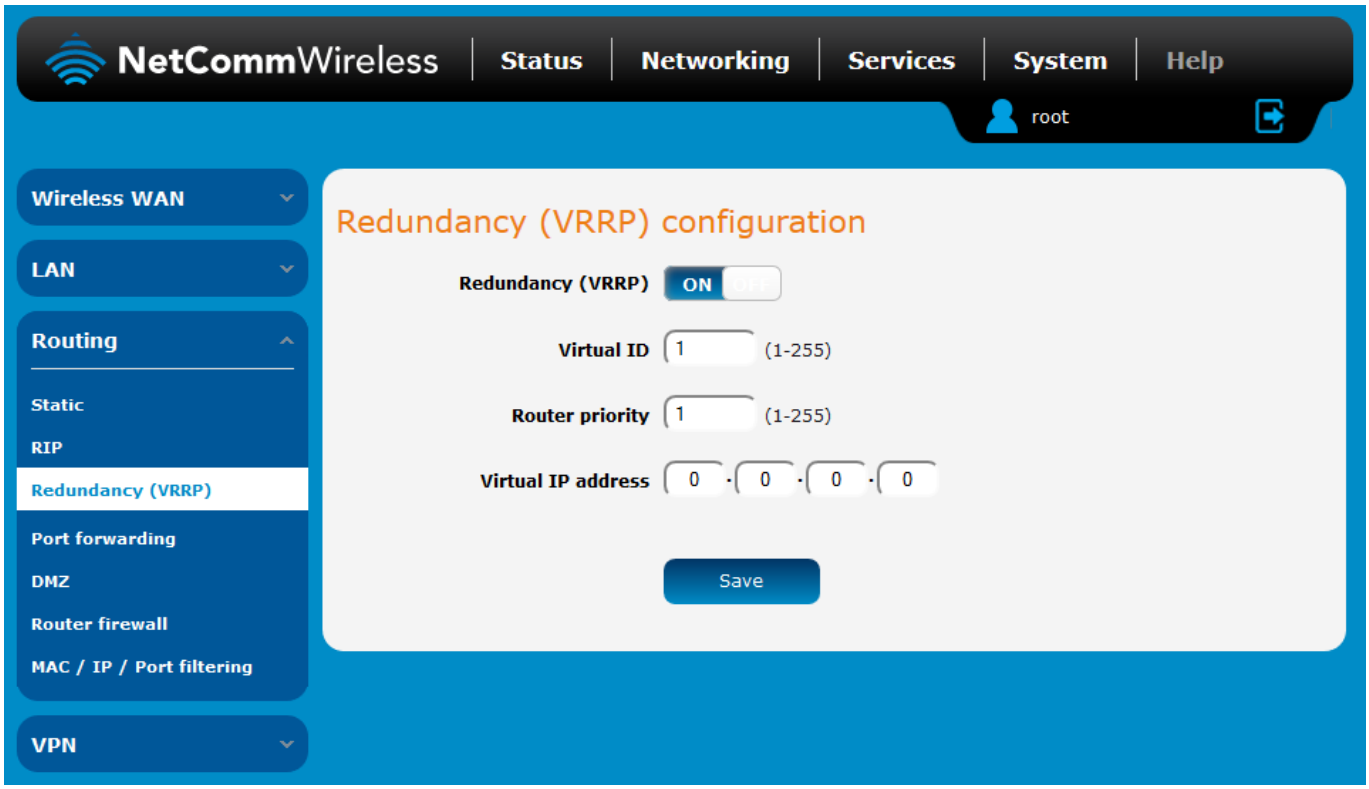


Figure 1 - NetComm M2M Router VRRP configuration page

ITEM	DEFINITION
Redundancy (VRRP)	Enables or disables the VRRP function.
Virtual ID	This is the VRRP ID which is different for each virtual router on the network.
Router Priority	The priority determining which router will take on the role of the master. A higher value has a higher priority.
Virtual IP address	This is the virtual IP address that both virtual routers share.

Table 2 - VRRP configuration items

NOTE: Configuring VRRP changes the MAC address of the Ethernet port and therefore if you want to resume with the web configuration you must use the new IP address (VRRP IP) or on a command prompt type: arp –d <ip address> (i.e arp –d 192.168.1.50) to clear the arp cache.(old MAC address).

VRRP in Action – How it operates on Ethernet

Device Configuration

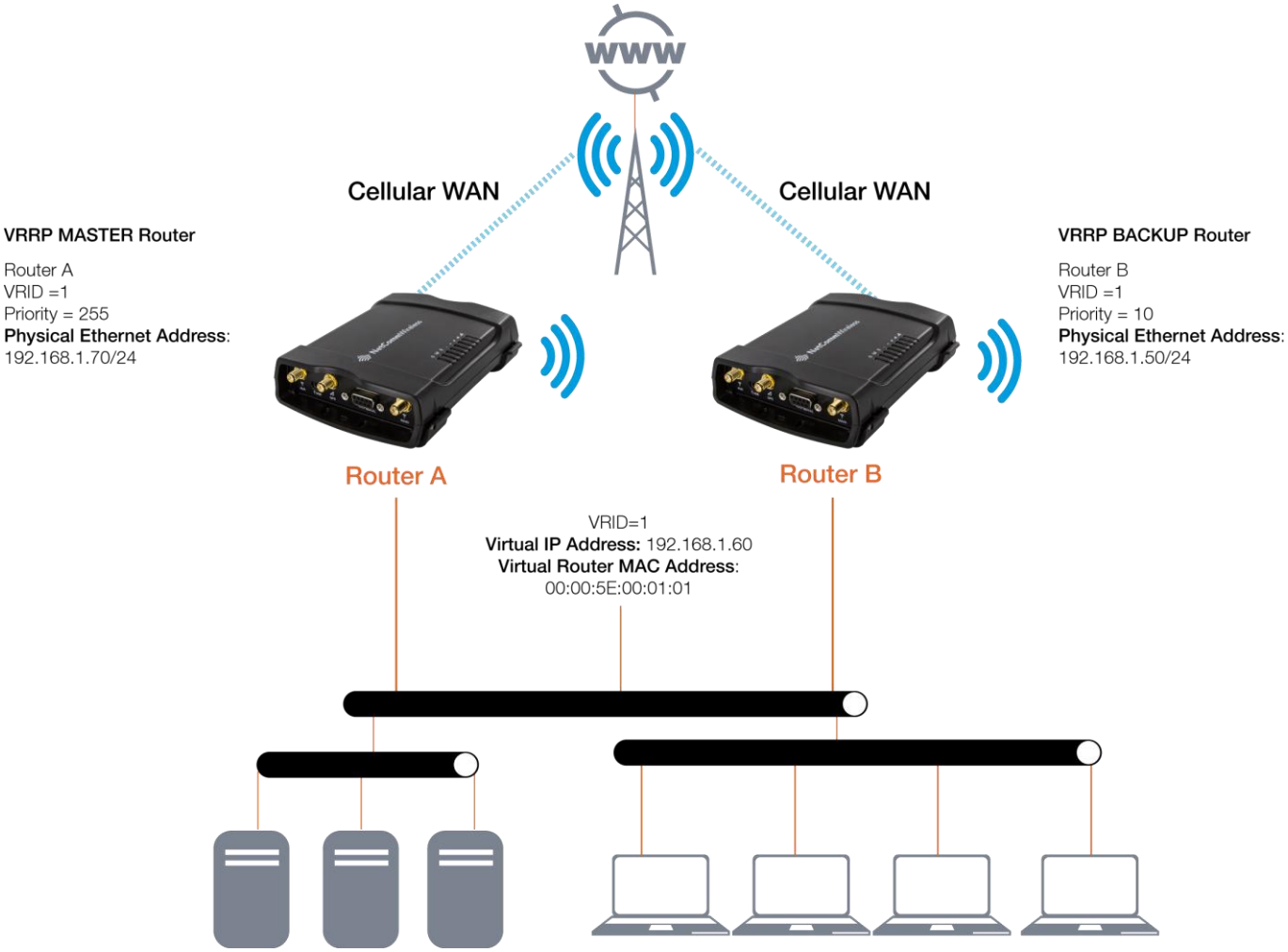


Figure 2 - VRRP in Action - How it operates on Ethernet

Referring to the logical network diagram, in our example, we have configured Router A's priority to be 255 and Router B's priority to be 10. If we did not set the priority on the routers, Router A would have become the master because the IP address of its Ethernet interface is higher than that of Router B.

Tips:

- It is a good idea for your priority values to be at extremes, as it helps the protocol make "clean state" transitions.
- When planning your VRRP configuration, we recommended that you decide in advance which instance will be your preferred master with highest priority. Configuring the preferred master's startup state allows it to transition straight to master when it is started, rather than waiting for advertisements from other instances.

Router A Configuration

1. Establish a mobile broadband connection. See the device's User Guide for detailed instructions.

2. Click the **Networking** menu from the top of the screen, then select the **LAN** folder on the left and finally, click the **LAN** menu item. Configure the LAN IP address

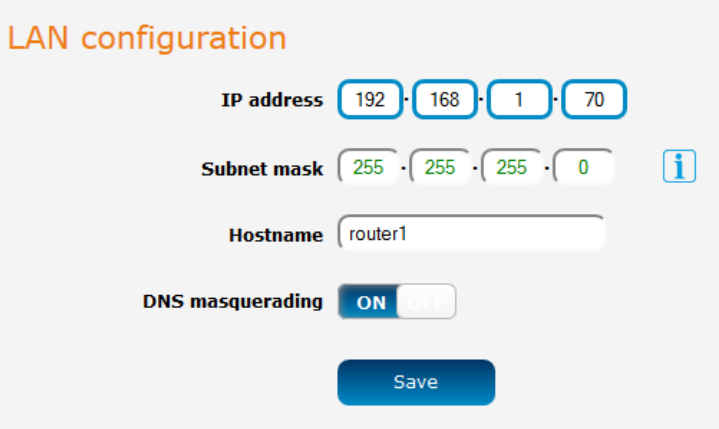


Figure 3 – Router A LAN IP Address Configuration

3. Under the LAN folder on the left side of the screen, click the **DHCP** menu item. Configure the DHCP Server settings:

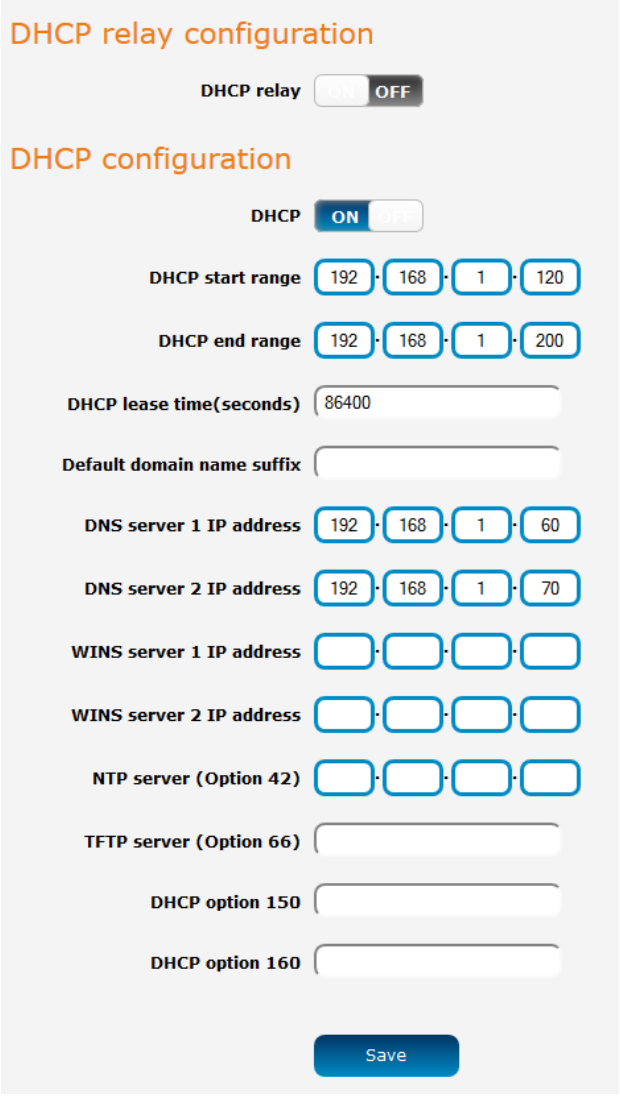


Figure 4 – Router A LAN DHCP Server Configuration Settings

4. Click the **Routing** menu on the left side of the screen and then click the **Redundancy (VRRP)** menu item. Click the **Redundancy (VRRP)** toggle key to turn VRRP on. Configure the VRRP settings:

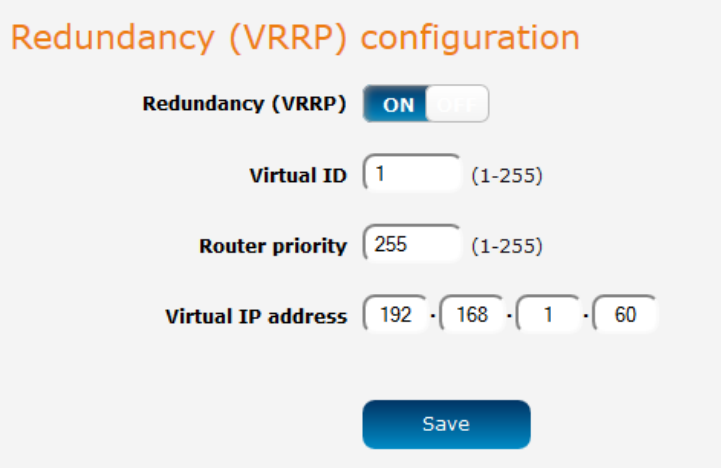


Figure 5 – Router A VRRP Configuration Settings

5. Click **Save** and reboot the router. When it has finished starting up, click the **Status** link to see the LAN settings. The MAC address of Router A changes to the VRRP virtual MAC address 00:00:5E:00:01:01 where the last octet '01' is the Virtual Device ID.

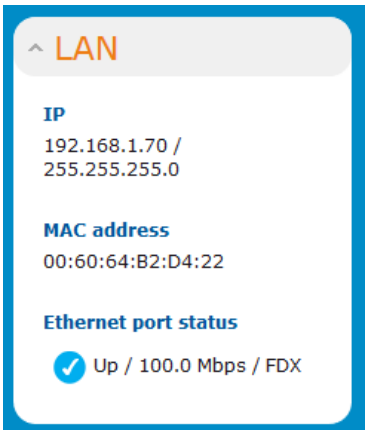


Figure 6 – Router A's VRRP LAN address

Router B Configuration

1. Establish a mobile broadband connection. See the device's User Guide for detailed instructions.

2. Click the **Networking** menu from the top of the screen, then select the **LAN** folder on the left and finally, click the **LAN** menu item. Configure the LAN IP address

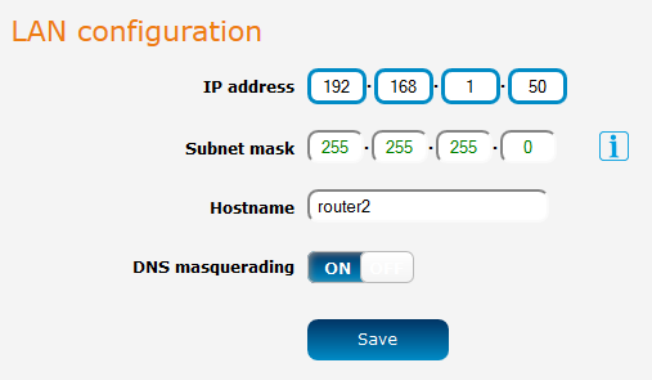


Figure 7 – Router B LAN IP Address Configuration

3. Under the LAN folder on the left side of the screen, click the **DHCP** menu item. Configure the DHCP Server settings:

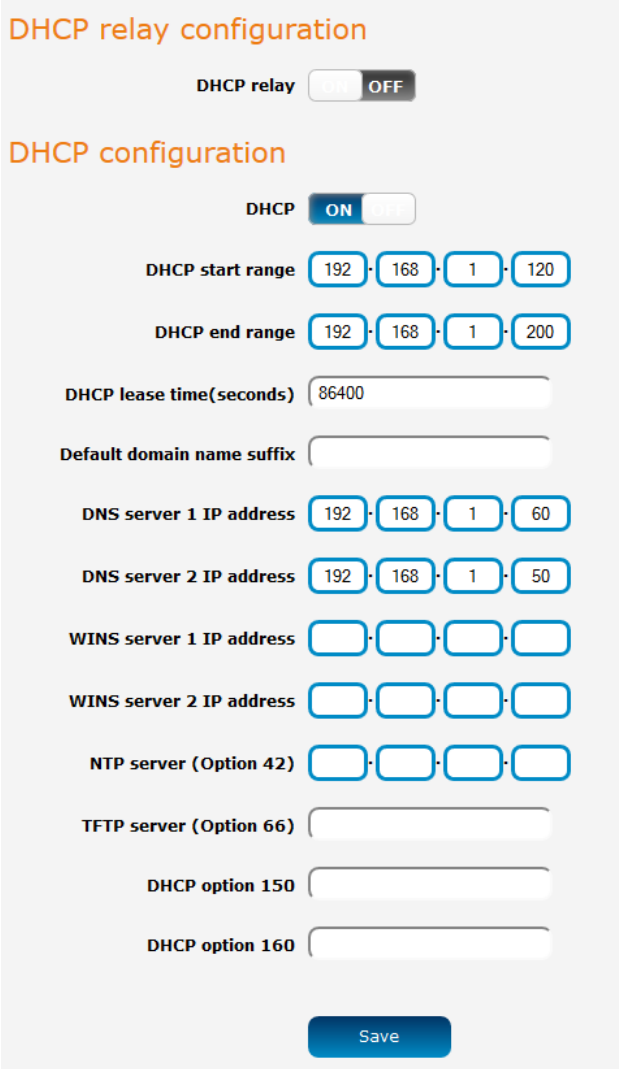


Figure 8 – Router B LAN DHCP Server Configuration Settings

4. Click the **Routing** menu on the left side of the screen and then click the **Redundancy (VRRP)** menu item. Click the **Redundancy (VRRP)** toggle key to turn VRRP on. Configure the VRRP settings:

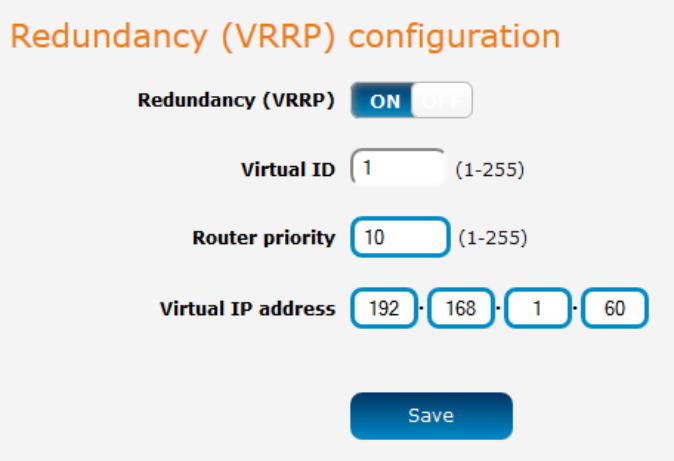


Figure 9 – Router B VRRP Configuration Settings

5. Click **Save** and reboot the router. When it has finished starting up, click the **Status** link to see the LAN settings. The MAC address of Router A changes to the VRRP virtual MAC address 00:00:5E:00:01:01 where the last octet '01' is the Virtual Device ID.

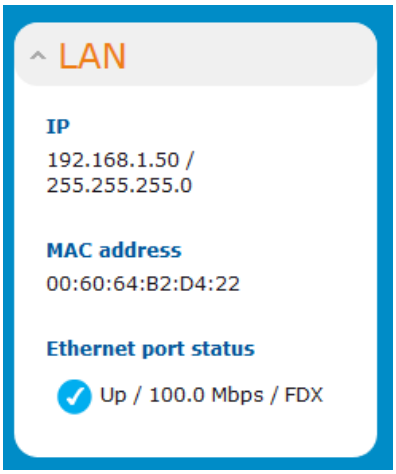


Figure 10 – Router B's VRRP LAN address

VRRP in Action – Test VRRP for 3G Mobile Broadband Failover Internet Connection on Ethernet

VRRP Experience from 'Test PC 1'

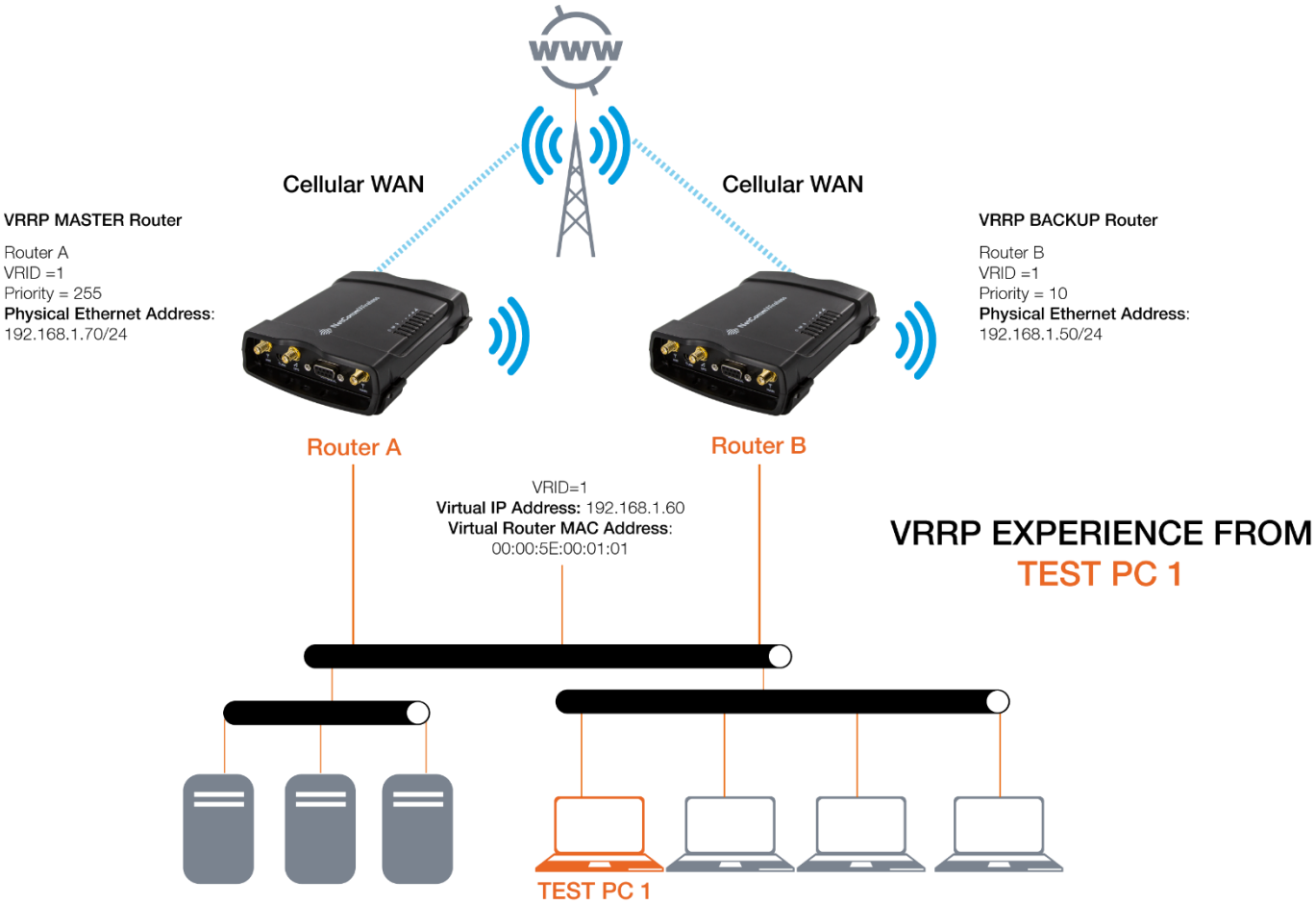
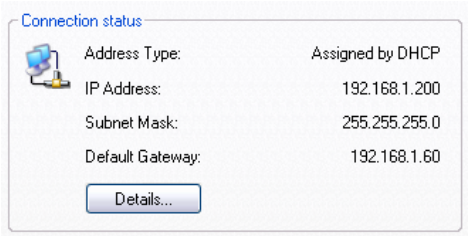


Figure 11 - VRRP concept generic logical network diagram

Test PC 1




```
C:\Documents and Settings\carmenl>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . . : 192.168.1.200
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        Default Gateway . . . . . . . . . : 192.168.1.60

C:\Documents and Settings\carmenl>arp -a

Interface: 192.168.1.200 --- 0x2
  Internet Address      Physical Address      Type
  192.168.1.50          00-00-5e-00-01-01     dynamic
  192.168.1.60          00-00-5e-00-01-01     dynamic
  192.168.1.70          00-00-5e-00-01-01     dynamic
```

Figure 12 - Test PC 1 configuration

When both Cellular Routers are up, the master VRRP router, Router A is used as the default internet gateway.

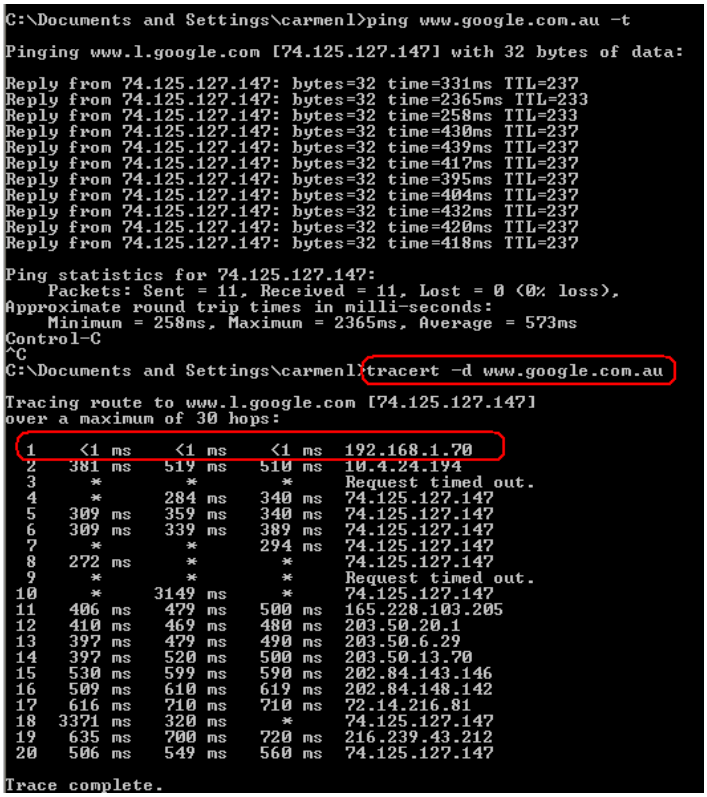


Figure 13 – Router A as default internet gateway

When Master Router A is down, the backup router, Router B becomes the gateway to the internet.

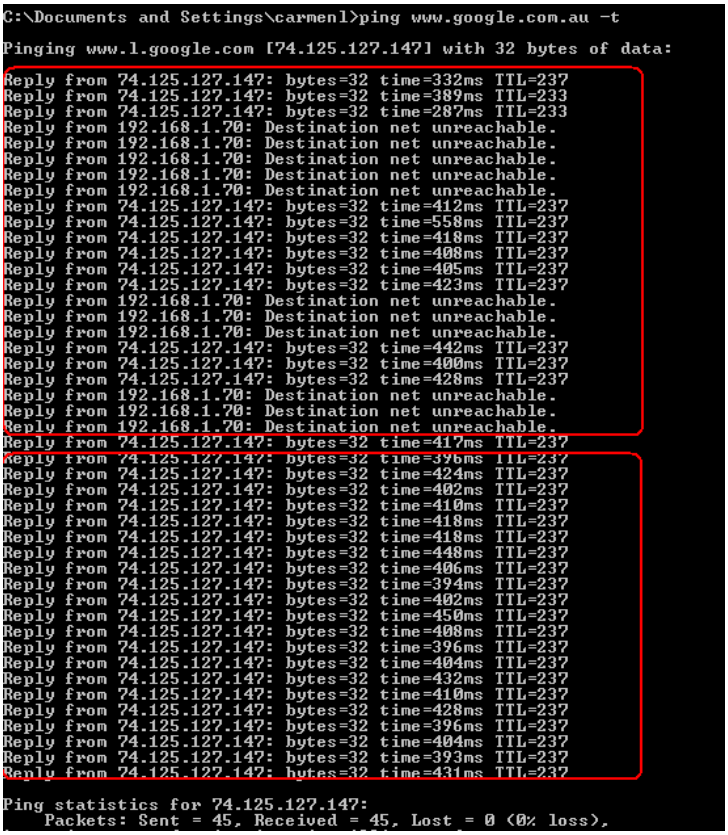


Figure 14 - Router B becomes the internet gateway

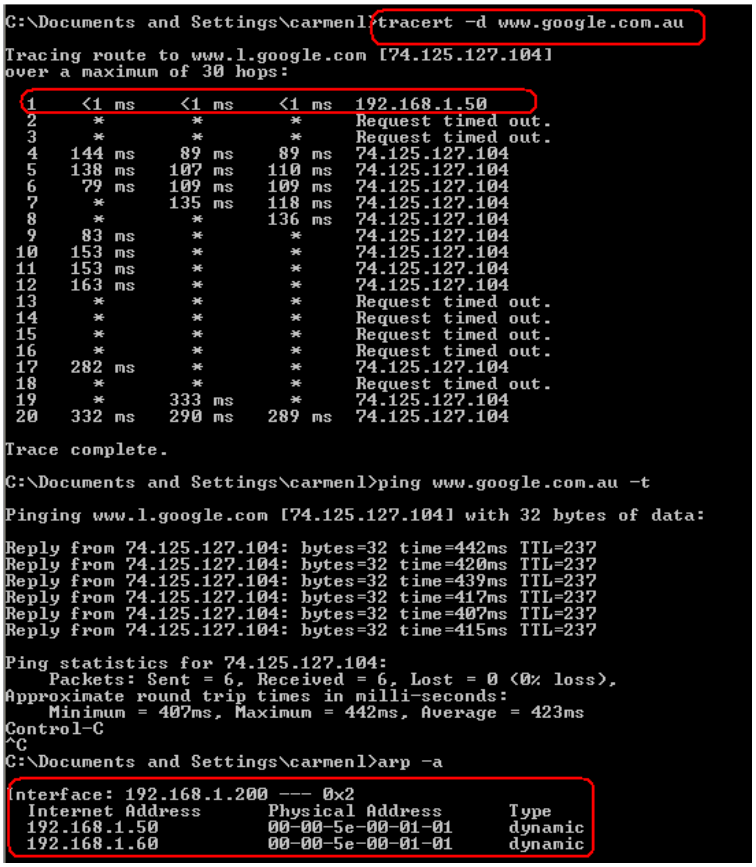


Figure 15 - Router B as internet gateway

When Master Router A's (192.168.1.70) 3G connection is back online, Master Router A becomes the internet gateway.

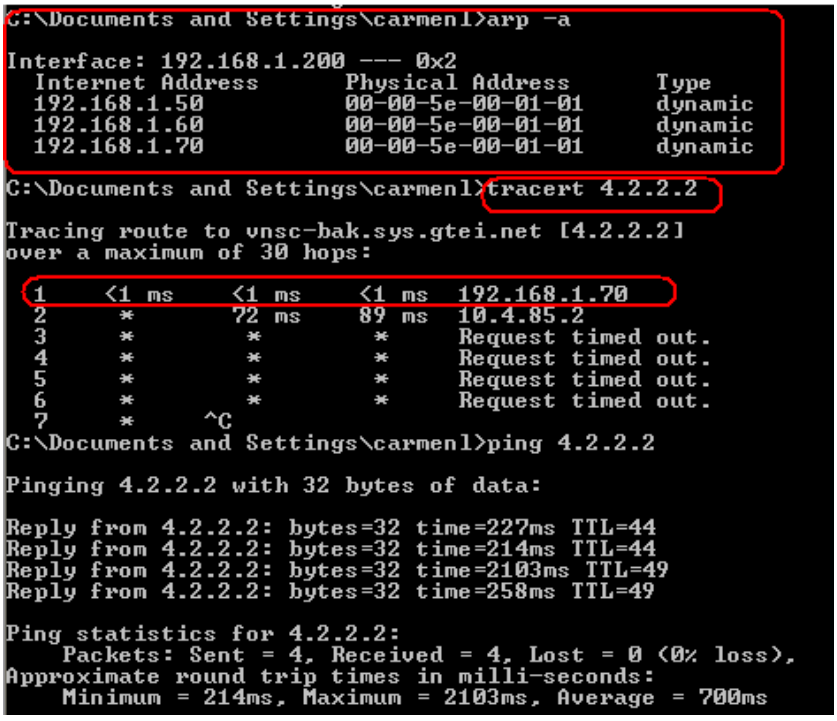


Figure 16 - Router A as internet gateway after connection is restored