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DrayTek Training

DrayTek WAN Connectivity Options

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Introduction

DrayTek routers support a variety of WAN connectivity options. Routers are available in single, dual and multi-WAN versions. In this training guide we will go through each WAN connectivity option and the configuration parameters involved.

Types of Routers

xDSL Routers

These routers will have at least one WAN interface that will be either ADSL or VDSL. The dual WAN routers will have one xDSL WAN interface and an Ethernet WAN Interface. The tables below provide a list of these routers and the type of WAN interface available.

Single WAN Routers – Only one WAN is active			
Router Model	**WAN Type**		
	WAN 1	**WAN 2**	**WAN 3**
Vigor120	ADSL2+	-	-
Vigor130	ADSL2+/VDSL2	-	-
VigorNIC 132F	ADSL2+/VDSL2	SFP	-
Vigor2710ne	ADSL2+	-	-
Vigor2760 Series	ADSL2+/VDSL2	LAN 4 (Gigabit Ethernet)	USB backup

Vigor120

Vigor130

VigorNIC 132F

Vigor2710ne

Vigor2760 Series

Dual WAN Routers – Multiple WANS can be active at same time				
Router Model	**WAN Type**			
	WAN 1	**WAN 2**	**WAN 3**	**WAN 4**
Vigor2832 Series	ADSL2+	Gigabit Ethernet	USB	USB
Vigor2860 Series	ADSL2+/VDSL2	Gigabit Ethernet	USB	USB
VigorBX 2000	ADSL2+/VDSL2	Gigabit Ethernet	USB	USB

Vigor2832 Series

Vigor2860 Series

VigorBX 2000 Series

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Broadband Routers

Broadband routers will have one or more Ethernet WAN interfaces. These routers can be connected to a NBN NTU (Network Termination Unit) for services like FTTH/FTTP (Fibre to the Premise), HFC, Satellite, or fixed wireless. . The tables below provide a list of these routers and the type of WAN interface available.

Single WAN Routers – Only one WAN is active			
Router Model	WAN Type		
	WAN 1	WAN 2	WAN 3
Vigor2120 Series	Gigabit Ethernet	USB backup	-
Vigor2132 Series	Gigabit Ethernet	-	-

Vigor2120 Series   Vigor2132ac

Dual WAN Routers – Multiple WANS can be active at same time				
Router Model	**WAN Type**			
	WAN 1	**WAN 2**	**WAN 3**	**WAN 4**
Vigor2912 Series	Fast Ethernet	Fast Ethernet	USB backup (Shared with WAN 2)	-
Vigor2925 Series	Gigabit Ethernet	Gigabit Ethernet	USB	USB
Vigor2952	Gigabit Ethernet	Gigabit Ethernet/SFP	USB	USB
Vigor2960	Gigabit Ethernet	Gigabit Ethernet	USB	USB

Vigor2912 Series

Vigor2925 Series

Vigor2952

Vigor2960

Multi- WAN Routers – Multiple WANS can be active at same time						
Router Model	**WAN Type**					
	WAN 1	**WAN 2**	**WAN 3**	**WAN 4**	**WAN 5**	**Additional WAN**
Vigor3220	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	USB	-
Vigor3900	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	SFP	2 x USB

Vigor3220

Vigor3900

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LTE Routers

These routers have an embedded 4G LTE modem. The table below provide a list of these routers and the type of WAN interface available.

LTE Routers – Multiple WANS can be active at same time				
Router Model	WAN Type			
	WAN 1	WAN 2	WAN 3	WAN 4
Vigor2860L Series	ADSL2+/VDSL2	Gigabit Ethernet	Embedded LTE	USB
Vigor2925L Series	Gigabit Ethernet	Gigabit Ethernet	Embedded LTE	USB

Vigor2860L Series

Vigor2925L Series

WAN Connectivity Options

In addition to the physical WAN interface in the router, there are a number of different methods of establishing a connection to the service provider.

- PPPoE – Point to Point Protocol over Ethernet – Connects the users to Internet through Ethernet with a single medium: DSL, Cable or WLAN
- PPPoA – Point to Point Protocol over ATM – uses PPP dial-up protocol with ATM.
- MPoA - 1483 Bridge IP
            -1483 Routed IP

MPoA is a specification that enables ATM services to be integrated with existing LANs, which use either Ethernet, token-ring or TCP/IP protocols. The goal of MPoA is to allow different LANs to send packets to each other via an ATM backbone.

xDSL WAN (ADSL2/2+, VDSL2)

The xDSL WAN is suitable for premises with existing copper wires and connection to the internet can be ADSL2/2+ or VDSL2. One of the examples for deployment with DSL in the last mile is FTTB (Fibre to the Building) or FTTN (Fibre to the Node) that utilises copper wires on VDSL2 technology to end user.

ADSL

ADSL routers have the option to select the required modulation for the Internet connection as shown in the diagram below.
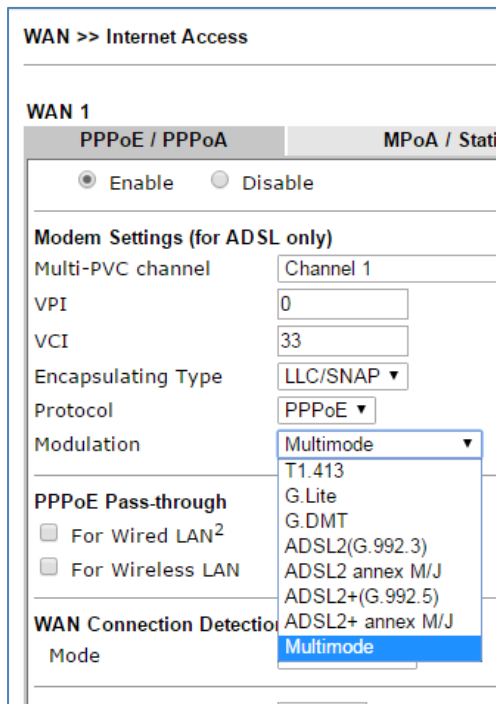
ADSL Modulation Modes

T1.413 – 1.5 Mb/s downstream

G.Lite - ITU G.992.2 1.5 Mb/s downstream

G.DMT – 8Mb/s downstream, 1Mb/s upstream

ADSL2 (G992.3) 12Mb/s downstream, 1Mb/s Upstream

ADSL2 annex M/J 12Mb/s downstream, 3Mb/s Upstream

ADSL2+ (G992.5) - 24 Mb/s downstream, 1Mb/s Upstream

ADSL2+ annex M/J -24 Mb/s downstream, 3Mb/s Upstream

Multimode – Router will auto-detect line type

For ADSL connections in Australia and New Zealand we use the following settings:

Parameter	In Australia		In New Zealand	
VPI	8		0	
VCI	35		100	
Protocol	PPPoE/PPPoA	MPoA		
Encapsulation	LLC/SNAP	LLC		

ADSL Modem Codes

Draytek provides various modem codes for getting better operability with different ISPs/ IPDSLAMs. . Usually the standard modem code will be suitable for most installations, but where stability issues are encountered you can try one of the alternative modem codes.

Below we have the modem codes for the Vigor120 router. Usually the standard modem code will be suitable for most installations, but where stability issues are encountered you can try one of the other modem codes.

Firmware Downloads

Name	Description
Vigor120+v3.2.4.4+annex+A_STD.zip	Annex A modem code 321311. (Standard)
Vigor120+v3.2.4.4+annex+A_310801.zip	Annex A for modem code 310801
Vigor120+v3.2.4.4+annex+A_310811.zip	Annex A for modem code 310811
Vigor120+v3.2.4.4+annex+A_3211201.zip	Annex A for modem code 3211201
Vigor120+v3.2.4.4+annex+A_2_332201.zip	Annex A_2 for modem code 332201
Vigor120+v3.2.4.4+annex+A_2_3431301.zip	Annex A_2 for modem code 3431301
Vigor120+v3.2.4.4+annex+A_2_343601.zip	Annex A_2 for modem code 343601
Vigor120+v3.2.4.4+annex+A_2_343701.zip	Annex A_2 for modem code 343701
Vigor120+v3.2.4.4+annex+A_2_344001.zip	Annex A_2 for modem code 344001
Vigor120+v3.2.4.4+annex+A_2_344101.zip	Annex A_2 for modem code 344101

VDSL

VDSL2 has a theoretical maximum of 350 Mbit/s at the source to 100 Mbit/s at 0.5 km and 50 Mbit/s at 1 km but degrades at a much slower rate from there. At 1.6 km its performance is equal to ADSL2+ as shown in the diagram below.
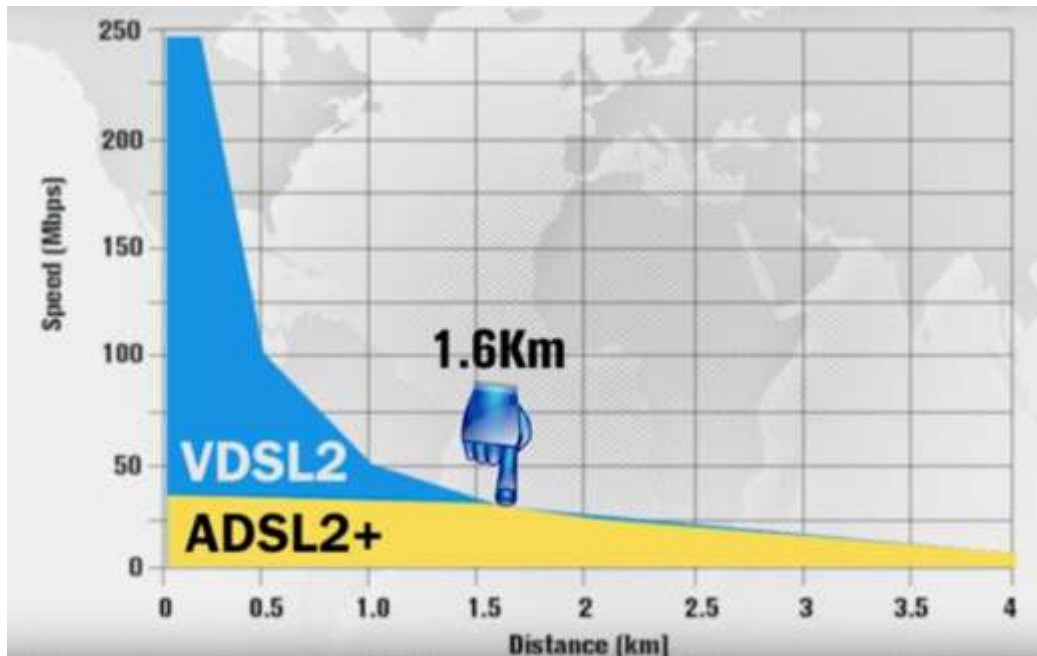
VDSL2 is used in Fibre to the Node deployment of NBN connections. Here optic fibre is installed from the NBN point of Interconnect to a node which is usually a roadside cabinet. From here existing copper cabling is utilised to provide a VDSL2 service to the premises. The distance between the node and the premises is about 300m, to ensure the required NBN speeds are provided.
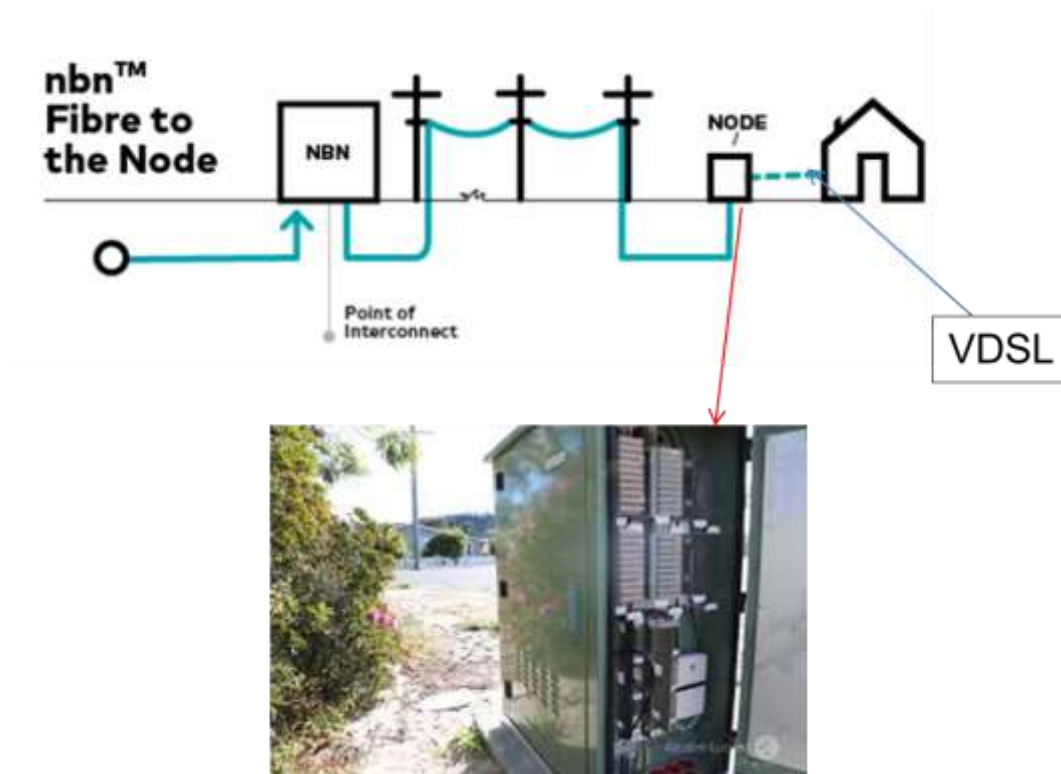
VDSL Modem Codes

NBN installations requires VDSL2 with vectoring, hence there are two modem codes that are suitable:

- AnnexA_574307_571801
- Annex A _579C17_573F01

DrayTek VDSL routers are shipped with modem code "AnnexA_574307_571801" pre-installed. This will work with NBN VDSL2 installations as well as ADSL2+ installations. The other modem code "Annex A _579C17_573F01" has been developed to improve sync speeds with VDSL2 connections but is not recommended for ADSL+ installations.

VLAN Tag

Many service providers require the use of a VLAN tag to access the NBN. The most common VLAN tag is 100.

Checking the VDSL Connection Status

When VDSL connection issues are encountered you can have a look at the **Diagnostics>>DSL status** page in the router. The details on this page will give an indication of error conditions that are affecting the VDSL connection.

Diagnostics >> DSL Status

| General | | | | | Refresh |

ATU-R Information

Type:	ADSL2/2+
Hardware:	Annex A
Firmware:	05-04-08-00-00-06
Power Mngt Mode:	DSL_G997_PMS_NA
Line State:	TRAINING
Running Mode:	
Vendor ID:	b5004946 544e0000

ATU-C Information

Vendor ID:	00000000 00000000 [unknown]

Line Statistics

	Downstream		Upstream	
Actual Rate	0	Kbps	0	Kbps
Attainable Rate	0	Kbps	0	Kbps
Path Mode	Fast		Fast	
Interleave Depth	0		0	
Actual PSD	0. 0	dB	0. 0	dB

	Near End		Far End	
Trellis	ON		ON	
Bitswap	OFF		OFF	
ReTx	0		0	
SNR Margin	0	dB	0	dB
Attenuation	0	dB	0	dB
CRC	0		0	
FECS	0	s	0	s
ES	0	s	0	s
SES	0	s	0	s
LOSS	0	s	0	s
UAS	0	s	0	s
HEC Errors	0		0	
RS Corrections	0		0	
LOS Failure	0		0	
LOF Failure	0		0	
LPR Failure	0		0	
NCD Failure	0		0	
LCD Failure	0		0	
NFEC	0		0	
RFEC	0		0	
LYSMB	0		0	

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NBN VDSL Configuration Examples

There are a number of configuration examples available on the Internet showing how to configure VDSL routers for NBN connections. Below is a list of useful resources:

Application Notes

1. NBN Configuration Application notes –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/List/Index/49/nbn
2. How to Connect DrayTek Vigor router to VDSL2 connection on NBN network –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/673/49/how-to-connect-draytek-vigor-router-to-vdsl2-connection-on-nbn-network

3. Configuring Vigor130 for VDSL Bridge mode –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/704/51/configuring-vigor130--for-vdsl-bridge-mode

Videos

1. How to Configure the Vigor 2760 Router for NBN VDSL Network -
   https://youtu.be/EMzJxOXeG9U
2. How to Configure the Vigor2860 Router for VDSL2 Connection on NBN Network -
   https://youtu.be/G2U9M4Vp4as
3. How to Configure the Vigor130 Router for VDSL2 Bridge Mode -
   https://youtu.be/DFFr3b1Psoo

Ethernet WAN

Another common WAN application is Ethernet WAN, where the user can connect the router to Ethernet switch, cable modem or DSL modem provided by ISP.

The customer can connect the Ethernet WAN on a DrayTek router to a NBN NTU (Network Termination Unit) for services like FTTH/FTTP (Fibre to the Premise), HFC, Satellite, or fixed wireless.

Source: NBN Fibre User Guide
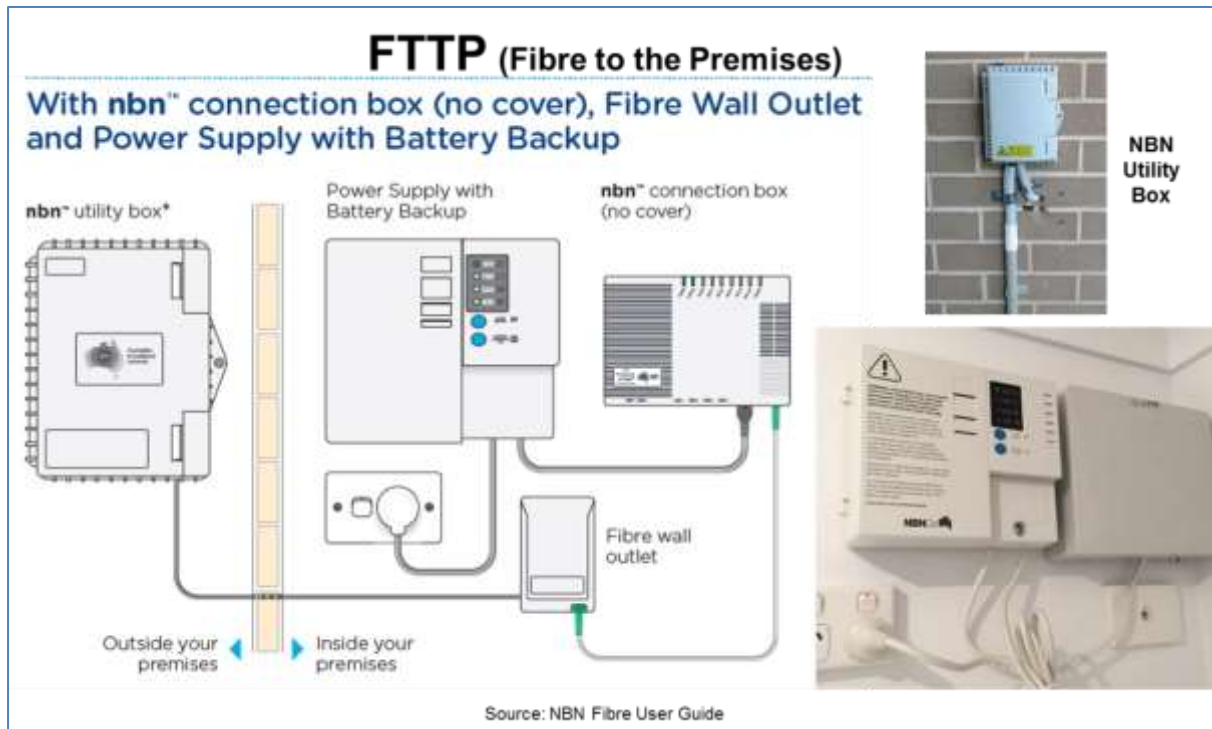
Configuration of Ethernet WAN

The Ethernet WAN interface can be configured to auto-negotiate the WAN connection speed. You can select a fixed connection speed and duplex setting, for instances where auto negotiation does not work. Some NBN connections will also require a VLAN tag value to be inserted.
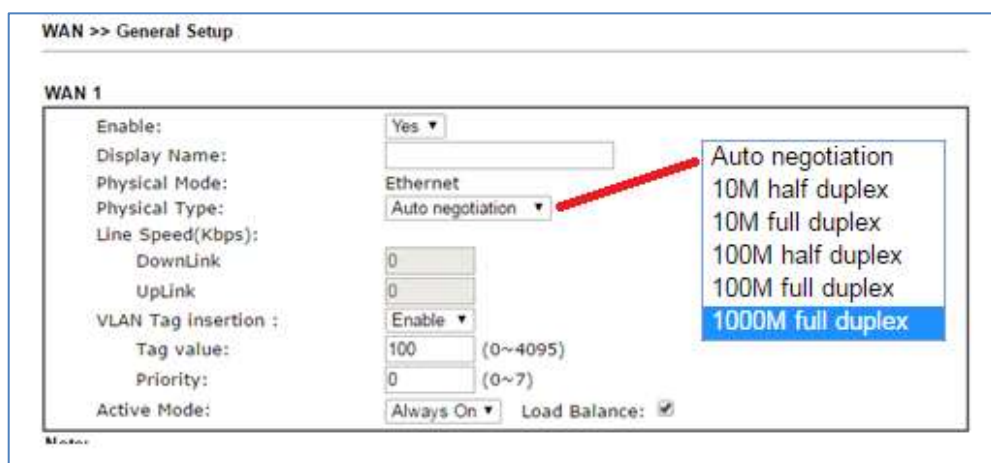
WAN Access Mode Settings

There are three modes that can be selected for Internet access. These are: PPPoE, Static or Dynamic IP and PPTP/L2TP.

PPoE

Static or Dynamic IP

PPTP/L2TP

NBN Configuration Examples

There are a number of configuration examples available on the Internet showing how to configure DrayTek broadband routers for NBN connections. Below is a list of useful resources:

Application Notes

1. NBN Configuration Application notes –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/List/Index/49/nbn
2. How to Connect a DrayTek Vigor2925 router to DODO NBN –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/582/53/how-to-connect-a-draytek-vigor2925-router-to-dodo-nbn
3. How to Connect a DrayTek Vigor2860 Router to TPG NBN –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/664/54/how-to-connect-a-draytek-vigor2860-router-to-tpg-nbn
4. How to Connect a DrayTek Vigor2860 router to AAPT NBN –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/608/66/how-to-connect-a-draytek-vigor2860-router-to-aapt-nbn

Video

1. How to Configure the DrayTek Vigor 2860 for TPG NBN - https://youtu.be/_hX9Ow0TN0g

USB WAN

DrayTek routers also have the flexibility to support 3G and 4G connection with external USB dongle. The list of supported dongles on DrayTek products is available on our web site: http://www.draytek.com.au/support/3g-4g-modem-compatibility

WAN Access Modes

There are two access modes available for 3G/4G USB modems. These are PPP mode and DHCP mode.

PPP Mode

For this mode enter the APN Name (Access Point Name) for the service provider that you will be connecting to. The APN is a gateway between a GSM, GPRS, 3G or 4G mobile networks and another computer network, frequently the public Internet.

For some service providers you may also need to enter a username and password for authentication.

DHCP Mode

For DHCP mode you just need to select enable and enter the APN Name.

Notes:

1. Most service providers now only allocate a private IP address for the 3G/4G WAN connection. This can cause problems for incoming VPN connections. It is possible however with some service providers to request a public IP address for the WAN connection.
2. Most modern 3G/4G USB modems are running NAT so the router will always see a private IP address on the WAN connection. If a public IP address has been assigned to the 3G/4G modem you will need to enable port forwarding in the modem so you can access services on the LAN from the Internet. For example port forward port 5060 for SIP services from the Internet to a server on the LAN.

Configuration Examples

There are a number of configuration examples available on the Internet showing how to configure DrayTek routers for 3G/4G connections. Below is a list of useful resources:

Application Notes

1. 3G/4G Application notes - http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/List/Index/33/3g4g
2. Configure 4G Netgear 320U on Draytek Vigor 2830 – http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/670/33/configure-4g-netgear-320u-on-draytek-vigor-2830
3. Vigor2960 / 3900 / 300B 4G Configuration - http://www.i helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/606/33/vigor2960--3900--300b-4g-configuration

Videos

1. How to Configure the DrayTek Vigor2860 and Vigor2925 Routers for 4G USB WAN Connections - https://youtu.be/k9b37S7cGlA
2. Vigor2960 / 3900 /300B 4G Configuration - https://youtu.be/A8DM5-nPZMw

LTE WAN

LTE WAN routers support 4G LTE connection with the embedded 4G LTE modem. This function is available in Vigor2860L and Vigor2925L series.

LTE routers are unlocked and accept SIM cards from major providers:

- Australia: Telstra, Optus, Vodafone, etc.
- New Zealand: Spark, 2Degrees and Vodafone

Have a built in SIM card slot with cover protection.

Supported are 4 G LTE bands are:

- B3 (1800MHz)
- B7 (2600MHz)
- B8 (900MHz)
- B20 (800MHz)

Note 1: Band 28 (700MHz) and 3G WCDMA Band 5 (850MHz) is currently not supported

The maximum data rate for downlink is 150Mbps and the data rate for uplink is 50Mbps.

LTE Configuration

Ensure the SIM card is inserted into the SM card slot as shown in the diagram above paying attention to the notch in the SIM card.

LTE Access Mode configuration is only available for DHCP mode.

Enter the relevant details including the APN Name.

```
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:1380)
     Path MTU Discovery                 Choose IP
    LTE hardware version                20002

    WAN Connection Detection
    Mode                                ARP Detect ▼
```

Notes

1. Most service providers now only allocate a private IP address for the 3G/4G WAN connection. This can cause problems for incoming VPN connections. It is possible however with some service providers to request a public IP address for the WAN connection.
2. In some instances when using 4G modems the assigned public IP address may not be sent to the modem via DHCP. To overcome this DrayTek have added a CLI command to manually assign an IP address for the WAN connection. For example to manually assign a fixed IP address for the LTE WAN use the command:
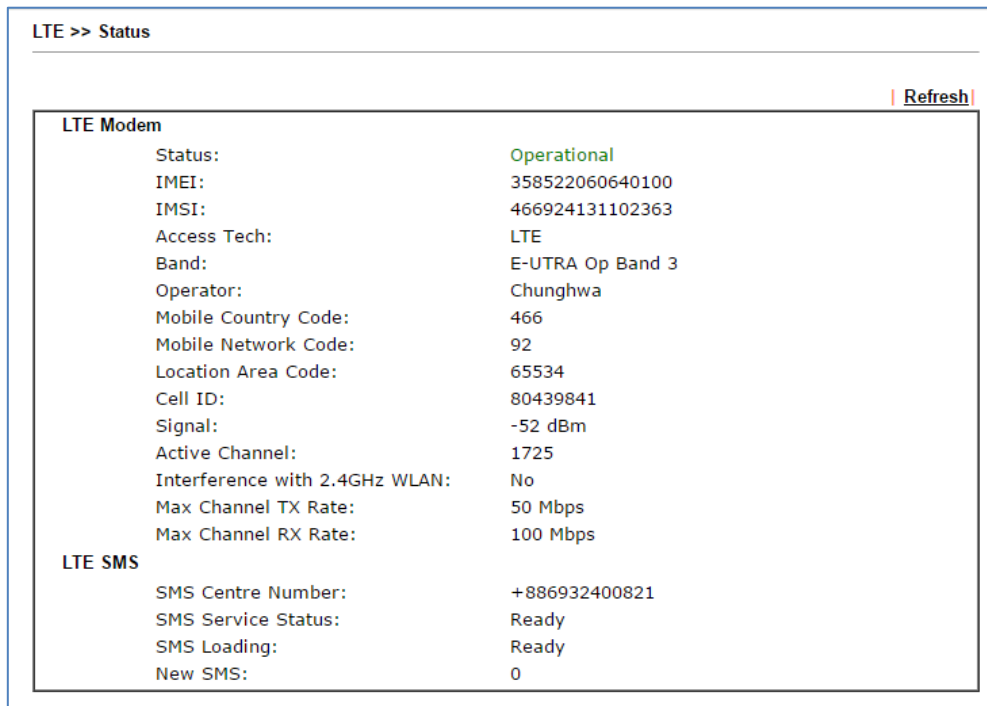   ➢ *wan lte set fixed 1.1.1.1*

Video Demonstration

Configuring the Vigor2860L and Vigor2925L for LTE Internet Access

https://youtu.be/iLWPmZyen6g

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Checking the Status of LTE WAN

You can view the current status of the LTE WAN connection by going to **LTE >> Status** menu in the router. Here you can check the LTE details including the LTE band used, signal strength etc.

```
LTE >> Status

                                                              | Refresh|
 LTE Modem
        Status:                          Operational
        IMEI:                            358522060640100
        IMSI:                            466924131102363
        Access Tech:                     LTE
        Band:                            E-UTRA Op Band 3
        Operator:                        Chunghwa
        Mobile Country Code:             466
        Mobile Network Code:             92
        Location Area Code:              65534
        Cell ID:                         80439841
        Signal:                          -52 dBm
        Active Channel:                  1725
        Interference with 2.4GHz WLAN:   No
        Max Channel TX Rate:             50 Mbps
        Max Channel RX Rate:             100 Mbps
 LTE SMS
        SMS Centre Number:               +886932400821
        SMS Service Status:              Ready
        SMS Loading:                     Ready
        New SMS:                         0
```

Configuration Examples

There are a number of configuration examples available on the Internet showing how to configure DrayTek routers for LTE connections. Below is a list of useful resources:

Application Notes

1. Configuring the Vigor2860L and Vigor2925L for LTE Internet access
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/693/33/configuring-the-vigor2860l-and-vigor2925l-for-lte-internet-access
2. Troubleshooting LTE Connectivity Issues with DrayTek LTE Routers
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/709/33/troubleshooting-lte-connectivity-issues-with-draytek-lte-routers
3. How to check if the DrayTek Vigor2860/2925 LTE Router Frequency Bands are supported on your Area
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/710/33/how-to-check-if-the-draytek-vigor28602925-lte-router-frequency-bands-are-supported-on-your-area

Video

1. Configuring the Vigor2860L and Vigor2925L for LTE Internet Access –
   http://www.i-helpdesk.com.au/index.php?/default_import/Knowledgebase/Article/View/695/33/video---configuring-the-vigor2860l-and-vigor2925l-for-lte-internet-access

Fibre WAN

Fibre WAN connections are available on the Vigor3900 and Vigor2952 routers. These routers have a Small Form-factor Pluggable (SFP) slot and will accept the installation of a SFP fibre module to allow connection to fibre optic cable.
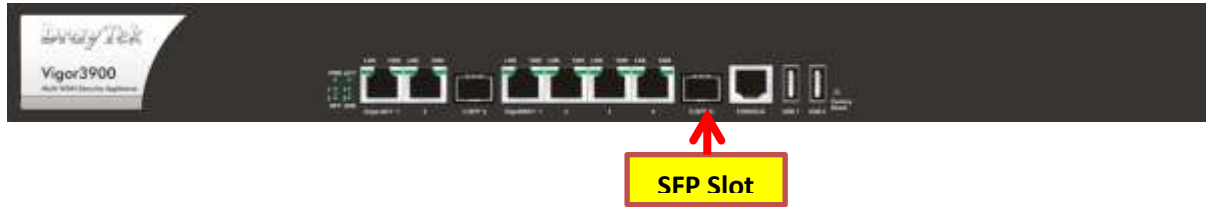

Configuration of the WAN Interface is similar to that of the Ethernet WAN Interface.

Wireless (Wi-Fi) WAN

The Wireless WAN (Wi-Fi WAN) is a new feature that has been added to the Vigor2860n/ac and Vigor2925n/ac routers. It allows the user to connect the router to any Wi-Fi hotspot or Wi-Fi tethering from a mobile phone. This function is useful during an emergency when all wired connections are dropped and no 4G USB dongle is available.

WAN 2 can be configured to use the Gigabit Ethernet WAN port of to use the router's Wireless connection.
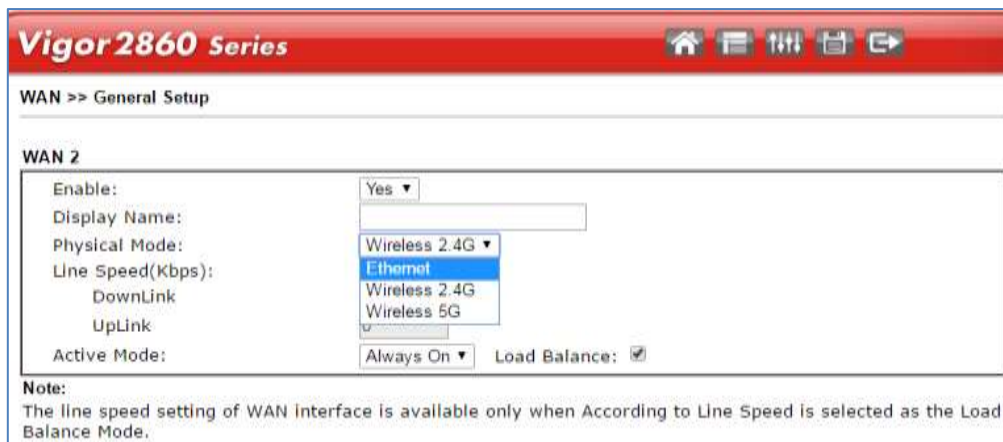
Configuring Wireless WAN

After enabling Wireless WAN for WAN 2 in **WAN >> General Setup** configuration menu, go to **WAN >> Internet Access>>WAN2** details page.

- Use the AP Discovery tool to search for available Wi-Fi Hotspots.
- Select the required Hotspot and add it to Universal Repeater Parameters section on this page.

Video Demonstration

How to set up a wireless WAN in Vigor Router

https://youtu.be/hRw4AtdVAgM

Detailed Wireless WAN Configuration Steps

Vigor2860n/ac and Vigor2925n/ac routers running firmware version 3.8.1 or later, support the Wireless WAN feature.

1. Enable Wireless LAN function on the router: Go to Wireless LAN (2.4GHz) >> General Setup, and enable Wireless LAN.

2. Change the Physical Mode of WAN 2: Go to WAN >> General Setup >> WAN2, set Physical Mode as "Wireless", click OK to apply and reboot the router.

3. Go to WAN >> Internet Access, you will see the WAN2's Physical Mode changed to "Wireless". Set Access Mode as "Static or Dynamic IP" and click Details Page to setup.

WAN >> Internet Access

Internet Access

Index	Display Name	Physical Mode	Access Mode		
WAN1		ADSL / VDSL2	MPoA / Static or Dynamic IP ▼	Details Page	IPv6
WAN2		Wireless	Static or Dynamic IP ▼	Details Page	IPv6
WAN3		USB	3G/4G USB Modem(DHCP mode) ▼	Details Page	IPv6
WAN4		USB	None ▼	Details Page	IPv6

4. Enter the details for Wi-Fi connection:

- Enable Static or Dynamic IP
- Set up IP address as required.
- Set up Universal Repeater Parameters, you may use AP Discovery to find available access point.
- Enter Pass Phrase for the SSID.
- Click OK to apply and reboot the router.

WAN 2

Static or Dynamic IP
◉ Enable   ○ Disable

◉ Obtain an IP address automatically
○ Specify an IP address

IP Address	
Subnet Mask	
Gateway IP Address	192.168.241.1

WAN Connection Detection

Mode	ARP Detect ▼

MTU	1492 (Max:1500)

Universal Repeater Parameters

SSID	staffs_6F AP Discovery
MAC Address (Optional)	00 :1D :AA :74 :DA :38
Channel :	Channel 8, 2447MHz ▼
Security Mode	WPA2/PSK ▼
Encryption Mode	AES ▼
Pass Phrase	•••••••

Note: If Channel is modified, the Channel setting of wireless 2.4G would be also modified.

OK   Cancel

4. After the router reboots, check the WAN connection status via Online Status >> Physical Connection.

Online Status

Physical Connection		System Uptime: 0day 0:0:57	
IPv4		IPv6	

LAN Status		Primary DNS: 172.16.20.1		Secondary DNS: 8.8.8.8	
IP Address	TX Packets	RX Packets			
192.168.86.1	618	623			

WAN 1 Status

Enable	Line	Name	Mode	Up Time	
Yes	VDSL2	---		00:00:00	
IP	GW IP	TX Packets	TX Rate(Bps)	RX Packets	RX Rate(Bps)
---	---	0	0	0	0

WAN 2 Status >> Release

Enable	Line	Name	Mode	Up Time	
Yes	Wireless		DHCP Client	0:00:35	
IP	GW IP	TX Packets	TX Rate(Bps)	RX Packets	RX Rate(Bps)
172.16.20.202	172.16.20.1	6	3	181	496

SSID	Channel	Security	PHY Mode	Rate	Signal Strength
staffs_6F	8	WPA2/PSK	11n	300	100%

Additional Resources
Video

How to set up a wireless WAN in Vigor Router
https://youtu.be/hRw4AtdVAgM

Exercises
1. Configure and test Vigor LTE router for LTE WAN connectivity.
2. Configure and test Wi-Fi WAN for Vigor2860n/ac or Vigor2925n/ac