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## Generate AllowedIPs Text / QR Code in Terminal For Granular WireGuard® Tunnel Exclusions



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### Credits

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### Background: WireGuard®

Hopefully you know by now, but WireGuard® is an extremely simple yet fast and modern VPN that utilizes state-of-the-art cryptography. You can read more about it here

### Generate AllowedIPs Value As Text String or QR Code in Terminal For Granular WireGuard® Tunnel Exclusions

Given a list of IPv4 addresses (dotted quad, CIDR) print an inclusion list (AllowedIPs string) suitable for the WireGuard® mobile app, optionally generating a QR code using ANSI escape characters in a standard terminal window. Useful for excluding only a partial set of LAN (or WAN) addresses from the WireGuard® tunnel. Currently, the only “easy” option for accessing a LAN is to opt *all* RFC1918/RFC3330 private addresses out of the tunnel, using the checkbox that the WireGuard® client provides. This script allows a more granular specification, and also allows the specification of specific WAN addresses as well

### Specific Use-Case (LAN + Security Concerns)

Consider a mobile user with an on-demand WireGuard® VPN connection for the purpose of both privacy and security that needs to access only a small subset of LAN hosts (or WAN hosts) outside of the tunnel. By using fine-grained addresses in the AllowedIPs parameter, this can be accomplished without hassle. The effect:

- As usual, the tunnel is used by default for Internet resources

- – Protects privacy from ISPs that mine and sell browsing habits
- Allow access to only *specific* LAN resources as specified by the exclusion list on the command-line
- – Protects the client from rogue LAN devices by reducing the amount of devices that can interact with your device
- – Protects the broader LAN in the event that your device is compromised by limiting the amount of LAN addresses your device can access

## Natively Supported WireGuard® Options for LAN Access via Tunnel Bypass

One existing and very simple solution is to use the built-in “Exclude Private IPs” option in the WireGuard® mobile app, which generates a fixed list that simply generates an **AllowedIPs** address list that excludes all RFC1918/RFC3330 Private Addresses. However, this is a very broad range and is not trivial to tweak

Using this rinky-dink little app, you can specify granular exclusions, e.g. 192.168.1.2 192.168.1.3 192.168.1.4 for the WireGuard® tunnel and receive a list of networks suitable for the **AllowedIPs**

Allowing, e.g., only 192.168.1.2, 192.168.1.3 and 192.168.1.4 (as opposed to 192.168.0.0/16) effectively protects the rest of the 192.168.0.0/16 network from being exposed to the device. It also effectively protects the device from the rest of the 192.168.0.0/16 network (and 10/8 and 172.16/12 as well, if relevant)

## Why Is Code Required? Can’t I Just Specify The List Myself?

In case it isn’t already clear, WireGuard® mobile only allows the client to specify IP addresses that are “allowed” to use the tunnel. It is an opt-in system, most easily used when performing a LAN-to-LAN tunnel. It does not allow the user to specify a blacklist- to do this, a long list of “non-blacklisted” networks must be generated. Because of this, you can’t briefly or easily say “all traffic except to/from host 192.168.1.3 should transit the tunnel easily”. Instead, you need a list of CIDR notation networks that make up the entire IPv4 address space, excluding “192.168.1.3”.

If you’re curious, the value for this specific example looks like this and is rather unwieldy, which is where the QR code functionality comes in handy:

0.0.0.0/1,128.0.0.0/2,224.0.0.0/3,208.0.0.0/4,200.0.0.0/5,196.0.0.0/6,194.0.0.0/7,193.0.0.0/8,192.0.0.0/9,192.168.0.0/10,192.168.0.0/11,192.168.0.0/12,192.168.0.0/13,192.168.0.0/14,192.168.0.0/15,192.168.0.0/16,192.168.0.0/17,192.168.0.0/18,192.168.0.0/19,192.168.0.0/20,192.168.0.0/21,192.168.0.0/22,192.168.0.0/23,192.168.0.0/24,192.168.0.0/25,192.168.0.0/26,192.168.0.0/27,192.168.0.0/28,192.168.0.0/29,192.168.0.0/30,192.168.0.0/31,192.168.0.0/32,192.168.0.0/33,192.168.0.0/34,192.168.0.0/35,192.168.0.0/36,192.168.0.0/37,192.168.0.0/38,192.168.0.0/39,192.168.0.0/40,192.168.0.0/41,192.168.0.0/42,192.168.0.0/43,192.168.0.0/44,192.168.0.0/45,192.168.0.0/46,192.168.0.0/47,192.168.0.0/48,192.168.0.0/49,192.168.0.0/50,192.168.0.0/51,192.168.0.0/52,192.168.0.0/53,192.168.0.0/54,192.168.0.0/55,192.168.0.0/56,192.168.0.0/57,192.168.0.0/58,192.168.0.0/59,192.168.0.0/60,192.168.0.0/61,192.168.0.0/62,192.168.0.0/63,192.168.0.0/64,192.168.0.0/65,192.168.0.0/66,192.168.0.0/67,192.168.0.0/68,192.168.0.0/69,192.168.0.0/70,192.168.0.0/71,192.168.0.0/72,192.168.0.0/73,192.168.0.0/74,192.168.0.0/75,192.168.0.0/76,192.168.0.0/77,192.168.0.0/78,192.168.0.0/79,192.168.0.0/80,192.168.0.0/81,192.168.0.0/82,192.168.0.0/83,192.168.0.0/84,192.168.0.0/85,192.168.0.0/86,192.168.0.0/87,192.168.0.0/88,192.168.0.0/89,192.168.0.0/90,192.168.0.0/91,192.168.0.0/92,192.168.0.0/93,192.168.0.0/94,192.168.0.0/95,192.168.0.0/96,192.168.0.0/97,192.168.0.0/98,192.168.0.0/99,192.168.0.0/100,192.168.0.0/101,192.168.0.0/102,192.168.0.0/103,192.168.0.0/104,192.168.0.0/105,192.168.0.0/106,192.168.0.0/107,192.168.0.0/108,192.168.0.0/109,192.168.0.0/110,192.168.0.0/111,192.168.0.0/112,192.168.0.0/113,192.168.0.0/114,192.168.0.0/115,192.168.0.0/116,192.168.0.0/117,192.168.0.0/118,192.168.0.0/119,192.168.0.0/120,192.168.0.0/121,192.168.0.0/122,192.168.0.0/123,192.168.0.0/124,192.168.0.0/125,192.168.0.0/126,192.168.0.0/127,192.168.0.0/128,192.168.0.0/129,192.168.0.0/130,192.168.0.0/131,192.168.0.0/132,192.168.0.0/133,192.168.0.0/134,192.168.0.0/135,192.168.0.0/136,192.168.0.0/137,192.168.0.0/138,192.168.0.0/139,192.168.0.0/140,192.168.0.0/141,192.168.0.0/142,192.168.0.0/143,192.168.0.0/144,192.168.0.0/145,192.168.0.0/146,192.168.0.0/147,192.168.0.0/148,192.168.0.0/149,192.168.0.0/150,192.168.0.0/151,192.168.0.0/152,192.168.0.0/153,192.168.0.0/154,192.168.0.0/155,192.168.0.0/156,192.168.0.0/157,192.168.0.0/158,192.168.0.0/159,192.168.0.0/160,192.168.0.0/161,192.168.0.0/162,192.168.0.0/163,192.168.0.0/164,192.168.0.0/165,192.168.0.0/166,192.168.0.0/167,192.168.0.0/168,192.168.0.0/169,192.168.0.0/170,192.168.0.0/171,192.168.0.0/172,192.168.0.0/173,192.168.0.0/174,192.168.0.0/175,192.168.0.0/176,192.168.0.0/177,192.168.0.0/178,192.168.0.0/179,192.168.0.0/180,192.168.0.0/181,192.168.0.0/182,192.168.0.0/183,192.168.0.0/184,192.168.0.0/185,192.168.0.0/186,192.168.0.0/187,192.168.0.0/188,192.168.0.0/189,192.168.0.0/190,192.168.0.0/191,192.168.0.0/192,192.168.0.0/193,192.168.0.0/194,192.168.0.0/195,192.168.0.0/196,192.168.0.0/197,192.168.0.0/198,192.168.0.0/199,192.168.0.0/200,192.168.0.0/201,192.168.0.0/202,192.168.0.0/203,192.168.0.0/204,192.168.0.0/205,192.168.0.0/206,192.168.0.0/207,192.168.0.0/208,192.168.0.0/209,192.168.0.0/210,192.168.0.0/211,192.168.0.0/212,192.168.0.0/213,192.168.0.0/214,192.168.0.0/215,192.168.0.0/216,192.168.0.0/217,192.168.0.0/218,192.168.0.0/219,192.168.0.0/220,192.168.0.0/221,192.168.0.0/222,192.168.0.0/223,192.168.0.0/224,192.168.0.0/225,192.168.0.0/226,192.168.0.0/227,192.168.0.0/228,192.168.0.0/229,192.168.0.0/230,192.168.0.0/231,192.168.0.0/232,192.168.0.0/233,192.168.0.0/234,192.168.0.0/235,192.168.0.0/236,192.168.0.0/237,192.168.0.0/238,192.168.0.0/239,192.168.0.0/240,192.168.0.0/241,192.168.0.0/242,192.168.0.0/243,192.168.0.0/244,192.168.0.0/245,192.168.0.0/246,192.168.0.0/247,192.168.0.0/248,192.168.0.0/249,192.168.0.0/250,192.168.0.0/251,192.168.0.0/252,192.168.0.0/253,192.168.0.0/254,192.168.0.0/255,192.168.0.0/256,192.168.0.0/257,192.168.0.0/258,192.168.0.0/259,192.168.0.0/260,192.168.0.0/261,192.168.0.0/262,192.168.0.0/263,192.168.0.0/264,192.168.0.0/265,192.168.0.0/266,192.168.0.0/267,192.168.0.0/268,192.168.0.0/269,192.168.0.0/270,192.168.0.0/271,192.168.0.0/272,192.168.0.0/273,192.168.0.0/274,192.168.0.0/275,192.168.0.0/276,192.168.0.0/277,192.168.0.0/278,192.168.0.0/279,192.168.0.0/280,192.168.0.0/281,192.168.0.0/282,192.168.0.0/283,192.168.0.0/284,192.168.0.0/285,192.168.0.0/286,192.168.0.0/287,192.168.0.0/288,192.168.0.0/289,192.168.0.0/290,192.168.0.0/291,192.168.0.0/292,192.168.0.0/293,192.168.0.0/294,192.168.0.0/295,192.168.0.0/296,192.168.0.0/297,192.168.0.0/298,192.168.0.0/299,192.168.0.0/300,192.168.0.0/301,192.168.0.0/302,192.168.0.0/303,192.168.0.0/304,192.168.0.0/305,192.168.0.0/306,192.168.0.0/307,192.168.0.0/308,192.168.0.0/309,192.168.0.0/310,192.168.0.0/311,192.168.0.0/312,192.168.0.0/313,192.168.0.0/314,192.168.0.0/315,192.168.0.0/316,192.168.0.0/317,192.168.0.0/318,192.168.0.0/319,192.168.0.0/320,192.168.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optional arguments:

```
-h, --help            show this help message and exit
--exclude n.n.n.n[/mask] [n.n.n.n[/mask] ...]
                        List of networks and IP addresses separated by commas
                        for exclusion
--loose                Specify strict CIDR block definitions, fail when the
                        host bit is set in a CIDR block
-D, --debug            Enable debug messages
-q, --qrencode         Output a QR code to the screen using ANSI escape chars
-l, --lines-output     Produce output in line-based format
-4, --no-ip6           Do not include ::0/0 output
-W, --no-wireguard-format
                        Exclude the "AllowedIPs = " literal
-C, --no-csv-output    Disable output of single-line CSV (WireGuard-style)
                        format
```

## Examples

Use WireGuard® tunnel for all networks except 192.168.1.0/24 and 192.168.2.0/24:

```
$ ./generate-wireguard-allowed-qr.py --exclude 192.168.1.0/24 192.168.2.0/24
AllowedIPs = 0.0.0.0/1,128.0.0.0/2,192.0.0.0/9,192.128.0.0/11,192.160.0.0/13,192.168.0.0/24,192.168.3.0/24,
192.168.4.0/22,192.168.8.0/21,192.168.16.0/20,192.168.32.0/19,192.168.64.0/18,192.168.128.0/17,192.169.0.0/16,
192.170.0.0/15,192.172.0.0/14,192.176.0.0/12,192.192.0.0/10,193.0.0.0/8,194.0.0.0/7,196.0.0.0/6,200.0.0.0/5,
208.0.0.0/4,224.0.0.0/3,::0/0
```

The same, but don't route IPv6 through the tunnel (note the last network in the output):

```
$ ./generate-wireguard-allowed-qr.py -4 --exclude 192.168.1.0/24 192.168.2.0/24
AllowedIPs = 0.0.0.0/1,128.0.0.0/2,192.0.0.0/9,192.128.0.0/11,192.160.0.0/13,192.168.0.0/24,192.168.3.0/24,
192.168.4.0/22,192.168.8.0/21,192.168.16.0/20,192.168.32.0/19,192.168.64.0/18,192.168.128.0/17,192.169.0.0/16,
192.170.0.0/15,192.172.0.0/14,192.176.0.0/12,192.192.0.0/10,193.0.0.0/8,194.0.0.0/7,196.0.0.0/6,200.0.0.0/5,
208.0.0.0/4,224.0.0.0/3
```

Allow only 192.168.1.1 and 192.168.1.2 to bypass the tunnel:

```
$ ./generate-wireguard-allowed-qr.py --exclude 192.168.1.1 192.168.1.2
AllowedIPs = 0.0.0.0/1,128.0.0.0/2,192.0.0.0/9,192.128.0.0/11,192.160.0.0/13,192.168.0.0/24,192.168.1.0/32,
192.168.1.3/32,192.168.1.4/30,192.168.1.8/29,192.168.1.16/28,192.168.1.32/27,192.168.1.64/26,192.168.1.128/25,
192.168.2.0/23,192.168.4.0/22,192.168.8.0/21,192.168.16.0/20,192.168.32.0/19,192.168.64.0/18,192.168.128.0/17,
192.169.0.0/16,192.170.0.0/15,192.172.0.0/14,192.176.0.0/12,192.192.0.0/10,193.0.0.0/8,194.0.0.0/7,196.0.0.0/6,
200.0.0.0/5,208.0.0.0/4,224.0.0.0/3,::0/0
```

The same, but also generate a QR code on the terminal that can be scanned by a mobile device. Note that when using `--qr`, the `AllowedIPs =` literal will not be printed as it is not required on a mobile device

```
$ ./generate-wireguard-allowed-qr.py --no-csv-output --qr --exclude 192.168.1.1 192.168.1.2
...
<QR CODE>
...
```

**NOTE:** When using QR code, the 'AllowedIPs =' string literal will not be included in the QR data by design, so that the data can be pasted into the value box on the mobile app **IMPORTANT:** You may also need to specify the WireGuard® peer address as an exclusion, you should test this

## QR Code Support Dependencies

There are two ways to generate QR codes. By default, the script will try to use the `qrcode` Python module if available. If not available, it will fall back to using the `qrencode` application if it is present on your system. If neither are found, it will report an error

### (RECOMMENDED) Python Package: `qrcode`

The `qrcode` is a simple, excellent QR code generation Python package that supports output to terminal windows as well as image files

## **(RECOMMENDED) Install qrcode via pip**

Use `pip install 'qrcode[]'` or `pip install -r requirements.txt`. This will allow QR code generation without any native applications, such as the `qrencode` application

## **Install qrcode With Your OS Package Manager**

This is not recommended as many distributions have dated versions of Python modules in their repositories. The distribution package is probably called `python3-qrcode`

### **OS Native / Package: qrencode**

Use your distribution package manager to install `qrencode`

#### **Debian / Ubuntu / Kali**

```
$ sudo apt-get install qrencode
```

#### **RHEL, Fedora, CentOS**

```
$ sudo yum install qrencode
```

#### **ArchLinux**

```
$ sudo pacman -S qrencode
```

### **Other Options - Choose Your Own Adventure (TM)**

If you would like to use a different QR code generator, you can change the `QR_ENCODE_COMMAND` list in the script, or you can add code to use some other Python library. This isn't recommended

## **TODO**

- Perform additional testing

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