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# **wg\_tool**

***Release 7.4.0***

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## WG-TOOL

### 1.1 Overview

Manage wireguard server and user configs. Ensures server and user configs remain consistent.

Available on

- [Github](#)
- [Archlinux AUR](#)

On Arch install using the PKGBUILD provided in packaging directory or from the AUR.

All git tags are signed with [arch@sapience.com](mailto:arch@sapience.com) key which is available via WKD or download from <https://www.sapience.com/tech>. Add the key to your package builder gpg keyring. The key is included in the Arch package and the `source=` line with `?signed` at the end can be used to verify the git tag. You can also manually verify the signature

### 1.2 Key features

- simplifies wireguard administration. ( server and users )
- guarantees server and user configs remain synchronized (public keys).
- handles key creation when needed
- users can have multiple profiles (bob:laptop bob:phone etc)
- users and/or profiles can be marked active/inactive
- ‘wg show’ output connections displayed by user:profile name.

This solves a long standing annoyance in a simple way by showing names instead of public keys as output by `wg show`. Also provides check that server config is up to date and if it needs to be restarted with new `wg0.conf`

- supports importing existing user/profiles

### 1.3 New / Interesting

- New option to set `PersistentKeepalive` for user profiles (defaults to 0 which is off) See options `-upd_user_keepalive` and `-user_keepalive` below.
- Use python 3 `ipaddress` in place of 3rd party `netaddr` module.
- Code reorg
- Split route - new option set `allowed_ips` in user configs. By default it has everything going via the VPN. Split routing is useful.

For example you may want to route via the VPN only those networks on the LAN (inside) of the vpn server while allowing all other packets to go directly out.

This is also useful when setting up wireguard to join 2+ locations where each location's subnet is available to users at either location.

This is done using "--allowed\_ips" which sets the wireguard config "AllowedIPs". This option can be used when creating a new user:profile or when modifying an existing profile with *-mod*.

See *Options* section for more detail.

- Require python 3.13 or later
- Adjust for upcoming python changes. Some argparse options have been deprecated in 3.12 and will be removed in 3.14
- New Feature: Multiple IP Address for user profiles.

See new options *-prefixlen\_4* and *-prefixlen\_6*.

I'd appreciate testing and feedback (see Issue #14)

New user profiles now get ip(s) from each server network. CIDR address for each network will have *prefixlen\_4* or IPv4 and *prefixlen\_6* for IPv6 networks. *prefixlen* are settable with new options.

Existing user profile (or -all) can have their IPs refreshed to pick up their new IPs from server config. If you already have multiple networks or simply added them to the server *Address* variable in *configs/server/server.conf* - and then refresh using:

```
wg-tool -mod -ips <user>:<profile>
```

or

```
wg-tool -mod -ips -all
```

- New option *-upd*, *-upd\_endpoint* used with *-mod* to update existing user profiles when server IP/Port is changed.
- *-mod* now supports *-all* to apply to all users.
- *wg-client* companion package now available. A linux client tool and separate graphical program to launch wireguard client. Simplify using wg for all users.
- *wg-peer-updn* now saves additional copy of dns file as *resolv.conf.wg* Helpful for clients which sleep and on resume network restart overwrites *resolv.conf* This makes it simple to put back the vpn *resolv.conf* file by copying *resolv.conf.wg* to *resolv.conf*. Used by *wg-client* package. Postdown will still restore original *resolv.conf*. save as usual.
- Change python build from poetry to hatch
- Can now generate html and pdf docs using sphinx Pre-built *wg\_tool.pdf* provided in repo See *Howto-Build* in the *Docs* directory

## 1.4 Interesting

The Wireguard server report shows users by user:profile names instead of by public key fingerprint.

Can get human readable server report based on output of *wg show*. Can do this either by running on the wg server (*-rrpt*, *\*-run\_show\_rpt*) or from saved report file (*-rpt\**, *-show\_rpt*).

This report shows users and profiles in nice human readable form.

It also indicates whether each user and profile are marked active (by showing (+) or (-) beside the name. If an inactive user is connected, it may be time ensure the server is running the latest *wg0.config*.

This feature solves a long standing problem with native wireguard reports which burden the administrator with mapping IPs or public keys to a user profile. The report does it for you and shows actual user and profile names.

Because of this feature, this tool eliminates any need for schemes, such as Vanity keys, attempting to map public keys to something more palatable.

It will also advise if the current server config being used is out of sync with current tool config and therefore needs updating and/or restarting

Sample output of `wg-tool -rrpt`

```
wg server:
  interface : wg0
    port : nnnnn
    pub_key : <x>

susan (+) : phone (+)
  endpoint : xxx.xxx.xxx.xxx:yyyyy
  address : xxx.xxx.xxx.xxx/32
handshake : 2 hours, 4 minutes, 15 seconds ago
transfer : 102.62 MiB received, 320.29 MiB sent
```

## 1.5 More background

The tool manages wireguard server configs and the user configs.

It also guarantees that server and user configs are kept properly synchronized. This ensures that any information that is shared between the server and clients, such as public keys, are always consistent.

It handles key creation whenever needed, such as when adding user/profiles or when doing key rollovers.

A wireguard server and user configs share several common variables, such as public keys, hostname and listening ports, and therefore it's crucial they are consistent.

wg-tool uses a single source of data which is used to populate the actual configs wireguard needs; this approach guarantees they are always consistent with one another. It also simplifies management significantly. Common tasks are handled by the tool in a convenient way. For example, It is very straightforward to add users or user profiles, roll keys or make users or profiles active or inactive.

In a nutshell to setup and use wireguard vpn one needs a server and each client gets a configuration, either in the form of a text based `.conf` file or a QR code. QR codes work nicely for wireguard phone app, for example, where the app uses on board camera to read the the QR code. For computer clients, the conf file is the simplest. The server and client keys share common information which must be kept synchronized. This includes shared public keys, pre-shared keys for added security along with network information (IPs, Ports and DNS).

wg-tool uses a file based configuration database kept under the `config` directory. This provides all the inputs the tool needs to generate the server and client configs. The latter are saved into the `wg-config/server` and `wg-config/users` directories for the server and clients respectively.

For convenience, previous configs are saved with `.prev` extension making it easy to compare with a prior version. It can be useful after making changes to diff the two configs.

The wg server config, `wg-config/server/wg0.conf` should be installed, as usual, in `/etc/wireguard`.

Each user can have 1 or more profiles. For example bob may have `bob:phone` and `bob:laptop`. The configs to share with each profile is saved into, in this example, `wg-config/users/bob` as `bob-phone.conf`, `bob-phone-qr.png`, `bob-laptop.conf` and `bob-laptop-qr.png`. These are provided to the user - bob in this case.

For wireguard clients running Linux, there are a couple of approaches the client DNS. Client DNS should always be through the wireguard tunnel.

- **preferred approach:**

- Activated by the `-dns_linux` option.

When using this option, wg-quick uses the provided `wg-peer-updn` script via PostUp/PostDown setting.

This script saves the current `dns resolv.conf` file when VPN is brought up using `wg-quick up`, installs the VPN dns into `/etc/resolv.conf` and then restores the prior `resolv.conf` when VPN is deactivated (wg-quick down).

- **alternative approach:**

- DNS information in config is used by wg-quick. wg-quick, in turn, relies on `resolvconf`.

## 1.6 Directory and File Structure

`wg-tool` uses 2 kinds of config files:

- **configs** : *inputs* to `wg-tool`
- **wg-configs** : *outputs* from `wg-tool` which are then used by wireguard server or clients.

For example, the wireguard server config file, `wg0.conf`, will be located in

```
wg-configs/server/wg0.conf
```

And the user QR codes and `.conf` files will be under

```
wg-configs/users/
```

Laying out this directory structure in a bit more detail.

`wg-tool` input configs

```
configs/  
  server/  
    server.conf  
  users/  
    user-1/  
      user-1.conf  
    user-2/  
      user-2.conf  
    ...
```

`wireguard` configs will be saved to

```
wg-configs/  
  server/  
    wg0.conf  
  users/  
    user-1/  
      user-1-profile-1.conf  
      user-1-profile-1.png  
  
      user-1-profile-2.conf  
      user-1-profile-2.png  
      ...  
    user-2/  
      user-2-profile-1.conf
```

(continues on next page)



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`user-2-profile-1.png``user-2-profile-2.conf``user-2-profile-2.png`

Each of the files is actually a symlink to the real file which is kept under a *db* directory at the same level as the symlinks.

This allows us to keep history of every config as far back as we choose. There are options to choose the amount of history to keep for configs and separately for wg-configs. The default, in addition to current values, is to keep 5 additional configs and 3 wg-configs.

Whenever a config file is changed the previous version is made available as a symlink named *xxx.prev*. This allows for straightforward comparisons and makes it easy to revert if that were ever needed; though it is pretty unlikely to ever be the case.

Each user can have multiple profiles - each profile provides separate access to the vpn. As an example, user *jane* may have a *phone* profile and a *laptop* profile. Each profile will provide the wireguard .conf file along with an image file of its QR code. These 2 files provide the standard wireguard configs for users.

Aside from the QR image files, all text files are in standard TOML format.



## GETTING STARTED

### 2.1 Using wg-tool for first time

There are 2 ways to get started; either create a new suite of users/profiles or import existing wireguard user.conf files. You can add users or new profiles for existing users at any time. This is very easy and explained below using the `--add_user` option. You can also import a user at any time, though it's primarily useful when first setting up wg-tool.

If you already have wireguard running then importing is the simplest and best way to proceed. If you're starting from scratch then wg-tool will create new users and profiles for you.

Either way it's pretty straightforward.

#### 2.1.1 Step 1 - Create Server Config

In either case the first step is to create a valid server config file. The best way to do that is to run:

```
wg-tool --init  
or  
wg-tool --work_dir=xxx --init
```

By default, when initializing, `work_dir` will be `/etc/wireguard/wg-tool` if it exists and with appropriate access permission (i.e. root), otherwise the current directory `./`.

This creates a template in: `configs/server/server.conf`.

This file must be edited and changed to reflect your own network settings etc. These are all wireguard standard fields.

The key fields to edit are:

- Address

This is the internal wg cidr mask on the server IP addresses (IPv4 and IPv6). N.B. If you prefer user:profile get IPv6 then put it first in the list.

- Hostname and ListenPort

wg server hostname as seen from internet and port chosen

- Hostname\_Int ListenPort\_Int

wg server hostname and port as seen on internal network. Useful for testing wg while inside the network. Client configs created with the `-int` option of **wg-tool** will use this internal server:port.

- PrivateKey, PublicKey

If you have existing wg server, change these to your current keys. If not they are freshly generated by `--init`. and can be safely used.

- PostUp PostDown

If you want to use the nftables provided by wg-tool - just copy `postup.nft` from the scripts directory. Change the 3 network variables at top for your setup.

- DNS

List of dns servers to be used by wg - typical VPN setup uses internal network DNS

### **postup.nft**

The nftables sample script, `scripts/postup.nft`, should be copied to `/etc/wireguard/scripts`.

Remember to edit the network variables at the top of the `postup.nft` script to match your network. One common case is to provide users with access to internet as well as to the internal network. The system border firewall must forward vpn traffic to the wireguard server which running on inside protected by the firewall.

The `postup.nft` script provides access to the internet and lan provided the wireguard server host has that access. If the wg server is in the DMZ then it probably only has access to DMZ net and internet.

Before deploying the `postup.nft` script, edit the 3 variables at the top for your own server setup:

- `vpn_net`

this cidr block must match whats in the server config

- `lan_ip lan_iface`

IP and interface of wireguard server

Remember to allow forwarding on the wireguard server, to ensure VPN traffic is permitted to go to the LAN:

```
sysctl -w net.ipv4.ip_forward=1
```

to keep this on reboot add to `/etc/sysctl.d/sysctl.conf` (or other filename):

```
net.ipv4.ip_forward = 1
```

The list of active users is managed in the `server.conf` file. This is generated and updated by wg-tool. The tool provides options to add and remove users from the active list. If a user is marked inactive, none of their profiles will be in `server wg0.conf`. If a user is active then only their active profiles will be provided to `wg0.conf`

Each user config has its own list active profiles. It too is managed by the tool.

N.B. the active users and active profiles lists, only affect whether they are included in the server `wg0.conf` file. No user or profile is removed when a user and/or profile is marked inactive.

## **2.1.2 Step 2 - import and/or add users and profiles**

Now that the server config is ready, we can add users and their profiles.

Each user can have 1 or more profiles. Each user's data, including all their profile info, is kept in a single config file. It also tracks the list of active profiles.

If a profile is active, it will be put in wireguard's `wg0.conf` server config, otherwise it won't.

Wireguard QR codes and `.conf` files are always created for every user/profile regardless of whether it is active or not.

Since each user has their own namespace, profile names can be same for different users.

## 2.2 Adding new users and profiles

Users and profiles can be created at any time. They can be created in bulk or one user at a time. For example this command:

```
wg-tool --add_user bob:phone,desk,ipad jane:phone,laptop
```

creates 2 users. *bob* gets 3 profiles : phone, desk and ipad while *jane* gets 2 profiles: phone and laptop.

If you don't provide a profile name, the default profile name is *main*.

At this point you should now have server config supporting these 5 user profiles and the corresponding wireguard QR codes and .conf files under wg-configs/users

You can get list of all users and their profiles

```
wg-tool --list_users
```

The (+) or (-) after a user or profile name indicates active or inactive.

Importing existing users and profiles

The tool can import 1 user:profile at a time. This is done using:

```
wg-tool --import_user <user.conf> user_name:profile_name
```

where <user.conf> is the standard wireguard conf file (the text version of the QR code). And the user\_name and profile\_name are what you want them to be known as now.

What worked for me was to copy all those existing wireguard user.conf files into ./old/ and then make a little shell script like the sample scripts/import\_users. Script just imports each profile 1 at a time.

Then run the shell script. End result should be working wg0.conf functionally identical to what you currently have. In addition a new set of user-profile.conf and associated qr codes. All found in wg-configs/

As above you may want to see a list of users/profiles:

```
wg-tool --list_users
```

And compare a user profile conf or 2 with existing ones - QR codes will be different, but contain the same information. You can check this for bob's laptop QR by doing this:

```
zbarimg wg-configs/users/bob/bob-laptop-qr.png
```

which is available in the zbar package. It should match the corresponding user.conf file in wg-configs/users/bob/bob-laptop.conf

## 2.3 Managing Users/Profiles

I recommend avoiding manually editing any config files, but if you do for some reason, then run *wg-tool* with no arguments. It will detect the changes and update *wg-configs*.

Pretty much everything you need to do should be available using *wg-tool*:

```
wg-tool --help
```

gives list of options.

### 2.3.1 Options

Many options take user/profiles as additional input. users/profiles are to be given on command line

```
user
or
user:prof
or
user_1:prof_1,prof_2 user2 user_3:laptop,tablet
```

Summary of available options:

**Positional arguments:**

- users : user\_1[:prof1,prof2,...] user\_2[:prof\_1,prof\_2]

**Options:**

- *(-h, -help)*  
Show this help message and exit
- *(-act, -active)*  
Mark one or more users or user[:profile, profile...] active
- *(-add, -add\_users)*  
Add user(s) and/or user profiles user:prof1,prof2,...
- *(-all, -all\_users)*  
Some opts (e.g. `upd_user_keys`) may apply to all users/profiles when this is turned on.
- *(-aips, -allowed\_ips)*  
Set the cidr blocks which will be routed through the vpn. The default is all ips given by:  
`0.0.0.0/0,::/0`  
Provide a comma separated list of CIDRs or the string *default* to use the default value where all ips are routed through wireguard.  
The current setting can be viewed by detailed user listing:  
`wg-tool -l -det [user:prof]`
- *(-det, -details)*  
Adds more detail to `-l` and `-rrpt`. For `-l` report will also include details about each profile. For `-rrpt` report will show all user:profiles known to running server, not just those for which it has a recent connection.
- *(-dnslin, -dns\_linux)*  
Use with `-mod`  
For a Linux client, provide support for managing the dns resolv.conf file. What this does is save existing one, install the wireguard dns version and then restore original on exit. Use together with `-add` for new user:profile or with `-mod` with existing profile.  
To bring up wireguard as a linux client one uses

```
wg-quick up <user-prof.conf>
wg-quick down <user-prof.conf>
```

This will then use the wireguard DNS while running and restore previous dns on exit.

To add dns search and use dns\_linux on existing user profile. First update the server config by editing *configs/server/server.conf* and add list of seach domains

```
DNS_SEARCH = ['sales.example.com', 'example.com']
```

then

```
wg-tool -mod -dnsrc -dns_linux bob:laptop
```

By default wg-quick uses resolvconf to manage dns resolv.conf. If you prefer, or dont use resolvconf then use this option. But only with Linux - it will not work for other clients (Android, iOS, etc)

With this option the usual DNS rows in in the conf file are replaced with PostUp and PostDown. PostUp saves existing resolv.conf, and installs the one needed by wireguard. PostDown restores the original saved resolv.conf.

To use this the script *wg-peer-updn*, available in the *scripts* directory must be in */etc/wireguard/scripts* for the client.

The installer for the wg\_tool package installs the script - but clients without this package should be provided both the user-profile.conf as well as the supporting script *wg-peer-updn*.

- (*-dnsrc, -dns\_search*)

Use with *-mod*

Adds the list DNS\_SEARCH from server config to client DNS search list. DNS\_SEARCH in server.conf should contain a list of dns domains for dns search and Use together with *-add* for new user:profile or with *-mod* with existing profile.

- (*-fp, -file\_perms*)

Ensure all files have appropriately restricted permissions

- (*-imp, -import\_user <file>*)

Import a standard wg user conf file into the spcified user\_name:profile\_name This is for one single user:profile

- (*-inact, -inactive*)

Mark one or more users or user[:profile, profile...] inactive

- (*-i, -init*)

Initialize and creat server config template. Please edit to match your server settings.

- (*wkd, -work\_dir <dirname>*)

Set working directory. This is is the directory holding all configs.

By default:

- when used with *-init*, work\_dir will be */etc/wireguard/wg-tool* if the directory exists and with appropriate access permission (i.e. root), otherwise the current directory *./*.
- if not initializing, then, with access permission, */etc/wireguard/wg-tool/* will be the work\_dir if there is a *config* dir in it, otherwise it is set to current dir *./*.

- (*-int, -int\_serv*)

With *-add\_users* uses internal wireguard server

- (*-ips, -ips\_refresh*)

Refresh profile IPs if needed

- (*-keep, -keep\_hist <num>*)  
How much config history to keep (default 5)
- (*-keep\_wg, -keep\_hist\_wg <num>*)  
How much wg-config history to keep (default 3)
- (*-l, -list\_users*)  
Summary of users/profiles - sorted by user.
- (*-mod, -mod\_users*)  
Modify existing user:profile(s). Use with *-dnsrch*, *-dnslin*, *-aips* and *upd* Can apply to all users/profiles via the *-all* option.
- (*-pfxlen\_4, -prefixlen\_4*)  
User profiles now get IP Addresses(es) from each server network. Each address is a block with cidr prefixlen\_4. Defaults to 32 which means 1 IP address. e.g. if set to 30 then would get a block of 4 x.x.x.x/30
- (*-pfxlen\_6, -prefixlen\_6*)  
Similar to *-prefixlen\_4* but for ipv6. Default is 128
- (*-rrpt, -run\_show\_rpt*)  
Run “wg show” and generate report of users, profiles. Also checks for consistency with current settings.
- (*-sop, -save\_opts*)  
Together with *-keep\_hist* and/or *-keep\_hist\_wg* to save these values as new defaults.
- (*-rpt, -show\_rpt <file>*)  
Same as *-rrpt* only reads file containing the output of *wg show* If file is name *stdin*, then it reads from stdin.
- (*upd, -upd\_endpoint*)  
Use with *-mod* Ensure user/profile is using current server endpoint. Add *-int* if want to use internal hostname/port.  
For example if the server IP changes, then you can update existing user/profiles with  
`wg-tool -mod -upd -all`
- (*-usk, -upd\_serv\_keys*)  
Generate new pair of server keys. NB This affects all users as they all use the server public key.
- (*-upd\_uka, -upd\_user\_keepalive*)  
Update client profile keepalive (see also *-user\_keepalive*)
- (*-uuk, -upd\_user\_keys*)  
Generate new set of keys for existing user(s). This is public and private key pair along with new pre-shared key.
- (*-uka, -user\_keepalive*)  
Number of seconds to use for persistent keep-alive (*-upd\_user\_keepalive* for existing profiles) Default is 0 which disables keepalive. Reasonable value is 25 seconds.
- (*-v, -verb*)  
Adds more verbose output.
- (*-V, -version*)  
Display current version



- (-wkd, -work\_dir)

Set the working directory path to search. If unset, path : /etc/wireguard/wg-tool:./

### 2.3.2 Note on MTU

I came across one hotel wifi, that while the vpn worked fine to provide internet access, I found that for my laptop to be able to also 'ssh internal-host' it would hang:

```
ssh -v <host>
```

hangs right after this is logged:

```
expecting SSH2_MSG_KEX_ECDH_REPLY
```

The *fix* was to set the MTU from 1500 down to 1400 on my laptop while at that hotel. The internet access continued to work fine, but this fixed whatever was a problem for ssh; so now 'ssh internal-host' worked as usual.

I have only had to change MTU setting at one location, but I mention it here in case anyone else comes across this.

## 2.4 Key Rollover

wg-tool makes key rollover particularly simple - at least as far as updating keys and regenerating user and/or server configs with the new keys.

Distribution of the updated config/QR code to each user is not addressed by the tool. Continue to use existing methods - encrypted email, in person display of QR code etc. ...

Its equally simple to update keys on a per user basis as well - just specify them on command line.

To roll the server keys run:

```
wg-tool --upd_serv_keys
```

This will also update all user profiles with the server's new public key.

To roll all user keys run:

```
wg-tool --upd_user_keys
```

or as usual you can specify which profiles to generate the new keys for.

```
wg-tool --upd_user_keys [user:prof1,prof2 user2 ..]
```

As usual, a change to any user profiles will generate new server wg0.conf file reflecting whatever change was made.



## 3.1 Notes

- Config changes are tracked by modification times.

For existing user/profiles without a saved value of *mod\_time*, the last change date-time of the config file is used and saved. These mod times are displayed when using *-l* and *-l -det* options.

### 3.1.1 2022-12

- Stronger file access permissions to protect private data in configs.
- Changes to *work\_dir*.

Backward compatible with previous version. Now prefers to use */etc/wireguard/wg-tool* if possible, otherwise falls back to current directory.

### 3.1.2 2022-11

See *Options* or for more detail.

- (*-dnsrc*, *-dns\_search*)

Adds the list *DNS\_SEARCH* from server config to client DNS search list. *DNS\_SEARCH* in *server.conf* should contain a list of dns domains for dns search. Use together with *-add* for new user:profile or with *-mod* with existing profile.

- (*-dnslin*, *-dns\_linux*)

For a Linux client, provide support for managing the dns *resolv.conf* file. What this does is save existing one, install the wireguard dns version and then restore original on exit. Use together with *-add* for new user:profile or with *-mod* with existing profile.

## 3.2 Install

While it is simplest to install from a package manager, manual installs are done as follow:

First clone the repo :

```
git clone https://github.com/gene-git/wg_tool
```

Then install to local directory. When running as non-root then set *root\_dest* to a user writable directory.

```
rm -f dist/*
/usr/bin/python -m build --wheel --no-isolation
root_dest="/"
./scripts/do-install $root_dest
```

### 3.2.1 Dependencies

#### Run Time :

- python (3.13 or later)
- wireguard-tools
- nftables (for wireguard server postup.nft)
- netaddr (aka python-netaddr )
- python-qrcode
- tomli\_w (aka python-tomli\_w )

#### Building Package:

- git
- hatch (aka python-hatch)
- wheel (aka python-wheel)
- build (aka python-build)
- installer (aka python-installer)
- rsync

### 3.2.2 Philosophy

We follow the *live at head commit* philosophy. This means we recommend using the latest commit on git master branch. This approach is also taken by Google<sup>12</sup>.

## 3.3 License

Created by Gene C. and licensed under the terms of the MIT license.

- SPDX-License-Identifier: MIT
- SPDX-FileCopyrightText: © 2022-present Gene C <[arch@sapience.com](mailto:arch@sapience.com)>

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<sup>1</sup> <https://github.com/google/googletest>

<sup>2</sup> <https://abseil.io/about/philosophy#upgrade-support>

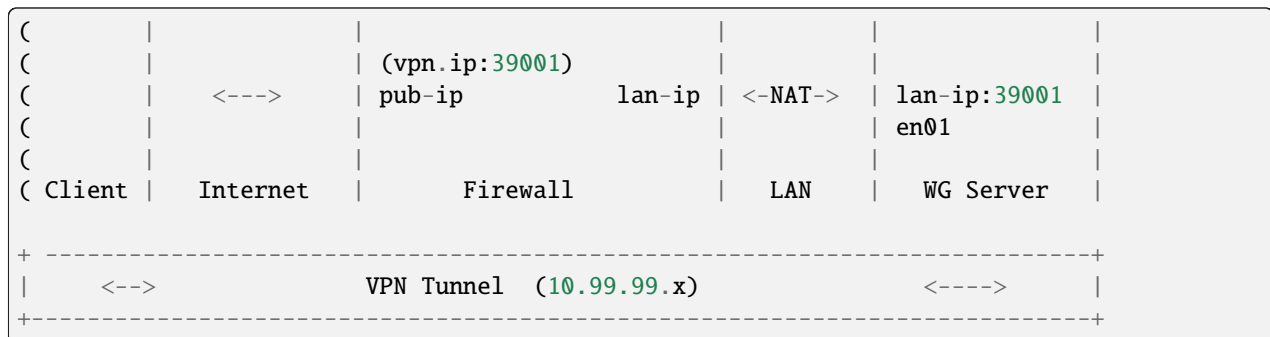
## NETWORKING NOTES

This note is an overview of wireguard networking setup. By default we assume that the wireguard server has access to internet and any desired local services. With this in mind, the default *postup.nft* script NATs the wireguard network so it's traffic to the LAN appears to come from the wireguard server itself. We also assume that the local DNS servers provided in wireguard configs, are available to the wireguard server - typically as they are on the same LAN.

Edit *postup.nft* and set the variables for your network

```
define vpn_net = 10.99.99.0/24 # must match server config define lan_ip = 10.0.0.1 # real lan ip of wg
server define lan_iface = eno1 # lan interface define wg = wg0
```

#### 4.1 Assumed Network Topology for default postup.nft



If your network differs, then adjust the nftables postup rules as needed.

We also assume that there are no other nftables rules running on the wireguard server itself. If there are then you should change the postdown rule to not flush all rules as happens by default and instead add the rules and remove them in postdown.



## 5.1 Ubuntu Notes

Provided by Jack Duan (@jduan00 via github #13)

I would like to share the steps I got it to work on Ubuntu 22.04. Feel free to include in your documentation to help others.

### 5.1.1 Install Prep

Assume these are already installed.

```
$ sudo apt install wireguard qrencode
```

Install necessary python3 packages for wg\_tool:

```
$ sudo apt install python3 python-is-python3 python3-poetry python3-build \
python3-installer python3-qrcode python3-tomli-w python3-tomli python3-netaddr
```

### 5.1.2 Build and install

```
$ git clone https://github.com/gene-git/wg_tool
$ cd wg_tool

$ sudo pip install hatchling

$ /usr/bin/python -m build --wheel --no-isolation

$ sudo ./scripts/do-install /
```

### 5.1.3 Getting wg and wg-tool to work

```
$ sudo -i
# cd /etc/wireguard

# wg-tool --init

# vi config/server/server.conf
```

Add the first set of users with wg-tool

```
# wg-tool --add_user --dns_search Mary:mac,iphone,ipad

# ln -s wg-configs/server/wg0.conf .

# systemctl enable wg-quick@wg0
# systemctl start wg-quick@wg0
# systemctl status wg-quick@wg0

# wg show
```

Add more users

```
# cd /etc/wireguard
# wg-tool --add_user --dns_search Joe:mac,iphone,ipad

# systemctl reload wg-quick@wg0

# wg show

# wg-tool --list_users

# wg-tool -rrpt
```

### 5.1.4 iptables

Also, I don't use PostUp scripts since persistent iptable rules are used.

```
# apt install iptables-persistent
# systemctl status iptables
# systemctl enable iptables
# systemctl restart iptables
```

Change /etc/iptables/rules.v4 Note

- 192.168.100.0/24 is used for wg subnet.
- On Ubuntu ens3 is the default network device name

```
# == For Wireguard VPN ==
*nat
:PREROUTING ACCEPT [0:0]
:INPUT ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
:POSTROUTING ACCEPT [0:0]
# -- NAT for vpn clients from wireguard
-A POSTROUTING -o ens3 -s 192.168.100.0/24 -j MASQUERADE
COMMIT
# -----
*filter
:INPUT ACCEPT [0:0]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
-A INPUT -i lo -j ACCEPT
-A INPUT -i wg+ -j ACCEPT
```

(continues on next page)



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```

-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT
-A INPUT -m state --state INVALID -j DROP
# -- Wireguard ports
-A INPUT -i ens3 -p udp -m multiport --dports 51820 -m state --state NEW -m limit --
↪limit 10/sec --limit-burst 20 -j ACCEPT
-A INPUT -i ens3 -p icmp -m icmp --icmp-type 8 -m limit --limit 5/sec -j ACCEPT
# -- last as the default rule for input
-A INPUT -j DROP
# -- forward --
-A FORWARD -m state --state RELATED,ESTABLISHED -j ACCEPT
-A FORWARD -m state --state INVALID -j DROP
-A FORWARD -i wg+ -s 192.168.100.0/24 -j ACCEPT
-A FORWARD -j REJECT --reject-with icmp-port-unreachable
# -- out --
-A OUTPUT -m state --state INVALID -j DROP
COMMIT
# == EOF ==

```

Run commands:

```

# systemctl restart iptables

# iptables -nvL
# iptables -t nat -nvL

```



## CHANGELOG

## 6.1 Tags

1.1.1 (2022-10-26) -> 7.5.1 (2025-08-19)  
205 commits.

## 6.2 Commits

- 2025-08-19 : 7.5.1

update pyproject version  
update Docs/Changelogs Docs/wg\_tool.pdf

- 2025-08-19 : 7.5.0

2025-03-08 update arch PKGBUILD to 7.5.0  
Fix bug **for** --init. Issue #18 Reported by @Crisp-Casper  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2025-03-08 : 7.4.0

2024-12-31 New option to **set** PersistentKeepAlive **for** user profiles.  
Sort options **list** printed by --help  
Update README  
Add user\_keepalive (seconds) to saved options  
Server config : drop unused mod\_time  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-12-31 : 7.3.0

2024-10-22 Git tags are now signed.  
Add git signing key to Arch Package  
Bump python vers  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-10-22 : 7.2.0

2024-10-20 Additional **input** protections **in** cidr utils  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-10-20 : 7.1.0

2024-09-07 Use python 3 ipaddress in place of 3rd party netaddr module.  
Code reorg and some tidying  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-09-07 : 7.0.4

more readme tweaks  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-09-07 : 7.0.3

2024-06-29 tweak RST formatting in readme  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-06-29 : 7.0.2

2024-06-28 bug: -V, --version didnt print anything - fixed  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-06-28 : 7.0.1

Remove stray character from PKGBUILD; Add nftables dependency  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-06-28 : 7.0.0

- Split routing support via `*--allowed_ips*`  
Gives ability to specify which networks use the vpn tunnel  
New option: `-aips, --allowed_ips`  
Applies to wireguard config `*AllowedIps*`  
This is a string of comma separated cidr blocks or can be the word `*default*`.  
Default is all packets use vpn - i.e. `0.0.0.0/0,::/0`  
Option can be used with new user profile or to modify an existing profile together  
with `*-mod*` option.

- general tidy ups

- add missing contrib directory to installer scrip

- Now uses sha3-384 to detect file changes (using python-cryptography module)  
which wraps openssl

- Update to require python 3.11 or greater

- Restricted file permissions - new option, (`*-fp, --fperms*`), to ensure all files have appropriate permissions.

Previous version this was always done - but it can be slow (esp. over NFS)

so  
now its an option to run if needed.

2024-04-30 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-30 : 6.7.7

fresh tag

- 2024-04-30 : **6.7.6**

2024-04-29      update Docs/Changelog.rst Docs/wg\_tool.pdf  
                  Take Changelog "hack" out of PKGBUILD ... was a bad idea  
                  update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-29 : **6.7.5**

one of those days ... another typo!  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-29 : **6.7.4**

typo

- 2024-04-29 : **6.7.3**

update Docs/Changelog.rst Docs/wg\_tool.pdf  
 Improve pulling latest Changelog so pacman -Qc shows it  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-29 : **6.7.2**

PKGBUILD change to get latest Changelog  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-29 : **6.7.1**

2024-04-23      Update version.py as our package tooling was updated  
                  update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-23 : **6.7.0**

2024-04-17      Adjust for upcoming python changes.  
                  Some argparse options have been deprecated in 3.12 and will be removed in  
                  3.14  
                  update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-04-17 : **6.6.1**

2024-01-19      Package update: "pacman -Qc wg\_tool" now shows the Changelog  
                  update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-19 : **6.6.0**

version now includes released vs development  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-19 : **6.5.0**

Remove githash from version  
 Closed github issue #17.  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-19 : 6.4.0

2024-01-17      Add --version option  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-17 : 6.3.0

Simplify ip address manipulations a few lines to original now bug **is** fixed  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-17 : 6.2.0

Bugfix : generating IPs was skipping too many available blocks  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-17 : 6.1.0

Fix: update AllowedIPs **with** --ips\_refresh  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-17 : 6.0.1

bump patch version **for** readme change  
readme tweak  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-17 : 6.0.0

↪up      Add support **for** multiple IP addresses **in** user profiles.  
Addresses will now be taken **from whichever** networks are **in** server  
config.  
cidr address **for** each network will have prefixlen\_4 **for** IPv4 **and**  
prefixlen\_6 **for** IPv6 networks.  
prefixlen are settable **with** new options.  
Existing user:profile (**or** -all) can have their IPs refreshed to pick\_  
their new IPs **from**  
**server** config. If you already have multiple networks **or** simply added  
them to Address variable **in**  
configs/server/server.conf - then can refresh using:  
    wg-tool -mod -ips user\_name:profile\_name  
**or**  
    wg-tool -mod -ips -all  
2024-01-13      update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-13 : 5.7.2

2024-01-12      Add ubuntu notes provided by Jack Duan (@jduan00 via github #13)  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-12 : 5.7.1

2024-01-11      update Docs/Changelog.rst Docs/wg\_tool.pdf  
lint picking  
update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-11 : 5.7.0

Add `-upd` option to update user/profile endpoint when server config<sub>u</sub> changes.  
 (closes GH issue #11)  
`-mod` option can now be used with `-all`  
 2024-01-07 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2024-01-07 : 5.6.3

rst fix `in` readme

- 2024-01-07 : 5.6.2

fix readme typo

- 2024-01-07 : 5.6.1

small readme update  
 2023-12-07 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2023-12-07 : 5.6.0

wg-peer-updn now saves additional copy of wg resolv.conf `in` resolv.conf.  
 Can be used by client when resume causes network restart to overwrites the wg resolv.conf.  
 Used by wg-client package to "fix" dns after sleep/resume.  
 2023-11-23 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2023-11-23 : 5.5.1

Improve description  
 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2023-11-23 : 5.5.0

Change python build `from` `poetry` to `hatch`.  
 It `is` cleaner `and` simpler.  
 Switch copyright lines to SPDX `format`  
 2023-11-12 update Docs/Changelog.rst Docs/wg\_tool.pdf

- 2023-11-12 : 5.4.1

Minor readme rst `format` change.  
 Add wg\_tool.pdf  
 2023-09-30 update Docs/Changelog.rst

- 2023-09-30 : 5.3.4

Add sample output of server report to README

- 2023-09-30 : 5.3.3

Improve README  
 2023-09-27 update Docs/Changelog.rst

- 2023-09-27 : 5.3.2

2023-09-26      update Docs/Changelog.rst  
Fix links **in** readme.  
Remove doc build dependency on myst-parser since no more markdown  
update Docs/Changelog.rst

- 2023-09-26 : 5.3.1

Release **as 5.3.1**  
fix rst **list** items **in** Changelog  
update Docs/Changelog.rst

- 2023-09-26 : 5.3.0

2023-09-25      Reorg docs - add Docs/**dir with** sphinx support  
update PKGBUILD **for** optional doc builds  
Migrate to rst **from markdown**  
update CHANGELOG.md

- 2023-09-25 : 5.1.1

2023-08-02      README - replace markdown url links **with** rst link notation  
update CHANGELOG.md

- 2023-08-02 : 5.1.0

2023-07-28      Improve code finding available client IPs to properly support IPv6.  
Client IPs are chosen **from the** server Address **list in** natural order. If **you**  
prefer clients  
get IPv6 addresses, those should be listed first. Similarly, **if** IPv4 **is**  
preferred, then put that first.  
Tidy to keep pylint clean  
update CHANGELOG.md

- 2023-07-28 : 4.7.0

2023-05-18      Fix **import open\_file** buglet  
update CHANGELOG.md

- 2023-05-18 : 4.6.0

install: switch **from pip** to python installer package. This adds optimized  
bytecode  
update CHANGELOG.md

- 2023-05-18 : 4.5.3

2023-05-17      PKGBUILD: build wheel back to using python -m build instead of poetry  
update CHANGELOG.md

- 2023-05-17 : 4.5.2

2023-05-08      Simplify Arch PKGBUILD **and** more closely follow arch guidelines  
update CHANGELOG.md



- 2023-05-08 : 4.5.1

2023-05-02      Add comment to README about linux using wg **and** ssh **and** MTU  
 typo  
 update CHANGELOG.md

- 2023-05-02 : 4.5.0

Add comment on philosophy of living at the head commit.  
 Change README **from** **markdown** to restructured text

- 2023-04-15 : 4.4.0

2023-04-11      update CHANGELOG.md  
                  Only show user public key **for** "-rpt" when also using "-det".  
                  Since we show user **and** profile name, the user key **is not** really needed  
 update CHANGELOG.md

- 2023-04-11 : 4.3.6

2023-01-06      postup.nft script add extra line: ct status dn timer accept - I saw a martial  
                  packet at firewall **from** **vpn** which was unexpected  
                  minor readme edit  
                  update project version  
 update CHANGELOG.md

- 2023-01-06 : 4.3.5

2022-12-29      Add SPDX licensing lines  
 update CHANGELOG.md

- 2022-12-29 : 4.3.4

2022-12-28      Add reminder **in** README to allow ip forwarding on wireguard server  
 update CHANGELOG.md

- 2022-12-28 : 4.3.3

2022-12-26      Add brief networking note  
 update CHANGELOG.md

- 2022-12-26 : 4.3.2

Change default python interpreter location to /usr/bin/python3 (remove  
 ↪env).  
                  This **is** also recommended by e.g. debian packaging guidelines  
                  (<https://www.debian.org/doc/packaging-manuals/python-policy>). While  
 ↪many distros  
                  (Arch, Fedora etc.) recommend /usr/bin/python - we keep python3 which  
 ↪will work  
                  on those **and** on debian until debian provides python (**and not** just  
 ↪python3).  
 2022-12-25      update CHANGELOG.md

- 2022-12-25 : 4.3.1

2022-12-20 Move archlinux **dir** to packaging.  
Add packaging/requirements.txt  
Update build dependencies **in** PKGBUILD  
Tweak README  
tweak README  
update CHANGELOG.md

• 2022-12-20 : **4.3.0**

2022-12-14 Change python to python3 (**as** per GH issue [#5 on ubuntu/debian](#).  
Remove pip option **from installer** (`--root-user-action=ignore`)  
indent fix  
To help **with** older pre 3.9 python versions, provide files without match().  
They are **in** lib38. Copy to lib38/\*.py lib/  
update CHANGELOG.md

• 2022-12-14 : **4.2.0**

2022-12-08 update CHANGELOG.md  
Installer now uses pip install  
PKGBUILD now uses poetry to build wheel  
update CHANGELOG.md

• 2022-12-08 : **4.1.0**

2022-12-04 Server show\_rpt was **not** treating inactive users/profiles properly - fixed  
update CHANGELOG.md

• 2022-12-04 : **4.0.0**

↪falls Stronger file access permissions to protect private data **in** configs.  
Changes to work\_dir:  
Backward compatible **with** previous version.  
Now prefers to use `*/etc/wireguard/wg-tool*` **if** possible, otherwise,  
back to current directory.  
Thanks to Yann Cardon  
↪from Improve comments **in** postup.nft including reference to alternate postup.  
**Yann** Cardon  
Merge pull request [#3 from ycardon/master](#)  
Create postup-alternate.nft  
Create postup-alternate.nft  
provides an other example of postup script **with** useful comments  
2022-12-03 update CHANGELOG.md

• 2022-12-03 : **3.7.0**

2022-12-01 bug: `--list` **if** username(s) given without profile. Now we **list all** profiles  
update CHANGELOG.md  
Typo **in** README fixed by @ycardon  
Merge pull request [#2 from ycardon/master](#)  
small typo **in** the readme  
small typo

(continues on next page)

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2022-11-30 --add-users > --add\_users  
update CHANGELOG.md

- 2022-11-30 : 3.6.0

bug fix **for** --init  
Thanks to @ycardon - this fixes issue #1 : [https://github.com/gene-git/wg\\_tool/issues/1](https://github.com/gene-git/wg_tool/issues/1)  
2022-11-29 update CHANGELOG.md

- 2022-11-29 : 3.5.0

turn off test mode  
update CHANGELOG.md

- 2022-11-29 : 3.4.0

Improve wg-peer-updn  
- Rename existing resolv.conf when saving  
- Add timestamp to wireguard resolv.conf  
update CHANGELOG.md

- 2022-11-29 : 3.3.1

Small add to README  
update CHANGELOG.md

- 2022-11-29 : 3.3.0

2022-11-28 Improve README  
update CHANGELOG.md

- 2022-11-28 : 3.2.0

typo  
update CHANGELOG.md

- 2022-11-28 : 3.1.0

fix typo creating new user profile **with** -dnssrc/-dnslin  
tweak readme  
update CHANGELOG.md

- 2022-11-28 : 3.0.0

Adds 3 new options:  
- --mod\_users : modify existing user profile (**with** --dns\_search **and** --dns\_linux)  
- --dns\_search : adds support **for** dns search domain list  
- --dns\_linux : adds support **for** managing resolv.conf instead of relying on qg-quick/resolconf  
2022-11-24 update CHANGELOG.md

- 2022-11-24 : 2.1.0

```
- improve error msg
- Check conf before using it - added when auto updating older configs.
↪using
    mtime of config
- minor tweak to bash variable check in install script
2022-11-11 update CHANGELOG.md
```

- 2022-11-11 : **2.0.0**

```
list users report now sorts by user name
Add support for tracking config modification date-time. mod_time displayed
in list user report
2022-11-08 update CHANGELOG.md
```

- 2022-11-08 : **1.7.5**

```
Improve handling of boolean False vs None in pre-file-write dictionary
cleaner
2022-11-07 update CHANGELOG.md
```

- 2022-11-07 : **1.7.4**

```
tweak readme
2022-11-04 update CHANGELOG.md
```

- 2022-11-04 : **1.7.3**

```
add poetry back to PKGBUILD makedepends
update CHANGELOG.md
```

- 2022-11-04 : **1.7.2**

```
change installer to use bash array for app list (even tho we only have 1
here)
tweak readme
2022-10-31 update CHANGELOG.md
```

- 2022-10-31 : **1.7.1**

```
Change build from poetry/pip to python -m build/installer
update CHANGELOG.md
```

- 2022-10-31 : **1.7.0**

```
Add support for python 3.11 tomllib
2022-10-30 update CHANGELOG.md
```

- 2022-10-30 : **1.6.1**

```
update readme
update CHANGELOG.md
```

- 2022-10-30 : **1.6.0**

-rpt now lists missing users/profiles **from running** server  
update CHANGELOG.md

- 2022-10-30 : **1.5.0**

2022-10-29      Add --details  
                 Modifes -l, -rpt **and** -rrpt to provide detailed information **in** addition to  
                 the summary.  
2022-10-29      update CHANGELOG.md

- 2022-10-29 : **1.4.0**

report: handle cases where running server has old user key **and** other edge  
cases  
update CHANGELOG.md

- 2022-10-29 : **1.3.2**

add --run\_show\_rpt. Similar to --show\_rpt, but runs wg-tool  
update CHANGELOG.md

- 2022-10-29 : **1.3.1**

bug fix: -inact user:prof made user inactive **not** just prof  
update CHANGELOG.md

- 2022-10-29 : **1.3.0**

2022-10-28      Add new option --work\_dir  
                 Refactor **and** tidy code up some  
                 upd changelog  
                 tweak readme  
2022-10-27      tweak readme **and** sync PKGBUILD  
                 upd changelog

- 2022-10-27 : **1.2.3**

Add missing packages to PKGBUILD depends (thank you @figue on aur)  
upd changelog

- 2022-10-27 : **1.2.2**

2022-10-26      duh - turn off debugger .. sorry  
                 markdown newline fix  
                 word smith readme  
2022-10-26      update changelog

- 2022-10-26 : **1.2.1**

update project vers  
actually add the code to make wg\_show report :)

- 2022-10-26 : **1.2.0**

Adds support to parse output of wg show **and** provide user/profile names  
Add new/coming soon section to readme  
readme - aur package now avail  
update changelog

- 2022-10-26 : **1.1.1**

proj vers update  
installer: share archlinux into /usr/share/wg\_tool  
Ready to share

## MIT LICENSE

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## HOW TO HELP WITH THIS PROJECT

Thank you for your interest in improving this project. This project is open-source under the MIT license.

### 8.1 Important resources

- [Git Repo](#)

### 8.2 Reporting Bugs or feature requests

Please report bugs on the issue tracker in the git repo. To make the report as useful as possible, please include

- operating system used
- version of python
- explanation of the problem or enhancement request.

### 8.3 Code Changes

If you make code changes, please update the documentation if it's appropriate.



## CONTRIBUTOR COVENANT CODE OF CONDUCT

### 9.1 Our Pledge

In the interest of fostering an open and welcoming environment, we as contributors and maintainers pledge to making participation in our project and our community a harassment-free experience for everyone, regardless of age, body size, disability, ethnicity, sex characteristics, gender identity and expression, level of experience, education, socio-economic status, nationality, personal appearance, race, religion, or sexual identity and orientation.

### 9.2 Our Standards

Examples of behavior that contributes to creating a positive environment include:

- Using welcoming and inclusive language
- Being respectful of differing viewpoints and experiences
- Gracefully accepting constructive criticism
- Focusing on what is best for the community
- Showing empathy towards other community members

Examples of unacceptable behavior by participants include:

- The use of sexualized language or imagery and unwelcome sexual attention or advances
- Trolling, insulting/derogatory comments, and personal or political attacks
- Public or private harassment
- Publishing others' private information, such as a physical or electronic address, without explicit permission
- Other conduct which could reasonably be considered inappropriate in a professional setting

### 9.3 Our Responsibilities

Maintainers are responsible for clarifying the standards of acceptable behavior and are expected to take appropriate and fair corrective action in response to any instances of unacceptable behavior.

Maintainers have the right and responsibility to remove, edit, or reject comments, commits, code, wiki edits, issues, and other contributions that are not aligned to this Code of Conduct, or to ban temporarily or permanently any contributor for other behaviors that they deem inappropriate, threatening, offensive, or harmful.

## 9.4 Scope

This Code of Conduct applies both within project spaces and in public spaces when an individual is representing the project or its community. Examples of representing a project or community include using an official project e-mail address, posting via an official social media account, or acting as an appointed representative at an online or offline event. Representation of a project may be further defined and clarified by project maintainers.

## 9.5 Enforcement

Instances of abusive, harassing, or otherwise unacceptable behavior may be reported by contacting the project team at <arch@sapience.com>. All complaints will be reviewed and investigated and will result in a response that is deemed necessary and appropriate to the circumstances. The Code of Conduct Committee is obligated to maintain confidentiality with regard to the reporter of an incident. Further details of specific enforcement policies may be posted separately.

## 9.6 Attribution

This Code of Conduct is adapted from the Contributor Covenant, version 1.4, available at <https://www.contributor-covenant.org/version/1/4/code-of-conduct.html>

## 9.7 Interpretation

The interpretation of this document is at the discretion of the project team.

## INDICES AND TABLES

- `genindex`
- `modindex`
- `search`