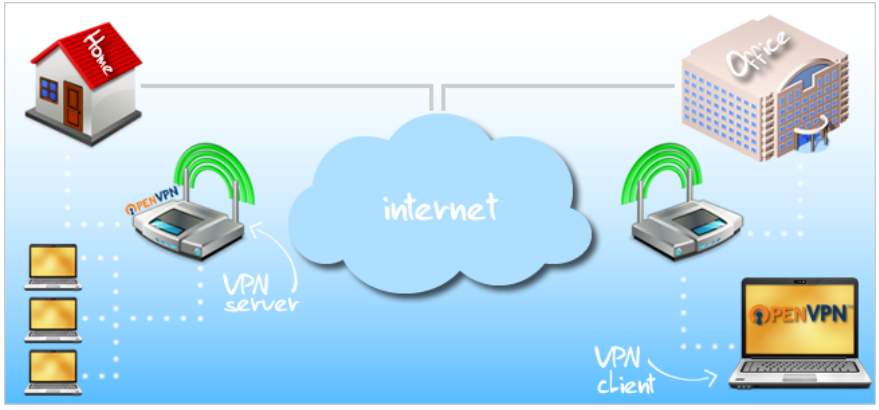
Connect anywhere with OpenVPN and Tomato

Today we will continue to exploit Tomato firmware features through installing OpenVPN with Tomato, then setting up to access the network anywhere in the world.

Wear Management - In the previous article we showed you how to install and tips on using Tomato, an open source firmware for routers on the Linksys WRT54GL. Today we will continue to exploit the features of this firmware by installing OpenVPN with Tomato, then setting up to be able to access the network anywhere in the world.

>>>**Enhance OpenVPN security with One Time Password on Ubuntu**

What is OpenVPN?



Basically, a **VPN** is a private network that uses a public network (usually the Internet) to connect remote locations or users to a LAN at the central office. Instead of using a rather complex connection like a digital subscriber line, VPN creates virtual links that are transmitted over the Internet between an organization's private network with a remote location or user.

Virtual Private Network (VPN) is a very secure, reliable connection between a local area network (LAN) and another system. You can imagine your router as a bridge to connect the network. Your computer and the OpenVPN server (in this case the router itself) will " *shake hands* " with each other using a certificate of mutual affirmation. After confirmation, both the client and server will agree to *'trust* ' each other and allow access to the server's network.

Usually, deploying VPN software and hardware is time-consuming and costly, so **OpenVPN** is a completely free open source VPN solution. Tomato with OpenVPN is now considered the most perfect solution for those who want a secure connection between two networks without any extra cost. However, the default of OpenVNP does not work as expected. So we need to tweak and reconfigure it a bit. Here are the steps to take:

Request

To do this tutorial we need a computer running Windows 7 with an admin account. If you are using Mac or Linux, this guide will also help you understand its performance, but you need to do more research to be most effective for yourself.

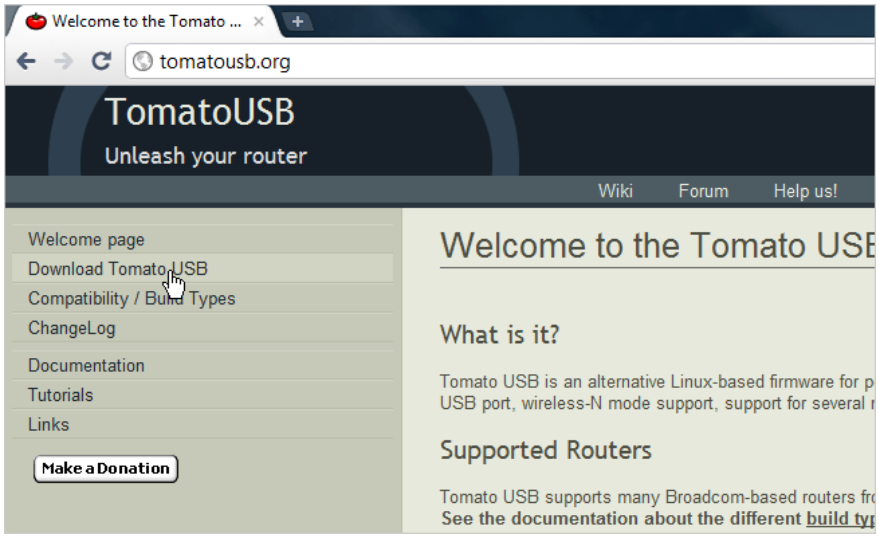
We will install a special version of Tomato called **TomatoUSB VPN** on the *Linksys WRT54GL* version 1.1 router. To check if your router is compatible with TomatoUSB, please go to the TomatoUSB Build page to see it.

Before we start we need to install the original firmware on the router or Tomato firmware that we described in the previous article.

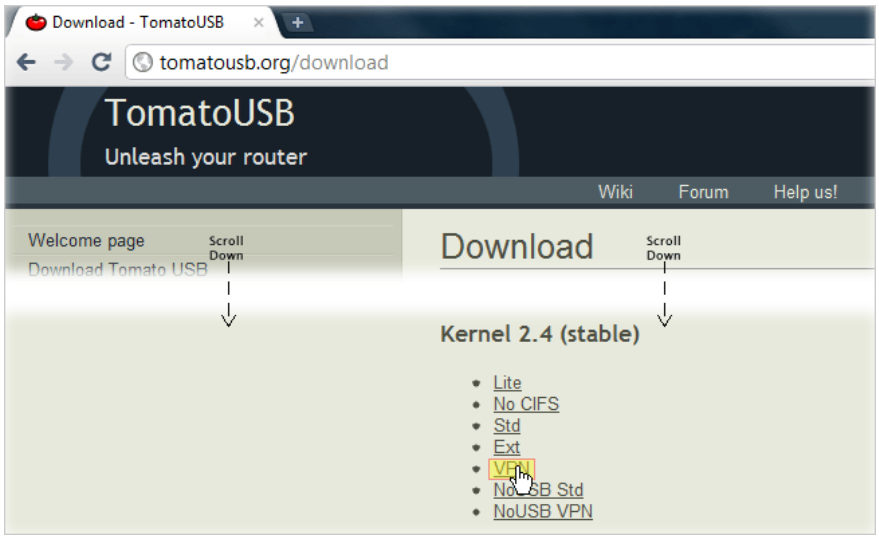
Install TomatoUSB

In the previous tutorial, we installed the Tomato v1.28 firmware from *PolarCloud* 's website. However, this version does not support OpenVPN, so we need to install a new version called **TomatoUSB VPN** .

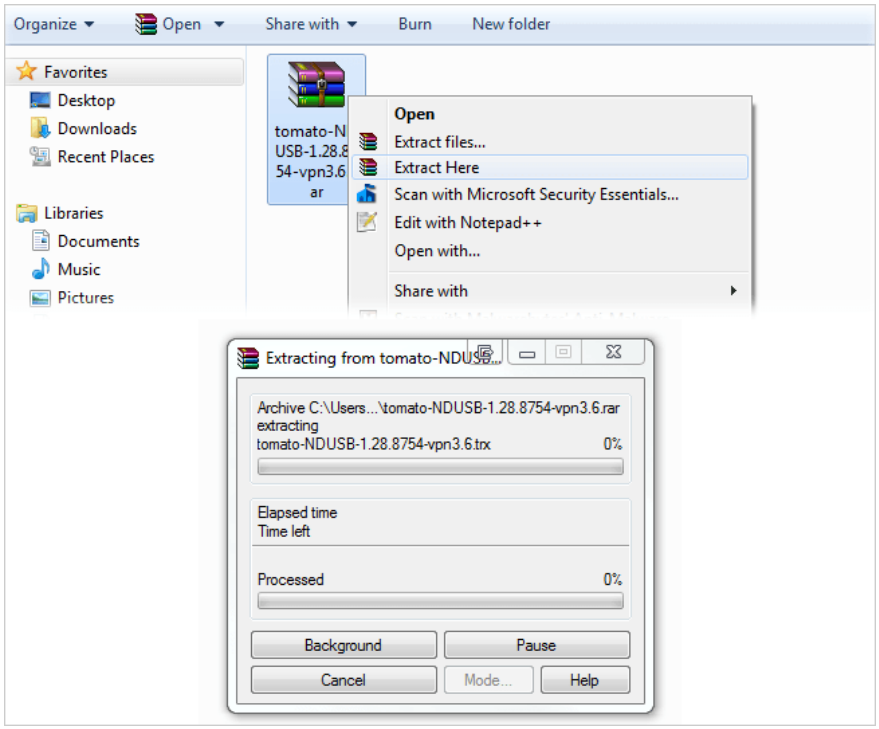
First go to TomatoUSB's homepage and click the **Download Tomato USB link** to download.



Scroll to the bottom of the page, in the **Kernel 2.4 (stable) section,** click the **VPN** link to download your file with the **.rar file** .

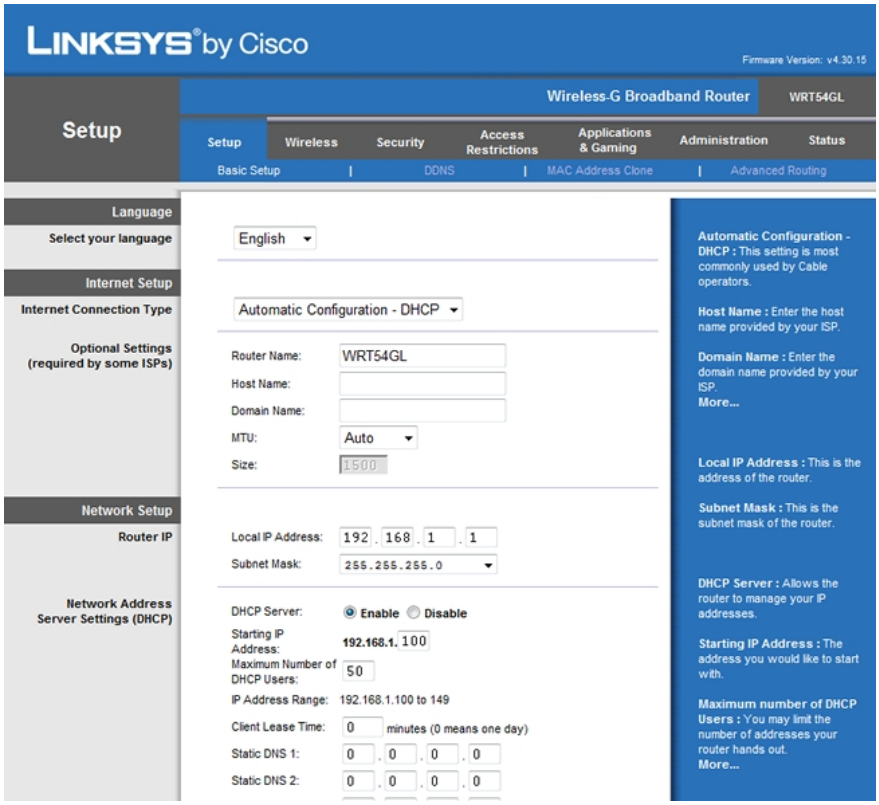


Then you use the decompression program (like WinRAR) to extract the downloaded file. You will receive two files, **CHANGELOG** and **tomato-NDUSB-1.28.8754-vpn3.6.trx** .

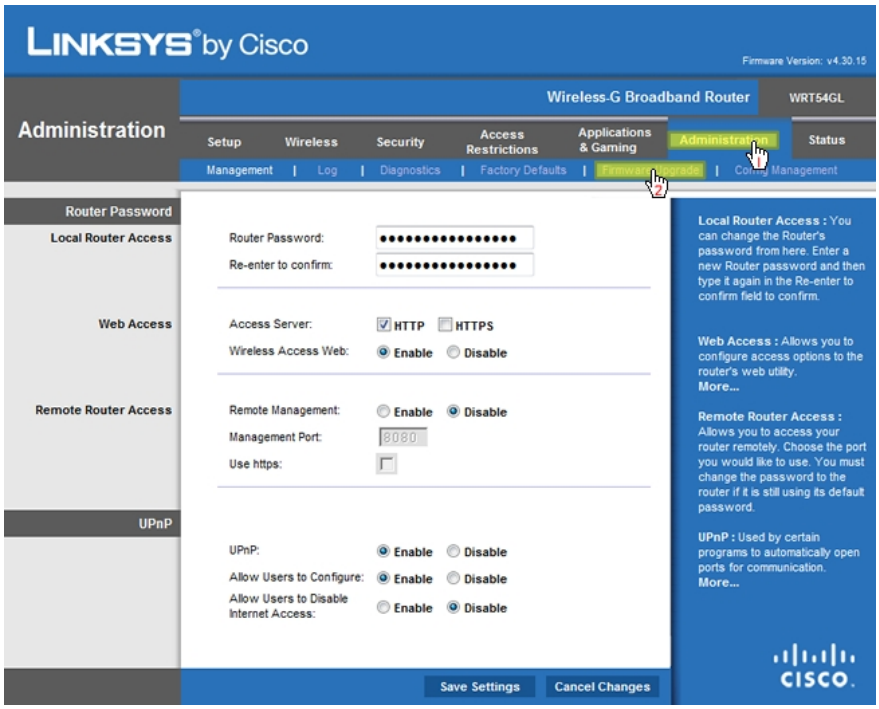


1. Where the router is running Linksys firmware

Open your browser and enter the IP address (default is *192.168.1.1*). Enter ' *admin* ' for both *"username"* and *"password"* fields when requested.

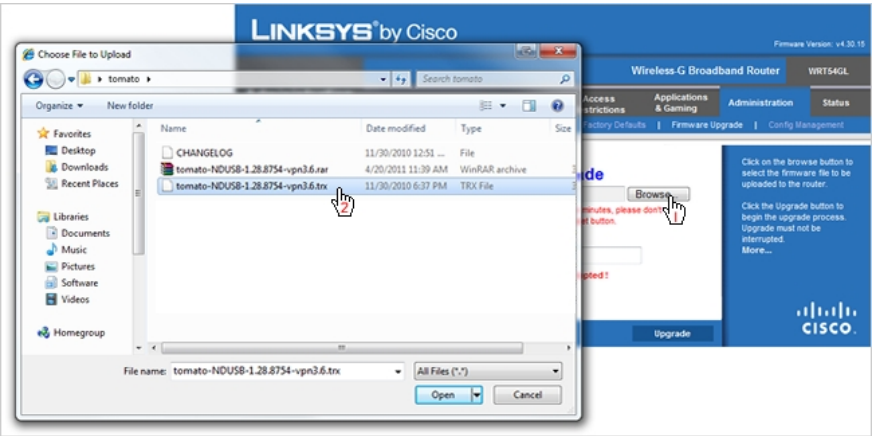


Login successfully, click the **Administration** > **Firmware Upgrade** menu **.**



Click the **Browse** button and navigate to the extracted TomatoUSB file, select the *tomato-NDUSB-1.28.8754-vpn3.6.trx file* , then click the **Upgrade** button on the browser interface.

Your router will start installing TomatoUSB VPN, this process takes a few minutes to complete. After the update process finishes, open the *command prompt* dialog box and enter **ipconfig –release** to redefine the new IP address for the router, then type **ipconfig –renew** to give it a new address. The numbers next to the **Default Gateway** line will be the router's new IP address.



Note: After installing Tomato, go to **Administration** > **Configuration** and select ' **Erase all NVRAM .** '.

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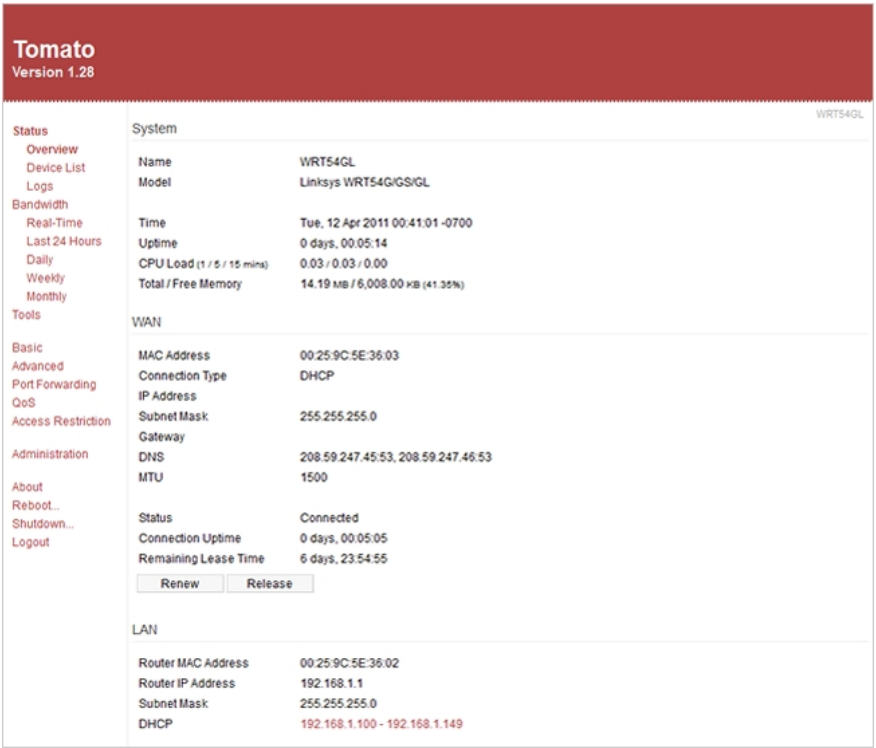
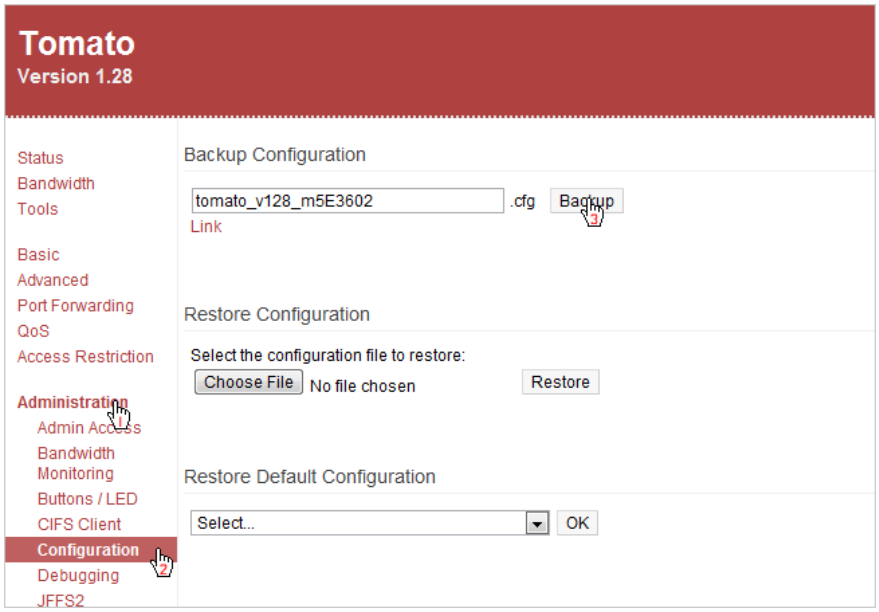
2. If the router is running Tomato firmware

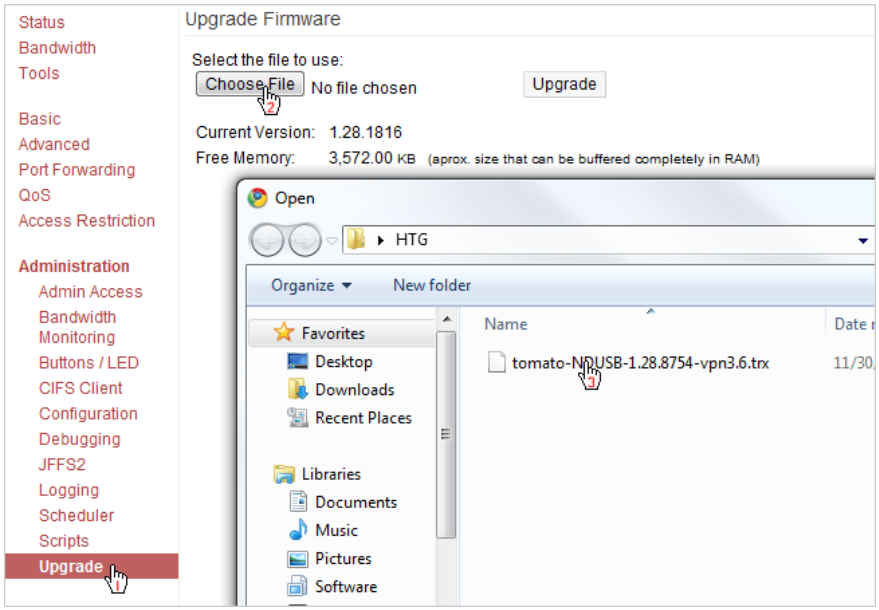
Open your browser and enter that IP address and then log in as above.



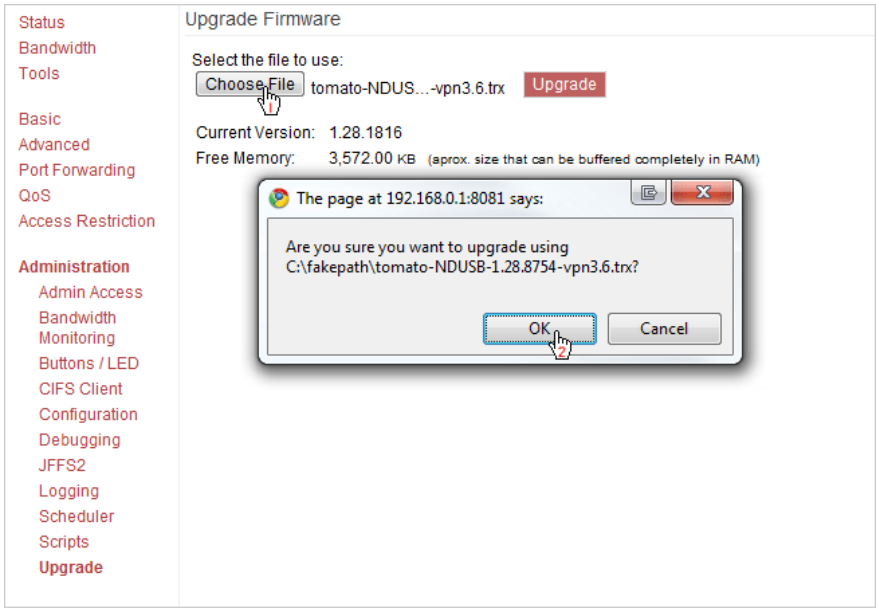
Although it is not necessary, you can also back up the Tomato configuration before proceeding to upgrade to TomatoUSB VPN. To save the configuration, go to **Administration** > **Configuration** and click **Backup** . This will ask you to save a file in **.cfg** format on your computer.



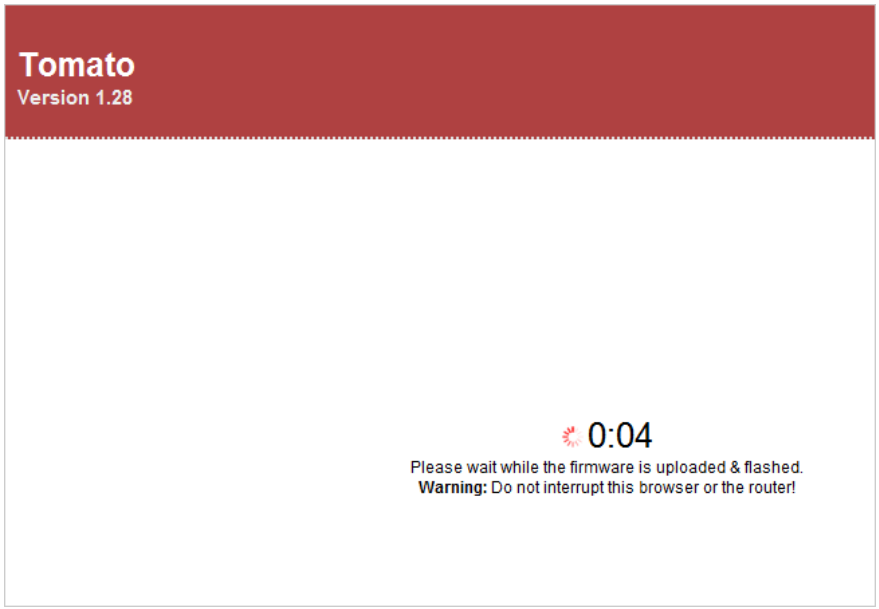
Now is the time to start upgrading Tomato to TomatoUSB VPN. Under **Administration** menu select **Upgrade** , then click **Choose File** button, navigate to the unzipped folder and select *tomato-NDUSB-1.28.8754-vpn3.6.trx* . **Press Upgrade** .



The dialog box asks for confirmation of upgrade, press **OK** .



Wait a few minutes for the router to update and restart automatically.

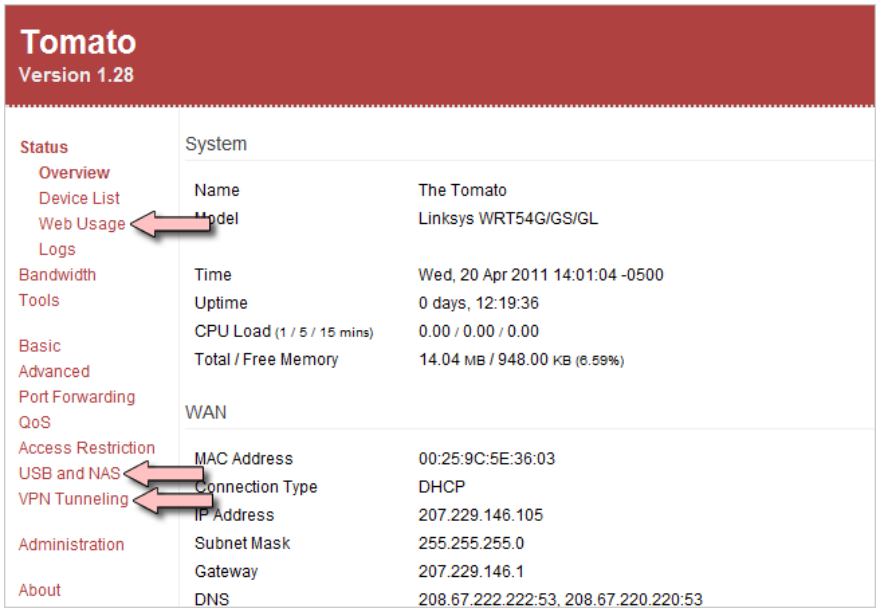


After restarting, you will probably get another IP address. In our case, the IP address remains the same. To determine the IP address, open the command prompt and type **ipconfig –release** , then **ipconfig –renew** and look at the **Default Gateway** line.

If your configuration is returned to the default, go to the **Configuration** page (*Administration* > *Configuration*) and click the **Choose File** button under *Restore Configuration* . Find the **.cfg** file you just saved in the previous step and click **Restore** .

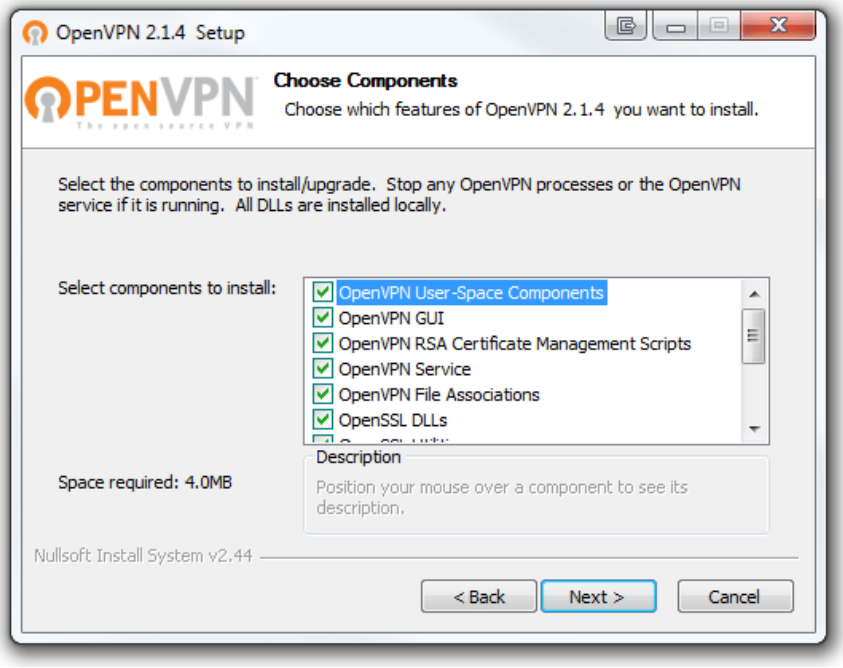
Configure OpenVPN

After upgrading to TomatoUSB VPN, at Tomato interface, there will be a new menu, *Web Usage, USB and NAS* , and *VPN Tunneling* . In this example we are only interested in the **VPN Tunneling** menu, click it and keep the browser open and go to the next step.



The next step is to go to **the** OpenVPN **home page** and download the *OpenVPN Windows Installer* **OpenVPN** version **2.1.4** . Note that while the latest version is **2.2.0,** there is an error that makes this process much more complicated. The OpenVPN program that we downloaded will allow you to connect to the VPN network, so install it on any computer you want it to be a client. Save *openvpn-2.1.4-install.exe* on your computer.

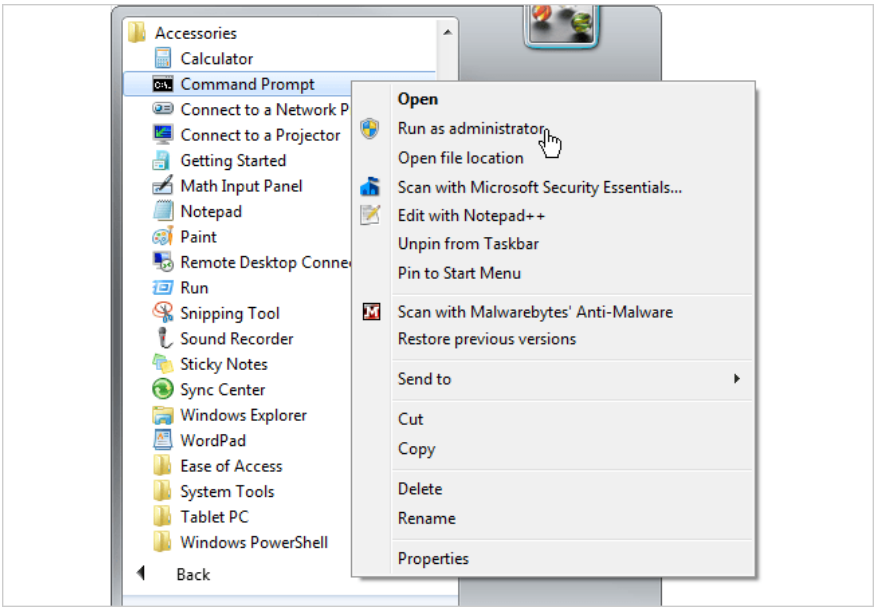
Navigating to the OpenVPN file just downloaded and double-clicking on it, the installation process will begin. The installation is very simple, just keep the default options and click **Next** . During installation, a small pop-up dialog box will appear and ask if you want to install a new virtual private network adapter named **TAP-Win32** , click **Install** .



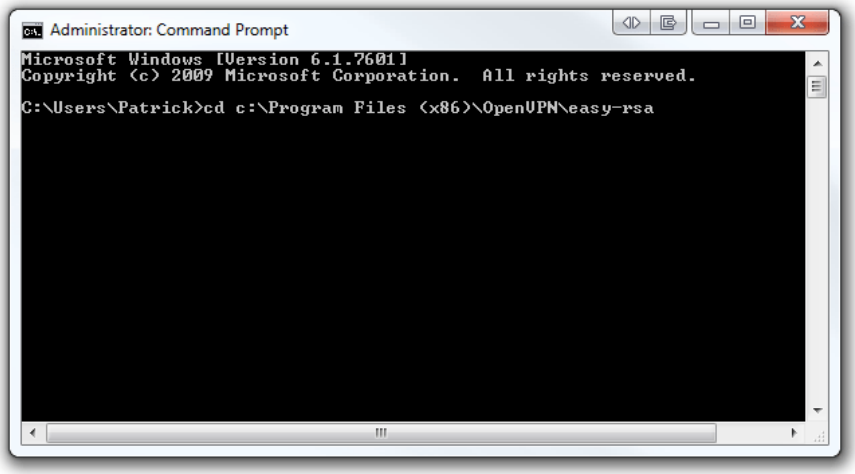
After installation is complete, you start creating Certificates and Keys for device authentication.

Create Certificates and Key

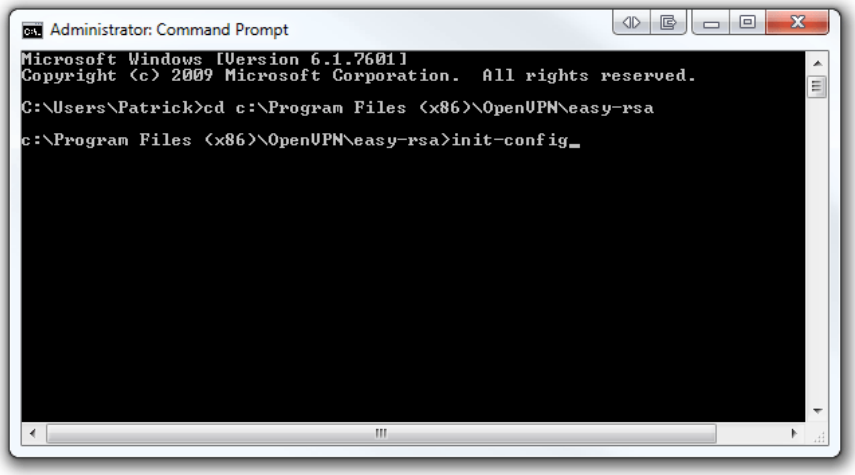
Go to the **Start** menu, select **Accessories** . Right-click *Command Prompt* select *Run as administrator* .



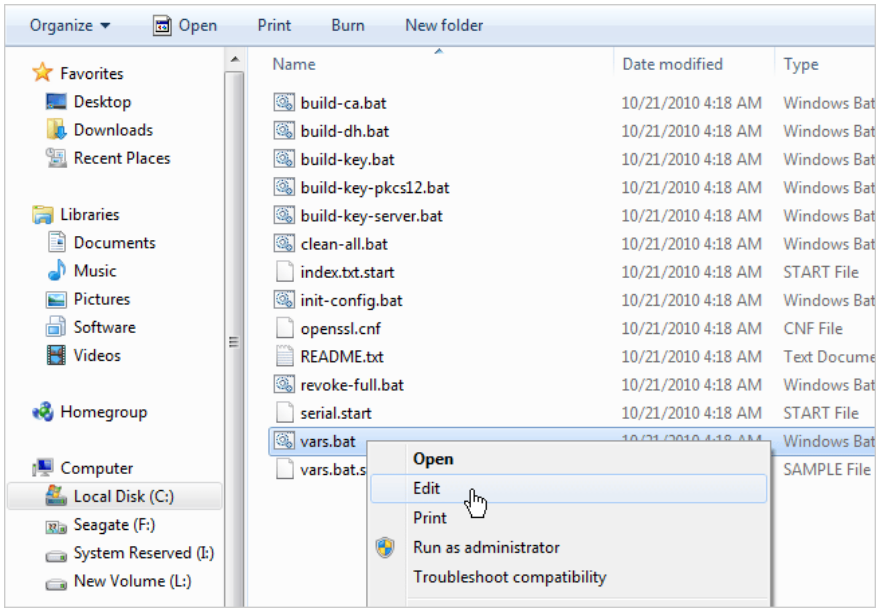
At the command prompt, type cd c: Program Files (x86) OpenVPNeasy-rsa if you are running Windows 7 64-bit as shown below. (If using 32-bit Windows 7, type cd c: Program FilesOpenVPNeasy-rsa). Press **Enter** .



Now type **init-config** , press **Enter** to copy the two files named *vars.bat* and *openssl.cnf* into the *easy-rsa* folder. Maintaining the command prompt window always opens and switches to the next step.



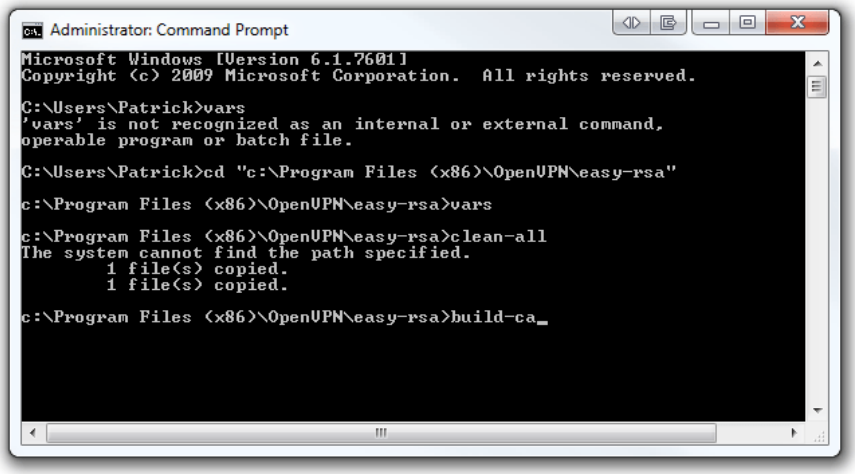
Open the folder *C: Program Files (x86) OpenVPNeasy-rsa* (or *C: Program FilesOpenVPNeasy-rsa* with 32-bit Windows 7) right-click the **vars.bat** file> select **Edit** to open it in Notepad. However we recommend using *Notepad* ++ as a text editor in a much better file. You can download Notepad ++ **here** .



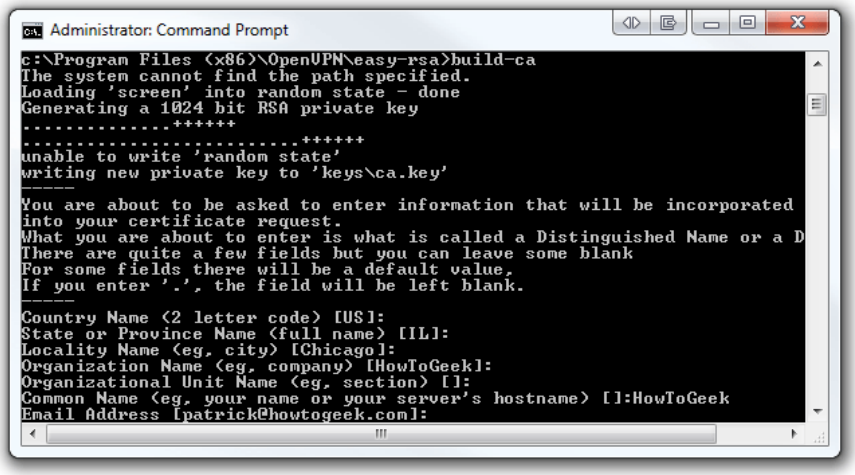
We will be most concerned about the end of this file. Start from line **31** , change the value of *Key_COUNTRY* , *Key_PROVINCE* . to your information. Such as the illustration below:

```
@echo off
rem Edit this variable to point to
rem the openssl.cnf file included
rem with easy-rsa.

set HOME=%ProgramFiles (x86)%\OpenVPN\easy-rsa
set KEY_CONFIG=openssl.cnf

rem Edit this variable to point to
rem your soon-to-be-created key
rem directory.
rem
rem WARNING: clean-all will do
rem a rm -rf on this directory
rem so make sure you define
rem it correctly!
set KEY_DIR=keys

rem Increase this to 2048 if you
rem are paranoid.  This will slow
rem down TLS negotiation performance
rem as well as the one-time DH parms
rem generation process.
set KEY_SIZE=1024

rem These are the default values for fields
rem which will be placed in the certificate.
rem Change these to reflect your site.
rem Don't leave any of these parms blank.

set KEY_COUNTRY=US
set KEY_PROVINCE=IL
set KEY_CITY=Chicago
set KEY_ORG=HowToGeek
set KEY_EMAIL=patrick@howtogeek.com
```

Go back to the command prompt window, type **vars** and press **Enter** , then type **clean-all** , press **Enter** . Finally type **build-ca** > **Enter** .

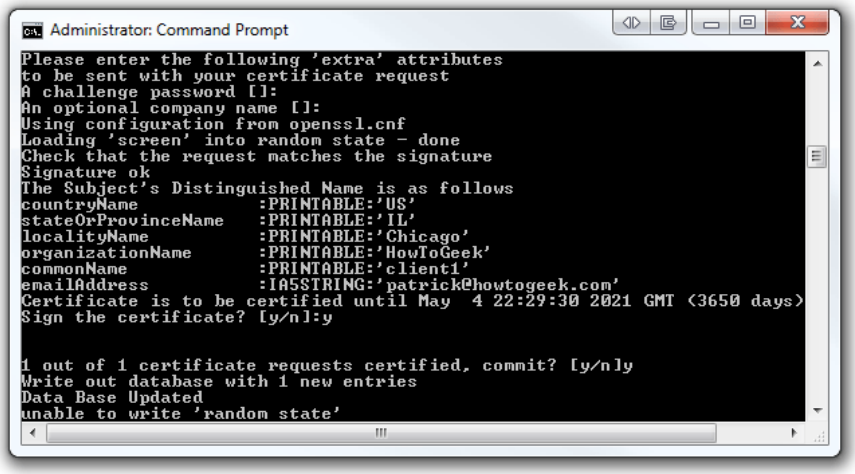


After executing the **build-ca** command, you will receive a request to enter information such as *Country* , *State* , or *Locality* . but since we have set up the *vars.bat* file above, just press **Enter.** to forgive. But before that, remember to enter the information in the **Common Name** section like your name. This command will output two files (*Root CA Certificate* and *Root CA Key*) in the *easy-rsa / Keys* folder.

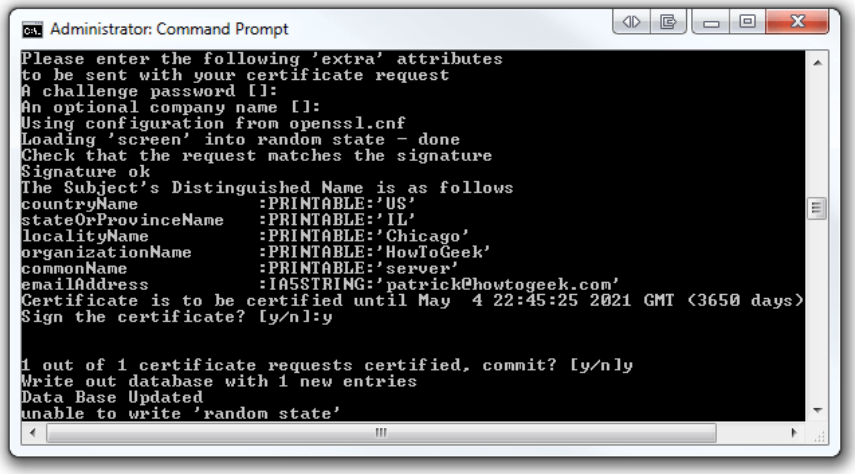


Now we will build a Key on the client machine. In the open command prompt, type **build-Key client1** . You can change *client1* to any name you want, just make sure the name matches the *Common Name* when requested. Other parameters are the default, then type ' **y** ' and press **Enter** .

If you get an error ' ***unable to write' random state*** 'you don't need to worry because your certificates are still working normally. This command will export two files (*Client1 Key* and *Client1 Certificate*) in the *easy-rsa / Keys* folder. If you want to create another Key for any client, repeat the steps above and just make sure to change the Common Name.

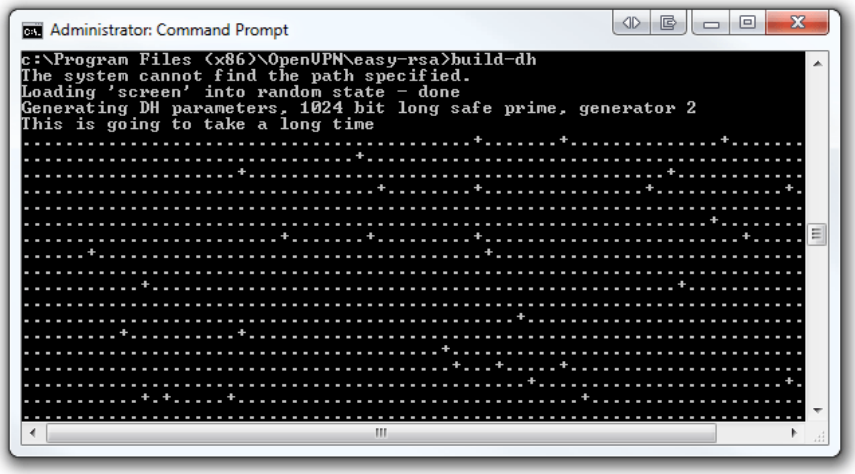


The final certificate is the **Key server** . In the command prompt, type **build-Key-server server** . You can replace ' *server* ' at the end of the command with the name you want (Example: *QTM-Server*) provided that the name must match the information recorded in Common Name. Finally press ' **y** ' to finish. This command will create two files (*Server Key* and *Server Certificate*) in the *easy-rsa / Keys* folder.



Next we have to create **Diffie Hellman** parameters. The Diffie Hellman protocol allows two users to exchange a secret key on an insecure environment. You can find out more about Diffie Hellman at RSA's website.

In the command prompt, type **build-dh** . This command will export **dh1024.pem** file in *easy-rsa / Keys* folder.

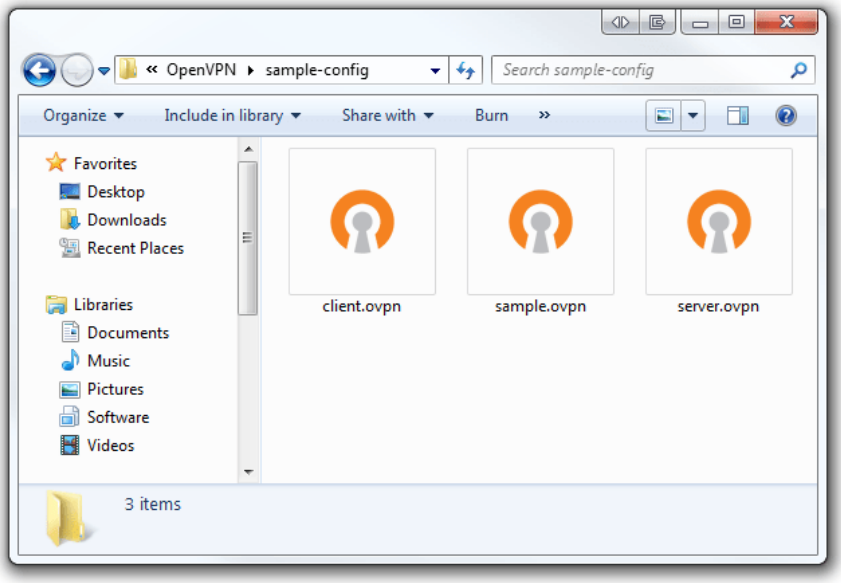


Initialize and configure the file for Client

Before we edit any file, setting up dynamic DNS service is a good idea. This service will be used if your ISP usually provides a dynamic IP address, if you have a static IP you can skip this step and move on to the next step.

Here we use DynDNS.com, a service that allows pointing a hostname to a dynamic IP address. The most important thing is to have OpenVPN always know your public IP address, and DynDNS will help OpenVPN do this. Register a free hostname and point to the public IP address. After registration is complete, set up Tomato auto-update in **Basic** > **DDNS** .

Go back to configuring OpenVPN. In Windows Explorer, move to *C: Program Files (x86) OpenVPNsample-config* (with Windows 7 64-bit) or *C: Program FilesOpenVPNsample-config* (with Windows 7 32-bit). In this directory you will see 3 files, but we only need to care about ***client.ovpn*** .



Right-click it and open it with Notepad or Notepad ++, you will see the content as shown below:

```
1  ##############################################
2  # Sample client-side OpenVPN 2.0 config file #
3  # for connecting to multi-client server.     #
4  #                                            #
5  # This configuration can be used by multiple #
6  # clients, however each client should have   #
7  # its own cert and key files.                #
8  #                                            #
9  # On Windows, you might want to rename this  #
10 # file so it has a .ovpn extension           #
11 ##############################################
12
13 # Specify that we are a client and that we
14 # will be pulling certain config file directive
15 # from the server.
16 client
17
18 # Use the same setting as you are using on
19 # the server.
20 # On most systems, the VPN will not function
21 # unless you partially or fully disable
22 # the firewall for the TUN/TAP interface.
23 ;dev tap
24 dev tun
25
26 # Windows needs the TAP-Win32 adapter name
27 # from the Network Connections panel
28 # if you have more than one.  On XP SP2,
29 # you may need to disable the firewall
30 # for the TAP adapter.
31 ;dev-node MyTap
32
33 # Are we connecting to a TCP or
34 # UDP server?  Use the same setting as
35 # on the server.
```

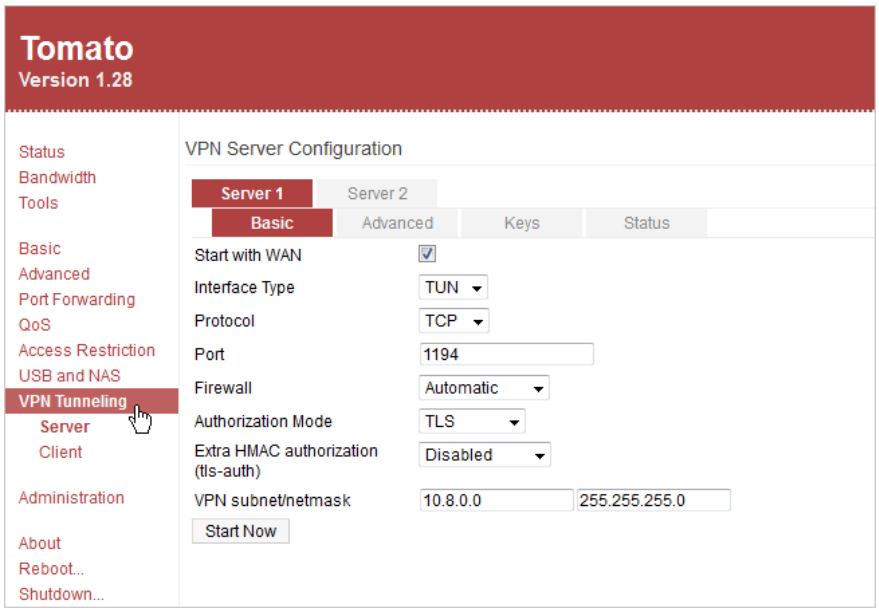
However, we want the *client.ovpn* file to be exported to be similar to the image below. Make sure you have changed DynDNS hostname in line **4** (or change the IP address if it is static). Keep port **1194** intact because this is the standard port of OpenVPN. Next, change lines **11** and **12** by the name of the *Certificate* file and *Key* you created for the client. Save this file as a new *.ovpn* file in the O *penVPN / config* folder.

```
client
dev tun
proto tcp
remote howtogeek.dyndns.org 1194
resolv-retry infinite
nobind
persist-key
persist-tun

ca ca.crt
cert client1.crt
key client1.key
ns-cert-type server
cipher AES-128-CBC
comp-lzo
verb 4
```

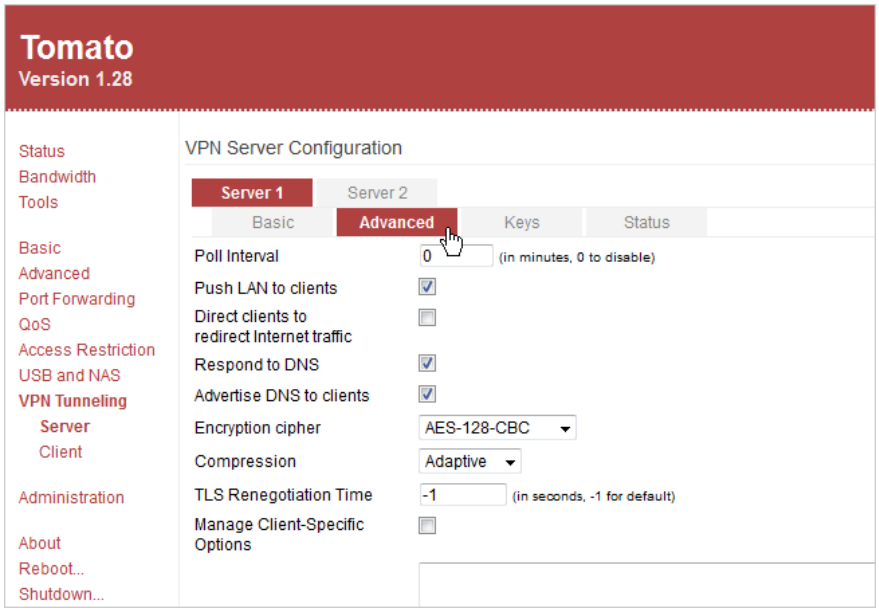
Configuring VPN Tunneling for Tomato

Now we will copy server certificates and keys and paste them into the Tomato VPN menu. We will then test some settings in Tomato, testing the VPN connection.

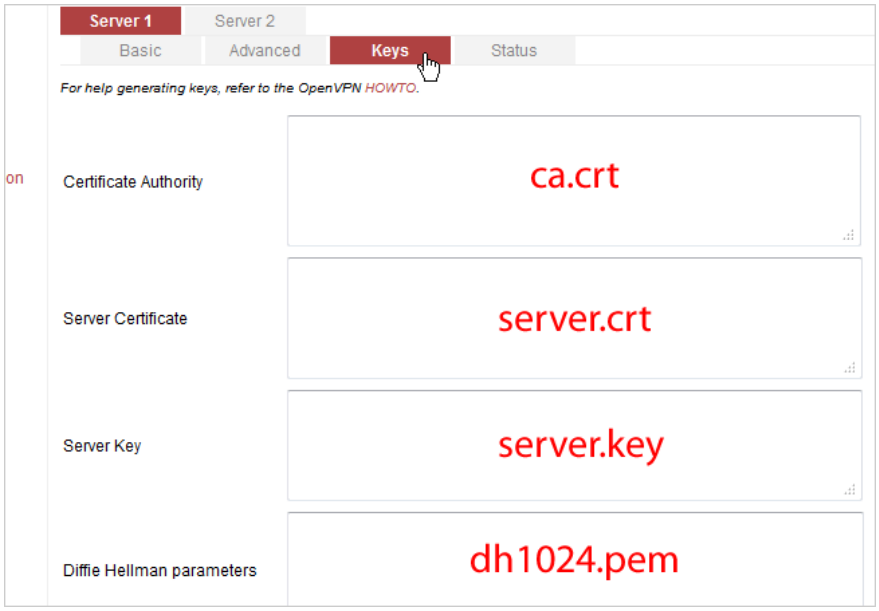
Open the browser and navigate to the router. Click the **VPN Tunneling** menu. Make sure **Server1** and **Basic** are both selected. Set up exactly the following, then click **Save** .



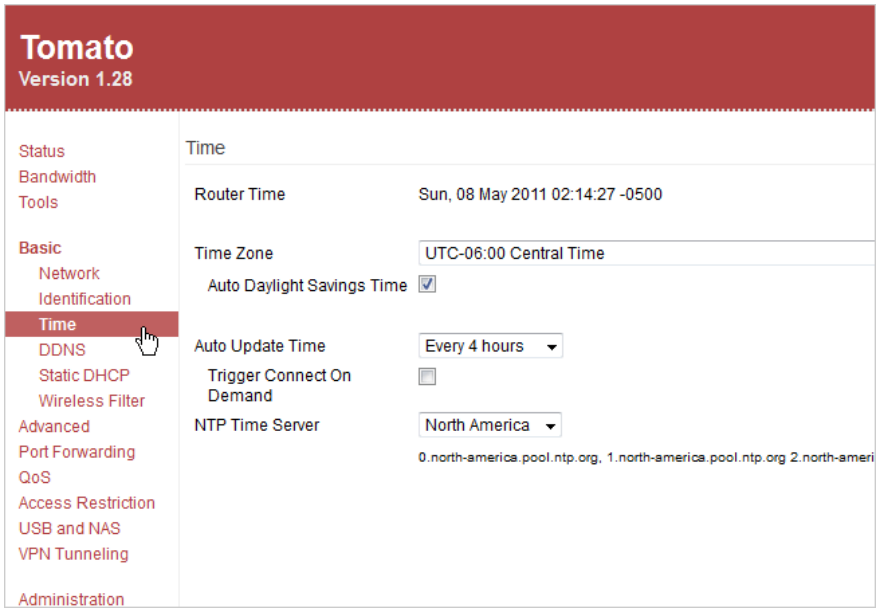
Switch to the **Advanced** tab next to the Basic tab. Set up the image below and click **Save** .



Finally, paste the Key and Certificates we created earlier. Switch to the **Keys** tab next to Advanced. In Windows Explorer, go to *C: Program Files (x86) OpenVPNeasy-rsaKeys* (Windows 7 64-bit) or *C: Program FilesOpenVPNeasy-rsaKeys* on Windows 7 32-bit. Open each corresponding file below (*ca.crt*, *server.crt*, *server.key*, and *dh1024.pem*) with Notepad or Notepad ++ utility and copy the contents. Paste this content into the corresponding boxes. Note that you only need to paste things below --BEGIN CERTIFICATE-- in *server.crt* . OpenVPN will still work properly if you paste the entire content, but it's best to just paste the ' *clean* ' information into it. Click **Save** and click **Start Now** .



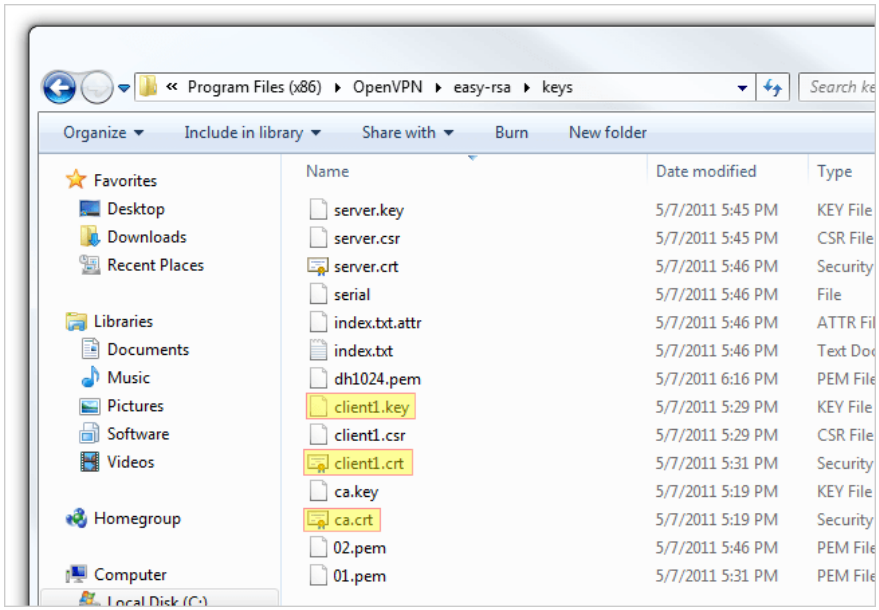
Before we test the VPN connection, there's another problem to check in Tomato. Go to **Basic** > **Time** menu. It is important to make sure that **Time Router** and **Time Zone display times** are correct with your current time zone. Set the **NTP Time Server section** according to the country you live in.



Set up OpenVPN Client

In this example we use a laptop running Windows 7 as a client. First, you also install OpenVPN for the client as shown above in configuring OpenVPN. Then open *C: Program FilesOpenVPNconfig* , this is where you will paste the files.

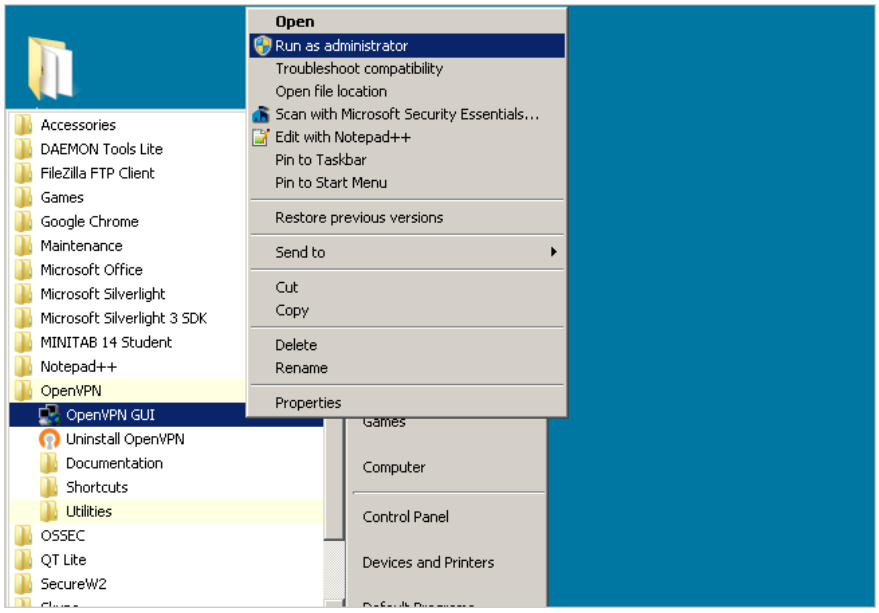
Now go back to the first computer to copy a total of 4 files to the laptop client. Navigate to *C: Program Files (x86) OpenVPNeasy-rsaKeys* and copy the *ca.crt, client1.crt* files, and *client1.key* then paste into the client's *config* folder.



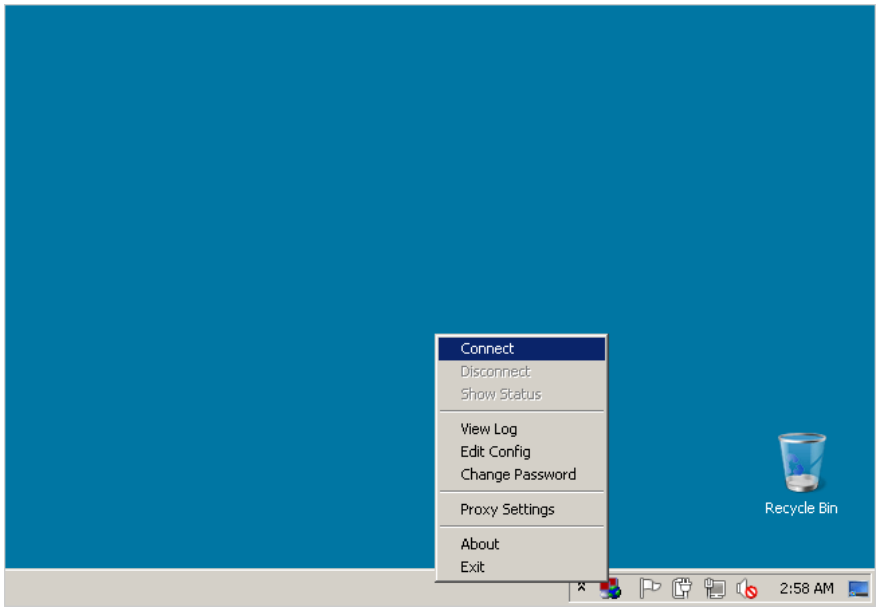
Finally we need to copy a file. Navigate to *C: Program Files (x86) OpenVPNconfig* and copy the previously created *client.ovpn* file, then paste it into the *config* folder.

Test OpenVPN Client

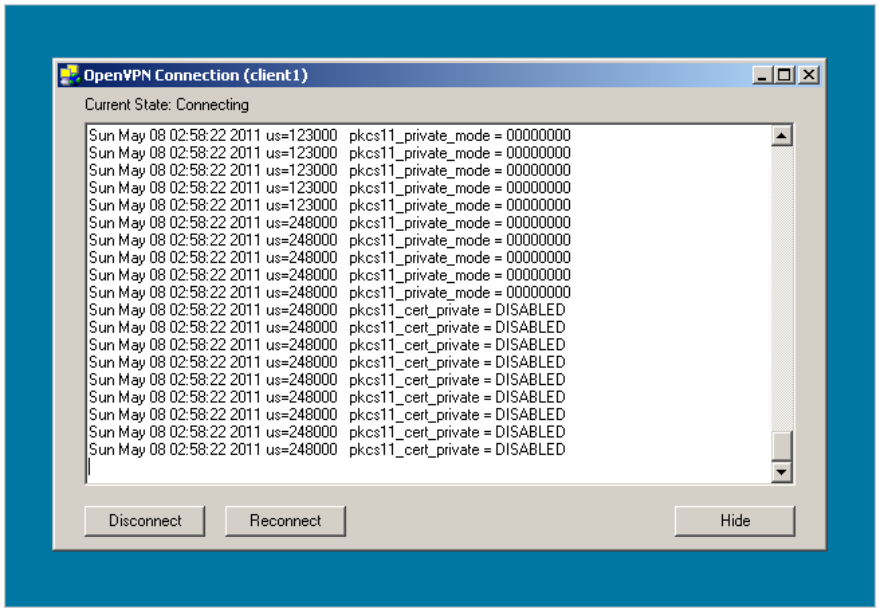
On the laptop client, click the **Windows Start** button> **All Programs** > **OpenVPN** . Right click on the **OpenVPN GUI** file> select **Run as administrator** . Note that you must always run OpenVPN as an *administrator* so it works best. To do this, set it up forever as an administrator by right-clicking on the file, selecting **Properties** , under the **Compatibility** tab, tick the entry ' *Run this program as an administrator* '.



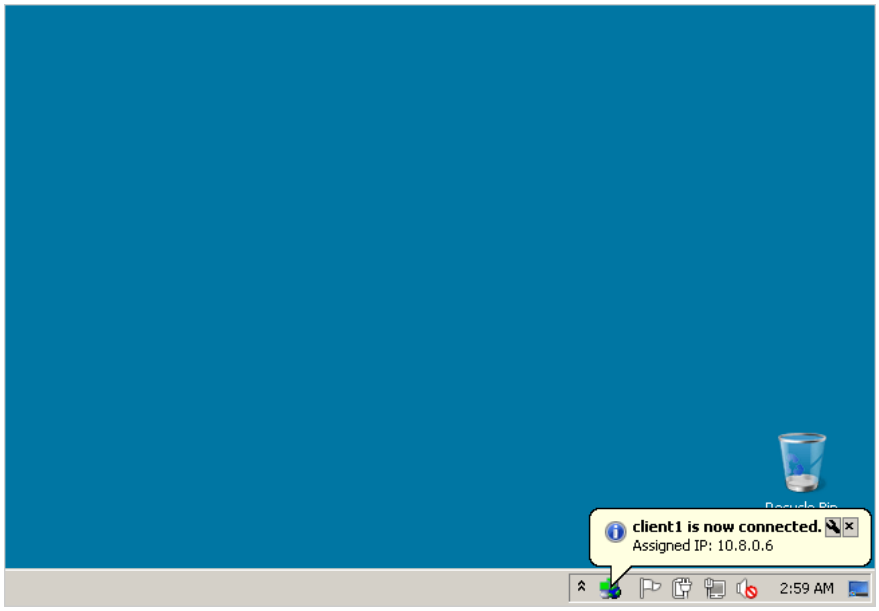
The OpenVPN GUI icon will appear next to the system clock of the taskbar. Right-click this icon and select **Connect** .



A pop-up dialog box will display connection logs.



Once you have connected to the VPN, the OpenVPN icon in the taskbar will turn green and display your virtual IP address.



So you succeeded. You now have a secure connection between the server and the client using OpenVPN and TomatoUSB. To continue checking the connection, try opening a browser on the client and navigating to the Tomato router on the server's network.

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