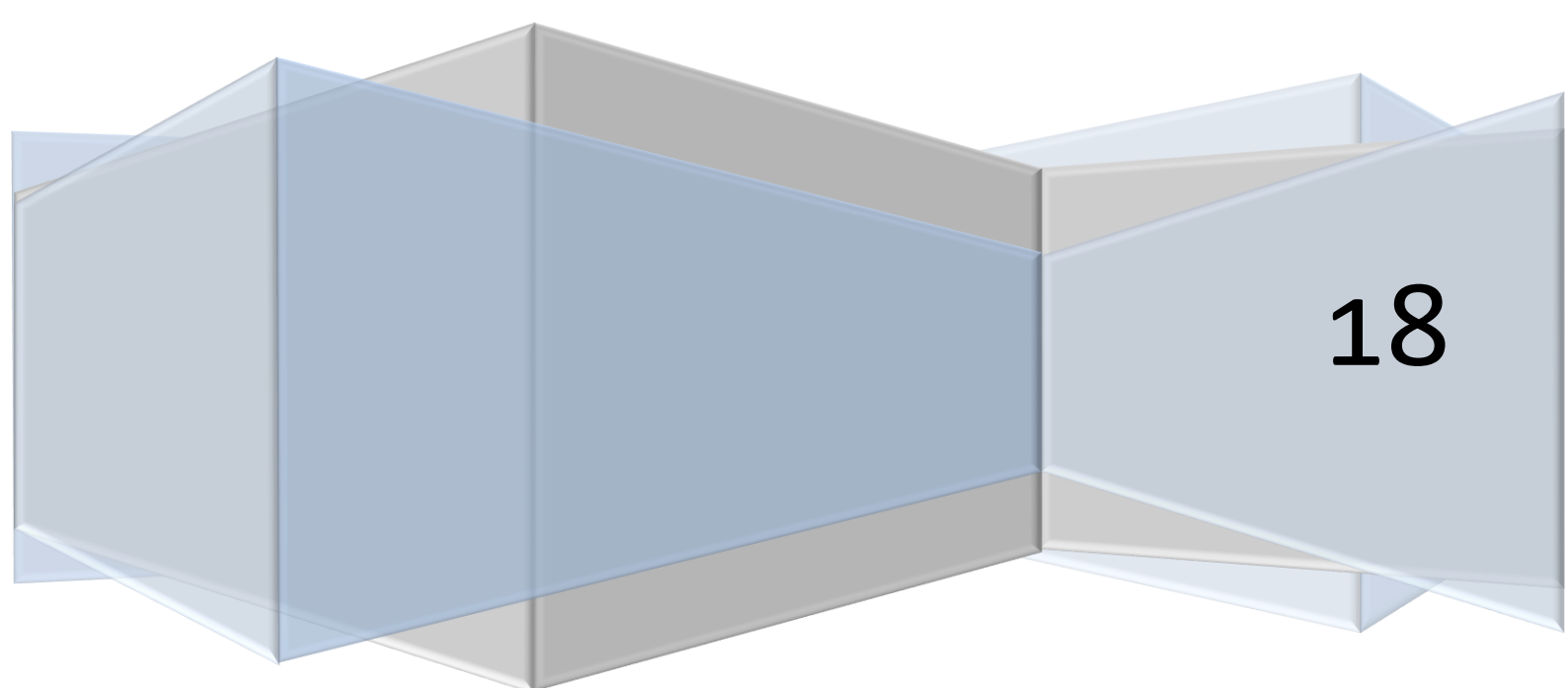


DrayTek Training

Routing in DrayTek Routers - Part 2

Roy Panetta



18

Table of Contents

1.0 Policy-Based Routing.....	3
1.1 Video Demonstration.....	3
2.0 Load Balance/Route Policy in DrayTek Routers.....	4
3.0 Load Balance/Route Policy Key Features.....	5
3.1 Advance Mode Setting.....	6
3.2 Configuration Options.....	6
3.2.1 Protocol Options	6
3.2.2 Source	7
3.2.3 Destination.....	7
3.2.4 Send Via if Criteria Matched	8
3.2.5 Additional Options	10
3.2.6 Failback	11
3.2.7 Adjustable Priority	12
3.3 Address Mapping	13
3.3.1 Configuration Steps.....	13
4.0 Configuration examples	15
4.1 Example 1.....	15
4.2 Example 2.....	17
4.3 Example 3.....	18
5.0 Application Notes.....	20
6.0 Diagnostics	21
7.0 Hands on Exercise	22
Configuration Steps.....	23
Configure WAN2	23
Configure WAN3 (LTE WAN)	24
Check WAN connectivity.....	30
Configure Load Balance/Route Policy.....	31
Configuration Part A.....	31
Testing the Load Balance/Route Policy.....	33
Configuration Part B – Testing Failover Option	35
Additional Diagnostics	36
8.0 Quiz	37
Quiz Answers.....	39

Additional Resources - Application Notes.....	40
---	----

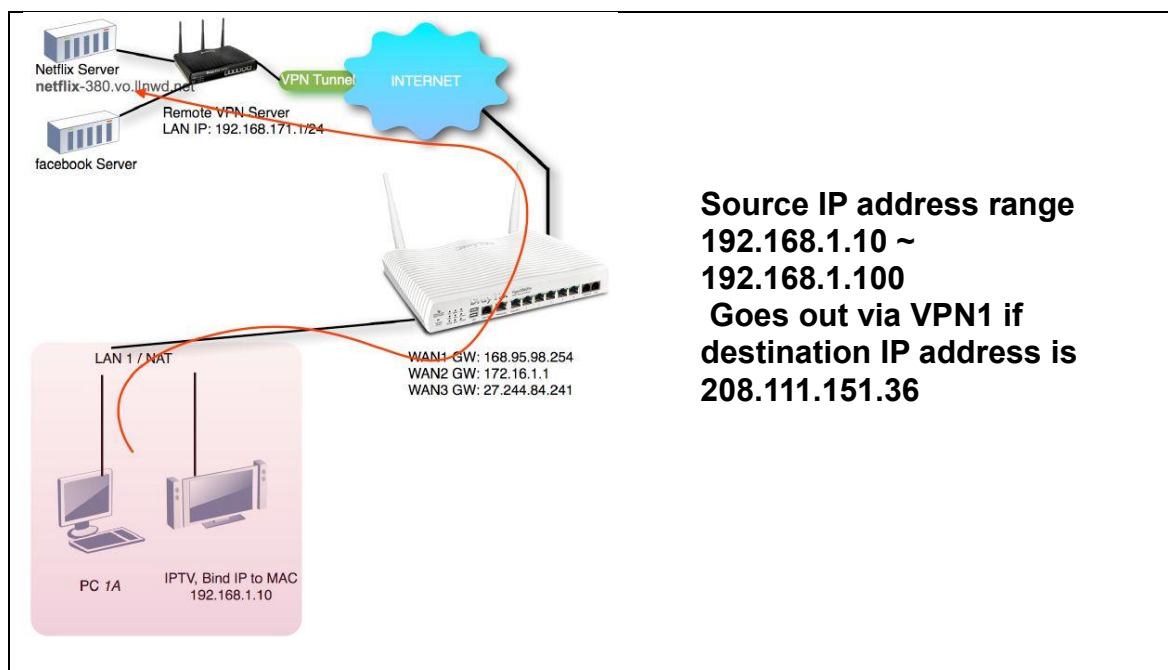
1.0 Policy-Based Routing

Routing based on the policies set by the network administrator, allows the routing decision to be based on to criteria other than destination, such as

- Protocol
- Source IP
- Destination IP
- Destination Domain Name
- Destination Port

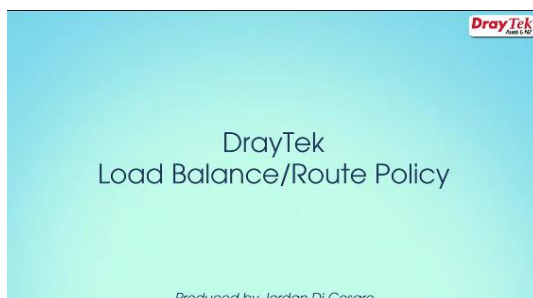
Selecting the path for certain types of traffic is useful when there are multiple WAN interfaces, for example:

- Load Balancing based on LAN Subnet
- VoIP traffic takes the more reliable WAN
- SMTP & POP3 traffic be sent to the interface which the mail server is connect to
- Restrict the higher-cost Internet line to critical services
- Traffic to Facebook sent over a VPN tunnel



Example – Traffic sent via VPN tunnel if source and destination conditions are met

1.1 Video Demonstration



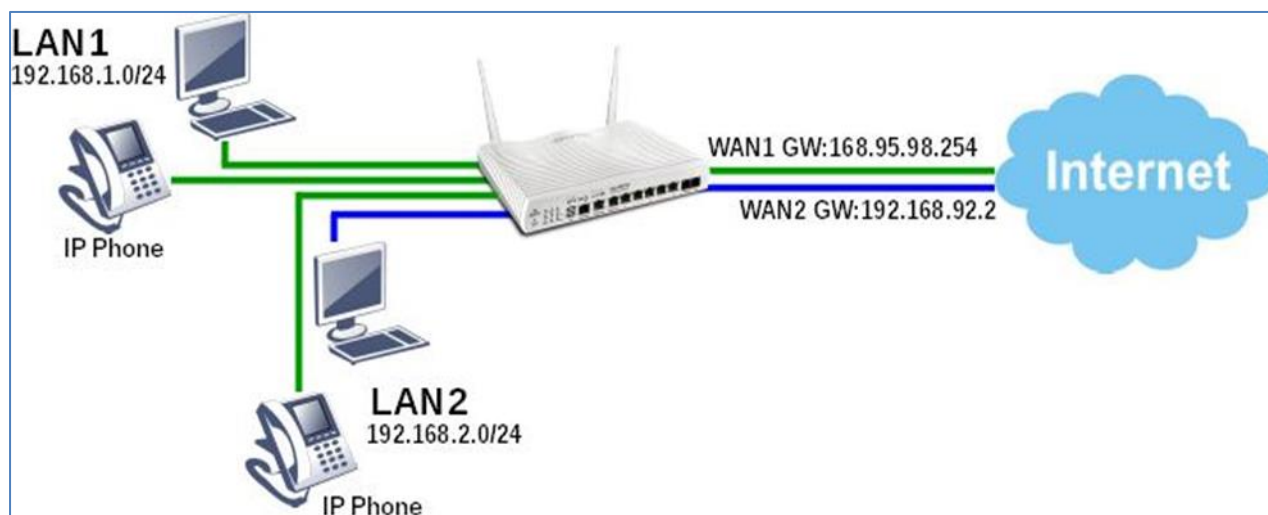
This video gives an overview DrayTek Load Balance Route Policy.

It is available on YouTube at:
<https://youtu.be/EGEAB51ZQPs>

2.0 Load Balance/Route Policy in DrayTek Routers

Load-Balance / Route Policy feature in DrayTek Dual and multi-WAN DrayOS routers is also referred to as "policy-based routing" in Cisco devices. In Linux based routers this feature is known as "Policy Route" and has most of the features of the Load Balance/Route Policy in DrayOS routers.

The diagram below provides a simple example where traffic from LAN1 (shown in green) is directed to the Internet through WAN1. Traffic from LAN2 (shown in blue) is directed to the Internet through WAN2



Load-Balance / Route Policy allow you to create a set of rules or "policies". Then, if a data packet arrives that matches any of the configured "policies", it will be directed to the specified interface as shown in the example above.

- Notes:**
- Load Balance / Route policy should not be confused with load balance mode that is configured in the WAN general setup menu shown here. In this mode traffic is distributed over multiple WAN interfaces to provide greater bandwidth or to provide redundancy if a WAN interface goes down.
 - Load Balance/Route Policy has higher priority than WAN load balance mode

Load Balance Mode: Auto Weight

Setup

Index	Enable	Physical Mode/Type	Line Speed(Kbps) DownLink/UpLink	Active Mode
WAN1	V	VDSL2/-	0 / 0	Always On
WAN2	V	Ethernet/Auto negotiation	0 / 0	Always On
WAN3	V	USB/-	0 / 0	Always On
WAN4	V	USB/-	0 / 0	Always On

3.0 Load Balance/Route Policy Key Features

There are several key features of the Load Balance/Route Policy. These are:

Adjustable priority for Load Balance/Route Policies

- More interfaces can be selected
- Source/destination IP subnets can be selected
- Flexible Failover (WAN, LAN, VPN)
- Failback option
- Diagnostic function

In **Routing >> Load-Balance/Route Policy** configuration menu, you can select wizard mode and advanced mode to configure the load balance /route policies. The Wizard Mode provides a simple and basic configuration and will guide through the configuration process. The **Advance Mode** provides all the options on one page and provides more options.

In addition, there are priority settings for each index in the sixth column.

DrayTek Vigor2862 Series

Routing >> Load-Balance/Route Policy

Load-Balance/Route Policy | [Set to Factory Default](#) | [Diagnose](#)

Index	Enable	Comment	Protocol	Interface	Priority	Src IP Start	Src IP End	Dest IP Start	Dest IP End	Dest Port Start	Dest Port End	Move Up	Move Down
1	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any		Down
2	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
3	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
4	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
5	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
6	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
7	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
8	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
9	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down
10	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down

<< [1-10](#) | [11-20](#) | [21-30](#) | [31-40](#) | [41-50](#) >>

[Next >>](#)

☒ Wizard Mode: most frequently used settings in three pages
☐ Advance Mode: all settings in one page

OK

3.1 Advance Mode Setting

The Advance Mode setting shown below provides all the options on one page and has more options than the Wizard Mode configuration.

Routing >> Load-Balance/Route Policy

Index: 1

☐ Enable

Comment

Criteria

Protocol

Source

Destination

Destination Port

Send via if Criteria Matched

Interface ☒ WAN/LAN

☐ VPN

Gateway ☒ Default Gateway

☐ Specific Gateway

Packet Forwarding to WAN via ☒ Force NAT

☐ Force Routing

☐ Failover to ☒ WAN/LAN

☐ VPN

☐ Route Policy

Gateway ☒ Default Gateway

☐ Specific Gateway

Priority

Priority:

Low High

250 150 0

Default Route Routes in Routing Table

3.2 Configuration Options

3.2.1 Protocol Options

The protocol options are ANY, TCP, UDP, TCP/UDP and ICMP.

Criteria

Protocol

Source

Destination

Destination Port

Send via if Criteria Matched

3.2.2 Source

For Source, available IP address options are:

- Any
- IP Range
- IP Subnet
- IP Object
- IP Group

A screenshot of a configuration window showing a dropdown menu for 'Source'. The menu is open, displaying options: Any, IP Range, IP Subnet, IP Object, and IP Group. The 'Source' label is highlighted with a red box.

For **Source IP subnet** use one of the predefined subnet masks to specify the range of IP addresses to apply to this rule.

A screenshot of a configuration window for 'Source IP Subnet'. The 'Source' field is set to 'IP Subnet' and is highlighted with a red box. The 'Network' field is empty, and the 'Mask' dropdown is open, showing a list of predefined subnet masks from 255.255.0.0 / 16 to 255.255.255.255 / 32. The '255.255.248.0 / 21' option is highlighted in blue.

1.2.3 Destination

For Destination, available IP address options are:

- Any
- IP Range
- IP Subnet
- Domain Name
- IP Object
- IP Group
- Country Object

A screenshot of a configuration window showing a dropdown menu for 'Destination'. The menu is open, displaying options: Any, IP Range, IP Subnet, Domain Name, IP Object, IP Group, and Country Object. The 'Destination' label is highlighted with a red box.

For **Destination IP subnet** use one of the predefined subnet masks to specify the range of IP addresses to apply to this rule.

3.2.4 Send Via if Criteria Matched Split WAN/LAN and VPN

For **Send to if Criteria Matched** option, the WAN/LAN and VPN options are split to make it easier to select the required option.

WAN/LAN

For WAN/LAN Interface setting, the pulldown list gives the option to select WAN, LAN, IP routed subnet and DMZ subnet.

The screenshot shows the 'Send via if Criteria Matched' configuration window. The 'Interface' section has radio buttons for 'WAN/LAN' (selected), 'VPN', 'Default Gateway', and 'Specific Gateway'. The 'Gateway' section has radio buttons for 'Default Gateway' (selected) and 'Specific Gateway'. The 'Priority' section shows a slider from 'Low' (250) to 'High' (0), with a 'Priority' input field set to 200. A pulldown menu is open, showing options: WAN1, LAN1, LAN2, LAN3, LAN4, LAN5, LAN6, IP Routed Subnet, DMZ Subnet, WAN1 (highlighted), WAN2, WAN3, WAN4, WAN5, WAN6, and WAN7. A 'More Options' button is at the bottom left.

VPN

VPN trunks are also supported. Choose the required VPN trunk member in the VPN profiles in the pulldown list to direct the traffic to that VPN trunk.

The screenshot shows the 'Send via if Criteria Matched' configuration window for a VPN interface. The 'Interface' section has radio buttons for 'WAN/LAN', 'VPN' (selected), 'Default Gateway', and 'Specific Gateway'. The 'Gateway' section has radio buttons for 'Default Gateway' (selected) and 'Specific Gateway'. The 'Priority' section shows a slider from 'Low' (250) to 'High' (0), with a 'Priority' input field set to 200. A pulldown menu is open, showing options: WAN1, VPN 3.??? (highlighted), VPN 1.???, VPN 2.???, VPN 3.???, VPN 4.???, VPN 5.???, VPN 6.???, VPN 7.???, VPN 8.???, VPN 9.???, VPN 10.???, VPN 11.???, VPN 12.???, VPN 13.???, VPN 14.???, VPN 15.???, VPN 16.???, VPN 17.???, VPN 18.???, VPN 19.???, and VPN 20.???. Below the pulldown menu, there is a 'Failover to' section with radio buttons for 'WAN/LAN', 'VPN' (selected), and 'Route Policy'. The 'Failover to' section also has a 'Default WAN' dropdown set to 'VPN 1.???' and an 'Index 1' dropdown set to 'Index 1'.

3.2.5 Additional Options

Additional options available within this section are:

- Packet Forwarding to WAN via
 - Force **NAT**
 - **Force Routing**
- **Failover to**
 - WAN/LAN
 - VPN
 - Route Policy

Failover is flexible. The load balance/Route policy rule can be configured so that Traffic can failover to the default WAN or LAN connection using the designated gateway, VPN trunk or failover to another Route Policy.

When the primary WAN specified in the Load Balance/Route policy fails, traffic will be directed to the second WAN selected in the policy settings.

Packet Forwarding to WAN via

☒ Force NAT

☐ Force Routing

☒ Failover to

☒ WAN/LAN

☐ VPN

☐ Route Policy

Gateway

Default WAN

LAN1

LAN2

LAN3

LAN4

LAN5

LAN6

LAN7

LAN8

IP Routed Subnet

DMZ Subnet

Default WAN

WAN1

WAN2

LTE

WAN4

WAN5

WAN6

WAN7

Priority

Priority: 200

Low

250

Default Route

Route

High

0

☒ Failback

Existing sessions affected by this Policy will be cleared immediately when the primary interface resumes service.

More Options

Packet Forwarding to WAN via

☒ Failover to

☒ Force NAT
☐ Force Routing

☐ WAN/LAN
☐ VPN
☐ Route Policy Gateway

☒ Failback
 Existing sessions affected by this Policy will be cleared immediately when the primary interface resumes service

LAN1
 LAN1
 LAN2
 LAN3
 LAN4
 LAN5
 LAN6
 IP Routed Subnet
 DMZ Subnet
 Default WAN
 WAN1
 WAN2
 WAN3

0.0.0.0

when the original interface

OK Cancel

3.2.6 Failback

Immediate Failback

Select the **Failback** option to enable Immediate Failback. Existing sessions affected by this policy will be cleared immediately when the original interface comes back on-line. New sessions will need to be established on the new WAN once it comes back on-line. This setting may be desirable if the router fails over to a 3G or 4G network where the data charges are high and data usage charges must be minimised.

☒ Failback

. Existing sessions affected by this Policy will be cleared immediately when the primary interface resumes service.

. Failback is only available for NAT hosts and when the primary interface is a physical WAN.

Gradual Failback

For this option do not select Failback option. Sessions will end normally on the backup interface and new sessions go through the original WAN it comes back on-line. It may take a while for all traffic to move to the original WAN.

3.2.7 Adjustable Priority

This option lets you select the priority of the load balance policy rule.

A lower number will have higher priority.

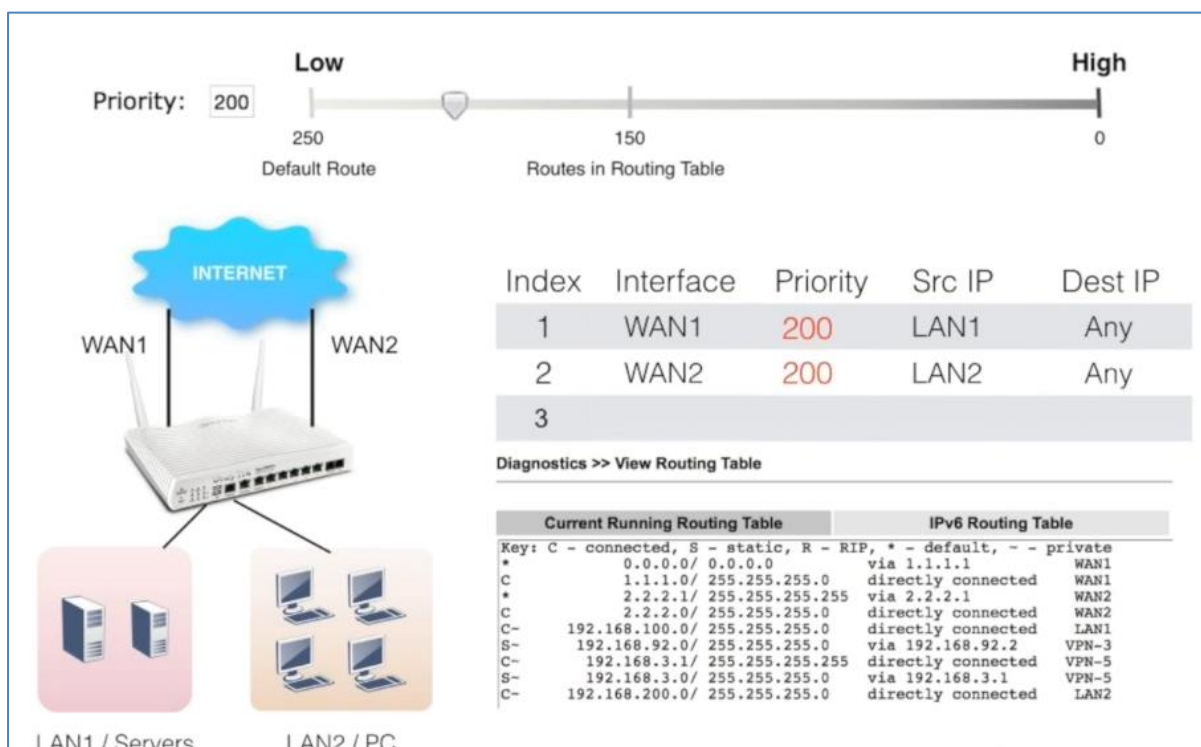
The priority setting can be between 1 and 249 and determines the order the policy rules will be implemented. A lower number has higher priority. If two rules have the same priority, say 200, which is the default setting, then the rules will be implemented in sequential order: Top to bottom.

The routes in the routing table in the router including configured static routes have a priority value of 150. So, a priority setting of less than 150 for a load balance/priority rule will override any routes in the routing table.



Example

Assigning a priority value of 200 for WAN 1 and WAN 2 is less than 150 so will have a lower priority than inter-LAN routes in the routing table.



3.3 Address Mapping

Address Mapping is integrated into the Load balance/route policy. Address mapping is used to specify an outgoing IP address for a device on the LAN. This is used when you have a block of public IP addresses in the router under WAN IP Alias.

3.3.1 Configuration Steps

Step1

Enter a block of assigned IP addresses into **WAN IP Alias** in the router.

In the example below, we have two IP addresses entered: 172.17.1.1 for index 2 and 172.17.2.2 for index 3. Do not select “**Join NAT IP Pool**” option for these two IP addresses. These two IP addresses will appear in the pull-down list in the route policy setting.

Index	Enable	Aux. WAN IP	Join NAT IP Pool
1.	☒	---	☒
2.	☒	172.17.1.1	☐
3.	☒	172.17.2.2	☐
4.	☐	0.0.0.0	☐
5.	☐	0.0.0.0	☐
6.	☐	0.0.0.0	☐
7.	☐	0.0.0.0	☐
8.	☐	0.0.0.0	☐

<< 1-8 | 9-16 | 17-24 | 25-32 >> Next >>

OK Clear All Close

Do not select Join NAT IP Pool

Step 2

Go to **Load Balance/Route Policy** menu and enter the source IP addresses for the devices on the LAN that we want to use a specific outgoing IP address. Here we have entered the IP address range 192.168.1.20 to 192.168.1.30. We select ANY for destination IP.

Next under Send to if Criteria Matched we select WAN1 for the Interface and select the first WAN IP alias IP address which is 172.17.1.1 and use the default gateway.

We can also select Auto Failover to other WAN, so the traffic will be sent via another Interface when the path fails. But do not enable this option if you want the traffic only use the designated IP address.

Click **OK** to save

Now any traffic going out to the Internet from the computers in the range 192.168.1.20 to 192.168.1.30 will have the outgoing IP address of 172.17.1.1.

Routing >> Load-Balance/Route Policy

Index: 1

☒ Enable

Comment:

Criteria

Protocol:

Source:

Destination:

Destination Port:

Send via if Criteria Matched

Interface: ☒ WAN/LAN

☐ VPN

Gateway: ☒ Default Gateway ☐ Specific Gateway

Packet Forwarding to WAN via: ☐ Force NAT ☐ Force Routing

☒ WAN/LAN

☐ VPN

☐ Route Policy

Gateway: ☒ Default Gateway ☐ Specific Gateway

Priority

☐ Failback

New sessions affected by this Policy will be sent via primary interface once that interface resumes service; while existing sessions will remain on the failovered interface.

Enter Source IP address for devices on the LAN to use outgoing IP addresses

Select required WAN IP Alias

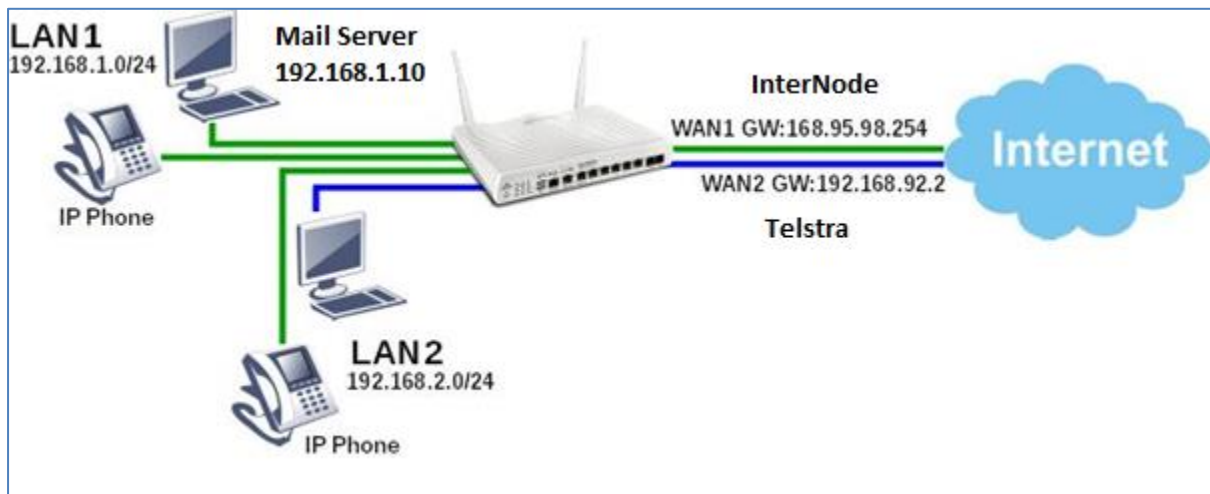
4.0 Configuration examples

4.1 Example 1

SMTP traffic from the mail server must use WAN 1

This example covers directing traffic from a source IP address or range of addresses to the required WAN interface.

Here we have a mail gateway that only accepts SMTP mail from its ISP, so SMTP mail must go out through this ISP's WAN connection (Internode). Internode connection is on WAN1. WAN2 is connected to Telstra.



Configuration Steps

Configure Load Balance/Route policy to send SMTP mail from 192.168.1.10 to WAN 1.

1. Select Enable for this rule.
2. Set protocol to be ANY,
3. Set the source IP to be that of the Mail server – 192.168.1.10
4. Set destination to ANY and destination port set to ANY.
5. For Send via if Criteria Matched select WAN1 for the Interface
6. Select the default gateway for this interface.

Routing >> Load-Balance/Route Policy

Index: 1

☒ Enable

Comment

Criteria

Protocol

Source

Destination

Destination Port

Send via if Criteria Matched

Interface ☒ WAN/LAN ☐ VPN

Gateway ☒ Default Gateway ☐ Specific Gateway

Packet Forwarding to WAN via ☒ Force NAT ☐ Force Routing

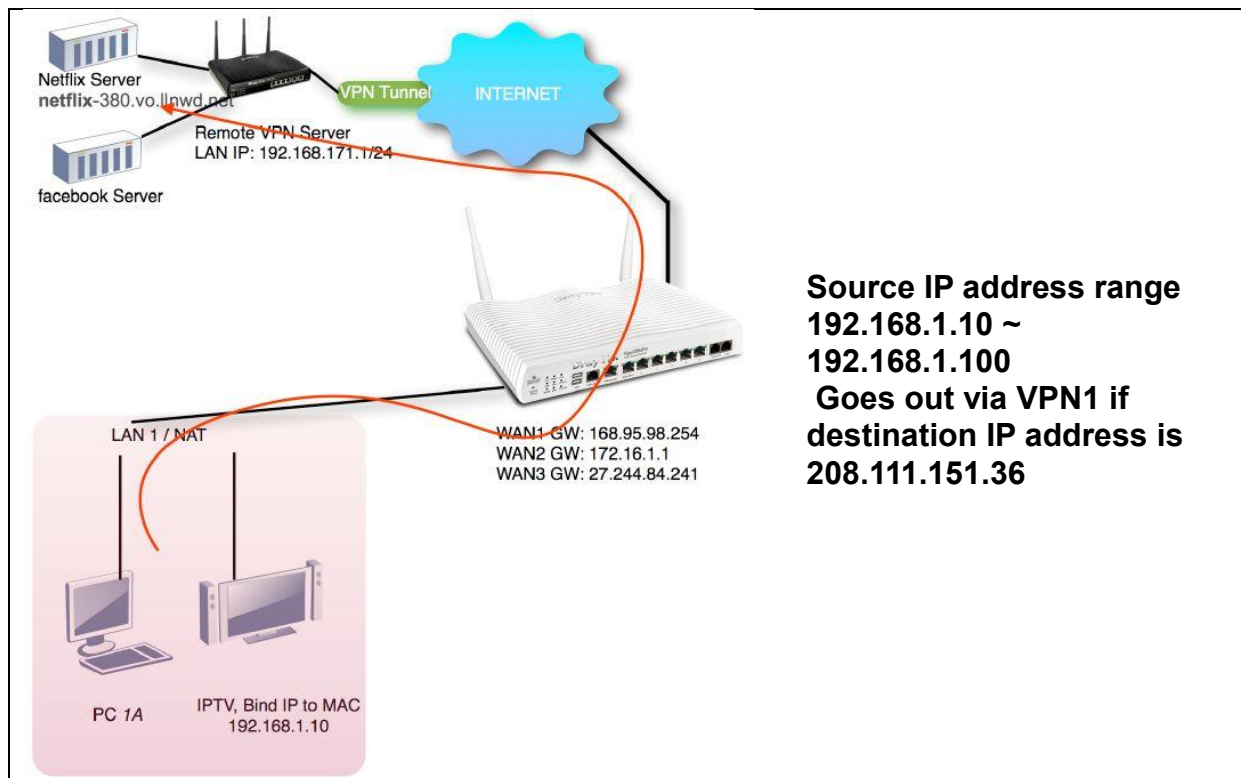
4.2 Example 2

Traffic to an Internet destination to go out through VPN1

In this example we want the range of IP addresses 192.168.1.10~192.168.1.100 going to the destination 208.111.151.36, regardless of the protocol used destination ports to go out through VPN1.

Configuration Steps

1. Select the first available index. We chose Index 1.
2. Set protocol to ANY.
3. Set source IP address range. Start at 192.168.1.10 and ending at 192.168.1.100.
4. For destination IP enter the start and end IP address range to be 208.111.151.36 as we are only looking at a single destination IP address.
5. Set destination port to ANY.
6. Select VPN as the Interface then select VPN 1 in the pull-down menu. And we will use the default gateway.



Routing >> Load-Balance/Route Policy

Index: 2

☒ Enable

Comment: Send traffic to VPN Delete

Criteria

Protocol: Any

Source: IP Range
Start: 192.168.1.10 End: 192.168.1.100

Destination: IP Range
Start: 208.111.151.36 End: 208.111.151.36

Destination Port: Any

Send via if Criteria Matched

Interface: ☐ WAN/LAN WAN1 ☒ VPN VPN 1.Route-test

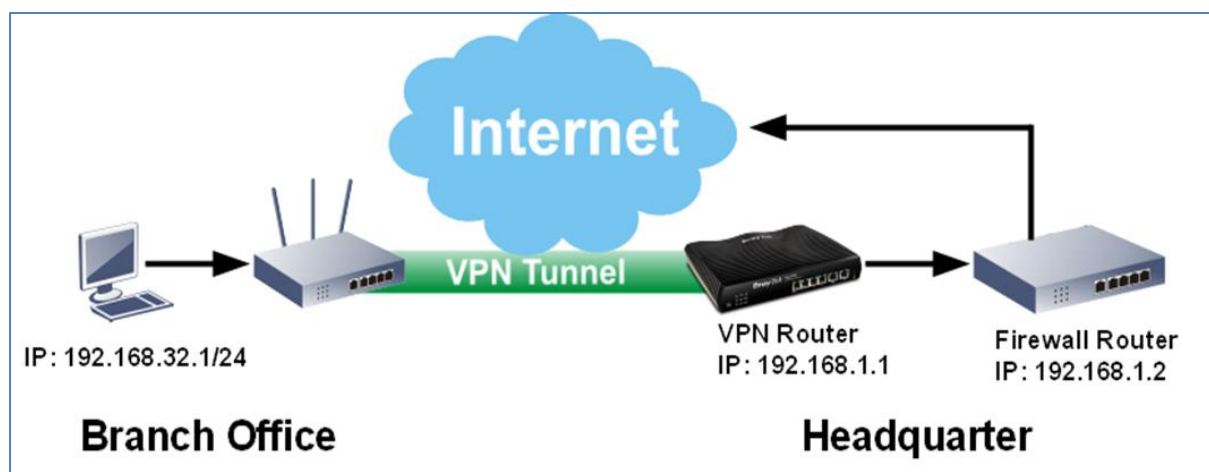
Gateway: ☒ Default Gateway ☐ Specific Gateway

4.3 Example 3

LAN clients in branch office to access the Internet through VPN tunnel in Head office router

In this example we want LAN clients in the branch office to access the Internet through the Head office router via the VPN tunnel.

Here we can configure the route policy in the branch office router to make this happen.



Configuration Steps

1. Select the first available index. We chose Index 2.
2. Set protocol to ANY.
3. Enter the branch office LAN IP subnet as the source IP address
4. Select destination as ANY.
5. For Interface select LAN1 and for Gateway we enter the IP address of the firewall router in the headquarter network.
6. Set the priority to a value less than 150 so that this policy will have higher priority than the routes defined in the routing tables (static routes)

Routing >> Load-Balance/Route Policy

Index: 2

☒ Enable

Comment: Internet via HQ network [Delete]

Criteria

Protocol: Any

Source: IP Subnet

Network: 192.168.32.0 Mask: 255.255.255.0 / 24

Destination: Any

Destination Port: Any

Send via if Criteria Matched

Interface: ☒ WAN/LAN LAN1 ☐ VPN VPN 1.Route-test

Gateway: ☐ Default Gateway ☒ Specific Gateway 192.168.1.2

Priority

Priority: 100

Low 250 150 0 High

Default Route Routes in Routing Table

OK Clear Cancel Diagnose

5.0 Application Notes

Several application notes are available on the DrayTek website at the link below:

<http://www.draytek.com/en/faq/faq-connectivity/connectivity.lbpr/>

Topics available are shown in the table below:

Index	Title
01	How to activate a failover WAN during times of heavy load?
02	[Vigor3900] How to use WAN Aggregation?
03	How to use Destination Domain Name in a Route Policy?
04	How to route all the traffic destined for a certain website to a specific WAN interface?
05	[Vigor3900] How to establish BGP connection on LAN?
06	[Vigor3900] How to establish BGP connection on WAN?
07	[Vigor3900] How to use a domain name in Route Policy?
08	How to use Route Policy Diagnose?
09	[Vigor3900] How to change default route to a LAN Gateway?
10	[Vigor3900] How to configure WAN load balancing with Policy Route?
11	[Vigor3900] How to use WAN Inbound Load Balance?
12	What's the difference between "Auto Weight" and "According to Line Speed" Load Balance mode?
13	What's the difference between "IP-Based" and "Session-Based" Load Balance?
14	[Vigor3900] How to configure WAN Inbound Load Balance in Failover mode?
15	How to set Internet gateway to another router on LAN?
16	Introduction to Load Balance/Route Policy
17	How to change the default route by Route Policy?
18	How to set up Address Mapping with Route Policy?
19	How to designate a WAN interface for LAN clients by Route Policy?

6.0 Diagnostics

The load Balance/Route Policy has a diagnostic feature to check if the load Balance/Route Policy has been configured correctly. Here the source and destination IP addresses are entered as well as the protocol and destination port. Clicking on **Analyze** will produce a graphical display with the results as shown in the diagram below:

Vigor2862 Series

Diagnostics >> Route Policy Diagnosis

Test how the packets will be routed

Mode: ☒ Analyze a single packet ☐ Analyze multiple packets by uploading an input file

Packet Information

Protocol: Any

Src IP: Specify an IP 192.168.1.2

Dst IP: Specify an IP 8.8.8.8

Dst Port: Any Port

Analyze

Analysis

the packet → LAN → → WAN2 → The packet was sent via WAN2 according to "policy 1"

Matched Route

Matched	Priority
0.0.0.0/0.0.0.0 WAN2	250

Matched Policy

Matched	Priority	failovered
Route Policy_1	200	No

close

Another diagnostic tool that can be used is the NAT Session Table. This can be used to check if traffic is using the correct interface.

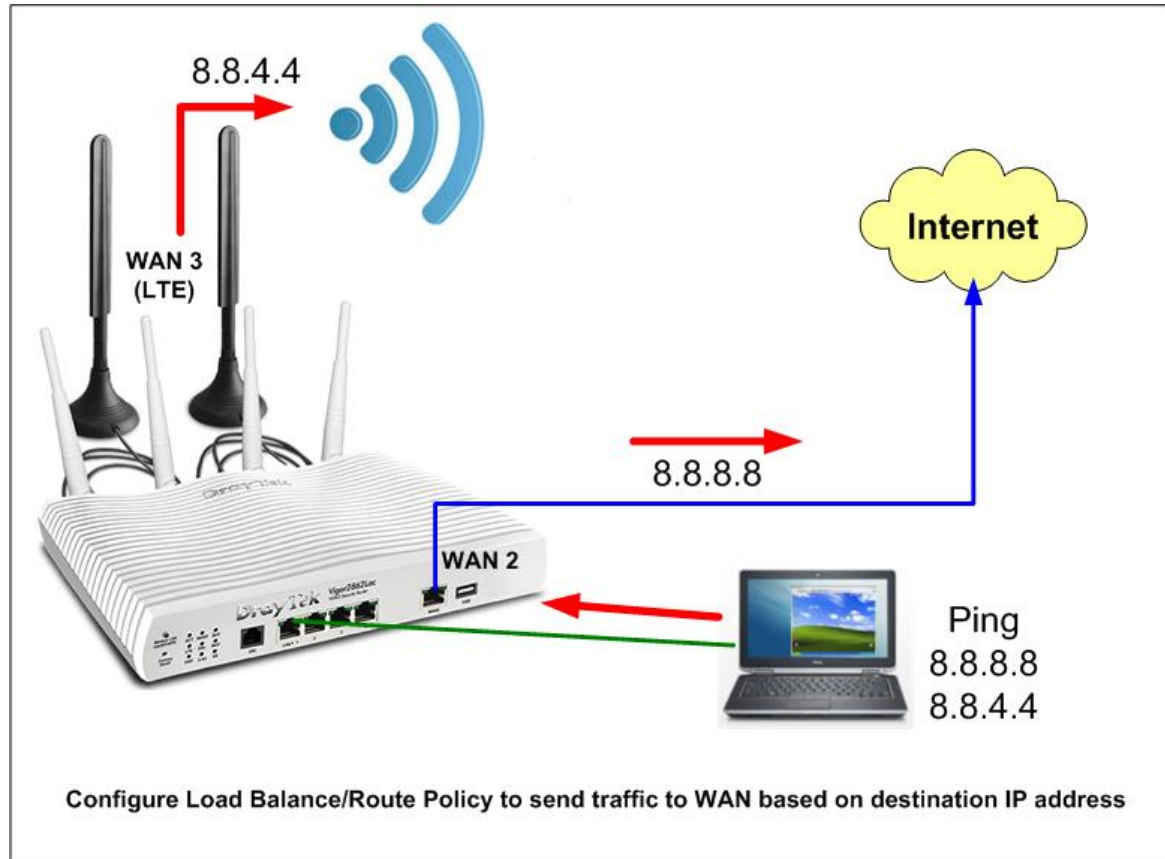
Diagnostics >> NAT Sessions Table

NAT Active Sessions Table (Limit: 128 entries) Refresh

Private IP	:Port	#Pseudo Port	Peer IP	:Port	Interface
192.168.1.10	56857	58137	209.10.120.50	443	WAN2
192.168.1.10	56896	58176	216.58.220.110	443	WAN2
192.168.1.10	56898	58178	107.21.250.224	80	LTE
192.168.1.10	56908	58188	85.236.41.61	12860	WAN2
192.168.1.10	60705	61985	216.58.220.110	443	WAN2
192.168.1.10	61344	62624	211.29.132.12	53	LTE

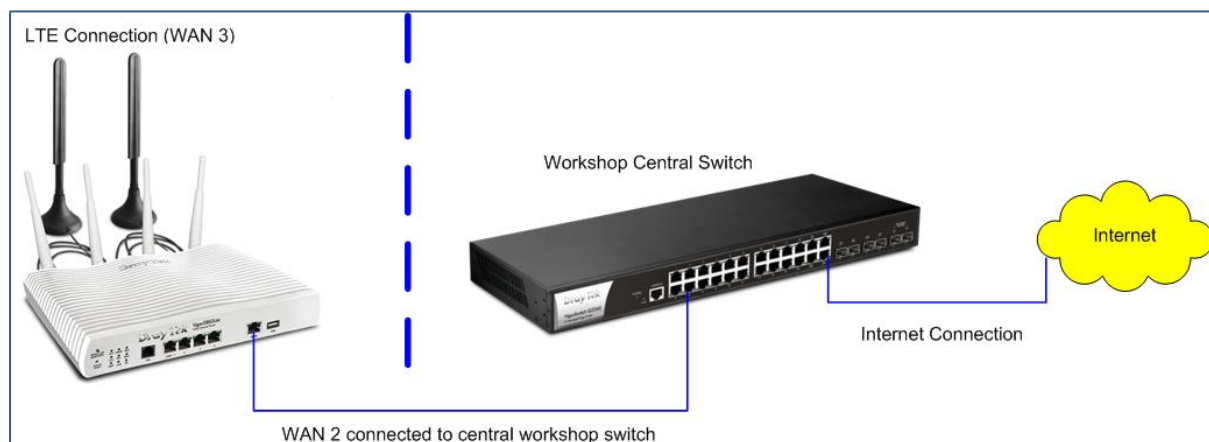
7.0 Hands on Exercise

The Load Balance/Route Policy will be used to send traffic to Internet via WAN2 and WAN 3 based on the destination IP address.



For this exercise use the Vigor2862Lac router.

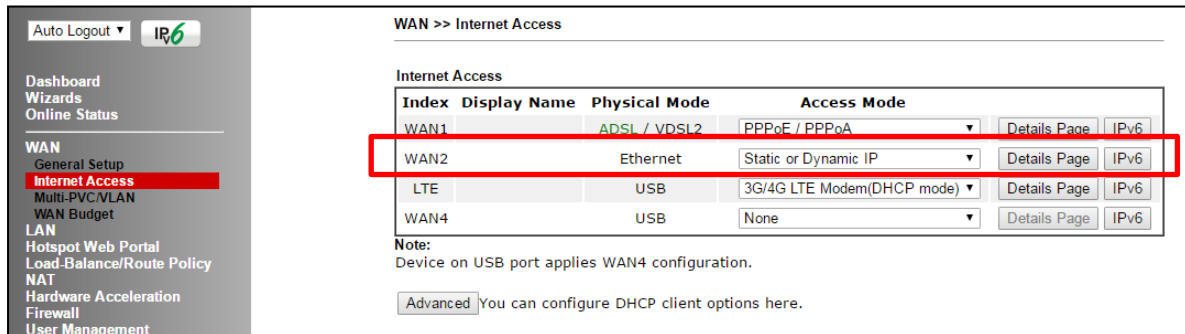
Configure the Vigor2862Lac router so that WAN2 is connected to the workshop central switch and WAN3 is connected via LTE as shown in the diagram below:



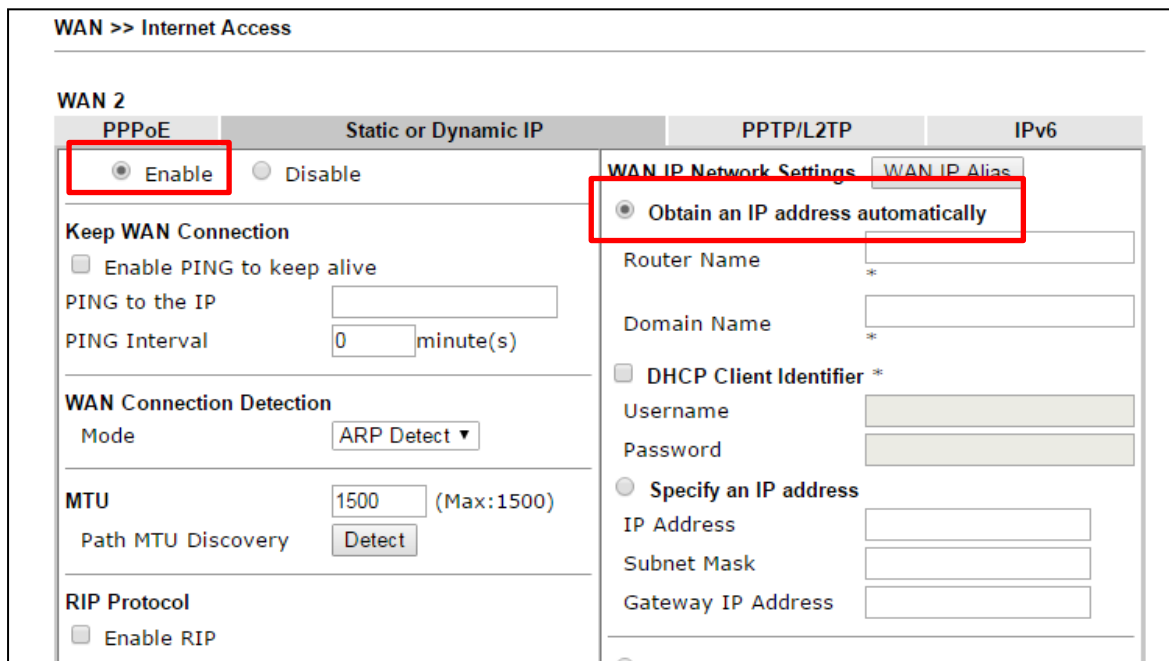
Configuration Steps

Configure WAN2

1. Log into the router. (Use 192.168.1.1: admin/admin)
2. Go to **WAN >> Internet Access** configuration menu in the router. Select **Static or Dynamic IP** for “Access Mode” from the pull-down menu and click on the **Details Page** tab.



3. Enable WAN 2 and select “Obtain IP address automatically”



4. Connect cable from central switch into WAN2 on the router.

Configure WAN3 (LTE WAN)

You may find it helpful to review the tutorial on YouTube covering the configuration process. The URL for the video is: <https://youtu.be/iLWPmZyen6g>

The supplied SIM cards for this exercise will be for:

1. Optus
2. Vodafone
3. Telstra

Step 1: Insert SIM Card into the Router



- (a) Use a small philips head screwdriver and remove the SIM Card slot cover plate on the rear of the router.



- (b) Insert the SIM Card noting the orientation of the SIM card. The notch in the card should be on the left hand side as shown above.

Once the SIM card is installed you can install the cover plate on the SIM card slot to prevent accidental removal of the SIM card.

Step 2: Attach Antennas onto the Router

Attach the two black coloured antennas to the router as shown in the diagram below. The primary antenna socket is the one nearest the SIM card slot.

Note: Diagrams below are for Vigor2860Ln router but also applies to the Vigor2862Lac.



If only one antenna is going to be used ensure that it is attached to the socket nearest the SIM card slot

Step 3 – Enable LTE WAN

Go to **WAN >> General Setup** configuration menu.

Here we select **LTE** and set **Active Mode** to **Always On**. (LTE corresponds to WAN3).

To do this, click on **LTE** to go to LTE configuration menu.

- Select **Yes** for Enable
- Set Active mode to **Always On**
- Click on **OK** to save

DrayTek Vigor2862 Series

WAN >> General Setup

Load Balance Mode: Auto Weight IP Based

Index	Enable	Physical Mode/Type	Line Speed(Kbps) DownLink/UpLink	Active Mode
WAN1	V	ADSL/-	0 / 0	Always On
WAN2	V	Ethernet/Auto negotiation	0 / 0	Always On
LTE	V	USB/-	0 / 0	Always On
WAN4	V	USB/-	0 / 0	Always On

Note:
The line speed setting of WAN interface is available only when According to Line Speed is selected as the Load Balance Mode.

OK

WAN >> General Setup

LTE

Enable: Yes

Display Name: 4G Connection

Physical Mode: USB

Line Speed(Kbps):
DownLink: 0
UpLink: 0

Active Mode: Always On

Load Balance: ☐

Note:
The line speed setting of WAN interface is available only when According to Line Speed is selected as the Load Balance Mode.

OK Cancel

Step 4 – Enable LTE WAN port

Go to **WAN >> Internet Access** configuration menu and click on the “Details Page” button.

For Index labelled “LTE”, click on the pulldown menu for **Accsss Mode** and select **3G/4G LTE Modem(DHCP mode)**.

- Click on **Details Page** to configure the LTE connection.
- Select “**Enable**” to enable this profile.

WAN >> Internet Access

Internet Access

Index	Display Name	Physical Mode	Access Mode		
WAN1		ADSL / VDSL2	MPoA / Static or Dynamic IP ▼	Details Page	IPv6
WAN2		Ethernet	Static or Dynamic IP ▼	Details Page	IPv6
LTE	4G Connection	USB	3G/4G LTE Modem(DHCP mode) ▼	Details Page	IPv6
WAN4		USB	None 3G/4G LTE Modem(DHCP mode)	Details Page	IPv6

Note:

Device on USB port applies WAN4 configuration.

Advanced You can configure DHCP client options here.

Select the required Network Mode. Options are:

4G/3G/2G

4G Only

3G Only

2G Only

Network Mode

APN Name

MTU

LTE software version

LTE hardware version

4G/3G/2G ▼ (Default:4G/3G/2G)

4G/3G/2G

4G Only

3G Only

2G Only

We have selected the default setting 4G/3G/2G Network Modes.

Now enter the APN Name to correspond to the 4G modem being used and the ISP that you will be connecting to.

4.1 Optus 4G Configuration

Enter the APN Name: **connect** or **yesinternet**

WAN >> Internet Access

LTE

3G/4G LTE Modem(DHCP mode)	IPv6
3G/4G LTE Modem(DHCP mode)	☒ Enable ☐ Disable
SIM PIN code	
Network Mode	4G/3G/2G ▼ (Default:4G/3G/2G)
APN Name	connect
Username	(Optional)
Password	(Optional)
Authentication	None ▼
MTU	1380 (Default:1500)
Path MTU Discovery	Choose IP
LTE hardware version	20002
WAN Connection Detection	
Mode	ARP Detect ▼

Note:

Please note that in some case USB port connection will be terminated temporarily to activate the new configuration.

Click OK to save.

4.2 Vodafone 4G Configuration

Enter the APN Name: **live.vodafone.com**

WAN >> Internet Access

LTE

3G/4G LTE Modem(DHCP mode)	IPv6
3G/4G LTE Modem(DHCP mode)	☒ Enable ☐ Disable
SIM PIN code	
Network Mode	4G/3G/2G ▼ (Default:4G/3G/2G)
APN Name	live.vodafone.com
Username	(Optional)
Password	(Optional)
Authentication	None ▼
MTU	1380 (Default:1500)
Path MTU Discovery	Choose IP
LTE hardware version	20002
WAN Connection Detection	
Mode	ARP Detect ▼

Note:

Please note that in some case USB port connection will be terminated temporarily to activate the new configuration.

Click **OK** to save.

4.3 Telstra 4G Configuration

Enter the **APN Name**: *telstra.internet*

WAN >> Internet Access

LTE

3G/4G LTE Modem(DHCP mode)	IPv6
3G/4G LTE Modem(DHCP mode)	☒ Enable ☐ Disable
SIM PIN code	
Network Mode	4G/3G/2G ▼ (Default:4G/3G/2G)
APN Name	telstra.internet
Username	(Optional)
Password	(Optional)
Authentication	None ▼
MTU	1380 (Default:1500)
Path MTU Discovery	Choose IP
LTE hardware version	20002
WAN Connection Detection	
Mode	ARP Detect ▼

Note:

Please note that in some case USB port connection will be terminated temporarily to activate the new configuration.

Click **OK** to save.

You may need to restart the router to bring up the connection.

It will take a few moments for the LTE connection to come up.

Check WAN connectivity

Once both WAN 2 and WAN 3 are configured, go to **Online Status>> Physical Connection** page on the router and check that both WAN connections are active. The page should look similar to the screen shot below.

DrayTek Vigor2862 Series

Online Status

Physical Connection

System Uptime: 0day 0:0:53

IPv4			IPv6		
LAN Status					
IP Address	TX Packets	RX Packets	Router Primary DNS:	Router Secondary DNS:	
192.168.1.1	1,166	798	192.168.101.1	8.8.4.4	
WAN 1 Status >> Renew					
Enable	Line	Name	Mode	Up Time	
Yes	VDSL2		DHCP Client	00:00:00	
IP	GW IP	TX Bytes	TX Rate(bps)	RX Bytes	RX Rate(bps)
---	---	0 (B)	0	0 (B)	0
WAN 2 Status >> Release					
Enable	Line	Name	Mode	Up Time	
Yes	Ethernet		DHCP Client	0:00:39	
IP	GW IP	TX Bytes	TX Rate(Kbps)	RX Bytes	RX Rate(bps)
192.168.101.64	192.168.101.1	33 (KB)	1.74	7 (KB)	960
LTE Status >> Release					
Enable	Line	Name	Mode	Up Time	
Yes	USB		DHCP Client	0:00:20	
IP	GW IP	TX Bytes	TX Rate(bps)	RX Bytes	RX Rate(bps)
10.40.216.107	10.40.216.108	874 (B)	336	1574 (B)	376
USB Modem					
Status	Base Station ID	Signal Strength(RSSI)	Signal Quality(CINR)	NetWork Mode	
Device Exists	Operational 00:A0:C6:00:01:55	-72 dBm	28 dB (99%)	4G/3G/2G	
WAN 4 Status					
Enable	Line	Name	Mode	Up Time	Signal
Yes	USB		---	00:00:00	-
IP	GW IP	TX Bytes	TX Rate(bps)	RX Bytes	RX Rate(bps)
---	---	0	0	0	0
Line 1 Information (VDSL2 Firmware Version: 77B507_A/B/C)					
Profile	State	UP Speed	Down Speed	SNR Upstream	SNR Downstream
	TRAINING	0 (Kbps)	0 (Kbps)	0 (dB)	0 (dB)

Check that you have Internet connectivity by going to an Internet web page or run ping to an external site.

```
C:\Users\Roy Panetta>Ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=18ms TTL=55
Reply from 8.8.8.8: bytes=32 time=17ms TTL=55
Reply from 8.8.8.8: bytes=32 time=15ms TTL=55
Reply from 8.8.8.8: bytes=32 time=24ms TTL=55

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 15ms, Maximum = 24ms, Average = 18ms
```

Configure Load Balance/Route Policy

Configuration Part A

Go to **Load Balance/Route Policy**, select “**Advance Mode**” and click **OK**.

Configure First Rule

1. Select **Index 1**
2. Enter the following settings.

	Enable	Protocol	Source	Destination	Destination Port	Interface	Gateway	Other Settings
Value	Yes	Any	Any	IP Range 8.8.8.8 – 8.8.8.8	Any	WAN 2	Default	Default

3. Click **OK** to save the settings

Routing >> Load-Balance/Route Policy

Index: 1

☒ Enable

Comment: Traffic to 8.8.8.8

Criteria

Protocol: Any

Source: Any

Destination: IP Range
Start: 8.8.8.8 End: 8.8.8.8

Destination Port: Any

Send via if Criteria Matched

Interface: ☒ WAN/LAN ☐ VPN ☐ VPN 1.Route-test

Gateway: ☒ Default Gateway ☐ Specific Gateway

Packet Forwarding to WAN via: ☒ Force NAT ☐ Force Routing

☐ Failover to: ☒ WAN/LAN ☐ VPN ☐ Route Policy

Gateway: ☒ Default Gateway ☐ Specific Gateway 0.0.0.0

Priority

Configure Second Rule

1. Select **Index 2**
2. Enter the following settings.

	Enable	Protocol	Source	Destination	Destination Port	Interface	Gateway	Other Settings
Value	Yes	Any	Any	IP Range 8.8.4.4 – 8.8.4.4	Any	WAN 3 (LTE)	Default	Default

3. Click **OK** to save the settings

Routing >> Load-Balance/Route Policy

Index: 2

☒ Enable

Comment: Traffic to 8.8.4.4

Criteria

Protocol: Any

Source: Any

Destination: IP Range
Start: 8.8.4.4 End: 8.8.4.4

Destination Port: Any

Send via if Criteria Matched

Interface: ☒ WAN/LAN ☐ VPN
LTE VPN 1.Route-test

Gateway: ☒ Default Gateway ☐ Specific Gateway

Packet Forwarding to WAN via: ☒ Force NAT ☐ Force Routing

☐ Failover to: ☒ WAN/LAN ☐ VPN ☐ Route Policy
Default WAN VPN 1.Route-test Index 1

Gateway: ☒ Default Gateway ☐ Specific Gateway 0.0.0.0

☐ Priority

Final Settings

Routing >> Load-Balance/Route Policy													
Load-Balance/Route Policy													
Set to Factory Default Diagnose													
Index	Enable	Comment	Protocol	Interface	Priority	Src IP Start	Src IP End	Dest IP Start	Dest IP End	Dest Port Start	Dest Port End	Move Up	Move Down
1	☒	Traffic ...	Any	WAN2	200	Any	Any	8.8.8.8	8.8.8.8	Any	Any		Down
2	☒	Traffic ...	Any	LTE	200	Any	Any	8.8.4.4	8.8.4.4	Any	Any	UP	Down
3	☐		Any	WAN1	200	Any	Any	Any	Any	Any	Any	UP	Down

Testing the Load Balance/Route Policy

Go to the command prompt in your PC and run the following tests:

1. Run trace route to 8.8.8.8 (*command: **tracert 8.8.8.8***), check if it's sent via WAN 2 (hop 1 is router LAN, hop 2 should be WAN 2).

```
C:\WINDOWS\System32>tracert 8.8.8.8

Tracing route to google-public-dns-a.google.com [8.8.8.8]
over a maximum of 30 hops:

  0  <1 ms    <1 ms    <1 ms    192.168.1.1
  1  <1 ms    <1 ms    <1 ms    192.168.101.1
  2  124 ms   130 ms   126 ms   lo0.bras1.syd2.on.ii.net [150.101.32.61]
  3  31 ms    30 ms    30 ms    be1.cr2.syd2.on.ii.net [150.101.197.80]
  4  16 ms    16 ms    15 ms    bundle-ether1.ken-edge903.syd2.telstra.net [203.50.11.173]
  5  18 ms    17 ms    22 ms    goo2503144.lnk.telstra.net [58.163.91.202]
  6  30 ms    17 ms    17 ms    108.170.247.33
  7  37 ms    41 ms    35 ms    216.239.41.81
  8  17 ms    22 ms    17 ms    google-public-dns-a.google.com [8.8.8.8]

Trace complete.
```

2. Run trace route to 8.8.4.4 (*command: **tracert 8.8.4.4***), check if it's sent via WAN3 (LTE) (hop 1 is router LAN, hop 2 should be WAN3 gateway).
3. Unplug WAN2, ping 8.8.8.8 see if you get timeout (*due to WAN2 being down*).

```
Trace complete.

C:\WINDOWS\System32>tracert 8.8.8.8

Tracing route to google-public-dns-a.google.com [8.8.8.8]
over a maximum of 30 hops:

  0  <1 ms    <1 ms    <1 ms    192.168.1.1
  1  *         *         *         Request timed out.
  2  *         *         *         Request timed out.
  3  *         *         *         Request timed out.
  4  *         *         *         Request timed out.
  5  *         *         *         Request timed out.
  6  *         *         *         Request timed out.
```

Load Balance/Route Policy Diagnostics

This diagnostic tool checks that the load balance rule is configured correctly.

1. Click on the **Diagnose** tab on the **Routing >> Load-Balance/Route Policy** page.

Routing >> Load-Balance/Route Policy

Load-Balance/Route Policy | [Set to Factory Default](#) **Diagnose**

Index	Enable	Comment	Protocol	Interface	Priority	Src IP Start	Src IP End	Dest IP Start	Dest IP End	Dest Port Start	Dest Port End	Move Up	Move Down
1	☒	Traffic ...	Any	WAN2	200	Any	Any	8.8.8.8	8.8.8.8	Any	Any		Down

2. Select **Analyse a single packet** option
3. Enter destination IP address 8.8.8.8
4. Click on **Analyze**

Result should be similar to diagram below:

Diagnostics >> Route Policy Diagnosis

Test how the packets will be routed

Mode ☒ **Analyze a single packet**
☐ Analyze multiple packets by uploading an input file

Packet Information

Protocol ICMP

Src IP Specify an IP 192.168.1.2

Dst IP Specify an IP 8.8.8.8

Dst Port Any Port

Analyze

Analysis

the packet → LAN →  WAN2 → The packet was sent via **WAN2** according to "policy_1"

Matched Route

Matched	Priority
0.0.0.0/0.0.0.0 WAN2	250

Matched Policy

Matched	Priority	failovered
Route Policy 1	200	No

Configuration Part B – Testing Failover Option

Modify Profile 1 to enable Failover to LTE

Go to Load **Routing >> Load-Balance/Route Policy** menu page.

1. Select **Index 1**
2. Select **Failover to** and select **WAN 3 (LTE)**

Routing >> Load-Balance/Route Policy

Index: 1

☒ Enable

Comment: Traffic to 8.8.8.8 Delete

Criteria

Protocol: Any

Source: Any

Destination: IP Range

Start: 8.8.8.8 End: 8.8.8.8

Destination Port: Any

Send via if Criteria Matched

Interface: ☒ WAN/LAN WAN2 ☐ VPN VPN 1.Route-test

Gateway: ☒ Default Gateway ☐ Specific Gateway

Packet Forwarding to WAN via: ☒ Force NAT ☐ Force Routing

☒ Failover to ☒ WAN/LAN LTE ☐ VPN VPN 1.Route-test ☐ Route Policy Index 1

Gateway: ☒ Default Gateway ☐ Specific Gateway 0.0.0.0

Priority

☐ Failback

New sessions affected by this Policy will be sent via primary interface once that interface resumes service; while existing sessions will remain on the failovered interface.

OK Clear Cancel Diagnose

Testing

1. Disconnect cable to WAN2
2. Ping 8.8.8.8 and check if you get a reply (*Traffic should be going through the LTE connection*)).

Additional Diagnostics

NAT Session Table

The NAT Session table can also be used to check if traffic is going out to the required WAN.

You can test this by adding another Load Balance/Route policy rule for index 3 to send web traffic on port 443 to WAN 2.

Routing >> Load-Balance/Route Policy

Index: 3

☒ Enable

Comment: Port 443 to WAN 2 Delete

Criteria

Protocol: Any

Source: Any

Destination: Any

Destination Port: Dest Port Range

Start: 443 End: 443

Send via if Criteria Matched

Interface: ☒ WAN/LAN WAN2 ☐ VPN VPN 1.Route-test

Gateway: ☒ Default Gateway ☐ Specific Gateway

Once the policy is configured go to some web sites. e.g. www.draytek.com.au (122.201.121.55)

Go to **Diagnostics >> NAT Sessions Table** menu in the router and check the NAT Session Table.

You should see traffic to port 443 is using interface WAN 2.

Diagnostics >> NAT Sessions Table

NAT Active Sessions Table (Limit: 128 entries) Refresh

192.168.1.12	64036	32804	192.168.0.2	8612	LTE
192.168.1.12	64036	32804	192.168.0.1	8612	LTE
192.168.1.12	64187	32955	216.58.203.100	443	WAN2
192.168.1.12	64188	32956	172.217.25.35	443	WAN2
192.168.1.12	64637	33405	192.168.0.10	8612	LTE
192.168.1.12	64983	33751	212.4.153.168	80	LTE
192.168.1.12	64985	33753	216.58.203.110	80	LTE
192.168.1.12	64986	33754	216.58.203.110	80	WAN2
192.168.1.12	64988	33756	122.201.121.55	443	WAN2
192.168.1.12	64989	33757	122.201.121.55	443	WAN2
192.168.1.12	64990	33758	122.201.121.55	443	WAN2
192.168.1.12	64991	33759	122.201.121.55	443	WAN2
192.168.1.12	64992	33760	122.201.121.55	443	WAN2
192.168.1.12	64993	33761	122.201.121.55	443	WAN2
192.168.1.12	64994	33762	54.66.209.197	443	WAN2
192.168.1.12	64995	33763	122.201.121.218	443	WAN2

8.0 Quiz

1. Which of the following events will NOT add a new route into router's routing table?

- a) a VPN tunnel established
- b) a Route Policy enabled
- c) a WAN connected
- d) a LAN subnet enabled

2. According to the routing table below, to which interface will the packet be sent if it is destined to 192.168.29.55?

Current Running Routing Table		IPv6 Routing Table	
Key: C - connected, S - static, R - RIP, * - default, ~ - private			
*	0.0.0.0/ 0.0.0.0	via 168.95.98.254	WAN1
*	100.96.52.1/ 255.255.255.255	via 100.96.52.1	USB1
C	100.96.52.0/ 255.255.255.248	directly connected	USB1
C~	192.168.1.0/ 255.255.255.0	directly connected	LAN1
S	111.70.71.151/ 255.255.255.255	via 111.70.71.151	USB2
S	111.251.203.209/ 255.255.255.255	via 111.251.203.209	WAN1
*	168.95.98.254/ 255.255.255.255	via 168.95.98.254	WAN1

- a) LAN 1
- b) USB 1
- c) USB 2
- d) WAN 1

3. Which of the following requirements can only be achieved by Policy Routing?

- a) Traffic to 172.16.3.0/24 need to be sent to LAN2
- b) Traffic to DrayTek Homepage should always take WAN2
- c) HTTP/HTTPS traffic should always take WAN1
- d) Traffic to the mail server need to be sent to gateway 172.16.3.1

4. It is a function that immediately clears all the existing sessions when the primary interface resumes service.

- a) Immediate Failback
- b) Gradual Failback
- c) Failover
- d) Redundancy

5. According to the route policy table below, what is the sequential process of the router?

Index	Enable	Protocol	Interface	Priority	Src IP Start	Src IP End	Dest IP
<u>1</u>	☒	Any	WAN1	200	Any	Any	Any
<u>2</u>	☒	Any	WAN2	200	192.168.1.10	192.168.1.100	Any
<u>3</u>	☒	Any	WAN3	175	192.168.1.10	192.168.1.100	Any

- a) 1,2,3
- b) 2,3,1
- c) 3,2,1
- d) 3,1,2

6. What is the default priority for Policy Route?

- a) 150
- b) 250
- c) 200
- d) 1

Quiz Answers

1. Which of the following events will NOT add a new route into router's routing table?
 - b) a Route Policy enabled
2. According to the routing table below, to which interface will the packet be sent if it is destined to 192.168.29.55?
 - d) **WAN 1** (All data packets for unknown destination networks are sent to the interface corresponding to the default route setting. Refer to section 3.6 in part 1 of this training manual)

Current Running Routing Table				IPv6 Routing Table	
Key: C - connected, S - static, R - RIP, * - default, ~ - private					
*	0.0.0.0/ 0.0.0.0			via 168.95.98.254	WAN1
*	100.96.52.1/ 255.255.255.255			via 100.96.52.1	USB1
C	100.96.52.0/ 255.255.255.248			directly connected	USB1
C~	192.168.1.0/ 255.255.255.0			directly connected	LAN1
S	111.70.71.151/ 255.255.255.255			via 111.70.71.151	USB2
S	111.251.203.209/ 255.255.255.255			via 111.251.203.209	WAN1
*	168.95.98.254/ 255.255.255.255			via 168.95.98.254	WAN1

3. Which of the following requirements can only be achieved by Policy Routing?
 - c) HTTP/HTTPS traffic should always take WAN1
4. It is a function that immediately clears all the existing sessions when the primary interface resumes service.
 - a) Immediate Failback
5. According to the route policy table below, what is the sequential process of the router?

Index	Enable	Protocol	Interface	Priority	Src IP Start	Src IP End	Dest IP
<u>1</u>	☒	Any	WAN1	200	Any	Any	Any
<u>2</u>	☒	Any	WAN2	200	192.168.1.10	192.168.1.100	Any
<u>3</u>	☒	Any	WAN3	175	192.168.1.10	192.168.1.100	Any

- d) 3,1,2
6. What is the default priority for Policy Route?
 - c) 200

Additional Resources - Application Notes

There are several application notes available on the DrayTek web site that provides examples on how to use Load Balance/Route Policy. Some of the application notes available are listed below:

Introduction to Load Balance/Route Policy

<http://www.draytek.com/en/faq/faq-connectivity/connectivity.lbpr/introduction-to-load-balance/route-policy/>

How to change the default route by Route Policy?

<http://www.draytek.com/en/faq/faq-connectivity/connectivity.lbpr/how-to-change-the-default-route-by-route-policy/>

[Vigor3900] How to establish BGP connection on LAN?

<http://www.draytek.com/en/faq/faq-connectivity/connectivity.lbpr/how-to-establish-lan-bgp-connection/>

How to use Destination Domain Name in a Route Policy?

<http://www.draytek.com/en/faq/faq-connectivity/connectivity.lbpr/how-to-use-destination-domain-name-in-a-route-policy/>