



VRRP Configuration Guide





Document History

This guide covers the following products:

- Vodafone MachineLink 4G Lite NWL-221
- Vodafone MachineLink 4G Lite NWL-222
- Vodafone MachineLink 4G Lite NWL-224

Ver.	Document Description	Date
v. 1.0	Initial document release.	November 2019

Table i - 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://vodafone.netcommwireless.com to download the latest firmware.



Note – The functions described in this document require that the router is assigned with a publicly routable IP address. Please ensure that your mobile carrier has provided you with a publicly routable IP address before performing the instructions in this document.

Copyright

Copyright© 2019 NetComm Wireless Limited. All rights reserved.

Copyright© 2019 Vodafone Group Plc. All rights reserved.

The information contained herein is proprietary to NetComm Wireless and Vodafone. No part of this document may be translated, transcribed, reproduced, in any form, or by any means without prior written consent of NetComm Wireless and Vodafone.

Trademarks and registered trademarks are the property of NetComm Wireless Limited or Vodafone Group or their respective owners. Specifications are subject to change without notice. Images shown may vary slightly from the actual product.



Note - This document is subject to change without notice.





Contents

Introduction	
What is VRRP?	4
VRRP terminology	4
Virtual Router	4
VRRP Instance	4
Virtual Router ID (VRID)	4
Virtual Router IP	5
Virtual MAC address	5
Master	5
Backup.	5
Phoney	5
Uwirei	
Router VRRP configuration	6
VRRP in action – How it operates on the Ethernet	8
Configuration diagram	8
MachineLink router 'A' configuration	9
LAN configuration	9
DHCP configuration	
Redundancy (VRRP) configuration	
Confirm MAC address of MachineLink router 'A'	
MachineLink router 'B' configuration	14
LAN configuration	
DHCP configuration	
Redundancy (VRRP) configuration	
Confirm MAC address of MachineLink router 'B'	
VRRP in Action	
VRRP experience from 'Test PC 1'	20
1621 PC 1	
Using the VRRP WAN watchdog	
Ping monitor	27

Notation

The following symbols are used in this user guide:



Note – The following note provides useful information.



Important – The following note requires attention.



Warning – The following note provides a warning.





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 1-254.

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 (VRID)

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 in order to determine 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

Open a web browser and navigate to the LAN IP address of the MachineLink router. The default is http://192.168.1.1.

1 Login to the router with the following credentials:

Username: root

i

Password:

Note – Original factory password is printed on the device's label on the underside of the router casing.
After the initial login you will be prompted to define your personal secure password.
Thereafter you must use that password to log in.

0	Status	Networking	Services	System	Help
	Log in				
		User	mame root	~	
			Log) in	

Figure 1: Login page





2 From the menu bar along the top of the screen, click on **Networking** then open the **Routing** menu on the left and select **Redundancy (VRRP)** from its drop-down menu.

					📑 Log out	Rroot
Status	Networking	Services	System	Help		
Wireless WAN	~	Redundancy (\	/RRP) confi	guration		
LAN	~	Redu	indancy (VRRP)			
Ethernet WAN/LAN	~		Virtual ID	1 (1-255)		
PPPoE			Router priority	1 (1-255)		
WAN failover		Vi	rtual IP address	0 - 0 - 0 - 0		
Routing	^					
Static RIP		VRRP	WAN watchdog	OFF		
Redundancy (VRRP)				Save		
DMZ						
Router firewall MAC / IP / Port filtering						
VPN	~					

Figure 2 – Vodafone MachineLink router VRRP configuration page

5 Enable the **Redundancy (VRRP)** checkbox and the following fields will be displayed:

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 1 – 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 the Ethernet

Configuration diagram



Figure 3 – VRRP in action - How it operates on Ethernet

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





MachineLink router 'A' configuration

LAN configuration

- 1 Establish a mobile broadband connection. See the Vodafone MachineLink User Guide for detailed instructions.
- 2 Open the **Networking** menu from the taskbar at top of the screen, then open the **LAN** menu from the menu on the left and click **LAN** from the drop-down menu.
- 3 Configure the LAN IP address using the fields on the **LAN configuration** page:

					→ Log out	A root
O Status	Networki	ing Service	es System	Help		
Wireless WAN	~	LAN config	uration			
LAN	^		IP address	192 · 168 · 1 · 70		
LAN			Subnet mask	255 · 255 · 255 · 0		
DHCP			Hostname	my.router		
Ethernet WAN/LAN	~		DNS masquerading			
PPPoE		l	bits musqueruunig			
WAN failover				Save		
Routing	~					
VDN						
VPN	Ť					

Figure 4 – MachineLink 'A' LAN IP address configuration

ltem	Description	Value
IP address	Change the last octet of the IP address from "1" to "70".	192.168.1.70
Subnet mask	Retain the default Subnet mask.	255.255.255.0
Hostname	Retain the default Hostname of my.router.	my.router
DNS masquerading	Turn DNS masquerading ON so that the DHCP server embedded in the MachineLink hands out its own IP address (e.g. 192.168.1.70) as the DNS server address to LAN clients.	ON

Table 5 – MachineLink 'A' LAN IP Address configuration settings details

4 Click Save.





5 The router will close and reopen in the new IP address:



6 As the IP address has changed, you will be prompted to log in to the new address.

DHCP configuration

- 1 Open the **Networking** menu from the taskbar at top of the screen, then open the **LAN** menu from the menu on the left and click **DHCP** from the drop-down menu.
- 2 Configure the DHCP using the fields in the **DHCP configuration** section of the page:

				⊢→ Log out	R root
O Status	Networki	ng Services System	Help		
Wireless WAN	~	DHCP relay configuration			
LAN	^	DHCP relay	OFF		
		DHCP configuration		ן	
DHCP		DHCP	ON		
Ethernet WAN/LAN	~	DHCP start range	192 · 168 · 1 · 100		
PPPoE		DHCP end range	192 - 168 - 1 - 199		
WAN failover		DHCP lease time(seconds)	86400		
Routing	~	Default domain name suffix			
VPN	~	DNS server 1 IP address	192 - 168 - 1 - 60		
		DNS server 2 IP address	192 • 168 • 1 • 70		
		WINS server 1 IP address	0.0.0.0		
		WINS server 2 IP address	0.0.0.0		
		NTP server (Option 42)	0.0.0.0		
		TFTP server (Option 66)			
		DHCP option 150			
		DHCP option 160			
			Save		
		L		J	

Figure 6 – MachineLink 'A' DHCP server configuration settings





ltem	Description	Value
DHCP toggle switch	Toggle "ON" to display all DHCP configuration options.	ON
DHCP start range	Sets the first IP address of the DHCP range.	192.168.1.120
DHCP end range	Sets the last IP address of the DHCP range.	192.168.1.200
DHCP lease time (seconds)	The length of time in seconds that DHCP allocated IP addresses are valid.	86400 seconds (24 hours)
Default domain name suffix	Specifies the default domain name suffix for the DHCP clients.	Can be left blank
DNS server 1 IP address	Specifies the primary DNS (Domain Name System) server's IP address.	192.168.1.60
DNS server 2 IP address	Specifies the secondary DNS (Domain Name System) server's IP address.	192.168.1.70
WINS server 1 IP address	Specifies the primary WINS (Windows Internet Name Service) server IP address.	0.0.0.0
WINS server 2 IP address	Specifies the secondary WINS (Windows Internet Name Service) server IP address.	0.0.0.0
NTP server (option 42)	The IP address of the NTP (Network Time Protocol) server.	Leave blank
TFTP server (option 66)	The TFTP (Trivial File Transfer Protocol) server.	Leave blank
DHCP option 150	Used to configure Cisco IP phones.	Leave blank
DHCP option 160	Used to configure Polycom IP phones.	Leave blank

Table 7 – MachineLink 'A' DCHP server configuration settings details

3 Click Save.





Redundancy (VRRP) configuration

- 1 Open the **Networking** menu from the taskbar at top of the screen, then open the **Routing** menu from the menu on the left and select **Redundancy (VRRP)** from the drop-down menu.
- 2 Click the **Redundancy (VRRP)** toggle key **ON** to display the VRRP configuration fields.
- 3 Configure the VRRP settings:

				☐→ Log out	R root
Status	Networking	Services System	Help		
Wireless WAN	~ R	edundancy (VRRP) conf	iguration		
LAN	~	Redundancy (VRRP)			
Ethernet WAN/LAN	~	Virtual ID	1 (1-255)		
PPPoE		Router priority	255 (1-255)		
WAN failover		Virtual IP address	192 - 168 - 1 - 60		
Routing	^				
Static RIP		VRRP WAN watchdog	OFF		
Redundancy (VRRP)			Save		
DMZ					
Router firewall					
MAC / IP / Port filtering					
VPN	~				

Figure 8 – MachineLink 'A' Redundancy (VRRP) configuration settings

Item	Description	Value
Redundancy (VRRP) toggle switch	Toggle "ON" to display all VRRP configuration options	I
Virtual ID	Enter an ID between 1 and 255. This is the VRRP ID which is different for each virtual router on the network.	1
Router priority	Value range is 1 thru 255. A higher value is a higher priority. As MachineLink 'A' will be the primary router, therefore it is set to the highest: priority: 255	255
Virtual IP address	This is the virtual IP address that both virtual routers share.	192.168.1.60

Table 9 – MachineLink 'A' Redundancy (VRRP) configuration settings details





4 Click **Save** and reboot the router.

Confirm MAC address of MachineLink router 'A'

When it has finished starting up, check the LAN settings on the Status page.



Figure 10 – MachineLink A's VRRP LAN address

The MAC address of MachineLink A changes to the VRRP virtual MAC address **00:00:5E:00:01:01** where the last octet '**01**' is the Virtual Device ID.





MachineLink router 'B' configuration

LAN configuration

- 1 Establish a mobile broadband connection. See the Vodafone MachineLink User Guide for detailed instructions.
- 2 Open the **Networking** menu from the taskbar at top of the screen, then open the **LAN** menu from the menu on the left and click **LAN** from the drop-down menu.
- 3 Configure the LAN IP address using the fields on the LAN configuration page:

		Ŀ	Log out 🛛 📿 root
O Status	Networking Services Syste	em Help	
Wireless WAN	 LAN configuration 		
LAN	^ IP ad	ddress 192 · 168 · 1 · 50	
LAN	Subnet	t mask 255 · 255 · 255 · 0	
DHCP	Host	tname my.router	
Ethernet WAN/LAN	~		
PPPoE	DNS masquer	rading	
WAN failovor		Save	
WAN Idilovei			
Routing	~		
VPN	~		

Figure 11 – MachineLink 'B' LAN IP Address Configuration

4 Use the same settings as for the LAN 'A' IP Address configuration with the following exceptions:

ltem	Description	Value
IP address	Change the last octet of the IP address from "1" to "50"	192.168.1. 50
Subnet mask		Same as in 'A'
Hostname		Same as in 'A'
DNS masquerading		Same as in 'A'

Table 12 – MachineLink 'B' LAN IP Address configuration settings details

5 Click Save.





6 The router close and will reopen in the new IP address:

💧 Login	×
$\leftrightarrow \Rightarrow {\tt G}$	192.168.1.50/index.html?src=/LAN.html

7 As the IP address has changed, you will be prompted to log in to the new address.





DHCP configuration

- 1 Open the **Networking** menu from the taskbar at top of the screen, then open the **LAN** menu from the menu on the left and click **DHCP** from the drop-down menu.
- 2 Configure the DHCP using the fields in the **DHCP configuration** section of the page:

Status	Networki	ng Services System	Groot A root
Wireless WAN	~	DHCP relay configuration	
LAN	^	DHCP relay	OFF
LAN		DHCP configuration	
DHOP		DHCP	ON
Ethernet WAN/LAN	~	DHCP start range	192 - 168 - 1 - 100
WAN failover		DHCP end range	192 - 168 - 1 - 199
Routing	~	DHCP lease time(seconds)	86400
VPN	~	Default domain name suffix	
		DNS server 1 IP address	192 - 168 - 1 - 60
		DNS server 2 IP address	192 - 168 - 1 - 50
		WINS server 1 IP address	0.0.0
		WINS server 2 IP address	0.0.0
		NTP server (Option 42)	0.0.0
		TFTP server (Option 66)	
		DHCP option 150	
		DHCP option 160	
			Save

Figure 13 – MachineLink 'B' DHCP server configuration settings

3 Use the same settings as for the DHCP server 'A' configuration with the following exceptions:

Item	Description	Value
DHCP toggle switch	Toggle "ON" to display all DHCP config options	ON





ltem	Description	Value	
DHCP start range	Sets the first IP address of the DHCP range Same as		
DHCP end range	Sets the last IP address of the DHCP range	Same as in 'A'	
DHCP lease time (seconds)	The length of time in seconds that DHCP allocated IP addresses are valid.	Same as in 'A'	
Default domain name suffix	Specifies the default domain name suffix for the DHCP clients.	Leave Blank	
DNS server 1 IP address	Specifies the primary DNS (Domain Name System) server's IP address.	Same as in 'A'	
DNS server 2 IP address	Specifies the secondary DNS (Domain Name System) server's IP address.	192.168.1.50	
WINS server 1 IP address	Specifies the primary WINS (Windows Internet Name Service) server IP address.	Same as in 'A'	
WINS server 2 IP address	Specifies the secondary WINS (Windows Internet Name Service) server IP address.	Same as in 'A'	
NTP server (option 42)	The IP address of the NTP (Network Time Protocol) server.	Leave blank	
TFTP server (option 66)	The TFTP (Trivial File Transfer Protocol) server.	Leave blank	
DHCP option 150	Used to configure Cisco IP phones.	Leave blank	
DHCP option 160	Used to configure Polycom IP phones.	Leave blank	

Table 14 – MachineLink 'B' DCHP server configuration settings details

4 Click Save.





Redundancy (VRRP) configuration

- 1 Open the **Networking** menu from the taskbar at top of the screen, then open the **Routing** menu from the menu on the left and select **Redundancy (VRRP)** from the drop-down menu.
- 2 Click the **Redundancy (VRRP)** toggle key ON to display the VRRP configuration fields.
- 3 Configure the VRRP settings:

					☐→ Log out	Rroot
Status	Networking	Services	System	Help		
Wireless WAN	~ R	edundancy (V	/RRP) confi	guration		
LAN	~	Redu	ndancy (VRRP)			
Ethernet WAN/LAN	~		Virtual ID	1 (1-255)		
PPPoE			Router priority	10 (1-255)		
WAN failover		Vir	tual IP address	192 - 168 - 1 - 60		
Routing	^					
Static RIP		VRRP	WAN watchdog	OFF		
Redundancy (VRRP)				Save		
Port forwarding DMZ						
Router firewall						
MAC / IP / Port filtering						
VPN	~					

Figure 15 – MachineLink 'B' VRRP configuration settings

4 Use the same settings as for the VRRP 'A' configuration with the following exception:

Item	Description	Value
Redundancy (VRRP) toggle switch	Toggle "ON" to display all VRRP configuration options	I
Virtual ID		Same as 'A'
Router priority	Value range is 1 thru 255. A higher value is a higher priority. MachineLink 'B' will be the secondary router, therefore set the router priority at a very low level: 10	10
Virtual IP address		Same as 'A'

Table 17 – MachineLink 'B' Redundancy (VRRP) configuration settings details





5 Click **Save** and reboot the router.

Confirm MAC address of MachineLink router 'B'

When it has finished starting up, check the LAN settings on the **Status** page.



Figure 18 – MachineLink 'B"s VRRP LAN address

The MAC address of MachineLink "B" changes to the VRRP virtual MAC address 00:00:5E:00:01:01 where the last octet '01' is the Virtual Device ID.





VRRP in Action

VRRP experience from 'Test PC 1'



Figure 19 - VRRP concept generic logical network diagram





Test PC 1

Connection status				
1	Address Type:	Assigned by DHCP		
2	IP Address:	192.168.1.200		
	Subnet Mask:	255.255.255.0		
	Default Gateway:	192.168.1.60		
	Details			

Figure 20 – VRRP connection status details

C:\Documents and Settings\carmenl>ipconfig
Windows IP Configuration
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : IP Address
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 21 – Test PC 1 configuration





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

C:\D	ocumer	nts a	ind Se	etting	ſs∕ca	armen	l>ping www.google.com.au −t
Ping	ing wu	w.l.	aooa]	le.com	n [74	1.125	5.127.147] with 32 bytes of data:
Repl	y fro	n <u>74</u> .	125.1	127.14	17:)	oytes	=32 time=331ms TTL=237
Rep1	y from	n 74.	125.1	127.14	17: J	bytes	=32 time=2365ms TTL=233
Repl.	y from	n 74.	125.1	127.14	17: I	bytes	=32 time=258ms TTL=233
Rep1	y from	n 74.	125.1	127.14	17: I	bytes	=32 time=430ms TTL=237
Rep1	y from	n 74.	125.1	127.14	17: I	bytes	=32 time=439ms TTL=237
Rep1	y from	n 74.	125.1	127.14	l7:)	bytes	=32 time=417ms TTL=237
Repl	y from	n 74.	125.1	127.14	17: J	bytes	=32 time=395ms TTL=237
Repl	y from	n 74.	125.1	127.14	17: J	bytes	=32 time=404ms TTL=237
Repl	y from	n <u>74</u> .	125.1	127.14	17: J	bytes	=32 time=432ms TTL=237
Repl	y from	n <u>74</u> .	125.1	127.14	17: J	bytes	=32 time=420ms TTL=237
Repl	y fro	n 74.	125.1	127.14	17:)	bytes	=32 time=418ms TTL=237
Ping	stat: Packet	istic	s for	• 74.1 = 11.	.25.1 Rece	27.1	47: = 11. Lost = 0 (0% loss).
Appr	oximat	te ro	und t	trip t	imes	in	milli-seconds:
	Minimu	.m =	258ms	s, Max	cimur	n = 2	365ms, Average = 573ms
Cont	rol-C						·····
^C							
C:\D	ocumer	nts a	ind Se	etting	(s∖ca	armen	1) tracert -d www.google.com.au
Trac	ing ro	nute	to un				
		,	LU WV	ww.r.g	loodi	Le.co	M [74.125.127.147]
over	a max	kimum	i of 3	30 hop	10081 10081	Le.co	om [74.125.127.147]
over	a max	cimum	1 of 3	30 hop	10091)S: /1		192 168 1 70
over	a max	cimum ms	of 3	W.1.9 30 hop ms	1009) s: <1	ms	192.168.1.70
over	a max <1 381	kimum ms ms	of 3	w.1.9 30 hop ms ms	009])s: (1 510	ms ms	192.168.1.70 10.4.24.194 Perguest timed out
over 1 2 3	a max <1 381 *	kimum ms ms	ن of 3 (1 517 284	30.1.9 30 hop ms ms	0093)s: (1 510 *	ms ms	192.168.1.70 10.4.24.194 Request timed out. 24 125 127 147
over 1 2 3 4 5	a max <1 381 * 309	kimum ms ms	0 0 0 0 f 3 519 284 359	ms ms ms ms	(1 510 340 340	MS MS MS	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 24 125 127 147
over 1 2 3 4 5 6	a max <1 381 * 309 309	kimum ms ms ms	<pre></pre>	MS MS MS MS MS MS	510 340 320	ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147
over 1 2 3 4 5 6 7	a max <1 381 * 309 309 *	kimum ms ms ms ms	co w of 3 519 284 359 339	ms ms ms ms ms ms ms ms	510 340 389	MS MS MS MS MS	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147
over 12345 678	a max <pre></pre>	kimum ms ms ms ms	co w of 3 519 284 359 339 *	ms ms ms ms ms ms ms ms	510 340 340 389 294	MS MS MS MS MS MS	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147
over 123456789	a max <1 381 * 309 309 * 272 *	ms ms ms ms ms ms	co w of 3 519 284 359 339 * *	ms ms ms ms ms ms ms	510 510 340 340 389 294 *	MS MS MS MS MS MS MS	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Perguest timed out
over 12345678910	a max <1 381 * 309 309 309 * 272 *	ms ms ms ms ms ms	co w of 3 519 284 359 339 * * *	ms ms ms ms ms ms ms	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	ns ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147
over 123456789101	a max <1 381 * 309 309 272 * 400	ms ms ms ms ms	<pre></pre>	ms ms ms ms ms ms ms	1009J 1000J 1000J 1000J 1000J 1000J 1000J 1000J 1000J 1000J 10	ns ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165 228 103 205
over 12345678901112	a max <1 381 * 309 309 309 272 * 406 416	ns ms ms ms ms ms	1 of 3 √1 519 284 359 339 * 3149 479	ms ms ms ms ms ms ms ms	510 510 510 510 340 340 389 294 * 500 480	ms ms ms ms ms ms ms ms	192.168.1.70 192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203 50 20 1
over 1234567899 1011213	a max <1 381 309 309 272 * 406 397	ms ms ms ms ms ms ms ms	<pre></pre>	ms ms ms ms ms ms ms ms ms	5009J 51 510 340 340 389 294 * 500 480 480	ms ms ms ms ms ms ms ms ms	192.168.1.70 19.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6 29
over 1234567890 11234 11234	a max <1 381 309 309 272 ** 406 410 397	ms ms ms ms ms ms ms ms ms ms ms	CO W of 3 519 519 284 359 339 * 3149 479 469 479 520	ms ms ms ms ms ms ms ms ms ms ms	510 510 510 340 340 340 389 294 ** 500 480 500 480 500	ns ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.6.29 203.50.6.127
over 12345678901112345 101112345	a max <1 381 309 309 272 406 410 397 530	ms ms ms ms ms ms ms ms ms ms ms ms ms	co w of 3 519 284 359 339 * * 3149 479 469 479 520	ms ms ms ms ms ms ms ms ms ms ms ms	510 510 510 340 340 340 389 294 ** 500 480 590 590	ns ms ms ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84 143 146
over 123456789011123456 101123456	a max (1 381 309 309 272 406 410 397 397 530	ms ms ms ms ms ms ms ms ms ms ms ms ms	CO W of 3 519 284 359 339 * 3149 479 469 479 520 590 519	ms ms ms ms ms ms ms ms ms ms ms ms ms	510 510 510 510 510 510 510 510	ns ms ms ms ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142
over 1234567890111234567	a max 381 381 309 309 272 406 410 397 530 509 616	ms ms ms ms ms ms ms ms ms ms ms ms ms	1 of 3 519 519 284 359 339 ** 3149 479 469 479 520 599 610	ms ms ms ms ms ms ms ms ms ms ms ms ms m	510 510 510 510 510 510 510 510	Le.co MS MS MS MS MS MS MS MS MS MS MS MS MS	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142 72.14.216 81
0 0 1 2 3 4 5 6 7 8 9 0 112345678 10 112345678 10 112345678 10 112345678 10 112345678 10 112345678 10 112345678 10 1123457678 10 1123457678778 10 112345778778778778778778778778778778778778778	a max 381 381 309 309 272 406 410 397 530 509 509 5101 3271	ms ms ms ms ms ms ms ms ms ms ms ms ms m	1 of 3 519 519 284 359 339 ** 3149 479 469 479 520 599 610 710	ms ms ms ms ms ms ms ms ms ms ms ms ms m	5 10 5 10 5 340 340 389 340 389 5 500 5 500 5 500 610 710	ns ms ms ms ms ms ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142 72.14.216.81 74.125.127.147
over 123456789911123456789	a max <pre></pre>	ms ms ms ms ms ms ms ms ms ms ms ms ms m	C 0 4 0 of 3 519 284 359 339 479 479 479 479 479 520 599 610 3200 710 3200	M. 1.9 M. hop ms ms ms ms ms ms ms ms ms ms ms ms ms	510 510 510 510 340 340 389 294 500 389 500 590 50 590 50 50 50 50 50 50 50 5	Le.co MS MS MS MS MS MS MS MS MS MS MS MS	192.168.1.70 192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142 72.14.216.81 74.125.127.147 216.239.43.212
0 0 1 2 3 4 5 6 7 8 9 0 1 1 2 3 4 5 6 7 8 9 0 1 1 2 3 4 5 6 7 8 9 0 1 1 2 3 4 5 6 7 8 9 0 1 1 2 3 4 5 6 7 8 9 0 1 1 1 2 3 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	a max 381 381 309 309 272 406 410 397 530 509 616 3371 565 565	ms ms ms ms ms ms ms ms ms ms ms ms ms m	C o f (1) 519 519 284 359 339 479 479 479 479 599 610 710 320 749 599 610 749 599 610 749 509 740 509 740 509 740 509 509 509 509 500 740 500 500 500 500 500 500 500 5	No.1.99 No.1 MS MS MS MS MS MS MS MS MS MS MS MS MS	003 510 510 510 510 510 510 510 510	Le.co ms ms ms ms ms ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142 72.14.216.81 74.125.127.147 216.239.43.212 24.125.127.147
00012345678901112341567890111234156789011234156789011234156789011234156789001123415678900112341567890011234156789001123415678900112341567890011234156789001123415678900112341567890011234156789001123415678900112341567890011234156789001123415678900112341567890011234156789000000000000000000000000000000000000	a max 381 381 309 309 272 406 410 397 530 509 616 3371 635 506	ms ms ms ms ms ms ms ms ms ms ms ms ms m	cof of 519 519 284 359 339 479 479 479 479 520 710 320 700 549	No 1.99 No hop ms ms ms ms ms ms ms ms ms ms ms ms ms	530 510 510 340 3894 5340 3894 500 590 590 710 720 720 756	Le.co ms ms ms ms ms ms ms ms ms ms ms ms ms	192.168.1.70 10.4.24.194 Request timed out. 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 74.125.127.147 Request timed out. 74.125.127.147 165.228.103.205 203.50.20.1 203.50.6.29 203.50.13.70 202.84.143.146 202.84.148.142 72.14.216.81 74.125.127.147 216.239.43.212 74.125.127.147

Figure 22 – MachineLink 'A' as default internet gateway





When master router MachineLink 'A' is down, the backup router MachineLink 'B' becomes the gateway to the internet.

C:\Documents and Settings\carmenl>ping www.google.com.au -t
Pinging www.l.google.com [74.125.127.147] with 32 bytes of data:
Reply from 74.125.127.147: bytes=32 time=332ms TTL=237
Reply from 74.125.127.147: bytes=32 time=389ms ITL=233
Reply from 74.125.127.147: bytes=32 time=287ms ITL=233
Reply from 192.168.1.70: Destination net unreachable.
Reply from 192.168.1.70: Destination net unreachable.
Reply from 192.158.1.70: Destination net unreachable.
Reply from 192.168.1.70: Destination net unreachable.
Reply from $172.100.1.70$. Destination net unreachable.
Reply from 74.125.127.147. $Jytes=32$ time=f12018 111-237 Baylu fyom 74 195 197 147. butes=32 time=528ms TT=237
Reply from 74.125.127.147. bytes $=32$ time $=330$ ms $111-237$
Reply from 74.125.127.147. bytes -32 time -410 ms $111-237$
Reply from 74 125 127 147; butes 32 time=405ms TTL=237
Reply from 74.125.127.147: hytes=32 time=423ms TTL=237
Reply from 192.168.1.70: Destination net unreachable.
Reply from 192.168.1.70: Destination net unreachable.
Reply from 192.168.1.70: Destination net unreachable.
Reply from 74.125.127.147: bytes=32 time=442ms TTL=237
Reply from 74.125.127.147: bytes=32 time=400ms TTL=237
Reply from 74.125.127.147: bytes=32 time=428ms TTL=237
Reply from 192.168.1.70: Destination net unreachable.
Reply from 192.168.1.20: Destination net unreachable.
Reply from 192.168.1.70: Destination net unreachable.
Reply from 74.125.127.147: bytes=32 time=417ms IIL=237
Reply from 74.125.127.147: Dytes=32 time=396ms IIL=237
Reply from 74.125.127.147: Dytes=32 time=424ms 11L=237
$\frac{1}{100} + \frac{1}{100} + \frac{1}$
Reply from 74.125.127.147. $Jytes=32$ time=4100s $IIII=237$ Reply from 74.125.127.147. $butes=32$ time=4100s $IIII=237$
Reply from 74.125.127.147. bytes=32 time=410ms $11D=237$
Reply from 74 125 127 147 bytes =32 time =448ms TTL=237
Reply from 74.125.127.147: hytes=32 time=406ms TTL=237
Reply from 74.125.127.147: bytes=32 time=394ms ITL=237
Reply from 74.125.127.147: bytes=32 time=402ms TTL=237
Reply from 74.125.127.147: bytes=32 time=450ms TTL=237
Reply from 74.125.127.147: bytes=32 time=408ms TTL=237
Reply from 74.125.127.147: bytes=32 time=396ms TTL=237
Reply from 74.125.127.147: bytes=32 time=404ms TTL=237
Reply from 74.125.127.147: bytes=32 time=432ms <u>TTL=237</u>
Reply from 74.125.127.147: bytes=32 time=410ms IIL=237
Reply from 74.125.127.147: bytes=32 time=428ms IIL=237
Reply from 74.125.127.147: bytes=32 time=395ms ILL=237
Reply From 74.125.127.147: Dytes=32 time=404ms llL=237
Reply from 74.125.127.147. $Bytes=32$ time=3730s 11L=237 Boxlu from 74.125.127.147. but os=22 time=421mg TTL=227
ARTING THINE (4.17.17.17.17.17.19.18.37.1.100.88.37.1.100.87.37.10.11.17.10.11.17.17.17.17.17.17.17.17.17.17.1
Ping statistics for 74.125.127.147: Packets: Sent = 45, Received = 45, Lost = 0 (0% loss),

Figure 23 – MachineLink 'B' becomes the internet gateway





C:\Documents and Settings\carmenl tracert -d www.google.com.au									
Tracing route to www.l.google.com [74.125.127.104] over a maximum of 30 hops:									
(1	<1	ms	<1	ms	<1	MS	192.168.1.50		
2	×		×		×		Request timed out.		
3	*		*		×		Request timed out.		
4	144	MS	87	ms	87	ms	74.125.127.104		
5	138	ms	107	ms	110	ms	74.125.127.104		
2	79	ms	107	ms	107	ms	74.125.127.104		
6	*		135	ms	110	ms	74.125.127.104 74.195.197.104		
å	02	-			130	ШS	74.143.147.104		
10	152	ms me	*		*		74.123.127.104 74.195 197 104		
11	153	me	*		¥		74 195 197 104		
12	163	me	¥		¥		74 125 127 104		
13	*	113	*		*		Request timed out.		
14	×		×		×		Request timed out.		
15	×		×		×		Request timed out.		
16	×		×		×		Request timed out.		
17	282	ms	×		×		74.125.127.104		
18	×		×		×		Request timed out.		
19	×		333	ms	×		74.125.127.104		
20	332	MS	290	ms	289	MS	74.125.127.104		
Trace complete.									
C:\Documents and Settings\carmenl>ping www.google.com.au -t									
Pinging www.l.google.com [74.125.127.104] with 32 bytes of data:									
Reply	fro	n 74	1.125.1	127.1	04: J	byte:	s=32 time=442ms TTL=237		
Reply	fro	n 74	1.125.1	127.1	04: J	bytes	s=32 time=420ms TTL=237		
Reply	fro	n 74	1.125.1	127.1	04: J	byte:	s=32 time=439ms TTL=237		
Reply	fro	n 74	1.125.1	127.1	04: J	byte:	s=32		
Reply	fro	n <u>74</u>	1.125.1	127.1	04: J	byte:	s=32 time=407ms TTL=237		
Reply	fror	n 74	1.125.1	127.1	04: J	bytes	s=32 time=415ms TTL=237		
Ping statistics for 74.125.127.104:									
Annyovimate yound tyin times in milli-seconds:									
Minimum = 407ms, Maximum = 442ms, Average = 423ms									
^C									
C:\Documents and Settings\carmenl>arp -a									
Interface: 192.168.1.200 0x2									
Inte	ernet	; Ad	ldress		Phys	sica	l Address Type		
192	.168	.1.5	0		00-0	00-5e	e-00-01-01 dynamic		
192	.168	.1.6	0		00-0	00-5e	e-00-01-01 dynamic		

Figure 24 – MachineLink 'B' as internet gateway





When master router MachineLink 'A's (192.168.1.70) 3G connection is back online, master router MachineLink 'A' becomes the internet gateway.

C:\Documents and Settings\carmen1>arp -a								
Interface: 192.168.1.200 0x2								
Internet Address	Phusica	Address	Tune					
192-168-1-50	00-00-5	-00-01-01	dunamic					
192 168 1 60	00-00-5	-00-01-01	dunamic					
192 168 1 70	00-00-5	-00-01-01	dunamic					
172.100.1.10	00 00 00	, 99 91 91	aynamic					
C:\Documents and Settings\carmenl\tracert 4.2.2.2								
Tracing route to vnsc-ba	uk.sys.gt	tei.net [4.2.2.	.21					
over a maximum of 30 hops:								
			_					
<mark>{1 <1 ms <1 ms</mark>	<1 ms	192.168.1.70						
2 ★ 72 ms	89 ms	10.4.85.2						
3 * *	×	Request timed	out.					
4 * *	×	Request timed	out.					
5 * *	×	Request timed	out.					
6 * *	×	Request timed	out.					
7 * ^C								
C:\Documents and Setting	ſs∖carmei	1)ping 4.2.2.2	2					
U								
Pinging 4.2.2.2 with 32 bytes of data:								
Replu from 4.2.2.2: bute	s=32 ti	ne=227ms TTL=44	1					
Reply from 4.2.2. by tes 32 time $214ms$ TTL=44								
Reply from 4.2.2.2: bytes 32 time 2103 ms TTL=49								
Reply from $4 2 2 2$: bute	s = 32 + 11	me = 258ms TTL=49)					
hepiy 1100 1.2.2.2. bycc	53-J2 (1)		r					
Ping statistics for 4 2	2 2:							
Packets: Sent = 4 Received = 4 Lost = 0 (0% loss)								
Anneographic sound the times in milli-seconds:								
Minimum = 214mo Max	/imum = '		a = 700ms					
HIIIIMAM - ZIANS, HAXIMAM - ZIOSMS, HVERAGE - 700MS								

Figure 25 – MachineLink 'A' as internet gateway after connection is restored



Using the VRRP WAN watchdog

By default, VRRP WAN watchdog is disabled. When it is disabled, VRRP monitors the status of the master and slave by the physical link. When enabled, the VRRP WAN watchdog feature monitors the status of the connection by both the physical link and controlled ping packets. Refer to the <u>Ping monitor</u> section for more information on how to configure the watchdog.

Virtual ID	1 (1-255)	
Router priority	1 (1-255)	
Virtual IP address	0.0.0.0	
VRRP WAN watchdog	ON	
Verbose logging	OFF	
First destination address]
Second destination address]
Periodic Ping timer	3	(3-65535) secs
Retry timer	3	(2-65535) secs
Consecutive error monitor		
Consecutive error monitor	ON	
Failover fail count	3	(3-65535) times
Failback success count	3	(3-65535) times
Periodic ratio monitor		
Periodic ratio monitor	ON	
Monitor total count	10	(3-65535) times
Failover fail count	5	(3-65535) times
Failback success count	5	(3-65535) times







Ping monitor

When Monitoring method is set to **Ping**, controlled ping packets can be used to determine the status of the link. These are small packets of data that the router sends to a remote address and if the connection is up, a reply is received. They are sent indefinitely at regular intervals that you specify. At each interval, 3 pings are sent to the first destination address and 3 pings are sent to the second destination address configured for each WAN interface to test the availability of the interface. The pings sent at each interval are from here on referred to as an "instance" of pings.

Ping timers

The **Periodic ping timer** setting sets a regular interval at which an instance of pings is sent to test the availability of an interface.

The **Retry timer** setting is activated only when all pings in an instance sent at the **Periodic ping timer** interval fail and is used to set a different, usually shorter, interval to speed up the router's response to an interface failure.

Methods of evaluating ping responses

For simplicity, we recommend using only one of the two methods of evaluating the ping responses. The available methods are:

- **Consecutive errors** using this method, the router will determine the availability of an interface based on a set number of consecutive ping instance responses.
- **Periodic ratio monitor** using this method, the router will determine the availability of an interface based on a set ratio of ping instance successes or failures to the number of attempts.

It should be noted that the **Periodic ratio monitor** evaluates an interface over a series of ping instances (defined by the **Total monitor count**) and when the series has completed, the success and fail counts are reset. For example, with the default **Total monitor count** value set to 10 and **Failover fail count** set to 5, the router sends 10 ping instances and if 4 of those instances fail and the first instance of the next series of 10 fails, the router will not fail over because the 5 failed instances occurred across a different series.

Failing over to a lower priority interface

Each WAN interface is independently monitored according to its own distinct settings, following the processes outlined below.

- At a regular interval stipulated by the **Periodic ping timer** setting, the router sends 3 ping requests via the interface to both the first and second destination addresses simultaneously. If it receives a reply to any of those pings on the interface, it is considered to be up and the router continues pinging on the interface at the **Periodic ping timer** interval.
- If the router does not receive a response to all six pings on the interface by the start of the next Periodic ping timer
 interval, it registers this failure as a Fail count and continues to send pings to both destination addresses at the Retry timer
 interval (typically set at a shorter interval than the Periodic ping timer since there may be a problem). If a response is
 received to any of those pings, the router returns to sending pings according to the Periodic ping timer setting.
- c However, if after another period defined by the **Retry timer** setting the router again does not receive a response to any of the pings, it registers another Fail count.





- d The router repeats the retry process until one of the following conditions is met:
 - i it receives a ping response and returns to testing the interface according to the **Periodic ping timer**;
 - ii the number configured in the **Failover fail count** field (under **Consecutive error monitor**) is reached, in which case the interface is marked as unavailable and the router automatically reroutes packets according to the configured priorities of the remaining interfaces;
 - the number of Failover fail count pings (under Periodic ratio monitor) is reached within a particular series of the
 Monitor total count, in which case the interface is marked as unavailable and the router automatically reroutes
 packets according to the configured priorities of the remaining interfaces.

Consecutive error monitor failover example



Periodic ratio monitor failover example







Failing back to a higher priority interface

The process for returning an unavailable interface to an available state is similar to the above process. When an interface is marked unavailable by the ping monitor, the router continues to retry pings to the two destination addresses via that interface according to the **Periodic ping timer** setting until one of the following conditions is met:

- it receives a 100% successful response to the six pings for a number of consecutive periods that equal the configured **Failback** success count setting
- the number of Failback success count pings (under Periodic ratio monitor) is reached within a particular series of the Monitor total count, in which case the router continues pinging at the Periodic ping timer interval and marks the interface as available.
 The router automatically reroutes packets according to the configured priorities of the available interfaces.

Consecutive error monitor failback example



Periodic ratio monitor failback example

