Wire Guard VPN setup

WHAT IS VPN WIREGUARD

This is a feature of SLZB-OS that allow them to connect to remote Home Assistant / Zigbee2MQTT server through secure VPN tunnel without any additional hardware. WireGuard is an extremely simple yet fast and modern VPN that utilizes state-of-the-art cryptography. It aims to be faster, simpler, leaner, and more useful than IPsec while avoiding the massive headache. It intends to be considerably more performant than OpenVPN.

Current VPN limits

Via VPN, the following is currently available:

- Webserver
- Radiomodules (sockets)

What doesn't work through a VPN:

- Ethernet to WiFi bridge
- MQTT

1. Prerequisites

1.1. Hardware and Software used

- A server with Home Assistant is installed and running. In this manual, we are using Raspberry Pi 3B+ with a clean fresh install of HAOSS.
- An SLZB-06 family coordinator (firmware version 2.2.6 or later).
- WireGuad add-on, Zigbee2MQTT add-on and ZHA integration.
- The Zigbee device you want to connect remotelly.

1.2. IP Address reservation

It is reccomended to reserve a static IP addresses on the router for Home Assistant server and the SLZB-06 family coordinator. In our case, on a TP-Link router, static IP address reservations can be configured under the `Network` >> `DHCP Server` >> `Address Reservation` section.

2. Establishing access to your Home Assistant / Zigbee2MQTT

In order to let remote SLZB-06 coordinator to establish secure connection with your Home Assistant / Zigbee2MQTT, coordinator should know how to reach your Home Assistant. There are two options here:

- if you do not have a white IP address - you can use intermediary services like DuckDNS, that will let SLZB-06 coordinator know how to find your Home Assistant (so coordinator will knock to the doors and ask "Hey, may I connect to your Wireguard Add-on and establish a secure tunnel?").
- if you have a white IP address - you can open a port to access your Home Assistant directly without intermediary services like DuckDNS (although you can use DuckDNS togather with white IP address).

TIP

You need to use only one option - if you do not have white/static IP address from your provider - use DuckDNS, if you have - either open port or use service like DuckDNS as well.

Lets looks through both options.

2.1. Port forwarding

The location of this function may vary depending on your router. On a TP-Link router, it can be found under `Advanced` >> `NAT Forwarding` >> `Port Forwarding`. Add a port forwarding rule in which you specify:

Service Name: `wireguard`
Device IP Address: `IP address of Home Assistant` (in our case 192.168.0.103)
External Port: `51820`
Internal Port: `51820`

Protocol: `UDP`

port-forwarding.a83d73ed.png

2.2. DuckDNS set-up

2.2.1. Duck DNS domain registration

1. Visit the duckdns.org website and log in using your preferred method.
2. Create a unique domain name, such as slzb-06, enter it in the domains section and click add domain. This will add the new domain to your list of domains.
   duck-dns.fc78d3b1.png

> **WARNING**
> **DuckDNS is not compatible with CGNAT!**

2.2.2. Install Duck DNS add-on

1. We'll need to install the DuckDNS add-on in Home Assistant. Head over to the Left panel within Home Assistant click `Settings` and choose `Add-ons`.
2. Navigate to the Add-on Store and search for `Duck DNS` add-on. Click `Install` and wait for the installation to complete.
3. Once installed, click `Configure` tab on the top side of the add-on.

2.2.3. Duck DNS add-on configuration

> TIP:
> Keep your DuckDNS token private!

1. In the `Domains` field, enter the domain you created in Duck DNS. In UI mode, delete the empty domain.
2. In the `Token` field, enter your Duck DNS token.
3. In the `Lets Encrypt` section, set `accept_terms` to true.
4. Save settings and run add-on.

```
domains:
  - slzb-06.duckdns.org
token: 490d69be-u835-984a-a9aa-8430bcbd02bd
```

```
aliases: []
lets_encrypt:
  accept_terms: true
  algo: secp384r1
  certfile: fullchain.pem
  keyfile: privkey.pem
seconds: 300
```

duckdns-addon-config
duckdns-addon-config.df4f6423.png

Once these steps are completed, you can use the Duck DNS address as the host in Wireguard and as the Endpoint hostname in the coordinator's web interface.

3. WireGuard add-on setting-up and configuration

3.1. Wireguard add-on installation

1. We'll need to install the WireGuad add-on in Home Assistant. Head over to the Left panel within Home Assistant click `Settings` and choose `Add-ons`.
2. Navigate to the Add-on Store and search for `WireGuard` Add-on. Click `Install` and wait for the installation to complete.
3. Once installed, click the `Configure` tab on the top side of the add-on.

3.2. WireGuard add-on configuration in Home Assistant

The configuration is divided into two parts: the server side and the client side.

3.2.1. Server side:

`host`: The public IP address that clients can use to access WireGuard. This guide uses a static public IP address. However, you can also use DuckDNS.

`address`: The IP address assigned to the WireGuard add-on interface. For a WireGuard network, it is recommended to use a different network than the main one to avoid routing problems. Home routers typically use the 192.168.0.0/24 or 192.168.1.0/24 network.

Network Selection: The /24 subnet mask is the most common. It determines how many devices can be on the network. A /24 subnet mask allows for 256 IP addresses or 254 connected devices. Two IP addresses are reserved for the network address and the gateway address. The /24 subnet mask is popular because of its simplicity. Every /24 network address always ends with 0. For example, 192.168.0.0/24, 192.168.1.0/24, 192.168.2.0/24, ..., 192.168.255.0/24. For WireGuard, you can choose any arbitrary network. For example, I chose 192.168.10.0/24. You can choose this one or another.

Host Selection: Once the network address is selected, you need to choose the host addresses. This includes the WireGuard interface address and the peer addresses. You can use an IP calculator to see the range of available addresses on the network. In my case, this is the range from 192.168.10.1 to 192.168.10.254. For the WireGuard add-on interface address, I chose 192.168.10.1.
`dns`: For DNS, you can use the router's address, or 1.1.1.1, 1.0.0.1.

3.2.2. Client side:

`name`: Arbitrary client name, e.g., myphone, mylaptop, SLZB-06
`addresses`: Address from the Wireguard network issued to the client. You can take the next address after the Wireguard interface.
`client_allowed_ips`: This is a list of networks that the WireGuard peer is allowed to access. In this guide, this is the main network and the WireGuard network.

```
server:
  host: 176.37.187.207 #Avoid publicly sharing your public IP address
  addresses:
    - 192.168.10.1
  dns:
    - 192.168.0.1
  log_level: debug
peers:
  - name: slzb-06
    addresses:
      - 192.168.10.2
    allowed_ips: []
    client_allowed_ips:
      - 192.168.0.0/24 #Change this address if your main network is different
      - 192.168.10.0/24
```

You can add more clients. For example, your phone or another coordinator. To do this, copy the client part, change the name, and increase the IP address by one.

```
- name: slzb-06-2
  addresses:
    - 192.168.10.3
  allowed_ips: []
  client_allowed_ips:
    - 192.168.0.0/24 #Change this address if your main network is different
    - 192.168.10.0/24
```

3.3. Getting Wireguard configuration for use at SLZB-06

3.3.1. Using File Editor

1. Install the `File Editor` add-on.
2. Go to the `Configuration` tab and turn off the `Enforce Basepath` switch. This will allow full access to the Home Assistant file system.

file-editor.ecadec62.png

4. Open the `File editor` add-on. In the top left corner, click the directory icon. Click the back arrow to go up one level. Select the directory `ssl` >> `wireguard` >> `SLZB-06` >> `client.conf`.
   config-file-view.9de171e5.png

3.3.2. Using Studio Code Server

If you prefer `Studio Code Server`. Open the add-on, on the left Exproler panel in a space, right-click >> `Add Folder to Workspace` >> select the `ssl` directory >> `wireguard` >> click ok. Select the `slzb-06` directory >> `client.conf`.
studio-code-server.2ae07bf4.png

> TIP:
> You can run Wireguard in a separate container instead of an HA addon

3a. WireGuard container setting-up and configuration

3a.1. Install wireguard container

`docker pull linuxserver/wireguard`

3a.2. Run container example

```
docker run -d \
  --name=wireguard \
  --cap-add=NET_ADMIN \
  --cap-add=SYS_MODULE `#optional` \
  -e PUID=1000 \
  -e PGID=1000 \
  -e TZ=Etc/UTC \
  -e SERVERURL=wireguard.domain.com `#optional` \
  -e SERVERPORT=51820 `#optional` \
  -e PEERS=1 `#optional` \
  -e PEERDNS=auto `#optional` \
  -e INTERNAL_SUBNET=10.13.13.0 `#optional` \
  -e ALLOWEDIPS=0.0.0.0/0 `#optional` \
  -e PERSISTENTKEEPALIVE_PEERS= `#optional` \
  -e LOG_CONFS=true `#optional` \
  -p 51820:51820/udp \
  -v /path/to/wireguard/config:/config \
  -v /lib/modules:/lib/modules `#optional` \
  --sysctl="net.ipv4.conf.all.src_valid_mark=1" \
  --restart unless-stopped \
  lscr.io/linuxserver/wireguard:latest
```

> TIP:
> Change `SERVERURL` to your URL wireguard (using some like dudckns if this ip changes)

/path/to/wireguard/config in order to use your config wireguard folder.

3a.3. Add route to access client vpn ip's from host and others containers (like zigbee2mqtt)

```
wireguard_internal_subnet=$(docker exec wireguard printenv INTERNAL_SUBNET)
wireguard_ip=$(docker inspect -f '{{range.NetworkSettings.Networks}}{{.IPAddress}}{{end}}'
wireguard)
ip route replace $wireguard_internal_subnet/24 via $wireguard_ip
```

3a.4. Get wireguard connection data

- Go to wireguard config folder and enter into `peer1` or `peer2` and read `peer1.conf` or `peer2.conf`
- Enter this info into SLZB-06

3a.5. zigbee2mqtt configuration.yaml for WG container

- Modify line `port: tcp://IP:6638` and replace IP with the IP Address of wireguard container (The `$wireguard_ip` value obtaneid previously)
- Restart Z2M container/addon

4. Wireguard configuration on SLZB-06

WARNING
You should never share your private key and public IP address with anyone.

TIP:
Newer versions of Wireguard require a `Preshared Key`. SLZB-06 supports `Preshared Key` starting from firmware version `v2.5.3`

A VPN tunnel allows you to be on one network and connect to another. To add a VPN configuration to the SLZB-06 coordinator, go to the device address, in the left-hand side menu, click `VPN`, and activate the `Enable VPN Wireguard` switch. Transfer local and endpoint IP addresses, and private and public keys from the `client.conf` file. Click `Save`

slzb-06-wireguard.9a580434.png

5. Configuring IP routing on Home Assistant server

1. Install the `Advanced SSH & Web Terminal` add-on on your Home Assistant.
2. Go to the `Configuration` tab and in the `password` row set a strong password. The password can be generated. Click `Save`
3. In the `Info` tab, disable the `Protection mode` switch and start the add-on.
4. Click `Open Web UI` and paste the following command:

```
host_result=$(host a0d7b954-wireguard); addon_ip=${host_result##* }; ip route replace
192.168.10.0/24 via $addon_ip; echo $addon_ip
```

where `192.168.10.0/24` is the network that we have allocated for the Wireguard interface and peers. This command tells Home Assistant that to reach the 192.168.10.0/24 network, it needs to go through the IP address of the Wireguard add-on.

To check if the command works, you can view the routing table by running the command `route -n`. If the desired network is in the list, then the command worked. Additionally, you can `ping` the coordinator.

ping.8feb7a1a.png
The routing command only works temporarily and then gets erased. To make it permanent, you need to create a sensor in the `configuration.yaml` file and restart Home Assistant. After that, the

sensor name will appear in `Devices & Services` >> `Entities`.

```
command_line:
  - sensor:
      name: wireguard_route
      command: "host_result=$(host a0d7b954-wireguard); addon_ip=${host_result##* }; ip route
replace 192.168.10.0/24 via $addon_ip; echo $addon_ip"
```

6. Running ZHA / Zigbee2MQTT with remote SLZB-06

6.1. ZHA launch with remote SLZB-06

1. Head over to the Left panel within Home Assistant click `Settings` and choose `Devices & Services`.
2. In the bottom right corner, click the `Add Integration` button, find and select the `Zigbee Home Automation` integration.
3. In the Radio Type window, select the line

- ZNP - for SLZB-06/06p7 and 06p10 (based on Texas Instruments chips) `Submit`.
- EZSP - for SLZB-06M and SLZB-06Mg24 (based on SiliconLabs chips) and click `Submit`.

zha-settings.14de33c1.png

4. In the Serial Port Settings window, enter `socket://192.168.10.2:6638`. Where 192.168.10.2 is the IP address assigned to the coordinator in Wireguard. Leave the Port speed and Data flow control unchanged and click `Submit`.

5. In the Network Formation window, select the option to create a new network. After following these steps, you should receive a success message.

zha-settings-2.5588b229.png

6.2. Running local and Remote SLZB-06 with Zigbee2MQTT via Wireguard

6.2.1. Zigbee2MQTT running with local SLZB-06

MQTT Settings

1. in Home Assistant go to `Settings` >> `Add-ons` >> `Add-on store` and install the `Mosquitto broker` addon >> enable Watchdog switch, then start it. As of the writing of this manual, the version of the add-on is 6.4.0.
2. Click on the Home Assistant user icon >> User settings section >> and enable the Advanced mode switch.
3. Go to `Settings` >> `People` >> `Users tab` >> click the add user button:
   `Display name`: mqtt_user
   `Username`: mqtt_user
   `Password`: mqtt_password
   You can choose your username and password.
4. Go to `Settings` >> `Devices & Services` >> press the Add Integration button >> MQTT >> MQTT
   `Broker`: core-mosquitto
   `Port`: 1883
   `Username`: mqtt_user
   `Password`: mqtt_password

Press Submit and Finish

Zigbee2MQTT Settings

1. Go back to the Add-on store, click `⋮` >> Repositories, fill in `https://github.com/zigbee2mqtt/hassio-zigbee2mqtt` and click Add
2. Install `Zigbee2MQTT` add-on and enable the Watchdog switch. As of the writing of this manual, the version of the add-on is 1.37.1-1.
3. Click on `Configuration` and paste in the following configuration. You need to change the mqtt login and password in it if they differ and the coordinator IP address. Click `Save`. Switch to the info tab and click Start. The add-on takes some time to start, so if you get a `502: Bad Gateway` error try again in a minute.

```
data_path: /config/zigbee2mqtt
socat:
  enabled: false
  master: pty,raw,echo=0,link=/tmp/ttyZ2M,mode=777
  slave: tcp-listen:8485,keepalive,nodelay,reuseaddr,keepidle=1,keepintvl=1,keepcnt=5
  options: "-d -d"
  log: false
mqtt:
  server: mqtt://core-mosquitto
  user: mqtt_user
  password: mqtt_password #Change password if it is different for you
serial:
  port: tcp://192.168.0.109:6638 #Change the IP address to the address of your coordinator
  adapter: zstack
```

z2m-settings.a64c51b6.png

6.2.2. Zigbee2MQTT running with remote SLZB-06 connected via Wireguard

To set up a second Zigbee2MQTT instance, you need to add another slightly modified repository URL to Home Assistant. Each such URL is perceived as new and unique. Here are some examples of modified URLs:

`https://github.com/zigbee2mqtt/hassio-zigbee2mqtt/`
`http://github.com/zigbee2mqtt/hassio-zigbee2mqtt`
`http://github.com/zigbee2mqtt/hassio-zigbee2mqtt/`
`http://www.github.com/zigbee2mqtt/hassio-zigbee2mqtt/`

1. Navigate to the `Add-on store`, click on the three dots `⋮` icon, and then select Repositories. Paste any of the provided links into the URL field.
2. Refresh the page and install the new Zigbee2MQTT instance. Activate the Watchdog switch.
3. Click on the Configuration tab and paste in the following configuration, change the network port and save it.

```
data_path: /config/zigbee2mqtt_lan2
socat:
  enabled: false
  master: pty,raw,echo=0,link=/tmp/ttyZ2M,mode=777
  slave: tcp-listen:8485,keepalive,nodelay,reuseaddr,keepidle=1,keepintvl=1,keepcnt=5
  options: "-d -d"
  log: false
mqtt:
  server: mqtt://core-mosquitto
  base_topic: zigbee2mqtt_lan2
  user: mqtt_user
  password: mqtt_password
serial:
  port: tcp://192.168.10.3:6638
  adapter: zstack
```

z2m-settings-2.f4ff5913.png
`data_path`: The directory where the Zigbee2MQTT configuration file is located. By default, this is the /config/zigbee2mqtt directory (the same as homeassistant/zigbee2mqtt/ in File Editor"). For the second network, I created a new directory by changing its name in the add-on settings to /config/zigbee2mqtt_lan2

`base_topic`: The MQTT topic for publishing messages to and from the Zigbee network. By default, the base topic is called zigbee2mqtt and is used by the first instance. For the second network, I created a different topic by changing its name to zigbee2mqtt_lan2 in the add-on settings.

`Network port`: By default, port 8485 is used. This port is occupied by the first add-on. For the second instance, I used port 8486 and saved the port settings.

z2m-port-exposed.16cfa3fd.png
As a result, we will have two instances of Zigbee2MQTT with two different Zigbee networks running independently of each other. Following the example of the second instance, more Zigbee2mqtt instances can be set up.

Advanced Config

For advanced Zigbee network configuration, including pan ID, coordinator transmit power, device last seen time, and Z2M logging level, you can utilize a separate Zigbee2MQTT configuration file named `configuration.yaml`.

If the addon has not been started after changing the configuration, the folder and file must be created manually.

For example, if your data path in the addon configuration is called `config/zigbee2mqtt_lan2`, then the directory that needs to be created will be named `zigbee2mqtt_lan2` in the `homeassistant` folder This is the same thing. Then you need to create a new file called `configuration.yaml` and paste the configuration below.

z2m-config-folder.e79bd1bf.png
If the addon is running, stop it and completely delete its directory with all subfolders. Create a folder with the same name again, and create a `configuration.yaml` file inside it. After that, you can start the Zigbee2MQTT addon.

```
mqtt:
  server: mqtt://core-mosquitto:1883
  user: mqtt_user
  password: mqtt_password
  base_topic: zigbee2mqtt_lan2
  version: 5
serial:
  port: tcp://192.168.10.3:6638
  adapter: zstack
  baudrate: 115200
  disable_led: false
advanced:
  transmit_power: 20
  channel: 15
  pan_id: GENERATE
  network_key: GENERATE
  availability_blocklist: []
  availability_passlist: []
  last_seen: ISO_8601
```

7. Pairing Zigbee devices on a remote coordinator

Adding Zigbee devices to a remote WireGuard coordinator is the same as adding them to a local network coordinator.

8. Conclusion

As a result of following this guide, we established a secure connection to a remote Zigbee LAN coordinator using a custom Wireguard VPN client.

9. Troubleshooting

z2m: MQTT error: Connection refused: Not authorized
Check the correctness of the mqtt_user data. Wrap mqtt_user and mqtt_password in quotes like this `"`

Zigbee2MQTT not adding to MQTT Bridge
Delete the MQTT integration settings and reconfigure it

502: Bad Gateway
Zigbee2MQTT is still starting up, or failed to start. Zigbee2MQTT takes about 1 minute to start. The error also occurs with various addon startup errors. See the logs for Zigbee2MQTT add-on errors.

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