

How To Configure Your FabFi Routers

5/25/09 : Based on the information at the <http://fabfi.fabfolk.com> wiki page.

In router configuration, you will do two major steps on both routers: 1) Install OpenWRT and 2) configure the routers – one as an upstream access point (AP) and one as downstream station (STA).

It's helpful to review the background information but you can jump straight to the steps by following this quickguide:

Preparation:

- 1) Download <http://fabfi.fabfolk.com/download/openwrt-wrt54gl.bin>
- 2) If you will not have internet access when configuring the routers, download

http://fabfi.fablab.af/download/fabfi_ALL.tar.gz
<http://fabfi.fablab.af/download/setrouter>

If you will have internet access during the configuration, skip this step.

- 3) Fill out the [Configuration Worksheet](#).

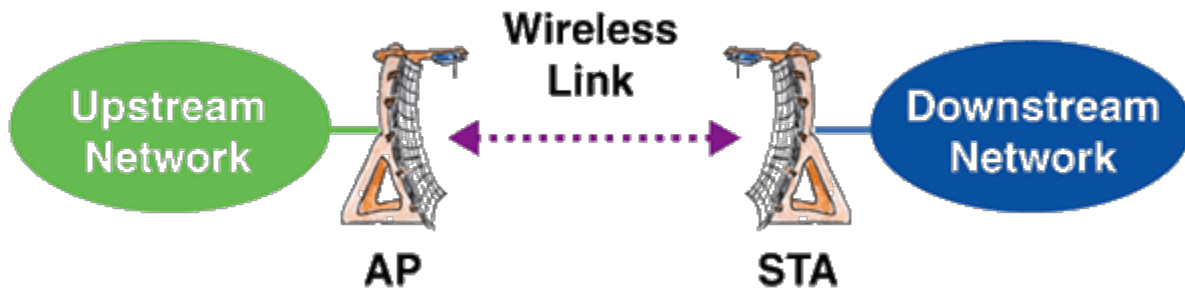
Configure your routers:

- 4) Select one router to be your AP and label it “AP”
- 5) Follow the directions for “[Installing OpenWRT on a Linksys WRT54GL](#)”
- 6) Follow the directions for “[Running the Config Script setrouter](#)”
- 7) Label the remaining router “STA”
- 8) Follow the directions for “[Installing OpenWRT on a Linksys WRT54GL](#)”
- 9) Follow the directions for “[Running the Config Script setrouter](#)”

You're finished!

Background Information

In every FabFi link there are two endpoints, upstream (AP) and downstream (STA). The upstream endpoint functions nearly like an out-of-the-box wireless router, whereas the downstream endpoint requires reconfiguration of the router such that the wireless interface is bridged to the WAN interface instead of the LAN. In order to enable this reconfiguration, and enable some other useful options, the default router firmware must be replaced with something more flexible. We have chosen [[OpenWRT](#)], an open source, Linux-based¹, 3rd party router firmware to replace the default firmware. The following sections detail the downloading, installation, and configuration of this firmware for the Linksys WRT54GL.



OpenWRT supports a variety of routers, but we will be focusing on the Linksys WRT54GL (because that's all we know anything about). No matter what router you use you must be ABSOLUTELY SURE that it is supported before installing OpenWRT, or there's no telling what could happen. You can find more information on the using router models other than the Linksys WRT54GL on the FabFi wiki².

OpenWRT, being a linux based firmware, keeps all of its configuration variables in plain text files, with the ones relevant to this application being located in two directories:

```
/etc/config  
/etc/init.d
```

the files we explicitly change or add in our configuration are

```
/etc/config/wireless  
/etc/config/network  
/etc/config/system  
/etc/passwd  
/etc/init.d/firewall  
/etc/init.d/custom-user-startup  
/etc/crontabs/root  
/etc/crontab  
/etc/setrouter  
/etc/checkwifi  
/etc/wifi_logs
```

(symbolic link, for convenience)
(copy, not necessary for operation)
(script to check wifi status and fix if down)
(directory for checkwifi logs)

To edit these files, log on to the router using telnet or SSH (depending on whether or not you've set a password already).

If you want to understand exactly what we change, download all these files from your router before running the config script and compare them to the versions that exist after running it.

The file `/etc/init.d/custom-user-startup` should not exist before the config script is run.

¹ OpenWRT uses a Borne shell

² <http://wiki.fablab.af/index.php/Fab-Fi>

Installing OpenWRT on a Linksys WRT54GL

When you take your WRT54GL out of the box, it will be preloaded with a web-based admin GUI. This GUI's firmware upgrade feature will be used to install OpenWRT.

Downloading OpenWRT

- Download a copy of the currently deployed FabFi firmware binary from the FabFi site³. As of this writing it is identical to the OpenWRT 7.09 "kamikaze" release⁴. If you are looking for the binary associated with a particular release, take a look at our distribution page⁵.
- Save the binary to your local machine.



Updating your Router's Firmware to OpenWRT

- Plug your PC or laptop into one of the four LAN ports on the WRT54GL.
- If you have WiFi or a second ethernet port on your computer, disable it.
- Open a browser (Explorer, Firefox, Safari, etc) and go to <http://192.168.1.1>
- Enter the default user name and password
user name : <blank>
password : admin
- Go to the '*Administration*' tab
- Go to the '*Firmware Upgrade*' subtab
- Click '*Browse*' and enter the .bin file you downloaded
- Click *upgrade*. The Power light on the front of the WRT54GL should start flashing and continue to do so until the firmware upgrade is complete.
- Wait for the router to reboot
- Close the browser on your computer.

³ <http://fabfi.fabfolk.com/download/openwrt-wrt54gl.bin>

⁴ <http://downloads.openwrt.org/kamikaze/7.09/brcm-2.4/openwrt-wrt54g-2.4-squashfs.bin>

⁵ <http://fabfi.fabfolk.com/distribution.html>

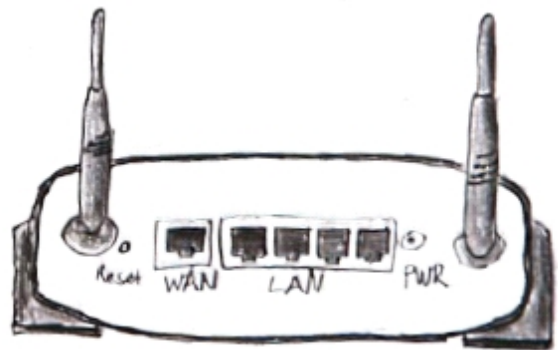
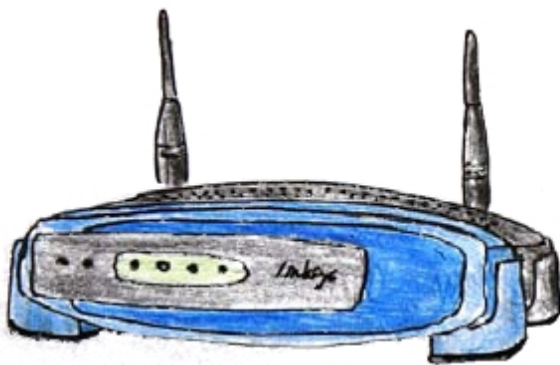
Configuring the Router for Use In a FabFi System

Configuring an OpenWRT router is usually done by logging in to the router with telnet or SSH and manually editing the files. Because there is a significant amount of stuff to change, we provide a FabFi Configuration Script `setrouter` that walks through the entire configuration step by step.

`setrouter` prompts the user to name the link, set a password and download required software. Based on the link name provided, the script selects an IP addresses using our addressing scheme. After completing the script for both an AP and a STA router, the link is ready to deploy.

The script can be run in two ways, connected to the internet and not connected to the internet. If you have a wired internet connection available, it's the easiest way to configure the system because the script get the right files and puts them in the right places for you.

Your first step is to fill out the configuration worksheet to gather the information needed during the script. Then select the correct instructions to run the script based on your connection (or lack of) to the internet.



How To Telnet Into the Router

Once OpenWRT has been installed on your router you will no longer be able to connect to it with a web-based GUI. (unless you install one. It's a waste of space IMO.) Instead you will need to use telnet. For linux users, simply type:

```
telnet 192.168.1.1
```

in your terminal (you should already to be connected to the router through one of the LAN ports and the router should be powered on)

If you're a windows user, you can type a similar command at your command prompt, but because you'll need SSH for all of the following steps, you should download a telnet/SSH client now. We like to use a free program called PuTTY⁶ and our instructions following assume you're using it too.

Once you've downloaded PuTTY, select the *telnet* radio button in its login window and type in the IP address of the router (192.168.1.1) into the *Host Name* field.

Once you're telnetted in, you'll see the OpenWRT splash screen and a command prompt.

⁶ <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

setrouter Configuration Worksheet

The configuration script will need to know some information in order to set up your pair of routers correctly. Fill out the following information before running the script so you don't need to spend time figuring it out while you're doing it.

- Do you need to download config files?

___ **YES** You have a wired internet connection available and you have not previously run `setrouter`

___ **NO** You do not have a wired internet connection available, or have previously run `setrouter` on the current router.

- Select a wireless channel number You will use the same for both STA and AP. Select the channel with the minimum number of other devices to avoid conflicts. If you don't know, pick any number. Circle one:

My channel number is: 1 2 3 4 5 6 7 8 9 10 11

- Estimate the distance between STA and AP in meters. The easiest way to do this is probably with a GPS.

The distance between my antennas is : _____ meters.

- WEP key (must be the same for STA and AP). You select this yourself but do not need to distribute it to users on your network. It is only for the STA and AP pairs to recognize each other.

My WEP Key is : _____

- The pair ID number (must be the same for AP and STA). This must be a unique number within the wider FabFi system. Your number should be the next sequentially higher number than the last FabFi node added. We use this pair number as the class C IP address of the network so it must be an integer between 0 and 254.

My FabFi ID pair number is: _____

- AP or STA (AP is upstream, STA is downstream). Each pair has 1 AP and one or more STAs. We strongly suggest you label your routers with a marker, tape, or other kind of label while you are configuring them so that you can tell them apart. You must make at least one AP and one STA. Use this space to remind yourself of which you are working on now:

___ **AP** Wait to check off these lines when you answer the question in the script. If you have checked

___ **STA** off the line, it means you have created that router and the next one should be the other kind of router.

- STA number. Each pair must have one AP but can have many STA's. If you are creating a STA, the script will ask you for the station number. You should use "1" unless a pair has multiple stations. We use this value to determine the class D section of the STA's upstream IP address so it must be an integer between 1 and 254.

Cross off the numbers as you use them and use the next free one in future setups. Write in other numbers if needed.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

- The script will prompt you to enter a root password. You will need to use it to log in from now on. Write down your password here:

My root password is : _____

- The script will then ask you if you would like to install optional software. If you don't know, select NO.
 - **nmap** is a program to search for computers connected to the router. This program is helpful for finding devices connected to your router with static IP's.

___ YES I want to install nmap

___ NO If you plan on installing a lot of other software, skip it because it's big.

- **tcpdump**: a packet sniffer, good for debugging firewall and routing problems.

___ YES I want to install tcpdump

___ NO

End of worksheet.

You're now ready to run the `setrouter` script.

Be sure to use the correct instructions for either "with" or "without" a wired internet connection.

Running the Config Script `setrouter`

WITH INTERNET CONNECTION	WITHOUT INTERNET CONNECTION
	Copy the setrouter and fabfi_ALL.tar.gz files on to the router in the <code>/tmp</code> directory. You will have needed to have downloaded these files previously.
	For a new install of OpenWRT you will need to set a root password with the <code>passwd</code> command, then transfer the files using <code>scp</code> . You may want to use the free program WinSCP ⁷ to transfer files from a Windows machine.
Use the Configuration Script worksheet to determine the information you'll need before running the script.	Use the Configuration Script Worksheet to determine the information you'll need before running the script.
Plug a network cable into the WAN (labeled 'Internet') port on your router that's connected to the internet.	
Telnet into your router. See How To Telnet Into the Router for help.	Telnet into your router. See How To Telnet Into the Router for help.
Download the config script to your router with following command : <pre>wget http://fabfi.fablab.af/download/setrouter -O /tmp/setrouter</pre>	
Run the script by typing <pre>sh /tmp/setrouter</pre>	Run the script by typing <pre>sh /tmp/setrouter</pre>
If you have trouble running the script you may need to change the permissions of the file. Type <pre>chmod +x /tmp/setrouter</pre>	If you have trouble running the script you may need to change the permissions of the file. Type <pre>chmod +x chmod +x /tmp/setrouter</pre>
and try running the script again.	and try running the script again.
Follow the instructions in the script.	Follow the instructions in the script.

You're done!

Your router is now ready to be physically installed on the reflector. The remaining information in this document is not necessary for basic configuration.

WARNING: if you abort the script after you see the list of settings printed out but before you set a password, you will have to use `ssh` and the password `cisco123` to log in the next time (see below for `ssh` commands). Everything else will work the same as above

⁷ <http://winscp.net/eng/index.php>

Advanced Configuration Topics

Manual File Download

Don't like the config script? A tarball with everything you need for APs and STAs can be found at http://fabfi.fablab.af/download/fabfi_ALL.tar.gz

Place this file in /tmp directory on the router and unzip it with this command (warning: will overwrite files in your /etc directory):

```
tar -C /tmp -xzf <path to tarball>
```

you will then find tarballs for the APs and STAs in

```
/tmp/fabfi_configs
```

unzip the one you want with the command

```
tar -C / -xzf <path to tarball>
```

Note: if you don't use the config script, you will encounter a bug in the OpenWRT distribution where ipkg will not be able to find some packages. To fix this change the

```
src packages http://downloads.openwrt.org/kamikaze/packages/mipsel
```

line in /etc/ipkg.conf to

```
src packages http://downloads.openwrt.org/kamikaze/7.09/packages/mipsel
```

Logging Into Your Configured Router

Once you have set a password for your router, telnet will no longer be available. The next time you log in (and from now on) you must use SSH:

- from upstream :

```
ssh root@<external IP of router>
```

- from downstream :

```
ssh root@<LAN gateway IP of router>
```

For windows users, use PuTTY and select the SSH radio button.

Tweaks for Weak Signals

By default, OpenWRT STAs are configured to search for new APs when the signal dips below -60dB. If you only have one SSID configured the setting probably doesn't really matter, but just in case, you can change this setting in the

```
/etc/init.d/custom-user-startup
```

file by adding the line

```
wl roam_trigger -##
```

where ## is the dB level below which you want the router to roam. For the big link in Jalalabad, this is set at -87dB because the noise floor is so low, and our signal strength is nominally in the mid -70s.

Disabling Logging

The current version of our distribution runs a wifi status check/repair/logging script. We recommend you use it because it increases system reliability, but if you want to turn it off, you simply comment out a line in a file on the router.

The file is :

```
/etc/crontabs/root
```

Find the line :

```
sh /etc/checkwifi
```

and add a # in front of it like this :

```
# sh /etc/checkwifi
```

Alternatively, you can also directly edit the script in :

```
/etc/checkwifi
```

The log folder is cleaned up daily by this line in the cron file :

```
mv -f /etc/wifi_logs/today.log /etc/wifi_logs/`date +"%Y-%m-%d"`;cd  
/etc/wifi_logs;a=0; a_in...
```