



Shield Pro
OpenVPN Server
Setup Guide

This document assumes you are familiar with SSH/SCP and how to transfer files to/from your computer and that the Shields Web GUI is set in Advanced Mode. Also, as you progress through the setup please make note of all passwords, in a secure location, as there isn't a way to recover if lost.

Itus recommends using GRC's Ultra High Security Password Generator for generating the passwords required to setup OpenVPN: <https://www.grc.com/passwords.htm>

Step 1: Generate Necessary Directories/Files

1. At the Shield's command line copy & paste the below:

```
mkdir -p /etc/ssl/certs
mkdir -p /etc/ssl/crls
mkdir -p /etc/ssl/newcerts
mkdir -p /etc/ssl/private
touch /etc/ssl/index.txt
echo 01 > /etc/ssl/serial
```

Step 2: Update the CA_default section of the /etc/ssl/openssl.cnf file to match the below:

1. vi /etc/ssl/openssl.cnf (You could also utilize WinSCP)

```
[ CA_default ]

dir                = /etc/ssl                # Where everything is kept
certs              = $dir/certs              # Where the issued certs are kept
crl_dir            = $dir/certs              # Where the issued crl are kept
database           = $dir/index.txt          # database index file.
#unique_subject    = no
new_certs_dir      = $dir/newcerts           # default place for new certs.

certificate        = $dir/certs/ca.crt       # The CA certificate
serial             = $dir/serial              # The current serial number
crlnumber          = $dir/crlnumber          # the current crl number
crl                = $dir/crl.pem            # The current CRL
private_key        = $dir/certs/cakey.pem    # The private key
RANDFILE           = $dir/private/.rand      # private random number file
```

Step 3: Create the private key (cakey.pem)

1. cd /etc/ssl/certs
2. Enter OpenSSL by typing **openssl**
3. Within OpenSSL copy & paste the below:

```
genrsa -aes256 -out cakey.pem 2048
```
4. Enter pass phrase for cakey.pem: **<Enter New Unique Password Here>**

Step 4: Create the CA cert (ca.crt)

1. Within OpenSSL copy & paste the below:

```
req -new -x509 -key cakey.pem -out ca.crt -days 365
```
2. Enter pass phrase for cakey.pem: **<Enter Password from creating cakey.pem>**
3. Enter Requested Information:
 - Country Name (2 letter code) [AU]:
 - State or Province Name (full name) [Some-State]:
 - Locality Name (eg, city) []:
 - Organization Name (eg, company) [Internet Widgits Pty Ltd]:
 - Organizational Unit Name (eg, section) []:

- Common Name (e.g. server FQDN or YOUR name) []:
- Email Address []:

Step 5: Create the OpenVPN server private key (server.key)

1. Within OpenSSL copy & paste the below:
`genrsa -aes256 -out server.key 2048`
2. Enter pass phrase for server.key: **<Enter New Unique Password Here>**

Step 6: Create the OpenVPN server cert signing request (server.csr)

1. Within OpenSSL copy & paste the below:
`req -out server.csr -new -key server.key`
2. Enter pass phrase for server.key: **<Enter Password from creating server.key>**
3. Enter Requested Information:
 - Country Name (2 letter code) [AU]:
 - State or Province Name (full name) [Some-State]:
 - Locality Name (eg, city) []:
 - Organization Name (eg, company) [Internet Widgits Pty Ltd]:
 - Organizational Unit Name (eg, section) []:
 - Common Name (e.g. server FQDN or YOUR name) []:
 - Email Address []:
4. Enter a challenge password []: **< Enter unique challenge password here, not same as above >**

Step 7: Create the OpenVPN server cert (server.crt)

1. Within OpenSSL copy & paste the below:
`ca -out server.crt -in server.csr -keyfile cakey.pem -cert ca.crt -policy policy_anything`
2. Enter pass phrase for cakey.pem: **<Enter Password from creating cakey.pem>**
3. Enter Requested Information:
 - Sign the certificate? [y/n]:
 - 1 out of 1 certificate requests certified, commit? [y/n]
 - Write out database with 1 new entries
 - Data Base Updated

Step 8: Create the cert signing request for each VPN client (<device name>-client.csr)

Note: Steps 8 & 9 will need to be repeated for each client you wish to have connect to the VPN

1. Within OpenSSL copy & paste the below:
`req -out <device name>-client.csr -new -keyout <device name>-client.key`
2. Enter PEM pass phrase: **<Enter New Unique Password Here>**
3. Enter Requested Information:
 - Country Name (2 letter code) [AU]:
 - State or Province Name (full name) [Some-State]:
 - Locality Name (eg, city) []:
 - Organization Name (eg, company) [Internet Widgits Pty Ltd]:
 - Organizational Unit Name (eg, section) []:
 - Common Name (e.g. server FQDN or YOUR name) []:
 - Email Address []:
4. Enter a challenge password []: **< Enter unique challenge password here, not same as above >**

Step 9: Create the cert for each VPN client (<device name>-client.crt)

1. Within OpenSSL copy & paste the below:

```
ca -out <device name>-client.crt -in <device name>-client.csr -keyfile cakey.pem -cert  
ca.crt -policy policy_anything
```
2. Enter pass phrase for cakey.pem: <Enter Password from creating cakey.pem>
3. Enter Requested Information:
 - o Sign the certificate? [y/n]: Y
 - o 1 out of 1 certificate requests certified, commit? [y/n] Y
 - o Data Base Updated

Step 10: Create Diffie-Hellman Parameters

1. Within OpenSSL copy & paste the below: (Note: This is going to take a long time)

```
dhparam -out dh2048.pem 2048
```
2. Exit OpenSSL by typing **exit**

Step 11: Change Permissions on generated certs & keys

1. At the command line copy & paste the below:

```
chmod 600 /etc/ssl/certs/*
```

Step 12: Create VPN Interface

1. At the command line copy & paste the below:

```
uci set network.vpn0=interface  
uci set network.vpn0.ifname=tun0  
uci set network.vpn0.proto=none
```

Step 13: Create VPN Firewall rule

Note: If running in Bridge mode you will need to forward UDP port 1194 to the LAN IP of the Shield.

1. At the command line copy & paste the below:

```
uci add firewall rule  
uci set firewall.@rule[-1].name=Allow-OpenVPN-Inbound  
uci set firewall.@rule[-1].target=ACCEPT  
uci set firewall.@rule[-1].src=*  
uci set firewall.@rule[-1].proto=udp  
uci set firewall.@rule[-1].dest_port=1194
```

Step 14: Create VPN Firewall zone

1. At the command line copy & paste the below:

```
uci add firewall zone  
uci set firewall.@zone[-1].name=vpn  
uci set firewall.@zone[-1].input=ACCEPT  
uci set firewall.@zone[-1].forward=ACCEPT  
uci set firewall.@zone[-1].output=ACCEPT  
uci set firewall.@zone[-1].network=vpn0
```

Step 15: Redirect All Blocked Domains On The VPN To Shield

Note: Items you will need to change are marked in **bold** below.

Shield Block IP : To calculate this take the Shields LAN/Web GUI IP and increment the 4th octet by one. Example: 10.10.10.10 → 10.10.10.11

1. At the command line copy & paste the below:

```
uci add firewall redirect
uci set firewall.@redirect[-1].target=DNAT
uci set firewall.@redirect[-1].src=vpn
uci set firewall.@redirect[-1].proto=tcp
uci set firewall.@redirect[-1].src_dip=<Shield Block IP>
uci set firewall.@redirect[-1].src_dport=80
uci set firewall.@redirect[-1].dest_ip=<Shield Block IP>
uci set firewall.@redirect[-1].dest_port=88
uci set firewall.@redirect[-1].dest=lan
uci set firewall.@redirect[-1].name=vpn-Itusfilter
```

Step 16: Redirect all DNS Traffic On The VPN To Shield

Note: Items you will need to change are marked in **bold** below.

1. At the command line copy & paste the below:

```
uci add firewall redirect
uci set firewall.@redirect[-1].target=DNAT
uci set firewall.@redirect[-1].src=vpn
uci set firewall.@redirect[-1].proto=tcpudp
uci set firewall.@redirect[-1].src_dip=any
uci set firewall.@redirect[-1].src_dport=53
uci set firewall.@redirect[-1].dest_ip=<Shield LAN/Web GUI IP>
uci set firewall.@redirect[-1].dest_port=53
uci set firewall.@redirect[-1].dest=lan
uci set firewall.@redirect[-1].name='vpn-dns-traffic-to-shield'
```

Step 17: Commit Changes

1. At the command line copy & paste the below:

```
uci commit network
/etc/init.d/network reload
uci commit firewall
/etc/init.d/firewall reload
```

Step 18: Configure Dnsmasq To Respond To VPN DNS Queries

1. Edit the /etc/config/dhcp file and comment out or remove the below line
option localservice '1'
2. Restart Dnsmasq
/etc/init.d/dnsmasq restart

Step 19: Configure OpenVPN

Note: If the Shield is not on the 10.10.10.X network change the items marked in **bold** below.

1. At the command line copy & paste the below:

```
echo >> /etc/config/openvpn
uci set openvpn.SSLVPN_Server=openvpn
uci set openvpn.SSLVPN_Server.enabled=1
uci set openvpn.SSLVPN_Server.dev=tun
uci set openvpn.SSLVPN_Server.port=1194
uci set openvpn.SSLVPN_Server.proto=udp
uci set openvpn.SSLVPN_Server.keepalive='10 120'
uci set openvpn.SSLVPN_Server.log=/tmp/openvpn.log
uci set openvpn.SSLVPN_Server.verb=3
uci set openvpn.SSLVPN_Server.server='10.8.0.0 255.255.255.0'
uci set openvpn.SSLVPN_Server.push='route 10.10.10.0 255.255.255.0'
uci set openvpn.SSLVPN_Server.askpass=/etc/openvpn/cert.pass
uci commit openvpn
```

Step 20: Configure OpenVPN Certificate Password

1. At the command line copy & paste the below:

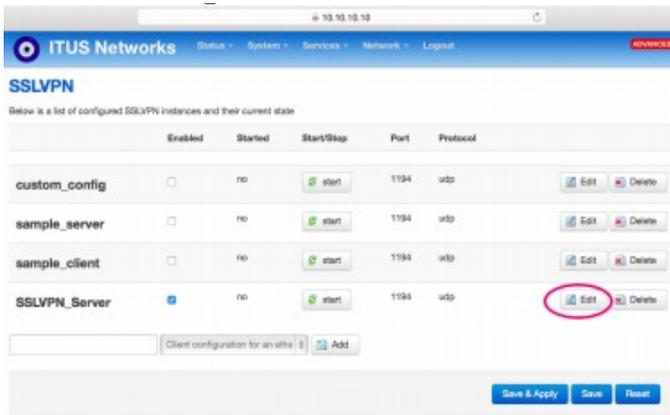
```
mkdir -p /etc/openvpn/
touch /etc/openvpn/cert.pass
chmod 600 /etc/openvpn/cert.pass
echo Replace with Password from Step 5 creating server.key > /etc/openvpn/cert.pass
```

Step 21: Download Certs And Keys To Your Computer

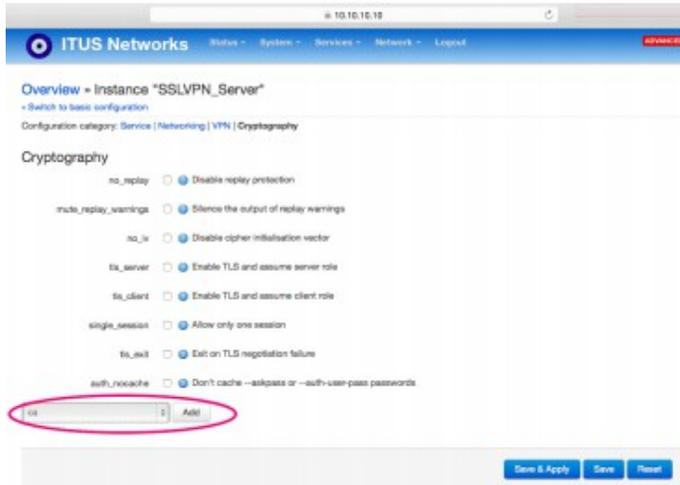
1. Utilizing your favorite SCP client download the below files to your computer
 - o /etc/ssl/certs
 - ca.crt
 - dh2048.pem
 - server.crt
 - server.key
 - <device>-client.crt
 - <device>-client.key

Step 22: Upload Certs And Keys To SSLVPN Server Instance

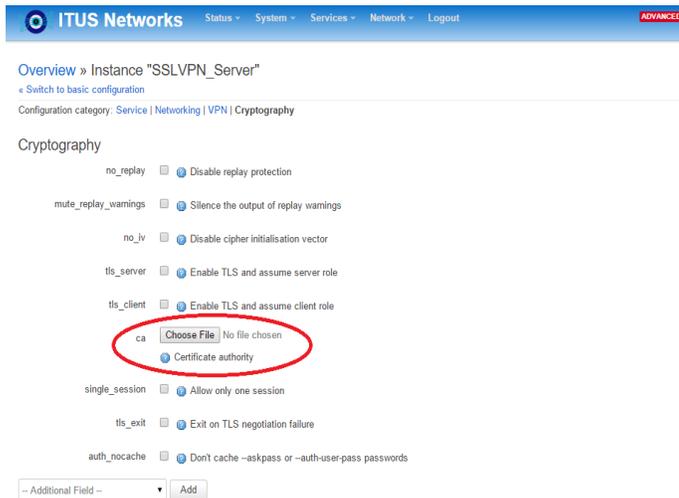
1. Login to Shield Web GUI
2. Select **Services** then **SSLVPN** from the menu
3. Edit the **SSLVPN_Server** instance



4. Click **Switch to advanced configuration**
5. Click **Cryptography**
6. Choose **ca** from the drop down list and click **add**

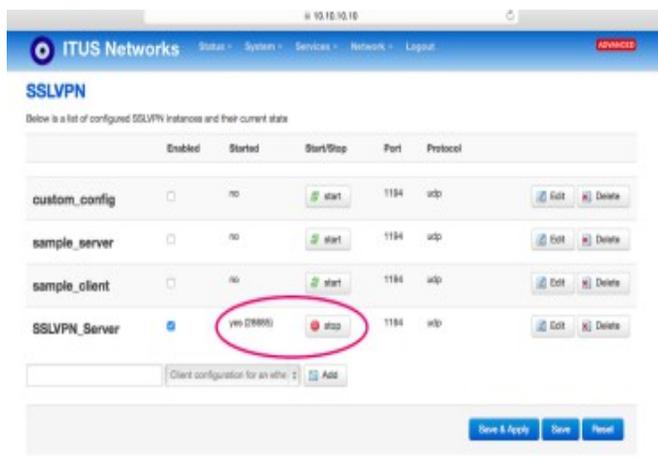


7. Click **Choose File** next to **ca** and upload **ca.crt**



8. Click **Save & Apply** when finished.

9. Choose **dh** from the drop down list and click **add**
10. Click **Choose File** next to **dh** and upload **dh2048.pem**
11. Click **Save & Apply** when finished.
12. Choose **cert** from the drop down list and click **add**
13. Click **Choose File** next to **cert** and upload **server.crt**
14. Click **Save & Apply** when finished.
15. Choose **key** from the drop down list and click **add**
16. Click **Choose File** next to **key** and upload **server.key**
17. Click **Save & Apply** when finished.
18. Check **auth_nocache**
19. Click **Save & Apply** when finished.
20. Select **Overview** to return to the SSLVPN overview page and click start to **start** the SSLVPN_Server service. If the SSLVPN_Server service is already started, click **stop** and then **start** to restart it



Step 23: Allow VPN Traffic Through WAN Connection

Note: You can skip this step if you do not want/need your OpenVPN clients to have access to the internet/WAN while connected.

1. Login to Shield Web GUI
2. Select **Network** then **Firewall** from the menu

3. Edit the vpn: vpn0 Zone

ITUS Networks Status System Services Network Logout

General Settings Port Forwards Traffic Rules P2P Block Custom Rules

Firewall - Zone Settings

The firewall creates zones over your network interfaces to control network traffic flow.

General Settings

Enable SYN-flood protection

Drop invalid packets

Input: accept

Output: accept

Forward: drop

Zones

Zone → Forwardings	Input	Output	Forward	Masquerading	MSS clamping	
lan:lan → WAN	accept	accept	accept	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete
wan:wlan → LAN	drop	accept	drop	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Edit Delete
vpn:vpn → ACCEPT	accept	accept	accept	<input type="checkbox"/>	<input type="checkbox"/>	Edit Delete

[Add](#)

[Save & Apply](#) [Save](#) [Reset](#)

4. Under Inter-Zone Forwarding next to Allow forward to destination zones check wan:vpn0

ITUS Networks Status System Services Network Logout

General Settings Port Forwards Traffic Rules P2P Block Custom Rules

Firewall - Zone Settings - Zone "vpn"

Zone "vpn"

This section defines common properties of "vpn". The input and output options set the default policies for traffic entering and leaving this zone while the forward option describes the policy for forwarded traffic between different networks within the zone. Covered network specifies which available networks are members of this zone.

General Settings Advanced Settings

Name: vpn

Input: accept

Output: accept

Forward: accept

Masquerading:

MSS clamping:

Covered networks: blockdomain: (no interface attached)

lan:lan

vpn:vpn

wlan:wlan

create:

Inter-Zone Forwarding

The options below control the forwarding policies between this zone (vpn) and other zones. Destination zones cover forwarded traffic originating from "vpn". Source zones match forwarded traffic from other zones targeted at "vpn". 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:

- wan:lan
- wan:vpn0

Allow forward from source zones:

- lan:lan
- wan:vpn0

[Back to Overview](#) [Save & Apply](#) [Save](#) [Reset](#)

5. Click Save & Apply when finished.

ITUS Networks Status System Services Network Logout

SSLVPN

Below is a list of configured SSLVPN instances and their current state:

	Enabled	Started	Start/Stop	Port	Protocol	
custom_config	<input type="checkbox"/>	no	start	1184	udp	Edit Delete
sample_server	<input type="checkbox"/>	no	start	1184	udp	Edit Delete
sample_client	<input type="checkbox"/>	no	start	1184	udp	Edit Delete
SSLVPN_Server	<input checked="" type="checkbox"/>	yes (2888)	stop	1184	udp	Edit Delete

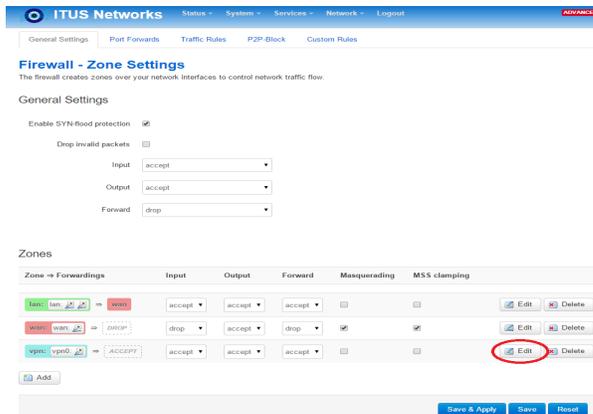
Client configuration for an sdn: [Add](#)

[Save & Apply](#) [Save](#) [Reset](#)

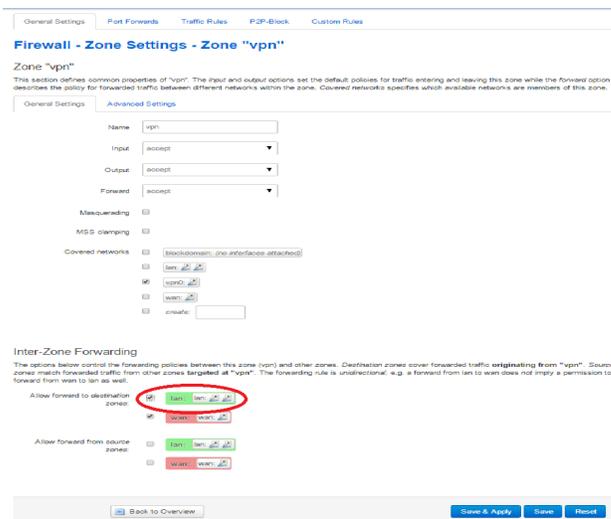
Step 24: Allow VPN Traffic To Other Devices Within Your Network

Note: You can skip this step if you do not want/need your OpenVPN clients to have access to the other devices within your network while connected.

1. Login to Shield Web GUI
2. Select **Network** then **Firewall** from the menu
3. Edit the **vpn: vpn0 Zone**



6. Under **Inter-Zone Forwarding** next to **Allow forward to destination zones** check **lan**



7. Click **Save & Apply** when finished.

Step 25: Setup Dynamic DNS

1. Create account/hostname at noip.com
2. Login to Shield Web GUI
3. Select **Services** then **Dynamic DNS** from the menu

4. Edit the **myddns_ipv4** configuration
5. Check **Enabled**
6. Set **DDNS Service Provider** to **No-IP.com**
7. Enter **Hostname/Domain** created during the noip.com registration process
8. Enter **Username & Password** created during the noip.com registration process
9. Click **Save & Apply** when finished.
10. **Start** the **mydddns_ipv4** configuration

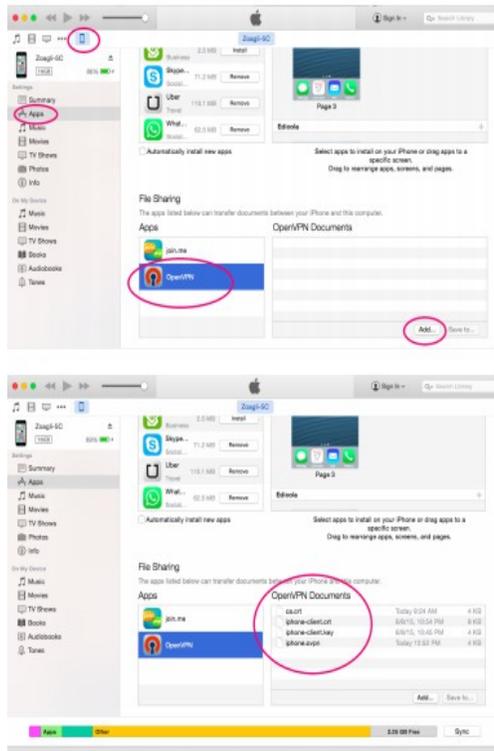
Note: If myddns fails to start you can view the log file by clicking edit and selecting Log File Viewer

Step 26: OpenVPN Client Configuration

- **Configure OpenVPN client for iPhone**
 1. Install the OpenVPN Connect client from the App Store
 2. Create a text file called **iphone.ovpn** with the following entries.
 - a. Items you will need to change are marked in **bold** below.
 - b. The entry **<no-ip.com hostname>** needs to resolve to the Shield's WAN IP
 - c. If you do not want to direct all traffic through the VPN you can remove "redirect-gateway"

```
redirect-gateway
dev tun
tls-client
float
remote <no-ip.com hostname> 1194
pull
proto udp
reneg-sec 3600
ca ca.crt
cert iphone-client.crt
key iphone-client.key
```

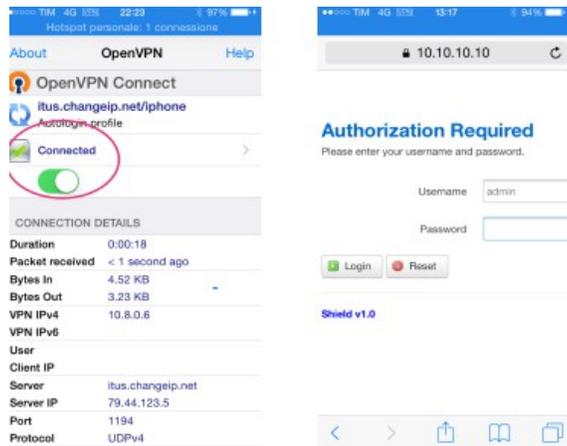
3. Using iTunes Sync, select the **iphone device > Apps > OpenVPN > Add** in order to upload **iphone.ovpn**, **ca.crt**, **iphone-client.crt**, and **iphone-client.key**



4. In the OpenVPN Connect app, click the plus sign to add the iphone profile. You will be prompted to enter the password from when you created the <device name>-client.csr during Step 8.



- In the OpenVPN Connect client, click the button to connect. Once connected, you should be able to access the internal network.



- **Configure OpenVPN client for Windows**

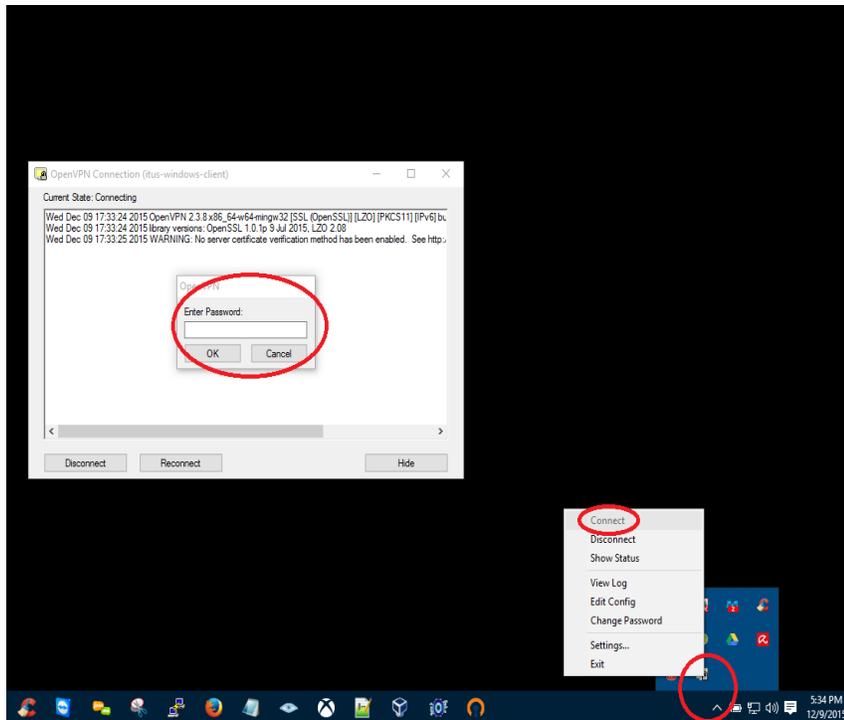
- Download and install OpenVPN keeping all defaults during installation
<https://openvpn.net/index.php/open-source/downloads.html>
- Create a text file called **windows.ovpn** with the following entries.
 - Items you will need to change are marked in **bold** below.
 - The entry **<no-ip.com hostname>** needs to resolve to the Shield's WAN IP
 - If you do not want to direct all traffic through the VPN you can remove "redirect-gateway"

```

redirect-gateway
dev tun
tls-client
float
remote <no-ip.com hostname>1194
pull
proto udp
reneg-sec 3600
ca ca.crt
cert windows-client.crt
key windows-client.key

```

- Copy **windows.ovpn**, **ca.crt**, **windows-client.crt**, and **windows-client.key** to the **C:\Program Files\OpenVPN\config** directory
- Launch **OpenVPN GUI**, it goes to the system tray, and click **Connect**. You will be prompted to enter the password from when you created the <device name>-client.csr during Step 8.

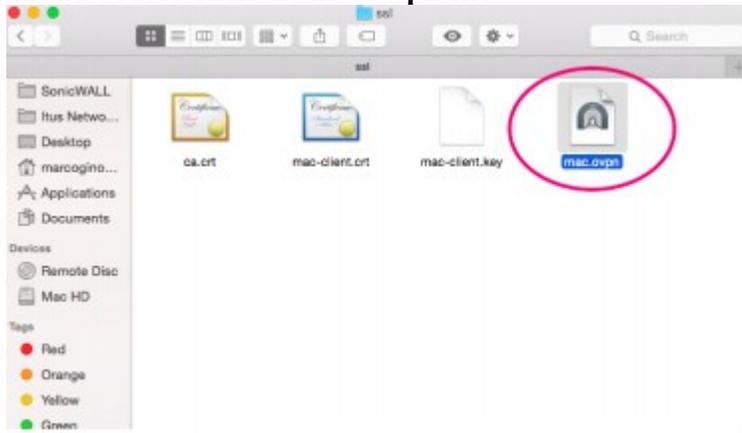


- **Configure the Tunnelblick client for Mac OS X**

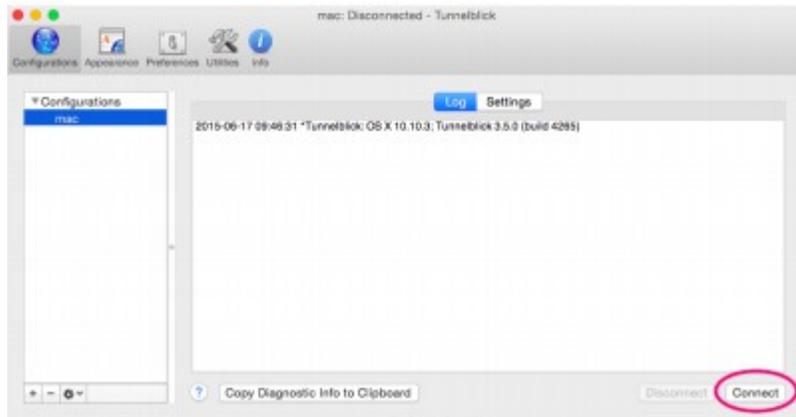
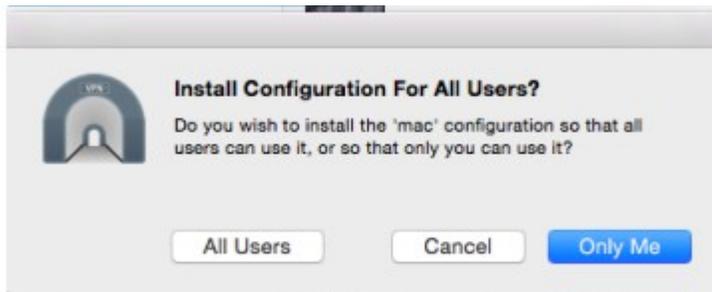
1. Install the tunnelblick client for Mac OS X
2. Create a text file called **mac.ovpn** with the following entries.
 - a. Items you will need to change are marked in **bold** below.
 - b. The entry **<no-ip.com hostname>** needs to resolve to the Shield's WAN IP
 - c. If you do not want to direct all traffic through the VPN you can remove "redirect-gateway"

```
redirect-gateway  
dev tun  
tls-client  
remote <no-ip.com hostname>1194  
pull  
proto udp  
reneg-sec 3600  
ca /users/<username>/ssl/ca.crt  
cert /users/<username>/ssl/mac-client.crt  
key /users/<username>/ssl/mac-client.key
```

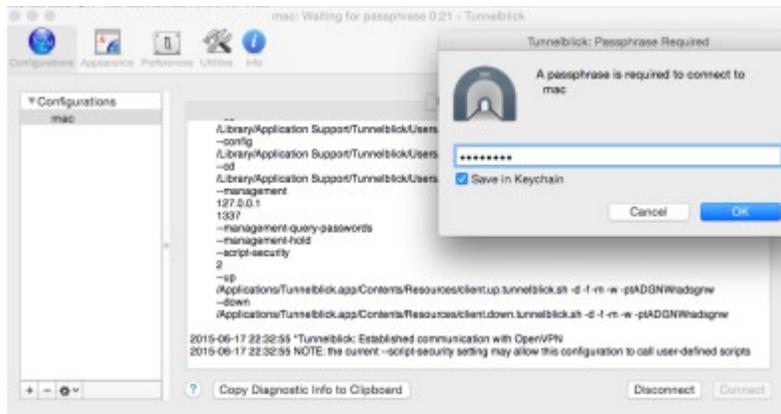
- Put **ca.crt**, **mac-client.key**, **mac-client.crt**, and **mac.ovpn** in the `/users/<username>/ssl/` folder and double-click the **mac.ovpn** file



- Select **Only Me** to install the configuration file. Enter your Mac OS X password when prompted



- Launch the Tunnelblick client and select **Connect**
- You will be prompted to enter the password from when you created the `<device name>-client.csr` during Step 8.



7. Once connected, you should be able to access the internal network

