

How to set up OpenVPN Client on HH5a with OpenWrt

The instructions are fairly generic and should work with all other makes and models of OpenWrt routers.

Document revision history:

v1.3c (3 Feb 2024)	- Minor revisions.
v1.2p (15 Dec 2023)	- Keepsolid/VPNunlimited .ovpn parsing bug in 19.07 & 21.02?
v1.2n (23 Apr 2022)	- Minor updates for OpenWrt 22.03.
v1.2m (10 Oct 2021)	- Fix for OpenWrt 21.02 LuCI not loading.
v1.2ck (19 Aug 2021)	- Updated for OpenWrt 21.02.
v1.2j (3 Apr 2021)	- Add check for 'tun' in .ovpn file.
v1.2e (30 Oct 2019)	- Add DNS servers to LAN interface.
v1.2 (5 Sep 2019)	- Refreshed for OpenWrt 19.07 only.
v1.1 (21 Aug 2018)	- For LEDE 17.01 and OpenWrt 18.06.
v0.1 (29 Nov 2017)	- Created by 'bill'.

Contents

1. Introduction (updated Dec 2023)	4
2. Installing the OpenVPN Client	6
2.1 Downloading the OpenVPN client package	6
Edit default LAN IP address	7
Modem-router Owners Only:	12
All router owners:	15
2.2 Configuring the OpenVPN Client for OpenWrt 19	18
Creating tun0 interface	18
Creating VPN zone	20
Editing OpenVPN configuration	23
Uploading additional configuration files	26
How to start VPN client	28
Testing VPN tunnel	30
2.3 DNS Resolvers and Leak Protection	31
2.4 Kill switch	36
2.5 LED configuration	36
2.6 System Log spammed by odhcp messages	37
2.7 OpenWrt 19.07 information	39
2.8 How to upgrade OpenWrt	39
2.8.1 Upgrading to 19.07.x	39
2.8.2 Upgrading to 21.02.x (LuCI bug)	42
2.8.3 Upgrading to 22.03.x or 23.05.x	44
2.9 Simple VPN and non-VPN access with HH5A, up to 21.02	45
2.10 Troubleshooting	47
2.10.1 Hub One (stock firmware) blocking VPN	47
2.10.2 AEAD Decrypt error: bad packet ID (may be a replay)	48
3. Bug fixes for Home Hub 5A	49
3.1 How to disable 'dsl_control' (DSL port)	49
3.2 Random WAN port MAC address fix	50
For up to OpenWrt 19	50
OpenWrt – all versions	51
OpenWrt - 21.02	53
OpenWrt - 22.03 or later	55
4. VPN service provider configuration files	57

OpenWrt OpenVPN Client for BT Home Hub 5A

• CyberGhost (Feb 2024)	57
• ExpressVPN (2018)	57
• Hotspot Shield (2018)	58
• IPVanish (2018)	58
• KeepSolid/VPN Unlimited (Dec 2023)	58
• Mullvad (2019)	60
• NordVPN (2018)	60
• PIA (2018)	61
• ProtonVPN (Dec 2023)	62
• PureVPN (2019)	63
• Surfshark (2018)	63
• VPNbook (2018)	63
• Zoog VPN (2019)	64

1. Introduction (updated Dec 2023)

This is a supplement to the 'OpenWrt/LEDE Installation Guide for the BT Home Hub 5A'. It describes how to install and configure the OpenVPN client for use with 3rd party VPN service providers. The instructions are fairly generic and should work with all other makes and models of OpenWrt routers.

This tutorial uses just LuCI. A file transfer utility such as WinSCP (Windows file transfer utility) may be required.

Update (Dec 2023): This tutorial has been refreshed to use ProtonVPN. They appear to offer free access to 3 countries at time of writing. Simply set up an account. Their free plan do not permit torrenting.

Speed test results using www.speedtest.net, speedof.me, BT wholesale, and Thinkbroadband speed testers in the UK for a number of routers I have personally tested over **ethernet** connection with my current VPN provider (Not ProtonVPN btw) to their closest and fastest server (using AES-256-CBC cipher).

Device	OpenWrt	SoC	Openvpn speed
BT Home Hub 5A	19.07.7	500 MHz MIPS VRX268	9 Mbps *
TP-Link Archer C50 v4	r10242 - Jun'19	580 MHz MIPS MT7628A	12 Mbps *
TP-Link Archer A6/C6 v3	22.03.0-rc4	880 MHz MIPS MT7621DAT	19 Mbps *
Xiaomi 4A Gigabit	22.03.0-rc4	880 MHz MIPS MT7621A	19 Mbps *
Linksys EA6350 v3	19.07.10	710 MHz ARM IPQ4018	25 Mbps *
TP-Link Archer VR2600 v1	21.02.1	1.4 GHz ARM IPQ8064	62 Mbps *
Dell Wyse 3040 (Realtek nic) + HH5a managed switch	22.03.4 22.03.4	1.44 GHz x86 Atom x5-z8350, AES-NI	135 Mbps **
Intel computer + RTL8169 PCI nic + HH5a managed switch	22.03.4 22.03.4	2.9 GHz x86 Core i5-3475s, AES-NI	244-294 Mbps
Intel computer (Intel nic) + HH5a managed switch	22.03.4 22.03.4	2.9 GHz x86 Core i5-3475s 2.7 GHz x86 Core i5-3340m 3.4 GHz x86 Core i5-8250u, AES-NI	440-482 Mbps
Intel computer (RTL8111 nic) + HH5a managed switch	22.03.4 22.03.4	2.8 GHz x86 Core i5-8400, AES-NI	450-500 Mbps

(* = Speeds via **wireless** will be **lower** than above quoted ethernet speeds)

(** = Monitor must be connected when OpenWrt starts to prevent performance degradation)

See also: <https://OpenWrt.org/docs/guide-user/services/vpn/openvpn/performance>

As can be seen from table above, most budget routers cannot reach 20 Mbps when connecting to VPN service providers.

Used routers using Qualcomm IPQ8064/65 tend to offer much faster speeds between 60 and 75 Mbps. The TP-Link C2600/VR2600(v) are difficult to flash. In the UK, the Netgear D7800 modem-router is worth considering, and is usually less expensive than the Netgear R7800 which has a faster 1.7 GHz cores.

OpenWrt OpenVPN Client for BT Home Hub 5A

Asus also offer routers with OpenVPN client/server functionality out of the box. eg. The **RT-AC86u** (1.8 GHz ARM) running stock AsusWrt can achieve openvpn speeds of **75 Mbps**. There is also 'custom' AsusWrt firmware from 'Merlin' which can achieve **170 Mbps** according to this PIA blog when hardware accelerated AES encryption is enabled.

<https://www.privateinternetaccess.com/blog/2018/08/hardware-acceleration-is-here-for-routers-using-openvpn/>

GL-inet offer their new GL-AX1800 AX router (1.2 GHz IPQ6000) running a custom version of OpenWrt, and they claim it is capable of upto **115 Mbps** OpenVPN speeds with stock firmware, although google searches have reported speeds topping out at 70 Mbps – this may or may not depend on the cipher being used.

A **Raspberry Pi 4** with a AX88179 USB3 gigabit ethernet adapter can supposedly achieve 100 Mbps. A **NanoPi R4S** is alleged to be capable of 220 Mbps. The new **Raspberry Pi 5** boasts huge improvements in hardware performance and OpenWrt is expected soon – it is not known at this time whether the embedded AES-NI will be supported by OpenWrt.

For fastest OpenVPN speeds use a device where there is support for hardware accelerated AES-NI encryption (crypto engine) from OpenWrt/DDWRT etc.

I have also tested Openvpn client on x86 (64bit) 22.03.4 squashfs installed on Intel based devices. The AES-NI is supported by most Intel processors on OpenWrt. All devices booting from a usb2 flash drive. A VLAN trunk on the single ethernet cable into a HH5a (22.03.4) used as a managed switch to provide the separate WAN and LAN ethernet ports. ISP speed test returns 518 Mbps. Best OpenVPN speed test returns **500 Mbps**.

In general, I found OpenVPN client works very well on HH5a. I've had one unit with LEDE 17.01.4 running 24/7 for over a year connected to my VPN provider, and only times I had to reboot it had nothing to do with the VPN service. I upgraded it to OpenWrt 19.07.3 and it continued to be reliable for a further 10+ months of use before upgrading to faster Xiaomi 4A Giga and Linksys EA6350 v3 devices.

9 Mbps ethernet speeds is likely to be too slow for downloading files with HH5a, but is adequate for normal web browsing and HD video streaming.

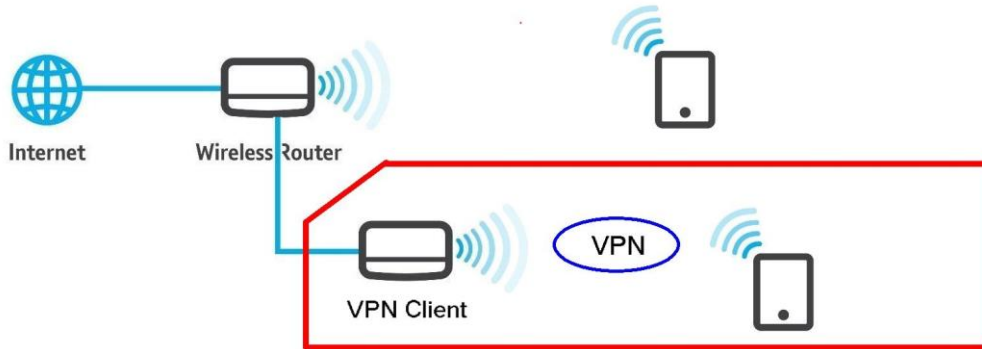
You can choose which devices use the VPN and which devices don't use the VPN to connect to the internet. There are two options in OpenWrt. One is called '**Policy based Routing**', and the other is '**VPN Bypass**'. Both are beyond the scope of this document.

Also, due to the lack of processing power, it is not recommended to use a HH5a simultaneously as the main router and as a VPN client.

I've tested Wireguard on HH5a running 19.07.4 and speed tests and file downloads returned 40 mbps (speeds will be lower with later versions of OpenWrt) on my former 55 mbps FTTC connection at the time. This is considerably faster than the <9 mbps when using openvpn. I personally don't use Wireguard because I find it is unreliable with my current VPN provider. Also, it is not easy to change servers quickly because there is no GUI for managing multiple Wireguard connections, particularly if you use more than one VPN provider.

2. Installing the OpenVPN Client

2.1 Downloading the OpenVPN client package



Unless you are particularly paranoid about privacy, it is likely you only wish certain devices to use a VPN, whereas the majority of other devices will continue to connect to the regular internet service, particularly devices which are geolocation sensitive, such as smart TVs. Also, the maximum openvpn speed through HH5a is about 9 mbps and so it is unlikely the HH5a would be used as the sole internet wired router for broadband connections significantly greater than 10 mbps. This tutorial shows HH5a wired to existing internet facing router.

To install OpenVPN client, a working internet connection is required. The red WAN port on the HH5A will be enabled for this purpose, so it can be connected to an existing router for internet access.

Example configuration:

Main ISP router LAN IP address	192.168.1.1
HH5a VPN client LAN IP address	192.168.111.1
HH5a VPN client static WAN IP address	192.168.1.209 (or use DHCP)
LEDE 17.01.2 stable or later.	

It is recommended to factory reset the HH5a.

Power on the HH5a and wait a few minutes. Press and hold the Reset button on the back of the HH5A for at least 10 seconds. Release the button when the main power light starts blinking rapidly in red colour. When the colour changes to a constant green colour, the factory reset is complete.

Alternatively, navigate to **LuCI -> System -> Backup/Flash Firmware** menu. Click on **Perform Reset** button.



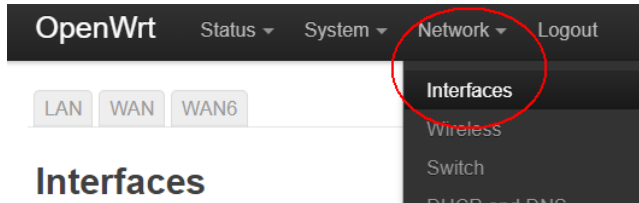
OpenWrt OpenVPN Client for BT Home Hub 5A

Edit default LAN IP address

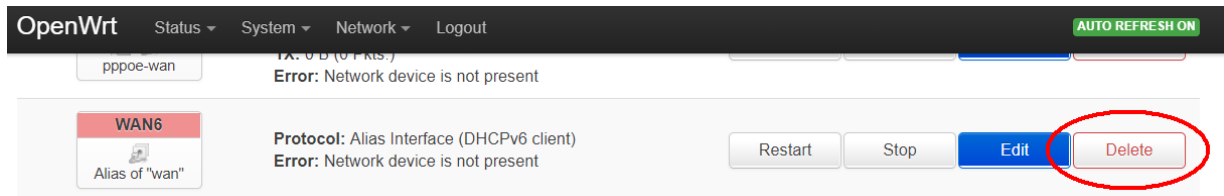
Connect a computer to one of the yellow LAN sockets on the HH5a with an Ethernet cable, and use a web browser and go to 192.168.1.1 and log into LUCI web admin.

Do **not** connect anything to the red WAN port at this time.

In LuCI and go to Network -> Interfaces.

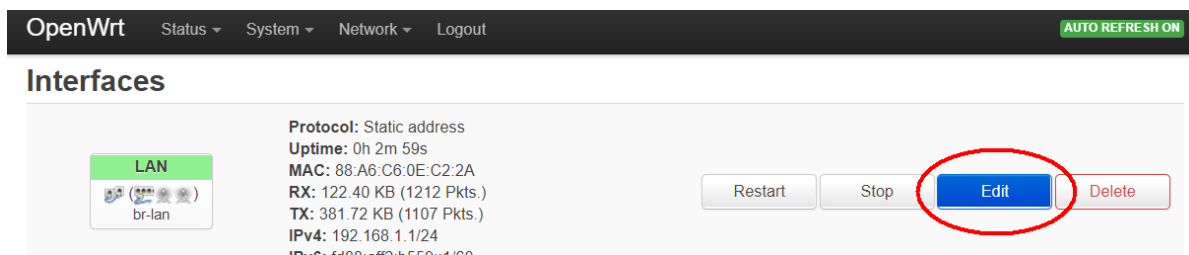


IPv6 is beyond the scope of this document, so you may wish to delete the WAN6 interface.



Press 'Save & Apply' button at the bottom of the page.

Navigate to Network -> Interfaces -> LAN.

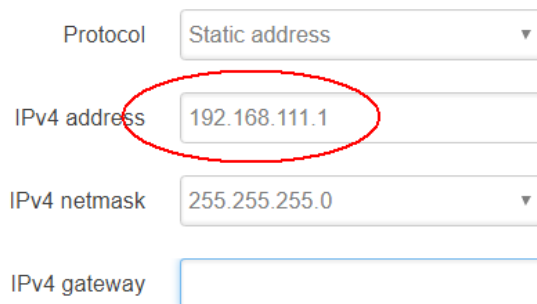


Click on 'Edit' button.

IMPORTANT:

If necessary, change the LAN IP address of the HH5a to use a different subnet (eg. 192.168.111.x). **Do NOT** use the same subnet, such as 192.168.1.x, on both WAN and LAN interfaces.

This example shows 192.168.111.1 assigned to the LAN interface of the HH5A.



Protocol: Static address

IPv4 address: 192.168.111.1

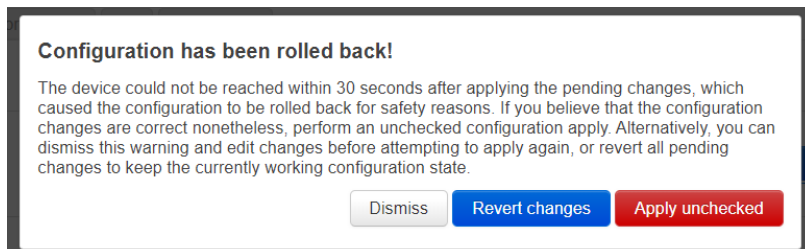
IPv4 netmask: 255.255.255.0

IPv4 gateway:

Press 'Save' button.

Press 'Save & Apply' button at bottom of the page.

The following prompt will appear after 30 seconds.



Simply click on the Apply unchecked button to continue.

After another 30 seconds has elapsed, the following message is likely to appear, to confirm the IP address has successfully changed.

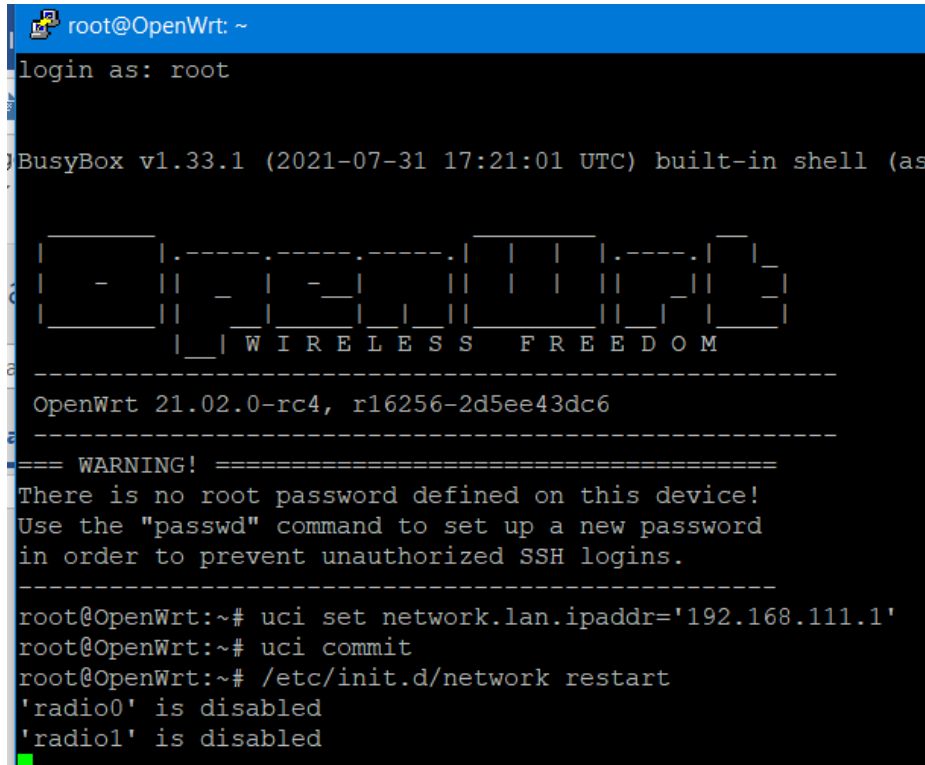
Device unreachable!

Could not regain access to the device after applying the configuration changes. You might need to reconnect if you modified network related settings such as the IP address or wireless security credentials.

OpenWrt OpenVPN Client for BT Home Hub 5A

If you are unable to change the LAN IP address using LuCI (An issue I've frequently seen since this annoying Rollback feature was introduced), it can be changed by SSH into the router, and executing the following commands:

```
uci set network.lan.ipaddr='192.168.111.1'
uci commit
/etc/init.d/network restart
```

A terminal window showing an SSH session on an OpenWrt router. The prompt is 'root@OpenWrt: ~'. The user logs in as 'root'. The terminal shows the BusyBox version 'v1.33.1 (2021-07-31 17:21:01 UTC) built-in shell (as)'. A ASCII art banner for 'WIRELESS FREEDOM' is displayed. Below it, the OpenWrt version '21.02.0-rc4, r16256-2d5ee43dc6' is shown. A warning message states: 'WARNING! There is no root password defined on this device! Use the "passwd" command to set up a new password in order to prevent unauthorized SSH logins.' The user then executes the commands: 'uci set network.lan.ipaddr='192.168.111.1'', 'uci commit', and '/etc/init.d/network restart'. The output of the last command is: ''radio0' is disabled' and ''radio1' is disabled'.

You may need to unplug the Ethernet cable between the PC and the HH5a a couple of times to encourage the PC to drop its former 192.168.1.x IP address, and acquire a new 192.168.111.x IP address.

Now point a web browser to 192.168.111.1 and log into LuCI.

The next step is to edit the WAN interface settings.

Navigate to Network -> Interfaces -> WAN.

For the 'WAN' interface, click 'Edit'.

OpenWrt OpenVPN Client for BT Home Hub 5A

The screenshot shows the OpenWrt web interface. At the top, there is a navigation bar with 'OpenWrt', 'Status', 'System', 'Network', and 'Logout'. The 'Network' menu is open, showing options like 'Interfaces', 'Wireless', 'Switch', 'DHCP and DNS', 'Hostnames', 'Static Routes', 'Diagnostics', and 'Firewall'. The 'Interfaces' option is highlighted. Below the navigation bar, there are tabs for 'LAN' and 'WAN'. The 'LAN' tab is selected, showing the 'br-lan' interface. The 'WAN' tab is also visible, showing the 'pppoe-wan' interface. The 'WAN' interface is currently in an error state, displaying 'Error: Network device is not present'. The 'Edit' button for the 'WAN' interface is circled in red.

OpenWrt Status System Network Logout AUTO REFRESH ON

LAN WAN

Interfaces

LAN
br-lan
Restart Stop Edit Delete

WAN
pppoe-wan
Restart Stop Edit Delete

Protocol: PPPoE
RX: 0 B (0 Pkts.)
TX: 0 B (0 Pkts.)
Error: Network device is not present

OpenWrt OpenVPN Client for BT Home Hub 5A

The default protocol for most routers is 'DHCP client'. However, as the HH5a is a modem-router, its default is 'PPPoE'.

For the HH5a, change the Protocol from 'PPPoE' to 'DHCP client'.

Click on 'Switch Protocol' button

The screenshot shows the OpenWrt web interface. At the top is a navigation bar with 'OpenWrt', 'Status', 'System', 'Network', and 'Logout'. Below this is the 'Interfaces - WAN' section. A descriptive paragraph follows. Then, a 'Common Configuration' section contains a 'General Setup' tab. Under this tab, there is a 'Status' box showing 'Device: pppoe-wan' and traffic statistics. Below that, the 'Protocol' is set to 'DHCP client' in a dropdown menu. At the bottom of this section, there is a 'Really switch protocol?' label and a 'Switch protocol' button, both of which are circled in red in the image.

Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

Alternatively, if you are confident with managing your IP addresses, you may wish to use 'Static address', but you will have to complete the remaining fields. For this example, the main ISP facing router has IP address 192.168.1.1, and 192.168.1.209 is unlikely to be in use, so has been chosen for the HH5a WAN interface. 8.8.8.8 is Google's DNS server.

IPv4 address:	192.168.1.209	
IPv4 gateway:	192.168.1.1	(same as LAN IP address of ISP facing router)
DNS server:	8.8.8.8 and 8.8.4.4	

OpenWrt OpenVPN Client for BT Home Hub 5A

Protocol: Static address

Bring up on boot: ☒

IPv4 address: 192.168.1.209

IPv4 netmask: 255.255.255.0

IPv4 gateway: 192.168.1.1

IPv4 broadcast:

Use custom DNS servers: ☒
8.8.8.8
8.8.4.4

If you are using OpenWrt 21.02, the 'custom DNS servers' boxes has moved to 'Advanced Settings' tab:

Interfaces » WAN

General Settings | **Advanced Settings** | Firewall Settings | DHCP Server

Force link: ☒
? Set interface properties regardless of t

Use default gateway: ☒
? If unchecked, no default route is config

Use custom DNS servers: ☒
8.8.8.8
8.8.4.4

Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

Modem-router Owners Only:

This is specific to routers which possess a Lantiq based DSL modem, such as the HH5a. For all other cable routers, you can review and skip past the following steps.

For OpenWrt 19.07 or earlier:

Go to Network -> Interfaces, and for the 'WAN' interface, click 'Edit'.

Under 'Physical Settings', choose 'eth0.2'

OpenWrt OpenVPN Client for BT Home Hub 5A

Interfaces » WAN

General Settings | Advanced Settings | **Physical Settings** | Firewall Settings

Bridge interfaces ☐
creates a bridge over specified interface(s)

Interface **eth0.2**

Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

For OpenWrt 21.02, there is no 'Physical Settings' tab.

Select 'eth0.2' in Device list box as shown below.

Interfaces » WAN

General Settings | Advanced Settings | Firewall Settings | DHCP Server

Status **Device:** dsl0.101
RX: 0 B (0 Pkts.)
TX: 0 B (0 Pkts.)
Error: Network device is not present

Protocol DHCP client

Device **eth0.2**

Bring up on boot

Hostname to send when requesting DHCP

Device list box contents:
unspecified
Bridge: "br-lan" (lan)
Ethernet Switch: "eth0"
Switch VLAN: "eth0.1"
Switch VLAN: "eth0.2"
Wireless Network Master "OpenWrt" (lan)

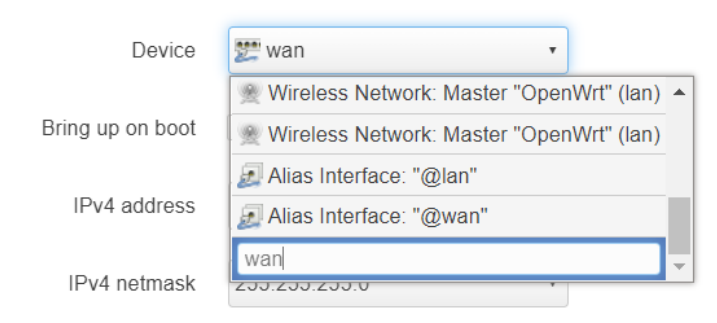
Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

NEW For OpenWrt 22.03, there is no 'Physical Settings' tab.

Manually type in 'wan' in Device list box as shown below.

OpenWrt OpenVPN Client for BT Home Hub 5A



The screenshot shows the OpenWrt network configuration interface. The 'Device' dropdown menu is open, showing the following options: 'wan', 'Wireless Network: Master "OpenWrt" (lan)', 'Wireless Network: Master "OpenWrt" (lan)', 'Alias Interface: "@lan"', 'Alias Interface: "@wan"', and 'wan'. The 'wan' option is selected. The 'Bring up on boot' checkbox is checked. The 'IPv4 address' field is empty. The 'IPv4 netmask' field is set to '255.255.255.0'.

Do NOT use the Alias interface @wan, it will not work.

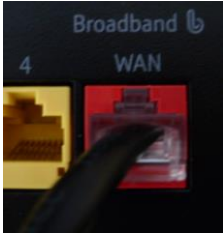
Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

OpenWrt OpenVPN Client for BT Home Hub 5A

All router owners:

The next step is to download and install the OpenVPN package.

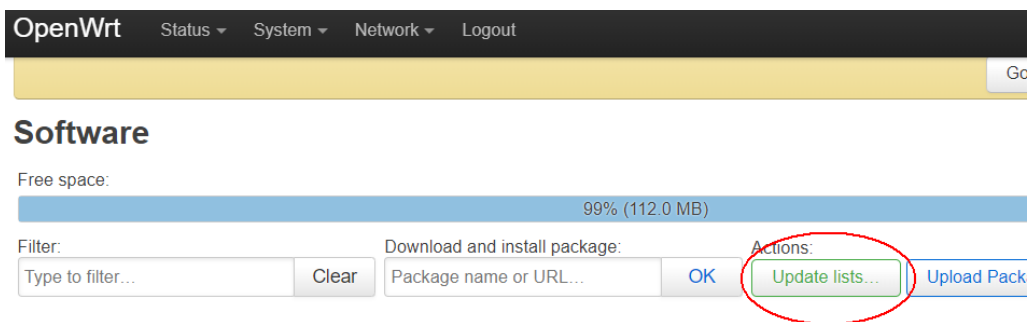


Connect an Ethernet cable from the red ethernet WAN port of the HH5a to a vacant LAN socket on your internet wired router.

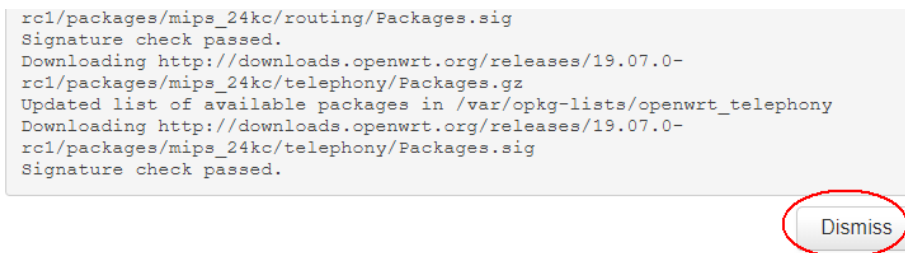
Check your PC has internet access with your web browser through the HH5a.

Navigate to System -> Software

Click on 'Update lists...' button.



A popup window shows the list of packages being updated. Press the Dismiss button.



Now enter 'openvpn-openssl' into the Filter box.

Free space: 99% (112.0 MB)

Filter: openvpn-openssl Clear

Download and install package: Package name or URL... OK Update lists... Upload Package... Configure opkg...

Available Installed Updates

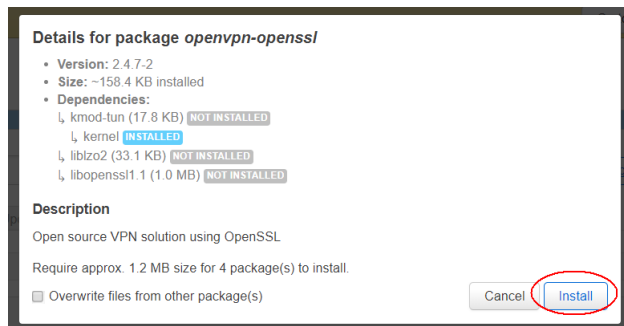
« Displaying 1-1 of 1 »

Package name	Version	Size (.ipk)	Description
<u>openvpn-openssl</u>	2.4.7-2	158.3 KB	Open source VPN solution using OpenSSL

Install...

Press the `Install` button shown above.

A popup window will appear. Press the `Install` button to continue as shown below.



A window showing the progress for downloading and installing the `openvpn-openssl` package.

When complete, press the Dismiss button.



OpenWrt OpenVPN Client for BT Home Hub 5A

Now repeat above steps for 'luci-app-openvpn' package and install it.

Software

Free space: 97% (109.7 MB)

Filter: luci-app-openvpn Clear

Download and install package: Package name or URL... OK

Actions: Update lists... Upload Package... Configure opkg...

Available Installed Updates

« Displaying 1-29 of 29 »

Package name	Version	Size (.ipk)	Description
<u>luci-app-openvpn</u>	git-19.310.44720-c2be304-1	12.2 KB	LuCI Support for OpenVPN

Install...

↳ rpcd-mod-luci **INSTALLED**
↳ rpcd-mod-luci **INSTALLED**
↳ cgi-io **INSTALLED**

Description
LuCI Support for OpenVPN

Require approx. 49.4 KB size for 2 package(s) to install.

☐ Overwrite files from other package(s)

Cancel **Install**

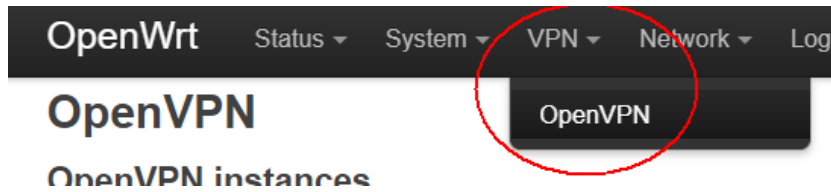
Executing package manager

```
Installing luci-app-openvpn (git-19.242.20917-ae8ddb0-1) to root...  
Downloading http://downloads.openwrt.org/releases/19.07-  
SNAPSHOT/packages/arm_cortex-a7_neon-vfpv4/luci/luci-app-openvpn_git-  
19.242.20917-ae8ddb0-1_all.ipk  
Configuring luci-app-openvpn.
```

Dismiss

OpenWrt OpenVPN Client for BT Home Hub 5A

Select another menu option such as `Network -> Interfaces` and eventually the 'VPN' menu should appear as shown below.



(Added. Bug in 19.07.3) If the 'VPN' menu fails to appear, you may have to navigate LuCI to `Logout`. When you log in again, the 'VPN' menu should be visible.

2.2 Configuring the OpenVPN Client for OpenWrt 19

Creating tun0 interface

In LuCI, go to the `Network -> Interfaces` menu.

Click on the 'Add new interface' button.



OpenWrt OpenVPN Client for BT Home Hub 5A

Specify a name of your choice for the interface. eg. VPNtun0

Choose 'Unmanaged' for the Protocol.

Enter 'tun0' for Custom Interface.

Protocol: Static address

Add new interface...

Name: VPNtun0

Protocol: Unmanaged

Bridge interfaces: ☐ creates a bridge over specified interface(s)

Interface: unspecified

- Bridge: "br-lan" (lan)
- Ethernet Switch: "eth0"
- Wireless Network: Master "OpenWrt" (lan)
- Wireless Network: Master "OpenWrt" (lan)
- Alias Interface: "@lan"
- Alias Interface: "@wan"
- tun0

Powered by LuCI openwrt.19.07 branch c1 r106

Press the Enter key after carefully typing in tun0

Protocol: Static address

Add new interface...

Name: VPNtun0

Protocol: Unmanaged

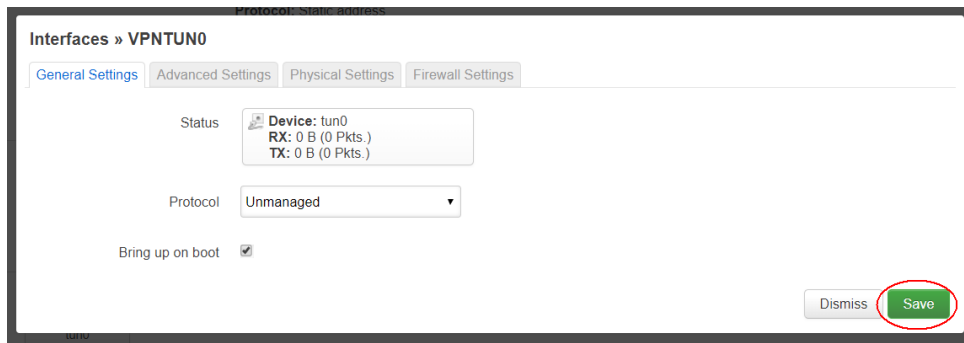
Bridge interfaces: ☐ creates a bridge over specified interface(s)

Interface: tun0

Cancel Create interface

Press the 'Create Interface' button.




OpenWrt OpenVPN Client for BT Home Hub 5A



Then press 'Save' button.

Then press 'Save & Apply' button at bottom of the page.

The page will refresh and return to the Network -> Interfaces menu.

Interfaces	
<div><div>LAN</div><div>br-lan</div></div>	<div><div>Protocol: Static address</div><div>Uptime: 0h 28m 40s</div><div>MAC: 98:1E:19:E7:16:AE</div><div>RX: 1.17 MB (9672 Pkts.)</div><div>TX: 16.07 MB (15379 Pkts.)</div><div>IPv4: 192.168.111.1/24</div><div>IPv6: fd62:d9e7:ea2a::1/60</div></div> <div><div>Restart</div><div>Stop</div><div>Edit</div><div></div></div>
<div><div>WAN</div><div>eth0.2</div></div>	<div><div>Protocol: DHCP client</div><div>Uptime: 0h 20m 13s</div><div>MAC: 32:46:8E:5C:90:FE</div><div>RX: 4.73 MB (7825 Pkts.)</div><div>TX: 533.47 KB (2722 Pkts.)</div><div>IPv4: 192.168.1.203/24</div></div> <div><div>Restart</div><div>Stop</div><div>Edit</div><div></div></div>
<div><div>VPNTUN0</div><div>tun0</div></div>	<div><div>Protocol: Unmanaged</div><div>RX: 0 B (0 Pkts.)</div><div>TX: 0 B (0 Pkts.)</div><div>Error: Network device is not present</div></div> <div><div>Restart</div><div>Stop</div><div>Edit</div><div></div></div>

Creating VPN zone

The procedure below differs from the current OpenWrt wiki page. The following is based on the old wiki page setup method before it was rewritten from 2018 onwards. The advantage of this older method, is the ability to turn 'Kill switch' ON and OFF as required.

In LuCI, go to Network -> Firewall menu.

Scroll to the bottom of the page.

OpenWrt OpenVPN Client for BT Home Hub 5A

Now click on the Add button as shown below:

Zones

Name	Zone ⇒ Forwardings	Input	Output	Forward	Masquerading	MSS clamping	
lan	lan ⇒ wan	accept	accept	accept	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete
wan	wan ⇒ REJECT	reject	accept	reject	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Edit Delete
Add							

Specify a name of your choice for the new VPN firewall zone. eg. VPN_zone

Edit the five parameters as shown below for:

Name: VPN_zone
Input: Reject
Masquerading: tick
MSS Clamping: tick
Covered Networks: VPN_tun0

Firewall - Zone Settings

[General Settings](#) [Advanced Settings](#) [Conntrack Settings](#) [Extra iptables arguments](#)

This section defines common properties of "this new zone". The *input* and *output* options set the default policy for traffic entering or leaving the zone while the *forward* option describes the policy for forwarded traffic between different networks within available networks are members of this zone.

Name: VPN_zone

Input: reject

Output: accept

Forward: reject

Masquerading: ☒

MSS clamping: ☒

Covered networks: VPNtun0: ☒ VPNtun0: ☒ lan: ☐ wan: ☐ -- custom --

The options below control the forwarding policy for traffic originating from this new zone. Selecting a zone in the list below will show the policy for that zone. The policy is unidirectional, e.g. a forward from lan to wan will be shown as forward from lan to wan.

Allow forward to destination zones:

Press 'Save' button.

OpenWrt OpenVPN Client for BT Home Hub 5A

Press 'Save & Apply' button at the bottom of the page.

Return to Network -> Firewall menu.

Scroll down the page until you find the Zones section.

Click on 'Edit' button for the 'lan' zone as shown below.

Zones

Zone ⇒ Forwardings	Input	Output	Forward	Masquerading		
lan ⇒ wan	accept	accept	accept	<input type="checkbox"/>		Edit Delete
wan ⇒ REJECT	reject	accept	reject	<input checked="" type="checkbox"/>		Edit Delete
VPN_zone ⇒ REJECT	reject	accept	reject	<input checked="" type="checkbox"/>		Edit Delete

Scroll to the bottom of the page and change the 'Allow forward to destination zones' from 'wan' to the newly created 'VPN_zone' as shown below.

Covered networks: lan

The options below control the forwarding policies between this zone (lan) and other zones. *Destination zones* cover forwarded traffic originating from lan. *Source zones* match forwarded traffic from other zones targeted at lan. The forwarding rule is *unidirectional*, e.g. a forward from lan to wan does not imply a permission to forward from wan to lan as well.

Allow forward to destination zones: VPN_zone VPNtun0

Allow forward from source zones: ☒ VPN_zone VPNtun0 ☐ wan wan

Dismiss Save

Press the 'Save' button.

Press the 'Save & Apply' button at the bottom of the page.

OpenWrt OpenVPN Client for BT Home Hub 5A

Important: Check the three zones: `lan`, `wan`, `VPN_zone` match **ALL** of the settings shown below:

Zones

Zone ⇒ Forwardings	Input	Output	Forward	Masquerading			
lan ⇒ VPN_zone	accept ▼	accept ▼	accept ▼	<input type="checkbox"/>		Edit	Delete
wan ⇒ REJECT	reject ▼	accept ▼	reject ▼	<input checked="" type="checkbox"/>		Edit	Delete
VPN_zone ⇒ REJECT	reject ▼	accept ▼	reject ▼	<input checked="" type="checkbox"/>		Edit	Delete

Editing OpenVPN configuration

Update (Dec 2023): ProtonVPN offer free accounts to their USA, Netherlands and Japan servers. (The free accounts do not permit torrenting)

Download the relevant OpenVPN configuration files from your chosen VPN service provider. See [section 4](#). The free VPN service provider, ProtonVPN, is used in this example.

In LuCI, go to VPN -> OpenVPN menu.

Scroll down to the OVPN configuration file upload section as shown below.

Enter a name for the VPN instance. eg. `Netherlands_94`

For best performance it is recommended to use the `.ovpn` files for UDP connections. They will contain `udp` in the filename.

Choose the `.ovpn` file you wish to use.

OVPN configuration file upload

node-nl-94.p...net.udp.ovpn

OpenWrt OpenVPN Client for BT Home Hub 5A

Press the Upload button.

~~Press the 'Save & Apply' button.~~

The ovpn file will be uploaded to the folder `/etc/openvpn` on the router and renamed. The new filename is derived from the name of the 'VPN instance'. eg.

`/etc/openvpn/Netherlands_94.ovpn`

The new VPN instance will appear in the list as shown below.

OpenVPN instances

Below is a list of configured OpenVPN instances and their current state

Name	Enabled	Started	Start/Stop	Port	Protocol	
Netherlands_94	<input type="checkbox"/>	no	<button>start</button>	5060	udp	<button>Edit</button> <button>Delete</button>

Click on the 'Edit' button to reveal the contents of the `.ovpn` file.

(NEW) Where necessary, you may need to edit the file to read 'tun' as in example below.

Overview » Instance "VPNbook_DE4_tcp80"

Section to modify the OVPN config file (`/etc/openvpn/VPNbook_DE4_tcp80.ovpn`)

```
client
dev tun3
proto tcp
remote 51.68.180.4 80
remote de4.vpnbook.com 80
```

Change to 'tun'

Scroll down the page and look for a line containing 'auth-user-pass' as shown below. This indicates a separate file containing the username and password (ie. Credentials) to log into the VPN service is required.

If you cannot see 'auth-user-pass' line, it may mean your VPN provider does not require one.

OpenWrt OpenVPN Client for BT Home Hub 5A

Overview » Instance "Netherlands_94"

Section to modify the OVPN config file (/etc/openvpn/Netherlands_94.ovpn)

```
tun-mtu 1500
mssfix 0
persist-key
persist-tun

reneg-sec 0

remote-cert-tls server
auth-user-pass

<ca>
-----BEGIN CERTIFICATE-----
```

If an `auth-user-pass` file is required, scroll to the bottom of the page and enter a valid username (eg. `openvpnusername`) and password (eg. `openvpnpassword`) on separate lines as shown below.

Section to add an optional 'auth-user-pass' file with your credentials

```
openvpnusername
openvpnpassword
```

This will be saved to a filename derived from the name of the 'VPN instance'. In this example, the filename will be:

```
/etc/openvpn/Netherlands_94.auth)
```

Locate and edit the 'auth-user-pass' line in the `.ovpn` file to add the full path of the above file as shown below.

Tip: simply copy & paste the highlighted blue text shown below.

OpenWrt OpenVPN Client for BT Home Hub 5A

```
reneg-sec 0  
  
remote-cert-tls server  
auth-user-pass /etc/openvpn/Netherlands_94.auth
```

```
<ca>  
-----BEGIN CERTIFICATE-----
```

Section to add an optional 'auth-user-pass' file with your credentials (`/etc/openvpn/Netherlands_94.auth`)

```
openvpnusername
```

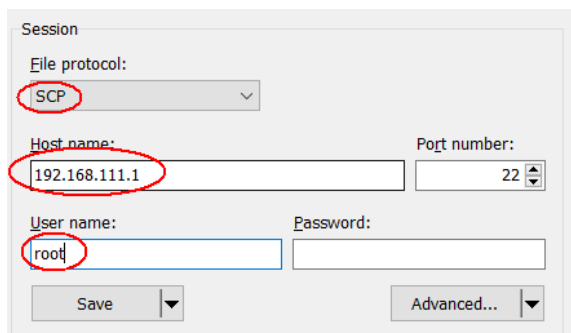
Press Save button.

Uploading additional configuration files

If your VPN service provider has supplied any additional configuration files, such as separate certificates or static keys which are not contained within the `.ovpn` file, these must be uploaded to the `/etc/openvpn` folder on the router. You will also need to edit the `.ovpn` file contents to include the full path to these files. Windows users can use WinSCP to upload these files to the router. For example:

```
ca /etc/openvpn/ca.crt  
cert /etc/openvpn/server.crt  
key /etc/openvpn/server.key  
dh /etc/openvpn/dh1024.pem
```

Start WinSCP and log into the HH5A at 192.168.111.1.



The image shows the WinSCP Session dialog box. The 'File protocol' dropdown is set to 'SCP'. The 'Host name' field contains '192.168.111.1'. The 'Port number' field is set to '22'. The 'User name' field contains 'root'. The 'Password' field is empty. There are 'Save' and 'Advanced...' buttons at the bottom.

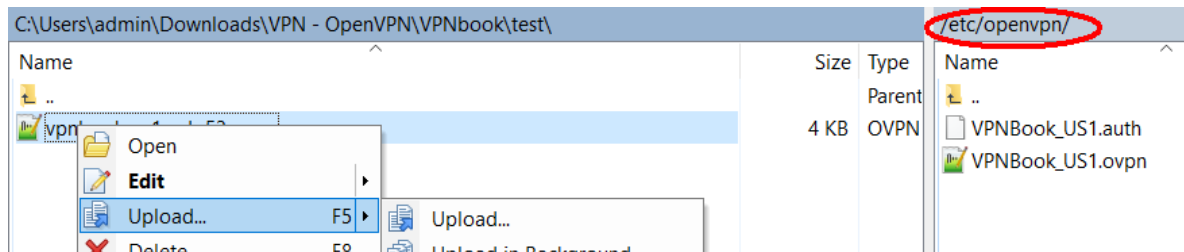
In the left hand pane of WinSCP, navigate to the folder which contains any additional certificates or static key files which your VPN provider has supplied.

OpenWrt OpenVPN Client for BT Home Hub 5A

In the right hand pane of WinSCP, navigate to the `/etc/openvpn` folder.

Upload the files to the on the HH5A by right-clicking on a file in the left hand pane, and choose 'Upload'.

In this tutorial, ProtonVPN does not provide any 'extra' certificate or key files so there is nothing extra to upload. You can see there is already an `VPNBook_US1.ovpn` file which was uploaded earlier, and the credentials (username & password) `VPNBook_US1.auth` file.



OpenWrt OpenVPN Client for BT Home Hub 5A

How to start VPN client

In LuCI, go to the `VPN -> OpenVPN` menu.

Note that simply pressing the 'Start' button **does not** start the VPN instance.

Tick the 'Enabled' check box as shown below.

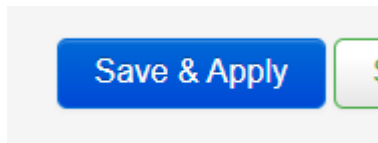
OpenVPN

OpenVPN instances

Below is a list of configured OpenVPN instances and their current state

Name	Enabled	Started	Start/Stop	Port	Protocol		
custom_config	<input type="checkbox"/>	no	<button>start</button>	-	-	<button>Edit</button>	<button>Delete</button>
sample_server	<input type="checkbox"/>	no	<button>start</button>	1194	udp	<button>Edit</button>	<button>Delete</button>
sample_client	<input type="checkbox"/>	no	<button>start</button>	-	udp	<button>Edit</button>	<button>Delete</button>
VPNBook_US1	<input checked="" type="checkbox"/>	no	<button>start</button>	53	udp	<button>Edit</button>	<button>Delete</button>

Then press `Save & Apply` button to initiate the VPN connection.



If the VPN instance starts, you should see the status change from 'No' to 'Yes' as shown below:

VPNBook_US1	<input checked="" type="checkbox"/>	yes (1913)	<button>stop</button>	53	udp	<button>Edit</button>
-------------	-------------------------------------	------------	-----------------------	----	-----	-----------------------

The `Start/Stop` button will function correctly while the `Enabled` check box is ticked.

You may need to shut down and restart the HH5A if nothing happens.

If the VPN instance fails to start, there is likely to be a problem with the configuration. If required by the VPN provider, check the credentials and the path has been appended to the 'auth-user-pass' line in the `.ovpn` file.

OpenWrt OpenVPN Client for BT Home Hub 5A

Go to Status -> System Log menu to examine the system log. Look for lines beginning 'daemon.notice.openvpn'.

Look specifically for '**Initialization Sequence Completed**' as shown in the image below. The message is an indication of a successful VPN connection.

```
Fri Sep 6 09:31:21 2019 daemon.notice openvpn(VPNBook_US1)[12541]: Incoming Data Channel: Cipher 'AES-256-GCM' initialized with 256 bit key
Fri Sep 6 09:31:21 2019 daemon.notice openvpn(VPNBook_US1)[12541]: TUN/TAP device tun0 opened
Fri Sep 6 09:31:21 2019 daemon.notice openvpn(VPNBook_US1)[12541]: TUN/TAP TX queue length set to 100
Fri Sep 6 09:31:21 2019 daemon.notice openvpn(VPNBook_US1)[12541]: /sbin/ifconfig tun0 10.8.0.70 pointopoint 10.8.0.69 mtu 1500
Fri Sep 6 09:31:21 2019 daemon.notice netifd: Interface 'VPNBook' is enabled
Fri Sep 6 09:31:21 2019 daemon.notice netifd: Network device 'tun0' link is up
Fri Sep 6 09:31:21 2019 daemon.notice netifd: Interface 'VPNBook' has link connectivity
Fri Sep 6 09:31:21 2019 daemon.notice netifd: Interface 'VPNBook' is setting up now
Fri Sep 6 09:31:21 2019 daemon.notice netifd: Interface 'VPNBook' is now up
Fri Sep 6 09:31:21 2019 user.notice firewall: Reloading firewall due to ifup of VPNBook (tun0)
Fri Sep 6 09:31:23 2019 daemon.notice openvpn(VPNBook_US1)[12541]: /sbin/route add -net 198.7.62.204 netmask 255.255.255.255 gw 192.168.1.254
Fri Sep 6 09:31:23 2019 daemon.notice openvpn(VPNBook_US1)[12541]: /sbin/route add -net 0.0.0.0 netmask 128.0.0.0 gw 10.8.0.69
Fri Sep 6 09:31:23 2019 daemon.notice openvpn(VPNBook_US1)[12541]: /sbin/route add -net 128.0.0.0 netmask 128.0.0.0 gw 10.8.0.69
Fri Sep 6 09:31:23 2019 daemon.notice openvpn(VPNBook_US1)[12541]: /sbin/route add -net 10.8.0.1 netmask 255.255.255.255 gw 10.8.0.69
Fri Sep 6 09:31:23 2019 daemon.notice openvpn(VPNBook_US1)[12541]: Initialization Sequence Completed
```

If you do not see '**Initialization Sequence Completed**', then it indicates there is a problem with the VPN connection. The router may be misconfigured, or there is a problem with the VPN provider.

Go to Network -> Interfaces menu, and the tun0 interface should look like the following image.



Protocol: Unmanaged
Uptime: 0h 2m 27s
RX: 7.40 MB (7897 Pkts.)
TX: 1.03 MB (6718 Pkts.)

OpenWrt OpenVPN Client for BT Home Hub 5A

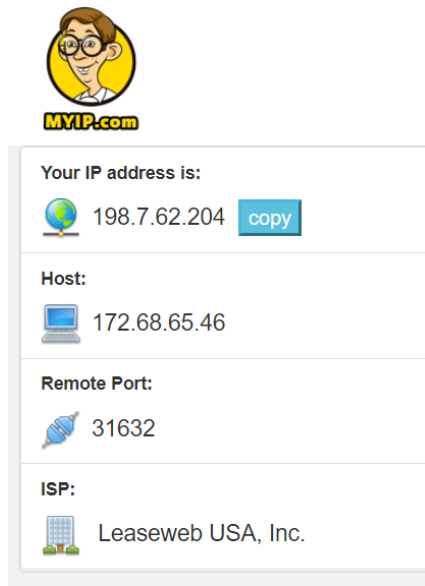
Testing VPN tunnel

Then check the PC is able to access the internet with a web browser through the VPN service.

You can verify your public IP address has changed to the one provided by your VPN service provider:

myip.com

whatismyipaddress.com



If you are unable to bring up any web page, there is probably a DNS resolver issue. OpenWrt uses the DNS servers known to the WAN interface, and these may be unreachable via the VPN tunnel.

Ping a known website by its IP address to verify whether there is internet connectivity, but note that some VPN providers such as VPNbook may block use of ICMP Ping.

```
C:\Users\admin>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=14ms TTL=55
Reply from 8.8.8.8: bytes=32 time=15ms TTL=55
Reply from 8.8.8.8: bytes=32 time=15ms TTL=55
Reply from 8.8.8.8: bytes=32 time=15ms 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 = 14ms, Maximum = 15ms, Average = 14ms
```

Proceed to [section 2.3](#) to set up the DNS resolvers.

OpenWrt OpenVPN Client for BT Home Hub 5A

Remember to complete the steps in [section 3](#) to resolve a number of known bugs with the HH5a.

unitd	Enabled	Start
led	Enabled	Start
dsl_control	Disabled	Start
eventd	Enabled	Start

Vendor Class to send when requesting DHCP

Override MAC address 96:6F:97:AD:8B:9A

Override MTU 1500

2.3 DNS Resolvers and Leak Protection

The HH5a will be using the default DNS servers defined by the WAN interface connection. This will usually be your ISP's DNS servers, or your local DNS server. This is likely to be 'undesirable' from a privacy point of view or may be blocked by your ISP when using the VPN tunnel.

Most VPN service providers offer their own internal DNS servers for additional privacy.

Unlike DDWRT or Tomato OpenVPN client implementations, there isn't a simple toggle setting to enable OpenVPN users on OpenWrt to choose to use the internal DNS servers provided by their VPN service provider.

If you know the IP addresses of your VPN provider's DNS servers, complete the following additional instructions. Otherwise, consider using OpenDNS or Google DNS servers.

Using LuCI, go to `Network -> Interfaces`

For LAN interface, click on `Edit` button

VPNBOOK tun0	Uptime: 0h 4m 41s MAC: 00:00:00:00:00:00 RX: 329.68 KB (769 Pkts.) TX: 176.99 KB (814 Pkts.)	Restart Stop Edit
LAN br-lan	Protocol: Static address Uptime: 2h 11m 38s MAC: 88:A6:C6:0E:C2:2A RX: 3.27 MB (18720 Pkts.) TX: 15.16 MB (23314 Pkts.)	Restart Stop Edit

If your VPN provider does not offer their own DNS servers, you may wish to use:

Google servers: 8.8.8.8 and 8.8.4.4

OpenDNS servers: 208.67.222.222 and 208.67.220.220

Cloudflare DNS servers: 1.1.1.1 and 1.0.0.1

OpenWrt OpenVPN Client for BT Home Hub 5A

Edit the 'Use custom DNS servers' boxes as in example shown below.

Protocol: Static address

Bring up on boot: ☒

IPv4 address: 192.168.111.1

IPv4 netmask: 255.255.255.0

IPv4 gateway:

IPv4 broadcast:

Use custom DNS servers: 8.8.8.8, 8.8.4.4

Press 'Save' button.

Press 'Save & Apply' button at bottom of the page.

Using LuCI, go to Network -> Diagnostics

Now to ping a known host such as Google's DNS server 8.8.8.8

Diagnostics

Execution of various network commands to check the connection and na

8.8.8.8 openwrt.org

IPv4 Ping IPv4 Tracerout

```
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=117 time=116.614 ms
64 bytes from 8.8.8.8: seq=1 ttl=117 time=121.427 ms
64 bytes from 8.8.8.8: seq=2 ttl=117 time=122.201 ms
64 bytes from 8.8.8.8: seq=3 ttl=117 time=125.079 ms
64 bytes from 8.8.8.8: seq=4 ttl=117 time=122.045 ms

--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 116.614/121.473/125.079 ms
```

If the results returns "0 packets received", there is likely to be a problem with the configuration (unless the VPN provider blocks use of ping command). Check the VPN instance is started and/or has not stopped prematurely. Review the contents of settings for the VPN instance, username & password, and firewall zone settings.

OpenWrt OpenVPN Client for BT Home Hub 5A

Ping a known host such as `www.google.com`

Diagnostics

Execution of various network commands to check the connection and network status

The screenshot shows the OpenWrt Diagnostics interface. At the top, there are two input fields: the first contains 'www.google.com' and the second contains 'openwrt.org'. Below the first field is a dropdown menu with 'IPv4 Ping' selected. To the right of the second field is a button labeled 'IPv4 Traceroute'. Below these fields is a text area displaying the results of a ping command. The results show five successful pings to 172.217.3.68 with varying response times. At the bottom of the text area, a line of statistics is circled in red: '5 packets transmitted, 5 packets received, 0% packet loss'. The text area also contains a header 'PING www.google.com (172.217.3.68): 56 data bytes' and a separator '--- www.google.com ping statistics ---'.

```
PING www.google.com (172.217.3.68): 56 data bytes
64 bytes from 172.217.3.68: seq=0 ttl=117 time=117.989 ms
64 bytes from 172.217.3.68: seq=1 ttl=117 time=118.384 ms
64 bytes from 172.217.3.68: seq=2 ttl=117 time=119.926 ms
64 bytes from 172.217.3.68: seq=3 ttl=117 time=120.622 ms
64 bytes from 172.217.3.68: seq=4 ttl=117 time=121.096 ms

--- www.google.com ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 117.989/119.603/121.096 ms
```

If the results returns “0 packets received”, there is likely to be a problem with the DNS servers you have specified. (unless the VPN provider blocks use of ping command)

OpenWrt OpenVPN Client for BT Home Hub 5A

Using the computer connected to the LAN port, check it has internet access. Try pinging known IP address and host.

```
C:\Users\admin>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=4ms TTL=58
Reply from 8.8.8.8: bytes=32 time=4ms TTL=58
Reply from 8.8.8.8: bytes=32 time=4ms TTL=58
Reply from 8.8.8.8: bytes=32 time=5ms TTL=58

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 5ms, Average = 4ms
```

If the results returns “0 packets received”, there is likely to be a problem with the firewall on the OpenWrt router. In LuCI, go to Network -> Firewall Review the Zones settings for the Lan.

```
C:\Users\admin>ping www.google.com
Ping request could not find host www.google.com. Please check the name and try again.

C:\Users\admin>_
```

If you see the above error message, there is likely to be a problem with the DNS settings.

If you explicitly wish your connected wired and wireless devices to directly access the DNS servers, you can complete the following optional procedure:

Click on DHCP Server tab.

Click on Advanced Settings tab.

OpenWrt OpenVPN Client for BT Home Hub 5A

In the box 'DHCP-Options', enter you new DNS servers, prefixed with '6,' and if there is more than one server, separated by comma, ','.

eg. for Google servers 8.8.8.8 and 8.8.4.4, the line would be:

6,8.8.8.8,8.8.4.4

for OpenDNS servers 208.67.222.222 and 208.67.220.220, the line would be:

6, 208.67.222.222, 208.67.220.220

for recently launched Cloudflare DNS servers 1.1.1.1 and 1.0.0.1, the line would be:

6,1.1.1.1,1.0.0.1

The screenshot shows the 'Interfaces » LAN' configuration page in the OpenWrt web interface. The 'DHCP Server' tab is selected and circled in red. Within this tab, the 'Advanced Settings' sub-tab is also circled in red. The 'Dynamic DHCP' checkbox is checked. The 'IPv4-Netmask' is set to '255.255.255.0'. The 'DHCP-Options' field is circled in red and contains the text '6,8.8.8.8,8.8.4.4'. At the bottom right, the 'Save' button is circled in red.

Press 'Save' button.

Press 'Save & Apply' button at the bottom of the page.

OpenWrt OpenVPN Client for BT Home Hub 5A

Disconnect and reconnect the PC from the HH5a to force it to acquire new DHCP supplied settings.

In Windows, open a `cmd` window and enter the command `ipconfig /all`

The new DNS servers should be visible

```
Default Gateway . . . . . : 192.168.111.1
DHCP Server . . . . . : 192.168.111.1
DNS Servers . . . . . : 8.8.8.8
                        8.8.4.4
NetBIOS over Tcpip. . . . . : Enabled
```

You can test for DNS leaks using this useful website:

<https://dnsleaktest.com/>

2.4 Kill switch

By completing the instructions described earlier in this guide, a 'Kill switch' has been added.

When inspecting the Firewall Zones, it can be observed all LAN traffic is directed towards the VPN firewall zone only. ie. if the VPN connection should fail, LAN traffic will not be directed to the WAN interface.

Zones		
Zone → Forwardings	Input	Output
lan ⇒ VPN_zone	accept	accept
wan ⇒ REJECT	reject	accept
VPN_zone ⇒ REJECT	reject	accept

2.5 LED configuration

Go to System -> LED Configuration menu. You may wish to edit the existing LED configuration for 'Internet' as shown below. The 'b' (broadband) indicator will light up while the HH5a is connected to the VPN service provider.

Edit the settings by renaming the original 'dsl' LED configuration as shown below:

OpenWrt OpenVPN Client for BT Home Hub 5A

Name

LED Name

Default state ☐

Trigger

Device

Trigger Mode ☒ Link On ☐ Transmit ☐ Receive

2.6 System Log spammed by odhcp messages

If you discover the System Log is being repeatedly spammed with `odhcpd` messages as in example below:

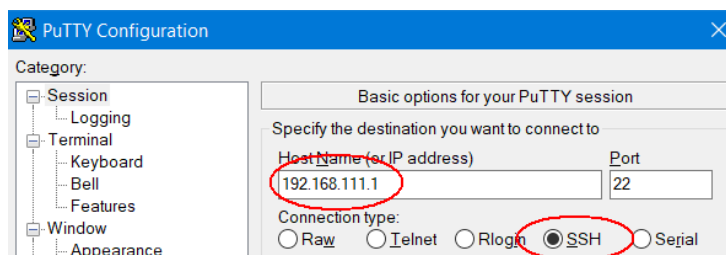
```
Wed Oct 18 22:58:53 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:05:34 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:11:58 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:17:07 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:19:07 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:19:12 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
Wed Oct 18 23:20:20 2017 daemon.info odhcpd[643]: Using a RA lifetime of 0 seconds on br-lan
```

Here is the explanation for the above example.

https://bugs.OpenWrt.org/index.php?do=details&task_id=1274

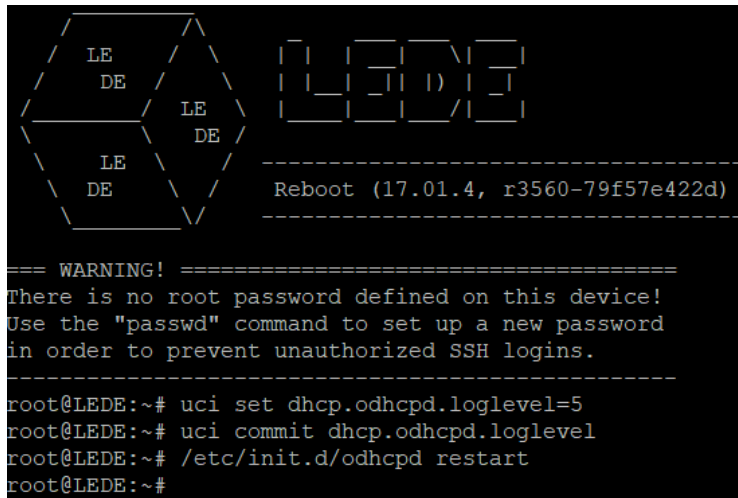
“As such the frequency and contents of the trace is completely normal; the trace is there for trouble shooting purposes (which is often required if people complain about IPv6 connectivity issues) but if you want to suppress the trace you can set the `loglevel uci` parameter to 0 in the `dhcp odhcpd uci` section.”

To change the `loglevel`, open a SSH session using PuTTY to the HH5a.



Changing the `loglevel` from default of 6 to 5 will suppress `info` messages from `odhcpd`. (The `loglevel` of 4 can suppress `info` and `notice` messages) Execute the following three commands by copying each line and pasting into PuTTY:

```
uci set dhcp.odhcpd.loglevel=5
uci commit dhcp.odhcpd.loglevel
/etc/init.d/odhcpd restart
```



```
LE
DE
LE
DE
LE
DE
Reboot (17.01.4, r3560-79f57e422d)

==== WARNING! =====
There is no root password defined on this device!
Use the "passwd" command to set up a new password
in order to prevent unauthorized SSH logins.
=====

root@LEDE:~# uci set dhcp.odhcpd.loglevel=5
root@LEDE:~# uci commit dhcp.odhcpd.loglevel
root@LEDE:~# /etc/init.d/odhcpd restart
root@LEDE:~#
```

The above UCI commands will add a `loglevel` line to the `/etc/config/dhcp` file.

```
config odhcpd 'odhcpd'
    option maindhcp '0'
    option leasefile '/tmp/hosts/odhcpd'
    option leasetrigger '/usr/sbin/odhcpd-update'
    option loglevel '5'
```

If you see these similar messages with later versions of OpenWrt:

```
Thu Oct 10 08:20:13 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:29:13 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:36:34 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:43:46 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:47:15 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:51:42 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 08:55:25 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
Thu Oct 10 09:01:34 2019 daemon.notice odhcpd[1016]: Sending a RA on lan
```

OpenWrt OpenVPN Client for BT Home Hub 5A

Changing the `loglevel` from default of 6 to 4 will suppress `notice` messages from `odhcpd`. (The `loglevel` of 4 can suppress `info` and `notice` messages) Execute the following three commands by copying each line and pasting into PuTTY:

```
uci set dhcp.odhcpd.loglevel=4
uci commit dhcp.odhcpd.loglevel
/etc/init.d/odhcpd restart
```

2.7 OpenWrt 19.07 information

OpenWrt 19.07 currently includes OpenVPN client 2.4.7. This v1.2 guide has been refreshed for OpenWrt 19.07 only. If you are looking for instructions for LEDE 17.01 or OpenWrt 18.06, please download the older v1.1 guide.

There have also been changes to LuCI since the early availability of OpenWrt 19.07-snapshots. This guide has been refreshed based on OpenWrt 19.07.0-rc1 stable release.

There are some issues which I have witnessed when testing OpenWrt with my VPN provider:

- When attempting to change the `LAN` IP address, the `auto rollback` prompt does not appear if both `WAN` and `LAN` IP addresses are on the same subnet (eg. 192.168.1.x). To resolve the problem, change the `LAN` IP address first BEFORE allowing any IP address to be assigned to the `WAN` interface. Section [2.1](#) has been revised following this discovery.

New to OpenWrt 19.07, is the ability to upload and edit the `.ovpn` configuration file saved directly to the `/etc/config/openvpn` folder using LuCI. However, you may still have to use WinSCP or other tool to upload/edit any other files provided by the VPN service provider.

2.8 How to upgrade OpenWrt

2.8.1 Upgrading to 19.07.x

OpenWrt OpenVPN Client for BT Home Hub 5A

If you already possess a HH5a with LEDE 17.01 or OpenWrt 18.06 configured with working OpenVPN client as described in previous versions of this document, and wish to upgrade to OpenWrt 19.07, then I recommend the following summarised procedure for the HH5a. It involves temporarily disabling the VPN and re-instating normal internet access through the router.

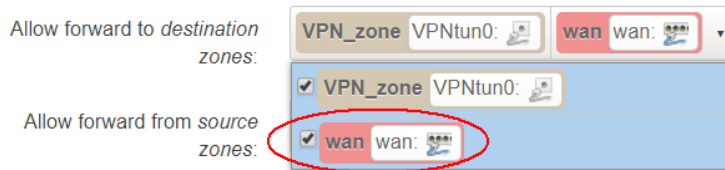
Navigate to LuCI > Network > Firewall Click on Edit button for the lan zone.

Zones

Zone ⇒	Forwardings	Input	Output	Forward	Masquerading	
lan	⇒ VPN_zone	accept ▼	accept ▼	accept ▼	<input type="checkbox"/>	<div>≡ Edit</div>

OpenWrt OpenVPN Client for BT Home Hub 5A

Add the wan zone as shown below to the 'Allow forward to destination zones'. This removes the 'Kill Switch' when the VPN is not active.



Navigate to LuCI > VPN > OpenVPN. Untick box for the active VPN instance. Then press 'Save & Apply' button. The 'stop' button should change to 'start' as shown below. You may need to restart the router.



Use a web browser and confirm the router is connected to your ISP. eg. visit myip.com

Download the latest OpenWrt firmware, and navigate to LuCI > System > Backup/Flash firmware.

Ensure 'Keep settings' is enabled as shown below, and flash the new firmware to the router.

Flash new firmware image

Upload a sysupgrade-compatible image here to replace the running firmware. Check "Keep settings" to retain the current settings (if you have a backup of the current settings).

Keep settings ☒

Image No file chosen

After the new firmware is installed, navigate to LuCI > System > Software. Click on Update lists... button.

Install the 'openvpn-openssl' and 'luci-app-openvpn' packages (as described in section [2.1](#))

Remove the wan from the lan firewall zone to reinstate the 'Kill switch'.

(Added) For 'Allow forward to destination zones' uncheck 'wan' to the newly created 'VPN_zone' as shown below.

OpenWrt OpenVPN Client for BT Home Hub 5A

Covered networks: lan

The options below control the forwarding policies between this zone (lan) and other zones. *Destination zones* cover forwarded traffic originating from lan. *Source zones* match forwarded traffic from other zones targeted at lan. The forwarding rule is *unidirectional*, e.g. a forward from lan to wan does not imply a permission to forward from wan to lan as well.

Allow forward to destination zones:
VPN_zone VPNtun0: ☒

Allow forward from source zones:
wan wan: ☐

Dismiss Save

Zones

Zone ⇒ Forwardings	Input	Output	Forward	Masquerading
lan ⇒ VPN_zone	accept	accept	accept	<input type="checkbox"/>

Enable the VPN by ticking the check box and pressing 'Save & Apply' button. You may need to press the 'Start' button too.

VPNbookUS1 ☒ yes (3940) stop

Use a web browser and go to myip.com to confirm VPN is active.

For HH5A, remember to disable `dsl_control` as described in section [3.1](#)

vpn	Enabled	Start
led	Enabled	Start
dsl_control	Disabled	Start
eventd	Enabled	Start

2.8.2 Upgrading to 21.02.x (LuCI bug)

The procedure described in section [2.8.1](#) has always worked for 18.06 and 19.07 for a number of different model routers I own which have very basic openvpn client configuration.

For HH5a, upgrading from 19.07 to 21.02 is not much different to previous versions of OpenWrt while keeping settings. **Warning:** for other devices which have been migrated to the new DSA architecture, it is NOT possible to keep settings when upgrading to 21.02.

OpenWrt OpenVPN Client for BT Home Hub 5A

If you discover LuCI fails to load after upgrading to 21.02.0 and keeping existing settings, you may have to make 2 changes, if clearing the browser cache, and opening LuCI using incognito window in Chrome, or InPrivate window in Edge browser etc. fails to resolve the problem.

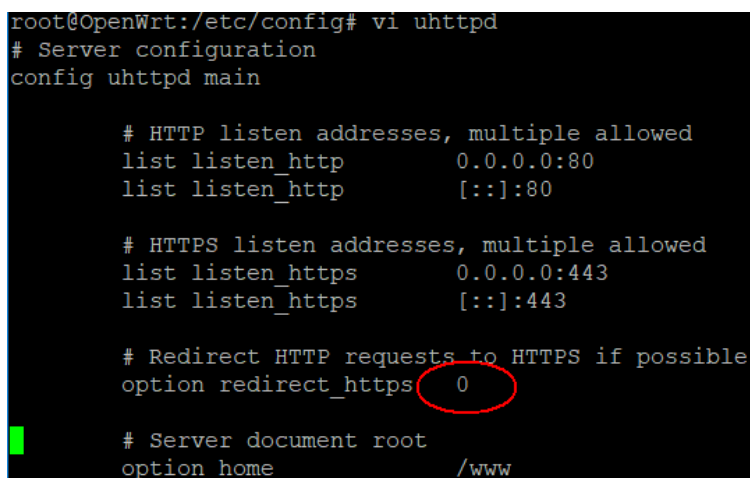
Use VI or WinSCP, locate and edit the file `/etc/config/uhttpd`

Locate the following line:

```
option redirect_https 1
```

Change line to read:

```
option redirect_https 0
```

A terminal window showing the configuration of the uhttpd service. The prompt is 'root@OpenWrt:/etc/config#'. The file being edited is 'uhttpd'. The configuration includes sections for 'Server configuration' and 'config uhttpd main'. Under 'config uhttpd main', there are settings for HTTP and HTTPS listen addresses, a redirect option, and a document root. The 'option redirect_https 0' line is circled in red.

```
root@OpenWrt:/etc/config# vi uhttpd
# Server configuration
config uhttpd main

    # HTTP listen addresses, multiple allowed
    list listen_http      0.0.0.0:80
    list listen_http      [::]:80

    # HTTPS listen addresses, multiple allowed
    list listen_https     0.0.0.0:443
    list listen_https     [::]:443

    # Redirect HTTP requests to HTTPS if possible
    option redirect_https 0

    # Server document root
    option home            /www
```

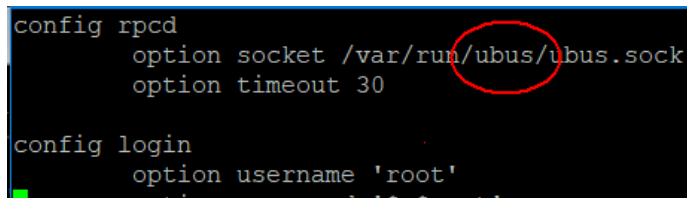
Use VI or WinSCP, locate and edit the file `/etc/config/rpcd`

Locate the following line:

```
option socket /var/run/ubus.sock
```

Change the line to read:

```
option socket /var/run/ubus/ubus.sock
```

A terminal window showing the configuration of the rpcd service. The prompt is 'root@OpenWrt:/etc/config#'. The file being edited is 'rpcd'. The configuration includes sections for 'config rpcd' and 'config login'. Under 'config rpcd', there are settings for the socket and timeout. The 'option socket /var/run/ubus/ubus.sock' line is circled in red.

```
root@OpenWrt:/etc/config# vi rpcd
config rpcd
    option socket /var/run/ubus/ubus.sock
    option timeout 30

config login
    option username 'root'
    option password 'root'
```

Reboot the HH5a and LuCI should appear.

2.8.3 Upgrading to 22.03.x or 23.05.x

It is NOT possible to directly upgrade and keep configuration settings from versions of OpenWrt prior to 22.03.

OpenWrt 22.03 for HH5a moves from using legacy Switch architecture to new DSA.

Similarly, upgrading from 22.03 to 23.05 did not retain settings for some devices I tested. It may be because 23.05 introduces new Firewall 4.

When you install OpenWrt 22.03/23.05 sysupgrade.bin using LuCI, you **MUST untick** the 'Keep Settings' check box. You may also need to tick the 'Force Upgrade' checkbox to continue. After installation, go to 192.168.1.1 and set up the HH5a from scratch for basic internet access.

After installing the packages `openvpn-openssl` and `luci-app-openvpn`

You can then use Windows tools such as WinSCP to restore the following openvpn files and folders.

Configuration file: `/etc/config/openvpn`

Contents of the folder: `/etc/openvpn/`

2.9 Simple VPN and non-VPN access with HH5A, up to 21.02

(Sep 2021): Note this procedure does NOT work with devices which use DSA, such as HH5a with very latest development snapshots or OpenWrt 22.03.

This may be a 'simpler' alternative to using 'VPN Bypass' and 'Policy Based Routing (PBR)' offered by OpenWrt.

There may be a situation where you wish to configure the wifi on the HH5A so you can choose between whether a wifi device uses the VPN, or not. For example, you may wish devices which are connected to 2.4 GHz wifi or LAN interface to use VPN, but devices connected to 5 GHz wifi are NOT to use VPN.

Normally, I would recommend you simply connect your wifi device to your existing wifi network if you do not require VPN.

Please note the proposed solution only works because the WAN port of the HH5A is wired to the LAN port of the main ISP facing router.

If your openvpn client router is connected direct to your internet service provider, this proposed solution must NOT be attempted and it will NOT work!

By bridging a wifi interface to the WAN port on the HH5A, your wifi devices will connect to the LAN interface of your existing ISP facing router, which will serve a DHCP IP address to your device, to enable it to connect to the internet.

OpenWrt OpenVPN Client for BT Home Hub 5A

In LuCI, navigate to **Network > Wireless**

Click 'Edit' for the wireless interface which will **not** be used for VPN.

Change the Network setting from LAN to WAN.

Interface Configuration

General Setup | Wireless Security | MAC-Filter | Advanced Settings

Mode: Access Point

ESSID:

Network: wan: (selected)

Hide ESSID: ☒

WMM Mode: -- custom --

Save the settings.

Similarly, the HH5A OpenWrt client router is installed in another room, and wired to LAN interface of the main ISP facing router by a long ethernet cable. There may be a situation where you want to provide an extra ethernet connection but do not wish to install an ethernet switch or lay additional cables to the same room as the HH5A.

If your openvpn client router is connected direct to your internet service provider, this proposed solution must NOT be attempted and it will NOT work!

The HH5A has four LAN ports. You can reconfigure one or more ethernet ports so they are bridged to the original WAN interface. In example below, I have bridged former LAN 4 port to the WAN port.

Navigate to **LuCI -> Network -> Switch**

Enable mirroring of outgoing packets ☐

VLANs on "switch0"

VLAN ID	CPU (eth0)	LAN 1	LAN 2	LAN 3	LAN 4	WAN
Port status:	1000baseT full-duplex	100baseT full-duplex	no link	no link	no link	100baseT full-duplex
1	tagged	untagged	untagged	untagged	off	off
2	tagged	off	off	off	untagged	untagged

VPN access (circled in blue) | **non-VPN access** (circled in red)

[Add VLAN](#)

OpenWrt OpenVPN Client for BT Home Hub 5A

LAN 4 port is connected to the ISP facing router's LAN. ie. Does NOT use the VPN.

Any ethernet device plugged into the LAN 4 port will bypass the VPN and connect to the existing network for regular internet access.

2.10 Troubleshooting

2.10.1 Hub One (stock firmware) blocking VPN

A reader recently reported a problem connecting to three different party VPN providers, namely PureVPN, VPNbook and ProtonVPN.

Their main ISP facing router is a Plusnet Hub One running stock firmware (firmware 4.7.5.1.83.8.263) and connecting to Plusnet broadband service. They were trying to configure a HH5a with OpenWrt 19.07.5 and Openvpn client.

When trying to connect to VPNbook, the system log displayed the following messages which were repeated. There was no 'Initialisation Completed' message.

```
daemon.notice openvpn(PureVPN)[15279]: TCP/UDP: Preserving recently used remote address: [AF_INET]5.254.77.10:53
daemon.notice openvpn(PureVPN)[15279]: UDP link local: (not bound)
daemon.notice openvpn(PureVPN)[15279]: UDP link remote: [AF_INET]5.254.77.10:53
daemon.err openvpn(PureVPN)[15279]: TLS Error: TLS key negotiation failed to occur within 60 seconds (check your network connectivity)
daemon.err openvpn(PureVPN)[15279]: TLS Error: TLS handshake failed
daemon.notice openvpn(PureVPN)[15279]: SIGUSR1[soft,tls-error] received, process restarting
```

After some trial and error, adding the IP address of the OpenWrt HH5a into the Hub One's DMZ resolved the problem for when using UDP. DMZ is not required for TCP connections.

There have been no other similar reports from other readers when using HH5a or Hub One with stock firmware.

2.10.2 AEAD Decrypt error: bad packet ID (may be a replay)

I was installing openwrt 22.03.5 on linksys EA6350 v3, and observed this error messages in the System log. They were appearing every few seconds when streaming video through the vpn connection.

```
AEAD Decrypt error: bad packet ID (may be a replay): [ # ] -- see the man page entry for --no-replay and --replay-window for more info or silence this warning with --mute-replay-warnings
```

Using mssfix parameter within the .ovpn file did not resolve the issue.

This was caused by using a wireless bridge (all devices on same LAN subnet 192.168.10.x). The WAN ethernet port from the EA6350 v3 was connected to the bridge, and the bridge connects wirelessly to my home wifi.

I was able to reproduce the issue with two different wireless bridges. Old Belkin f7d4302 (Broadcom) running FreshTomato using 2.4 GHz, and Asus RT-AC57u (MT7621) running Padavan using 5 GHz.

When I hard wired the Linksys EA6350 v3 openwrt router to the home ethernet home LAN, the above error message did not appear.

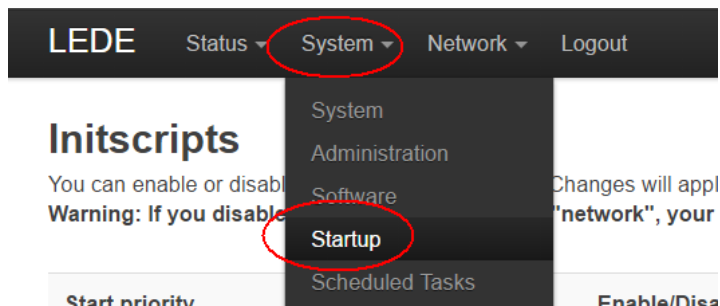
3. Bug fixes for Home Hub 5A

3.1 How to disable 'dsl_control' (DSL port)

It appears when the DSL port is not being used, a bug in the VDSL app causes unexpected high load, and can eventually cause the HH5a to crash and reboot without warning. This usually occurs within an hour of starting the HH5A. This issue may also affect other modem routers with Lantiq SoC.

In the meantime, it is recommended to disable 'dsl_control' if the DSL port won't be used.

Start LUCI and navigate to `System -> Startup` menu



Scroll down until you find 'dsl_control'. Then click on 'Enabled' and 'Stop' buttons.

96	led	Enabled	Start	Restart	Stop
97	dsl_control	Enabled	Start	Restart	Stop
98	sysntpd	Enabled	Start	Restart	Stop

Ensure that Disabled is displayed as shown below.

core	Enabled	Start
led	Enabled	Start
dsl_control	Disabled	Start
eventd	Enabled	Start

Optionally, shut down and restart the HH5a.

The DSL port is now disabled.

3.2 Random WAN port MAC address fix

If the HH5a is configured to use the red Ethernet WAN port, you may observe when using DHCP-client, the WAN port acquires a different IP address every time the hub is power-cycled. This is because the WAN port's MAC address has not been defined properly during boot up. A side effect is if the hub is attached to your LAN, it could use up the pool of DHCP IP addresses if the hub is rebooted very frequently. Fortunately, the WAN port's MAC address does not change during DHCP IP address renewal.

For up to OpenWrt 19

To resolve the issue, start LUCI and navigate to `Network -> Interfaces` menu.

The screenshot shows the LUCI web interface with the 'Interfaces' menu selected. The 'Interface Overview' table displays the following data:

Network	Status	Actions
LAN br-lan	Uptime: 0h 1m 47s MAC-Address: 8C:10:D4:0C:2C:EC RX: 64.77 KB (602 Pkts.) TX: 169.11 KB (576 Pkts.) IPv4: 192.168.1.1/24 IPv6: fdad:4053:2891::1/60	Connect Stop Edit
WAN eth1.2	Uptime: 0h 0m 0s MAC-Address: 96:6F:97:AD:8B:9A RX: 0 B (0 Pkts.) TX: 13.05 KB (43 Pkts.)	Connect Stop Edit

Notice the MAC addresses for the LAN and WAN interfaces are very different in above example.

Click on 'Edit' and go the 'Advanced Settings' tab.

Interfaces - WAN

On this page you can configure the network interface network interfaces separated by spaces. You can al

Common Configuration

General Setup **Advanced Settings** Phy

Scroll down the page until you find the 'Override MAC Address' field.

OpenWrt OpenVPN Client for BT Home Hub 5A



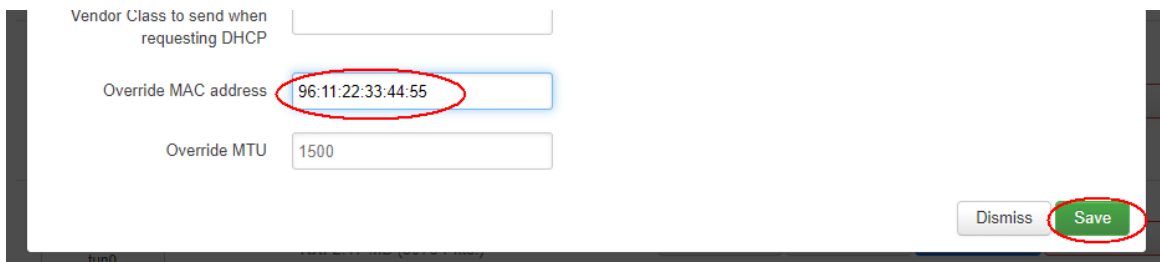
Vendor Class to send when requesting DHCP

Override MAC address 96:6F:97:AD:8B:9A

Override MTU 1500

In the above example, the MAC address beginning '96:6F' changes every time the hub is power cycled.

Enter a new MAC address. Ensure any address you choose is NOT used elsewhere. You can choose to use the MAC address already shown in the above box such as the address beginning '96:6F' if you wish. Ensure the 2nd digit is always an even number, such as '6' in example below.



Vendor Class to send when requesting DHCP

Override MAC address 96:11:22:33:44:55

Override MTU 1500

Dismiss Save

Press the 'Save' button

Press the 'Save & Apply' button at the bottom of the page.

OpenWrt – all versions

The above method is no longer available starting from OpenWrt 21.02, as part of eventual migration to DSA.

Fortunately, you can also fix the problem by editing the 'wan_dev' section of the /etc/config/network configuration file.

For LEDE 17, search for 'ptm0' as shown below.

For OpenWrt 18, 19 & 21, search for 'dsl0'

For dhcp-client mode

```
config interface 'wan'
    option ifname 'eth0.2'
    option proto 'dhcp'
    option ipv6 'auto'
```

OpenWrt OpenVPN Client for BT Home Hub 5A

```
config device 'wan_dev'  
    option name 'ptm0'          # requires to be changed to 'eth0.2'  
    option macaddr 'xx:xx:xx:xx:xx:yy'
```

For LEDE 17, OpenWrt 18 and 19, the existing 'wan_dev' should be amended to read:

```
config device 'wan_dev'  
    option name 'eth0.2'  
    option macaddr '78:65:59:ae:fc:51'
```

For OpenWrt 21.02, the option name should be changed from ds10 to eth0.2:

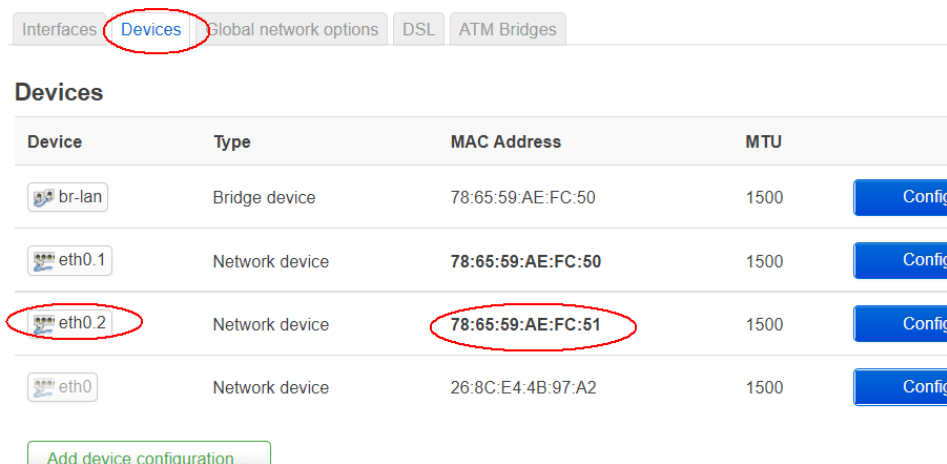
```
config device  
    option name 'eth0.2'  
    option macaddr '78:65:59:ae:fc:51'
```





Enter a new MAC address. Ensure any address you choose is NOT in active use elsewhere.

Important: Ensure the 2nd digit is always an even number, such as '8' in above example images.

Note that if you choose to edit the 'option name' to match what is shown in the 'wan' section, the 'Override MAC address' option in LuCI will no longer work in versions of OpenWrt up to 19.07.

For OpenWrt 21.02, navigate to **LuCI -> Network -> Interfaces -> Devices** tab. You can make further changes by clicking on 'Configure' button in future.



Interfaces	Devices	Global network options	DSL	ATM Bridges
Devices				
Device	Type	MAC Address	MTU	
 br-lan	Bridge device	78:65:59:AE:FC:50	1500	Config
 eth0.1	Network device	78:65:59:AE:FC:50	1500	Config
 eth0.2	Network device	78:65:59:AE:FC:51	1500	Config
 eth0	Network device	26:8C:E4:4B:97:A2	1500	Config
Add device configuration...				

OpenWrt OpenVPN Client for BT Home Hub 5A

Network device: eth0.2

General device options Advanced device options

Device type: Network device

Existing device: eth0.2

MTU: 1500

MAC address: 78:65:59:ae:fc:51

TX queue length: 1000

Enable IPv6: ☒

IPv6 MTU: 1500

DAD transmits: 1

OpenWrt - 21.02

If you don't wish to use SSH and VI, this alternative method also appears to work but may leave your **/etc/config/network** file looking a bit more complicated

Navigate to **LuCI -> Network -> Interfaces -> Devices** tab

Locate the 'eth0.2' entry and click **Configure** button.

Devices

Device	Type	MAC Address	MTU	
br-lan	Bridge device	78:65:59:AE:FC:50	1500	Configure...
eth0.1	Network device	78:65:59:AE:FC:50	1500	Configure...
dsl0	Network device	78:65:59:AE:FC:51	-	Configure...
eth0	Network device	F2:70:0D:28:94:52	1500	Configure...
eth0.2	VLAN (802.1q)	F2:70:0D:28:94:52	1500	Configure...

OpenWrt OpenVPN Client for BT Home Hub 5A

Edit the `MAC address` field as shown below:

Ensure any address you choose is NOT in active use elsewhere.

Important: Ensure the 2nd digit is always an even number, such as '8' in the following example image.

VLAN (802.1q): eth0.2

General device options

Advanced device options

Device type VLAN (802.1q)

Base device  eth0

VLAN ID 2

Device name eth0.2

MTU 1500

MAC address 78:65:59:AE:FC:57

Press the 'Save' button.

Interfaces





Devices

Global network options

DSL

ATM Bridges

Devices

Device	Type	MAC Address	MTU
 br-lan	Bridge device	78:65:59:AE:FC:50	1500
 eth0.1	Network device	78:65:59:AE:FC:50	1500
 dsl0	Network device	78:65:59:AE:FC:51	-
 eth0.2	VLAN (802.1q)	78:65:59:AE:FC:57	1500

Press the 'Save & Apply' button.

Now reboot the HH5a for the changes to take effect.

The `/etc/config/network` file will contain a new section:









OpenWrt OpenVPN Client for BT Home Hub 5A

```
config device
    option name 'eth0.2'
    option type '8021q'
    option ifname 'eth0'
    option vid '2'
    option macaddr '78:65:59:AE:FC:57'
```

OpenWrt - 22.03 or later

Navigate to **LuCI -> Network -> Interfaces -> Devices** tab

Locate the 'wan' entry and click **Configure** button.

Devices				
Device	Type	MAC Address	MTU	
 br-lan	Bridge device	90:4D:4A:3E:1C:6E	1500	Configure... Unconfigure
 lan1	Network device	90:4D:4A:3E:1C:6E	1500	Configure... Unconfigure
 lan2	Network device	90:4D:4A:3E:1C:6E	1500	Configure... Unconfigure
 lan3	Network device	90:4D:4A:3E:1C:6E	1500	Configure... Unconfigure
 lan4	Network device	90:4D:4A:3E:1C:6E	1500	Configure... Unconfigure
 dsl0	Network device	90:4D:4A:3E:1C:6F	-	Configure... Unconfigure
 eth0	Network device	FE:91:5D:B6:C0:65	1508	Configure... Unconfigure
 wan	Network device	FE:91:5D:B6:C0:65	1500	Configure... Unconfigure

Edit the MAC address field as shown below:

Ensure any address you choose is NOT in active use elsewhere.

Important: Ensure the 2nd digit is always an even number, such as '8' in the following example image.

OpenWrt OpenVPN Client for BT Home Hub 5A

Network device: wan

General device options

Advanced device options

Device type Network device

Existing device wan

MTU 1500

MAC address FE:91:5D:B6:C0:65

Press the 'Save' button.

Devices

Device	Type	MAC Address	MTU	
br-lan	Bridge device	90:4D:4A:3E:1C:6E	1500	Configure...
lan1	Network device	90:4D:4A:3E:1C:6E	1500	Configure...
lan2	Network device	90:4D:4A:3E:1C:6E	1500	Configure...
lan3	Network device	90:4D:4A:3E:1C:6E	1500	Configure...
lan4	Network device	90:4D:4A:3E:1C:6E	1500	Configure...
dsl0	Network device	90:4D:4A:3E:1C:6F	-	Configure...
wan	Network device	FE:91:5D:B6:C0:65	1500	Configure...

Press the 'Save & Apply' button.

Now reboot the HH5a for the changes to take effect.

The /etc/config/network file will contain a new section:

```
config device
    option name 'wan'
    option macaddr 'FE:91:5D:B6:C0:65'
```


4. VPN service provider configuration files

The OpenVPN client configuration files can be found on the VPN service providers website.

Some providers choose to include the Certificate and static key within the OVPN file. However, others are known to supply them separately.

Place the ovpn, certificate and key files into the `/etc/openvpn` folder on HH5a.

- **CyberGhost (Feb 2024)**

Home page: www.cyberghostvpn.com

Required files:

- `.ovpn`
- `ca.crt`
- `client.crt`
- `client.key`

You may need to add the following into the imported `.ovpn` file if you encounter the IPv6 errors described in this thread: <https://forum.openwrt.org/t/use-openvpn-of-cyberghost-on-openwrt/186529/14>

```
verb 5

# to block IPv6 traffic necessary on newer clients
pull-filter ignore "route-ipv6"
pull-filter ignore "ifconfig-ipv6"
block-ipv6
```

- **ExpressVPN (2018)**

Home page: <https://www.expressvpn.com>

Downloads page: Available to registered users

Required files: `*.ovpn`

Ensure the `.ovpn` file includes certificates and

keys, otherwise, you will have to specify paths to any additional files.

Tested: Yes

• Hotspot Shield (2018)

Home page: <https://www.hotspotshield.com>

Downloads page:

Required files: `config.ovpn`

Tested: Yes

• IPVanish (2018)

Home page: www.ipvanish.com

Downloads page: www.ipvanish.com/software/configs/

Required files: `*.ovpn`
`ca.ipvanish.com.crt`

Tested: No

• KeepSolid/VPN Unlimited (Dec 2023)

Home page: <https://www.vpnunlimitedapp.com>

Downloads page: <https://my.KeepSolid.com/products/vpn/>

Log into account and generate unique `ovpn` file for the device.
Username & Password **are not required** when using the `ovpn` file.

Required files: `*.ovpn`

OpenWrt OpenVPN Client for BT Home Hub 5A

Your subscriptions

KeepSolid VPN Unlimited®
Your subscription period is LIFETIME
[More options](#)

Extras **Manage** Go to website

Manual Configurations

Device
Router2

Server
[Streaming] BBC iPlayer

Choose a server that is closest to your location, it usually provides the best connection speed.

Protocol
OpenVPN

Generate View manual

Tested: Yes.

Not the best for torrent users as they only have 3 dedicated torrent servers in Canada, France and Romania. Lifetime subscription (5 connections) has been offered for as little as US\$18 from [stacksocial.com](#) with discount code in the past.

Update (15 Dec 2023): Openvpn suddenly stopped working on 19.07.10 and 21.02.2 routers. Upon investigation, it looked like new .ovpn files required. However, the new .ovpn files from Keepsolid simply would not work.

For 21.02: I had to open the downloaded .ovpn files in notepad++, copy and paste entire contents into notepad.exe in Windows. Use the new notepad compatible .ovpn file.

For 19.07: OpenWrt/Keepsolid don't support **allow-compression** or **comp-lzo** parameters respectively.

At time of writing, I have not yet ascertained why there is a problem parsing the new .ovpn files into openwrt. I have noted the <ca> section of the new .ovpn files contains two certificates.

The issue is resolved by upgrading to openWrt 22.03.5.

Wireguard protocol is now supported. (Note there are privacy concerns when using wireguard) <https://www.vpnunlimitedapp.com/help/manuals/open-wrt-wireguard-setup>

OpenWrt OpenVPN Client for BT Home Hub 5A

Update (Aug 2021): I briefly tested wireguard client on 21.02-0-rc4 returning 32 mbps in speed tests. Too early to comment on wireguard server reliability/availability – connection is to 'unique' server IP address, and not to a DNS resolved host name.

To fix the time sync issue, this worked for me:
Go to LuCI > System > Startup > 'Local Startup' tab.

Add this dirty quick fix:

```
date -s "2030-01-01 00:00:00"
```

from: <https://forum.OpenWrt.org/t/problematic-system/56435/36>

Wireguard frequently stops working after a few days especially if the wireguard router is turned off for any length of time. It then requires new config to be generated and applied to the openwrt router to resolve the problem. This can be frustrating (This is not an issue when using openvpn)

• Mullvad (2019)

Home page: <https://www.mullvad.net>

Downloads page: <https://www.mullvad.net/download/config/>

Required files: *.ovpn (Download the Android version)

Tested: Yes.

No longer provide free 3 hour trials since April 2019.

Wireguard also supported:
<https://mullvad.net/en/help/running-wireguard-router/>

• NordVPN (2018)

Home page: <http://www.nordvpn.com>

Downloads page: <https://nordvpn.com/api/files/zip>

Required files: *.ovpn

OpenWrt OpenVPN Client for BT Home Hub 5A

Tested: Yes

3 day free trial available.

Nord also supports wireguard:

<https://support.nordvpn.com/Connectivity/Router/1047411192/OpenWrt-CI-setup-with-NordVPN.htm>

- **PIA (2018)**

Home page: <https://www.privateinternetaccess.com/>

Downloads page:

<https://helpdesk.privateinternetaccess.com/hc/en-us/articles/218984968-What-is-the-difference-between-the-OpenVPN-config-files-on-your-website->

Required files:
*.ovpn
ca.rsa.2048.crt
ca.rsa.2048.pem

Tested: No

OpenWrt OpenVPN Client for BT Home Hub 5A

• ProtonVPN (Dec 2023)

Home page: <https://protonvpn.com/>

Required files: *.ovpn

OpenVPN configuration files

These configuration files let you choose which Proton VPN server you connect to when using a third-party VPN app or setting up a VPN connection on a router.

1. Select platform

☒ Android [View guide](#) ☐ iOS [View guide](#) ☐ Windows [View guide](#) ☐ macOS [View guide](#) ☐ GNU/Linux [View guide](#) ☐ Router [View guide](#)

2. Select protocol

☒ UDP ☐ TCP [What is the difference between UDP and TCP protocols?](#)

3. Select config file and download

☐ Country configs ☐ Standard server configs ☒ Free server configs ☐ Secure Core configs

Install a Free server configuration file to connect to a specific server in one of the three free locations.

▼ Japan

▲ Netherlands

Name	Status	Action
NL-FREE#102068	45%	Download
NL-FREE#102068	33%	Download

OpenVPN username & password located here:

OpenVPN / IKEv2 username

Use the following credentials when connecting to Proton VPN servers without application. Example use cases include: Tunnelblick on macOS, OpenVPN on GNU/Linux.

These credentials cannot be used to sign in to our official Proton VPN apps. [Learn more](#)

OpenVPN / IKEv2 username

OpenVPN / IKEv2 password

[Reset credentials](#)

Tested: Offer free account to access their free USA, Netherland and Japan servers.

OpenWrt OpenVPN Client for BT Home Hub 5A

nb. openvpn username/password are not the same as Account username/password.

- **PureVPN (2019)**

Home page: www.purevpn.com

Downloads page: <https://support.purevpn.com/openvpn-files>

Required files: `*.ovpn`
`ca.crt` for v1 files only
`Wdc.key` for v1 files only

Tested: Yes

2021: PureVPN now offer two different versions of .ovpn files. The newer v2 files include the certificate and keys within the single file. The older v1 files require separate certificate and key files to be uploaded to the router and .ovpn file edited to point path of these uploaded files.

- **Surfshark (2018)**

Home page: www.surfshark.com

Downloads page: <https://account.surfshark.com/setup/manual>

Required files: `*.ovpn`

Tested: Yes.

- **VPNbook (2018)**

Home page: www.vpnbook.com

Downloads page: www.vpnbook.com/freevpn

Required files: `*.ovpn`

Tested: Yes. Username & Password changes every 2 weeks.

OpenWrt OpenVPN Client for BT Home Hub 5A

I don't consider this to be a safe or secure VPN provider so use with caution.

Update (Jan 2022): VPNbook has proven to be unreliable lately. Consider using ProtonVPN instead.

- **Zoog VPN (2019)**

Home page: <https://zoogvpn.com/>

Downloads page: <https://zoogvpn.com/vpn-setup/android>

Log into zoogvpn website to retrieve opvn files.

Required files: *.ovpn (Download the Android version)

Tested: Yes. Username & Password is same as required to log into zoogvpn account.

Free accounts offer 2GB per month usage allowance and access to UK, NL, US free servers. The free servers use 128 bit instead of 256 bit cipher. Appears to work when briefly tested.